Chapter 23
Noise

This section describes the existing ambient noise conditions in the Plan Area, discusses noise and vibration thresholds for short-term construction and long-term operation of the conveyance components (CM1) and conservation measures (CM2–CM22); identifies potential impacts from construction and operational noise related to the construction and operation of the conveyance components and conservation measures; and identifies mitigation measures to mitigate significant impacts.

23.1 Environmental Setting/Affected Environment

The study area (the area in which impacts may occur) for noise consists of the Plan Area (the area covered by the BDCP) and the Areas of Additional Analysis, as discussed in Chapter 4, *Approach to the Environmental Analysis*. The potential effects of Conservation Measure (CM) 1 on these receptors are evaluated at the project level, and the effects of CM2–CM22 are evaluated at the program level, consistent with the approach described in Chapter 4.

This section describes the existing environment in the study area, and identifies receptors that may potentially be affected by noise. The section begins with an explanation of the fundamentals of noise analysis.

This section does not discuss the noise setting or potential effects in the SWP and CVP Export Service Areas Region (Export Service Areas Region) because direct and indirect effects on noise from implementing the alternatives are primarily related to effects in the Plan Area. Operational changes in the other geographic regions of the project area—Upstream of the Delta and the State Water Project (SWP) and Central Valley Project (CVP) Export Service Areas—would not result in changes to the existing environment and thus these regions are not addressed further in the noise analysis. However, to the extent that there is a potential for growth inducement effects on noise in the Export Service Areas Region, this topic is addressed in Chapter 30, *Growth Inducement and Other Indirect Effects*.

23.1.1 Definitions of Noise

Noise is generally defined as a loud, unpleasant, unexpected, or undesired sound that is typically associated with human activity and that interferes with or disrupts normal activities. Levels of sound are measured and expressed in decibels (dB). Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. Methods used to measure or quantify sound levels depend on the source, the receiver, and the reason for measurement. The most common metric is the overall A-weighted sound level measurement, which measures sound in a manner similar to the way a person perceives or hears sound, thus achieving a strong correlation for evaluating acceptable and unacceptable sound levels. A-weighted measurement has been adopted by regulatory bodies worldwide. These sound levels are expressed as dBA.

A-weighted sound levels are typically measured or presented as L_{eq}, which is defined as the average sound level for a stated period of time. The L_{eq} is commonly used to measure steady-state sound that

is usually dominant. The A-weighted noise levels of common sources measured in the environment and industry for various qualitative sound levels are provided in Table 23-1.

Statistical methods are used to capture the dynamics of a changing acoustical environment. These measurements are typically denoted by L_{xx}, where $_{xx}$ represents the percent of time a sound level is exceeded. The L_{90} represents the sound level that is exceeded during 90% of the measurement period. Similarly, the L_{10} represents the sound level exceeded for 10% of the measurement period. Another sound level expression is L_{max}, which is the maximum sound pressure level over a defined period. These methods are used for measuring existing noise for various land use categories in the counties in the study area (Section 23.2.3, *Regional and Local Plans, Policies, and Regulations*).

Table 23-1. Typical Sound Levels Measured in the Environment and Industry

Source at a Given Distance	A-Weighted Sound Level in Decibels (dBA)	Qualitative Description
Carrier deck jet operation	140	
	130	Pain threshold
Jet takeoff (200 feet)	120	
Auto horn (3 feet)	110	Maximum vocal effort
Jet takeoff (1,000 feet) shout (0.5 feet)	100	
New York subway station Heavy truck (50 feet)	90	Very annoying Hearing damage (8-hour, continuous exposure)
Pneumatic drill (50 feet)	80	Annoying
Freight train (50 feet) Freeway traffic (50 feet)	70	Intrusive (telephone use difficult)
Air conditioning unit (20 feet)	60	
Dishwasher (next room)	50	Quiet
Living room, bedroom	40	
Library, soft whisper (5 feet)	30	Very quiet
Broadcasting/recording studio	20	
	10	Just audible

Source: Adapted from New York Department of Environmental Conservation 2001 (Table E, Assessing and Mitigating Noise Impacts).

dBA = A-weighted sound level in decibels.

Another metric used to determine the effect of environmental noise is the difference in response that people have to daytime and nighttime noise levels. During the evening and at night, exterior background noises are generally lower than daytime levels. However, most household noise also decreases at night and exterior noise becomes more noticeable. Furthermore, most people sleep at night and are more sensitive to intrusive noises at that time. To account for human sensitivity to evening and nighttime noise levels, the Daytime-Nighttime Noise Level (DNL) (also abbreviated as L_{dn}) and California's Community Noise Equivalent Level (CNEL) were developed. The DNL is a noise metric that accounts for the greater annoyance of noise during the nighttime hours (10:00 p.m. to 7:00 a.m.). The CNEL is a noise index that accounts for the greater annoyance of noise during the evening hours (7:00 p.m. to 10:00 p.m.) and nighttime hours.

DNL values are calculated by averaging hourly L_{eq} sound levels for a 24-hour period and applying a weighting factor to the nighttime L_{eq} values. CNEL values are calculated similarly, except that a weighting factor is also added to evening L_{eq} values. The weighting factors, which reflect the increased sensitivity to noise during evening and nighttime hours, are added to each hourly L_{eq} sound level before the 24-hour DNL or CNEL is calculated. For the purposes of assessing noise, the 24-hour day is divided into three time periods, with the following weightings.

- Daytime hours: 7:00 a.m. to 7:00 p.m. (12 hours) – weighting factor of 0 dBA.
- Evening hours (for CNEL only): 7:00 p.m. to 10:00 p.m. (3 hours) – weighting factor of 5 dBA.
- Nighttime hours (for both CNEL and DNL): 10:00 p.m. to 7:00 a.m. (9 hours) – weighting factor of 10 dBA.

The adjusted time-period noise levels are then averaged to compute the overall DNL or CNEL value. For a continuous sound source, the DNL value is easily computed by adding 6.4 dBA to the overall 24-hour sound level (L_{eq}). For example, if the expected continuous sound level from a sound source is 60.0 dBA, the resulting DNL from the source would be 66.4 dBA. Similarly, the CNEL for a continuous sound source is computed by adding 6.7 dBA to the overall 24-hour L_{eq}. Given the small differences, the two are often used interchangeably.

The effects of noise on people can be listed in three general categories.

- Subjective effects of annoyance, nuisance, dissatisfaction.
- Interference with activities such as speech, sleep, learning.
- Physiological effects such as startling and hearing loss.

In most cases, effects from sounds typically found in the natural environment (compared to an industrial or an occupational setting) would be limited to the first two categories: creating an annoyance or interference with activities. No completely satisfactory method exists to measure the subjective effects of sound, or to measure the corresponding reactions of annoyance and dissatisfaction. This lack of a common standard arises primarily from the wide variation in individual thresholds of annoyance and habituation to sound. Thus, an important way of determining a person's subjective reaction to a new sound is by comparing it to the existing or "ambient" environment to which that person has adapted. In general, the more the level or tonal (frequency) variations of a sound exceed the previously existing ambient sound level or tonal quality, the less acceptable the new sound will be, as judged by the exposed individual.

The general human response to changes in sound levels having similar frequency content (for example, comparing increases in continuous [L_{eq}] traffic sound levels) is summarized as follows.

- A 3 dB change in sound level is considered a barely noticeable difference.
- A 5 dB change in sound level will typically be noticeable.
- A 10 dB change in sound level is considered to be a doubling in loudness.

Noise-sensitive land uses include places where people reside such as residences, hospitals, and health care facilities. Recreational areas, places of worship, and libraries are also considered to be sensitive to noise during use hours which are typically during the day. The discussion of noise impacts in this chapter is limited to effects on human use areas. Noise from construction of surface elements of the project could have an indirect effect on wildlife in the vicinity of the project and in nearby wildlife preserve areas. While noise pollution can be detrimental to wildlife generally, bird

populations are particularly susceptible because they rely on acoustic signals for mating, predator evasion, and communication between adults and offspring, among other behaviors. The project's effects on wildlife in the vicinity of the project and in nearby wildlife preserve areas are discussed in Chapter 12, *Terrestrial Biological Resources*.

23.1.2 Groundborne Vibration

This section describes basic concepts related to groundborne vibration. In contrast to airborne sound, groundborne vibration is not a phenomenon that most people experience every day. The background vibration velocity level in residential areas is usually much lower than the threshold of human perception. Most perceptible indoor vibration is caused by sources within buildings, such as mechanical equipment operation, people moving, or doors slamming. Typical outdoor sources of perceptible groundborne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads.

Construction activity can result in varying degrees of ground vibration depending on the equipment and method used. Equipment such as air compressors, light trucks, and hydraulic loaders generate little or no ground vibration. Pile drivers, vibratory compactors, and demolition equipment have the potential to generate substantial vibration, which may present a concern if close to buildings (Federal Transit Administration 2006).

Dynamic construction equipment such as pile drivers can create vibrations that radiate along the surface and downward into the earth. These surface waves can be felt as groundborne vibration. Vibration can result in effects ranging from annoying people to damaging structures. Variations in geology and distance result in different vibration levels comprising different frequencies and displacements. In all cases, vibration amplitudes will decrease with increasing distance from the vibration source.

As vibration waves travel outward from a source, they excite the particles of rock and soil through which they pass and cause them to oscillate. The actual distance that these particles move is usually only a few ten-thousandths to a few thousandths of an inch. The rate or velocity (in inches per second) at which these particles move is the commonly accepted definition of the vibration amplitude, referred to as the peak particle velocity (PPV).

Groundborne vibration can also be expressed in terms of root mean square (RMS) vibration velocity to evaluate human response to vibration levels. RMS is defined as the average of the squared amplitude of the vibration signal. The vibration amplitude is expressed in terms of vibration decibels (VdB), which use a reference level of 1 micro-inch per second. The threshold of perception for most people is around 65 VdB. Vibration levels in the 70–80 VdB range are often noticeable but acceptable. Typically, vibration levels must exceed 100 VdB before building damage occurs. Historic structures, however, may have a damage threshold as low as 90 VdB.

The potential for annoyance and physical damage to buildings from vibration is the primary issue associated with groundborne vibration. The human response to continuous groundborne vibration is shown in Table 23-2.

Table 23-2. Human Response to Continuous Vibration from Traffic

Peak Particle Velocity (Inches/Second)	Human Response
0.4–0.6	Unpleasant
0.2	Annoying
0.1	Begins to annoy
0.08	Readily perceptible
0.006–0.019	Threshold of perception

Source: Whiffen and Leonard 1971.

Damage potential thresholds for vibration generated by construction activities are shown in Table 23-3.

Table 23-3. Maximum Vibration Levels for Preventing Damage

Building Category	Limiting Velocity (PPV in Inches/ Second)	Approximate Maximum Vibration Level (VdB)
Reinforced-concrete, steel, or timber (no plaster)	0.5 [a]	102
Engineered concrete and masonry (no plaster)	0.3 [a]	98
Historic and some old buildings	0.25 [b]	96
Non-engineered timber and masonry buildings	0.2 [a]	94
Buildings extremely susceptible to vibration damage	0.12 [a]	90

PPV = peak particle velocity.
VdB = root mean square velocity in decibels are 1 micro-inch/second.
[a] Source: Federal Transit Administration 2006.
[b] Source: California Department of Transportation 2004.

At higher frequencies, groundborne vibration can be perceived as a noise source. At sufficiently high amplitudes, propagation of vibration waves through the ground can cause building elements to vibrate at a frequency that is audible to the human ear. Groundborne noise could result in rattling of windows, walls, or other items coupled to building surfaces. Groundborne vibration levels resulting in groundborne noise are often experienced as a combination of perceptible vibration and low frequency noise.

Land uses sensitive to groundborne vibration include places where people reside, schools, libraries, and places of worship. Hospital operating rooms and certain types of industries that use vibration-sensitive equipment are considered highly sensitive to groundborne noise and vibration. Outdoor park facilities, such as picnic areas or athletic fields, are not considered sensitive to groundborne noise or vibration.

The human response to different levels of groundborne noise and vibration is shown in Table 23-4. Vibration levels with spectral components within the range of human hearing (30 hertz [Hz] and 60 Hz in the table) would produce the corresponding approximate A-weighted noise levels. Thus, it is possible to experience vibrations as audible noise, even though physical vibrations may not be detected.

Table 23-4. Human Response to Groundborne Noise

Vibration Velocity (VdB)	Low-Frequency Noise Level[a] (dBA)	Mid-Frequency Noise Level[b] (dBA)	Human Response
65	25	40	Approximate threshold of perception for many humans. Low-frequency sound usually inaudible; mid-frequency sound excessive for quiet sleeping areas.
75	35	50	Approximate dividing line between barely perceptible and distinctly perceptible. Many people find transit vibration at this level annoying. Low-frequency noise acceptable for sleeping areas; mid-frequency noise annoying in most quiet occupied areas.
85	45	60	Vibration acceptable only for an infrequent number of events per day. Low-frequency noise annoying for sleeping areas; mid-frequency noise annoying for institutional land uses such as schools and churches, even with infrequent events.

Source: Federal Transit Administration 2006.
VdB = vibration decibel.
dBA = A-weighted decibel.
[a] Approximate noise level when vibration spectrum peak is near 30 Hz.
[b] Approximate noise level when vibration spectrum peak is near 60 Hz.

Groundborne noise also has the potential to affect nesting birds. This discussion is located in Chapter 12, *Terrestrial Biological Resources*.

23.1.3 Potential Environmental Effects Area

This section describes noise conditions in the Plan Area (see Figure 1-3), including southern Sutter County, western Sacramento and San Joaquin Counties; eastern Yolo, Solano, Contra Costa, and Alameda Counties; the southwestern part of Sacramento County; and the cities of Isleton, West Sacramento, Rio Vista, and Antioch. In general, most of the Plan Area includes places where the existing environment is typical of a quiet rural setting. Primary noise sources are traffic traveling on surrounding rural roadways, agricultural operations (including crop duster planes), overhead commercial aircraft, and recreational related noise (e.g., fishing boats, wakeboarding and waterski boats). Typical ambient sound levels as a function of population density are presented in Table 23-5.

Table 23-5. Typical Ambient Sound Levels as a Function of Population Density

Location	L_{dn} (A-Weighted Decibel)
Rural: Undeveloped	35
Rural: Partially Developed	40
Suburban: Quiet	45
Suburban: Normal	50
Urban: Normal	55
Urban: Noisy	60
Urban: Very Noisy	65

Sources: Cowan 1994; Hoover and Keith 2000.
L_{dn} = day-night sound level.

23.1.3.1 Sutter County

Existing Sources of Noise

Noise sources in southern Sutter County include transportation and non-transportation activities. Traffic noise occurs along the corridors of State Routes (SRs) 70, 99, and 113. Freight and passenger rail traffic and aircraft from the Sacramento International Airport and Sutter County Airport contribute to the noise environment. Motorized boats along the Sacramento River also contribute noise. Non-transportation noise sources include agricultural operations, commercial and industrial activities, parks and school playing fields, heating and cooling equipment, landscape maintenance, heavy equipment use, and outdoor sporting event facilities.

Existing Noise-Sensitive Land Uses

Sutter County land in the study area is primarily in natural preserve and open space. The Yolo Bypass, a leveed, 59,000-acre floodplain, traverses the county from the Sutter County-Yolo County Line, near the Fremont Weir in the north, to the Yolo County-Solano County line in the south. Land within the Yolo Bypass is also used for agricultural and managed wetland (duck club) activities.

Existing Noise Levels

Land uses near project components are primarily rural and consist of agricultural use and low-density residential development. As such existing noise levels are in the range of 40 to 50 dBA (see Table 23-5).

23.1.3.2 Sacramento County

Existing Sources of Noise

Noise sources in western Sacramento County, Sacramento, and Isleton include transportation and non-transportation activities. Traffic noise occurs along the corridors of Interstates 5 and 80 (I-5, I-80), Highway 50, and SR 160. Freight and passenger rail traffic, and aircraft from the Sacramento International Airport, Sacramento Executive Airport, Franklin Field Airport, and Borges-Clarksburg Airport contribute to the noise environment. Motorized boats along the Sacramento River also contribute noise. Non-transportation noise sources include agricultural operations, commercial and

industrial activities, parks and school playing fields, heating and cooling equipment, landscape maintenance, heavy equipment use, and outdoor sporting event facilities.

Existing Noise-Sensitive Land Uses

Sacramento County land in the study area is primarily in agricultural, recreation, natural preserve, and open space uses. Residential, commercial, and industrial uses are concentrated in the communities and cities (including Sacramento and Isleton) in the Delta. Residential and recreational uses are the primary noise-sensitive land uses within the county.

Existing Ambient Noise Level

Land uses near project components are primarily rural and consist of agricultural use and low-density residential development. As such existing noise levels are in the range of 40 to 50 dBA (see Table 23-5).

23.1.3.3 Yolo County

Existing Sources of Noise

Noise sources in eastern Yolo County and West Sacramento include transportation and non-transportation activities. Traffic noise occurs along the corridors of Interstates 5 and 80 and State Routes 84 and 113. Freight and passenger rail traffic, and aircraft from the Sacramento International Airport and Bourges-Clarksburg Airport, contribute to the noise environment. Motorized boats along the Sacramento River also contribute noise. Non-transportation noise sources in the county include agricultural operations, commercial and industrial activities, parks and school playing fields, heating and cooling equipment, landscape maintenance, and heavy equipment use.

Existing Noise-Sensitive Land Uses

Yolo County land in the study area is primarily in agricultural use. Residential, commercial, office and industrial, recreational, and vacant land uses also exist within the county. Residential, commercial, and industrial uses are concentrated in the community of Clarksburg, in the east-central portion of the county along the border of Yolo and Sacramento Counties. Residential uses are the primary noise-sensitive land use in the county.

Existing Noise Levels

Table 23-6 summarizes existing noise measurements for portions of Yolo County near potential project-related construction, or operations and maintenance activities. Relevant noise levels described in the Yolo County Draft General Plan (County of Yolo 2009) are the traffic noise levels along SR 84 in the area.

Table 23-6. Existing Highway Traffic Noise Levels in Yolo County

Roadway	Average Daily Traffic	L_{dn} (dBA) 100 feet from Centerline	Centerline to 70 L_{dn} (feet)	Centerline to 65 L_{dn} (feet)	Centerline to 60 L_{dn} (feet)
State Route 84, Clarksburg Road to West Sacramento	1,600	56.8	<50	<50	62

Source: Adapted from Yolo County 2009.
dBA = A-weighted sound level in decibels.
L_{dn} = day-night sound level.

Land uses near project components are primarily rural and consist of agricultural use and low-density residential development. As such existing noise levels in areas located away from SR 84 are in the range of 40 to 50 dBA (see Table 23-5).

23.1.3.4 Solano County

Existing Sources of Noise

Noise sources in eastern Solano County and the city of Rio Vista include transportation and non-transportation activities. Traffic noise occurs along the corridors of I-680 and SR 84, SR 113, SR 160, and SR 12. Rail operations and aircraft from the Rio Vista Municipal Airport and Travis Air force Base contribute to the noise environment. Motorized boats along the Sacramento River also contribute noise. Non-transportation noise sources in the county include agricultural operations, commercial and industrial activities, parks and school playing fields, heating and cooling equipment, landscape maintenance, natural gas compression stations, and heavy equipment use.

Existing Noise-Sensitive Land Uses

Unincorporated Solano County land in the study area is primarily in agricultural or natural resources use. Rural residential development has occurred in various communities in the unincorporated county. Residential and commercial land uses are concentrated in highway areas and in the city of Rio Vista. Residential uses are the primary noise-sensitive land uses in the county.

Existing Noise Levels

Land uses near project components are primarily rural and consist of agricultural use and low-density residential development. As such existing noise levels are in the range of 40 to 50 dBA (see Table 23-5).

23.1.3.5 San Joaquin County

Existing Sources of Noise

Noise sources in western San Joaquin County include transportation and non-transportation activities, including Stockton Port shipping activities. Traffic noise occurs along the corridors of I-5, SR 4, and SR 12. Rail operations and aircraft from the Stockton Metropolitan Airport, Kingdon Executive Airport, Lodi Airport, Lodi Airpark, Tracy Municipal Airport, and an airstrip near Vernalis contribute to the noise environment in the western portion of the county. Motorized boats along the

San Joaquin River also contribute noise. Non-transportation noise sources in the county include agricultural operations, commercial and industrial activities, parks and school playing fields, heating and cooling equipment, landscape maintenance, natural gas compression stations, and heavy equipment use.

Existing Noise-Sensitive Land Uses

San Joaquin County land in the study area is primarily in agricultural use. Residential, commercial, industrial, and public facilities are mostly adjacent to the cities of Tracy, Stockton, and Lathrop. Recreational and residential land uses are the primary noise-sensitive land uses in the county.

Existing Noise Levels

Land uses near project components are primarily rural and consist of agricultural use and low-density residential development. As such existing noise levels are in the range of 40 to 50 dBA (see Table 23-5).

23.1.3.6 Contra Costa County

Existing Sources of Noise

Noise sources in eastern Contra Costa County and eastern Antioch include transportation and non-transportation activities. Traffic noise occurs along the corridors of SR 4 and SR 160. Rail operations and aircraft from the Byron Airport contribute to the noise environment. Motorized boats along the San Joaquin River also contribute noise. Non-transportation noise sources in the county include agricultural operations, commercial and industrial activities, parks and school playing fields, heating and cooling equipment, landscape maintenance, and heavy equipment use.

Existing Noise-Sensitive Land Uses

Contra Costa County land in the study area is primarily in agricultural and recreational use. Residential, commercial, industrial, and open space land uses also exist in both unincorporated and incorporated areas of the county. Residential, commercial, and industrial uses are concentrated in the city of Oakley, in eastern Contra Costa County. Residential uses are the primary noise-sensitive land uses in the county.

Existing Noise Levels

Existing noise measurements for portions of Contra Costa County in the vicinity of the study area, as described in the Contra Costa County General Plan (Contra Costa County 2005), include traffic noise levels from existing roadways in the area. The noise contour maps indicate that roadway noise near potential project-related activities evaluated in this EIR/EIS ranged from 60 to 75 dB in 2005.

Land uses near project components are primarily rural and consist of agricultural use and low-density residential development. As such existing noise levels are in the range of 40 to 50 dBA (see Table 23-5).

23.1.3.7 Alameda County

Existing Sources of Noise

Noise sources in far northeastern Alameda County are primarily related to rail operations and farming.

Existing Noise-Sensitive Land Uses

Alameda County land in the study area is primarily in agricultural use. Residential uses are the primary noise-sensitive land uses in the county.

Existing Noise Levels

Land uses near project components are primarily rural and consist of agricultural use and low-density residential development. As such existing noise levels are in the range of 40 to 50 dBA (see Table 23-5).

23.2 Regulatory Setting

23.2.1 Federal Plans, Policies, and Regulations

Although no federal regulations limit overall environmental noise levels, federal guidance documents and regulations address environmental noise from specific sources such as trucks, trains, and airplanes. In addition, Occupational Safety and Health Administration (OSHA) standards address occupational noise exposure common in the construction industry. Noise exposure of this type is dependent on work conditions and is addressed through a facility's or contractor's health and safety plan.

A summary of various federal noise guidelines is presented in Table 23-7 and Figure 23-1. As an example, the Federal Railroad Administration (FRA) and Federal Transit Administration (FTA) guidelines are presented on a sliding scale. Therefore, if the existing noise exposure at a sensitive receptor is 50 dBA, an effect would occur if an increase of 5 dBA is predicted. Applicable federal guidelines related to noise effects on aquatic and biological species are presented in Chapter 11, *Fish and Aquatic Resources*, and Chapter 12, *Terrestrial Biological Resources*.

Table 23-7. Summary of Federal Guidelines/Regulations for Residential Exterior Noise

Agency	L_{eq} (dBA)
Federal Energy Regulatory Commission	49
Federal Highway Administration	67
Federal Aviation Administration	59
Federal Railroad Administration and Federal Transit Administration[a, b]	Sliding scale, refer to Figure 23-1
U.S. Environmental Protection Agency[c]	49
U.S. Department of Housing and Urban Development[d]	65

dBA = A-weighted sound level in decibels.
L_{eq} = overall 24-hour sound level.
[a] Federal Railroad Administration 1998.
[b] Federal Transit Administration 2006.
[c] U.S. Environmental Protection Agency 1974.
[d] 24 CFR Part 51B.

The Federal Highway Administration (FHWA) has developed methods for evaluating construction noise, which are discussed in the Roadway Noise Construction Model User's Guide (Federal Highway Administration 2006). The FHWA does not recommend specific noise level criteria for construction activities. Title 23, Part 772 of the Code of Federal Regulations (23 CFR 772), "Procedures for Abatement of Highway Traffic Noise and Construction Noise," outlines procedures for noise studies that are required for approval of Federal-aid highway projects. FHWA published a final rule revising 23 CFR 772 on July 13, 2010 (Appendix A). The FHWA requires that State highway agencies prepare updated state-specific policies and procedures for applying the revised regulation in their state. The FHWA noise regulation requires State DOTs to establish a definition of "approach" that is at least 1 dB(A) less than the noise abatement criteria (NAC) for use in identifying traffic noise impacts in traffic noise analyses. The Federal Transit Administration has developed criteria for groundborne vibration and methods for the assessment of construction noise (Federal Transit Administration 2006).

23.2.2 State Plans, Policies, and Regulations

The California Noise Control Act was enacted in 1973 (Health and Safety Code § 46010 et seq.) and states that the Office of Noise Control (ONC) should provide assistance to local communities in developing local noise control programs. It also commits ONC staff to work with the Office of Planning and Research (OPR) to provide guidance for the preparation of the required noise elements in city and county general plans, pursuant to Government Code § 65302(f). In preparing the noise element, a city or county must identify local noise sources and analyze and quantify, to the extent practicable, current and projected noise levels for various sources, including highways and freeways; passenger and freight railroad operations; ground rapid transit systems; commercial, general, and military aviation and airport operations; and other ground stationary noise sources. California Administrative Code, Title 4, has guidelines for evaluating the compatibility of various land uses as a function of community noise exposure, as presented on Figure 23-2 (Office of Planning and Research 2003).

Section 01570 of the California Department of Water Resources (DWR) Specification 05-16 suggests the following guidelines for DWR construction projects:

> Where ambient noise levels are less than 60 dBA and it is determined that construction related noise will cause noise levels to exceed 60 dBA, or where the ambient noise levels are greater than 60 dBA and it is determined that construction related noise will cause noise levels to exceed the ambient level by 5 dBA, a temporary sound wall shall be constructed between the sensitive area and the construction related noise source. The 60 dBA limit is not a regulatory requirement. Although the 60 dBA limit is not a regulatory requirement, it has been established as a threshold for establishing noise impacts by consensus of experts, local and resource agencies, including the U.S. Fish and Wildlife Service (USFWS). It is estimated that among other things, noise levels above 60 dBA may interfere with communication among birds and other wildlife.

Applicable state guidelines related to noise effects on aquatic and biological species are presented in Chapter 11, *Fish and Aquatic Resources*, and Chapter 12, *Terrestrial Biological Resources*.

23.2.2.1 Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction Projects

The Caltrans Traffic Noise Analysis Protocol (Protocol) specifies the policies, procedures, and practices to be used by agencies that sponsor new construction or reconstruction of federal-aid highway projects (e.g. Type I projects). The Protocol defines a noise increase as a *substantial increase* when the predicted noise levels with project implementation exceed existing noise levels by 12 dB (California Department of Transportation 2011).

23.2.2.2 Caltrans Vibration Criteria

For continuous/frequent intermittent sources such as pile driving Caltrans recommends a threshold of 0.25 in/sec PPV for "historic and some old buildings" and 0.3 in/sec for "older residential structures." (California Department of Transportation 2004:27). These criteria are primarily directed, but not limited to all construction related to pile driving, demolition and pavement breaking activities.

23.2.3 Regional and Local Plans, Policies, and Regulations

As stated above, California Government Code § 65302(f) requires city and county general plans to include a noise element. The purpose of a noise element is to guide future development to enhance future land use compatibility. In addition to general plan requirements, some jurisdictions have established noise ordinances in their municipal codes. Noise ordinances establish limits for which penalties or enforcement action may be taken. Therefore, a noise ordinance generally must not be exceeded, whereas general plan limits are to be considered during the development of a project and may or may not be strictly applied, depending on the particular circumstances of the proposed project. Local standards are listed below for informational purposes and were considered in the development of thresholds to determine if noise impacts are adverse.

23.2.3.1 Sutter County

The Sutter County General Plan was recently updated and the final plan was adopted in March 2011. The General Plan Noise Element (Sutter County 2010) states that new non-transportation noise sources will be mitigated to the noise level standards shown in Table 23-8. Policy N 1.6 relates to construction noise and states: require discretionary projects to limit noise-generating construction

activities within 1,000 feet of noise-sensitive uses (i.e., residential uses, daycares, schools, convalescent homes, and medical care facilities) to daytime hours between 7:00 a.m. and 6:00 p.m. on weekdays, 8:00 a.m. and 5:00 P.M. on Saturdays, and prohibit construction on Sundays and holidays unless permission for the latter has been applied for and granted by the County. Sutter County does not have a noise ordinance.

Table 23-8. Sutter County Noise Standards for Non-Transportation Sources

Noise Level Descriptor	Daytime	Nighttime
Hourly L_{eq}, dB	55	45
Maximum level, dB	70	65

Source: Sutter County 2010.
Note: Noise levels are measured at the property line of the noise-sensitive use.
dB = decibels.
L_{eq} = overall 24-hour sound level.

23.2.3.2 Sacramento County

The Sacramento County 2030 General Plan Update was adopted in November 2011. The City of Isleton General Plan does not include a noise element.

Sacramento County

The Sacramento County 2030 General Plan Update Noise Element (Sacramento County 2011) states that interior and exterior noise created by new non-transportation noise sources may not exceed the noise level standards shown in Table 23-9 at existing noise-sensitive areas in a project's vicinity. The Plan states that noise associated with construction activities shall adhere to County Code requirements.

Table 23-9. Sacramento County Noise Level Performance Standards

	Exterior Noise Levels (dBA)				Interior Noise Levels (dBA)	
	Daytime		Nighttime		Anytime	
Receiving Land Use	L_{50}	L_{max}	L_{50}	L_{max}	L_{50}	L_{max}
All residential	55	75	50	70	35	55
Transient lodging	55	75	–	–	35	55
Hospitals and nursing homes	55	75	–	–	35	55
Theaters and auditoriums	–	–	–	–	30	50
Churches, meeting halls, schools, libraries, etc.	55	75	–	–	35	60
Office buildings	60	75	–	–	45	65
Commercial buildings	–	–	–	–	45	65
Playgrounds, parks, etc.	65	75	–	–	–	–
Industry	60	80	–	–	50	70

Source: Sacramento County 2011.
dBA = A-weighted sound level in decibels.

Sacramento County Code Section 6.68, Noise Control, states that exterior noise shall not exceed 50 dBA between 10:00 p.m. and 7:00 a.m. and 55 dBA between 7:00 a.m. and 10:00 p.m. for residential and agricultural areas. Construction activities between the hours of 6:00 a.m. and 8:00 p.m. Monday through Friday and 7:00 a.m. and 8:00 p.m. on weekends are exempt from this ordinance. Construction may be allowed to continue past these limits when an unforeseen or unavoidable condition occurs and the nature of the project requires work to continue until a specific amount of work is completed that will not jeopardize inspection acceptance or create undue financial hardships for the contractor or owner (Sacramento County 2009).

23.2.3.3 Yolo County

The Yolo County General Plan Health and Safety Element (County of Yolo 2009) addresses limitations for noise sources based on OPR's noise compatibility guidelines (Figure 23-2). Yolo County does not have a noise ordinance, but the 2009 General Plan recommends the adoption of a comprehensive noise ordinance by 2011.

23.2.3.4 Solano County

The Solano County General Plan was adopted in December 2008 (Solano County 2008). The City of Rio Vista adopted the latest general plan in 2002 (City of Rio Vista 2002).

Solano County

Exterior noise standards are presented in the Solano County General Plan Noise Element (Solano County 2008) as those recommended by OPR's noise compatibility guidelines (Figure 23-2). The Noise Element recommends the adoption of a noise ordinance that would set performance standards and exemptions, and specifies restrictions on noise-emitting construction activities based on standards for construction equipment.

City of Rio Vista

The City of Rio Vista General Plan Safety and Noise Element (City of Rio Vista 2002) establishes noise standards for new uses affected by non-transportation noise (Table 23-10).

In addition, the Safety and Noise Element has policies limiting construction activities between 7:00 a.m. and 5:00 p.m. without an exemption from the city to cover special circumstances. The noise standards require mufflers on internal combustion engines used in conjunction with construction activities. The noise ordinance (City of Rio Vista 2009) prohibits any outside construction or repair work on buildings or structures within a residential zone or within 500 feet of a residential zone in the city on Sundays and between the hours of 7:00 p.m. and 7:00 a.m. Monday through Saturday.

Table 23-10. City of Rio Vista Existing Noise Level Performance Standards

	Exterior Noise Levels, L_{eq} (dBA)		Interior Noise Level, L_{eq} (dBA)
Receiving Land Use	Daytime	Nighttime	Anytime
All residential	50	45	35
Transient lodging	55	–	40
Hospitals and nursing homes	50	45	35
Theaters and auditoriums	–	–	35
Churches, meeting halls, schools, libraries, etc.	55	–	40
Office buildings	55	–	45
Commercial buildings	55	–	45
Playgrounds, parks, etc.	65	–	–
Industry	65	65	50

Source: City of Rio Vista 2002.
dBA = A-weighted sound level in decibels.
L_{eq} = overall 24-hour sound level.

23.2.3.5 San Joaquin County

The San Joaquin County General Plan Noise Element (San Joaquin County 1992) includes an hourly equivalent sound level of 50 dB from stationary sources during the daytime and 45 dB during nighttime for outdoor activity areas in residential areas and other sensitive-receptor land uses.

The San Joaquin County Ordinance includes noise restrictions related to airport operations, vehicle noise-making devices, uses of parks, and barking dogs. The ordinance does not include specific restrictions for construction or operation of equipment.

23.2.3.6 Contra Costa County

The Contra Costa County General Plan (Contra Costa County 2005) and City of Antioch General Plan (City of Antioch 2003) address noise standards of the study area in Contra Costa County.

Contra Costa County

The Contra Costa County General Plan Noise Element (Contra Costa County 2005) requires that new projects meet exterior noise level standards as established in OPR's noise compatibility guidelines (Figure 23-2).

Construction activities must be concentrated during the hours of the day that are not noise-sensitive for adjacent land uses and should be commissioned to occur during normal daytime work hours to provide relative quiet during the more sensitive evening and early morning periods. Contra Costa County does not have a noise ordinance.

City of Antioch

Noise standards established in the City of Antioch General Plan Environmental Hazards Element (City of Antioch 2003) include a noise level of 60 dBA CNEL for residences, hospitals, and libraries;

65 dBA CNEL for school classrooms; and 70 dBA CNEL for school play and sports areas and commercial/industrial areas at the front setback. Non-residential development adjacent to occupied noise-sensitive land uses must implement a construction noise mitigation plan. This plan must include the use of temporary noise-attenuation fences; the use of noise-reduction features on construction equipment; and the restriction of construction to between the hours of 7:00 a.m. and 7:00 p.m. Monday through Saturday. No construction is allowed on Sundays or public holidays.

The City of Antioch Noise Ordinance (City of Antioch 2009) prohibits the operation of heavy construction equipment and construction activities on weekdays prior to 7:00 a.m. and after 6:00 p.m., on weekdays within 300 feet of occupied dwelling space prior to 8:00 a.m. and after 5:00 p.m., and on weekends and holidays prior to 9:00 a.m. and after 5:00 p.m., irrespective of the distance from the occupied dwelling.

23.2.3.7 Alameda County

The Alameda County General Plan consists of three general plans, one for each geographical area. The East County General Plan is relevant to this summary. The East County General Plan Environmental Safety Element (Alameda County 2000) requires noise studies as part of development review for projects located in areas exposed to high noise levels, and in areas adjacent to existing residential or other sensitive land uses. The East County General Plan Noise Element also requires the use of noise-reduction techniques to mitigate noise impacts generated by stationary sources.

The Alameda County General Ordinance Code Chapter 6.60 (Alameda County 2009) establishes noise standards for residential and commercial areas as shown in Table 23-11. Construction activities between the hours of 7:00 a.m. and 7:00 p.m. Monday through Friday, and 8:00 a.m. and 5:00 p.m. on weekends are exempt from these standards.

Table 23-11. Alameda County Existing Noise Level Standards

Cumulative Number of Minutes in Any 1-hour Period	Residential Noise Level Standards (dBA)		Commercial Noise Level Standards (dBA)	
	Daytime 7 a.m. to 10 p.m.	Nighttime 10 p.m. to 7 a.m.	Daytime 7 a.m. to 10 p.m.	Nighttime 10 p.m. to 7 a.m.
30	50	45	65	60
15	55	50	70	65
5	60	55	75	70
1	65	60	80	75
0	70	65	85	80

Source: Alameda County 2009.
dBA = A-weighted sound level in decibels.

23.3 Environmental Consequences

23.3.1 Methods for Analysis

23.3.1.1 Construction Noise and Vibration

The assessment of potential construction noise levels was based on methodology developed by the FTA (2006). Potential effects associated with construction activities would be temporary, which, for the purposes of this chapter, is defined as the 9-year construction period. Noise levels produced by commonly used construction equipment are summarized in Table 23-12. Individual types of construction equipment are expected to generate maximum noise levels ranging from 80 to 96 dBA at a distance of 50 feet. The construction noise level at a given receiver depends on the type of construction activity, the noise level generated by that activity, and the distance and shielding between the activity and noise-sensitive receivers.

Utilization factors for construction noise are used in the analysis to develop L_{eq} noise exposure values. The L_{eq} value accounts for the energy-average of noise over a specified interval (usually 1 hour), so a utilization factor represents the amount of time a type of equipment is used during the interval.

Sheet piles would be driven using impact hammers during construction of intake facilities, and drilled piles will be used for other project components such as pumping plants, canal box culvert siphons, and barge unloading facilities. Vibration source levels for pile drivers are shown in Table 23-13.

Table 23-12. Commonly Used Construction Equipment Noise Emission Levels

Equipment	Typical Noise Level (dBA) 50 Feet from Source
Pile-driver (Impact)	101
Pile-driver (Sonic)	96
Grader	85
Bulldozers	85
Truck	85
Loader	80
Air Compressor	80
Backhoe	80
Pneumatic Tool	85
Excavator	85
Auger Drill Rig (for drilled piles)	85
Crane, Derrick	88
Concrete Mixer Truck	79
Concrete Batch Plant	N/A
Compactor (Ground)	83
Concrete mixer	85

Source: Federal Highway Administration 2006.
dBA = A-weighted decibel.

Table 23-13. Vibration Source Levels for Pile Drivers

Equipment		PPV at 25 feet (Inches/Second)	Approximate Vibration Level (Vdb)
Pile Driver (impact)	Upper range	1.518	112
	Typical	0.644	104
Pile Driver (sonic)	Upper range	0.734	105
	Typical	0.170	93

Source: Federal Transit Administration 2006.
PPV = peak particle velocity.
VdB = root mean square velocity in decibels re 1 micro-inch/second.

23.3.1.2 Traffic Noise Modeling

Traffic noise levels at sensitive receptors near construction haul routes were evaluated through use of the FHWA Traffic Noise Model Lookup program (TNM). TNM estimates average noise levels at fixed distances from the roadway centerline based on estimated traffic volumes for automobiles and medium- and heavy-duty trucks, vehicle speeds, and a designated noise drop-off rate based on ground type. Shielding effects from topographical features and buildings are not accounted for in the model. The model was programmed to produce a conservative, worst-hour estimate of temporary traffic-generated noise levels due to heavy truck and increased commuter trips associated with construction of project and conservation components. An estimate of peak-hour construction-generated traffic was based on Appendix 19A, *Bay Delta Conservation Plan Construction Traffic Impact Analysis Report*.

The environmental consequences analysis includes an assessment of traffic noise impacts based on loudest-hour traffic noise levels under future project alternatives, compared to Existing Conditions. Existing loudest-hour noise levels are shown in Table 23-14.

23.3.1.3 Groundborne Vibration from Tunneling Operations

Currently, there are no federal regulations or California Environmental Quality Act (CEQA) guidelines for vibration resulting from tunnel construction. Vibration sources from construction of the project would include tunnel boring machine (TBM) operation and pile driving.

Vibration from TBM operations occurs at low frequencies, whereas groundborne noise typically is caused by higher frequency vibrations that manifest as audible noise inside of buildings.

Haul trains operating inside of the tunnel during construction would be the only likely source of any perceivable groundborne noise and vibration. Groundborne noise from moving haul trains would be generated from the wheel-rail interface and could propagate through the ground to nearby buildings at a frequency within the range of human hearing and manifest as audible noise inside structures.

23.3.1.4 Existing Baseline Conditions in the Study Area

Under NEPA (and CEQA), the baseline is the existing ambient noise level in a given location. Baseline noise levels vary greatly depending on the extent of urban development and proximity to transportation corridors. Ambient rural noise levels are typically in the range of 40–50 dB (Table

23-5). Ambient noise levels near major highways can be as high as 75 dB. Modeled existing traffic noise levels at locations near roadways in the study area are discussed in Section 23.4.1.2.

To assess increases in noise levels due to construction of the project, a baseline of 40 dBA is used to describe the existing ambient noise level in the study area. Because many of the facilities that would be constructed under the project alternatives are located primarily in rural areas, a baseline level of 40 dBA would be characteristic of the project's mostly rural setting, and was therefore assumed to apply to the entire study area. The ambient baseline level of 40 dBA is used in this analysis to conservatively account for increases in noise levels during daytime hours, and potentially sleep disturbance during nighttime hours. Noise monitoring at specific locations has not been conducted for this project.

The thresholds for construction indicate that, where existing ambient noise level is less than 60 dBA, impacts would be significant where construction noise levels are predicted exceed the DWR standard of 60 dBA (50 dBA during nighttime hours). Therefore an existing ambient noise level of 40 dBA conservatively accounts for the most stringent construction noise increase thresholds used in the environmental consequences analysis.

The existing Banks and Jones Pumping Plants contribute to the noise environment in an isolated rural setting near the Contra Costa/Alameda county line. Existing pump noise, along with traffic on Kelso Road and overflights from small aircraft, would contribute to the noise environment at residential and recreational use directly adjacent to the Jones Pumping Plant. Banks Pumping Plant is located at the end of Kelso Road, and is not adjacent to noise-sensitive residential or recreational use areas.

For noise-sensitive land uses adjacent to project truck routes, the environmental consequences analysis includes an assessment of traffic noise impacts based on loudest-hour traffic noise levels under future project alternatives compared to Existing Conditions. Existing loudest-hour noise levels are shown in Table 23-14.

Table 23-14. Existing Loudest-Hour Traffic Noise Levels

Roadway	Segment	Existing Loudest-hour Volume	Existing Traffic Noise Level, dBA L_{eq} (1h) (100 feet from roadway centerline)
Byron Hwy	Contra Costa Co./ Alameda Co. Line to Alameda Co./San Joaquin Co. Line	656	58
Brentwood Blvd	Delta Rd (Oakley City Limits) to Balfour Rd	1,516	61
Brentwood Blvd	Balfour Rd to Brentwood City Limits (South)	1,013	60
Balfour Rd	Brentwood Blvd to Brentwood City Limits	1,300	61
Bethel Island Rd	Oakley City Limits to End	330	55
Balfour Rd	Brentwood City Limits to Byron Hwy	297	54
Old SR 41	Brentwood City Limits (South) to Marsh Creek Rd	1,682	62
Byron Hwy	Delta Rd to Old SR 4	240	53
Byron Hwy	SR 4 to Contra Costa Co./ Alameda Co. Line	907	59
SR 160 (Freeport Blvd)	Sacramento City Limits to Freeport Bridge	476	59

Roadway	Segment	Existing Loudest-hour Volume	Existing Traffic Noise Level, dBA L_{eq} (1h) (100 feet from roadway centerline)
SR 160 (Freeport Blvd/ River Rd)	Freeport Bridge to Scribner Rd	180	55
SR 160	Scribner Rd to Hood Franklin Rd	125	53
SR 160	Hood Franklin Rd to Lambert Rd	170	55
SR 160	Lambert Rd to Paintersville Bridge	122	53
SR 160 (Paintersville Bridge)	Sutter Slough Bridge Rd to SR 160 (River Rd)	128	53
SR 160	Paintersville Bridge to Walnut Grove Bridge	128	53
SR 160	Walnut Grove Bridge to A St (Isleton)	465	59
SR 160	A St (Isleton) to SR 12	378	58
SR 160	SR 12 to Brannan Island Rd	894	62
SR 84	West Sacramento City Limits to Courtland Rd	169	55
SR 84 (Courtland Rd/ Ryer Ave)	Courtland Rd to Cache Slough Ferry	25	46
SR 12 EB	I-80 to Beck Ave	1,847	65
SR 12 WB	I-80 to Beck Ave	1,625	64
SR 12	Beck Ave to Sunset Ave/ Grizzly Island Rd	3,573	68
SR 12	Sunset Ave/ Grizzly Island Rd to Walters Rd/	2,353	66
SR 12	Walters Rd/ to SR 113	1,075	63
SR 12	SR 113 to SR 84 (River Rd)	1,544	64
SR 12 (Rio Vista Bridge)	SR 84 (River Rd) to SR 160 (River Rd)	1,685	64
SR 12	SR 160 (River Rd) to Sacramento Co./ SJ Co. Line	1,030	62
SR 12	Sacramento Co./ SJ Co. Line to I-5	1,164	63
SR 113	I-80 to Dixon City Limits	1,341	64
SR 113	Dixon City Limits to SR 12	294	57
SR 4 (Marsh Creek Rd)	Vasco Rd to Byron Hwy	733	61
SR 4	Marsh Creek Rd to Discovery Bay Blvd	1,224	63
SR 4	Discovery Bay Blvd to Tracy Blvd	746	61
SR 4	Tracy Blvd to I-5	1,492	64
A St/4th St/ Jackson Blvd.	SR 160 to Isleton City Limits	75	48
Main Street (Old SR 4)	SR 160 to Cypress Rd	1,663	62
Main Street (Old SR 4)	Cypress Rd to Delta Rd (Oakley City Limits)	1,335	61
Cypress Rd	Main Street to Bethel Island Rd	764	58
Bethel Island Rd	Cypress Rd to Oakley City Limits	367	55
Delta Rd	Main Street to Byron Hwy	334	55
Pocket Rd	I-5 to Freeport Blvd	2,191	63
Freeport Blvd (Old SR 160)	Pocket Rd to Sacramento City Limits	492	56

Roadway	Segment	Existing Loudest-hour Volume	Existing Traffic Noise Level, dBA L_{eq} (1h) (100 feet from roadway centerline)
Freeport Bridge	River Rd to SR 160 (Freeport Blvd)	346	55
Hood Franklin Rd	SR 160 (River Rd) to I-5	137	51
Lambert Rd	SR 160 (River Rd) to Herzog Rd	29	44
Lambert Rd	Herzog Rd to Franklin Blvd	38	46
Franklin Blvd	Lambert Rd to Twin Cities Rd	71	48
Twin Cities Rd	River Rd to I-5	248	53
Twin Cities Rd	I-5 to Franklin Blvd	318	55
Sutter Slough Bridge Rd	Sacramento Co./ Yolo Co. Line to Paintersville Bridge	113	50
River Rd	Paintersville Bridge to Twin Cities Rd	134	51
River Rd	Twin Cities Rd to Walnut Grove Bridge	365	55
Walnut Grove Rd/River Rd	Walnut Grove Bridge to Sacramento Co./ SJ Co. Line	332	55
Isleton Rd	River Rd (Walnut Grove)/Isleton Rd Bridge to 1.5 miles west of Isleton Rd Bridge	283	54
Race Track Rd/ Tyler Island Rd	Walnut Grove Rd to Southern End of Tyler Island	34	45
Tyler Island Rd	Southern End of Tyler Island to SR 160 (River Rd)	39	46
Jackson Slough Rd	Isleton City Limits to SR 12	53	47
Jackson Slough Rd	Brannan Island Rd to SR 12	52	47
Walnut Grove Rd	Sacramento Co./ SJ Co. Line to I-5	232	53
Peltier Rd	Blossom Rd to I-5	23	44
Tracy Blvd	SR 4 to Clifton Court Rd	209	53
Tracy Blvd	Clifton Court Rd to Tracy City Limits	171	52
Byron Hwy	Alameda Co./San Joaquin Co. Line to Mountain House Pkwy	824	59
Mountain House Pkwy	Byron Hwy to Arnaudo Blvd	298	54
Mountain House Pkwy	Arnaudo Blvd to I-205	769	58
Eight Mile Rd	Stockton City Limits to I-5	769	58
Tracy Blvd	Tracy City Limits to I-205	759	58
Harbor Blvd	Industrial Blvd to US 50	2,317	63
Industrial Blvd/ Lake Washington Blvd	Harbor Blvd to Jefferson Blvd	1,858	62
Jefferson Blvd (Old SR 84)	Lake Washington Blvd to Southport Pkwy	1,718	62
Jefferson Blvd (Old SR 84)	Southport Pkwy to West Sacramento City Limits	146	51
River Rd	Freeport Bridge to Courtland Rd	249	54
River Rd	Courtland Rd to Sacramento Co./ Yolo Co. Line	63	48
Courtland Rd	SR 84 to River Rd	77	48

23.3.2 Determination of Effects

The action alternatives pass through several counties and through or near several communities and cities. Many of these jurisdictions have noise standards that relate to land use compatibility with transportation noise sources (e.g., traffic, rail, and aircraft) and non-transportation sources (e.g., pumping plants, construction activity, heating and ventilating equipment) (refer to section 23.3.3 for a discussion of local plans and policies). Noise from transportation sources is controlled at the federal level, not at the local level. As such, local noise ordinances do not apply to transportation sources but rather to non-transportation sources such as construction equipment. In many of these jurisdictions, noise from construction activities is exempt from noise ordinance standards during daytime hours, leaving no numerical noise level limits that can be applied during daytime hours.

Section 01570 of DWR Specification 05-16 identifies DWR noise thresholds that are reasonably consistent with local standards with regard to construction noise. As discussed above, the 60 dBA noise standard in DWR Specification 05-16 has been established by consensus of experts, local and resource agencies, including USFWS, as a threshold for establishing noise impacts.

Thresholds described below for determining if construction or restoration noise impacts would be adverse are based on the DWR 60 dBA threshold with a -10 dB adjustment for work that would occur at night. BDCP compatibility with applicable plans and policies is described throughout the impact headers (refer to Impacts NOI-1 through NOI-4). Exceedances of established noise thresholds could indicate an incompatibility with an applicable plan, policy, or regulation adopted to avoid or mitigate noise effects. Note that as discussed in Chapter 13, *Land Use,* Section 13.2.3, state and federal agencies are not generally subject to local land use regulations; incompatibilities with plans and policies are not, by themselves, physical consequences to the environment.

The thresholds discussed in this chapter and used for determination of effects under NEPA are equivalent to the thresholds used for determination of significant impacts under CEQA. Thresholds described below for determining if construction vibration effects would be adverse under NEPA and have significant impacts under CEQA are based on guidance in FTA 2006. Thresholds described below for determining if operational noise impacts would be adverse under NEPA and have significant impacts under CEQA are based on local noise ordinance standards. Criteria derived from the Appendix G checklist of the CEQA Guidelines were also considered when establishing the applicable thresholds.

23.3.2.1 Construction and Restoration Activity

Onsite Construction Equipment

Onsite construction and restoration activity between the hours of 7:00 a.m. to 10:00 p.m. (daytime) would have adverse noise effects if the activity is predicted to result in a 1-hour A-weighted equivalent sound level that exceeds 60 dBA at noise-sensitive land uses where the ambient noise level is less than 60 dBA, or if the activity is predicted to increase the ambient noise level at residential locations by 5 dB or more where the ambient noise level is already greater than 60 dBA (pursuant to Section 01570 of DWR Specification 05-16).

Onsite construction and restoration activity between the hours of 10:00 p.m. to 7:00 a.m. (nighttime) would have adverse noise effects if the activity is predicted to result in a 1-hour A-weighted equivalent sound level that exceeds 50 dBA at noise-sensitive land uses where the ambient noise level is less than 50 dBA, or if the activity is predicted to increase the ambient noise level at

residential locations by 5 dB or more where the ambient noise level is already greater than 50 dBA. The lower noise threshold for nighttime activity is based on the 5 to 10 dB reduction in noise performance standards that is commonly applied to noise levels during nighttime hours as used in local noise ordinances in the Plan Area.

In addition to raising the overall ambient noise level, construction activities during nighttime hours can potentially result in noise events that can disturb the sleep of people living in nearby residential areas. To address the potential for sleep disturbance during nighttime hours, onsite construction and restoration activity between the hours of 10:00 p.m. to 7:00 a.m. would have adverse noise effects if the activity is predicted to result in a single event maximum sound level exceeding 50 dBA at the nearest residential use (Nelson 1987). The 50 dBA L_{max} standard is used as the governing threshold for the construction noise analysis.

For the purposes of this analysis, sensitive land uses are defined as places where people reside, schools, libraries, and places of worship (e.g., residential parcels, natural/recreational parcels, agricultural parcels, and schools).

Truck Trips and Worker Commute Trips

Increased volumes of traffic on public roads due to project-generated heavy truck trips and commuter trips on local roadways are considered to result in a significant traffic noise impact if the increase in volume would result in a substantial increase in noise as defined in the Caltrans Protocol. The Protocol defines a substantial increase as a 12 dB increase in traffic noise levels under design year plus project conditions, compared to Existing Conditions. For the purposes of this analysis, sensitive land uses are defined as places where people reside, schools, libraries, and places of worship (e.g., residential parcels, natural/recreational parcels, agricultural parcels, and schools). Project-related transportation activity not occurring on public roads is evaluated as any other construction activity, using 60 dBA daytime and 50 dBA nighttime thresholds as described above.

23.3.2.2 Groundborne Vibration and Noise during Construction

Groundborne vibration from pile driving was analyzed based on procedures specified in the FTA Guidance Manual (Federal Transit Administration 2006). Vibration propagating from pile driving events would be considered to result in adverse effects if vibration levels would exceed 0.2 in/sec PPV at nearby residences (Table 23-2). This conservative threshold is more stringent than the Caltrans recommended guideline for historic and older buildings (*see* Section 23.1.2).

The thresholds for groundborne noise used in this analysis are based on thresholds used in the IRP (Integrated Resources Plan) for the City of Los Angeles Department of Public Works, and adapted from tunnel equipment groundborne vibration data used in other tunneling projects in the city of Los Angeles (City of Los Angeles Department of Public Works 2005). The threshold for groundborne vibration effects from TBM operations is 80 VdB (using a crest factor of 4), or 0.04 inches per second PPV (in/sec PPV). Based on IRP data, at the minimum tunnel depth of 60 feet to be used in the alternatives using the pipeline/tunnel conveyance, vibrations from TBM operation are predicted to be about 0.008 in/sec PPV. The threshold for groundborne vibrations from locomotive operation is 75 VdB (using a crest factor of 5), or 0.025 in/sec PPV. The groundborne noise threshold for tunnel locomotives is 45 dBA, which is equivalent to approximately 0.01 in/sec PPV.

Based on IRP data for typical tunnel locomotive operations, the groundborne noise threshold of 0.01 in/sec PPV may be exceeded within a 110-foot diagonal distance from the tunnel centerline (or

a 92-foot horizontal distance from the tunnel centerline above ground). However DWR has indicated that tunnel locomotives would be traveling at speeds of 5 to 10 miles per hour and would not cause excessive groundborne noise levels (Sanchez pers. comm.). Due to variations in geology, actual groundborne noise and vibration levels could vary along the conveyance alignments. For the east and west conveyance alignments, tunneling depth would be at least 120 feet below msl, and therefore groundborne noise under these alternatives would be well below the threshold discussed above and would not cause adverse effects to sensitive receptors within the immediate vicinity. For the purposes of this analysis, sensitive receptors that may be exposed to increased groundborne vibration include residences, outdoor parks, schools, and agriculture areas.

23.3.2.3 Conveyance Facility Operations

Operation of conveyance facilities would result in adverse effects if operational noise at residential locations would exceed 50 dBA (one-hour L_{eq}) during daytime hours (7:00 a.m. to 10:00 p.m.) or 45 dBA (one-hour L_{eq}) during nighttime hours (10:00 p.m. to 7:00 a.m.). Effects associated with conveyance facility operations would occur throughout the project lifetime and are considered permanent. If the existing ambient noise level during either period equals or exceeds the applicable threshold, an adverse effect would occur if the project-related noise level equals or exceeds the ambient noise level. This threshold is designed to comply with local ordinance performance standards in the Plan Area.

23.3.3 Effects and Mitigation Approaches

The Noise Abatement Plan (see Appendix 3B, *Environmental Commitments*) will be in place during construction to avoid or minimize adverse effects. Supplementary information for the EIR/EIS Bay Delta Conservation Plan includes approaches to designing mitigation which are taken into account in the discussion of mitigation measures in the Environmental Consequences section of this chapter and are incorporated into the Noise Abatement Plan as appropriate. The supplementary information is included here as background information for the design of noise mitigation measures and the Noise Abatement Plan.

Supplemental Information for the EIR/EIS Bay–Delta Conservation Plan (California Department of Water Resources 2010a) identifies the following plan for controlling noise.

> 1.15 TRAFFIC CONTROL/NOISE ABATEMENT/LIGHTING PLAN
>
> The Contractor shall minimize noise impacts to the extent feasible by preparing, before construction begins, and implementing a Noise Abatement Plan. The Noise Abatement Plan must be prepared in consultation with the Engineer and State Regulatory agencies, and subject to final approval by DWR. The following components shall be included in the plan:
>
> 1. In the event of complaints by nearby residents due to nighttime construction activities, the Contractor shall monitor noise levels. Noise shall be measured at the property line of nearby residential uses. In the event that construction noise exceeds the applicable limits specified in the Noise Element of the applicable County General Plan, the responsible construction activity shall cease until feasible measures, such as temporary sound walls, are implemented to reduce nighttime noise levels to compliance with the County General Plan.
> 2. Preventive maintenance including practicable methods and devices to control, prevent, and minimize noise.
> 3. Rerouting truck traffic to avoid or reduce noise impacts to sensitive locations.

4. Scheduling construction activities with the most intense noise activities to occur when ambient noise is also at its peak.
5. The Contractor shall limit off-site trucking activities (e.g., deliveries, export of materials, etc.) to the hours of 6:00 a.m. to 10:00 p.m. to minimize impacts to nearby residences.
6. To the extent feasible, the Contractor shall locate, store, and maintain portable and stationary equipment as far as possible from nearby residents.

23.3.3.1 No Action Alternative

The No Action Alternative includes continued implementation of SWP/CVP operations, maintenance, enforcement, and protection programs by federal, state, and local agencies and non-profit groups, as well as projects that are permitted or are assumed to be constructed by 2060. Climate change that would occur with or without the BDCP is also part of the No Action Alternative. A complete list and description of programs, plans, and other assumptions considered under the No Action Alternative is provided in Chapter 3, Appendix 3D, *Defining Existing Conditions, No Action Alternative, No Project Alternative, and Cumulative Impact Conditions*.

Future of Noise Conditions in the Delta

Future noise conditions in the Delta are not expected to change substantially as existing repair, maintenance, habitat protection, and flood management activities would continue.

Over time, subsidence places greater stress on levees, increasing the already high costs of continued levee maintenance and repair. In some cases, the costs of maintaining, improving, or repairing levees could become higher than the assessed value of the use of the lands they protect.

Failure of a levee, depending on the location and magnitude of the event, could cause catastrophic flooding. If a catastrophic flood were to occur, emergency flood fighting and clean-up actions would require the use of a considerable amount of heavy construction equipment. Timing and duration of use would directly correlate with flood fighting needs, but could last for days, weeks, even months. Depending on the location and magnitude of the flood, people may or may not be present during flood fighting activities. If people are present they could be exposed to higher than normal levels of noise and vibration levels for extended periods of time.

Furthermore, because of the unpredictable nature of an emergency response, compliance with applicable noise standards to manage noise levels may not be possible. All of these effects could be considered significant. However, because the timing, duration, and magnitude of a flood event are unpredictable, a determination of noise effects under these conditions is not possible.

SWP/CVP Operations

SWP/CVP operations identified as continuing actions under the No Action Alternative include repair, maintenance, or protection of infrastructure such as levees, and may also include actions for water quality management, habitat and species protection, or flood management. While these continuing actions would result in noise effects depending on the type of construction needed for repairs, or adjustments to potential irrigation water and drainage needed for water quality and flood management, these noise effects would be temporary in nature and would not result in noise that is substantially inconsistent with noise from current operations.

Ongoing Plans, Policies, and Programs

The programs, plans, and projects included under the No Action Alternative are summarized in Table 23-15, along with their anticipated noise effects. For a full description of conditions under the No Action Alternative, see Appendix 3D, *Defining Existing Conditions, No Action Alternative, No Project Alternative, and Cumulative Impact Conditions*.

Table 23-15. Noise Effects from the Plans, Policies, and Programs for the No Action Alternative

Agency	Program/Project	Status	Description of Program/ Project	Noise Effects
California Department of Water Resources	Mayberry Farms Subsidence Reversal and Carbon Sequestration Project	Completed October 2010	Permanently flood 308-acre parcel of DWR owned land (Hunting Club leased) and restore 274 acres of palustrine emergent wetlands within Sherman Island to create permanent wetlands and to monitor waterfowl, water quality, and greenhouse gases.	Operation of heavy equipment would generate temporary and localized noise.
Contra Costa Water District	Contra Costa Canal Fish Screen Project (Rock Slough)	Under construction as of July 2011	Installation of a fish screen at Rock Slough Intake.	Construction of the screen would result in temporary and localized noise.
Contra Costa Water District, Bureau of Reclamation, and California Department of Water Resources	Middle River Intake and Pump Station (previously known as the Alternative Intake Pump Station)	Project completed and was formally dedicated July 20, 2010	This project includes a potable water intake and pump station to improve drinking water quality for Contra Costa Water District customers.	Construction noise from this project has already occurred.
California Department of Water Resources	Federal Energy Regulatory Commission (FERC) License Renewal for Oroville Project	Draft Water Quality Certification issued December 6, 2010 and comments on Draft received December 10, 2010	The renewed federal license will allow the Oroville Facilities to continue providing hydroelectric power and regulatory compliance with water supply and flood control.	No effects related to noise.
Freeport Regional Water Authority and Bureau of Reclamation	Freeport Regional Water Project	Project was completed late 2010.	Project includes an intake/pumping plant near Freeport on the Sacramento River and a conveyance structure to transport water through Sacramento County to the Folsom South Canal.	No effects related to noise.

Agency	Program/Project	Status	Description of Program/ Project	Noise Effects
California Department of Water Resources and Solano County Water Agency	North Bay Aqueduct Alternative Intake Project		This project will construct an alternative intake on the Sacramento River and a new segment of pipeline to connect it to the North Bay Aqueduct system.	Construction of the intake would result in temporary and localized noise.
Reclamation District 2093	Liberty Island Conservation Bank		This project includes the restoration of inaccessible, flood prone land, zoned as agriculture but not actively farmed, to area enhancement of wildlife resources.	No effects related to noise.
City of Stockton	Delta Water Supply Project (Phase 1)	The project is currently under construction.	This project consists of a new intake structure and pumping station adjacent to the San Joaquin River; a water treatment plant along Lower Sacramento Road; and water pipelines along Eight Mile, Davis, and Lower Sacramento Roads.	Construction of the intake would result in temporary and localized noise.
Bureau of Reclamation and State Water Resources Control Board	Battle Creek Salmon and Steelhead Restoration Project	Project is ongoing.	This project includes restoration of approximately 48 miles of habitat in Battle Creek and its tributaries to improve passage, growth, and recovery for anadromous fish populations.	Operation of heavy equipment associated with the project would generate temporary and localized noise.
Tehama Colusa Canal Authority and Bureau of Reclamation	Red Bluff Diversion Dam Fish Passage Project	Expected completion in 2012.	Proposed improvements include modifications made to upstream and downstream anadromous fish passage and water delivery to agricultural lands within CVP.	Operation of heavy equipment associated with the project would generate temporary and localized noise.
Bureau of Reclamation, California Department of Fish and Wildlife, and Natomas Central Mutual Water Company	American Basin Fish Screen and Habitat Improvement Project		This three-phase project includes consolidation of diversion facilities; removal of decommissioned facilities; aquatic and riparian habitat restoration; and installing fish screens in the Sacramento River. Total project footprint encompasses about 124 acres east of the Yolo Bypass.	Operation of heavy equipment associated with the project would generate temporary and localized noise.

Agency	Program/Project	Status	Description of Program/ Project	Noise Effects
Bureau of Reclamation, U.S. Army Corps of Engineers, Sacramento Area Flood Control Agency, and Central Valley Flood Protection Board	Folsom Dam Safety and Flood Damage Reduction Project	Expected completion by 2016.	This project includes implementation of an auxiliary spillway, dam safety modifications, security and reduction improvements, and flood damage prevention.	Construction of the auxiliary spillway would result in temporary and localized noise.
Bureau of Reclamation	Delta-Mendota Canal/California Aqueduct Intertie	Anticipated completion by 2012.	The purpose of the intertie is to better coordinate water delivery operations between the California Aqueduct (state) and the Delta-Mendota Canal (federal) and to provide better pumping capacity for the Jones Pumping Plant. New project facilities include a pipeline and pumping plant.	Construction of the intertie would result in temporary and localized noise.
Yolo County	General Plan Update	General plan was adopted November 10, 2009.	Anticipated implementation of policies and programs such as the Farmland Conversion Mitigation Program would minimize conversion of agricultural land to nonagricultural uses through mitigation.	Construction of projects under the updated plan would generate temporary and localized noise. Operation of commercial and industrial facilities would be a source of noise as well.
Zone 7 Water Agency and California Department of Water Resources	South Bay Aqueduct Improvement and Enlargement Project	Project is ongoing.	The project includes construction of the Dyer Reservoir, Altamont Water Treatment Plant, and a pipeline to transport the water from the enlarged South Bay Aqueduct.	Construction of this project would result in temporary and localized noise.
NMFS/USFWS	2008 and 2009 Biological Opinions	Ongoing.	The Biological Opinions issued by NMFS and USFWS establish certain RPAs to be implemented. Some of the RPAs require habitat restoration.	Implementation of certain RPAs would result in temporary and localized noise and vibration associated with restoration construction.

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Construction activities and the operation of heavy equipment associated with these projects would be a source of localized and temporary noise. In some cases there may be operational sources of noise as well. Because these projects have undergone or will undergo separate environmental review, it is assumed that potential noise effects have been or will be adequately addressed. As such the No Action Alternative is not expected to result in direct and adverse noise effects.

Catastrophic Seismic Risks

The Delta and vicinity are within a highly active seismic area, with a generally high potential for major future earthquake events along and/or nearby regional faults, with the probability for such events increasing over time. Based on the location, extent and non-engineered nature of many existing levee structures in the Delta area, the potential for significant damage to, or failure of, these structures during a major local seismic event is generally moderate to high. (See Appendix 3E, *Potential Seismic and Climate Change Risks to SWP/CVP Water Supplies* for more detailed discussion). To reclaim land or rebuild levees after a catastrophic event due to climate change or a seismic event would introduce considerable heavy equipment and associated vehicles, including dozers, excavators, pumps, water trucks, and haul trucks, which would create adverse noise effects.

***CEQA Conclusion*:** In total, the ongoing programs and plans under the No Action Alternative would include activities that will generate temporary and localized noise. However, because these projects have undergone or will undergo separate environmental review, it is assumed that potential noise effects have been or will be adequately addressed. Therefore, the effects of these plans, policies, and programs are not considered significant.

23.3.3.2 Alternative 1A—Dual Conveyance with Pipeline/Tunnel and Intakes 1–5 (15,000 cfs; Operational Scenario A)

A total of five intakes would be constructed on the east bank of the Sacramento River under Alternative 1A. This alternative would also include an intermediate and Byron Tract forebay, and the conveyance facility would be a buried tunnel primarily along the east side of the Sacramento River (see Figures 3-2 and 3-3 in Chapter 3, *Description of Alternatives*).

Impact NOI-1: Exposure of Noise-Sensitive Land Uses to Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Construction of Intakes

Potential reasonable worst-case equipment noise levels from construction of the intakes were evaluated by combining the noise levels of the six loudest pieces of equipment that would likely operate at the same time (cranes and trucks). Assuming 100% utilization within a given hour of day, the combined noise level is 96 dBA L_{eq} (1hr) at 50 feet. The estimated sound levels from construction as a function of distance based on calculated point-source attenuation over “soft” (i.e., acoustically absorptive) ground are shown in Table 23-16.

Table 23-16. Predicted Noise Levels from Construction Activities

Distance Between Source and Receiver (feet)	Calculated L_{eq} (1hr)/Nighttime L_{max} Sound Level (dBA)
50	96
100	88
200	80
400	72
600	68
800	64
1,000	62
1,200	**60**
1,500	57
2,000	54
2,500	51
2,800	**50**
3,000	49
4,000	46
5,280	43

Notes: Calculations are based on Federal Transit Administration 2006. Calculations do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.

Bold denotes daytime (1hr) and nighttime (1hr) maximum noise thresholds.

L_{eq} (1 hour) = hourly-equivalent sound level (over 1 hour).

dBA = A-weighted decibel.

Estimated sound levels from impact pile driving conducted during periods of construction described above are shown in Table 23-17. Because noise from pile driving is not constant, a utilization factor of 20% has been applied (Thalheimer 2000). The utilization factor reduces the impact pile driver peak level of 101 dBA to 94 dBA L_{eq} (1hr) at 50 feet. Use of the pile driver simultaneously with noise from other equipment in Table 23-16 would produce a combined level of 98 dBA L_{eq} (1hr) at 50 feet, as shown in Table 23-17.

The results shown in Table 23-17 indicate that during periods of pile driving, residences within 1,400 feet of an active intake construction site could be exposed to construction noise in excess of the 60 dBA L_{eq} (1hr) daytime threshold. The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet.

Table 23-17. Predicted Noise Levels from Construction—Pile Driving and Construction Equipment for Intake Structures

Distance Between Source and Receiver (feet)	Calculated Daytime L_{eq} (1hr) Sound Level (dBA)	Nighttime L_{max} Sound Level (dBA)
50	98	96
100	90	88
200	82	80
400	74	72
600	70	68
800	66	64
1,000	64	62
1,200	62	60
1,400	**60**	57
1,500	59	54
2,000	56	51
2,800	52	**50**
3,500	50	49
4,000	48	46
5,280	45	43

Notes: Calculations are based on Federal Transit Administration 2006. Calculations do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.

Nighttime L_{max} sound levels are based on the same operating assumptions as daytime levels with the exception of pile driving.

Bold denotes daytime and nighttime maximum noise thresholds.

L_{eq} (1hr) = hourly-equivalent sound level (over 1 hour).

dBA = A-weighted decibel.

While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest. The work areas for construction of Intakes 1–5 would extend through several residential areas and communities near the Sacramento River. Noise from intake construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks in areas indicated in Table 23-18.

Although this assessment includes daytime and nighttime construction noise estimates, construction of the intakes would primarily occur during daytime hours. If nighttime construction of the intakes were to occur, noise levels could be the same as that generated during daytime hours.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b would be available to reduce this effect.

Table 23-18. Land Use Affected by Equipment Noise from Construction of Intakes, Alternative 1A

Location	Zoning	Daytime Threshold (60 dBA L_{eq} [1h]) Total Affected Parcels	Nighttime Threshold (50 dBA L_{max} [1h]) Total Affected Parcels
Sacramento County – including River Road near the community of Hood; neighborhoods in the community of Hood; Lambert Road; Vorden Road.	Residential	121	121
	Natural/Recreational	1	4
	Agricultural/Other [a]	109	157
Yolo County – including County Road E9 near the community of Clarksburg; neighborhoods in the community of Clarksburg.	Residential	4	98
	Natural/Recreational	1	5
	Agricultural/Other [a]	152	189
	Schools	None	Clarksburg Middle School

[a] Includes agricultural or unclassified use that permits residential use.

Construction of Conveyance (Tunnel), Forebays, Barge Unloading Facilities, and Intermediate Pumping Plant

Potential reasonable worst-case equipment noise levels from construction work areas adjacent to tunnel shaft sites would be comparable to those listed for the intake sites in Table 23-16. Assuming 100% equipment utilization within a given hour of day, the combined noise level at work areas is 96 dBA L_{eq} (1hr) at 50 feet.

The results shown in Table 23-16 indicate that noise-sensitive land uses within 1,200 feet of an active tunnel work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet.

While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest. This includes all construction sites along the tunnel conveyance alignment, as well as at the site of the Byron Tract Forebay adjacent to and south of Clifton Court Forebay. For a map of the proposed pipeline/tunnel alignment, see Mapbook Figure M3-1. The tunnel and forebay construction work areas would extend through several residential areas and communities near the Sacramento River. Noise from construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks indicated in Table 23-19.

Although this assessment includes daytime and nighttime construction noise estimates for the forebays, barge unloading facilities, intermediate pumping plant, and conveyance tunnels, construction of the forebays, barge unloading facilities, and intermediate pumping plant would primarily occur during daytime hours. If nighttime construction of the forebays, barge unloading facilities, and intermediate pumping plant were to occur, noise levels could be the same as those generated during daytime hours. Construction of the conveyance tunnels and reusable tunnel material (RTM) storage actions would occur on a 24-hour basis.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b would be available to reduce this effect.

Table 23-19. Land Use Affected by Equipment Noise from Construction of Conveyance and Associated Facilities, Alternative 1A

		Daytime Threshold (60 dBA L_{eq} [1h])	Nighttime Threshold (50 dBA L_{max} [1h])
Location	Zoning	Total Affected Parcels	Total Affected Parcels
Sacramento County – including River Road near the community of Hood; neighborhoods in the community of Hood; Lambert Road; Vorden Road.	Residential	116	119
	Natural/Recreational	7	14
	Agricultural/Other [a]	313	503
	Schools	Bates Elementary, Mokelumne High	Bates Elementary, Mokelumne High
Yolo County – including County Road E9 near the community of Clarksburg; neighborhoods in the community of Clarksburg.	Residential	0	89
	Natural/Recreational	1	5
	Agricultural/Other [a]	150	170
	Schools	None	Clarksburg Middle School, River Delta Community Day
San Joaquin County	Residential	9	18
	Natural/Recreational	1	1
	Agricultural/Other [a]	187	273
Contra Costa County	Agricultural/Other [a]	94	118
Alameda County	Agricultural/Other [a]	21	45

[a] Includes agricultural or unclassified use that permits residential use.

Truck Trips and Worker Commutes

Project-generated heavy trucks and worker commutes are predicted to result in increased traffic noise levels at noise-sensitive land uses adjacent to local roadways. Based on information provided by DWR as part of the cost estimate (see Appendix 22A), project-generated vehicle traffic volumes for the pipeline/tunnel alternative are predicted to have a maximum heavy truck composition of 41%, which was assumed to apply to any of the local roadways under a worst-case noise scenario. Future noise levels are shown in Table 23-20.

Table 23-20. Predicted Future Traffic Noise Levels on Commuter Roads and Haul Routes, Pipeline/Tunnel Alignment

Roadway	Segment	Existing Noise Level, dBA	Future With-Project Noise Level, dBA	Noise Level Increase, dB	Substantial Increase?
Byron Hwy	Contra Costa Co./ Alameda Co. Line to Alameda Co./San Joaquin Co. Line	58	66	**8**	**no**
Brentwood Blvd	Delta Rd (Oakley City Limits) to Balfour Rd	61	67	**6**	**no**
Brentwood Blvd	Balfour Rd to Brentwood City Limits (South)	60	66	**6**	**no**
Balfour Rd	Brentwood Blvd to Brentwood City Limits	61	61	**0**	**no**
Bethel Island Rd	Oakley City Limits to End	55	55	**0**	**no**
Balfour Rd	Brentwood City Limits to Byron Hwy	54	54	**0**	**no**
Old SR 41	Brentwood City Limits (South) to Marsh Creek Rd	62	67	**5**	**no**
Byron Hwy	Delta Rd to Old SR 4	53	53	**0**	**no**
Byron Hwy	SR 4 to Contra Costa Co./ Alameda Co. Line	59	67	**8**	**no**
SR 160 (Freeport Blvd)	Sacramento City Limits to Freeport Bridge	59	67	**8**	**no**
SR 160 (Freeport Blvd/ River Rd)	Freeport Bridge to Scribner Rd	55	67	**12**	**yes**
SR 160	Scribner Rd to Hood Franklin Rd	53	66	**13**	**yes**
SR 160	Hood Franklin Rd to Lambert Rd	55	68	**13**	**yes**
SR 160	Lambert Rd to Paintersville Bridge	53	68	**15**	**yes**
SR 160 (Paintersville Bridge)	Sutter Slough Bridge Rd to SR 160 (River Rd)	53	68	**15**	**yes**
SR 160	Paintersville Bridge to Walnut Grove Bridge	53	68	**15**	**yes**
SR 160	Walnut Grove Bridge to A St (Isleton)	59	69	**10**	**no**
SR 160	A St (Isleton) to SR 12	58	69	**11**	**no**
SR 160	SR 12 to Brannan Island Rd	62	70	**8**	**no**
SR 84	West Sacramento City Limits to Courtland Rd	55	67	**12**	**yes**
SR 84 (Courtland Rd/ Ryer Ave)	Courtland Rd to Cache Slough Ferry	46	46	**0**	**no**
SR 12 EB	I-80 to Beck Ave	65	69	**4**	**no**
SR 12 WB	I-80 to Beck Ave	64	69	**5**	**no**

Roadway	Segment	Existing Noise Level, dBA	Future With-Project Noise Level, dBA	Noise Level Increase, dB	Substantial Increase?
SR 12	Beck Ave to Sunset Ave/ Grizzly Island Rd	68	72	**4**	**no**
SR 12	Sunset Ave/ Grizzly Island Rd to Walters Rd/	66	72	**6**	**no**
SR 12	Walters Rd/ to SR 113	63	71	**8**	**no**
SR 12	SR 113 to SR 84 (River Rd)	64	71	**7**	**no**
SR 12 (Rio Vista Bridge)	SR 84 (River Rd) to SR 160 (River Rd)	64	71	**7**	**no**
SR 12	SR 160 (River Rd) to Sacramento Co./ SJ Co. Line	62	65	**3**	**no**
SR 12	Sacramento Co./ SJ Co. Line to I-5	63	65	**2**	**no**
SR 113	I-80 to Dixon City Limits	64	69	**5**	**no**
SR 113	Dixon City Limits to SR 12	57	68	**11**	**no**
SR 4 (Marsh Creek Rd)	Vasco Rd to Byron Hwy	61	68	**7**	**no**
SR 4	Marsh Creek Rd to Discovery Bay Blvd	63	69	**6**	**no**
SR 4	Discovery Bay Blvd to Tracy Blvd	61	68	**7**	**no**
SR 4	Tracy Blvd to I-5	64	69	**5**	**no**
A St/4th St/ Jackson Blvd.	SR 160 to Isleton City Limits	48	48	**0**	**no**
Main Street (Old SR 4)	SR 160 to Cypress Rd	62	67	**5**	**no**
Main Street (Old SR 4)	Cypress Rd to Delta Rd (Oakley City Limits)	61	67	**6**	**no**
Cypress Rd	Main Street to Bethel Island Rd	58	58	**0**	**no**
Bethel Island Rd	Cypress Rd to Oakley City Limits	55	55	**0**	**no**
Delta Rd	Main Street to Byron Hwy	55	55	**0**	**no**
Pocket Rd	I-5 to Freeport Blvd	63	67	**4**	**no**
Freeport Blvd (Old SR 160)	Pocket Rd to Sacramento City Limits	56	65	**9**	**no**
Freeport Bridge	River Rd to SR 160 (Freeport Blvd)	55	55	**0**	**no**
Hood Franklin Rd	SR 160 (River Rd) to I-5	51	67	**16**	**yes**
Lambert Rd	SR 160 (River Rd) to Herzog Rd	44	66	**22**	**yes**
Lambert Rd	Herzog Rd to Franklin Blvd	46	66	**20**	**yes**
Franklin Blvd	Lambert Rd to Twin Cities Rd	48	48	**0**	**no**
Twin Cities Rd	River Rd to I-5	53	61	**8**	**no**
Twin Cities Rd	I-5 to Franklin Blvd	55	55	**0**	**no**

Roadway	Segment	Existing Noise Level, dBA	Future With-Project Noise Level, dBA	Noise Level Increase, dB	Substantial Increase?
Sutter Slough Bridge Rd	Sacramento Co./ Yolo Co. Line to Paintersville Bridge	50	66	**16**	**yes**
River Rd	Paintersville Bridge to Twin Cities Rd	51	58	**7**	**no**
River Rd	Twin Cities Rd to Walnut Grove Bridge	55	61	**6**	**no**
Walnut Grove Rd/River Rd	Walnut Grove Bridge to Sacramento Co./ SJ Co. Line	55	61	**6**	**no**
Isleton Rd	River Rd (Walnut Grove)/Isleton Rd Bridge to 1.5 miles west of Isleton Rd Bridge	54	59	**5**	**no**
Race Track Rd/ Tyler Island Rd	Walnut Grove Rd to Southern End of Tyler Island	45	57	**12**	**yes**
Tyler Island Rd	Southern End of Tyler Island to SR 160 (River Rd)	46	46	**0**	**no**
Jackson Slough Rd	Isleton City Limits to SR 12	47	47	**0**	**no**
Jackson Slough Rd	Brannan Island Rd to SR 12	47	47	**0**	**no**
Walnut Grove Rd	Sacramento Co./ SJ Co. Line to I-5	53	61	**8**	**no**
Peltier Rd	Blossom Rd to I-5	44	44	**0**	**no**
Tracy Blvd	SR 4 to Clifton Court Rd	53	61	**8**	**no**
Tracy Blvd	Clifton Court Rd to Tracy City Limits	52	61	**9**	**no**
Byron Hwy	Alameda Co./San Joaquin Co. Line to Mountain House Pkwy	59	66	**7**	**no**
Mountain House Pkwy	Byron Hwy to Arnaudo Blvd	54	66	**12**	**yes**
Mountain House Pkwy	Arnaudo Blvd to I-205	58	66	**8**	**no**
Eight Mile Rd	Stockton City Limits to I-5	58	58	**0**	**no**
Tracy Blvd	Tracy City Limits to I-205	58	63	**5**	**no**
Harbor Blvd	Industrial Blvd to US 50	63	68	**5**	**no**
Industrial Blvd/ Lake Washington Blvd	Harbor Blvd to Jefferson Blvd	62	67	**5**	**no**
Jefferson Blvd (Old SR 84)	Lake Washington Blvd to Southport Pkwy	62	67	**5**	**no**
Jefferson Blvd (Old SR 84)	Southport Pkwy to West Sacramento City Limits	51	66	**15**	**yes**
River Rd	Freeport Bridge to Courtland Rd	54	54	**0**	**no**
River Rd	Courtland Rd to Sacramento Co./ Yolo Co. Line	48	66	**18**	**yes**
Courtland Rd	SR 84 to River Rd	48	66	**18**	**yes**

As shown in Table 23-20, predicted future traffic noise levels from project-generated worker commutes and truck trips would result in an increase of 12 dB or more compared to existing traffic noise levels along 16 project roadway segments.

During intake construction, segments of SR 160 between Freeport Bridge and Walnut Grove Bridge would be temporarily realigned around intake construction sites. As a result, future project noise levels would further increase at residences located near intake sites. Under Alternative 1A, noise levels at receivers near realigned segments of SR 160 would increase by up to 12 dB in addition to the noise increase shown in Table 23-20.

The increase in noise levels would exceed the project threshold for traffic noise and would be considered adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Construction of Power Transmission Lines

Potential reasonable worst-case equipment noise levels from construction of the power transmission lines were evaluated by combining the noise levels of the three loudest pieces of equipment that would likely operate at the same time (an excavator, a truck and a drill rig for driving micropiles for construction of towers). Assuming 100% utilization within a given hour of day, the combined noise level is 91 dBA L_{eq} (1hr) at 50 feet. The estimated sound levels from construction as a function of distance based on calculated point-source attenuation over "soft" (i.e., acoustically absorptive) ground are shown in Table 23-21.

Table 23-21. Predicted Noise Levels from Construction of Transmission Lines

Distance Between Source and Receiver (feet)	Calculated L_{eq} (1hr)/Nighttime L_{max} Sound Level (dBA)
50	91
100	83
200	75
400	67
600	63
800	**60**
1,000	57
1,200	55
1,400	53
1,800	**50**
2,000	49
3,000	44

Notes: Calculations are based on Federal Transit Administration 2006. Calculations do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.

Bold denotes daytime (1hr) and nighttime (1hr) maximum noise thresholds.

L_{eq} (1 hour) = hourly-equivalent sound level (over 1 hour).

dBA = A-weighted decibel.

The results shown in Table 23-21 indicate that noise-sensitive land uses within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime

(7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area.

Noise-sensitive land uses that could potentially be exposed to adverse noise impacts due to transmission line construction would extend outside the transmission line right-of-way within the utility planning area. Several residential land uses are near the proposed transmission line construction footprint. Likewise, Delta Elementary School and Delta High School on the west bank of the Sacramento River are within half a mile of the proposed Intake 2 transmission lines. Although there would be risk of increased noise levels, compared to the conveyance and associated components, the duration of construction of transmission lines would be shorter-term. Noise impacts would be intermittent and temporary, and would cease once construction work is complete.

Although this assessment includes daytime and nighttime construction noise estimates, construction of the transmission lines would primarily occur during daylight hours. If nighttime construction of the transmission lines were to occur, noise levels could be the same as those generated during daytime hours.

The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b would be available to reduce this effect.

Earth-moving activities at offsite borrow/spoil areas

Potential reasonable worst-case equipment noise levels from earth-moving activities at offsite borrow/spoil areas were evaluated by combining the noise levels of the three loudest pieces of equipment that would likely operate at the same time (an excavator, a truck and a bulldozer). Assuming 100% utilization within a given hour of day, the combined noise level would be 91 dBA L_{eq} (1hr) at 50 feet. The estimated sound levels from construction as a function of distance based on calculated point-source attenuation over "soft" (i.e., acoustically absorptive) ground are shown in Table 23-22.

The results shown in Table 23-22 indicate that noise-sensitive land uses within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Borrow/spoil areas are located throughout the conveyance alignment and are generally adjacent to or in close proximity of intake pumping plant sites, forebays, and main tunnel construction shafts. Noise-sensitive land uses that could potentially be exposed to adverse noise impacts due to earth-moving activities in offsite borrow/spoil areas would extend outside the borrow/spoil area right-of-way. The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. However, with the exception of tunneling and RTM placement, most construction activities would occur during daytime hours. Mitigation Measures NOI-1a and NOI-1b would be available to reduce this effect.

Table 23-22. Predicted Noise Levels from Earth-moving at offsite borrow/spoil areas

Distance Between Source and Receiver (feet)	Calculated L_{eq} (1hr)/Nighttime L_{max} Sound Level (dBA)
50	91
100	83
200	75
400	67
600	63
800	**60**
1,000	57
1,200	55
1,400	53
1,800	**50**
2,000	49
3,000	44

Notes: Calculations are based on Federal Transit Administration 2006. Calculations do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.

Bold denotes daytime (1hr) and nighttime (1hr) maximum noise thresholds.

L_{eq} (1 hour) = hourly-equivalent sound level (over 1 hour).

dBA = A-weighted decibel.

Noise exposure to workers at construction sites

Construction noise would affect workers on site. However, workers are subject to state and federal Occupational Health and Safety (OSHA) standards. OSHA mitigation standards for noise limits exposure are as follows: an 8-hour time-weighted average of 85 dBA or a dose of 50 percent are referred to as OSHA action levels [29 CFR 1910.95(c)(2)]. Occupational exposure to noise levels in excess of 85 dBA requires monitoring and mitigation to protect workers. Given that on-site workers would be protected under OSHA requirements, no adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise levels above the 60 dBA L_{eq} (1hr) daytime, the 50 dBA L_{max} nighttime, or the 12 dB traffic noise increase threshold would be considered significant. Based on reasonable worst-case modeling, the following significant impacts are expected as a result of Alternative 1A construction.

- **Intakes:** Sensitive receptors within 1,400 feet of an active intake construction site could be exposed to construction noise in excess of the 60 dBA L_{eq} (1hr) daytime threshold. The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-18, 125 residential parcels, 2 natural/recreational parcels, and 261 agricultural parcels would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 219 residential parcels, 9 natural/recreational parcels, 346 agricultural parcels, and 2 schools.
- **Conveyance and Associated Facilities:** Sensitive receptors within 1,200 feet of an active tunnel work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-19, 125 residential parcels, 9 natural/recreational parcels, 765 agricultural parcels, and 2 schools would be affected by

daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 226 residential parcels, 20 natural/recreational parcels, 1,109 agricultural parcels, and 4 schools.

- **Truck Trips and Worker Commutes:** Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 16 project roadway segments in the study area as shown in Table 23-20. The increase in noise levels would be substantial and exceed the project threshold for traffic noise.
- **Power Transmission Lines:** Sensitive receptors within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. As noted above, several residential land uses are near the proposed transmission line construction footprint. Likewise, Delta Elementary School and Delta High School on the west bank of the Sacramento River are within half a mile of the proposed Intake 2 transmission lines.
- **Borrow/spoil areas:** Sensitive receptors within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Borrow/spoil areas are located throughout the conveyance alignment and are generally adjacent to or in close proximity of intake pumping plant sites, forebays, and main tunnel construction shafts.

Mitigation Measures NOI-1a and NOI-1b would reduce noise impacts to sensitive land uses. Although implementation of these measures will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be considered significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

During construction, BDCP proponents will employ best practices to reduce construction noise at noise-sensitive land uses. Implementation of this measure will ensure that construction noise levels, as applicable, do not exceed 60 dBA (one-hour L_{eq}) during daytime hours (7:00 a.m. to 10:00 p.m.) and 50 dBA (single-event maximum) during nighttime hours (10:00 p.m. to 7:00 a.m.).

Measures used to limit construction noise include the following:

- Limiting above-ground noise-generating construction operations to the hours between 7 a.m. and 6 p.m. Monday through Friday, and between 8 a.m. and 5 p.m. on Saturdays.
- Locating stationary equipment (e.g., generators, compressors, rock crushers, cement mixers, idling trucks) as far as possible from noise-sensitive land uses.
- Prohibiting gasoline or diesel engines from having unmuffled exhaust.
- Requiring that all construction equipment powered by gasoline or diesel engines have sound-control devices that are at least as effective as those originally provided by the manufacturer and that all equipment be operated and maintained to minimize noise generation.

- Preventing excessive noise by shutting down idle vehicles or equipment.
- Using noise-reducing enclosures around noise-generating equipment.
- Selecting haul routes that affect the fewest number of people.
- Constructing barriers between noise sources and noise-sensitive land uses or take advantage of existing barrier features (e.g., terrain, structures) to block sound transmission to noise-sensitive land uses. The barriers shall be designed to obstruct the line of sight between the noise-sensitive land use and on-site construction equipment.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Prior to construction, BDCP proponents will make a construction schedule available to residents living in the vicinity of the construction areas before construction begins, and designate a noise disturbance coordinator. The coordinator will be responsible for responding to complaints regarding construction noise, will determine the cause of the complaint, and will ensure that reasonable measures are implemented to correct the problem when feasible. A contact telephone number for the noise disturbance coordinator will be conspicuously posted on construction site fences and will be included in the notification of the construction schedule.

Impact NOI-2: Exposure of Sensitive Receptors to Vibration or Groundborne Noise from Construction of Water Conveyance Facilities

NEPA Effects: Construction at the intake sites would involve use of impact pile driving and drilled piles, and tunnel construction would involve the use of TBMs and tunnel locomotives, both of which would cause groundborne vibration in localized areas. Groundborne vibrations from pile driving at intake sites and barge loading facilities would be intermittent, and temporary, occurring over a two month period during the in-river work period (June 1 to October 31). All pile driving activities will cease after construction is complete. During tunnel construction, groundborne noise due to vibrations from tunnel locomotive passbys and TBMs could occur intermittently where tunnels are located under or near residential areas.

Pile Driving at Intake Sites

Construction of the intakes would involve driving sheet piles within the intake rights-of-way. Use of impact piles would cause groundborne vibrations to exceed the threshold of 0.2 in/sec PPV at residential buildings within 70 feet of pile driving sites, as shown in Table 23-23.

Table 23-23. Predicted Vibration Levels from Construction Activities—Impact Pile Driving at Intake Structures

Distance Between Source and Receiver (feet)	Calculated Peak Particle Velocity (in/sec PPV)
50	0.3004
60	0.2458
70	**0.2075**
75	0.1923
80	0.1792
90	0.1574
100	0.1402
150	0.0897

Note: Calculations are based on Federal Transit Administration 2006 and California Department of Transportation Vibration Guidance Manual 2004. Assumes ground type n value of 1.1.
PPV = peak particle velocity.

Groundborne vibration from impact pile driving is predicted to exceed vibration thresholds at nearby residences in the areas shown in Table 23-24. While groundborne vibration levels in excess of 0.2 in/sec PPV could occur at any of these residences, the highest vibration levels are expected at those residences nearest to the intake work areas. Construction of intakes and barge unloading facilities would result in excessive groundborne vibration levels at these nearby residential structures. The effect of exposing sensitive receptors to groundborne vibration would be adverse. Mitigation Measure NOI-2 is available to reduce this effect.

Table 23-24. Land Use Affected by Vibrations from Pile Driving During Construction of Intakes, Alternative 1A

Location	Zoning	Total Affected Parcels
Sacramento County – including River Road near the community of Hood; Neighborhoods in the community of Hood	Residential[a]	88
Yolo County – including County Road E9 near the community of Clarksburg	Residential[a]	1
San Joaquin County	Residential[a]	13

[a] Includes agricultural or unclassified use that permits residential use.

Construction of Water Conveyance (Tunnel)

The use of tunneling equipment during construction would cause groundborne vibration and potentially groundborne noise within buildings in the vicinity of tunnel construction areas. Vibration sources include the TBM and locomotives moving soil, equipment, and construction workers between tunnel shaft sites. As discussed in Chapter 3, *Description of Alternatives*, the typical depth of tunnel installation would be approximately 100 feet below mean sea level (msl), but could be up to 160 feet below msl depending on site conditions. This analysis uses a conservative worst-case assumption of 60 feet below msl despite the fact that all proposed Delta tunnels will be constructed with a minimum of 100 feet of soil (soft ground) cover.

Groundborne vibration levels from operation of the TBM and tunnel locomotives are described below. Sensitive receptors that may be exposed to increased groundborne vibration include residences, outdoor parks, schools, and agriculture areas. As shown in Table 23-23, there are a number of potentially affected parcels within 1,200 feet of the tunnel conveyance. However, at a 60-foot tunnel depth, groundborne vibrations from the TBM are estimated to be 0.008 in/sec PPV, which is below the threshold of 0.04 in/sec PPV.[1] As demonstrated by measured ground vibration data from modern tunneling projects, the deep soil cover will effectively dampen, and absorb propagated energy.

During tunnel construction, passbys from locomotives hauling workers and material inside of the tunnel would produce localized groundborne vibration that could manifest as noise inside of buildings. However, as described in Section 23.4.2, *Determination of Effects,* tunnel locomotives would be operated at slow speeds inside of tunnels and would not result in excessive vibrations. Groundborne noise from tunnel locomotive operation during construction is therefore not predicted to exceed groundborne noise thresholds or result in an adverse noise impact to sensitive receptors along the tunnel conveyance.

The potential for tunneling induced ground vibration effects will be thoroughly analyzed in the preliminary and final design phases of the project, using site-specific geotechnical data and the expected TBM configuration. Potential effects on surface structures and human perception will be evaluated in detail during preliminary design. As additional precautions, and where necessary, a ground vibration monitoring program using seismographs and other high-precision equipment will be implemented during construction to ensure ground vibration is within the required contract limits.

***CEQA Conclusion*:** Groundborne vibrations during tunneling would not exceed 0.008 in/sec PPV at 60-foot tunnel depth and would therefore be less than significant. Likewise**,** locomotives are not expected to generate significant noise levels because they will travel at low speeds between 5 and 10 miles per hour. However, the impact of exposing residential structures to groundborne vibration during intake construction would be significant as reasonable worst-case modeling indicates that 102 residential parcels would be exposed to vibration levels in excess of 0.2 in/sec PPV during intake pile driving (see Table 23-24). Although Mitigation Measure NOI-2 will reduce this impact, it is not anticipated that feasible measures will be available in all situations to reduce vibration to levels below the applicable thresholds. This impact would therefore be significant and unavoidable.

Mitigation Measure NOI-2: Employ Vibration-Reducing Construction Practices during Construction of Water Conveyance Facilities

During construction, BDCP proponents will implement vibration-reducing construction practices such that vibration from pile driving does not exceed 0.2 in/sec PPV at nearby residences.

The BDCP proponents shall ensure that the following measures are implemented to reduce adverse effects and/or significant effects as described above if the measures are applicable and

[1] A case study of a similar tunneling project (the New Crystal Springs Bypass Tunnel Project) shows that in a tunneling project which took place 60-155 feet below ground surface in an urban residential neighborhood more heavily populated than any of the BDCP alternatives, the groundborne vibration did not exceed 0.032 in/sec PPV during the daytime hours of 7 am to 6 pm, or 0.016 in/sec PPV during the nighttime hours of 6 pm to 7 am and was indistinguishable from the surrounding noise. (Wilson et al., 2011)

feasible. Not all measures listed below may be feasible or applicable to all contractors. Rather, these measures serve as an overlying mitigation framework to be used for specific construction practices. The applicability of measures listed below would vary based on the location, timing, nature, and feasibility of each activity.

- Locating equipment as far as practical from vibration-sensitive (and noise-sensitive) land uses (at least 100 feet)
- Use of alternative pile driving methods such as vibratory driving, hydraulic press-in driving, or use of pre-drilled pile holes.

Depending on the equipment selected, the measures identified above can reduce vibration from pile driving to below 0.2 in/sec PPV at nearby residences. The specific noise reduction cannot be currently quantified since the actual equipment to be used is unknown and that the contractor may have alternative ways to achieve the performance limit. If the above measures are determined feasible, BDCP proponents will retain a qualified acoustical consultant or engineering firm to conduct vibration monitoring at potentially affected buildings to measure the actual vibration levels during construction and ensure vibration from pile driving does not exceed 0.2 in/sec PPV.

For cases where the above measures are not feasible, the resident or property owner will be notified in writing prior to construction activity that construction may occur within 100 feet of their building. A representative for the BDCP proponents will inspect the potentially affected buildings prior to construction to inventory existing cracks in paint, plaster, concrete, and other building elements. BDCP proponents will retain a qualified acoustical consultant or engineering firm to conduct vibration monitoring at potentially affected buildings to measure the actual vibration levels during construction. Following completion of construction, a representative for the BDCP proponents will conduct a second inspection to inventory changes in existing cracks and new cracks or damage, if any, that occurred as a result of construction-induced vibration. If new damage is found, then the BDCP proponents will promptly arrange to have the damage repaired, or will reimburse the property owner for appropriate repairs.

In addition, if construction activity is required within 100 feet of residences or other vibration-sensitive buildings, a designated complaint coordinator will be responsible for handling and responding to any complaints received during such periods of construction. A reporting program will be required that documents complaints received, actions taken, and the effectiveness of these actions in resolving disputes.

Impact NOI-3: Exposure of Noise-Sensitive Land Uses to Noise from Operation of Water Conveyance Facilities

NEPA Effects: Potential reasonable worst-case pump noise levels during operation of the intake structures were evaluated by calculating sound power levels of the pump based on horsepower (Hoover and Keith 2000). For Alternative 1A, faceplate horsepower for vertical column and vertical volute type pumps is specified in the pump selection appendix of the Pipeline/Tunnel Option Conceptual Engineering Report (CER) (California Department of Water Resources 2010b). Pump specifications are shown in Table 23-25. Combined source noise levels assume that pump enclosures (including buildings) provide a nominal 15 dB of noise attenuation. This analysis assumes that pumps are operating 24 hours a day.

Table 23-25. Pump Specifications—Alternative 1A

Pump Location	Quantity	Pumping Plant Capacity (cfs)	Pump Horse-power	Individual Pump Source Level (dBA)	Combined Source Level (dBA)	Assumed Attenuation (dB)	Combined Source Level at 50 feet with Attenuation (dBA)
Intake 1	6	3,000	4,500	97	104	15	89
Intake 2	6	3,000	4,500	97	104	15	89
Intake 3	6	3,000	3,500	96	102	15	88
Intake 4	6	3,000	3,500	96	102	15	88
Intake 5	6	3,000	3,500	96	102	15	88
Intermediate Plant	16 (10/6)[a]	15,000	18,000/ 8,000[a]	103/99[a]	114	15	99

[a] Vertical Column Pumps/Vertical Volute Pumps in the Intermediate Pumping Plant.
cfs = cubic feet per second.
dB = decibels.
dBA = A-weighted sound level in decibels.

The estimated sound levels from pump operation as a function of distance based on calculated point-source attenuation over "soft" (i.e., acoustically absorptive) ground are shown in Table 23-26.

The results shown in Table 23-26 indicate that operating noise from pumping plants would exceed the nighttime threshold of 45 dBA at noise-sensitive land uses within a distance of up to 2,600 feet from intake pumping plant locations, and 6,000 feet from the pumping plant located at the proposed intermediate forebay. Noise from operation of pumping plants is predicted to exceed daytime and nighttime noise thresholds at nearby residences and outdoor parks in areas indicated in Table 23-27.

Table 23-26. Predicted Noise Levels from Intake and Intermediate Pumping Plant Operations—Alternative 1A

Distance Between Source and Receiver (feet)	Intakes 1–2 Calculated L_{eq} Sound Level (dBA)	Intakes 3–5 Calculated L_{eq} Sound Level (dBA)	Intermediate Pumping Plant Calculated L_{eq} Sound Level (dBA)
50	89	88	99
100	82	80	91
200	74	72	83
300	69	68	79
400	66	65	75
600	61	60	71
800	58	57	67
1,000	55	54	65
1,200	53	52	63
1,400	52	**50**	61
1,600	**50**	49	60

Distance Between Source and Receiver (feet)	Intakes 1–2 Calculated L_{eq} Sound Level (dBA)	Intakes 3–5 Calculated L_{eq} Sound Level (dBA)	Intermediate Pumping Plant Calculated L_{eq} Sound Level (dBA)
2,000	47	46	57
2,200	46	**45**	56
2,600	**45**	43	54
3,600	41	40	**50**
5,000	37	36	47
6,000	35	34	**45**
7,000	33	32	43

Notes: Calculations are based on Federal Transit Administration 2006. Calculation do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.
Noise levels assume a nominal pump enclosure attenuation of 15 dB.
Bold denotes daytime and nighttime maximum noise thresholds.
dBA = A-weighted sound level in decibels.

As shown in Table 23-27, operation of water conveyance facilities could result in substantial increases in noise levels affecting nearby communities and residences. While noise levels in excess of applicable thresholds could occur throughout the affected area, the highest noise levels are expected at those land uses most adjacent to the pumping plants. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measure NOI-3 is available to reduce this effect.

Table 23-27. Land Use Affected by Noise from Operation of Pumping Plants, Alternative 1A

		50 dBA L_{eq} Daytime Operations Threshold	45 dBA L_{eq} Nighttime Operations Threshold
Location	Zoning	Total Affected Parcels	Total Affected Parcels
Sacramento County – including River Road near the community of Hood; neighborhoods in the community of Hood; Lambert Road; Vorden Road.	Residential	108	121
	Natural/Recreational	2	2
	Agricultural/Other [a]	79	156
Yolo County – including County Road E9 near the community of Clarksburg; neighborhoods in the community of Clarksburg.	Agricultural/Other [a]	85	138

[a] Includes agricultural or unclassified use that permits residential use.

Noise Exposure to Workers at Conveyance Facilities

Noise from operation of conveyance facilities would affect workers on site. However, workers are subject to state and federal Occupational Health and Safety (OSHA) standards. OSHA mitigation

standards for noise limits exposure are as follows: an 8-hour time-weighted average of 85 dBA or a dose of 50 percent are referred to as OSHA action levels [29 CFR 1910.95(c)(2)]. Occupational exposure to noise levels in excess of 85 dBA requires monitoring and mitigation to protect workers. Given that on-site workers would be protected under OSHA requirements, no adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during pumping plant operations to noise levels above the daytime (50 dBA L_{max}) or nighttime (45 dBA L_{max}) noise thresholds would be significant. Based on reasonable worst-case modeling, 108 residential parcels, 2 natural/recreational parcels, and 165 agricultural parcels would be affected by daytime noise levels in excess of the operational threshold. The nighttime threshold would be exceeded at 121 residential parcels, 2 natural/recreational parcels, and 294 agricultural parcels. The impact of exposing these receptors to noise increases above thresholds would be significant. Mitigation Measure NOI-3 will reduce operational noise levels below applicable thresholds, thus resulting in a less-than-significant impact.

Mitigation Measure NOI-3: Design and Construct Intake Facilities and Other Pump Facilities Such That Operational Noise Does Not Exceed 50 dBA (One-Hour L_{eq}) during Daytime Hours (7:00 A.M. to 10:00 P.M.) or 45 dBA (One-Hour L_{eq}) during Nighttime Hours (10:00 P.M. to 7:00 A.M.) or the Applicable Local Noise Standard (Whichever Is Less) at Nearby Noise Sensitive Land Uses

BDCP proponents will retain a qualified acoustical consultant to design acoustical treatments for the intake facilities and other pump facilities. Implementation of this measure will ensure that operational noise levels, as applicable, do not exceed 50 dBA (one-hour L_{eq}) during daytime hours (7:00 a.m. to 10:00 p.m.) or 45 dBA (one-hour L_{eq}) during nighttime hours (10:00 p.m. to 7:00 a.m.) or the applicable local noise standard (whichever is less) at nearby noise-sensitive land uses. Measures that can be implemented to achieve this include but at not limited to:

- enclosing all pumps, motors, and other noise-generating equipment in solid wall structures;
- limiting openings in the enclosing structure and installing acoustic ventilation louvers where ventilation openings are required,
- installing acoustic access doors and wall panels,
- using low-noise motors,
- using low noise transformers,
- placing sound barriers (earth berms or constructed barriers) around noise sources

Verification noise monitoring will be conducted at each operational intake or pump location to confirm that acoustical treatments reduce operational noise to comply with the applicable noise standard. If noise is not in compliance with the applicable standard, BDCP proponents will implement additional necessary treatments until compliance is achieved.

Impact NOI-4: Exposure of Noise-Sensitive Land Uses to Noise from Implementation of Proposed Conservation Measures 2-10

NEPA Effects: Implementation of CM2 and CM3–CM10 could generate increases in noise related to restoration or enhancement activities. Habitat restoration and enhancement conservation measures are anticipated to require use of noise-generating equipment during construction and maintenance:

- Grading, excavation, and placement of fill material.
- Breaching, modification, or removal of existing levees, and construction of new levees.
- Modification, demolition, and removal of existing infrastructure (e.g., buildings, roads, fences, electric transmission and gas lines, irrigation infrastructure).
- Construction of new infrastructure (e.g., buildings, roads, fences, electric transmission and gas lines, irrigation infrastructure).
- Removal of existing vegetation and planting/seeding of vegetation.
- Levee maintenance.
- Mowing, burning, and trimming to manage vegetation.

Because the specific areas for implementing these conservation measures have not been determined, this effect is evaluated qualitatively.

- Yolo Bypass Fishery Enhancement (CM2). Noise-generating activities from enhancement activities in the Yolo Bypass would include use of construction vehicles and equipment for modifying or installing new facilities, or changes in operation of existing facilities, including the following.
    - Installing fish ladders and experimental ramps at Fremont Weir or widening the existing fish ladder.
    - Installing fish screens on small Yolo Bypass diversions.
    - Constructing new or replacement operable check-structures at Tule Canal/Toe Drain.
    - Replacing the Lisbon Weir with a fish-passable gate structure.
    - Realigning Lower Putah Creek.
    - Increasing operation of upstream unscreened pumps.
    - Installing operable gates at Freemont Weir.
    - Constructing physical barriers in the Sacramento River.
    - Constructing associated support facilities (operations buildings, parking lots, access facilities such as roads and bridges).
    - Improving levees adjacent to the Fremont Weir Wildlife Area.
    - Replacing agricultural crossings of the Tule Canal/Toe Drain with fish-passable structures such as flat car bridges, earthen crossings with large, open culverts.
    - Grading, removal of existing berms, levees, and water control structures, construction of berms or levees, re-working of agricultural delivery channels, and earthwork or construction of structures to reduce Tule Canal/Toe Drain channel capacities.
- Tidal Habitat Restoration (CM4). Restoration of freshwater tidal habitat in the Cache Slough, Cosumnes/Mokelumne, West Delta, South Delta, and Suisun Marsh ROAs would require breaching and lowering of levees, installing new or modified levees to protect adjacent areas from flooding, connecting remnant sloughs or channels to improve circulation, and modifying ground elevations to reduce impacts of subsidence. Noise-generating activities would include use of construction vehicles and equipment for the following activities.

- Construction site preparation could require clearing and grubbing, demolition of existing structures, surface water quality protection, dust control, establishment of storage areas and stockpile areas, temporary utilities and fuel storage, and erosion control.
- Earthwork activities for development of the restoration habitat areas could include the construction activities described below on the landside and waterside of existing levees in areas that would be selected for tidal habitat restoration.

- Seasonally Inundated Floodplain Restoration (CM5). Seasonally inundated floodplain habitat would be restored within the north, east, and/or south Delta. Noise-generating activities would include use of construction vehicles and equipment for modifying or installing new facilities, or changes in operation of existing facilities, including the following activities.
  - Site preparation could require clearing and grubbing, demolition of existing structures, surface water quality protection, dust control, establishment of storage areas and stockpile areas, temporary utilities and fuel storage, and erosion control.
  - Earthwork activities for development of the seasonally inundated floodplains could include setting back levees, removal of existing levees, removal of riprap to allow for channel meander between the setback levees, grading to restore drainage patterns and increase inundation frequency and duration, and establishment of riparian habitat.
- Channel Margin Habitat Enhancement (CM6). Channel margin habitat would be enhanced on the Sacramento River between Freeport and Walnut Grove, the San Joaquin River between Vernalis and Mossdale, Steamboat and Sutter Sloughs, and the North and South Forks of the Mokelumne River. Noise-generating activities would include use of construction vehicles and equipment for the following activities.
  - Site preparation could require clearing and grubbing, demolition of existing structures, surface water quality protection, dust control, establishment of storage areas and stockpile areas, temporary utilities and fuel storage, and erosion control.
  - Earthwork activities for development of the channel margin habitat areas could include modification of levees or setting back levees. Riprap would be removed where levees are set back and channel geometry would be modified in unconfined channel reaches or along channels where levees are set back.
- Riparian Habitat Restoration (CM7). Riparian habitat restoration in Cosumnes/Mokelumne, east, west, and south Delta areas would require site preparation and earthwork using noise-generating construction vehicles and equipment for the following activities.
  - Clearing and grubbing, demolition of existing structures, surface water quality protection, dust control, establishment of storage areas and stockpile areas, temporary utilities and fuel storage, and erosion control.
  - Removal of riprap, minor landform modifications to restore water circulation, planting of riparian vegetation, irrigation and maintenance of plantings, and control of nonnative species.
- Grassland Communities Restoration (CM8). Restoration of grassland habitat would require sowing native species using a variety of techniques (e.g., seed drilling, native hay spreading, plugs). Noise-generating activities would include use of construction vehicles and equipment for reseeding and for recontouring graded land.

- Vernal Pool Complex Restoration (CM9). Vernal pool complex restoration could require use of noise-generating construction vehicles and equipment to excavate or recontour historical vernal pools and swales to natural bathymetry.
- Nontidal Marsh Restoration (CM10). Nontidal wetlands restoration could include the use of noise-generating construction vehicles and equipment for site preparation, planting of native marsh vegetation, and maintenance of plantings, including grading to establish an elevational gradient to support both open water perennial aquatic habitat intermixed with shallower marsh habitat.

The effect would vary according to the type of construction equipment and techniques used in construction of the specific conservation measure, the location and timing of the actions called for in the conservation measure, and the noise environment at the time of implementation. However, the noise levels from these activities are expected to be similar to those shown in Table 23-16 because similar types of equipment will be used. The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet.

The effect of exposing sensitive land uses to increases in construction noise levels above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to reduce this effect.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise increases above the daytime (60 dBA L_{eq}) and nighttime (50 dBA L_{max}) thresholds would be significant. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16. The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet. The impact of exposing these receptors to noise increases above thresholds would be significant. Although Mitigation Measures NOI-1a and NOI-1b will reduce this impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1.

23.3.3.3 Alternative 1B—Dual Conveyance with East Alignment and Intakes 1–5 (15,000 cfs; Operational Scenario A)

Impact NOI-1: Exposure of Noise-Sensitive Land Uses to Noise from Construction of Water Conveyance Facilities

NEPA Effects: For a description of noise generated by this component of the project, see the discussion of Impact NOI-1, *Construction of Intakes*, under Alternative 1A. A total of five intakes would be constructed under Alternative 1B. No intermediate forebay would be constructed, and the conveyance facility would be a canal on the east side of the Sacramento River (see Figures 3-4 and 3-5 in Chapter 3, *Description of Alternatives*).

Construction of Intakes

The results shown in Table 23-17 indicate that during periods of pile driving, residences located within 1,400 feet of an active intake construction site could be exposed to construction noise in excess of the DWR daytime (7 a.m. to 10 p.m.) maximum noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet.

While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest. The work areas for construction of Intakes 1–5 would extend through several residential areas and communities near the Sacramento River. Noise from construction of intakes is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks indicated in Table 23-28.

Although this assessment includes daytime and nighttime construction noise estimates, construction of the intakes would primarily occur during daytime hours. If nighttime construction of the intakes were to occur, noise levels could be the same as that generated during daytime hours.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Table 23-28. Land Use Affected by Equipment Noise from Construction of Intakes, Alternative 1B

		Daytime Threshold (60 dBA L_{eq} [1h])	Nighttime Threshold (50 dBA L_{max} [1h])
Location	Zoning	Total Affected Parcels	Total Affected Parcels
Sacramento County – including River Road near the community of Hood; neighborhoods in the community of Hood; Lambert Road; Vorden Road.	Residential	120	120
	Natural/Recreational	4	4
	Agricultural/Other [a]	212	159
Yolo County – including County Road E9 near the community of Clarksburg; neighborhoods in the community of Clarksburg.	Residential	4	98
	Natural/Recreational	1	5
	Agricultural/Other [a]	152	189
	Schools	None	Clarksburg Middle School

[a] Includes agricultural or unclassified use that permits residential use.

Construction of Conveyance (Canal), Forebay, Barge Unloading Facilities, and Intermediate Pumping Plant

Alternative 1B would use the east alignment conveyance alternative. A pipeline connecting the intakes to the canal would be constructed via open trenching to a depth of approximately 30 feet. Hydraulic siphons would be constructed in tunnels at approximately 160-foot depths where the canal alignment crosses a major waterway or floodway. Potential reasonable worst-case equipment noise levels from construction work areas would be comparable to those listed for the intake sites in Table 23-17. Assuming 100% equipment utilization within a given hour of day, the combined noise level at work areas is 96 dBA L_{eq} (1hr) at 50 feet.

The results shown in Table 23-16 indicate that residences within 1,200 feet of an active work area could be exposed to construction noise in excess of the DWR daytime (7 a.m. to 10 p.m.) maximum noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet.

While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest. This includes all construction sites along the canal or tunnel conveyance alignment, as well as at the site of the Byron Tract Forebay adjacent to and south of Clifton Court Forebay. For a map of the proposed east alignment, see Mapbook Figure M3-2. The canal, tunnel, and forebay construction work areas would extend through several residential areas and communities near the Sacramento River. Noise from construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks indicated in Table 23-29.

Although this assessment includes daytime and nighttime construction noise estimates for the forebay, barge unloading facilities, intermediate pumping plant, and conveyance tunnels and canals, construction of the forebay, barge unloading facilities, intermediate pumping plant, and canals would primarily occur during daytime hours. If nighttime construction of the forebay, barge unloading facilities, intermediate pumping plant, and canals were to occur, noise levels could be the same as those generated during daytime hours. Construction of the conveyance tunnels and RTM storage actions would occur on a 24-hour basis.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Table 23-29. Land Use Affected by Equipment Noise from Construction of Conveyance and Associated Facilities, Alternative 1B

		Daytime Threshold (60 dBA L_{eq} [1h])	Nighttime Threshold (50 dBA L_{max} [1h])
Location	Zoning	Total Affected Parcels	Total Affected Parcels
Sacramento County – including River Road near the community of Hood; neighborhoods in the community of Hood; Lambert Road.	Residential	99	99
	Natural/Recreational	2	7
	Agricultural/Other [a]	217	310
Yolo County	Residential	21	125
	Natural/Recreational	1	5
	Agricultural/Other [a]	159	177
	Schools	None	Clarksburg Middle School, Delta Elementary (K–6 Charter), Delta High
San Joaquin County	Residential	9	26
	Natural/Recreational	2	2
	Agricultural/Other [a]	472	1,118
	Schools	Holt Union Elementary	Holt Union Elementary
Contra Costa County	Agricultural/Other [a]	89	98
Alameda County	Agricultural/Other [a]	21	45

[a] Includes agricultural or unclassified use that permits residential use.

Truck Trips and Worker Commutes

Project-generated heavy trucks and worker commutes are predicted to result in increased traffic noise levels at noise-sensitive land uses adjacent to local roadways. Project-generated vehicle traffic volumes for the east alignment alternative are predicted to have a maximum heavy truck composition of 38%, which was assumed to apply to any of the local roadways under a worst-case noise scenario. Future noise levels are shown in Table 23-30.

Table 23-30. Predicted Future Traffic Noise Levels on Commuter Roads and Haul Routes, East Alignment

Roadway	Segment	Existing Noise Level, dBA	Future With-Project Noise Level, dBA	Noise Level Increase, dB	Substantial Increase?
Byron Hwy	Contra Costa Co./ Alameda Co. Line to Alameda Co./San Joaquin Co. Line	58	65	**7**	**no**
Brentwood Blvd	Delta Rd (Oakley City Limits) to Balfour Rd	61	66	**5**	**no**
Brentwood Blvd	Balfour Rd to Brentwood City Limits (South)	60	66	**6**	**no**
Balfour Rd	Brentwood Blvd to Brentwood City Limits	61	61	**0**	**no**
Bethel Island Rd	Oakley City Limits to End	55	55	**0**	**no**
Balfour Rd	Brentwood City Limits to Byron Hwy	54	54	**0**	**no**
Old SR 41	Brentwood City Limits (South) to Marsh Creek Rd	62	66	**4**	**no**
Byron Hwy	Delta Rd to Old SR 4	53	53	**0**	**no**
Byron Hwy	SR 4 to Contra Costa Co./ Alameda Co. Line	59	65	**6**	**no**
SR 160 (Freeport Blvd)	Sacramento City Limits to Freeport Bridge	59	70	**11**	**no**
SR 160 (Freeport Blvd/ River Rd)	Freeport Bridge to Scribner Rd	55	69	**14**	**yes**
SR 160	Scribner Rd to Hood Franklin Rd	53	69	**16**	**yes**
SR 160	Hood Franklin Rd to Lambert Rd	55	71	**16**	**yes**
SR 160	Lambert Rd to Paintersville Bridge	53	71	**18**	**yes**
SR 160 (Paintersville Bridge)	Sutter Slough Bridge Rd to SR 160 (River Rd)	53	72	**19**	**yes**
SR 160	Paintersville Bridge to Walnut Grove Bridge	53	72	**19**	**yes**
SR 160	Walnut Grove Bridge to A St (Isleton)	59	72	**13**	**yes**
SR 160	A St (Isleton) to SR 12	58	72	**14**	**yes**
SR 160	SR 12 to Brannan Island Rd	62	73	**11**	**no**
SR 84	West Sacramento City Limits to Courtland Rd	55	66	**11**	**no**
SR 84 (Courtland Rd/ Ryer Ave)	Courtland Rd to Cache Slough Ferry	46	46	**0**	**no**
SR 12 EB	I-80 to Beck Ave	65	71	**6**	**no**
SR 12 WB	I-80 to Beck Ave	64	71	**7**	**no**

Roadway	Segment	Existing Noise Level, dBA	Future With-Project Noise Level, dBA	Noise Level Increase, dB	Substantial Increase?
SR 12	Beck Ave to Sunset Ave/ Grizzly Island Rd	68	74	**6**	**no**
SR 12	Sunset Ave/ Grizzly Island Rd to Walters Rd/	66	74	**8**	**no**
SR 12	Walters Rd/ to SR 113	63	73	**10**	**no**
SR 12	SR 113 to SR 84 (River Rd)	64	73	**9**	**no**
SR 12 (Rio Vista Bridge)	SR 84 (River Rd) to SR 160 (River Rd)	64	73	**9**	**no**
SR 12	SR 160 (River Rd) to Sacramento Co./ SJ Co. Line	62	65	**3**	**no**
SR 12	Sacramento Co./ SJ Co. Line to I-5	63	65	**2**	**no**
SR 113	I-80 to Dixon City Limits	64	69	**5**	**no**
SR 113	Dixon City Limits to SR 12	57	68	**11**	**no**
SR 4 (Marsh Creek Rd)	Vasco Rd to Byron Hwy	61	70	**9**	**no**
SR 4	Marsh Creek Rd to Discovery Bay Blvd	63	71	**8**	**no**
SR 4	Discovery Bay Blvd to Tracy Blvd	61	70	**9**	**no**
SR 4	Tracy Blvd to I-5	64	71	**7**	**no**
A St/4th St/ Jackson Blvd.	SR 160 to Isleton City Limits	48	48	**0**	**no**
Main Street (Old SR 4)	SR 160 to Cypress Rd	62	66	**4**	**no**
Main Street (Old SR 4)	Cypress Rd to Delta Rd (Oakley City Limits)	61	66	**5**	**no**
Cypress Rd	Main Street to Bethel Island Rd	58	58	**0**	**no**
Bethel Island Rd	Cypress Rd to Oakley City Limits	55	55	**0**	**no**
Delta Rd	Main Street to Byron Hwy	55	55	**0**	**no**
Pocket Rd	I-5 to Freeport Blvd	63	69	**6**	**no**
Freeport Blvd (Old SR 160)	Pocket Rd to Sacramento City Limits	56	68	**12**	**yes**
Freeport Bridge	River Rd to SR 160 (Freeport Blvd)	55	65	**10**	**no**
Hood Franklin Rd	SR 160 (River Rd) to I-5	51	69	**18**	**yes**
Lambert Rd	SR 160 (River Rd) to Herzog Rd	44	63	**19**	**yes**
Lambert Rd	Herzog Rd to Franklin Blvd	46	63	**17**	**yes**
Franklin Blvd	Lambert Rd to Twin Cities Rd	48	63	**15**	**yes**
Twin Cities Rd	River Rd to I-5	53	59	**6**	**no**
Twin Cities Rd	I-5 to Franklin Blvd	55	63	**8**	**no**

Roadway	Segment	Existing Noise Level, dBA	Future With-Project Noise Level, dBA	Noise Level Increase, dB	Substantial Increase?
Sutter Slough Bridge Rd	Sacramento Co./ Yolo Co. Line to Paintersville Bridge	50	64	**14**	**yes**
River Rd	Paintersville Bridge to Twin Cities Rd	51	51	**0**	**no**
River Rd	Twin Cities Rd to Walnut Grove Bridge	55	60	**5**	**no**
Walnut Grove Rd/River Rd	Walnut Grove Bridge to Sacramento Co./ SJ Co. Line	55	61	**6**	**no**
Isleton Rd	River Rd (Walnut Grove)/Isleton Rd Bridge to 1.5 miles west of Isleton Rd Bridge	54	54	**0**	**no**
Race Track Rd/ Tyler Island Rd	Walnut Grove Rd to Southern End of Tyler Island	45	45	**0**	**no**
Tyler Island Rd	Southern End of Tyler Island to SR 160 (River Rd)	46	46	**0**	**no**
Jackson Slough Rd	Isleton City Limits to SR 12	47	47	**0**	**no**
Jackson Slough Rd	Brannan Island Rd to SR 12	47	47	**0**	**no**
Walnut Grove Rd	Sacramento Co./ SJ Co. Line to I-5	53	65	**12**	**yes**
Peltier Rd	Blossom Rd to I-5	44	63	**19**	**yes**
Tracy Blvd	SR 4 to Clifton Court Rd	53	66	**13**	**yes**
Tracy Blvd	Clifton Court Rd to Tracy City Limits	52	66	**14**	**yes**
Byron Hwy	Alameda Co./San Joaquin Co. Line to Mountain House Pkwy	59	65	**6**	**no**
Mountain House Pkwy	Byron Hwy to Arnaudo Blvd	54	64	**10**	**no**
Mountain House Pkwy	Arnaudo Blvd to I-205	58	65	**7**	**no**
Eight Mile Rd	Stockton City Limits to I-5	58	65	**7**	**no**
Tracy Blvd	Tracy City Limits to I-205	58	67	**9**	**no**
Harbor Blvd	Industrial Blvd to US 50	63	66	**3**	**no**
Industrial Blvd/ Lake Washington Blvd	Harbor Blvd to Jefferson Blvd	62	66	**4**	**no**
Jefferson Blvd (Old SR 84)	Lake Washington Blvd to Southport Pkwy	62	66	**4**	**no**
Jefferson Blvd (Old SR 84)	Southport Pkwy to West Sacramento City Limits	51	64	**13**	**yes**
River Rd	Freeport Bridge to Courtland Rd	54	54	**0**	**no**
River Rd	Courtland Rd to Sacramento Co./ Yolo Co. Line	48	64	**16**	**yes**
Courtland Rd	SR 84 to River Rd	48	64	**16**	**yes**

As shown in Table 23-30, predicted future traffic noise levels from project-generated worker commutes and truck trips would result in an increase of 12 dB or more compared to existing traffic noise levels along 21 project roadway segments.

During intake construction, segments of SR 160 between Freeport Bridge and Walnut Grove Bridge would be temporarily realigned around intake construction sites. As a result, future project noise levels would further increase at residences located near intake sites. Under Alternative 1B, noise levels at receivers near realigned segments of SR 160 would increase by up to 12 dB in addition to the noise increase shown in Table 23-30.

The increase in noise levels exceed the project threshold for traffic noise and would be considered adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Construction of Power Transmission Lines

Noise from construction of power transmission lines for Alternative 1B is the same as Alternative 1A. The results shown in Table 23-21 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. Noise-sensitive receptors that could be exposed to adverse noise impacts due to transmission line construction include residential areas near the proposed transmission line construction footprint. Although this assessment includes daytime and nighttime construction noise estimates, construction of the transmission lines would primarily occur during daylight hours. If nighttime construction of the transmission lines were to occur, noise levels could be the same as those generated during daytime hours. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Earth-moving activities at offsite borrow/spoil areas

Noise from earth-moving activities at offsite borrow/spoil areas for Alternative 1B is the same as Alternative 1A. The results shown in Table 23-22 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA Lmax would be exceeded at a distance of 1,800 feet from the area. Noise-sensitive land uses that could potentially be exposed to adverse noise impacts due to earth-moving activities in offsite borrow/spoil areas would extend outside the borrow/spoil area right-of-way. The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. However, with the exception of tunneling and RTM placement, most construction activities would occur during daytime hours. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Noise exposure to workers at construction sites

Impact NOI-1 for Alternative 1B is the same as Impact NOI-1 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise levels above the 60 dBA L_{eq} (1hr) daytime, the 50 dBA L_{max} nighttime, or the 12 dB traffic noise

increase threshold would be considered significant. Based on reasonable worst-case modeling, the following significant impacts are expected as a result of Alternative 1B construction.

- **Intakes:** Sensitive receptors within 1,400 feet of an active intake construction site could be exposed to construction noise in excess of the 60 dBA L_{eq} (1hr) daytime threshold. The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-28, 124 residential parcels, 5 natural/recreational parcels, and 364 agricultural parcels would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 218 residential parcels, 9 natural/recreational parcels, 348 agricultural parcels, and 1 school.
- **Conveyance and Associated Facilities:** Sensitive receptors within 1,200 feet of an active tunnel work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-29, 129 residential parcels, 5 natural/recreational parcels, 958 agricultural parcels, and 1 school would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 250 residential parcels, 14 natural/recreational parcels, 1,748 agricultural parcels, and 4 schools.
- **Truck Trips and Worker Commutes:** Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 21 project roadway segments in the study area as shown in Table 23-30. The increase in noise levels would be substantial and exceed the project threshold for traffic noise.
- **Power Transmission Lines:** Sensitive receptors within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. As noted above, several residential land uses are near the proposed transmission line construction footprint.
- **Borrow/spoil areas:** Sensitive receptors within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Borrow/spoil areas are located throughout the conveyance alignment and are generally adjacent to or in close proximity of intake pumping plant sites, forebays, and main tunnel construction shafts.

Mitigation Measures NOI-1a and NOI-1b would reduce noise impacts to sensitive land uses. Although implementation of these measures will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be considered significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

Impact NOI-2: Exposure of Sensitive Receptors to Vibration or Groundborne Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Pile Driving at Intake Sites

For a description of noise generated by this component of the project, see the discussion of Impact NOI-2, *Pile Driving at Intake Sites*, under Alternative 1A. Under Alternative 1B, groundborne vibration from impact pile driving would exceed vibration thresholds at land uses described in Table 23-31. While groundborne vibration levels in excess of 0.2 in/sec PPV could occur at any of these residences, the highest vibration levels are expected at those residences nearest to the intake work areas. Construction of intakes and barge unloading facilities would result in excessive groundborne vibration levels at these nearby residential structures. The effect of exposing sensitive receptors to groundborne vibration would be adverse. Mitigation Measure NOI-2 is available to reduce this effect.

Table 23-31. Land Use Affected by Vibrations from Pile Driving During Construction of Intakes, Alternative 1B

Location	Zoning	Total Affected Parcels
Sacramento County – including River Road near the community of Hood; Neighborhoods in the community of Hood	Residential[a]	80
Yolo County – including County Road E9 near the community of Clarksburg	Residential[a]	1
San Joaquin County	Residential[a]	4

[a] Includes agricultural or unclassified use that permits residential use.

Construction of Water Conveyance (Pipeline Portions)

The use of tunneling equipment during construction could cause groundborne vibration and potentially groundborne noise within buildings in the vicinity of tunnel construction areas. Vibration sources include the TBM and locomotives moving soil, equipment, and construction workers between tunnel shaft sites. As discussed in Chapter 3, *Description of Alternatives*, the typical depth of tunnel installation would be approximately 100 feet below msl, but could be up to 160 feet below msl depending on site conditions. For the east alignment alternative, tunnel depth would be 120 feet or greater below msl. Groundborne noise levels for the east alignment alternative would therefore be below the applicable threshold and would not result in an adverse noise impact to sensitive receptors adjacent to the water conveyance.

***CEQA Conclusion*:** Groundborne vibrations from tunneling activities would not exceed applicable thresholds as tunnel depth would be 120 feet or greater below msl and would therefore be less than significant. However, the impact of exposing residential structures to groundborne vibration during intake construction would be significant as reasonable worst-case modeling indicates that 85 residential parcels would be exposed to vibration levels in excess of 0.2 in/sec PPV during intake

pile driving (see Table 23-31). Although Mitigation Measure NOI-2 will reduce this impact, it is not anticipated that feasible measures will be available in all situations to reduce vibration to levels below the applicable thresholds. This impact would therefore be significant and unavoidable.

Mitigation Measure NOI-2: Employ Vibration-Reducing Construction Practices during Construction of Water Conveyance Facilities

Please see Mitigation Measure NOI-2 under Impact NOI-2 in the discussion of Alternative 1A.

Impact NOI-3: Exposure of Noise-Sensitive Land Uses to Noise from Operation of Water Conveyance Facilities

NEPA Effects: Potential reasonable worst-case pump noise levels during operation of the intake structures were evaluated by calculating sound power levels of the pump based on horsepower (Hoover and Keith 2000). For Alternative 1B, faceplate horsepower for vertical column type pumps is specified in the pump selection appendix of the East Option CER (California Department of Water Resources 2010c). Pump specifications are shown in Table 23-32. Combined source noise levels assume that pump enclosures (including buildings) provide a nominal 15 dB of noise attenuation. This analysis assumes that pumps are operating 24 hours a day.

The estimated sound levels from pump operation as a function of distance based on calculated point-source attenuation over "soft" (i.e., acoustically absorptive) ground are shown in Table 23-33.

Table 23-32. Pump Specifications—Alternative 1B

Pump Location	Quantity	Pumping Plant Capacity (cfs)	Pump Horsepower	Individual Pump Source Level (dBA)	Combined Source Level (dBA)	Assumed Attenuation (dB)	Combined Source Level with Attenuation (dBA)
Intake 1	6	3,000	3,500	96	103	15	88
Intake 2	6	3,000	3,500	96	103	15	88
Intake 3	6	3,000	3,500	96	103	15	88
Intake 4	6	3,000	3,500	96	103	15	88
Intake 5	6	3,000	3,500	96	103	15	88
Intermediate Plant	15	15,000	7,000	99	110	15	95

cfs = cubic feet per second.
dB = decibels.
dBA = A-weighted sound level in decibels.

Table 23-33. Predicted Noise Levels from Intake and Intermediate Plant Pump Operations—Alternative 1B

Distance Between Source and Receiver (feet)	Intakes 1–5 Calculated L_{eq} Sound Level (dBA)	Intermediate Plant Calculated L_{eq} Sound Level (dBA)
50	88	95
100	80	87
200	72	79
300	68	75
400	65	72
600	60	67
800	57	64
1,000	54	61
1,200	52	59
1,400	**50**	57
1,600	49	56
2,000	46	53
2,200	**45**	52
2,600	43	**50**
3,600	40	47
4,000	38	**45**
4,500	37	44
5,000	36	43

Notes: Calculations are based on Federal Transit Administration 2006. Calculation do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.
Noise levels assume a nominal pump enclosure attenuation of 15 dB.
Bold denotes daytime and nighttime maximum noise thresholds.
dBA = A-weighted sound level in decibels.

The results shown in Table 23-33 indicate that operating noise from pumping plants would exceed the nighttime threshold of 45 dBA at noise-sensitive land uses within a distance of up to 2,200 feet from intake pumping plant locations, and 4,000 feet from the intermediate pumping plant along the east conveyance alignment. Noise from operation of pumping plants is predicted to exceed daytime and nighttime noise thresholds at nearby residences and outdoor parks in areas indicated in Table 23-34.

Table 23-34. Land use affected by noise from operation of pumping plants, Alternative 1B

Location	Zoning	50 dBA L_{eq} Daytime Operations Threshold Total Affected Parcels	45 dBA L_{eq} Nighttime Operations Threshold Total Affected Parcels
Sacramento County – including River Road near the community of Hood; neighborhoods in the community of Hood.	Residential	108	121
	Natural/Recreational	2	2
	Agricultural/Other [a]	56	101
Yolo County – including County Road E9 near the community of Clarksburg; neighborhoods in the community of Clarksburg.	Agricultural/Other [a]	85	138
San Joaquin County	Agricultural/Other [a]	27	61

[a] Includes agricultural or unclassified use that permits residential use.

Operation of water conveyance facilities could result in substantial increases in noise levels affecting nearby communities and residences. While noise levels in excess of applicable thresholds could occur throughout the affected area, the highest noise levels are expected at those land uses most adjacent to the pumping plants. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measure NOI-3 is available to reduce this effect.

Noise exposure to workers at conveyance facilities

Impact NOI-3 for Alternative 1B is the same as Impact NOI-3 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during pumping plant operations to noise levels above the daytime (50 dBA L_{max}) or nighttime (45 dBA L_{max}) noise thresholds would be significant. Based on reasonable worst-case modeling, 108 residential parcels, 2 natural/recreational parcels, and 168 agricultural parcels would be affected by daytime noise levels in excess of the operational threshold. The nighttime threshold would be exceeded at 121 residential parcels, 2 natural/recreational parcels, and 300 agricultural parcels. The impact of exposing these receptors to noise increases above thresholds would be significant. Mitigation Measure NOI-3 would reduce operational noise levels below applicable thresholds, thus resulting in a less-than-significant level.

Mitigation Measure NOI-3: Design and Construct Intake Facilities and Other Pump Facilities Such That Operational Noise Does Not Exceed 50 dBA (One-Hour L_{eq}) during Daytime Hours (7:00 A.M. to 10:00 P.M.) or 45 dBA (One-Hour L_{eq}) during Nighttime Hours (10:00 P.M. to 7:00 A.M.) or the Applicable Local Noise Standard (Whichever Is Less) at Nearby Noise Sensitive Land Uses

Please see Mitigation Measure NOI-3 under Impact NOI-3 in the discussion of Alternative 1A.

Impact NOI-4: Exposure of Noise-Sensitive Land Uses to Noise from Implementation of Proposed Conservation Measures 2-10

NEPA Effects: Although locations or target acreages may vary for proposed conservation measures, at the program level of development, the amount and location of restoration actions under this alternative would be the same as Alternative 1A, and therefore the impact would be the same as under Alternative 1A. Habitat restoration and enhancement conservation measures are anticipated to include a number of noise-generating activities, including from construction equipment use. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet.

The effect of exposing sensitive land uses to increases in construction noise levels above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to reduce this effect.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise increases above the daytime (60 dBA L_{eq}) and nighttime (50 dBA L_{max}) thresholds would be significant. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet. The impact of exposing these receptors to noise increases above thresholds would be significant. Although Mitigation Measures NOI-1a and NOI-1b will reduce this impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

23.3.3.4 Alternative 1C—Dual Conveyance with West Alignment and Intakes W1–W5 (15,000 cfs; Operational Scenario A)

Impact NOI-1: Exposure of Noise-Sensitive Land Uses to Noise from Construction of Water Conveyance Facilities

NEPA Effects: A total of five intakes would be constructed under Alternative 1C. They would be sited on the west bank of the Sacramento River, directly opposite the locations identified for the pipeline/tunnel and east alignments. Under this alternative, water would be carried south in a canal

along the western side of the Delta to an intermediate pumping plant and then pumped through a tunnel to a continuing canal to the proposed Byron Tract Forebay immediately northwest of Clifton Court Forebay (see Figures 3-6 and 3-7 in Chapter 3, *Description of Alternatives*).

Construction of Intakes

Potential reasonable worst-case equipment noise levels from construction of intakes would be comparable to those listed for the intake sites in Table 23-17. The results shown in Table 23-17 indicate that during periods of pile driving, residences located within 1,400 feet of an active intake construction site could be exposed to construction noise in excess of the DWR daytime (7 a.m. to 10 p.m.) maximum noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet.

While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest. The work areas for construction of Intakes 1–5 would extend through several residential areas and communities near the Sacramento River. Noise from construction of intakes is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks indicated in Table 23-35.

Although this assessment includes daytime and nighttime construction noise estimates, construction of the intakes would primarily occur during daytime hours. If nighttime construction of the intakes were to occur, noise levels could be the same as that generated during daytime hours.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Table 23-35. Land Use Affected by Equipment Noise from Construction of Intakes, Alternative 1C

		Daytime Threshold (60 dBA L_{eq} [1h])	Nighttime Threshold (50 dBA L_{max} [1h])
Location	Zoning	Total Affected Parcels	Total Affected Parcels
Sacramento County – including River Road near the community of Hood; neighborhoods in the community of Hood.	Residential	48	122
	Natural/Recreational	2	3
	Agricultural/Other [a]	74	161
Yolo County – including County Road E9 near the community of Clarksburg; neighborhoods in the community of Clarksburg.	Residential	15	107
	Natural/Recreational	1	5
	Agricultural/Other [a]	114	190
	Schools	None	Clarksburg Middle School, Delta Elementary (K-6 Charter), Delta High

[a] Includes agricultural or unclassified use that permits residential use.

Construction of Conveyance (Tunnel and Canal), Forebays, Barge Unloading Facilities, and Intermediate Pumping Plant

Potential reasonable worst-case equipment noise levels from construction work areas adjacent to tunnel shaft sites would be comparable to those listed for the intake sites in Table 23-16. Assuming 100% equipment utilization within a given hour of day, the combined noise level at work areas is 96 dBA L_{eq} (1hr) at 50 feet.

The results shown in Table 23-16 indicate that residences located within 1,200 feet of an active tunnel work area could be exposed to construction noise in excess of the DWR daytime (7 a.m. to 10 p.m.) maximum noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet.

While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest. This includes all construction sites along the canal or tunnel conveyance alignment, as well as at the site of the Byron Tract Forebay adjacent to and west of Clifton Court Forebay. For a map of the proposed west alignment, see Mapbook Figure M3-3. The canal, tunnel, and forebay work areas would extend through several residential areas and communities located near the Sacramento River. Noise from construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks indicated in Table 23-36.

Although this assessment includes daytime and nighttime construction noise estimates for the forebay, barge unloading facilities, intermediate pumping plant, and conveyance tunnels and canals, construction of the forebay, barge unloading facilities, intermediate pumping plant, and canals would primarily occur during daytime hours. If nighttime construction of the forebay, barge unloading facilities, intermediate pumping plant, and canals were to occur, noise levels could be the same as those generated during daytime hours. Construction of the conveyance tunnels and RTM storage actions would occur on a 24-hour basis.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Truck Trips and Worker Commutes

Project-generated heavy trucks and worker commutes are predicted to result in increased traffic noise levels at noise-sensitive land uses adjacent to local roadways. Based on information provided by DWR as part of the cost estimate (see Appendix 22A), project-generated vehicle traffic volumes for the west alignment alternative are predicted to have a maximum heavy truck composition of 41%, which was assumed to apply to any of the local roadways under a worst-case noise scenario. Future noise levels are shown in Table 23-37.

Table 23-36. Land Use Affected by Equipment Noise from Construction of Conveyance and Associated Facilities, Alternative 1C

Location	Zoning	Daytime Threshold (60 dBA L_{eq} [1h]) Total Affected Parcels	Nighttime Threshold (50 dBA L_{max} [1h]) Total Affected Parcels
Sacramento County – including River Road near the community of Hood; neighborhoods in the community of Hood; Lambert Road.	Residential	27	107
	Natural/Recreational	10	15
	Agricultural/Other [a]	118	186
Yolo County	Residential	23	129
	Natural/Recreational	1	5
	Agricultural/Other [a]	408	500
	Schools	Clarksburg Middle School	Clarksburg Middle School, Delta Elementary (K-6 Charter), Delta High
San Joaquin County	Residential	0	0
	Natural/Recreational	0	0
	Agricultural/Other [a]	1	3
	Schools	Holt Union Elementary	Holt Union Elementary
Contra Costa County—including the neighborhoods of Knightsen, Discovery Bay and Byron	Residential	1,098	2,851
	Natural/Recreational	16	206
	Agricultural/Other [a]	512	829
	Schools	Knightsen Elementary, Old River Elementary	Knightsen Elementary, Old River Elementary
Alameda County	Agricultural/Other [a]	9	14

[a] Includes agricultural or unclassified use that permits residential use.

Table 23-37. Predicted Future Traffic Noise Levels on Commuter Roads and Haul Routes, West Alignment

Roadway	Segment	Existing Noise Level, dBA	Future With-Project Noise Level, dBA	Noise Level Increase, dB	Substantial Increase?
Byron Hwy	Contra Costa Co./ Alameda Co. Line to Alameda Co./San Joaquin Co. Line	58	68	**10**	**no**
Brentwood Blvd	Delta Rd (Oakley City Limits) to Balfour Rd	61	69	**8**	**no**
Brentwood Blvd	Balfour Rd to Brentwood City Limits (South)	60	69	**9**	**no**
Balfour Rd	Brentwood Blvd to Brentwood City Limits	61	65	**4**	**no**
Bethel Island Rd	Oakley City Limits to End	55	57	**2**	**no**
Balfour Rd	Brentwood City Limits to Byron Hwy	54	63	**9**	**no**
Old SR 41	Brentwood City Limits (South) to Marsh Creek Rd	62	69	**7**	**no**
Byron Hwy	Delta Rd to Old SR 4	53	66	**13**	**yes**
Byron Hwy	SR 4 to Contra Costa Co./ Alameda Co. Line	59	69	**10**	**no**
SR 160 (Freeport Blvd)	Sacramento City Limits to Freeport Bridge	59	72	**13**	**yes**
SR 160 (Freeport Blvd/ River Rd)	Freeport Bridge to Scribner Rd	55	55	**0**	**no**
SR 160	Scribner Rd to Hood Franklin Rd	53	53	**0**	**no**
SR 160	Hood Franklin Rd to Lambert Rd	55	55	**0**	**no**
SR 160	Lambert Rd to Paintersville Bridge	53	53	**0**	**no**
SR 160 (Paintersville Bridge)	Sutter Slough Bridge Rd to SR 160 (River Rd)	53	74	**21**	**yes**
SR 160	Paintersville Bridge to Walnut Grove Bridge	53	74	**21**	**yes**
SR 160	Walnut Grove Bridge to A St (Isleton)	59	74	**15**	**yes**
SR 160	A St (Isleton) to SR 12	58	74	**16**	**yes**
SR 160	SR 12 to Brannan Island Rd	62	74	**12**	**yes**
SR 84	West Sacramento City Limits to Courtland Rd	55	72	**17**	**yes**
SR 84 (Courtland Rd/ Ryer Ave)	Courtland Rd to Cache Slough Ferry	46	63	**17**	**yes**
SR 12 EB	I-80 to Beck Ave	65	72	**7**	**no**
SR 12 WB	I-80 to Beck Ave	64	72	**8**	**no**
SR 12	Beck Ave to Sunset Ave/ Grizzly Island Rd	68	75	**7**	**no**

Roadway	Segment	Existing Noise Level, dBA	Future With-Project Noise Level, dBA	Noise Level Increase, dB	Substantial Increase?
SR 12	Sunset Ave/ Grizzly Island Rd to Walters Rd/	66	75	**9**	**no**
SR 12	Walters Rd/ to SR 113	63	74	**11**	**no**
SR 12	SR 113 to SR 84 (River Rd)	64	74	**10**	**no**
SR 12 (Rio Vista Bridge)	SR 84 (River Rd) to SR 160 (River Rd)	64	74	**10**	**no**
SR 12	SR 160 (River Rd) to Sacramento Co./ SJ Co. Line	62	67	**5**	**no**
SR 12	Sacramento Co./ SJ Co. Line to I-5	63	67	**4**	**no**
SR 113	I-80 to Dixon City Limits	64	71	**7**	**no**
SR 113	Dixon City Limits to SR 12	57	70	**13**	**yes**
SR 4 (Marsh Creek Rd)	Vasco Rd to Byron Hwy	61	70	**9**	**no**
SR 4	Marsh Creek Rd to Discovery Bay Blvd	63	71	**8**	**no**
SR 4	Discovery Bay Blvd to Tracy Blvd	61	70	**9**	**no**
SR 4	Tracy Blvd to I-5	64	71	**7**	**no**
A St/4th St/ Jackson Blvd.	SR 160 to Isleton City Limits	48	48	**0**	**no**
Main Street (Old SR 4)	SR 160 to Cypress Rd	62	69	**7**	**no**
Main Street (Old SR 4)	Cypress Rd to Delta Rd (Oakley City Limits)	61	69	**8**	**no**
Cypress Rd	Main Street to Bethel Island Rd	58	64	**6**	**no**
Bethel Island Rd	Cypress Rd to Oakley City Limits	55	57	**2**	**no**
Delta Rd	Main Street to Byron Hwy	55	66	**11**	**no**
Pocket Rd	I-5 to Freeport Blvd	63	71	**8**	**no**
Freeport Blvd (Old SR 160)	Pocket Rd to Sacramento City Limits	56	70	**14**	**yes**
Freeport Bridge	River Rd to SR 160 (Freeport Blvd)	55	70	**15**	**yes**
Hood Franklin Rd	SR 160 (River Rd) to I-5	51	51	**0**	**no**
Lambert Rd	SR 160 (River Rd) to Herzog Rd	44	44	**0**	**no**
Lambert Rd	Herzog Rd to Franklin Blvd	46	46	**0**	**no**
Franklin Blvd	Lambert Rd to Twin Cities Rd	48	48	**0**	**no**
Twin Cities Rd	River Rd to I-5	53	69	**16**	**yes**
Twin Cities Rd	I-5 to Franklin Blvd	55	55	**0**	**no**
Sutter Slough Bridge Rd	Sacramento Co./ Yolo Co. Line to Paintersville Bridge	50	72	**22**	**yes**
River Rd	Paintersville Bridge to Twin Cities Rd	51	69	**18**	**yes**

Roadway	Segment	Existing Noise Level, dBA	Future With-Project Noise Level, dBA	Noise Level Increase, dB	Substantial Increase?
River Rd	Twin Cities Rd to Walnut Grove Bridge	55	57	**2**	**no**
Walnut Grove Rd/River Rd	Walnut Grove Bridge to Sacramento Co./ SJ Co. Line	55	69	**14**	**yes**
Isleton Rd	River Rd (Walnut Grove)/Isleton Rd Bridge to 1.5 miles west of Isleton Rd Bridge	54	54	**0**	**no**
Race Track Rd/ Tyler Island Rd	Walnut Grove Rd to Southern End of Tyler Island	45	45	**0**	**no**
Tyler Island Rd	Southern End of Tyler Island to SR 160 (River Rd)	46	46	**0**	**no**
Jackson Slough Rd	Isleton City Limits to SR 12	47	47	**0**	**no**
Jackson Slough Rd	Brannan Island Rd to SR 12	47	47	**0**	**no**
Walnut Grove Rd	Sacramento Co./ SJ Co. Line to I-5	53	69	**16**	**yes**
Peltier Rd	Blossom Rd to I-5	44	44	**0**	**no**
Tracy Blvd	SR 4 to Clifton Court Rd	53	53	**0**	**no**
Tracy Blvd	Clifton Court Rd to Tracy City Limits	52	52	**0**	**no**
Byron Hwy	Alameda Co./San Joaquin Co. Line to Mountain House Pkwy	59	69	**10**	**no**
Mountain House Pkwy	Byron Hwy to Arnaudo Blvd	54	68	**14**	**yes**
Mountain House Pkwy	Arnaudo Blvd to I-205	58	69	**11**	**no**
Eight Mile Rd	Stockton City Limits to I-5	58	58	**0**	**no**
Tracy Blvd	Tracy City Limits to I-205	58	58	**0**	**no**
Harbor Blvd	Industrial Blvd to US 50	63	71	**8**	**no**
Industrial Blvd/ Lake Washington Blvd	Harbor Blvd to Jefferson Blvd	62	71	**9**	**no**
Jefferson Blvd (Old SR 84)	Lake Washington Blvd to Southport Pkwy	62	71	**9**	**no**
Jefferson Blvd (Old SR 84)	Southport Pkwy to West Sacramento City Limits	51	70	**19**	**yes**
River Rd	Freeport Bridge to Courtland Rd	54	70	**16**	**yes**
River Rd	Courtland Rd to Sacramento Co./ Yolo Co. Line	48	72	**24**	**yes**
Courtland Rd	SR 84 to River Rd	48	70	**22**	**yes**

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As shown in Table 23-37, predicted future traffic noise levels from project-generated worker commutes and truck trips would result in an increase of 12 dB or more compared to existing traffic noise levels along 22 project roadway segments.

During intake construction, segments of County Highway E9 would be temporarily realigned around intake construction sites. Under the west alignment alternative, no additional noise increase is anticipated at residences adjacent to intake construction sites.

The increase in noise levels exceed the project threshold for traffic noise and would be considered adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Construction of Power Transmission Lines

Noise from construction of power transmission lines for Alternative 1C is the same as Alternative 1A. The results shown in Table 23-21 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. Noise-sensitive receptors that could be exposed to adverse noise impacts due to transmission line construction include residential areas near the proposed transmission line construction footprint. Likewise, as noted in Chapter 24, *Hazards and Hazardous Materials*, Lakewood Drive, Sycamore Drive, and Summer Lake Community Parks, as well as Mokelumne High (Continuation) School would be near the proposed transmission line construction footprint for Alternative 1C. Although this assessment includes daytime and nighttime construction noise estimates, construction of the transmission lines would primarily occur during daylight hours. If nighttime construction of the transmission lines were to occur, noise levels could be the same as those generated during daytime hours. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Earth-moving activities at offsite borrow/spoil areas

Noise from earth-moving activities at offsite borrow/spoil areas for Alternative 1C is the same as Alternative 1A. The results shown in Table 23-22 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Noise-sensitive land uses that could potentially be exposed to adverse noise impacts due to earth-moving activities in offsite borrow/spoil areas would extend outside the borrow/spoil area right-of-way. The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. However, with the exception of tunneling and RTM placement, most construction activities would occur during daytime hours. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Noise exposure to workers at construction sites

Impact NOI-1 for Alternative 1C is the same as Impact NOI-1 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise levels above the 60 dBA L_{eq} (1hr) daytime, the 50 dBA L_{max} nighttime, or the 12 dB traffic noise increase threshold would be considered significant. Based on reasonable worst-case modeling, the following significant impacts are expected as a result of Alternative 1C construction.

- **Intakes:** Sensitive receptors within 1,400 feet of an active intake construction site could be exposed to construction noise in excess of the 60 dBA L_{eq} (1hr) daytime threshold. The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-35, 63 residential parcels, 3 natural/recreational parcels, and 188 agricultural parcels would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 229 residential parcels, 8 natural/recreational parcels, 351 agricultural parcels, and 3 schools.
- **Conveyance and Associated Facilities:** Sensitive receptors within 1,200 feet of an active tunnel work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-36, 1,148 residential parcels, 26 natural/recreational parcels, 1,048 agricultural parcels, and 4 schools would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 3,087 residential parcels, 221 natural/recreational parcels, 1,532 agricultural parcels, and 6 schools.
- **Truck Trips and Worker Commutes:** Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 22 project roadway segments in the study area as shown in Table 23-37. The increase in noise levels would be substantial and exceed the project threshold for traffic noise.
- **Power Transmission Lines:** Sensitive receptors within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. As noted above, residential areas and several schools are near the proposed transmission line construction footprint.
- **Borrow/spoil areas:** Sensitive receptors within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Borrow/spoil areas are located throughout the conveyance alignment and are generally adjacent to or in close proximity of intake pumping plant sites, forebays, and main tunnel construction shafts.

Mitigation Measures NOI-1a and NOI-1b would reduce noise impacts to sensitive land uses. Although implementation of these measures will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be considered significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

Impact NOI-2: Exposure of Sensitive Receptors to Vibration or Groundborne Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Pile Driving at Intake Sites

For a description of noise generated by this component of the project, see the discussion of Impact NOI-2, *Pile Driving at Intake Sites*, under Alternative 1A. Under Alternative 1C, groundborne vibration from impact pile driving would exceed vibration thresholds at land uses described in Table 23-38. While groundborne vibration levels in excess of 0.2 in/sec PPV could occur at any of these residences, the highest vibration levels are expected at those residences nearest to the intake work areas. Construction of intakes and barge unloading facilities would result in excessive groundborne vibration levels at these nearby residential structures. The effect of exposing sensitive receptors to groundborne vibration would be adverse. Mitigation Measure NOI-2 is available to reduce this effect.

Table 23-38. Land Use Affected by Vibrations from Pile Driving During Construction of Intakes, Alternative 1C

Location	Zoning	Total Affected Parcels
Sacramento County – including River Road near the community of Hood; Neighborhoods in the community of Hood	Residential[a]	1
Yolo County – including County Road E9 near the community of Clarksburg	Residential[a]	85
Solano County	Residential[a]	2

[a] Includes agricultural or unclassified use that permits residential use.

Construction of Conveyance (Tunnel Portions)

The use of tunneling equipment during construction would cause groundborne vibration and potentially groundborne noise within buildings in the vicinity of tunnel construction areas. Vibration sources include the TBM and locomotives moving soil, equipment, and construction workers between tunnel shaft sites. As discussed in Chapter 3, *Description of Alternatives*, the typical depth of tunnel installation would be approximately 100 feet below msl, but could be up to 160 feet below msl depending on site conditions. For the west alignment alternative, tunnel depth would be 120 feet or greater below msl. Groundborne noise levels for the west alignment alternative would therefore be below the applicable threshold and would not result in an adverse noise impact to sensitive receptors adjacent to tunnel water conveyance.

***CEQA Conclusion*:** Groundborne vibrations from tunneling activities would not exceed applicable thresholds as tunnel depth would be 120 feet or greater below msl and would therefore be less than significant. However, the impact of exposing residential structures to groundborne vibration during intake construction would be significant as reasonable worst-case modeling indicates that 88 residential parcels would be exposed to vibration levels in excess of 0.2 in/sec PPV during intake

pile driving (see Table 23-38). Although Mitigation Measure NOI-2 will reduce this impact, it is not anticipated that feasible measures will be available in all situations to reduce vibration to levels below the applicable thresholds. This impact would therefore be significant and unavoidable.

Mitigation Measure NOI-2: Employ Vibration-Reducing Construction Practices during Construction of Water Conveyance Facilities

Please see Mitigation Measure NOI-2 under Impact NOI-2 in the discussion of Alternative 1A.

Impact NOI-3: Exposure of Noise-Sensitive Land Uses to Noise from Operation of Water Conveyance Facilities

NEPA Effects: Potential reasonable worst-case pump noise levels during operation of the intake structures were evaluated by calculating sound power levels of the pump based on horsepower (Hoover and Keith 2000). Faceplate horsepower for vertical column type pumps is specified in the pump selection appendix of the West Option CER (California Department of Water Resources 2010d). Pump specifications are shown in Table 23-39. Combined source noise levels assume that pump enclosures (including buildings) provide a nominal 15 dB of noise attenuation. This analysis assumes that pumps are operating 24 hours a day.

Table 23-39. Pump Specifications—Alternative 1C

Pump Location	Quantity	Pumping Plant Capacity (cfs)	Pump Horse-power	Individual Pump Source Level (dBA)	Combined Source Level (dBA)	Assumed Attenuation (dB)	Combined Source Level with Attenuation (dBA)
Intake 1	6	3,000	5,000	97	105	15	90
Intake 2	6	3,000	3,500	96	103	15	88
Intake 3	6	3,000	3,500	96	103	15	88
Intake 4	6	3,000	3,500	96	103	15	88
Intake 5	6	3,000	3,500	96	103	15	88
Intermediate Plant	15	15,000	12,000	101	113	15	98

cfs = cubic feet per second.
dB = decibels.
dBA = A-weighted sound level in decibels.

The estimated sound levels from pump operation as a function of distance based on calculated point-source attenuation over "soft" (i.e., acoustically absorptive) ground are shown in Table 23-40.

Table 23-40. Predicted Noise Levels from Pump Operation, Intakes, Alternative 1C

Distance Between Source and Receiver (Feet)	Intake 1 Calculated L_{eq} Sound Level (dBA)	Intakes 2–5 Calculated L_{eq} Sound Level (dBA)	Intermediate Plant Calculated L_{eq} Sound Level (dBA)
50	90	88	98
100	82	80	90
200	74	72	82
300	69	68	77
400	66	65	74
600	62	60	69
800	58	57	66
1,000	56	54	63
1,200	54	52	61
1,400	52	**50**	60
1,600	**50**	49	58
2,000	48	46	56
2,200	47	**45**	55
2,600	**45**	43	53
3,200	43	41	**50**
4,000	40	38	48
4,900	38	36	**45**
5,000	36	35	44

Notes: Calculations are based on Federal Transit Administration 2006. Calculations do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.
Noise levels assume a nominal pump enclosure attenuation of 15 dB.
Bold denotes daytime and nighttime maximum noise thresholds.
dBA = A-weighted sound level in decibels.

The results shown in Table 23-40 indicate that operating noise from pumping plants would exceed the nighttime threshold of 45 dBA at noise-sensitive land uses within a distance of up to 2,600 feet from intake pumping plant locations, and 4,900 feet from the intermediate pumping plant along the west conveyance alignment. Noise from operation of pumping plants is predicted to exceed daytime and nighttime noise thresholds at nearby residences and outdoor parks in areas indicated in Table 23-41.

Table 23-41. Land Use Affected by Noise from Operation of Pumping Plants, Alternative 1C

		50 dBA L_{eq} Daytime Operations Threshold	45 dBA L_{eq} Nighttime Operations Threshold
Location	Zoning	Total Affected Parcels	Total Affected Parcels
Sacramento County – including River Road near the community of Hood; neighborhoods in the community of Hood.	Residential	2	71
	Natural/Recreational	2	2
	Agricultural/Other [a]	45	73
Yolo County – including County Road E9 near the community of Clarksburg; neighborhoods in the community of Clarksburg.	Residential	0	6
	Natural/Recreational	0	1
	Agricultural/Other [a]	87	132

[a] Includes agricultural or unclassified use that permits residential use.

Operation of water conveyance facilities could result in substantial increases in noise levels affecting nearby communities and residences. While noise levels in excess of applicable thresholds could occur throughout the affected area, the highest noise levels are expected at those land uses most adjacent to the pumping plants. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measure NOI-3 is available to reduce this effect.

Noise exposure to workers at conveyance facilities

Impact NOI-3 for Alternative 1C is the same as Impact NOI-3 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during pumping plant operations to noise levels above the daytime (50 dBA L_{max}) or nighttime (45 dBA L_{max}) noise thresholds would be significant. Based on reasonable worst-case modeling, 2 residential parcels, 2 natural/recreational parcels, and 132 agricultural parcels would be affected by daytime noise levels in excess of the operational threshold. The nighttime threshold would be exceeded at 77 residential parcels, 3 natural/recreational parcels, and 205 agricultural parcels. The impact of exposing these receptors to noise increases above thresholds would be significant. Mitigation Measure NOI-3 would reduce operational noise levels below applicable thresholds, thus resulting in a less-than-significant level.

Mitigation Measure NOI-3: Design and Construct Intake Facilities and Other Pump Facilities Such That Operational Noise Does Not Exceed 50 dBA (One-Hour L_{eq}) during Daytime Hours (7:00 A.M. to 10:00 P.M.) or 45 dBA (One-Hour L_{eq}) during Nighttime Hours (10:00 P.M. to 7:00 A.M.) or the Applicable Local Noise Standard (Whichever Is Less) at Nearby Noise Sensitive Land Uses

Please see Mitigation Measure NOI-3 under Impact NOI-3 in the discussion of Alternative 1A.

Impact NOI-4: Exposure of Noise-Sensitive Land Uses to Noise from Implementation of Proposed Conservation Measures 2-10

NEPA Effects: Although locations or target acreages may vary for proposed conservation measures, at the program level of development, the amount and location of restoration actions under this alternative would be the same as Alternative 1A, and therefore the impact would be the same as under Alternative 1A. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet.

The effect of exposing sensitive land uses to increases in construction noise levels above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise increases above the daytime (60 dBA L_{eq}) and nighttime (50 dBA L_{max}) thresholds would be considered significant. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet. The impact of exposing these receptors to noise increases above thresholds would be significant. Although Mitigation Measures NOI-1a and NOI-1b will reduce this impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be considered significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

23.3.3.5 Alternative 2A—Dual Conveyance with Pipeline/Tunnel and Five Intakes (15,000 cfs; Operational Scenario B)

Five intakes would be constructed under Alternative 2A on the east bank of the Sacramento River. This alternative would also construct an intermediate forebay, and the conveyance facility would be a buried pipeline (see Figures 3-2 and 3-3 in Chapter 3, *Description of Alternatives*). An operable barrier would be constructed at the head of Old River.

Impact NOI-1: Exposure of Noise-Sensitive Land Uses to Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Construction of Intakes

Potential reasonable worst-case equipment noise levels from construction of intakes under this alternative would be comparable to those listed for the intake sites in Table 23-17. The results shown in Table 23-17 indicate that during periods of pile driving, residences located within 1,400 feet of an active intake construction site could be exposed to construction noise in excess of the DWR daytime (7 a.m. to 10 p.m.) maximum noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet.

While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest. The work areas for construction of Intakes 1, 2, 3, 6, and 7 would extend through several residential areas and communities located near the Sacramento River. Noise from intake construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks in areas indicated in Table 23-42.

Although this assessment includes daytime and nighttime construction noise estimates, construction of the intakes would primarily occur during daytime hours. If nighttime construction of the intakes were to occur, noise levels could be the same as that generated during daytime hours.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b would be available to reduce this effect.

Table 23-42. Land Use Affected By Equipment Noise from Construction of Intakes, Alternative 2A

		Daytime Threshold (60 dBA L_{eq} [1h])	Nighttime Threshold (50 dBA L_{max} [1h])
Location	Zoning	Total Affected Parcels	Total Affected Parcels
Sacramento County – including River Road near the community of Hood; neighborhoods in the community of Hood; Lambert Road; Vorden Road.	Residential	3	112
	Natural/Recreational	9	15
	Agricultural/Other [a]	140	214
	Schools	None	None
Yolo County – including County Road E9 near the community of Clarksburg; neighborhoods in the community of Clarksburg.	Residential	4	98
	Natural/Recreational	1	5
	Agricultural/Other [a]	128	164
	Schools	None	Clarksburg Middle School, River Delta Community Day

[a] Includes agricultural or unclassified use that permits residential use.

Construction of Conveyance (Tunnel), Forebays, Barge Unloading Facilities, and Intermediate Pumping Plant

For a description of noise generated by this component of the project, see the discussion of Impact NOI-1, *Construction of Conveyance (Tunnel), Forebays, Barge Unloading Facilities, and Intermediate Pumping Plant*, under Alternative 1A. Noise from construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks indicated in Table 23-43. While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest. This includes all construction sites along the tunnel conveyance alignment, as well as at the site of the Byron Tract Forebay adjacent to and south of Clifton Court Forebay. For a map of the proposed pipeline/tunnel alignment, see Mapbook Figure M3-1.

Although this assessment includes daytime and nighttime construction noise estimates for the forebays, barge unloading facilities, intermediate pumping plant, and conveyance tunnels, construction of the forebays, barge unloading facilities, and intermediate pumping plant would primarily occur during daytime hours. If nighttime construction of the forebays, barge unloading facilities, and intermediate pumping plant were to occur, noise levels could be the same as those generated during daytime hours. Construction of the conveyance tunnels and RTM storage actions would occur on a 24-hour basis.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b would be available to reduce this effect.

Table 23-43. Land Use Affected by Equipment Noise from Construction of Conveyance and Associated Facilities, Alternative 2A

		Daytime Threshold (60 dBA L_{eq} [1h])	Nighttime Threshold (50 dBA L_{max} [1h])
Location	Zoning	Total Affected Parcels	Total Affected Parcels
Sacramento County – including River Road near the community of Hood; neighborhoods in the community of Hood; Lambert Road; Vorden Road.	Residential	105	121
	Natural/Recreational	14	26
	Agricultural/Other [a]	403	597
	Schools	Bates Elementary, Mokelumne High	Bates Elementary, Mokelumne High
Yolo County – including County Road E9 near the community of Clarksburg; neighborhoods in the community of Clarksburg.	Residential	0	89
	Natural/Recreational	1	5
	Agricultural/Other [a]	133	166
	Schools	None	None
San Joaquin County	Residential	9	18
	Natural/Recreational	1	1
	Agricultural/Other [a]	187	273
Contra Costa County	Agricultural/Other [a]	94	118
Alameda County	Agricultural/Other [a]	21	45

[a] Includes agricultural or unclassified use that permits residential use.

Truck Trips and Worker Commutes

The estimate of truck trips and worker commutes under Alternative 2A would be similar to Alternative 1A except for the addition of trips associated with construction of the operable barrier. Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 16 project roadway segments in the study area as shown in Table 23-20.

During intake construction, segments of SR 160 between Freeport Bridge and Walnut Grove Bridge would be temporarily realigned around intake construction sites. As a result, future project noise levels would further increase at residences located near intake sites. Under Alternative 2A, noise levels at receivers near realigned segments of SR 160 would increase by up to 6 dB in addition to the noise increase shown in Table 23-20.

The increase in noise levels exceed the project threshold for traffic noise and would be considered adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Construction of Power Transmission Lines

Noise from construction of power transmission lines for Alternative 2A is the same as Alternative 1A. The results shown in Table 23-21 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. Several residential land uses are near the proposed transmission line construction footprint. Likewise, Delta Elementary School and Delta High School on the west bank of the Sacramento River are within half a mile of the proposed Intake 2 transmission lines. Although this assessment includes daytime and nighttime construction noise estimates, construction of the transmission lines would primarily occur during daylight hours. If nighttime construction of the transmission lines were to occur, noise levels could be the same as those generated during daytime hours. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Earth-moving activities at offsite borrow/spoil areas

Noise from earth-moving activities at offsite borrow/spoil areas for Alternative 2A is the same as Alternative 1A. The results shown in Table 23-22 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Noise-sensitive land uses that could potentially be exposed to adverse noise impacts due to earth-moving activities in offsite borrow/spoil areas would extend outside the borrow/spoil area right-of-way. The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. However, with the exception of tunneling and RTM placement, most construction activities would occur during daytime hours. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Noise exposure to workers at construction sites

Impact NOI-1 for Alternative 2A is the same as Impact NOI-1 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise levels above the 60 dBA L_{eq} (1hr) daytime, the 50 dBA L_{max} nighttime, or the 12 dB traffic noise increase threshold would be considered significant. Based on reasonable worst-case modeling, the following significant impacts are expected as a result of Alternative 2A construction.

- **Intakes:** Sensitive receptors within 1,400 feet of an active intake construction site could be exposed to construction noise in excess of the 60 dBA L_{eq} (1hr) daytime threshold. The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-42, 7 residential parcels, 10 natural/recreational parcels, and 268 agricultural parcels would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 210 residential parcels, 20 natural/recreational parcels, 378 agricultural parcels, and 2 schools.
- **Conveyance and Associated Facilities:** Sensitive receptors within 1,200 feet of an active tunnel work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-43, 114 residential parcels, 16 natural/recreational parcels, 838 agricultural parcels, and 2 schools would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 228 residential parcels, 32 natural/recreational parcels, 1,119 agricultural parcels, and 2 schools.
- **Truck Trips and Worker Commutes:** Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 16 project roadway segments in the study area as shown in Table 23-20. The increase in noise levels would be substantial and exceed the project threshold for traffic noise. See the discussion of Impact NOI-1 under Alternative 1A.
- **Power Transmission Lines:** Sensitive receptors within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. As noted above, several residential land uses are near the proposed transmission line construction footprint. Likewise, Delta Elementary School and Delta High School on the west bank of the Sacramento River are within half a mile of the proposed Intake 2 transmission lines.
- **Borrow/spoil areas:** Sensitive receptors within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Borrow/spoil areas are located throughout the conveyance alignment and are generally adjacent to or in close proximity of intake pumping plant sites, forebays, and main tunnel construction shafts.

Mitigation Measures NOI-1a and NOI-1b would reduce noise impacts to sensitive land uses. Although implementation of these measures will reduce the impact, it is not anticipated that feasible

measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be significant and unavoidable**.**

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

Impact NOI-2: Exposure of Sensitive Receptors to Vibration or Groundborne Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Pile Driving at Intake Sites

Impact NOI-2 for Alternative 2A is the same as for Alternative 1A. In addition, an operable barrier would be constructed at the head of Old River. Construction of the operable barrier would include impact driving of sheet piles, which would cause high groundborne vibration levels in areas immediately adjacent to pile driving sites. However, the nearest residential use is 3,000 feet away from the construction site, so vibration levels would be well below the impact threshold.

Groundborne vibration levels from impact pile driving are predicted to exceed vibration thresholds at nearby residences in the areas shown in Table 23-44. While groundborne vibration levels in excess of 0.2 in/sec PPV could occur at any of these residences, the highest vibration levels are expected at those residences nearest to the intake work areas. Construction of intakes and barge unloading facilities would result in excessive groundborne vibration levels at these nearby residential structures. The effect of exposing sensitive receptors to groundborne vibration would be adverse. Mitigation Measure NOI-2 is available to reduce this effect.

Table 23-44. Land Use Affected by Vibrations from Pile Driving During Construction of Intakes, Alternative 2A

Location	Zoning	Total Affected Parcels
Sacramento County – including River Road near the community of Hood; Neighborhoods in the community of Hood	Residential[a]	79
Yolo County – including County Road E9 near the community of Clarksburg	Residential[a]	1
San Joaquin County	Residential[a]	13

[a] Includes agricultural or unclassified use that permits residential use.

Construction of Water Conveyance (Tunnel)

Vibration sources include the TBM and locomotives moving soil, equipment, and construction workers between tunnel shaft sites. At a 60-foot tunnel depth, groundborne vibrations from the TBM are estimated to be 0.008 in/sec PPV, which is below the threshold of 0.04 in/sec PPV. As

described in Section 23.4.2, *Determination of Effects*, tunnel locomotives would be operated at slow speeds inside of tunnels and would not result in excessive vibrations. Groundborne noise from tunnel locomotive operation during construction is therefore not predicted to exceed groundborne noise thresholds or result in an adverse noise impact to sensitive receptors along the tunnel conveyance.

***CEQA Conclusion*:** Groundborne vibrations during tunneling would not exceed 0.008 in/sec PPV at 60-foot tunnel depth and would therefore be less than significant. Likewise**,** locomotives are not expected to generate significant noise levels because they will travel at low speeds between 5 and 10 miles per hour. However, the impact of exposing residential structures to groundborne vibration during intake construction would be significant as reasonable worst-case modeling indicates that 93 residential parcels would be exposed to vibration levels in excess of 0.2 in/sec PPV during intake pile driving (see Table 23-44). Although Mitigation Measure NOI-2 will reduce this impact, it is not anticipated that feasible measures will be available in all situations to reduce vibration to levels below the applicable thresholds. This impact would therefore be considered significant and unavoidable.

Mitigation Measure NOI-2: Employ Vibration-Reducing Construction Practices during Construction of Water Conveyance Facilities

Please see Mitigation Measure NOI-2 under Impact NOI-2 in the discussion of Alternative 1A.

Impact NOI-3: Exposure of Noise-Sensitive Land Uses to Noise from Operation of Water Conveyance Facilities

NEPA Effects: Potential reasonable worst-case pump noise levels during operation of the intake structures were evaluated by calculating sound power levels of the pump based on horsepower (Hoover and Keith 2000). Under Alternative 2A, faceplate horsepower for vertical column and vertical volute type pumps is specified in pump selection appendix of the Conceptual Engineering Report [*Note to Lead Agencies: from a power requirement perspective, it was assumed that intakes 6 and 7 are equivalent to intakes 4 and 5*]. Pump specifications are shown in Table 23-45. Combined source noise levels assume that pump enclosures (including buildings) provide a nominal 15 dB of noise attenuation. This analysis assumes that pumps are operating 24 hours a day.

Table 23-45. Pump Specifications—Alternative 2A

Pump Location	Quantity	Pumping Plant Capacity (cfs)	Pump Horsepower	Individual Pump Source Level (dBA)	Combined Source Level (dBA)	Assumed Attenuation (dB)	Combined Source Level with Attenuation (dBA)
Intake 1	6	3,000	4,500	97	104	15	89
Intake 2	6	3,000	4,500	97	104	15	89
Intake 3	6	3,000	3,500	96	102	15	88
Intake 6	6	3,000	3,500	96	102	15	88
Intake 7	6	3,000	3,500	96	102	15	88
Intermediate Plant	16 (10/6)[a]	15,000	18,000/ 8,000[a]	103/99[a]	114	15	99

[a] Vertical Column Pumps/Vertical Volute Pumps in the Intermediate Pumping Plant.
cfs = cubic feet per second.
dB = decibels.
dBA = A-weighted sound level in decibels.

The estimated sound levels from pump operation as a function of distance based on calculated point-source attenuation over "soft" (i.e., acoustically absorptive) ground are shown in Table 23-46.

Table 23-46. Predicted Noise Levels from Pump Operation, Intakes, Alternative 2A

Distance Between Source and Receiver (Feet)	Intake 1-2 Calculated L_{eq} Sound Level (dBA)	Intakes 3, 6, 7 Calculated L_{eq} Sound Level (dBA)	Intermediate Pumping Plant Calculated L_{eq} Sound Level (dBA)
50	89	88	99
100	82	80	91
200	74	72	83
300	69	68	79
400	66	65	75
600	61	60	71
800	58	57	67
1,000	55	54	65
1,200	53	52	63
1,400	52	**50**	61
1,600	**50**	49	60
2,000	47	46	57
2,200	46	**45**	56
2,600	**45**	43	54
3,600	41	40	**50**
5,000	37	36	47
6,000	35	34	**45**
7,000	33	32	46

Notes: Calculations are based on Federal Transit Administration 2006. Calculation do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.
Noise levels assume a nominal pump enclosure attenuation of 15 dB.
Bold denotes daytime and nighttime maximum noise thresholds.
dBA = A-weighted sound level in decibels.

The results shown in Table 23-46 indicate that operating noise from pumping plants would exceed the nighttime threshold of 45 dBA at noise-sensitive land uses within a distance of up to 2,600 feet from intake pumping plant locations, and 6,000 feet from the pumping plant located at the proposed intermediate forebay. Noise from operation of pumping plants is predicted to exceed daytime and nighttime noise thresholds at nearby residences and outdoor parks in areas indicated in Table 23-47.

Table 23-47. Land use affected by noise from operation of pumping plants, Alternative 2A

		50 dBA L_{eq} Daytime Operations Threshold	45 dBA L_{eq} Nighttime Operations Threshold
Location	Zoning	Total Affected Parcels	Total Affected Parcels
Sacramento County – including River Road near the community of Hood; neighborhoods in the community of Hood; Lambert Road; Vorden Road.	Natural/Recreational	4	5
	Agricultural/Other[a]	92	178
Yolo County – including County Road E9 near the community of Clarksburg; neighborhoods in the community of Clarksburg.	Agricultural/Other[a]	64	103

[a] Includes agricultural or unclassified use that permits residential use.

Operation of water conveyance facilities could result in substantial increases in noise levels affecting nearby communities and residences. While noise levels in excess of applicable thresholds could occur throughout the affected area, the highest noise levels are expected at those land uses most adjacent to the pumping plants. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measure NOI-3 is available to reduce this effect.

Noise exposure to workers at conveyance facilities

Impact NOI-3 for Alternative 2A is the same as Impact NOI-3 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during pumping plant operations to noise levels above the daytime (50 dBA L_{max}) or nighttime (45 dBA L_{max}) noise thresholds would be significant. Based on reasonable worst-case modeling, 4 natural/recreational parcels and 156 agricultural parcels would be affected by daytime noise levels in excess of the operational threshold. The nighttime threshold would be exceeded at 5 natural/recreational parcels and 281 agricultural parcels (see Table 23-47). The impact of exposing these receptors to noise increases above thresholds would be significant. Mitigation Measure NOI-3 would reduce operational noise levels below applicable thresholds, thus resulting in a less-than-significant level.

Mitigation Measure NOI-3: Design and Construct Intake Facilities and Other Pump Facilities Such That Operational Noise Does Not Exceed 50 dBA (One-Hour L_{eq}) during Daytime Hours (7:00 A.M. to 10:00 P.M.) or 45 dBA (One-Hour L_{eq}) during Nighttime

Hours (10:00 P.M. to 7:00 A.M.) or the Applicable Local Noise Standard (Whichever Is Less) at Nearby Noise Sensitive Land Uses

Please see Mitigation Measure NOI-3 under Impact NOI-3 in the discussion of Alternative 1A.

Impact NOI-4: Exposure of Noise-Sensitive Land Uses to Noise from Implementation of Proposed Conservation Measures 2-10

NEPA Effects: Although locations or target acreages may vary for proposed conservation measures, at the program level of development, the amount and location of restoration actions under this alternative would be the same as Alternative 1A, and therefore the impact would be the same as under Alternative 1A. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet.

The effect of exposing sensitive land uses to increases in construction noise levels above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise increases above the daytime (60 dBA L_{eq}) and nighttime (50 dBA L_{max}) thresholds would be considered significant. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet. The impact of exposing these receptors to noise increases above thresholds would be significant. Although Mitigation Measures NOI-1a and NOI-1b will reduce this impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

23.3.3.6 Alternative 2B—Dual Conveyance with East Alignment and Five Intakes (15,000 cfs; Operational Scenario B)

A total of five intakes would be constructed under Alternative 2B. This alternative would also construct an intermediate forebay and an operable barrier at the head of Old River; the conveyance

would be a canal on the east side of the Sacramento River (see Figures 3-4 and 3-5 in Chapter 3, *Description of Alternatives*). Intake sites for Alternative 2B are the same as Alternative 2A.

Impact NOI-1: Exposure of Noise-Sensitive Land Uses to Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Construction of Intakes

The work areas for construction of Intakes 1, 2, 3, 6, and 7 would extend through several residential areas and communities located near the Sacramento River. Noise from intake construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks in areas indicated in Table 23-48. While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest.

Although this assessment includes daytime and nighttime construction noise estimates, construction of the intakes would primarily occur during daytime hours. If nighttime construction of the intakes were to occur, noise levels could be the same as that generated during daytime hours.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Table 23-48. Land Use Affected By Equipment Noise from Construction of Intakes, Alternative 2B

		Daytime Threshold (60 dBA L_{eq} [1h])	Nighttime Threshold (50 dBA L_{max} [1h])
Location	Zoning	Total Affected Parcels	Total Affected Parcels
Sacramento County – including River Road near the community of Hood; neighborhoods in the community of Hood; Lambert Road; Vorden Road.	Residential	3	112
	Natural/Recreational	9	15
	Agricultural/Other[a]	138	215
	Schools	None	None
Yolo County – including County Road E9 near the community of Clarksburg; neighborhoods in the community of Clarksburg.	Residential	4	98
	Natural/Recreational	1	5
	Agricultural/Other[a]	128	164
	Schools	None	Clarksburg Middle School, River Delta Community Day

[a] Includes agricultural or unclassified use that permits residential use.

Construction of Conveyance (Canal), Forebay, Barge Unloading Facilities, and Intermediate Pumping Plant

For a description of noise generated by this component of the project, see the discussion of Impact NOI-1, *Construction of Conveyance (Canal), Forebay, Barge Unloading Facilities, and Intermediate Pumping Plant*, under Alternative 1B. Noise from construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks indicated in Table 23-49. While equipment could operate at any work area identified for this alternative, the

highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest. This includes all construction sites along the canal or tunnel conveyance alignment, as well as at the site of the Byron Tract Forebay adjacent to and south of Clifton Court Forebay. For a map of the proposed east alignment, see Mapbook Figure M3-2.

Although this assessment includes daytime and nighttime construction noise estimates for the forebay, barge unloading facilities, intermediate pumping plant, and conveyance tunnels and canals, construction of the forebay, barge unloading facilities, intermediate pumping plant, and canals would primarily occur during daytime hours. If nighttime construction of the forebay, barge unloading facilities, intermediate pumping plant, and canals were to occur, noise levels could be the same as those generated during daytime hours. Construction of the conveyance tunnels and muck storage actions would occur on a 24-hour basis.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Table 23-49. Land Use Affected by Equipment Noise from Construction of Conveyance and Associated Facilities, Alternative 2B

		Daytime Threshold (60 dBA L_{eq} [1h])	Nighttime Threshold (50 dBA L_{max} [1h])
Location	Zoning	Total Affected Parcels	Total Affected Parcels
Sacramento County – including River Road near the community of Hood; neighborhoods in the community of Hood; Lambert Road; Vorden Road.	Residential	100	100
	Natural/Recreational	10	19
	Agricultural/Other[a]	340	447
	Schools	Bates Elementary, Mokelumne High	Bates Elementary, Mokelumne High
Yolo County – including County Road E9 near the community of Clarksburg; neighborhoods in the community of Clarksburg.	Residential	21	125
	Natural/Recreational	1	5
	Agricultural/Other[a]	135	173
	Schools	None	None
San Joaquin County	Residential	9	26
	Natural/Recreational	2	2
	Agricultural/Other[a]	472	1,118
Contra Costa County	Agricultural/Other[a]	89	98
Alameda County	Agricultural/Other[a]	21	45

[a] Includes agricultural or unclassified use that permits residential use.

Truck Trips and Worker Commutes

The estimate of truck trips and worker commutes under Alternative 2B would be similar to Alternative 1B. Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 16 project roadway segments in the study area as shown in Table 23-30.

During intake construction, segments of SR 160 between Freeport Bridge and Walnut Grove Bridge would be temporarily realigned around intake construction sites. As a result, future project noise levels would further increase at residences located near intake sites. Under Alternative 2B, noise

levels at receivers near realigned segments of SR 160 would increase by up to 8 dB in addition to the noise increase shown in Table 23-30.

The increase in noise levels exceed the project threshold for traffic noise and would be considered adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Construction of Power Transmission Lines

Noise from construction of power transmission lines for Alternative 2B is the same as Alternative 1A. The results shown in Table 23-21 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. Noise-sensitive receptors that could be exposed to adverse noise impacts due to transmission line construction include residential areas near the proposed transmission line construction footprint. Although this assessment includes daytime and nighttime construction noise estimates, construction of the transmission lines would primarily occur during daylight hours. If nighttime construction of the transmission lines were to occur, noise levels could be the same as those generated during daytime hours. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Earth-moving activities at offsite borrow/spoil areas

Noise from earth-moving activities at offsite borrow/spoil areas for Alternative 2B is the same as Alternative 1A. The results shown in Table 23-22 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Noise-sensitive land uses that could potentially be exposed to adverse noise impacts due to earth-moving activities in offsite borrow/spoil areas would extend outside the borrow/spoil area right-of-way. The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. However, with the exception of tunneling and RTM placement, most construction activities would occur during daytime hours. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Noise exposure to workers at construction sites

Impact NOI-1 for Alternative 2B is the same as Impact NOI-1 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise levels above the 60 dBA L_{eq} (1hr) daytime, the 50 dBA L_{max} nighttime, or the 12 dB traffic noise increase threshold would be considered significant. Based on reasonable worst-case modeling, the following significant impacts are expected as a result of Alternative 2B construction.

- **Intakes:** Sensitive receptors within 1,400 feet of an active intake construction site could be exposed to construction noise in excess of the 60 dBA L_{eq} (1hr) daytime threshold. The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-48, 7 residential parcels, 10 natural/recreational parcels, and 266 agricultural parcels

would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 210 residential parcels, 20 natural/recreational parcels, 379 agricultural parcels, and 2 schools.

- **Conveyance and Associated Facilities:** Sensitive receptors within 1,200 feet of an active tunnel work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-49, 130 residential parcels, 13 natural/recreational parcels, 1,057 agricultural parcels, and 2 schools would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 251 residential parcels, 26 natural/recreational parcels, 1,881 agricultural parcels, and 2 schools.
- **Truck Trips and Worker Commutes:** Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 21 project roadway segments in the study area as shown in Table 23-30. The increase in noise levels would be substantial and exceed the project threshold for traffic noise. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.
- **Power Transmission Lines:** Sensitive receptors within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. As noted above, several residential land uses are near the proposed transmission line construction footprint.
- **Borrow/spoil areas:** Sensitive receptors within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Borrow/spoil areas are located throughout the conveyance alignment and are generally adjacent to or in close proximity of intake pumping plant sites, forebays, and main tunnel construction shafts.

Mitigation Measures NOI-1a and NOI-1b would reduce noise impacts to sensitive land uses. Although implementation of these measures will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

Impact NOI-2: Exposure of Sensitive Receptors to Vibration or Groundborne Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Pile Driving at Intake Sites

Impact NOI-2 for Alternative 2B is the same as for Alternative 1B. In addition, an operable barrier would be constructed at the head of Old River. Construction of the operable barrier would include impact driving of sheet piles, which would cause high groundborne vibration levels in areas immediately adjacent to pile driving sites. However, the nearest residential use is 3,000 feet away from the construction site, so vibration levels would be well below the impact threshold.

Groundborne vibration levels from impact pile driving are predicted to exceed vibration thresholds at nearby residences in the areas shown in Table 23-50. While groundborne vibration levels in excess of 0.2 in/sec PPV could occur at any of these residences, the highest vibration levels are expected at those residences nearest to the intake work areas. Construction of intakes and barge unloading facilities would result in excessive groundborne vibration levels at these nearby residential structures. The effect of exposing sensitive receptors to groundborne vibration would be adverse. Mitigation Measure NOI-2 is available to reduce this effect.

Table 23-50. Land Use Affected by Vibrations from Pile Driving During Construction of Intakes, Alternative 2B

Location	Zoning	Total Affected Parcels
Sacramento County – including River Road near the community of Hood; Neighborhoods in the community of Hood	Residential[a]	76
Yolo County – including County Road E9 near the community of Clarksburg	Residential[a]	1
San Joaquin County	Residential[a]	4

[a] Includes agricultural or unclassified use that permits residential use.

Construction of Water Conveyance (Pipeline Portions)

Under Alternative 2B, groundborne noise effects during construction of the conveyance would be the same as Impact NOI-2 for Alternative 1B. Tunnels and siphons would be constructed at a depth of more than 120 feet below msl. Groundborne noise levels at residential receivers are predicted to be below thresholds, and would not result in an adverse effect.

***CEQA Conclusion*:** Groundborne vibrations from tunneling activities would not exceed applicable thresholds as tunnel depth would be 120 feet or greater below msl and would therefore be less than significant. However, the impact of exposing residential structures to groundborne vibration during intake construction would be significant as reasonable worst-case modeling indicates that 81 residential parcels would be exposed to vibration levels in excess of 0.2 in/sec PPV during intake pile driving (see Table 23-50). Although Mitigation Measure NOI-2 will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce vibration to levels below the applicable thresholds. This impact would therefore be considered significant and unavoidable.

Mitigation Measure NOI-2: Employ Vibration-Reducing Construction Practices during Construction of Water Conveyance Facilities

Please see Mitigation Measure NOI-2 under Impact NOI-2 in the discussion of Alternative 1A.

Impact NOI-3: Exposure of Noise-Sensitive Land Uses to Noise from Operation of Water Conveyance Facilities

NEPA Effects: Potential reasonable worst-case pump noise levels during operation of the intake structures were evaluated by calculating sound power levels of the pump based on horsepower (Hoover and Keith 2000). Faceplate horsepower for vertical column type pumps is specified in pump selection appendix of the Conceptual Engineering Report. Pump specifications are shown in Table 23-51. Combined source noise levels assume that pump enclosures (including buildings) provide a nominal 15 dB of noise attenuation. This analysis assumes that pumps are operating 24 hours a day.

Table 23-51. Pump Specifications—Alternative 2B

Pump Location	Quantity	Pumping Plant Capacity (cfs)	Pump Horsepower	Individual Pump Source Level (dBA)	Combined Source Level (dBA)	Assumed Attenuation (dB)	Combined Source Level with Attenuation (dBA)
Intake 1	6	3,000	3,500	96	103	15	88
Intake 2	6	3,000	3,500	96	103	15	88
Intake 3	6	3,000	3,500	96	103	15	88
Intake 6	6	3,000	3,500	96	103	15	88
Intake 7	6	3,000	3,500	96	103	15	88
Intermediate Plant	15	15,000	7,000	99	110	15	95

cfs = cubic feet per second.
dB = decibels.
dBA = A-weighted sound level in decibels.

The estimated sound levels from pump operation as a function of distance based on calculated point-source attenuation over "soft" (i.e., acoustically absorptive) ground are shown in Table 23-52.

Table 23-52. Predicted Noise Levels from Pump Operation, Intakes, Alternative 2B

Distance Between Source and Receiver (Feet)	Intakes 1,2,3,6, and 7 Calculated L_{eq} Sound Level (dBA)	Intermediate Plant Calculated L_{eq} Sound Level (dBA)
50	88	95
100	80	87
200	72	79
300	68	75
400	65	72
600	60	67
800	57	64
1,000	54	61
1,200	52	59
1,400	**50**	57
1,600	49	56
2,000	46	53
2,200	**45**	52
2,600	43	**50**
3,600	40	47
4,000	38	**45**
4,500	37	44
5,000	36	43

Notes: Calculations are based on Federal Transit Administration 2006. Calculation do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.
Noise levels assume a nominal pump enclosure attenuation of 15 dB.
Bold denotes daytime and nighttime maximum noise thresholds.

dBA = A-weighted sound level in decibels.

The results shown in Table 23-44 indicate that operating noise from pumping plants would exceed the nighttime threshold of 45 dBA at noise-sensitive land uses within a distance of up to 2,200 feet from intake pumping plant locations, and 4,000 feet from the intermediate pumping plant along the east conveyance alignment. Noise from operation of pumping plants is predicted to exceed daytime and nighttime noise thresholds at nearby residences and outdoor parks in areas indicated in Table 23-53.

Operation of water conveyance facilities could result in substantial increases in noise levels affecting nearby communities and residences. While noise levels in excess of applicable thresholds could occur throughout the affected area, the highest noise levels are expected at those land uses most adjacent to the pumping plants. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measure NOI-3 is available to reduce this effect.

Table 23-53. Land use affected by noise from operation of pumping plants, Alternative 2B

Location	Zoning	50 dBA L_{eq} Daytime Operations Threshold Total Affected Parcels	45 dBA L_{eq} Nighttime Operations Threshold Total Affected Parcels
Sacramento County – including River Road near the community of Hood; neighborhoods in the community of Hood.	Natural/Recreational	4	5
	Agricultural/Other[a]	70	123
Yolo County – including County Road E9 near the community of Clarksburg; neighborhoods in the community of Clarksburg.	Agricultural/Other[a]	64	103
San Joaquin County	Agricultural/Other[a]	27	61

[a] Includes agricultural or unclassified use that permits residential use.

Noise exposure to workers at conveyance facilities

Impact NOI-2B for Alternative 1B is the same as Impact NOI-3 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during pumping plant operations to noise levels above the daytime (50 dBA L_{max}) or nighttime (45 dBA L_{max}) noise thresholds would be significant. Based on reasonable worst-case modeling, 4 natural/recreational parcels and 161 agricultural parcels would be affected by daytime noise levels in excess of the operational threshold. The nighttime threshold would be exceeded at 5 natural/recreational parcels and 287 agricultural parcels (see Table 23-53). The impact of exposing these receptors to noise increases above thresholds would be significant. Mitigation Measure NOI-3 would reduce operational noise levels below applicable thresholds, thus resulting in a less-than-significant level.

Mitigation Measure NOI-3: Design and Construct Intake Facilities and Other Pump Facilities Such That Operational Noise Does Not Exceed 50 dBA (One-Hour L_{eq}) during Daytime Hours (7:00 A.M. to 10:00 P.M.) or 45 dBA (One-Hour L_{eq}) during Nighttime Hours (10:00 P.M. to 7:00 A.M.) or the Applicable Local Noise Standard (Whichever Is Less) at Nearby Noise Sensitive Land Uses

Please see Mitigation Measure NOI-3 under Impact NOI-3 in the discussion of Alternative 1A.

Impact NOI-4: Exposure of Noise-Sensitive Land Uses to Noise from Implementation of Proposed Conservation Measures 2-10

NEPA Effects: Although locations or target acreages may vary for proposed conservation measures, at the program level of development, the amount and location of restoration actions under this alternative would be the same as Alternative 1A, and therefore the impact would be the same as under Alternative 1A. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area

could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet.

The effect of exposing sensitive land uses to increases in construction noise levels above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise increases above the daytime (60 dBA L_{eq}) and nighttime (50 dBA L_{max}) thresholds would be significant. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet. The impact of exposing these receptors to noise increases above thresholds would be significant. Although Mitigation Measures NOI-1a and NOI-1b will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be considered significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

23.3.3.7 Alternative 2C—Dual Conveyance with West Alignment Intakes W1–W5 (15,000 cfs; Operational Scenario B)

A total of five intakes would be constructed under Alternative 2C. They would be sited on the west bank of the Sacramento River, directly opposite the locations identified for the pipeline/tunnel and east alignments. Under this alternative, water would be carried south in a canal along the western side of the Delta to an intermediate pumping plant and then pumped through a tunnel to a continuing canal to the proposed Byron Tract Forebay immediately northwest of Clifton Court Forebay (see Figures 3-6 and 3-7 in Chapter 3, *Description of Alternatives*). An operable barrier would also be constructed at the head of Old River.

Impact NOI-1: Exposure of Noise-Sensitive Land Uses to Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Construction of Intakes

Impact NOI-1 for Alternative 2C is the same as Impact NOI-1 for Alternative 1C in terms of construction equipment noise levels. Noise from construction of intakes is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks indicated

in Table 23-35 (see Impact NOI-1 in Alternative 1C). While equipment could operate at any construction work area, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest.

Although this assessment includes daytime and nighttime construction noise estimates, construction of the intakes would primarily occur during daytime hours. If nighttime construction of the intakes were to occur, noise levels could be the same as that generated during daytime hours.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Construction of Conveyance (Tunnel and Canal), Forebay, Barge Unloading Facilities, and Intermediate Pumping Plant

Impact NOI-1 for Alternative 2C is the same as Impact NOI-1 for Alternative 1C in terms of construction equipment noise levels. Noise from construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks indicated in Table 23-36 (see Impact NOI-1 in Alternative 1C). While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest. This includes all construction sites along the canal or tunnel conveyance alignment, as well as at the site of the Byron Tract Forebay adjacent to and west of Clifton Court Forebay. For a map of the proposed west alignment, see Mapbook Figure M3-3.

Although this assessment includes daytime and nighttime construction noise estimates for the forebay, barge unloading facilities, intermediate pumping plant, and conveyance tunnels and canals, construction of the forebay, barge unloading facilities, intermediate pumping plant, and canals would primarily occur during daytime hours. If nighttime construction of the forebay, barge unloading facilities, intermediate pumping plant, and canals were to occur, noise levels could be the same as those generated during daytime hours. Construction of the conveyance tunnels and RTM storage actions would occur on a 24-hour basis.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Truck Trips and Worker Commutes

The estimate of truck trips and worker commutes under Alternative 2C would be similar to Alternative 1C except for the addition of trips associated with construction of the operable barrier. Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 22 project roadway segments in the study area as shown in Table 23-37.

During intake construction, segments of County Highway E9 would be temporarily realigned around intake construction sites. Under the west alignment alternative, no additional noise increase is anticipated at residences adjacent to intake construction sites.

The increase in noise levels exceed the project threshold for traffic noise and would be considered adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Construction of Power Transmission Lines

Noise from construction of power transmission lines for Alternative 2C is the same as Alternative 1C. The results shown in Table 23-21 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. Noise-sensitive receptors that could be exposed to adverse noise impacts due to transmission line construction include residential areas near the proposed transmission line construction footprint. Likewise, as noted in Chapter 24, *Hazards and Hazardous Materials*, Lakewood Drive, Sycamore Drive, and Summer Lake Community Parks, as well as Mokelumne High (Continuation) School would be near the proposed transmission line construction footprint for Alternative 2C. Although this assessment includes daytime and nighttime construction noise estimates, construction of the transmission lines would primarily occur during daylight hours. If nighttime construction of the transmission lines were to occur, noise levels could be the same as those generated during daytime hours. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Earth-moving activities at offsite borrow/spoil areas

Noise from earth-moving activities at offsite borrow/spoil areas for Alternative 2C is the same as Alternative 1C. The results shown in Table 23-22 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Noise-sensitive land uses that could potentially be exposed to adverse noise impacts due to earth-moving activities in offsite borrow/spoil areas would extend outside the borrow/spoil area right-of-way. The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. However, with the exception of tunneling and RTM placement, most construction activities would occur during daytime hours. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Noise exposure to workers at construction sites

Impact NOI-1 for Alternative 2C is the same as Impact NOI-1 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise levels above the 60 dBA L_{eq} (1hr) daytime, the 50 dBA L_{max} nighttime, or the 12 dB traffic noise increase threshold would be considered significant. Based on reasonable worst-case modeling, the following significant impacts are expected as a result of Alternative 2C construction.

- **Intakes:** Sensitive receptors within 1,400 feet of an active intake construction site could be exposed to construction noise in excess of the 60 dBA L_{eq} (1hr) daytime threshold. The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-35 (see Impact NOI-1 in Alternative 1C), 63 residential parcels, 3 natural/recreational parcels, and 188 agricultural parcels would be affected by daytime noise levels in excess of this

threshold during construction. The nighttime threshold would be exceeded at 229 residential parcels, 8 natural/recreational parcels, 351 agricultural parcels, and 3 schools.

- **Conveyance and Associated Facilities:** Sensitive receptors within 1,200 feet of an active tunnel work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-36 (see Impact NOI-1 in Alternative 1C), 1,148 residential parcels, 26 natural/recreational parcels, 1,048 agricultural parcels, and 4 schools would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 3,087 residential parcels, 221 natural/recreational parcels, 1,532 agricultural parcels, and 6 schools.
- **Truck Trips and Worker Commutes:** Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 22 project roadway segments in the study area as shown in Table 23-37. The increase in noise levels would be substantial and exceed the project threshold for traffic noise. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.
- **Power Transmission Lines:** Sensitive receptors within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. As noted above, residential areas and several schools are near the proposed transmission line construction footprint.
- **Borrow/spoil areas:** Sensitive receptors within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Borrow/spoil areas are located throughout the conveyance alignment and are generally adjacent to or in close proximity of intake pumping plant sites, forebays, and main tunnel construction shafts.

Mitigation Measures NOI-1a and NOI-1b would reduce the impact. Although implementation of these measures will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

Impact NOI-2: Exposure of Sensitive Receptors to Vibration or Groundborne Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Pile Driving at Intake Sites

Under Alternative 2C, groundborne vibration effects would be the same as Impact NOI-2 for Alternative 1C. Groundborne vibration levels from construction of intakes would exceed vibration thresholds at nearby receptors, including residential structures (see Table 23-38 under Impact NOI-2 in Alternative 1C). The effect of exposing sensitive receptors to groundborne vibration would be adverse. Mitigation Measure NOI-2 is available to reduce this effect.

Construction of Water Conveyance (Tunnel Portions)

Under Alternative 2C, groundborne noise effects during construction of the conveyance would be the same as Impact NOI-2 for Alternative 1C. Tunnels and siphons would be constructed at a depth of more than 120 feet below msl. Groundborne noise levels at residential receivers are predicted to be below thresholds, and would not result in an adverse effect.

***CEQA Conclusion*:** Groundborne vibrations during tunneling would not exceed the applicable threshold as tunnel depth would be 120 feet or greater below msl and would therefore be less than significant. However, the impact of exposing residential structures to groundborne vibration during intake construction would be significant as reasonable worst-case modeling indicates that 88 residential parcels would be exposed to vibration levels in excess of 0.2 in/sec PPV during intake pile driving (see Table 23-38 under Impact NOI-2 in Alternative 1C). Although Mitigation Measure NOI-2 reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce vibration to levels below the applicable thresholds. This impact would therefore be significant and unavoidable.

Mitigation Measure NOI-2: Employ Vibration-Reducing Construction Practices during Construction of Water Conveyance Facilities

Please see Mitigation Measure NOI-2 under Impact NOI-2 in the discussion of Alternative 1A.

Impact NOI-3: Exposure of Noise-Sensitive Land Uses to Noise from Operation of Water Conveyance Facilities

NEPA Effects:

Impact NOI-3 for Alternative 2C is the same as Impact NOI-3 for Alternative 1C. Operation of pumping plants under Alternative 2C would expose persons to noise levels greater than the noise thresholds for project operations (see Table 23-41 under Impact NOI-3 in Alternative 1C). Noise levels from operation of project-level physical and structural components would therefore be considered to result in an adverse effect.

Operation of water conveyance facilities could result in substantial increases in noise levels affecting nearby communities and residences. While noise levels in excess of applicable thresholds could occur throughout the affected area, the highest noise levels are expected at those land uses most adjacent to the pumping plants. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measure NOI-3 is available to reduce this effect.

Noise exposure to workers at conveyance facilities

Impact NOI-3 for Alternative 2C is the same as Impact NOI-3 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during pumping plant operations to noise levels above the daytime (50 dBA L_{max}) or nighttime (45 dBA L_{max}) noise thresholds would be significant. Based on reasonable worst-case modeling, 2 residential parcels, 2 natural/recreational parcels, and 132 agricultural parcels would be affected by daytime noise levels in excess of the operational threshold. The nighttime threshold would be exceeded at 77 residential parcels, 3 natural/recreational parcels, and 205 agricultural parcels. The impact of exposing these receptors to noise increases above thresholds would be significant. Mitigation Measure NOI-3 would reduce operational noise levels below applicable thresholds, thus resulting in a less-than-significant level.

Mitigation Measure NOI-3: Design and Construct Intake Facilities and Other Pump Facilities Such That Operational Noise Does Not Exceed 50 dBA (One-Hour L_{eq}) during Daytime Hours (7:00 A.M. to 10:00 P.M.) or 45 dBA (One-Hour L_{eq}) during Nighttime Hours (10:00 P.M. to 7:00 A.M.) or the Applicable Local Noise Standard (Whichever Is Less) at Nearby Noise Sensitive Land Uses

Please see Mitigation Measure NOI-3 under Impact NOI-3 in the discussion of Alternative 1A.

Impact NOI-4: Exposure of Noise-Sensitive Land Uses to Noise from Implementation of Proposed Conservation Measures 2-10

NEPA Effects: Although locations or target acreages may vary for proposed conservation measures, at the program level of development, the amount and location of restoration actions under this alternative would be the same as Alternative 1A, and therefore the impact would be the same as under Alternative 1A. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet.

The effect of exposing sensitive land uses to increases in construction noise levels above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise increases above the daytime (60 dBA L_{eq}) and nighttime (50 dBA L_{max}) thresholds would be significant. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet. The impact of exposing these receptors to noise increases above thresholds would be significant.

Although Mitigation Measures NOI-1a and NOI-1b will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be considered significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

23.3.3.8 Alternative 3—Dual Conveyance with Pipeline/Tunnel and Intakes 1 and 2 (6,000 cfs; Operational Scenario A)

Two intakes would be constructed under Alternative 3 on the east bank of the Sacramento River. For the purposes of this analysis, Alternative 3 was assumed to construct Intakes 1 and 2. This alternative would also construct an intermediate forebay, and the conveyance facility would be a buried pipeline (see Figures 3-2 and 3-8 in Chapter 3, *Description of Alternatives*).

Impact NOI-1: Exposure of Noise-Sensitive Land Uses to Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Construction of Intakes

Potential reasonable worst-case equipment noise levels from construction of intakes would be comparable to those listed for the intake sites in Table 23-17. The results shown in Table 23-17 indicate that during periods of pile driving, residences located within 1,400 feet of an active intake construction site could be exposed to construction noise in excess of the DWR daytime (7 a.m. to 10 p.m.) maximum noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet from an active intake construction site.

While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest. The work areas for construction of Intakes 1 and 2 would extend through several residential areas and communities located near the Sacramento River. Noise from intake construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks in areas indicated in Table 23-54.

Although this assessment includes daytime and nighttime construction noise estimates, construction of the intakes would primarily occur during daytime hours. If nighttime construction of the intakes were to occur, noise levels could be the same as that generated during daytime hours.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Table 23-54. Land use affected by equipment noise from construction of intakes, Alternative 3

Location	Zoning	Daytime Threshold (60 dBA L_{eq} [1h]) Total Affected Parcels	Nighttime Threshold (50 dBA L_{max} [1h]) Total Affected Parcels
Sacramento County – including River Road across the river from the community of Clarksburg.	Natural/Recreational	0	3
	Agricultural/Other[a]	59	104
	Schools	None	None
Yolo County – including County Road E9 near the community of Clarksburg; neighborhoods in the community of Clarksburg.	Residential	4	98
	Natural/Recreational	1	5
	Agricultural/Other[a]	105	131
	Schools	None	Clarksburg Middle School

[a] Includes agricultural or unclassified use that permits residential use.

Construction of Conveyance (Tunnel), Forebays, Barge Unloading Facilities, and Intermediate Pumping Plant

Construction of the conveyance under Alternative 3 would be the same as Alternative 1A. Noise from construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks indicated in Table 23-19 (see Impact NOI-1 in Alternative 1A). While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest. This includes all construction sites along the tunnel conveyance alignment, as well as at the site of the Byron Tract Forebay adjacent to and south of Clifton Court Forebay. For a map of the proposed pipeline/tunnel alignment, see Mapbook Figure M3-1.

Although this assessment includes daytime and nighttime construction noise estimates for the forebays, barge unloading facilities, intermediate pumping plant, and conveyance tunnels, construction of the forebays, barge unloading facilities, and intermediate pumping plant would primarily occur during daytime hours. If nighttime construction of the forebays, barge unloading facilities, and intermediate pumping plant were to occur, noise levels could be the same as those generated during daytime hours. Construction of the conveyance tunnels and RTM storage actions would occur on a 24-hour basis.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b would be available to reduce this effect.

Truck Trips and Worker Commutes

The estimate of truck trips and worker commutes under Alternative 3 would be similar to Alternative 1A. Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 16 project roadway segments in the study area as shown in Table 23-20.

During intake construction, segments of SR 160 between Freeport Bridge and Walnut Grove Bridge would be temporarily realigned around intake construction sites. As a result, future project noise levels would further increase at residences located near intake sites. Under Alternative 3, noise

levels at receivers near realigned segments of SR 160 would increase by up to 6 dB in addition to the noise increase shown in Table 23-20.

The increase in noise levels exceed the project threshold for traffic noise and would be considered adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Construction of Power Transmission Lines

Noise from construction of power transmission lines for Alternative 3 is the same as Alternative 1A. The results shown in Table 23-21 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. Several residential land uses are near the proposed transmission line construction footprint. Likewise, Delta Elementary School and Delta High School on the west bank of the Sacramento River are within half a mile of the proposed Intake 2 transmission lines. Although this assessment includes daytime and nighttime construction noise estimates, construction of the transmission lines would primarily occur during daylight hours. If nighttime construction of the transmission lines were to occur, noise levels could be the same as those generated during daytime hours. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Earth-moving activities at offsite borrow/spoil areas

Noise from earth-moving activities at offsite borrow/spoil areas for Alternative 3 is the same as Alternative 1A. The results shown in Table 23-22 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Noise-sensitive land uses that could potentially be exposed to adverse noise impacts due to earth-moving activities in offsite borrow/spoil areas would extend outside the borrow/spoil area right-of-way. The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. However, with the exception of tunneling and RTM placement, most construction activities would occur during daytime hours. Measures NOI-1a and NOI-1b are available to address this effect.

Noise exposure to workers at construction sites

Impact NOI-1 for Alternative 3 is the same as Impact NOI-1 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise levels above the 60 dBA L_{eq} (1hr) daytime, the 50 dBA L_{max} nighttime, or the 12 dB traffic noise increase threshold would be considered significant. Based on reasonable worst-case modeling, the following significant impacts are expected as a result of Alternative 3 construction.

- **Intakes:** Sensitive receptors within 1,400 feet of an active intake construction site could be exposed to construction noise in excess of the 60 dBA L_{eq} (1hr) daytime threshold. The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-54, 4 residential parcels, 1 natural/recreational parcels, and 46 agricultural parcels

would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 98 residential parcels, 8 natural/recreational parcels, 235 agricultural parcels, and 1 school.

- **Conveyance and Associated Facilities:** Sensitive receptors within 1,200 feet of an active tunnel work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-19 (see Impact NOI-1 in Alternative 1A), 125 residential parcels, 9 natural/recreational parcels, 765 agricultural parcels, and 2 schools would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 226 residential parcels, 20 natural/recreational parcels, 1,109 agricultural parcels, and 4 schools.
- **Truck Trips and Worker Commutes:** Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 16 project roadway segments in the study area as shown in Table 23-30. The increase in noise levels would be substantial and exceed the project threshold for traffic noise. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.
- **Power Transmission Lines:** Sensitive receptors within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. As noted above, several residential land uses are near the proposed transmission line construction footprint. Likewise, Delta Elementary School and Delta High School on the west bank of the Sacramento River are within half a mile of the proposed Intake 2 transmission lines.
- **Borrow/spoil areas:** Sensitive receptors within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Borrow/spoil areas are located throughout the conveyance alignment and are generally adjacent to or in close proximity of intake pumping plant sites, forebays, and main tunnel construction shafts.

Mitigation Measures NOI-1a and NOI-1b would reduce the impact. Although implementation of these measures will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

Impact NOI-2: Exposure of Sensitive Receptors to Vibration or Groundborne Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Pile Driving at Intake Sites

Impact NOI-2 for Alternative 3 is the same as Impact NOI-2 for Alternative 1A. However, fewer sensitive receptors would be affected by groundborne vibration levels of this magnitude compared to Alternative 1A, because fewer intakes would be constructed (two rather than five). Groundborne vibration levels from impact pile driving are predicted to exceed vibration thresholds at nearby residences in the areas shown in Table 23-55.

While groundborne vibration levels in excess of 0.2 in/sec PPV could occur at any of these residences, the highest vibration levels are expected at those residences nearest to the intake work areas. Construction of intakes and barge unloading facilities would result in excessive groundborne vibration levels at these nearby residential structures. The effect of exposing sensitive receptors to groundborne vibration would be adverse. Mitigation Measure NOI-2 is available to reduce this effect.

Table 23-55. Land use affected by vibrations from pile driving during construction of intakes, Alternative 3

Location	Zoning	Total Affected Parcels
Sacramento County – including River Road near the community of Hood; Neighborhoods in the community of Hood	Residential[a]	41
Yolo County – including County Road E9 near the community of Clarksburg	Residential[a]	1
San Joaquin County	Residential[a]	13

[a] Includes agricultural or unclassified use that permits residential use.

Construction of Water Conveyance (Tunnel)

Vibration sources include the TBM and locomotives moving soil, equipment, and construction workers between tunnel shaft sites. At a 60-foot tunnel depth, groundborne vibrations from the TBM are estimated to be 0.008 in/sec PPV, which is below the threshold of 0.04 in/sec PPV. As described in Section 23.4.2, *Determination of Effects*, tunnel locomotives would be operated at slow speeds inside of tunnels and would not result in excessive vibrations. Groundborne noise from tunnel locomotive operation during construction is therefore not predicted to exceed groundborne noise thresholds or result in an adverse noise impact to sensitive receptors along the tunnel conveyance.

***CEQA Conclusion*:** Groundborne vibrations during tunneling would not exceed 0.008 in/sec PPV at 60-foot tunnel depth and would therefore be less than significant. Likewise**,** locomotives are not expected to generate significant noise levels because they will travel at low speeds between 5 and 10 miles per hour. However, the impact of exposing residential structures to groundborne vibration during intake construction would be significant as reasonable worst-case modeling indicates that 55 residential parcels would be exposed to vibration levels in excess of 0.2 in/sec PPV during intake pile driving (see Table 23-55). Although Mitigation Measure NOI-2 will reduce the impact, it is not

anticipated that feasible measures will be available in all situations to reduce vibration to levels below the applicable thresholds. This impact would therefore be significant and unavoidable.

Mitigation Measure NOI-2: Employ Vibration-Reducing Construction Practices during Construction of Water Conveyance Facilities

Please see Mitigation Measure NOI-2a under Impact NOI-2 in the discussion of Alternative 1A.

Impact NOI-3: Exposure of Noise-Sensitive Land Uses to Noise from Operation of Water Conveyance Facilities

NEPA Effects: Potential reasonable worst-case pump noise levels during operation of the intake structures were evaluated by calculating sound power levels of the pump based on horsepower (Hoover and Keith 2000). Faceplate horsepower for vertical column and vertical volute type pumps is specified in pump selection appendix of the Conceptual Engineering Report. Pump specifications are shown in Table 23-56. Combined source noise levels assume that pump enclosures (including buildings) provide a nominal 15 dB of noise attenuation. This analysis assumes that pumps are operating 24 hours a day.

Table 23-56. Pump Specifications—Alternative 3

Pump Location	Quantity	Pumping Plant Capacity (cfs)	Pump Horsepower	Individual Pump Source Level (dBA)	Combined Source Level (dBA)	Assumed Attenuation (dB)	Combined Source Level with Attenuation (dBA)
Intake 1	6	3,000	4,500	97	104	15	89
Intake 2	6	3,000	4,500	97	104	15	89
Intermediate Plant	16 (10/6)[a]	15,000	18,000/ 8,000[a]	103/99[a]	114	15	99

[a] Vertical Column Pumps/Vertical Volute Pumps in the Intermediate Pumping Plant.
cfs = cubic feet per second.
dB = decibels.
dBA = A-weighted sound level in decibels.

The estimated sound levels from pump operation as a function of distance based on calculated point-source attenuation over "soft" (i.e., acoustically absorptive) ground are shown in Table 23-57.

Table 23-57. Predicted Noise Levels from Pump Operation, Intakes, Alternative 3

Distance Between Source and Receiver (Feet)	Intake 1-2 Calculated L_{eq} Sound Level (dBA)	Intermediate Plant Calculated L_{eq} Sound Level (dBA)
50	89	99
100	82	91
200	74	83
300	69	79
400	66	75
600	61	71
800	58	67
1,000	55	65
1,200	53	63
1,400	52	61
1,600	**50**	60
2,000	47	57
2,200	46	56
2,600	**45**	54
3,600	41	**50**
5,000	37	47
6,000	35	**45**
7,000	33	43

Notes: Calculations are based on Federal Transit Administration 2006. Calculation do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.
Noise levels assume a nominal pump enclosure attenuation of 15 dB.
Bold denotes daytime and nighttime maximum noise thresholds.
dBA = A-weighted sound level in decibels.

The results shown in Table 23-57 indicate that operating noise from pumping plants would exceed the nighttime threshold of 45 dBA at noise-sensitive land uses within a distance of up to 2,600 feet from intake pumping plant locations, and 6,000 feet from the pumping plant located at the proposed intermediate forebay. Noise from operation of pumping plants is predicted to exceed daytime and nighttime noise thresholds at nearby residences and outdoor parks in areas indicated in Table 23-58.

Table 23-58. Land Use Affected by Noise from Operation of Pumping Plants, Alternative 3

Location	Zoning	50 dBA L_{eq} Daytime Operations Threshold Total Affected Parcels	45 dBA L_{eq} Nighttime Operations Threshold Total Affected Parcels
Sacramento County – including River Road near the community of Hood; neighborhoods in the community of Hood; Lambert Road; Vorden Road.	Agricultural/ Other[a]	46	99
Yolo County – including County Road E9 near the community of Clarksburg; neighborhoods in the community of Clarksburg.	Agricultural/ Other[a]	52	87

[a] Includes agricultural or unclassified use that permits residential use.

Operation of water conveyance facilities could result in substantial increases in noise levels affecting nearby communities and residences. While noise levels in excess of applicable thresholds could occur throughout the affected area, the highest noise levels are expected at those land uses most adjacent to the pumping plants. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measure NOI-3 is available to reduce this effect.

Noise exposure to workers at conveyance facilities

Impact NOI-3 for Alternative 3 is the same as Impact NOI-3 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during pumping plant operations to noise levels above the daytime (50 dBA L_{max}) or nighttime (45 dBA L_{max}) noise thresholds would be considered significant. Based on reasonable worst-case modeling 98 agricultural parcels would be affected by daytime noise levels in excess of the operational threshold. The nighttime threshold would be exceeded at 186 agricultural parcels (see Table 23-58). The impact of exposing these receptors to noise increases above thresholds would be significant. Mitigation Measure NOI-3 would reduce operational noise levels below applicable thresholds, thus resulting in a less-than-significant level.

Mitigation Measure NOI-3: Design and Construct Intake Facilities and Other Pump Facilities Such That Operational Noise Does Not Exceed 50 dBA (One-Hour L_{eq}) during Daytime Hours (7:00 A.M. to 10:00 P.M.) or 45 dBA (One-Hour L_{eq}) during Nighttime Hours (10:00 P.M. to 7:00 A.M.) or the Applicable Local Noise Standard (Whichever Is Less) at Nearby Noise Sensitive Land Uses

Please see Mitigation Measure NOI-3 under Impact NOI-3 in the discussion of Alternative 1A.

Impact NOI-4: Exposure of Noise-Sensitive Land Uses to Noise from Implementation of Proposed Conservation Measures 2-10

NEPA Effects: Although locations or target acreages may vary for proposed conservation measures, at the program level of development, the amount and location of restoration actions under this

alternative would be the same as Alternative 1A, and therefore the impact would be the same as under Alternative 1A. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet.

The effect of exposing sensitive land uses to increases in construction noise levels above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise increases above the daytime (60 dBA L_{eq}) and nighttime (50 dBA L_{max}) thresholds would be considered significant. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet. The impact of exposing these receptors to noise increases above thresholds would be significant. Although Mitigation Measures NOI-1a and NOI-1b will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be considered significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

23.3.3.9 Alternative 4—Dual Conveyance with Modified Pipeline/Tunnel and Intakes 2, 3, and 5 (9,000 cfs; Operational Scenario H)

Three intakes would be constructed under Alternative 4 on the east bank of the Sacramento River. This alternative would also construct an intermediate forebay, and the conveyance facility would be a buried pipeline (see Figures 3-9 and 3-10 in Chapter 3, *Description of Alternatives*).

Impact NOI-1: Exposure of Noise-Sensitive Land Uses to Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Construction of Intakes

Potential reasonable worst-case equipment noise levels from construction of the intakes were evaluated by combining the noise levels of the six loudest pieces of equipment that would likely operate at the same time (cranes and trucks). Assuming 100% utilization within a given hour of day, the combined noise level is 96 dBA L_{eq} (1hr) at 50 feet. The estimated sound levels from construction as a function of distance based on calculated point-source attenuation over "soft" (i.e., acoustically absorptive) ground are shown in Table 23-59.

Table 23-59. Predicted Noise Levels from Construction Activities

Distance Between Source and Receiver (feet)	Calculated L_{eq} (1hr)/Nighttime L_{max} Sound Level (dBA)
50	96
100	88
200	80
400	72
600	68
800	64
1,000	62
1,200	**60**
1,500	57
2,000	54
2,500	51
2,800	**50**
3,000	49
4,000	46
5,280	43

Notes: Calculations are based on Federal Transit Administration 2006. Calculations do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.
Bold denotes daytime (1hr) and nighttime (1hr) maximum noise thresholds.
L_{eq} (1 hour) = hourly-equivalent sound level (over 1 hour).
dBA = A-weighted decibel.

Estimated sound levels from impact pile driving conducted during periods of construction described above are shown in Table 23-60. Because noise from pile driving is not constant, a utilization factor of 20% has been applied (Thalheimer 2000). The utilization factor reduces the impact pile driver peak level of 101 dBA to 94 dBA L_{eq} (1hr) at 50 feet. Use of the pile driver simultaneously with noise from other equipment in Table 23-59 would produce a combined level of 98 dBA L_{eq} (1hr) at 50 feet, as shown in Table 23-60. The results shown in Table 23-60 indicate that during periods of pile driving, residences located within 1,400 feet of an active intake construction site could be exposed

to construction noise in excess of the DWR daytime (7 a.m.to 10 p.m.) maximum noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet from an active intake construction site.

Table 23-60. Predicted Noise Levels from Construction—Pile Driving and Construction Equipment for Intake Structures

Distance Between Source and Receiver (feet)	Calculated Daytime L_{eq} (1hr) Sound Level (dBA)	Nighttime L_{max} Sound Level (dBA)
50	98	96
100	90	88
200	82	80
400	74	72
600	70	68
800	66	64
1,000	64	62
1,200	62	60
1,400	**60**	57
1,500	59	54
2,000	56	51
2,800	52	**50**
3,500	50	49
4,000	48	46
5,280	45	43

Notes: Calculations are based on Federal Transit Administration 2006. Calculations do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.

Nighttime L_{max} sound levels are based on the same operating assumptions as daytime levels with the exception of pile driving.

Bold denotes daytime and nighttime maximum noise thresholds.

L_{eq} (1hr) = hourly-equivalent sound level (over 1 hour).

dBA = A-weighted decibel.

While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest. The work areas for construction of intakes 2, 3 and 5 would extend through several residential areas and communities located near the Sacramento River. Noise from intake construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks in areas indicated in Table 23-61.

Although this assessment includes daytime and nighttime construction noise estimates, construction of the intakes would primarily occur during daytime hours. If nighttime construction of the intakes were to occur, noise levels could be the same as that generated during daytime hours.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b would be available to reduce this effect.

Table 23-61. Land Use Affected by Equipment Noise from Construction of Intakes, Alternative 4

Location	Zoning	Daytime Threshold (60 dBA L_{eq} [1h]) Total Affected Parcels	Nighttime Threshold (50 dBA L_{max} [1h]) Total Affected Parcels
Sacramento County – including River Road across the river from the community of Clarksburg.	Residential	121	121
	Natural/Recreational	2	2
	Agricultural/Other[a]	105	120
	Schools	None	None
Yolo County – including County Road E9 near the community of Clarksburg; neighborhoods in the community of Clarksburg.	Residential	9	70
	Natural/Recreational	1	5
	Agricultural/Other[a]	100	104
	Schools	None	Clarksburg Middle School

[a] Includes agricultural or unclassified use that permits residential use.

Construction of Conveyance (Tunnel), Forebays, and Barge Unloading Facilities

Potential reasonable worst-case equipment noise levels from construction work areas adjacent to tunnel shaft sites would be comparable to those listed for the intake sites in Table 23-59. Assuming 100% equipment utilization within a given hour of day, the combined noise level at work areas is 96 dBA L_{eq} (1hr) at 50 feet.

The results shown in Table 23-59 indicate that noise-sensitive land uses within 1,200 feet of an active tunnel work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet.

While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest. This includes all construction sites along the tunnel conveyance alignment, as well as at the site of the Byron Tract Forebay adjacent to and south of Clifton Court Forebay. For a map of the proposed pipeline/tunnel alignment under Alternative 4, see Mapbook Figure M3-4. The tunnel and forebay construction work areas would extend through several residential areas and communities near the Sacramento River. Noise from construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks indicated in Table 23-62.

Although this assessment includes daytime and nighttime construction noise estimates for the forebays, barge unloading facilities, and conveyance tunnels, construction of the forebays and barge unloading facilities would primarily occur during daytime hours. If nighttime construction of the forebays and barge unloading facilities were to occur, noise levels could be the same as those generated during daytime hours. Construction of the conveyance tunnels and RTM storage actions would occur on a 24-hour basis.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to reduce this effect.

Table 23-62. Land Use Affected by Equipment Noise from Construction of Conveyance and Associated Facilities, Alternative 4

Location	Zoning	Daytime Threshold (60 dBA L_{eq} [1h]) Total Affected Parcels	Nighttime Threshold (50 dBA L_{max} [1h]) Total Affected Parcels
Sacramento County – including River Road near the community of Hood; neighborhoods in the community of Hood; Lambert Road; Twin Cities Road.	Residential	120	121
	Natural/Recreational	10	29
	Agricultural/Other[a]	184	250
	Schools	None	None
Yolo County – including County Road E9 near the community of Clarksburg; neighborhoods in the community of Clarksburg.	Residential	10	95
	Natural/Recreational	1	5
	Agricultural/Other[a]	100	104
	Schools	None	Clarksburg Middle School, River Delta Community Day
San Joaquin County	Residential	8	18
	Natural/Recreational	4	10
	Agricultural/Other[a]	164	435
Contra Costa County	Agricultural/Other[a]	92	122
	Natural/Recreational	1	1
Alameda County	Agricultural/Other[a]	13	27

[a] Includes agricultural or unclassified use that permits residential use.

Truck Trips and Worker Commutes

Project-generated heavy trucks and worker commutes are predicted to result in increased traffic noise levels at noise-sensitive land uses adjacent to local roadways. Based on information provided by DWR as part of the cost estimate (see Appendix 22A), project-generated vehicle traffic volumes for the pipeline/tunnel conveyance alternative are predicted to have a maximum heavy truck composition of 41%, which was assumed to apply to any of the local roadways under a worst-case noise scenario. Future noise levels are shown in Table 23-63.

Table 23-63. Predicted Future Traffic Noise Levels on Commuter Roads and Haul Routes, Alternative 4

Roadway	Segment	Existing Noise Level, dBA	Future With-Project Noise Level, dBA	Noise Level Increase, dB	Substantial Increase?
Byron Hwy	Contra Costa Co./ Alameda Co. Line to Alameda Co./San Joaquin Co. Line	58	66	**8**	**no**
Brentwood Blvd	Delta Rd (Oakley City Limits) to Balfour Rd	61	67	**6**	**no**
Brentwood Blvd	Balfour Rd to Brentwood City Limits (South)	60	66	**6**	**no**
Balfour Rd	Brentwood Blvd to Brentwood City Limits	61	61	**0**	**no**
Bethel Island Rd	Oakley City Limits to End	55	55	**0**	**no**
Balfour Rd	Brentwood City Limits to Byron Hwy	54	54	**0**	**no**
Old SR 41	Brentwood City Limits (South) to Marsh Creek Rd	62	67	**5**	**no**
Byron Hwy	Delta Rd to Old SR 4	53	53	**0**	**no**
Byron Hwy	SR 4 to Contra Costa Co./ Alameda Co. Line	59	67	**8**	**no**
SR 160 (Freeport Blvd)	Sacramento City Limits to Freeport Bridge	59	67	**8**	**no**
SR 160 (Freeport Blvd/ River Rd)	Freeport Bridge to Scribner Rd	55	67	**12**	**yes**
SR 160	Scribner Rd to Hood Franklin Rd	53	66	**13**	**yes**
SR 160	Hood Franklin Rd to Lambert Rd	55	68	**13**	**yes**
SR 160	Lambert Rd to Paintersville Bridge	53	68	**15**	**yes**
SR 160 (Paintersville Bridge)	Sutter Slough Bridge Rd to SR 160 (River Rd)	53	68	**15**	**yes**
SR 160	Paintersville Bridge to Walnut Grove Bridge	53	68	**15**	**yes**
SR 160	Walnut Grove Bridge to A St (Isleton)	59	69	**10**	**no**
SR 160	A St (Isleton) to SR 12	58	69	**11**	**no**
SR 160	SR 12 to Brannan Island Rd	62	70	**8**	**no**
SR 84	West Sacramento City Limits to Courtland Rd	55	67	**12**	**yes**
SR 84 (Courtland Rd/ Ryer Ave)	Courtland Rd to Cache Slough Ferry	46	46	**0**	**no**
SR 12 EB	I-80 to Beck Ave	65	69	**4**	**no**
SR 12 WB	I-80 to Beck Ave	64	69	**5**	**no**
SR 12	Beck Ave to Sunset Ave/	68	72	**4**	**no**

Roadway	Segment	Existing Noise Level, dBA	Future With-Project Noise Level, dBA	Noise Level Increase, dB	Substantial Increase?
	Grizzly Island Rd				
SR 12	Sunset Ave/ Grizzly Island Rd to Walters Rd/	66	72	**6**	**no**
SR 12	Walters Rd/ to SR 113	63	71	**8**	**no**
SR 12	SR 113 to SR 84 (River Rd)	64	71	**7**	**no**
SR 12 (Rio Vista Bridge)	SR 84 (River Rd) to SR 160 (River Rd)	64	71	**7**	**no**
SR 12	SR 160 (River Rd) to Sacramento Co./ SJ Co. Line	62	65	**3**	**no**
SR 12	Sacramento Co./ SJ Co. Line to I-5	63	65	**2**	**no**
SR 113	I-80 to Dixon City Limits	64	69	**5**	**no**
SR 113	Dixon City Limits to SR 12	57	68	**11**	**no**
SR 4 (Marsh Creek Rd)	Vasco Rd to Byron Hwy	61	68	**7**	**no**
SR 4	Marsh Creek Rd to Discovery Bay Blvd	63	69	**6**	**no**
SR 4	Discovery Bay Blvd to Tracy Blvd	61	68	**7**	**no**
SR 4	Tracy Blvd to I-5	64	69	**5**	**no**
A St/4th St/ Jackson Blvd.	SR 160 to Isleton City Limits	48	48	**0**	**no**
Main Street (Old SR 4)	SR 160 to Cypress Rd	62	67	**5**	**no**
Main Street (Old SR 4)	Cypress Rd to Delta Rd (Oakley City Limits)	61	67	**6**	**no**
Cypress Rd	Main Street to Bethel Island Rd	58	58	**0**	**no**
Bethel Island Rd	Cypress Rd to Oakley City Limits	55	55	**0**	**no**
Delta Rd	Main Street to Byron Hwy	55	55	**0**	**no**
Pocket Rd	I-5 to Freeport Blvd	63	67	**4**	**no**
Freeport Blvd (Old SR 160)	Pocket Rd to Sacramento City Limits	56	65	**9**	**no**
Freeport Bridge	River Rd to SR 160 (Freeport Blvd)	55	55	**0**	**no**
Hood Franklin Rd	SR 160 (River Rd) to I-5	51	67	**16**	**yes**
Lambert Rd	SR 160 (River Rd) to Herzog Rd	44	66	**22**	**yes**
Lambert Rd	Herzog Rd to Franklin Blvd	46	66	**20**	**yes**
Franklin Blvd	Lambert Rd to Twin Cities Rd	48	48	**0**	**no**
Twin Cities Rd	River Rd to I-5	53	61	**8**	**no**
Twin Cities Rd	I-5 to Franklin Blvd	55	55	**0**	**no**
Sutter Slough Bridge	Sacramento Co./ Yolo Co. Line	50	66	**16**	**yes**

Roadway	Segment	Existing Noise Level, dBA	Future With-Project Noise Level, dBA	Noise Level Increase, dB	Substantial Increase?
Rd	to Paintersville Bridge				
River Rd	Paintersville Bridge to Twin Cities Rd	51	58	**7**	**no**
River Rd	Twin Cities Rd to Walnut Grove Bridge	55	61	**6**	**no**
Walnut Grove Rd/River Rd	Walnut Grove Bridge to Sacramento Co./ SJ Co. Line	55	61	**6**	**no**
Isleton Rd	River Rd (Walnut Grove)/Isleton Rd Bridge to 1.5 miles west of Isleton Rd Bridge	54	59	**5**	**no**
Race Track Rd/ Tyler Island Rd	Walnut Grove Rd to Southern End of Tyler Island	45	57	**12**	**yes**
Tyler Island Rd	Southern End of Tyler Island to SR 160 (River Rd)	46	46	**0**	**no**
Jackson Slough Rd	Isleton City Limits to SR 12	47	47	**0**	**no**
Jackson Slough Rd	Brannan Island Rd to SR 12	47	47	**0**	**no**
Walnut Grove Rd	Sacramento Co./ SJ Co. Line to I-5	53	61	**8**	**no**
Peltier Rd	Blossom Rd to I-5	44	44	**0**	**no**
Tracy Blvd	SR 4 to Clifton Court Rd	53	61	**8**	**no**
Tracy Blvd	Clifton Court Rd to Tracy City Limits	52	61	**9**	**no**
Byron Hwy	Alameda Co./San Joaquin Co. Line to Mountain House Pkwy	59	66	**7**	**no**
Mountain House Pkwy	Byron Hwy to Arnaudo Blvd	54	66	**12**	**yes**
Mountain House Pkwy	Arnaudo Blvd to I-205	58	66	**8**	**no**
Eight Mile Rd	Stockton City Limits to I-5	58	58	**0**	**no**
Tracy Blvd	Tracy City Limits to I-205	58	63	**5**	**no**
Harbor Blvd	Industrial Blvd to US 50	63	68	**5**	**no**
Industrial Blvd/ Lake Washington Blvd	Harbor Blvd to Jefferson Blvd	62	67	**5**	**no**
Jefferson Blvd (Old SR 84)	Lake Washington Blvd to Southport Pkwy	62	67	**5**	**no**
Jefferson Blvd (Old SR 84)	Southport Pkwy to West Sacramento City Limits	51	66	**15**	**yes**
River Rd	Freeport Bridge to Courtland Rd	54	54	**0**	**no**
River Rd	Courtland Rd to Sacramento Co./ Yolo Co. Line	48	66	**18**	**yes**
Courtland Rd	SR 84 to River Rd	48	66	**18**	**yes**

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As shown in Table 23-63, predicted future traffic noise levels from project-generated worker commutes and truck trips would result in an increase of 12 dB or more compared to existing traffic noise levels along 16 project roadway segments.

During intake construction, segments of SR 160 between Freeport Bridge and Walnut Grove Bridge would be temporarily realigned around intake construction sites. As a result, future project noise levels would further increase at residences located near intake sites. Under Alternative 4, noise levels at receivers near realigned segments of SR 160 would increase by up to 3 dB in addition to the noise increase shown in Table 23-63.

The increase in noise levels would exceed the project threshold for traffic noise and would be considered adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Construction of Power Transmission Lines

Potential reasonable worst-case equipment noise levels from construction of the power transmission lines were evaluated by combining the noise levels of the three loudest pieces of equipment that would likely operate at the same time (an excavator, a truck and a drill rig for driving micropiles for construction of towers). Assuming 100% utilization within a given hour of day, the combined noise level is 91 dBA L_{eq} (1hr) at 50 feet. The estimated sound levels from construction as a function of distance based on calculated point-source attenuation over "soft" (i.e., acoustically absorptive) ground are shown in Table 23-64.

Table 23-64. Predicted Noise Levels from Construction of Transmission Lines

Distance Between Source and Receiver (feet)	Calculated L_{eq} (1hr)/Nighttime L_{max} Sound Level (dBA)
50	91
100	83
200	75
400	67
600	63
800	**60**
1,000	57
1,200	55
1,400	53
1,800	**50**
2,000	49
3,000	44

Notes: Calculations are based on Federal Transit Administration 2006. Calculations do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.
Bold denotes daytime (1hr) and nighttime (1hr) maximum noise thresholds.
L_{eq} (1 hour) = hourly-equivalent sound level (over 1 hour).
dBA = A-weighted decibel.

The results shown in Table 23-64 indicate that noise-sensitive land uses within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime

(7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area.

Noise-sensitive land uses that could potentially be exposed to adverse noise impacts due to transmission line construction would extend outside the transmission line right-of-way within the utility planning area. Several residential land uses are near the proposed transmission line construction footprint. Likewise, Delta Elementary School and Delta High School on the west bank of the Sacramento River are within half a mile of the proposed Intake 2 transmission lines. Although there would be risk of increased noise levels, compared to the conveyance and associated components, the duration of construction of transmission lines would be shorter-term. Noise impacts would be intermittent and temporary, and would cease once construction work is complete.

Although this assessment includes daytime and nighttime construction noise estimates, construction of the transmission lines would primarily occur during daylight hours. If nighttime construction of the transmission lines were to occur, noise levels could be the same as those generated during daytime hours.

The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b would be available to reduce this effect.

Earth-moving activities at offsite borrow/spoil areas

Potential reasonable worst-case equipment noise levels from earth-moving activities at offsite borrow/spoil areas were evaluated by combining the noise levels of the three loudest pieces of equipment that would likely operate at the same time (an excavator, a truck and a bulldozer). Assuming 100% utilization within a given hour of day, the combined noise level would be 91 dBA L_{eq} (1hr) at 50 feet. The estimated sound levels from construction as a function of distance based on calculated point-source attenuation over "soft" (i.e., acoustically absorptive) ground are shown in Table 23-65.

The results shown in Table 23-65 indicate that noise-sensitive land uses within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Borrow/spoil areas are located throughout the conveyance alignment and are generally adjacent to or in close proximity of intake pumping plant sites, forebays, and main tunnel construction shafts. Noise-sensitive land uses that could potentially be exposed to adverse noise impacts due to earth-moving activities in offsite borrow/spoil areas would extend outside the borrow/spoil area right-of-way. The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. However, with the exception of tunneling and RTM placement, most construction activities would occur during daytime hours. Mitigation Measures NOI-1a and NOI-1b would be available to reduce this effect.

Table 23-65. Predicted Noise Levels from Earth-moving at offsite borrow/spoil areas

Distance Between Source and Receiver (feet)	Calculated L_{eq} (1hr)/Nighttime L_{max} Sound Level (dBA)
50	91
100	83
200	75
400	67
600	63
800	**60**
1,000	57
1,200	55
1,400	53
1,800	**50**
2,000	49
3,000	44

Notes: Calculations are based on Federal Transit Administration 2006. Calculations do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.

Bold denotes daytime (1hr) and nighttime (1hr) maximum noise thresholds.

L_{eq} (1 hour) = hourly-equivalent sound level (over 1 hour).

dBA = A-weighted decibel.

Noise exposure to workers at construction sites

Construction noise would affect workers on site. However, workers are subject to state and federal Occupational Health and Safety (OSHA) standards. OSHA mitigation standards for noise limits exposure are as follows: an 8-hour time-weighted average of 85 dBA or a dose of 50 percent are referred to as OSHA action levels [29 CFR 1910.95(c)(2)]. Occupational exposure to noise levels in excess of 85 dBA requires monitoring and mitigation to protect workers. Given that on-site workers would be protected under OSHA requirements, no adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise levels above the 60 dBA L_{eq} (1hr) daytime, the 50 dBA L_{max} nighttime, or the 12 dB traffic noise increase threshold would be considered significant. Based on reasonable worst-case modeling, the following significant impacts are expected as a result of Alternative 4 construction.

- **Intakes:** Sensitive receptors within 1,400 feet of an active intake construction site could be exposed to construction noise in excess of the 60 dBA L_{eq} (1hr) daytime threshold. The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-61, 130 residential parcels, 3 natural/recreational parcels, and 205 agricultural parcels would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 191 residential parcels, 7 natural/recreational parcels, 224 agricultural parcels, and 1 school.
- **Conveyance and Associated Facilities:** Sensitive receptors within 1,200 feet of an active tunnel work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-62, 138 residential parcels, 15

natural/recreational parcels, and 553 agricultural parcels would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 234 residential parcels, 45 natural/recreational parcels, 938 agricultural parcels, and 2 schools.

- **Truck Trips and Worker Commutes:** Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 16 project roadway segments in the study area as shown in Table 23-63. The increase in noise levels would be substantial and exceed the project threshold for traffic noise.
- **Power Transmission Lines:** Sensitive receptors within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. As noted above, several residential land uses are near the proposed transmission line construction footprint. Likewise, Delta Elementary School and Delta High School on the west bank of the Sacramento River are within half a mile of the proposed Intake 2 transmission lines.
- **Borrow/spoil areas:** Sensitive receptors within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Borrow/spoil areas are located throughout the conveyance alignment and are generally adjacent to or in close proximity of intake pumping plant sites, forebays, and main tunnel construction shafts.

Mitigation Measures NOI-1a and NOI-1b would reduce noise impacts to sensitive land uses. Although implementation of these measures will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

During construction, BDCP proponents will employ best practices to reduce construction noise at noise-sensitive land uses. Implementation of this measure will ensure that construction noise levels, as applicable, do not exceed 60 dBA (one-hour L_{eq}) during daytime hours (7:00 a.m. to 10:00 p.m.) and 50 dBA (single-event maximum) during nighttime hours (10:00 p.m. to 7:00 a.m.).

Measures used to limit construction noise include the following:

- Limiting above-ground noise-generating construction operations to the hours between 7 a.m. and 6 p.m. Monday through Friday, and between 8 a.m. and 5 p.m. on Saturdays.
- Locating stationary equipment (e.g., generators, compressors, rock crushers, cement mixers, idling trucks) as far as possible from noise-sensitive land uses.
- Prohibiting gasoline or diesel engines from having unmuffled exhaust.
- Requiring that all construction equipment powered by gasoline or diesel engines have sound-control devices that are at least as effective as those originally provided by the

manufacturer and that all equipment be operated and maintained to minimize noise generation.

- Preventing excessive noise by shutting down idle vehicles or equipment.
- Using noise-reducing enclosures around noise-generating equipment.
- Selecting haul routes that affect the fewest number of people.
- Constructing barriers between noise sources and noise-sensitive land uses or take advantage of existing barrier features (e.g., terrain, structures) to block sound transmission to noise-sensitive land uses. The barriers shall be designed to obstruct the line of sight between the noise-sensitive land use and on-site construction equipment.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Prior to construction, BDCP proponents will make a construction schedule available to residents living in the vicinity of the construction areas before construction begins, and designate a noise disturbance coordinator. The coordinator will be responsible for responding to complaints regarding construction noise, will determine the cause of the complaint, and will ensure that reasonable measures are implemented to correct the problem when feasible. A contact telephone number for the noise disturbance coordinator will be conspicuously posted on construction site fences and will be included in the notification of the construction schedule.

Impact NOI-2: Exposure of Sensitive Receptors to Vibration or Groundborne Noise from Construction of Water Conveyance Facilities

NEPA Effects: Construction at the intake sites would involve use of impact pile driving and drilled piles, and tunnel construction would involve the use of TBMs and tunnel locomotives, both of which would cause groundborne vibration in localized areas. Groundborne vibrations from pile driving at intake sites and barge loading facilities would be intermittent, and temporary, occurring over a two month period during the in-river work period (June 1 to October 31). All pile driving activities will cease after construction is complete. During tunnel construction, groundborne noise due to vibrations from tunnel locomotive passbys and TBMs could occur intermittently where tunnels are located under or near residential areas.

Pile Driving at Intake Sites

Construction of the intakes would involve driving sheet piles within the intake rights-of-way. Use of impact piles would cause groundborne vibrations to exceed the threshold of 0.2 in/sec PPV at residential buildings within 70 feet of pile driving sites, as shown in Table 23-66.

Table 23-66. Predicted Vibration Levels from Construction Activities—Impact Pile Driving at Intake Structures

Distance Between Source and Receiver (feet)	Calculated Peak Particle Velocity (in/sec PPV)
50	0.3004
60	0.2458
70	**0.2075**
75	0.1923
80	0.1792
90	0.1574
100	0.1402
150	0.0897

Note: Calculations are based on Federal Transit Administration 2006 and California Department of Transportation Vibration Guidance Manual 2004. Assumes ground type n value of 1.1.
PPV = peak particle velocity.

Groundborne vibration from impact pile driving is predicted to exceed vibration thresholds at nearby residences in the areas shown in Table 23-67. While groundborne vibration levels in excess of 0.2 in/sec PPV could occur at any of these residences, the highest vibration levels are expected at those residences nearest to the intake work areas. Construction of intakes and barge unloading facilities would result in excessive groundborne vibration levels at these nearby residential structures. The effect of exposing sensitive receptors to groundborne vibration would be adverse. Mitigation Measure NOI-2 is available to reduce this effect.

Table 23-67. Land Use Affected By Vibrations From Pile Driving During Construction Of Intakes, Alternative 4

Location	Zoning	Total Affected Parcels
Sacramento County – including River Road near the community of Hood; Neighborhoods in the community of Hood	Residential[a]	78
San Joaquin County	Residential[a]	4

[a] Includes agricultural or unclassified use that permits residential use.

Construction of Water Conveyance (Tunnel)

The use of tunneling equipment during construction would cause groundborne vibration and potentially groundborne noise within buildings in the vicinity of tunnel construction areas. Vibration sources include the TBM and locomotives moving soil, equipment, and construction workers between tunnel shaft sites. As discussed in Chapter 3, *Description of Alternatives*, the typical depth of tunnel installation would be approximately 100 feet below msl, but could be up to 160 feet below msl depending on site conditions. This analysis uses a conservative worst-case assumption of 60 feet below msl despite the fact that all proposed Delta tunnels will be constructed with a minimum of 100 feet of soil (soft ground) cover.

Groundborne vibration levels from operation of the TBM and tunnel locomotives are described below. Sensitive receptors that may be exposed to increased groundborne vibration include residences, outdoor parks, schools, and agriculture areas. As shown in Table 23-19, there are a number of potentially affected parcels within 1,200 feet of the tunnel conveyance. However, at a 60-foot tunnel depth, groundborne vibrations from the TBM are estimated to be 0.008 in/sec PPV,

which is below the threshold of 0.04 in/sec PPV.[2] As demonstrated by measured ground vibration data from modern tunneling projects, the deep soil cover will effectively dampen, and absorb propagated energy.

During tunnel construction, passbys from locomotives hauling workers and material inside of the tunnel would produce localized groundborne vibration that could manifest as noise inside of buildings. However, as described in Section 23.4.2, *Determination of Effects*, tunnel locomotives would be operated at slow speeds inside of tunnels and would not result in excessive vibrations. Groundborne noise from tunnel locomotive operation during construction is therefore not predicted to exceed groundborne noise thresholds or result in an adverse noise impact to sensitive receptors along the tunnel conveyance.

The potential for tunneling induced ground vibration effects will be thoroughly analyzed in the preliminary and final design phases of the project, using site-specific geotechnical data and the expected TBM configuration. Potential effects on surface structures and human perception will be evaluated in detail during preliminary design. As additional precautions, and where necessary, a ground vibration monitoring program using seismographs and other high-precision equipment will be implemented during construction to ensure ground vibration is within the required contract limits.

***CEQA Conclusion*:** Groundborne vibrations during tunneling would not exceed 0.008 in/sec PPV at 60-foot tunnel depth and would therefore be less than significant. Likewise**,** locomotives are not expected to generate significant noise levels because they will travel at low speeds between 5 and 10 miles per hour. However, the impact of exposing residential structures to groundborne vibration during intake construction would be significant as reasonable worst-case modeling indicates that up to 82 residential parcels could be exposed to vibration levels in excess of 0.2 in/sec PPV during intake pile driving (see Table 23-67). Although Mitigation Measure NOI-2 will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce vibration to levels below the applicable thresholds. This impact would therefore be considered significant and unavoidable.

Mitigation Measure NOI-2: Employ Vibration-Reducing Construction Practices during Construction of Water Conveyance Facilities

During construction, BDCP proponents will implement vibration-reducing construction practices such that vibration from pile driving does not exceed 0.2 in/sec PPV at nearby residences.

The BDCP proponents shall ensure that the following measures are implemented to reduce adverse effects and/or significant effects as described above if the measures are applicable and feasible. Not all measures listed below may be feasible or applicable to all contractors. Rather, these measures serve as an overlying mitigation framework to be used for specific construction practices. The applicability of measures listed below would vary based on the location, timing, nature, and feasibility of each activity.

[2] A case study of a similar tunneling project (the New Crystal Springs Bypass Tunnel Project) shows that in a tunneling project which took place 60-155 feet below ground surface in an urban residential neighborhood more heavily populated than any of the BDCP alternatives, the groundborne vibration did not exceed 0.032 in/sec PPV during the daytime hours of 7 am to 6 pm, or 0.016 in/sec PPV during the nighttime hours of 6 pm to 7 am and was indistinguishable from the surrounding noise. (Wilson et al., 2011)

- Locating equipment as far as practical from vibration-sensitive (and noise-sensitive) land uses (at least 100 feet)
- Use of alternative pile driving methods such as vibratory driving, hydraulic press-in driving, or use of pre-drilled pile holes.

Depending on the equipment selected, the measures identified above can reduce vibration from pile driving to below 0.2 in/sec PPV at nearby residences. The specific noise reduction cannot be currently quantified since the actual equipment to be used is unknown and that the contractor may have alternative ways to achieve the performance limit. If the above measures are determined feasible, BDCP proponents will retain a qualified acoustical consultant or engineering firm to conduct vibration monitoring at potentially affected buildings to measure the actual vibration levels during construction and ensure vibration from pile driving does not exceed 0.2 in/sec PPV.

For cases where the above measures are not feasible, the resident or property owner will be notified in writing prior to construction activity that construction may occur within 100 feet of their building. A representative for the BDCP proponents will inspect the potentially affected buildings prior to construction to inventory existing cracks in paint, plaster, concrete, and other building elements. BDCP proponents will retain a qualified acoustical consultant or engineering firm to conduct vibration monitoring at potentially affected buildings to measure the actual vibration levels during construction. Following completion of construction, a representative for the BDCP proponents will conduct a second inspection to inventory changes in existing cracks and new cracks or damage, if any, that occurred as a result of construction-induced vibration. If new damage is found, then the BDCP proponents will promptly arrange to have the damage repaired, or will reimburse the property owner for appropriate repairs.

In addition, if construction activity is required within 100 feet of residences or other vibration-sensitive buildings, a designated complaint coordinator will be responsible for handling and responding to any complaints received during such periods of construction. A reporting program will be required that documents complaints received, actions taken, and the effectiveness of these actions in resolving disputes.

Impact NOI-3: Exposure of Noise-Sensitive Land Uses to Noise from Operation of Water Conveyance Facilities

NEPA Effects: Potential reasonable worst-case pump noise levels during operation of the intake structures were evaluated by calculating sound power levels of the pump based on horsepower (Hoover and Keith 2000). Faceplate horsepower for vertical column and vertical volute type pumps is specified in pump selection appendix of the Conceptual Engineering Report. Pump specifications are shown in Table 23-68. Combined source noise levels assume that pump enclosures (including buildings) provide a nominal 15 dB of noise attenuation. This analysis assumes that pumps are operating 24 hours a day.

Table 23-68. Pump Specifications—Alternative 4

Pump Location	Quantity	Pumping Plant Capacity (cfs)	Pump Horsepower	Individual Pump Source Level (dBA)	Combined Source Level (dBA)	Assumed Attenuation (dB)	Combined Source Level with Attenuation (dBA)
Intake 2	6	3,000	4,500	97	104	15	89
Intake 3	6	3,000	3,500	96	102	15	88
Intake 5	6	3,000	3,500	96	102	15	88

cfs = cubic feet per second.
dB = decibels.
dBA = A-weighted sound level in decibels.

The estimated sound levels from pump operation as a function of distance based on calculated point-source attenuation over "soft" (i.e., acoustically absorptive) ground are shown in Table 23-69.

Table 23-69. Predicted Noise Levels from Pump Operation, Intakes, Alternative 4

Distance Between Source and Receiver (Feet)	Intake 2 Calculated L_{eq} Sound Level (dBA)	Intakes 3 and 5 Calculated L_{eq} Sound Level (dBA)
50	89	88
100	82	80
200	74	72
300	69	68
400	66	65
600	61	60
800	58	57
1,000	55	54
1,200	53	52
1,400	52	**50**
1,600	**50**	49
2,000	47	46
2,200	46	**45**
2,600	**45**	43
3,600	41	40
5,000	37	36
6,000	35	34
7,000	33	32

Notes: Calculations are based on Federal Transit Administration 2006. Calculation do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.
Noise levels assume a nominal pump enclosure attenuation of 15 dB.
Bold denotes daytime and nighttime maximum noise thresholds.
dBA = A-weighted sound level in decibels.

The results shown in Table 23-69 indicate that operating noise from intake pumping plants would exceed the nighttime threshold of 45 dBA at noise-sensitive land uses within a distance of up to 2,600 feet from intake pumping plant locations. Noise from operation of intake pumping plants is predicted to exceed daytime and nighttime noise thresholds at nearby residences and outdoor parks in areas indicated in Table 23-70.

Table 23-70. Land Use Affected by Noise from Operation of Pumping Plants, Alternative 4

Location	Zoning	50 dBA L_{eq} Daytime Operations Threshold Total Affected Parcels	45 dBA L_{eq} Nighttime Operations Threshold Total Affected Parcels
Sacramento County – including River Road near the community of Hood; neighborhoods in the community of Hood; Lambert Road; Vorden Road.	Natural/Recreational	1	1
	Agricultural/Other[a]	27	38
Yolo County – including County Road E9 near the community of Clarksburg; neighborhoods in the community of Clarksburg.	Agricultural/Other[a]	43	72

[a] Includes agricultural or unclassified use that permits residential use.

Operation of water conveyance facilities could result in increases in noise levels affecting nearby communities and residences. While operating noise levels in excess of applicable thresholds could occur throughout the affected area, the highest noise levels are expected at those land uses most adjacent to the pumping plants. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measure NOI-3 is available to reduce this effect.

Noise exposure to workers at conveyance facilities

Noise from operation of conveyance facilities would affect workers on site. However, workers are subject to state and federal Occupational Health and Safety (OSHA) standards. OSHA mitigation standards for noise limits exposure are as follows: an 8-hour time-weighted average of 85 dBA or a dose of 50 percent are referred to as OSHA action levels [29 CFR 1910.95(c)(2)]. Occupational exposure to noise levels in excess of 85 dBA requires monitoring and mitigation to protect workers. Given that on-site workers would be protected under OSHA requirements, no adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during pumping plant operations to noise levels above the daytime (50 dBA L_{max}) or nighttime (45 dBA L_{max}) noise thresholds would be considered significant. Based on reasonable worst-case modeling, 70 agricultural parcels would be affected by daytime noise levels in excess of the operational threshold. The nighttime threshold would be exceeded at 110 agricultural parcels (see Table 23-70). The impact of exposing these receptors to noise increases above thresholds would be significant. Mitigation Measure NOI-3 would reduce operational noise levels below applicable thresholds, thus resulting in a less-than-significant level.

Mitigation Measure NOI-3: Design and Construct Intake Facilities and Other Pump Facilities Such That Operational Noise Does Not Exceed 50 dBA (One-Hour L_{eq}) during Daytime Hours (7:00 A.M. to 10:00 P.M.) or 45 dBA (One-Hour L_{eq}) during Nighttime Hours (10:00 P.M. to 7:00 A.M.) or the Applicable Local Noise Standard (Whichever Is Less) at Nearby Noise Sensitive Land Uses

BDCP proponents will retain a qualified acoustical consultant to design acoustical treatments for the intake facilities and other pump facilities. Implementation of this measure will ensure that operational noise levels, as applicable, do not exceed 50 dBA (one-hour L_{eq}) during daytime hours (7:00 a.m. to 10:00 p.m.) or 45 dBA (one-hour L_{eq}) during nighttime hours (10:00 p.m. to 7:00 a.m.) or the applicable local noise standard (whichever is less) at nearby noise-sensitive land uses. Measures that can be implemented to achieve this include but are not limited to:

- enclosing all pumps, motors, and other noise-generating equipment in solid wall structures;
- limiting openings in the enclosing structure and installing acoustic ventilation louvers where ventilation openings are required,
- installing acoustic access doors and wall panels,
- using low-noise motors,
- using low noise transformers,
- placing sound barriers (earth berms or constructed barriers) around noise sources

Verification noise monitoring will be conducted at each operational intake or pump location to confirm that acoustical treatments reduce operational noise to comply with the applicable noise standard. If noise is not in compliance with the applicable standard, BDCP proponents will implement additional necessary treatments until compliance is achieved.

Impact NOI-4: Exposure of Noise-Sensitive Land Uses to Noise from Implementation of Proposed Conservation Measures 2-10

NEPA Effects: Implementation of CM2 and CM3–CM10 could generate increases in noise related to restoration or enhancement activities. Habitat restoration and enhancement conservation measures are anticipated to require use of noise-generating equipment during construction and maintenance:

- Grading, excavation, and placement of fill material.
- Breaching, modification, or removal of existing levees, and construction of new levees.
- Modification, demolition, and removal of existing infrastructure (e.g., buildings, roads, fences, electric transmission and gas lines, irrigation infrastructure).
- Construction of new infrastructure (e.g., buildings, roads, fences, electric transmission and gas lines, irrigation infrastructure).
- Removal of existing vegetation and planting/seeding of vegetation.
- Levee maintenance.
- Mowing, burning, and trimming to manage vegetation.

Because the specific areas for implementing these conservation measures have not been determined, this effect is evaluated qualitatively.

- Yolo Bypass Fishery Enhancement (CM2). Noise-generating activities from enhancement activities in the Yolo Bypass would include use of construction vehicles and equipment for modifying or installing new facilities, or changes in operation of existing facilities, including the following.
    - Installing fish ladders and experimental ramps at Fremont Weir or widening the existing fish ladder.
    - Installing fish screens on small Yolo Bypass diversions.
    - Constructing new or replacement operable check-structures at Tule Canal/Toe Drain.
    - Replacing the Lisbon Weir with a fish-passable gate structure.
    - Realigning Lower Putah Creek.
    - Increasing operation of upstream unscreened pumps.
    - Installing operable gates at Freemont Weir.
    - Constructing physical barriers in the Sacramento River.
    - Constructing associated support facilities (operations buildings, parking lots, access facilities such as roads and bridges).
    - Improving levees adjacent to the Fremont Weir Wildlife Area.
    - Replacing agricultural crossings of the Tule Canal/Toe Drain with fish-passable structures such as flat car bridges, earthen crossings with large, open culverts.
    - Grading, removal of existing berms, levees, and water control structures, construction of berms or levees, re-working of agricultural delivery channels, and earthwork or construction of structures to reduce Tule Canal/Toe Drain channel capacities.
- Tidal Habitat Restoration (CM4). Restoration of freshwater tidal habitat in the Cache Slough, Cosumnes/Mokelumne, West Delta, South Delta, and Suisun Marsh ROAs would require breaching and lowering of levees, installing new or modified levees to protect adjacent areas from flooding, connecting remnant sloughs or channels to improve circulation, and modifying ground elevations to reduce impacts of subsidence. Noise-generating activities would include use of construction vehicles and equipment for the following activities.
    - Construction site preparation could require clearing and grubbing, demolition of existing structures, surface water quality protection, dust control, establishment of storage areas and stockpile areas, temporary utilities and fuel storage, and erosion control.
    - Earthwork activities for development of the restoration habitat areas could include the construction activities described below on the landside and waterside of existing levees in areas that would be selected for tidal habitat restoration.
- Seasonally Inundated Floodplain Restoration (CM5). Seasonally inundated floodplain habitat would be restored within the north, east, and/or south Delta. Noise-generating activities would include use of construction vehicles and equipment for modifying or installing new facilities, or changes in operation of existing facilities, including the following activities.
    - Site preparation could require clearing and grubbing, demolition of existing structures, surface water quality protection, dust control, establishment of storage areas and stockpile areas, temporary utilities and fuel storage, and erosion control.

- Earthwork activities for development of the seasonally inundated floodplains could include setting back levees, removal of existing levees, removal of riprap to allow for channel meander between the setback levees, grading to restore drainage patterns and increase inundation frequency and duration, and establishment of riparian habitat.

- Channel Margin Habitat Enhancement (CM6). Channel margin habitat would be enhanced on the Sacramento River between Freeport and Walnut Grove, the San Joaquin River between Vernalis and Mossdale, Steamboat and Sutter Sloughs, and the North and South Forks of the Mokelumne River. Noise-generating activities would include use of construction vehicles and equipment for the following activities.
  - Site preparation could require clearing and grubbing, demolition of existing structures, surface water quality protection, dust control, establishment of storage areas and stockpile areas, temporary utilities and fuel storage, and erosion control.
  - Earthwork activities for development of the channel margin habitat areas could include modification of levees or setting back levees. Riprap would be removed where levees are set back and channel geometry would be modified in unconfined channel reaches or along channels where levees are set back.
- Riparian Habitat Restoration (CM7). Riparian habitat restoration in Cosumnes/Mokelumne, east, west, and south Delta areas would require site preparation and earthwork using noise-generating construction vehicles and equipment for the following activities.
  - Clearing and grubbing, demolition of existing structures, surface water quality protection, dust control, establishment of storage areas and stockpile areas, temporary utilities and fuel storage, and erosion control.
  - Removal of riprap, minor landform modifications to restore water circulation, planting of riparian vegetation, irrigation and maintenance of plantings, and control of nonnative species.
- Grassland Communities Restoration (CM8). Restoration of grassland habitat would require sowing native species using a variety of techniques (e.g., seed drilling, native hay spreading, plugs). Noise-generating activities would include use of construction vehicles and equipment for reseeding and for recontouring graded land.
- Vernal Pool Complex Restoration (CM9). Vernal pool complex restoration could require use of noise-generating construction vehicles and equipment to excavate or recontour historical vernal pools and swales to natural bathymetry.
- Nontidal Marsh Restoration (CM10). Nontidal wetlands restoration could include the use of noise-generating construction vehicles and equipment for site preparation, planting of native marsh vegetation, and maintenance of plantings, including grading to establish an elevational gradient to support both open water perennial aquatic habitat intermixed with shallower marsh habitat.

The effect would vary according to the type of construction equipment and techniques used in construction of the specific conservation measure, the location and timing of the actions called for in the conservation measure, and the noise environment at the time of implementation. However, the noise levels from these activities are expected to be similar to those shown in Table 23-15 because similar types of equipment will be used. The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess

of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet.

The effect of exposing sensitive land uses to increases in construction noise levels above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to reduce this effect.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise increases above the daytime (60 dBA L_{eq}) and nighttime (50 dBA L_{max}) thresholds would be significant. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-59. The results shown in Table 23-59 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet. The impact of exposing these receptors to noise increases above thresholds would be significant. Although Mitigation Measures NOI-1a and NOI-1b will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be considered significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1.

23.3.3.10 Alternative 5—Dual Conveyance with Pipeline/Tunnel and Intake 1 (3,000 cfs; Operational Scenario C)

One intake would be constructed on the east bank of the Sacramento River under Alternative 5. Alternative 5 would also construct an intermediate forebay; the conveyance would be a buried pipeline (see Figures 3-2 and 3-12 in Chapter 3, *Description of Alternatives*).

Impact NOI-1: Exposure of Noise-Sensitive Land Uses to Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Construction of Intakes

Potential reasonable worst-case equipment noise levels from construction of intakes would be comparable to those listed for the intake sites in Table 23-17. The results shown in Table 23-17 indicate that during periods of pile driving, residences located within 1,400 feet of the active intake construction site could be exposed to construction noise in excess of the DWR daytime (7 a.m. to 10 p.m.) maximum noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet from an active intake construction site.

While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest. The work areas for construction of intake 1 would extend through several residential areas and communities located near the Sacramento River. Noise from intake construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences and outdoor parks in areas indicated in Table 23-71.

Although this assessment includes daytime and nighttime construction noise estimates, construction of the intakes would primarily occur during daytime hours. If nighttime construction of the intakes were to occur, noise levels could be the same as that generated during daytime hours.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b would be available to reduce this effect.

Table 23-71. Land Use Affected by Equipment Noise from Construction of Intakes, Alternative 5

		Daytime Threshold (60 dBA L_{eq} [1h])	Nighttime Threshold (50 dBA L_{max} [1h])
Location	Zoning	Total Affected Parcels	Total Affected Parcels
Sacramento County – including River Road near the community of Hood.	Natural/Recreational	0	3
	Agricultural/Other[a]	28	59
	Schools	None	None
Yolo County – including County Road E9 near the community of Clarksburg.	Agricultural/Other[a]	49	72
	Schools	None	None

[a] Includes agricultural or unclassified use that permits residential use.

Construction of Conveyance (Tunnel), Forebays, Barge Unloading Facilities, and Intermediate Pumping Plant

Construction of the conveyance under Alternative 5 would be similar to Alternative 1A. Noise from construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks indicated in Table 23-19 (see Impact NOI-1 in Alternative 1A). While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest. This includes all construction sites along the tunnel conveyance alignment, as well as at the site of the Byron Tract Forebay adjacent to and south of Clifton Court Forebay. For a map of the proposed pipeline/tunnel alignment, see Mapbook Figure M3-1.

Although this assessment includes daytime and nighttime construction noise estimates for the forebays, barge unloading facilities, intermediate pumping plant, and conveyance tunnels, construction of the forebays, barge unloading facilities, and intermediate pumping plant would primarily occur during daytime hours. If nighttime construction of the forebays, barge unloading facilities, and intermediate pumping plant were to occur, noise levels could be the same as those generated during daytime hours. Construction of the conveyance tunnels and RTM storage actions would occur on a 24-hour basis.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b would be available to reduce this effect.

Truck Trips and Worker Commutes

The estimate of truck trips and worker commutes under Alternative 5 would be similar to Alternative 1A. Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 16 project roadway segments in the study area as shown in Table 23-20.

During intake construction, segments of SR 160 between Freeport Bridge and Walnut Grove Bridge would be temporarily realigned around intake construction sites. As a result, future project noise levels would further increase at residences located near intake sites. Under Alternative 5, noise levels at receivers near realigned segments of SR 160 would increase by up to 6 dB in addition to the noise increase shown in Table 23-20.

The increase in noise levels would exceed the project threshold for traffic noise and would be considered adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Construction of Power Transmission Lines

Noise from construction of power transmission lines for Alternative 5 is the same as Alternative 1A. The results shown in Table 23-21 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. Several residential land uses are near the proposed transmission line construction footprint. Likewise, Delta Elementary School and Delta High School on the west bank of the Sacramento River are within half a mile of the proposed Intake 2 transmission lines. Although this assessment includes daytime and nighttime construction noise estimates, construction of the transmission lines would primarily occur during daylight hours. If nighttime construction of the transmission lines were to occur, noise levels could be the same as those generated during daytime hours. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Earth-moving activities at offsite borrow/spoil areas

Noise from earth-moving activities at offsite borrow/spoil areas for Alternative 5 is the same as Alternative 1A. The results shown in Table 23-22 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Noise-sensitive land uses that could potentially be exposed to adverse noise impacts due to earth-moving activities in offsite borrow/spoil areas would extend outside the borrow/spoil area right-of-way. The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. However, with the exception of tunneling and RTM placement, most construction activities would occur during daytime hours. Measures NOI-1a and NOI-1b are available to address this effect.

Noise exposure to workers at construction sites

Impact NOI-1 for Alternative 5 is the same as Impact NOI-1 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise levels above the 60 dBA L_{eq} (1hr) daytime, the 50 dBA L_{max} nighttime, or the 12 dB traffic noise increase threshold would be considered significant. Based on reasonable worst-case modeling, the following significant impacts are expected as a result of Alternative 5 construction.

- **Intakes:** Sensitive receptors within 1,400 feet of an active intake construction site could be exposed to construction noise in excess of the 60 dBA L_{eq} (1hr) daytime threshold. The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-71, 77 agricultural parcels would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 3 natural/recreational parcels and 131 agricultural parcels.
- **Conveyance and Associated Facilities:** Sensitive receptors within 1,200 feet of an active tunnel work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-19 (see Impact NOI-1 in Alternative 1A), 125 residential parcels, 9 natural/recreational parcels, 765 agricultural parcels, and 2 schools would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 226 residential parcels, 20 natural/recreational parcels, 1,109 agricultural parcels, and 4 schools.
- **Truck Trips and Worker Commutes:** Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 16 project roadway segments in the study area as shown in Table 23-20. The increase in noise levels would be substantial and exceed the project threshold for traffic noise. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.
- **Power Transmission Lines:** Sensitive receptors within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. As noted above, several residential land uses are near the proposed transmission line construction footprint. Likewise, Delta Elementary School and Delta High School on the west bank of the Sacramento River are within half a mile of the proposed Intake 2 transmission lines.
- **Borrow/spoil areas:** Sensitive receptors within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Borrow/spoil areas are located throughout the conveyance alignment and are generally adjacent to or in close proximity of intake pumping plant sites, forebays, and main tunnel construction shafts.

Mitigation Measures NOI-1a and NOI-1b would reduce noise impacts to sensitive land uses. Although implementation of these measures will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

Impact NOI-2: Exposure of Sensitive Receptors to Vibration or Groundborne Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Pile Driving at Intake Sites

Impact NOI-2 for Alternative 5 is the same as Impact NOI-2 for Alternative 1A. However, fewer sensitive receptors would be affected by groundborne vibration levels of this magnitude compared to Alternative 1A, because fewer intakes would be constructed (one rather than five). Groundborne vibration levels from impact pile driving are predicted to exceed vibration thresholds at nearby residences in the areas shown in Table 23-72.

While groundborne vibration levels in excess of 0.2 in/sec PPV could occur at any of these residences, the highest vibration levels are expected at those residences nearest to the intake work areas. Construction of intakes and barge unloading facilities would result in excessive groundborne vibration levels at these nearby residential structures. The effect of exposing sensitive receptors to groundborne vibration would be adverse. Mitigation Measure NOI-2 is available to reduce this effect.

Table 23-72. Land Use Affected by Vibrations from Pile Driving During Construction of Intakes, Alternative 5

Location	Zoning	Total Affected Parcels
Sacramento County – including River Road near the community of Hood; Neighborhoods in the community of Hood	Residential[a]	28
Yolo County – including County Road E9 near the community of Clarksburg	Residential[a]	1
San Joaquin County	Residential[a]	13

[a] Includes agricultural or unclassified use that permits residential use.

Construction of Water Conveyance (Tunnel)

Vibration sources include the TBM and locomotives moving soil, equipment, and construction workers between tunnel shaft sites. At a 60-foot tunnel depth, groundborne vibrations from the TBM are estimated to be 0.008 in/sec PPV, which is below the threshold of 0.04 in/sec PPV. As described in Section 23.4.2, *Determination of Effects*, tunnel locomotives would be operated at slow speeds inside of tunnels and would not result in excessive vibrations. Groundborne noise from tunnel locomotive operation during construction is therefore not predicted to exceed groundborne

noise thresholds or result in an adverse noise impact to sensitive receptors along the tunnel conveyance.

***CEQA Conclusion*:** Groundborne vibrations during tunneling would not exceed 0.008 in/sec PPV at 60-foot tunnel depth and would therefore be less than significant. Likewise**,** locomotives are not expected to generate significant noise levels because they will travel at low speeds between 5 and 10 miles per hour. However, the impact of exposing residential structures to groundborne vibration during intake construction would be significant as reasonable worst-case modeling indicates that 42 residential parcels would be exposed to vibration levels in excess of 0.2 in/sec PPV during intake pile driving (see Table 23-72). Although Mitigation Measure NOI-2 will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce vibration to levels below the applicable thresholds. This impact would therefore be considered significant and unavoidable.

Mitigation Measure NOI-2: Employ Vibration-Reducing Construction Practices during Construction of Water Conveyance Facilities

Please see Mitigation Measure NOI-2 under Impact NOI-2 in the discussion of Alternative 1A.

Impact NOI-3: Exposure of Noise-Sensitive Land Uses to Noise from Operation of Water Conveyance Facilities

NEPA Effects: Potential reasonable worst-case pump noise levels during operation of the intake structures were evaluated by calculating sound power levels of the pump based on horsepower (Hoover and Keith 2000). Faceplate horsepower for vertical column and vertical volute type pumps is specified in pump selection appendix of the Conceptual Engineering Report. Pump specifications are shown in Table 23-73. Combined source noise levels assume that pump enclosures (including buildings) provide a nominal 15 dB of noise attenuation. This analysis assumes that pumps are operating 24 hours a day.

Table 23-73. Pump Specifications—Alternative 5

Pump Location	Quantity	Pumping Plant Capacity (cfs)	Pump Horsepower	Individual Pump Source Level (dBA)	Combined Source Level (dBA)	Assumed Attenuation (dB)	Combined Source Level with Attenuation (dBA)
Intake 1	6	3,000	4,500	97	104	15	89
Intermediate Plant	16 (10/6)[a]	15,000	18,000/ 8,000[a]	103/99[a]	114	15	99

cfs = cubic feet per second.
dB = decibels.
dBA = A-weighted sound level in decibels.
[a] Vertical Column Pumps/Vertical Volute Pumps in the Intermediate Pumping Plant.

The estimated sound levels from pump operation as a function of distance based on calculated point-source attenuation over "soft" (i.e., acoustically absorptive) ground are shown in Table 23-74.

Table 23-74. Predicted Noise Levels from Pump Operation, Intakes, Alternative 5

Distance Between Source and Receiver (Feet)	Intake 1 Calculated L_{eq} Sound Level (dBA)	Intermediate Plant Calculated L_{eq} Sound Level (dBA)
50	89	99
100	82	91
200	74	83
300	69	79
400	66	75
600	61	71
800	58	67
1,000	55	65
1,200	53	63
1,400	52	61
1,600	**50**	60
2,000	47	57
2,200	46	56
2,600	**45**	54
3,600	41	**50**
5,000	37	47
6,000	35	**45**
7,000	33	43

Notes: Calculations are based on Federal Transit Administration 2006. Calculation do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.
Noise levels assume a nominal pump enclosure attenuation of 15 dB.
Bold denotes daytime and nighttime maximum noise thresholds.
dBA = A-weighted sound level in decibels.

The results shown in Table 23-74 indicate that operating noise from pumping plants would exceed the nighttime threshold of 45 dBA at noise-sensitive land uses within a distance of up to 2,600 feet from intake pumping plant locations, and 6,000 feet from the pumping plant located at the proposed intermediate forebay. Noise from operation of pumping plants is predicted to exceed daytime and nighttime noise thresholds at nearby residences and outdoor parks in areas indicated in Table 23-75.

Table 23-75. Land Use Affected by Noise from Operation of Pumping Plants, Alternative 5

Location	Zoning	50 dBA L_{eq} Daytime Operations Threshold Total Affected Parcels	45 dBA L_{eq} Nighttime Operations Threshold Total Affected Parcels
Sacramento County – including River Road near the community of Hood; neighborhoods in the community of Hood; Lambert Road; Vorden Road.	Agricultural/ Othera	34	80
Yolo County – including County Road E9 near the community of Clarksburg; neighborhoods in the community of Clarksburg.	Agricultural/ Othera	26	38

[a] Includes agricultural or unclassified use that permits residential use.

Operation of water conveyance facilities could result in substantial increases in noise levels affecting nearby communities and residences. While noise levels in excess of applicable thresholds could occur throughout the affected area, the highest noise levels are expected at those land uses most adjacent to the pumping plants. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measure NOI-3 is available to reduce this effect.

Noise exposure to workers at conveyance facilities

Impact NOI-3 for Alternative 5 is the same as Impact NOI-3 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during pumping plant operations to noise levels above the daytime (50 dBA L_{max}) or nighttime (45 dBA L_{max}) noise thresholds would be considered significant. Based on reasonable worst-case modeling, 60 agricultural parcels would be affected by daytime noise levels in excess of the operational threshold. The nighttime threshold would be exceeded at 118 agricultural parcels (see Table 23-75). This is a potentially significant impact. Mitigation Measure NOI-3 would reduce operational noise levels below applicable thresholds, thus resulting in a less-than-significant level.

Mitigation Measure NOI-3: Design and Construct Intake Facilities and Other Pump Facilities Such That Operational Noise Does Not Exceed 50 dBA (One-Hour L_{eq}) during Daytime Hours (7:00 A.M. to 10:00 P.M.) or 45 dBA (One-Hour L_{eq}) during Nighttime Hours (10:00 P.M. to 7:00 A.M.) or the Applicable Local Noise Standard (Whichever Is Less) at Nearby Noise Sensitive Land Uses

Please see Mitigation Measure NOI-3 under Impact NOI-3 in the discussion of Alternative 1A.

Impact NOI-4: Exposure of Noise-Sensitive Land Uses to Noise from Implementation of Proposed Conservation Measures 2-10

NEPA Effects: Although locations or target acreages may vary for proposed conservation measures, at the program level of development, the amount and location of restoration actions under this alternative would be the similar to Alternative 1A, except that less tidal habitat restoration is proposed. Noise levels during implementation of these conservation measures are expected to vary

according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet.

The effect of exposing sensitive land uses to increases in construction noise levels above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise increases above the daytime (60 dBA L_{eq}) and nighttime (50 dBA L_{max}) thresholds would be significant. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet. The impact of exposing these receptors to noise increases above thresholds would be significant. Although Mitigation Measures NOI-1a and NOI-1b will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be considered significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

23.3.3.11 Alternative 6A—Isolated Conveyance with Pipeline/Tunnel and Intakes 1–5 (15,000 cfs; Operational Scenario D)

A total of five intakes would be constructed under Alternative 6A. This alternative would also construct an intermediate forebay, and the conveyance facility would be a buried pipeline (see Figures 3-2 and 3-13 in Chapter 3, *Description of Alternatives*).

Impact NOI-1: Exposure of Noise-Sensitive Land Uses to Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Construction of Intakes

Impact NOI-1 for Alternative 6A is the same as Impact NOI-1 for Alternative 1A in terms of construction equipment noise levels. Noise from intake construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks in areas indicated in Table 23-18 (see Impact NOI-1 in Alternative 1A). While equipment could operate at

any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest.

Although this assessment includes daytime and nighttime construction noise estimates, construction of the intakes would primarily occur during daytime hours. If nighttime construction of the intakes were to occur, noise levels could be the same as that generated during daytime hours.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b would be available to reduce this effect.

Construction of Conveyance (Tunnel), Forebays, Barge Unloading Facilities, and Intermediate Pumping Plants

Construction of the conveyance under Alternative 6A would be the same as Alternative 1A. Noise from construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks indicated in Table 23-19 (see Impact NOI-1 in Alternative 1A). While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest. This includes all construction sites along the tunnel conveyance alignment, as well as at the site of the Byron Tract Forebay adjacent to and south of Clifton Court Forebay. For a map of the proposed pipeline/tunnel alignment, see Mapbook Figure M3-1.

Although this assessment includes daytime and nighttime construction noise estimates for the forebays, barge unloading facilities, intermediate pumping plant, and conveyance tunnels, construction of the forebays, barge unloading facilities, and intermediate pumping plant would primarily occur during daytime hours. If nighttime construction of the forebays, barge unloading facilities, and intermediate pumping plant were to occur, noise levels could be the same as those generated during daytime hours. Construction of the conveyance tunnels and RTM storage actions would occur on a 24-hour basis.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b would be available to reduce this effect.

Truck Trips and Worker Commutes

The estimate of truck trips and worker commutes under Alternative 6A would be similar to Alternative 1A except for the addition of trips associated with construction of the operable barrier. Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 16 project roadway segments in the study area as shown in Table 23-20.

During intake construction, segments of SR 160 between Freeport Bridge and Walnut Grove Bridge would be temporarily realigned around intake construction sites. As a result, future project noise levels would further increase at residences located near intake sites. Under Alternative 6A, noise levels at receivers near realigned segments of SR 160 would increase by up to 12 dB in addition to the noise increase shown in Table 23-20.

The increase in noise levels would exceed the project threshold for traffic noise and would be considered adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Construction of Power Transmission Lines

Noise from construction of power transmission lines for Alternative 6A are the same as Alternative 1A. The results shown in Table 23-21 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. Several residential land uses are near the proposed transmission line construction footprint. Likewise, Delta Elementary School and Delta High School on the west bank of the Sacramento River are within half a mile of the proposed Intake 2 transmission lines. Although this assessment includes daytime and nighttime construction noise estimates, construction of the transmission lines would primarily occur during daylight hours. If nighttime construction of the transmission lines were to occur, noise levels could be the same as those generated during daytime hours. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Earth-moving activities at offsite borrow/spoil areas

Noise from earth-moving activities at offsite borrow/spoil areas for Alternative 6A are the same as Alternative 1A. The results shown in Table 23-22 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Borrow/spoil areas are located throughout the conveyance alignment and are generally adjacent to or in close proximity of intake pumping plant sites, forebays, and main tunnel construction shafts. The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. However, with the exception of tunneling and RTM placement, most construction activities would occur during daytime hours. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Noise exposure to workers at construction sites

Impact NOI-1 for Alternative 6A is the same as Impact NOI-1 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise levels above the daytime 60 dBA L_{eq} (1hr) daytime, the 50 dBA L_{max} nighttime, or the 12 dB traffic noise increase threshold would be considered significant. Based on reasonable worst-case modeling, the following significant impacts are expected as a result of Alternative 6A construction.

- **Intakes:** Sensitive receptors within 1,400 feet of an active intake construction site could be exposed to construction noise in excess of the 60 dBA L_{eq} (1hr) daytime threshold. The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-18 (see Impact NOI-1 in Alternative 1A), 125 residential parcels, 2 natural/recreational parcels, and 261 agricultural parcels would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 219 residential parcels, 9 natural/recreational parcels, 346 agricultural parcels, and 2 schools.

- **Conveyance and Associated Facilities:** Sensitive receptors within 1,200 feet of an active tunnel work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-19 (see Impact NOI-1 in Alternative 1A), 125 residential parcels, 9 natural/recreational parcels, 765 agricultural parcels, and 2 schools would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 226 residential parcels, 20 natural/recreational parcels, 1,109 agricultural parcels, and 4 schools.
- **Truck Trips and Worker Commutes:** Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 16 project roadway segments in the study area as shown in Table 23-20. The increase in noise levels would be substantial and exceed the project threshold for traffic noise. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.
- **Power Transmission Lines:** Sensitive receptors within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. As noted above, several residential land uses are near the proposed transmission line construction footprint. Likewise, Delta Elementary School and Delta High School on the west bank of the Sacramento River are within half a mile of the proposed Intake 2 transmission lines.
- **Borrow/spoil areas:** Sensitive receptors within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Borrow/spoil areas are located throughout the conveyance alignment and are generally adjacent to or in close proximity of intake pumping plant sites, forebays, and main tunnel construction shafts.

Mitigation Measures NOI-1a and NOI-1b would reduce noise impacts to sensitive land uses. Although implementation of these measures will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

Impact NOI-2: Exposure of Sensitive Receptors to Vibration or Groundborne Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Pile Driving at Intake Sites

Impact NOI-2 for Alternative 6A is the same as Impact NOI-2 for Alternative 1A. Groundborne vibration levels from construction of intakes could exceed vibration thresholds at nearby receptors, including residential structures (see Table 23-24 under Impact NOI-2 in Alternative 1A). The effect of exposing sensitive receptors to groundborne vibration would be adverse. Mitigation Measure NOI-2 is available to reduce this effect.

Construction of Water Conveyance (Tunnel)

Under Alternative 6A, groundborne noise effects during construction of the conveyance would be the same as Impact NOI-2 for Alternative 1A. At a 60-foot tunnel depth, groundborne vibrations from the TBM are estimated to be 0.008 in/sec PPV, which is below the threshold of 0.04 in/sec PPV. As described in Section 23.4.2, *Determination of Effects*, tunnel locomotives would be operated at slow speeds inside of tunnels and would not result in excessive vibrations. Groundborne noise from tunnel locomotive operation during construction is therefore not predicted to exceed groundborne noise thresholds or result in an adverse noise impact to sensitive receptors along the tunnel conveyance.

***CEQA Conclusion*:** Groundborne vibrations during tunneling would not exceed 0.008 in/sec PPV at 60-foot tunnel depth and would therefore be less than significant. Likewise**,** locomotives are not expected to generate significant noise levels because they will travel at low speeds between 5 and 10 miles per hour. However, the impact of exposing residential structures to groundborne vibration during intake construction would be significant as reasonable worst-case modeling indicates that 102 residential parcels would be exposed to vibration levels in excess of 0.2 in/sec PPV during intake pile driving (see Table 23-24 under Impact NOI-2 in Alternative 1A). Although Mitigation Measure NOI-2 will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce vibration to levels below the applicable thresholds. This impact would therefore be significant and unavoidable.

Mitigation Measure NOI-2: Employ Vibration-Reducing Construction Practices during Construction of Water Conveyance Facilities

Please see Mitigation Measure NOI-2 under Impact NOI-2 in the discussion of Alternative 1A.

Impact NOI-3: Exposure of Noise-Sensitive Land Uses to Noise from Operation of Water Conveyance Facilities

NEPA Effects: Impact NOI-3 for Alternative 6A is the same as Impact NOI-3 for Alternative 1A. Operation of pumping plants under Alternative 6A would expose persons to noise levels greater than the noise thresholds for project operations. Operation of water conveyance facilities could result in substantial increases in noise levels affecting nearby communities and residences (see Table 23-27 under Impact NOI-3 in Alternative 1A). While noise levels in excess of applicable thresholds could occur throughout the affected area, the highest noise levels are expected at those land uses most adjacent to the pumping plants. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measure NOI-3 is available to reduce this effect.

Noise exposure to workers at conveyance facilities

Impact NOI-3 for Alternative 6A is the same as Impact NOI-3 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during pumping plant operations to noise levels above the daytime (50 dBA L_{max}) or nighttime (45 dBA L_{max}) noise thresholds would be significant. Based on reasonable worst-case modeling, 108 residential parcels, 2 natural/recreational parcels, and 165 agricultural parcels would be affected by daytime noise levels in excess of the operational threshold. The nighttime threshold would be exceeded at 121 residential parcels, 2 natural/recreational parcels, and 294 agricultural parcels. The impact of exposing these receptors to noise increases above thresholds would be significant. Mitigation Measure NOI-3 would reduce operational noise levels below applicable thresholds, thus resulting in a less-than-significant level.

Mitigation Measure NOI-3: Design and Construct Intake Facilities and Other Pump Facilities Such That Operational Noise Does Not Exceed 50 dBA (One-Hour L_{eq}) during Daytime Hours (7:00 A.M. to 10:00 P.M.) or 45 dBA (One-Hour L_{eq}) during Nighttime Hours (10:00 P.M. to 7:00 A.M.) or the Applicable Local Noise Standard (Whichever Is Less) at Nearby Noise Sensitive Land Uses

Please see Mitigation Measure NOI-3 under Impact NOI-3 in the discussion of Alternative 1A.

Impact NOI-4: Exposure of Noise-Sensitive Land Uses to Noise from Implementation of Proposed Conservation Measures 2-10

NEPA Effects: Although locations or target acreages may vary for proposed conservation measures, at the program level of development, the amount and location of restoration actions under this alternative would be the same as Alternative 1A, and therefore the impact would be the same as under Alternative 1A. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet.

The effect of exposing sensitive land uses to increases in construction noise levels above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise increases above the daytime (60 dBA L_{eq}) and nighttime (50 dBA L_{max}) thresholds would be significant. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet. The impact of exposing these receptors to noise increases above thresholds would be significant.

Although Mitigation Measures NOI-1a and NOI-1b will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be considered significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

23.3.3.12 Alternative 6B—Isolated Conveyance with East Alignment and Intakes 1–5 (15,000 cfs; Operational Scenario D)

A total of five intakes on the east bank of the Sacramento River would be constructed under Alternative 6B. This alternative would also construct an intermediate forebay, and the conveyance facility would be a canal on the east side of the Sacramento River (see Figures 3-4 and 3-14 in Chapter 3, *Description of Alternatives*).

Impact NOI-1: Exposure of Noise-Sensitive Land Uses to Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Construction of Intakes

Impact NOI-1 for Alternative 6B is the same as Impact NOI-1 for Alternative 1B in terms of construction equipment noise levels. Noise from intake construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks in areas indicated in Table 23-28 (see Impact NOI-1 in Alternative 1B). While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest.

Although this assessment includes daytime and nighttime construction noise estimates, construction of the intakes would primarily occur during daytime hours. If nighttime construction of the intakes were to occur, noise levels could be the same as that generated during daytime hours.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b would be available to reduce this effect.

Construction of Conveyance (Canal), Forebay, Barge Unloading Facilities, and Intermediate Pumping Plant

Impact NOI-1 for Alternative 6B is the same as Impact NOI-1 for Alternative 1B in terms of construction equipment noise levels. Noise from construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks indicated in Table 23-29 (see Impact NOI-1 in Alternative 1B). While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest. This includes all construction

sites along the canal or tunnel conveyance alignment, as well as at the site of the Byron Tract Forebay adjacent to and south of Clifton Court Forebay. For a map of the proposed east alignment, see Mapbook Figure M3-2.

Although this assessment includes daytime and nighttime construction noise estimates for the forebay, barge unloading facilities, intermediate pumping plant, and conveyance tunnels and canals, construction of the forebay, barge unloading facilities, intermediate pumping plant, and canals would primarily occur during daytime hours. If nighttime construction of the forebay, barge unloading facilities, intermediate pumping plant, and canals were to occur, noise levels could be the same as those generated during daytime hours. Construction of the conveyance tunnels and RTM storage actions would occur on a 24-hour basis.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b would be available to reduce this effect.

Truck Trips and Worker Commutes

The estimate of truck trips and worker commutes under Alternative 6B would be similar to Alternative 1B except for the addition of trips associated with construction of the operable barrier. Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 21 project roadway segments in the study area as shown in Table 23-30.

During intake construction, segments of SR 160 between Freeport Bridge and Walnut Grove Bridge would be temporarily realigned around intake construction sites. As a result, future project noise levels would further increase at residences located near intake sites. Under Alternative 6B, noise levels at receivers near realigned segments of SR 160 would increase by up to 12 dB in addition to the noise increase shown in Table 23-30.

The increase in noise levels would exceed the project threshold for traffic noise and would be considered adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Construction of Power Transmission Lines

Noise from construction of power transmission lines for Alternative 6B is the same as Impact NOI-1 for Alternative 1A. The results shown in Table 23-21 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. Several residential land uses are near the proposed transmission line construction footprint. Likewise, Delta Elementary School and Delta High School on the west bank of the Sacramento River are within half a mile of the proposed Intake 2 transmission lines. Although this assessment includes daytime and nighttime construction noise estimates, construction of the transmission lines would primarily occur during daylight hours. If nighttime construction of the transmission lines were to occur, noise levels could be the same as those generated during daytime hours. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Earth-moving activities at offsite borrow/spoil areas

Noise from earth-moving activities at offsite borrow/spoil areas for Alternative 6B is the same as Alternative 1A. The results shown in Table 23-22 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Borrow/spoil areas are located throughout the conveyance alignment and are generally adjacent to or in close proximity of intake pumping plant sites, forebays, and main tunnel construction shafts. The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. However, with the exception of tunneling and RTM placement, most construction activities would occur during daytime hours. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Noise exposure to workers at construction sites

Impact NOI-1 for Alternative 6B is the same as Impact NOI-1 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise levels above the daytime 60 dBA L_{eq} (1hr) daytime, the 50 dBA L_{max} nighttime, or the 12 dB traffic noise increase threshold would be considered significant. Based on reasonable worst-case modeling, the following significant impacts are expected as a result of Alternative 6B construction.

- **Intakes:** Sensitive receptors within 1,400 feet of an active intake construction site could be exposed to construction noise in excess of the 60 dBA L_{eq} (1hr) daytime threshold. The nighttime threshold of 50 dBA Lmax would be exceeded at a distance of 2,800 feet. As shown in Table 23-28 (see Impact NOI-1 in Alternative 1B), 124 residential parcels, 5 natural/recreational parcels, and 364 agricultural parcels would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 218 residential parcels, 9 natural/recreational parcels, 348 agricultural parcels, and 1 school.
- **Conveyance and Associated Facilities:** Sensitive receptors within 1,200 feet of an active tunnel work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA Lmax would be exceeded at a distance of 2,800 feet. As shown in Table 23-29 (see Impact NOI-1 in Alternative 1B), 129 residential parcels, 5 natural/recreational parcels, 958 agricultural parcels, and 1 school would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 250 residential parcels, 14 natural/recreational parcels, 1,748 agricultural parcels, and 4 schools.
- **Truck Trips and Worker Commutes:** Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 21 project roadway segments in the study area as shown in Table 23-30. The increase in noise levels would be substantial and exceed the project threshold for traffic noise. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

- **Power Transmission Lines:** Sensitive receptors within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA Lmax would be exceeded at a distance of 1,800 feet from the construction area. As noted above, several residential land uses are near the proposed transmission line construction footprint.
- **Borrow/spoil areas:** Sensitive receptors within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA Lmax would be exceeded at a distance of 1,800 feet from the area. Borrow/spoil areas are located throughout the conveyance alignment and are generally adjacent to or in close proximity of intake pumping plant sites, forebays, and main tunnel construction shafts.

Mitigation Measures NOI-1a and NOI-1b would reduce noise impacts to sensitive land uses. Although implementation of these measures will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be considered significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

Impact NOI-2: Exposure of Sensitive Receptors to Vibration or Groundborne Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Pile Driving at Intake Sites

Impact NOI-2 for Alternative 6B is the same as Impact NOI-2 for Alternative 1B. Groundborne vibration levels from construction of intakes could exceed vibration thresholds at nearby receptors, including residential structures (see Table 23-31 under Impact NOI-2 in Alternative 1B). The effect of exposing sensitive receptors to groundborne vibration would be adverse. Mitigation Measure NOI-2 is available to reduce this effect.

Construction of Water Conveyance (Pipeline Portions)

Under Alternative 6B, groundborne noise effects during construction of the conveyance would be the same as Impact NOI-2 for Alternative 1B. Tunnel depth would be 120 feet or greater below msl. Groundborne noise levels for the east alignment alternative would therefore be below the applicable threshold and would not result in an adverse noise impact to sensitive receptors adjacent to the water conveyance.

***CEQA Conclusion*:** Groundborne vibrations during tunneling would not exceed 0.008 in/sec PPV at 125-foot tunnel depth and would therefore be less than significant. However, the impact of exposing residential structures to groundborne vibration during intake construction would be significant as

reasonable worst-case modeling indicates that 85 residential parcels would be exposed to vibration levels in excess of 0.2 in/sec PPV during intake pile driving (see Table 23-31 under Impact NOI-3 in Alternative 1B). Although implementation of Mitigation Measure NOI-2 will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce vibration to levels below the applicable thresholds. This impact would therefore be considered significant and unavoidable.

Mitigation Measure NOI-2: Employ Vibration-Reducing Construction Practices during Construction of Water Conveyance Facilities

Please see Mitigation Measure NOI-2 under Impact NOI-2 in the discussion of Alternative 1A.

Impact NOI-3: Exposure of Noise-Sensitive Land Uses to Noise from Operation of Water Conveyance Facilities

NEPA Effects: Impact NOI-3 for Alternative 6B is the same as Impact NOI-3 for Alternative 1B. Operation of pumping plants under Alternative 6B would expose persons to noise levels greater than the noise thresholds for project operations. Operation of water conveyance facilities could result in substantial increases in noise levels affecting nearby communities and residences (see Table 23-34 under Impact NOI-3 in Alternative 1B). While noise levels in excess of applicable thresholds could occur throughout the affected area, the highest noise levels are expected at those land uses most adjacent to the pumping plants. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measure NOI-3 is available to reduce this effect.

Noise exposure to workers at conveyance facilities

Impact NOI-3 for Alternative 6B is the same as Impact NOI-3 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

CEQA Conclusion: The impact of exposing noise-sensitive land uses during pumping plant operations to noise levels above the daytime (50 dBA L_{max}) or nighttime (45 dBA L_{max}) noise thresholds would be significant. Based on reasonable worst-case modeling, 108 residential parcels, 2 natural/recreational parcels, and 168 agricultural parcels would be affected by daytime noise levels in excess of the operational threshold. The nighttime threshold would be exceeded at 121 residential parcels, 2 natural/recreational parcels, and 300 agricultural parcels. The impact of exposing these receptors to noise increases above thresholds would be significant(see Table 23-34 under Impact NOI-3 in Alternative 1B). Mitigation Measure NOI-3 would reduce operational noise levels below applicable thresholds, thus resulting in a less-than-significant level.

Mitigation Measure NOI-3: Design and Construct Intake Facilities and Other Pump Facilities Such That Operational Noise Does Not Exceed 50 dBA (One-Hour L_{eq}) during Daytime Hours (7:00 A.M. to 10:00 P.M.) or 45 dBA (One-Hour L_{eq}) during Nighttime Hours (10:00 P.M. to 7:00 A.M.) or the Applicable Local Noise Standard (Whichever Is Less) at Nearby Noise Sensitive Land Uses

Please see Mitigation Measure NOI-3 under Impact NOI-3 in the discussion of Alternative 1A.

Impact NOI-4: Exposure of Noise-Sensitive Land Uses to Noise from Implementation of Proposed Conservation Measures 2-10

NEPA Effects: Although locations or target acreages may vary for proposed conservation measures, at the program level of development, the amount and location of restoration actions under this alternative would be the same as Alternative 1A, and therefore the impact would be the same as under Alternative 1A. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet. See the discussion of Impact NOI-4 under Alternative 1A.

The effect of exposing sensitive land uses to increases in construction noise levels above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise increases above the daytime (60 dBA L_{eq}) and nighttime (50 dBA L_{max}) thresholds would be significant. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet. The impact of exposing these receptors to noise increases above thresholds would be significant. Although Mitigation Measures NOI-1a and NOI-1b would reduce this impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be significant and unavoidable*.*

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

23.3.3.13 Alternative 6C—Isolated Conveyance with West Alignment and Intakes W1–W5 (15,000 cfs; Operational Scenario D)

A total of five intakes would be constructed under Alternative 6C. They would be sited on the west bank of the Sacramento River, directly opposite the locations identified for pipeline/tunnel and east alignments. Under this alternative, water would be carried south in a canal along the western side of the Delta to an intermediate pumping plant and then pumped through a tunnel to a continuing canal to the proposed Byron Tract Forebay immediately northwest of Clifton Court Forebay (see Figures 3-6 and 3-15 in Chapter 3, *Description of Alternatives*).

Impact NOI-1: Exposure of Noise-Sensitive Land Uses to Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Construction of Intakes

Impact NOI-1 for Alternative 6C is the same as Impact NOI-1 for Alternative 1C in terms of construction equipment noise levels. Noise from construction of intakes is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks indicated in Table 23-35 (see Impact NOI-1 in Alternative 1C). While equipment could operate at any construction work area, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest.

Although this assessment includes daytime and nighttime construction noise estimates, construction of the intakes would primarily occur during daytime hours. If nighttime construction of the intakes were to occur, noise levels could be the same as that generated during daytime hours.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Construction of Conveyance (Tunnel and Canal), Forebay, Barge Unloading Facilities, and Intermediate Pumping Plant

Impact NOI-1 for Alternative 6C is the same as Impact NOI-1 for Alternative 1C in terms of construction equipment noise levels. Noise from construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks indicated in Table 23-36 (see Impact NOI-1 in Alternative 1C). While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest. This includes all construction sites along the canal or tunnel conveyance alignment, as well as at the site of the Byron Tract Forebay adjacent to and west of Clifton Court Forebay. For a map of the proposed west alignment, see Mapbook Figure M3-3.

Although this assessment includes daytime and nighttime construction noise estimates for the forebay, barge unloading facilities, intermediate pumping plant, and conveyance tunnels and canals, construction of the forebay, barge unloading facilities, intermediate pumping plant, and canals would primarily occur during daytime hours. If nighttime construction of the forebay, barge unloading facilities, intermediate pumping plant, and canals were to occur, noise levels could be the same as those generated during daytime hours. Construction of the conveyance tunnels and RTM storage actions would occur on a 24-hour basis.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Truck Trips and Worker Commutes

The estimate of truck trips and worker commutes under Alternative 6C would be similar to Alternative 1C except for the addition of trips associated with construction of the operable barrier. Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 22 project roadway segments in the study area as shown in Table 23-37.

During intake construction, segments of County Highway E9 would be temporarily realigned around intake construction sites. Under the west alignment alternative, no additional noise increase is anticipated at residences adjacent to intake construction sites.

The increase in noise levels would exceed the project threshold for traffic noise and would be considered adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Construction of Power Transmission Lines

Noise from construction of power transmission lines for Alternative 6C is the same as Impact NOI-1 for Alternative 1A. The results shown in Table 23-21 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. Noise-sensitive receptors that could be exposed to adverse noise impacts due to transmission line construction include residential areas near the proposed transmission line construction footprint. Likewise, as noted in Chapter 24, *Hazards and Hazardous Materials*, Lakewood Drive, Sycamore Drive, and Summer Lake Community Parks, as well as Mokelumne High (Continuation) School would be near the proposed transmission line construction footprint for Alternative 6C. Although this assessment includes daytime and nighttime construction noise estimates, construction of the transmission lines would primarily occur during daylight hours. If nighttime construction of the transmission lines were to occur, noise levels could be the same as those generated during daytime hours. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Earth-moving activities at offsite borrow/spoil areas

Noise from earth-moving activities at offsite borrow/spoil areas for Alternative 6C is the same as Alternative 1C. The results shown in Table 23-22 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Noise-sensitive land uses that could potentially be exposed to adverse noise impacts due to earth-moving activities in offsite borrow/spoil areas would extend outside the borrow/spoil area right-of-way. The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. However, with the exception of tunneling and RTM placement, most construction activities would occur during daytime hours. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Noise exposure to workers at construction sites

Impact NOI-1 for Alternative 6C is the same as Impact NOI-1 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise levels above the daytime 60 dBA L_{eq} (1hr) daytime, the 50 dBA L_{max} nighttime, or the 12 dB traffic noise increase threshold would be considered significant. Based on reasonable worst-case modeling, the following significant impacts are expected as a result of Alternative 6C construction.

- **Intakes:** Sensitive receptors within 1,400 feet of an active intake construction site could be exposed to construction noise in excess of the 60 dBA L_{eq} (1hr) daytime threshold. The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-35 (see Impact NOI-1 in Alternative 1C), 63 residential parcels, 3 natural/recreational parcels, and 188 agricultural parcels would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 229 residential parcels, 8 natural/recreational parcels, 351 agricultural parcels, and 3 schools.
- **Conveyance and Associated Facilities:** Sensitive receptors within 1,200 feet of an active tunnel work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-36 (see Impact NOI-1 in Alternative 1C), 1,148 residential parcels, 26 natural/recreational parcels, 1,048 agricultural parcels, and 4 schools would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 3,087 residential parcels, 221 natural/recreational parcels, 1,532 agricultural parcels, and 6 schools.
- **Truck Trips and Worker Commutes:** Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 22 project roadway segments in the study area as shown in Table 23-37. The increase in noise levels would be substantial and exceed the project threshold for traffic noise. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.
- **Power Transmission Lines:** Sensitive receptors within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. As noted above, residential areas and several schools are near the proposed transmission line construction footprint.
- **Borrow/spoil areas:** Sensitive receptors within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Borrow/spoil areas are located throughout the conveyance alignment and are generally adjacent to or in close proximity of intake pumping plant sites, forebays, and main tunnel construction shafts.

Mitigation Measures NOI-1a and NOI-1b would reduce noise impacts to sensitive land uses. Although implementation of these measures will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be considered significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

Impact NOI-2: Exposure of Sensitive Receptors to Vibration or Groundborne Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Pile Driving at Intake Sites

Impact NOI-2 for Alternative 6C is the same as Impact NOI-2 for Alternative 1C. Groundborne vibration levels from construction of intakes could exceed vibration thresholds at nearby receptors, including residential structures (see Table 23-38 under Impact NOI-2 in Alternative 1C). The effect of exposing sensitive receptors to groundborne vibration would be adverse. Mitigation Measure NOI-2 is available to reduce this effect.

Construction of Conveyance (Tunnel Portions)

Under Alternative 6C, groundborne noise effects during construction of the conveyance would be the same as Impact NOI-2 for Alternative 1C. Tunnels and siphons would be constructed at a depth of more than 120 feet below msl. Groundborne noise levels at residential receivers are predicted to be below thresholds, and would not result in an adverse effect.

***CEQA Conclusion*:** Groundborne vibrations during tunneling would not exceed 0.008 in/sec PPV at 120-foot tunnel depth and would therefore be less than significant. Likewise, locomotives are not expected to generate significant noise levels because they will travel at low speeds between 5 and 10 miles per hour. However, the impact of exposing residential structures to groundborne vibration during intake construction would be significant as reasonable worst-case modeling indicates that 88 residential parcels would be exposed to vibration levels in excess of 0.2 in/sec PPV during intake pile driving (see Table 23-38 under Impact NOI-2 in Alternative 1C). Although Mitigation Measure NOI-2 will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce vibration to levels below the applicable thresholds. This impact would therefore be significant and unavoidable.

Mitigation Measure NOI-2: Employ Vibration-Reducing Construction Practices during Construction of Water Conveyance Facilities

Please see Mitigation Measure NOI-2 under Impact NOI-2 in the discussion of Alternative 1A.

Impact NOI-3: Exposure of Noise-Sensitive Land Uses to Noise from Operation of Water Conveyance Facilities

NEPA Effects: Impact NOI-3 for Alternative 6C is the same as Impact NOI-3 for Alternative 1C. Operation of pumping plants under Alternative 6C would expose persons to noise levels greater than the noise thresholds for project operations. Operation of water conveyance facilities could result in substantial increases in noise levels affecting nearby communities and residences (see Table 23-41 under Impact NOI-3 in Alternative 1C). While noise levels in excess of applicable thresholds could occur throughout the affected area, the highest noise levels are expected at those land uses most adjacent to the pumping plants. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measure NOI-3 is available to reduce this effect.

Noise exposure to workers at conveyance facilities

Impact NOI-3 for Alternative 6C is the same as Impact NOI-3 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during pumping plant operations to noise levels above the daytime (50 dBA L_{max}) or nighttime (45 dBA L_{max}) noise thresholds would be significant. Based on reasonable worst-case modeling, 2 residential parcels, 2 natural/recreational parcels, and 132 agricultural parcels would be affected by daytime noise levels in excess of the operational threshold. The nighttime threshold would be exceeded at 77 residential parcels, 3 natural/recreational parcels, and 205 agricultural parcels. The impact of exposing these receptors to noise increases above thresholds would be significant(see Table 23-41 under Impact NOI-3 in Alternative 1C). Mitigation Measure NOI-3 would reduce operational noise levels below applicable thresholds, thus resulting in a less-than-significant level.

Mitigation Measure NOI-3: Design and Construct Intake Facilities and Other Pump Facilities Such That Operational Noise Does Not Exceed 50 dBA (One-Hour L_{eq}) during Daytime Hours (7:00 A.M. to 10:00 P.M.) or 45 dBA (One-Hour L_{eq}) during Nighttime Hours (10:00 P.M. to 7:00 A.M.) or the Applicable Local Noise Standard (Whichever Is Less) at Nearby Noise Sensitive Land Uses

Please see Mitigation Measure NOI-3 under Impact NOI-3 in the discussion of Alternative 1A.

Impact NOI-4: Exposure of Noise-Sensitive Land Uses to Noise from Implementation of Proposed Conservation Measures 2-10

NEPA Effects: Although locations or target acreages may vary for proposed conservation measures, at the program level of development, the amount and location of restoration actions under this alternative would be the same as Alternative 1A, and therefore the impact would be the same as under Alternative 1A. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet.

The effect of exposing sensitive land uses to increases in construction noise levels above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise increases above the daytime (60 dBA L_{eq}) and nighttime (50 dBA L_{max}) thresholds would be significant. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet. The impact of exposing these receptors to noise increases above thresholds would be significant.

Although Mitigation Measures NOI-1a and NOI-1b would reduce this impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This effect would therefore be significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

23.3.3.14 Alternative 7—Dual Conveyance with Pipeline/Tunnel, Intakes 2, 3, and 5, and Enhanced Aquatic Conservation (9,000 cfs; Operational Scenario E)

Three intakes would be constructed under Alternative 7 on the east bank of the Sacramento River. This alternative would also construct an intermediate forebay, and the conveyance facility would be a buried pipeline (see Figures 3-2 and 3-11 in Chapter 3, *Description of Alternatives*).

Impact NOI-1: Exposure of Noise-Sensitive Land Uses to Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Construction of Intakes

Potential reasonable worst-case equipment noise levels from construction of intakes would be comparable to those listed for the intake sites in Table 23-17. The results shown in Table 23-17 indicate that during periods of pile driving, residences located within 1,400 feet of an active intake construction site could be exposed to construction noise in excess of the DWR daytime (7 a.m. to 10 p.m.) maximum noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet from an active intake construction site.

While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest. The work areas for construction of Intakes 2, 3, and 5 would extend through several residential areas and communities located near the Sacramento River. Noise from intake construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks in areas indicated in Table 23-76.

Although this assessment includes daytime and nighttime construction noise estimates, construction of the intakes would primarily occur during daytime hours. If nighttime construction of the intakes were to occur, noise levels could be the same as that generated during daytime hours.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Table 23-76. Land Use Affected by Equipment Noise from Construction of Intakes, Alternative 7

Location	Zoning	Daytime Threshold (60 dBA L_{eq} [1h]) Total Affected Parcels	Nighttime Threshold (50 dBA L_{max} [1h]) Total Affected Parcels
Sacramento County – including River Road across the river from the community of Clarksburg, River Road near the community of Hood.	Residential	3	112
	Natural/Recreational	1	1
	Agricultural/Other[a]	65	97
	Schools	None	None
Yolo County – including County Road E9 near the community of Clarksburg; neighborhoods in the community of Clarksburg.	Residential	4	98
	Natural/Recreational	1	5
	Agricultural/Other[a]	98	118
	Schools	None	Clarksburg Middle School

[a] Includes agricultural or unclassified use that permits residential use.

Construction of Conveyance (Tunnel), Forebays, Barge Unloading Facilities, and Intermediate Pumping Plant

Construction of the conveyance under Alternative 7 would be the same as Alternative 1A. Noise from construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks indicated in Table 23-19 (see Impact NOI-1 in Alternative 1A). While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest. This includes all construction sites along the tunnel conveyance alignment, as well as at the site of the Byron Tract Forebay adjacent to and south of Clifton Court Forebay. For a map of the proposed pipeline/tunnel alignment, see Mapbook Figure M3-1.

Although this assessment includes daytime and nighttime construction noise estimates for the forebays, barge unloading facilities, intermediate pumping plant, and conveyance tunnels, construction of the forebays, barge unloading facilities, and intermediate pumping plant would primarily occur during daytime hours. If nighttime construction of the forebays, barge unloading facilities, and intermediate pumping plant were to occur, noise levels could be the same as those generated during daytime hours. Construction of the conveyance tunnels and RTM storage actions would occur on a 24-hour basis.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b would be available to reduce this effect.

Truck Trips and Worker Commutes

The estimate of truck trips and worker commutes under Alternative 7 would be similar to Alternative 1A. Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 16 project roadway segments in the study area as shown in Table 23-20.

During intake construction, segments of SR 160 between Freeport Bridge and Walnut Grove Bridge would be temporarily realigned around intake construction sites. As a result, future project noise levels would further increase at residences located near intake sites. Under Alternative 7, noise

levels at receivers near realigned segments of SR 160 would increase by up to 3 dB in addition to the noise increase shown in Table 23-20.

The increase in noise levels would exceed the project threshold for traffic noise and would be considered adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Construction of Power Transmission Lines

Noise from construction of power transmission lines for Alternative 7 is the same as Alternative 1A. The results shown in Table 23-21 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. Several residential land uses are near the proposed transmission line construction footprint. Likewise, Delta Elementary School and Delta High School on the west bank of the Sacramento River are within half a mile of the proposed Intake 2 transmission lines.

Although this assessment includes daytime and nighttime construction noise estimates, construction of the transmission lines would primarily occur during daylight hours. If nighttime construction of the transmission lines were to occur, noise levels could be the same as those generated during daytime hours.

The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Earth-moving activities at offsite borrow/spoil areas

Noise from earth-moving activities at offsite borrow/spoil areas for Alternative 7 is the same as Alternative 1A. The results shown in Table 23-22 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Borrow/spoil areas are located throughout the conveyance alignment and are generally adjacent to or in close proximity of intake pumping plant sites, forebays, and main tunnel construction shafts. The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. However, with the exception of tunneling and RTM placement, most construction activities would occur during daytime hours. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Noise exposure to workers at construction sites

Impact NOI-1 for Alternative 7 is the same as Impact NOI-1 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise levels above the daytime 60 dBA L_{eq} (1hr) daytime, the 50 dBA L_{max} nighttime, or the 12 dB traffic noise increase threshold would be considered significant. Based on reasonable worst-case modeling, the following significant impacts are expected as a result of Alternative 7 construction.

- **Intakes:** Sensitive receptors within 1,400 feet of an active intake construction site could be exposed to construction noise in excess of the 60 dBA L_{eq} (1hr) daytime threshold. The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in

Table 23-76, 7 residential parcels, 2 natural/recreational parcels, and 163 agricultural parcels would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 210 residential parcels, 6 natural/recreational parcels, 215 agricultural parcels, and 1 school.

- **Conveyance and Associated Facilities:** Sensitive receptors within 1,200 feet of an active tunnel work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-19 (see Impact NOI-1 in Alternative 1A), 125 residential parcels, 9 natural/recreational parcels, 765 agricultural parcels, and 2 schools would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 226 residential parcels, 20 natural/recreational parcels, 1,109 agricultural parcels, and 4 schools.
- **Truck Trips and Worker Commutes:** Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 16 project roadway segments in the study area as shown in Table 23-20. The increase in noise levels would be substantial and exceed the project threshold for traffic noise. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.
- **Power Transmission Lines:** Sensitive receptors within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distan$_{ce}$ of 1,800 feet from the construction area. As noted above, several residential land uses are near the proposed transmission line construction footprint. Likewise, Delta Elementary School and Delta High School on the west bank of the Sacramento River are within half a mile of the proposed Intake 2 transmission l.
- **Borrow/spoil areas:** Sensitive receptors within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Borrow/spoil areas are located throughout the conveyance alignment and are generally adjacent to or in close proximity of intake pumping plant sites, forebays, and main tunnel construction shafts.

Mitigation Measures NOI-1a and NOI-1b would reduce noise impacts to sensitive land uses. Although implementation of these measures will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

Impact NOI-2: Exposure of Sensitive Receptors to Vibration or Groundborne Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Pile Driving at Intake Sites

Pile Driving at Intake Sites Impact NOI-2 for Alternative 7 is the same as Impact NOI-2 for Alternative 1A. However, fewer sensitive receptors would be affected by groundborne vibration levels of this magnitude compared to Alternative 1A, because fewer intakes would be constructed (three rather than five).

Groundborne vibration levels from impact pile driving are predicted to exceed vibration thresholds at nearby residences in the areas shown in Table 23-77. While groundborne vibration levels in excess of 0.2 in/sec PPV could occur at any of these residences, the highest vibration levels are expected at those residences nearest to the intake work areas. Construction of intakes and barge unloading facilities would result in excessive groundborne vibration levels at these nearby residential structures. The effect of exposing sensitive receptors to groundborne vibration would be adverse. Mitigation Measure NOI-2 is available to reduce this effect.

Table 23-77. Land Use Affected by Vibrations from Pile Driving During Construction of Intakes, Alternative 7

Location	Zoning	Total Affected Parcels
Sacramento County – including River Road near the community of Hood; Neighborhoods in the community of Hood	Residential[a]	40
San Joaquin County	Residential[a]	13

[a] Includes agricultural or unclassified use that permits residential use.

Construction of Water Conveyance (Tunnel)

Under Alternative 7, groundborne noise effects during construction of the conveyance would be the same as Impact NOI-2 for Alternative 1A. At a 60-foot tunnel depth, groundborne vibrations from the TBM are estimated to be 0.008 in/sec PPV, which is below the threshold of 0.04 in/sec PPV. As described in Section 23.4.2, *Determination of Effects*, tunnel locomotives would be operated at slow speeds inside of tunnels and would not result in excessive vibrations. Groundborne noise from tunnel locomotive operation during construction is therefore not predicted to exceed groundborne noise thresholds or result in an adverse noise impact to sensitive receptors along the tunnel conveyance.

***CEQA Conclusion*:** Groundborne vibrations during tunneling would not exceed 0.008 in/sec PPV at 60-foot tunnel depth and would therefore be less than significant. Likewise, locomotives are not expected to generate significant noise levels because they will travel at low speeds between 5 and 10 miles per hour. However, the impact of exposing residential structures to groundborne vibration during intake construction would be significant as reasonable worst-case modeling indicates that 53 residential parcels would be exposed to vibration levels in excess of 0.2 in/sec PPV during intake pile driving (see Table 23-77). Although Mitigation Measure NOI-2 will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce vibration to levels

below the applicable thresholds. This impact would therefore be considered significant and unavoidable.

Mitigation Measure NOI-2: Employ Vibration-Reducing Construction Practices during Construction of Water Conveyance Facilities

Please see Mitigation Measure NOI-2 under Impact NOI-2 in the discussion of Alternative 1A.

Impact NOI-3: Exposure of Noise-Sensitive Land Uses to Noise from Operation of Water Conveyance Facilities

NEPA Effects: Potential reasonable worst-case pump noise levels during operation of the intake structures were evaluated by calculating sound power levels of the pump based on horsepower (Hoover and Keith 2000). Faceplate horsepower for vertical column and vertical volute type pumps is specified in pump selection appendix of the Conceptual Engineering Report. Pump specifications are shown in Table 23-78. Combined source noise levels assume that pump enclosures (including buildings) provide a nominal 15 dB of noise attenuation. This analysis assumes that pumps are operating 24 hours a day.

Table 23-78. Pump Specifications—Alternative 7

Pump Location	Quantity	Pumping Plant Capacity (cfs)	Pump Horsepower	Individual Pump Source Level (dBA)	Combined Source Level (dBA)	Assumed Attenuation (dB)	Combined Source Level with Attenuation (dBA)
Intake 2	6	3,000	4,500	97	104	15	89
Intake 3	6	3,000	3,500	96	102	15	88
Intake 5	6	3,000	3,500	96	102	15	88
Intermediate Plant	16 (10/6)[a]	15,000	18,000/ 8,000[a]	103/99[a]	114	15	99

[a] Vertical Column Pumps/Vertical Volute Pumps in the Intermediate Pumping Plant.
cfs = cubic feet per second.
dB = decibels.
dBA = A-Weighted Sound Level in Decibels.

The estimated sound levels from pump operation as a function of distance based on calculated point-source attenuation over "soft" (i.e., acoustically absorptive) ground are shown in Table 23-79.

Table 23-79. Predicted Noise Levels from Pump Operation, Intakes, Alternative 7

Distance Between Source and Receiver (Feet)	Intake 2 Calculated L_{eq} Sound Level (dBA)	Intakes 3 and 5 Calculated L_{eq} Sound Level (dBA)	Intermediate Plant Calculated L_{eq} Sound Level (dBA)
50	89	88	99
100	82	80	91
200	74	72	83
300	69	68	79
400	66	65	75
600	61	60	71
800	58	57	67
1,000	55	54	65
1,200	53	52	63
1,400	52	**50**	61
1,600	**50**	49	60
2,000	47	46	57
2,200	46	**45**	56
2,600	**45**	43	54
3,600	41	40	**50**
5,000	37	36	47
6,000	35	34	**45**
7,000	33	32	46

Notes: Calculations are based on Federal Transit Administration 2006. Calculation do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.
Noise levels assume a nominal pump enclosure attenuation of 15 dB.
Bold denotes daytime and nighttime maximum noise thresholds.
dBA = A-weighted sound level in decibels.

The results shown in Table 23-79 indicate that operating noise from pumping plants would exceed the nighttime threshold of 45 dBA at noise-sensitive land uses within a distance of up to 2,600 feet from intake pumping plant locations, and 6,000 feet from the pumping plant located at the proposed intermediate forebay. Noise from operation of pumping plants is predicted to exceed daytime and nighttime noise thresholds at nearby residences and outdoor parks in areas indicated in Table 23-80.

Operation of water conveyance facilities could result in substantial increases in noise levels affecting nearby communities and residences. While noise levels in excess of applicable thresholds could occur throughout the affected area, the highest noise levels are expected at those land uses most adjacent to the pumping plants. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measure NOI-3 is available to reduce this effect.

Table 23-80. Land Use Affected by Noise from Operation of Pumping Plants, Alternative 7

Location	Zoning	50 dBA L_{eq} Daytime Operations Threshold Total Affected Parcels	45 dBA L_{eq} Nighttime Operations Threshold Total Affected Parcels
Sacramento County – including River Road near the community of Hood; neighborhoods in the community of Hood; Lambert Road; Vorden Road.	Natural/Recreational	1	1
	Agricultural/Other[a]	52	106
Yolo County – including County Road E9 near the community of Clarksburg; neighborhoods in the community of Clarksburg.	Agricultural/Other[a]	44	77

[a] Includes agricultural or unclassified use that permits residential use.

Noise exposure to workers at conveyance facilities

Impact NOI-3 for Alternative 7 is the same as Impact NOI-3 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during pumping plant operations to noise levels above the daytime (50 dBA L_{max}) or nighttime (45 dBA L_{max}) noise thresholds would be considered significant. Based on reasonable worst-case modeling, 1 natural/recreational parcel and 96 agricultural parcels would be affected by daytime noise levels in excess of the operational threshold. The nighttime threshold would be exceeded at 1 natural/recreational parcel and 183 agricultural parcels. The impact of exposing these receptors to noise increases above thresholds would be significant (see Table 23-80). Mitigation Measure NOI-3 would reduce operational noise levels below applicable thresholds, thus resulting in a less-than-significant level.

Mitigation Measure NOI-3: Design and Construct Intake Facilities and Other Pump Facilities Such That Operational Noise Does Not Exceed 50 dBA (One-Hour L_{eq}) during Daytime Hours (7:00 A.M. to 10:00 P.M.) or 45 dBA (One-Hour L_{eq}) during Nighttime Hours (10:00 P.M. to 7:00 A.M.) or the Applicable Local Noise Standard (Whichever Is Less) at Nearby Noise Sensitive Land Uses

Please see Mitigation Measure NOI-3 under Impact NOI-3 in the discussion of Alternative 1A.

Impact NOI-4: Exposure of Noise-Sensitive Land Uses to Noise from Implementation of Proposed Conservation Measures 2-10

NEPA Effects: Although locations or target acreages may vary for proposed conservation measures, at the program level of development, the amount and location of restoration actions under this alternative would be the same as Alternative 1A, except that more channel margin habitat enhancement and seasonally inundated floodplain restoration is proposed, and therefore the effects would be the same as under Alternative 1A. Noise levels during implementation of these

conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet.

The effect of exposing sensitive land uses to increases in construction noise levels above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise increases above the daytime (60 dBA L_{eq}) and nighttime (50 dBA L_{max}) thresholds would be significant. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet. The impact of exposing these receptors to noise increases above thresholds would be significant. Although Mitigation Measures NOI-1a and NOI-1b would reduce this impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This effect would therefore be significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

23.3.3.15 Alternative 8—Dual Conveyance with Pipeline/Tunnel, Intakes 2, 3, and 5, and Increased Delta Outflow (9,000 cfs; Operational Scenario F)

The impacts of Alternative 8 would be the same as Alternative 7. Both are assumed to construct Intakes 2, 3 and 5 and an intermediate forebay, and the conveyance facility would be a buried pipeline (see Figures 3-2 and 3-11 in Chapter 3, *Description of Alternatives*).

Impact NOI-1: Exposure of Noise-Sensitive Land Uses to Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Construction of Intakes

Impact NOI-1 for Alternative 8 is the same as Impact NOI-1 for Alternative 7 in terms of construction equipment noise levels. Noise from intake construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks in areas indicated in

Table 23-76 (see Impact NOI-1 in Alternative 7). While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest.

Although this assessment includes daytime and nighttime construction noise estimates, construction of the intakes would primarily occur during daytime hours. If nighttime construction of the intakes were to occur, noise levels could be the same as that generated during daytime hours.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b would be available to reduce this effect.

Construction of Conveyance (Tunnel), Forebays, Barge Unloading Facilities, and Intermediate Pumping Plant

Construction of the conveyance under Alternative 8 would be the same as Alternative 1A. Noise from construction activities is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks indicated in Table 23-19 (see Impact NOI-1 in Alternative 1A). While equipment could operate at any work area identified for this alternative, the highest noise levels are expected to occur at those sites where the duration and intensity of construction activities would be greatest. This includes all construction sites along the tunnel conveyance alignment, as well as at the site of the Byron Tract Forebay adjacent to and south of Clifton Court Forebay. For a map of the proposed pipeline/tunnel alignment, see Mapbook Figure M3-1.

Although this assessment includes daytime and nighttime construction noise estimates for the forebays, barge unloading facilities, intermediate pumping plant, and conveyance tunnels, construction of the forebays, barge unloading facilities, and intermediate pumping plant would primarily occur during daytime hours. If nighttime construction of the forebays, barge unloading facilities, and intermediate pumping plant were to occur, noise levels could be the same as those generated during daytime hours. Construction of the conveyance tunnels and RTM storage actions would occur on a 24-hour basis.

The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b would be available to reduce this effect.

Truck Trips and Worker Commutes

The estimate of truck trips and worker commutes under Alternative 8 would be similar to Alternative 7. Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 16 project roadway segments in the study area as shown in Table 23-20.

During intake construction, segments of SR 160 between Freeport Bridge and Walnut Grove Bridge would be temporarily realigned around intake construction sites. As a result, future project noise levels would further increase at residences located near intake sites. Under Alternative 8, noise levels at receivers near realigned segments of SR 160 would increase by up to 3 dB in addition to the noise increase shown in Table 23-20.

The increase in noise levels would exceed the project threshold for traffic noise and would be considered adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Construction of Power Transmission Lines

Noise from construction of power transmission lines for Alternative 8 is the same as Alternative 1A. The results shown in Table 23-21 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. Several residential land uses are near the proposed transmission line construction footprint. Likewise, Delta Elementary School and Delta High School on the west bank of the Sacramento River are within half a mile of the proposed Intake 2 transmission lines. Although this assessment includes daytime and nighttime construction noise estimates, construction of the transmission lines would primarily occur during daylight hours. If nighttime construction of the transmission lines were to occur, noise levels could be the same as those generated during daytime hours. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Earth-moving activities at offsite borrow/spoil areas

Noise from earth-moving activities at offsite borrow/spoil areas for Alternative 8 are the same as Alternative 1A. The results shown in Table 23-22 (see Impact NOI-1 in Alternative 1A) indicate that noise-sensitive land uses within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Borrow/spoil areas are located throughout the conveyance alignment and are generally adjacent to or in close proximity of intake pumping plant sites, forebays, and main tunnel construction shafts. The effect of exposing these noise-sensitive land uses to noise increases above thresholds would be adverse. However, with the exception of tunneling and RTM placement, most construction activities would occur during daytime hours. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Noise exposure to workers at construction sites

Impact NOI-1 for Alternative 8 is the same as Impact NOI-1 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise levels above the daytime 60 dBA L_{eq} (1hr) daytime, the 50 dBA L_{max} nighttime, or the 12 dB traffic noise increase threshold would be considered significant. Based on reasonable worst-case modeling, the following significant impacts are expected as a result of Alternative 8 construction.

- **Intakes:** Sensitive receptors within 1,400 feet of an active intake construction site could be exposed to construction noise in excess of the 60 dBA L_{eq} (1hr) daytime threshold. The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-76 (see Impact NOI-1 in Alternative 7), 7 residential parcels, 2 natural/recreational parcels, and 163 agricultural parcels would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 210 residential parcels, 6 natural/recreational parcels, 215 agricultural parcels, and 1 school.
- **Conveyance and Associated Facilities:** Sensitive receptors within 1,200 feet of an active tunnel work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be

exceeded at a distance of 2,800 feet. As shown in Table 23-19 (see Impact NOI-1 in Alternative 1A), 125 residential parcels, 9 natural/recreational parcels, 765 agricultural parcels, and 2 schools would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 226 residential parcels, 20 natural/recreational parcels, 1,109 agricultural parcels, and 4 schools.

- **Truck Trips and Worker Commutes:** Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 16 project roadway segments in the study area as shown in Table 23-20. The increase in noise levels would be substantial and exceed the project threshold for traffic noise. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.
- **Power Transmission Lines:** Sensitive receptors within 800 feet of an active transmission line construction area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the construction area. As noted above, several residential land uses are near the proposed transmission line construction footprint. Likewise, Delta Elementary School and Delta High School on the west bank of the Sacramento River are within half a mile of the proposed Intake 2 transmission lines.
- **Borrow/spoil areas:** Sensitive receptors within 800 feet of equipment operating in the borrow/spoil area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 1,800 feet from the area. Borrow/spoil areas are located throughout the conveyance alignment and are generally adjacent to or in close proximity of intake pumping plant sites, forebays, and main tunnel construction shafts.

Mitigation Measures NOI-1a and NOI-1b would reduce noise impacts to sensitive land uses. Although implementation of these measures will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

Impact NOI-2: Exposure of Sensitive Receptors to Vibration or Groundborne Noise from Construction of Water Conveyance Facilities

NEPA Effects:

Pile Driving at Intake Sites

Impact NOI-2 for Alternative 8 is the same as Impact NOI-2 for Alternative 1A. Groundborne vibration levels from construction of intakes could exceed vibration thresholds at nearby receptors,

including residential structures (see Table 23-24 under Impact NOI-2 in Alternative 1A). The effect of exposing sensitive receptors to groundborne vibration would be adverse. Mitigation Measure NOI-2 is available to reduce this effect.

Construction of Water Conveyance (Tunnel)

Under Alternative 8, groundborne noise effects during construction of the conveyance would be the same as Impact NOI-2 for Alternative 1A. At a 60-foot tunnel depth, groundborne vibrations from the TBM are estimated to be 0.008 in/sec PPV, which is below the threshold of 0.04 in/sec PPV. As described in Section 23.4.2, *Determination of Effects*, tunnel locomotives would be operated at slow speeds inside of tunnels and would not result in excessive vibrations. Groundborne noise from tunnel locomotive operation during construction is therefore not predicted to exceed groundborne noise thresholds or result in an adverse noise impact to sensitive receptors along the tunnel conveyance.

***CEQA Conclusion*:** Groundborne vibrations during tunneling would not exceed 0.008 in/sec PPV at 60-foot tunnel depth and would therefore be less than significant. Likewise**,** locomotives are not expected to generate significant noise levels because they will travel at low speeds between 5 and 10 miles per hour. However, the impact of exposing residential structures to groundborne vibration during intake construction would be significant as reasonable worst-case modeling indicates that 102 residential parcels would be exposed to vibration levels in excess of 0.2 in/sec PPV during intake pile driving (see Table 23-24 under Impact NOI-2 in Alternative 1A). Although Mitigation Measure NOI-2 will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce vibration to levels below the applicable thresholds. This impact would therefore be considered significant and unavoidable.

Mitigation Measure NOI-2: Employ Vibration-Reducing Construction Practices during Construction of Water Conveyance Facilities

Please see Mitigation Measure NOI-2 under Impact NOI-2 in the discussion of Alternative 1A.

Impact NOI-3: Exposure of Noise-Sensitive Land Uses to Noise from Operation of Water Conveyance Facilities

NEPA Effects: Impact NOI-3 for Alternative 8 is the same as Impact NOI-3 for Alternative 7. Operation of water conveyance facilities could result in substantial increases in noise levels affecting nearby communities and residences (see Table 23-80 under Impact NOI-3 in Alternative 7). While noise levels in excess of applicable thresholds could occur throughout the affected area, the highest noise levels are expected at those land uses most adjacent to the pumping plants. The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measure NOI-3 is available to reduce this effect.

Noise exposure to workers at conveyance facilities

Impact NOI-3 for Alternative 8 is the same as Impact NOI-3 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during pumping plant operations to noise levels above the daytime (50 dBA L_{max}) or nighttime (45 dBA L_{max}) noise thresholds would be considered significant. Based on reasonable worst-case modeling, 1

natural/recreational parcel and 96 agricultural parcels would be affected by daytime noise levels in excess of the operational threshold. The nighttime threshold would be exceeded at 1 natural/recreational parcel and 183 agricultural parcels. The impact of exposing these receptors to noise increases above thresholds would be significant(see Table 23-80 under Impact NOI-3 in Alternative 7). Mitigation Measure NOI-3 would reduce operational noise levels below applicable thresholds, thus resulting in a less-than-significant level.

Mitigation Measure NOI-3: Design and Construct Intake Facilities and Other Pump Facilities Such That Operational Noise Does Not Exceed 50 dBA (One-Hour L_{eq}) during Daytime Hours (7:00 A.M. to 10:00 P.M.) or 45 dBA (One-Hour L_{eq}) during Nighttime Hours (10:00 P.M. to 7:00 A.M.) or the Applicable Local Noise Standard (Whichever Is Less) at Nearby Noise Sensitive Land Uses

Please see Mitigation Measure NOI-3 under Impact NOI-3 in the discussion of Alternative 1A.

Impact NOI-4: Exposure of Noise-Sensitive Land Uses to Noise from Implementation of Proposed Conservation Measures 2-10

NEPA Effects: Although locations or target acreages may vary for proposed conservation measures, at the program level of development, the amount and location of restoration actions under this alternative would be the same as Alternative 1A, and therefore the impact would be the same as under Alternative 1A. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-16 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-16 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet.

The effect of exposing sensitive land uses to increases in construction noise levels above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise increases above the daytime (60 dBA L_{eq}) and nighttime (50 dBA L_{max}) thresholds would be significant. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-15 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-15 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet. The impact of exposing these receptors to noise increases above thresholds would be significant. Although Mitigation Measures NOI-1a and NOI-1b would reduce this impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

23.3.3.16 Alternative 9—Through Delta Separate Corridors (15,000 cfs; Operational Scenario G)

Alternative 9 would construct two fish screens, at the entrances to the Delta Cross Channel and Georgiana Slough. These intakes would be smaller sized than for the other alternatives. Two new diversion pumping plants would be constructed, on the San Joaquin River at the Head of Old River and on Middle River upstream of Victoria Canal. There would be no new forebay. The conveyance would be through existing canals and Delta channels, with modifications to the levees and channels, operable barriers, a fish movement corridor around Clifton Court Forebay, and a water supply corridor.

Impact NOI-1: Exposure of Noise-Sensitive Land Uses to Noise from Construction of Water Conveyance Facilities

NEPA Effects: Construction of operable barriers and pumping plants under Alternative 9 would require the use of impact-driven sheet piles to construct cofferdams and barrier foundations. Potential reasonable worst-case equipment noise levels from construction work areas would be comparable to those listed for the intake sites in Table 23-17. Assuming 100% equipment utilization within a given hour of day, the combined noise level at work areas is 98 dBA L_{eq} (1hr) at 50 feet.

The results shown in Table 23-17 indicate that during periods of pile driving, residences located within 1,400 feet of an active intake construction site could be exposed to construction noise in excess of the DWR daytime (7 a.m. to 10 p.m.) maximum noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet.

Noise from construction is predicted to exceed daytime and nighttime noise thresholds at nearby residences, schools and outdoor parks in areas indicated in Table 23-81.

Table 23-81. Land Use Affected by Equipment Noise from Construction, Alternative 9

		Daytime Threshold (60 dBA L_{eq} [1h])	Nighttime Threshold (50 dBA L_{max} [1h])
Location	Zoning	Total Affected Parcels	Total Affected Parcels
Sacramento County – including neighborhoods in the communities of Walnut Grove, Grand Island Estates, and Locke.	Residential	197	234
	Natural/Recreational	32	37
	Agricultural/Other[a]	335	419
	Schools	None	Walnut Grove Elementary
San Joaquin County	Residential	15	18
	Natural/Recreational	1	2
	Agricultural/Other[a]	219	531
Contra Costa County	Agricultural/Other[a]	54	79
Alameda County	Agricultural/Other[a]	16	19

[a] Includes agricultural or unclassified use that permits residential use.

Pile driving and equipment noise during construction of the operable barriers, fish screens, and pumping plants could result in a substantial increase in ambient noise levels affecting nearby communities and residences. For above-ground construction during nighttime hours, single-event noise levels could result in sleep disturbance in nearby residential areas.

Although this assessment includes daytime and nighttime construction noise estimates, construction of the operable barriers, fish screens, and pumping plants would primarily occur during daytime hours. If nighttime construction of theses facilities were to occur, noise levels could be the same as that generated during daytime hours.

The effect of exposing noise-sensitive land uses to noise increases above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Truck Trips and Worker Commutes

Project-generated heavy trucks and worker commutes are predicted to result in increased traffic noise levels at noise-sensitive land uses adjacent to local roadways. Project-generated vehicle traffic volumes for the Through Delta/Separate Corridors are predicted to have a maximum heavy truck composition of 96%, which was assumed to apply to any of the local roadways under a worst-case noise scenario. Future noise levels are shown in Table 23-82.

Table 23-82. Predicted Future Traffic Noise Levels on Commuter Roads and Haul Routes, Through Delta/Separate Corridors

Roadway	Segment	Existing Noise Level, dBA	Future With-Project Noise Level, dBA	Noise Level Increase, dB	Substantial Increase?
Byron Hwy	Contra Costa Co./ Alameda Co. Line to Alameda Co./San Joaquin Co. Line	58	74	**16**	**yes**
Brentwood Blvd	Delta Rd (Oakley City Limits) to Balfour Rd	61	76	**15**	**yes**
Brentwood Blvd	Balfour Rd to Brentwood City Limits (South)	60	76	**16**	**yes**
Balfour Rd	Brentwood Blvd to Brentwood City Limits	61	61	**0**	**no**
Bethel Island Rd	Oakley City Limits to End	55	55	**0**	**no**
Balfour Rd	Brentwood City Limits to Byron Hwy	54	54	**0**	**no**
Old SR 41	Brentwood City Limits (South) to Marsh Creek Rd	62	76	**14**	**yes**
Byron Hwy	Delta Rd to Old SR 4	53	53	**0**	**no**
Byron Hwy	SR 4 to Contra Costa Co./ Alameda Co. Line	59	74	**15**	**yes**
SR 160 (Freeport Blvd)	Sacramento City Limits to Freeport Bridge	59	59	**0**	**no**
SR 160 (Freeport Blvd/ River Rd)	Freeport Bridge to Scribner Rd	55	55	**0**	**no**

Roadway	Segment	Existing Noise Level, dBA	Future With-Project Noise Level, dBA	Noise Level Increase, dB	Substantial Increase?
SR 160	Scribner Rd to Hood Franklin Rd	53	53	**0**	**no**
SR 160	Hood Franklin Rd to Lambert Rd	55	55	**0**	**no**
SR 160	Lambert Rd to Paintersville Bridge	53	53	**0**	**no**
SR 160 (Paintersville Bridge)	Sutter Slough Bridge Rd to SR 160 (River Rd)	53	77	**24**	**yes**
SR 160	Paintersville Bridge to Walnut Grove Bridge	53	77	**24**	**yes**
SR 160	Walnut Grove Bridge to A St (Isleton)	59	77	**18**	**yes**
SR 160	A St (Isleton) to SR 12	58	77	**19**	**yes**
SR 160	SR 12 to Brannan Island Rd	62	78	**16**	**yes**
SR 84	West Sacramento City Limits to Courtland Rd	55	77	**22**	**yes**
SR 84 (Courtland Rd/ Ryer Ave)	Courtland Rd to Cache Slough Ferry	46	46	**0**	**no**
SR 12 EB	I-80 to Beck Ave	65	76	**11**	**no**
SR 12 WB	I-80 to Beck Ave	64	76	**12**	**yes**
SR 12	Beck Ave to Sunset Ave/ Grizzly Island Rd	68	79	**11**	**no**
SR 12	Sunset Ave/ Grizzly Island Rd to Walters Rd/	66	79	**13**	**yes**
SR 12	Walters Rd/ to SR 113	63	79	**16**	**yes**
SR 12	SR 113 to SR 84 (River Rd)	64	79	**15**	**yes**
SR 12 (Rio Vista Bridge)	SR 84 (River Rd) to SR 160 (River Rd)	64	79	**15**	**yes**
SR 12	SR 160 (River Rd) to Sacramento Co./ SJ Co. Line	62	68	**6**	**no**
SR 12	Sacramento Co./ SJ Co. Line to I-5	63	68	**5**	**no**
SR 113	I-80 to Dixon City Limits	64	79	**15**	**yes**
SR 113	Dixon City Limits to SR 12	57	78	**21**	**yes**
SR 4 (Marsh Creek Rd)	Vasco Rd to Byron Hwy	61	77	**16**	**yes**
SR 4	Marsh Creek Rd to Discovery Bay Blvd	63	78	**15**	**yes**
SR 4	Discovery Bay Blvd to Tracy Blvd	61	77	**16**	**yes**
SR 4	Tracy Blvd to I-5	64	78	**14**	**yes**

Roadway	Segment	Existing Noise Level, dBA	Future With-Project Noise Level, dBA	Noise Level Increase, dB	Substantial Increase?
A St/4th St/ Jackson Blvd.	SR 160 to Isleton City Limits	48	48	**0**	**no**
Main Street (Old SR 4)	SR 160 to Cypress Rd	62	76	**14**	**yes**
Main Street (Old SR 4)	Cypress Rd to Delta Rd (Oakley City Limits)	61	76	**15**	**yes**
Cypress Rd	Main Street to Bethel Island Rd	58	58	**0**	**no**
Bethel Island Rd	Cypress Rd to Oakley City Limits	55	55	**0**	**no**
Delta Rd	Main Street to Byron Hwy	55	55	**0**	**no**
Pocket Rd	I-5 to Freeport Blvd	63	63	**0**	**no**
Freeport Blvd (Old SR 160)	Pocket Rd to Sacramento City Limits	56	56	**0**	**no**
Freeport Bridge	River Rd to SR 160 (Freeport Blvd)	55	55	**0**	**no**
Hood Franklin Rd	SR 160 (River Rd) to I-5	51	51	**0**	**no**
Lambert Rd	SR 160 (River Rd) to Herzog Rd	44	44	**0**	**no**
Lambert Rd	Herzog Rd to Franklin Blvd	46	46	**0**	**no**
Franklin Blvd	Lambert Rd to Twin Cities Rd	48	48	**0**	**no**
Twin Cities Rd	River Rd to I-5	53	70	**17**	**yes**
Twin Cities Rd	I-5 to Franklin Blvd	55	62	**7**	**no**
Sutter Slough Bridge Rd	Sacramento Co./ Yolo Co. Line to Paintersville Bridge	50	75	**25**	**yes**
River Rd	Paintersville Bridge to Twin Cities Rd	51	70	**19**	**yes**
River Rd	Twin Cities Rd to Walnut Grove Bridge	55	70	**15**	**yes**
Walnut Grove Rd/River Rd	Walnut Grove Bridge to Sacramento Co./ SJ Co. Line	55	70	**15**	**yes**
Isleton Rd	River Rd (Walnut Grove)/Isleton Rd Bridge to 1.5 miles west of Isleton Rd Bridge	54	67	**13**	**yes**
Race Track Rd/ Tyler Island Rd	Walnut Grove Rd to Southern End of Tyler Island	45	45	**0**	**no**
Tyler Island Rd	Southern End of Tyler Island to SR 160 (River Rd)	46	46	**0**	**no**
Jackson Slough Rd	Isleton City Limits to SR 12	47	47	**0**	**no**

Roadway	Segment	Existing Noise Level, dBA	Future With-Project Noise Level, dBA	Noise Level Increase, dB	Substantial Increase?
Jackson Slough Rd	Brannan Island Rd to SR 12	47	47	**0**	**no**
Walnut Grove Rd	Sacramento Co./ SJ Co. Line to I-5	53	70	**17**	**yes**
Peltier Rd	Blossom Rd to I-5	44	44	**0**	**no**
Tracy Blvd	SR 4 to Clifton Court Rd	53	73	**20**	**yes**
Tracy Blvd	Clifton Court Rd to Tracy City Limits	52	73	**21**	**yes**
Byron Hwy	Alameda Co./San Joaquin Co. Line to Mountain House Pkwy	59	74	**15**	**yes**
Mountain House Pkwy	Byron Hwy to Arnaudo Blvd	54	74	**20**	**yes**
Mountain House Pkwy	Arnaudo Blvd to I-205	58	74	**16**	**yes**
Eight Mile Rd	Stockton City Limits to I-5	58	58	**0**	**no**
Tracy Blvd	Tracy City Limits to I-205	58	73	**15**	**yes**
Harbor Blvd	Industrial Blvd to US 50	63	75	**12**	**yes**
Industrial Blvd/ Lake Washington Blvd	Harbor Blvd to Jefferson Blvd	62	75	**13**	**yes**
Jefferson Blvd (Old SR 84)	Lake Washington Blvd to Southport Pkwy	62	75	**13**	**yes**
Jefferson Blvd (Old SR 84)	Southport Pkwy to West Sacramento City Limits	51	75	**24**	**yes**
River Rd	Freeport Bridge to Courtland Rd	54	54	**0**	**no**
River Rd	Courtland Rd to Sacramento Co./ Yolo Co. Line	48	75	**27**	**yes**
Courtland Rd	SR 84 to River Rd	48	75	**27**	**yes**

As shown in Table 23-82, predicted future traffic noise levels from project-generated worker commutes and truck trips would result in an increase of 12 dB or more compared to existing traffic noise levels along 43 project roadway segments. The increase in noise levels would exceed the project threshold for traffic noise and would be considered adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

Noise exposure to workers at construction sites

Impact NOI-1 for Alternative 9 is the same as Impact NOI-1 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise levels above the daytime 60 dBA L_{eq} (1hr) daytime, the 50 dBA L_{max} nighttime, or the 12 dB traffic noise increase threshold would be considered significant. Based on reasonable worst-case modeling, Sensitive receptors within 1,400 feet of a construction activity could be exposed to construction noise in excess of the 60 dBA L_{eq} (1hr) daytime threshold. The nighttime threshold of 50 dBA L_{max} would be exceeded at a distance of 2,800 feet. As shown in Table 23-81, 212 residential parcels, 33 natural/recreational parcels, and 624 agricultural parcels would be affected by daytime noise levels in excess of this threshold during construction. The nighttime threshold would be exceeded at 252 residential parcels, 39 natural/recreational parcels, 1,048 agricultural parcels, and 1 school. Traffic noise from truck trips and worker commutes would result in an increase of 12 dB or more compared to existing traffic noise levels at residences and outdoor use areas along 43 project roadway segments in the study area as shown in Table 23-82. The increase in noise levels would exceed the project threshold for traffic noise.

Mitigation Measures NOI-1a and NOI-1b would reduce noise impacts to sensitive land uses. Although implementation of these measures will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would therefore be significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

Impact NOI-2: Exposure of Sensitive Receptors to Vibration or Groundborne Noise from Construction of Water Conveyance Facilities

NEPA Effects: Use of impact piles during construction of operable barriers and pumping plants would exceed the groundborne vibration threshold of 0.2 in/sec PPV within 70 feet of pile driving sites, as shown in Table 23-23. No residences are located within 70 feet of areas where operable barriers or pumping plants would be built under Alternative 9 and there would be no adverse effect.

***CEQA Conclusion*:** As shown in Table 23-23, groundborne vibration during construction of the operable barriers and pumping plants would exceed the vibration threshold of 0.2 in/sec PPV within 70 feet of pile driving sites. However, no residences are located within 70 feet of areas where operable barriers or pumping plants would be built. This impact would therefore be less-than-significant.

Impact NOI-3: Exposure of Noise-Sensitive Land Uses to Noise from Operation of Water Conveyance Facilities

NEPA Effects: Potential reasonable worst-case pump noise levels during operation of the intake structures were evaluated by calculating sound power levels of the pump based on horsepower (Hoover and Keith 2000). Under the pipeline/tunnel alignment, faceplate horsepower for vertical column type pumps is specified in pump selection appendix of the Conceptual Engineering Report.

Pump specifications are shown in Table 23-83. Combined source noise levels assume that pump enclosures (including buildings) provide a nominal 15 dB of noise attenuation. This analysis assumes that pumps are operating 24 hours a day.

Table 23-83. Pump Specifications—Alternative 9

Pump Location	Quantity	Pumping Plant Capacity (cfs)	Pump Horsepower	Individual Pump Source Level (dBA)	Combined Source Level (dBA)	Assumed Attenuation (dB)	Combined Source Level with Attenuation (dBA)
Old River	3	3,000	500	87	92	15	77
Middle River	3	3,000	400	86	91	15	76

cfs = cubic feet per second.
dB = decibels.
dBA = A-Weighted Sound Level in Decibels.

The estimated sound levels from pump operation as a function of distance based on calculated point-source attenuation over "soft" (i.e., acoustically absorptive) ground are shown in Table 23-84.

Table 23-84. Predicted Noise Levels from Pump Operation, Intakes, Alternative 9

Distance Between Source and Receiver (Feet)	Old River Plant Calculated L_{eq} Sound Level (dBA)	Middle River Plant Calculated L_{eq} Sound Level (dBA)
50	81	80
100	73	72
200	65	64
400	57	56
600	53	52
700	51	**50**
750	**50**	49
1,000	47	46
1,100	46	**45**
1,200	**45**	44
1,300	44	43

Notes: Calculations are based on Federal Transit Administration 2006. Calculation do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.
Noise levels assume a nominal pump enclosure attenuation of 15 dB.
Bold denotes daytime and nighttime maximum noise thresholds.
dBA = A-weighted sound level in decibels.

The results shown in Table 23-84 indicate that operating noise from pumping plants would exceed the nighttime threshold of 45 dBA at noise-sensitive land uses within a distance of up to 1,200 feet from pumping plant locations. Noise from operation of pumping plants is predicted to exceed daytime and nighttime noise thresholds at nearby residences and outdoor parks in areas indicated in Table 23-85.

Table 23-85. Land Use Affected by Noise from Operation of Pumping Plants, Alternative 9

		50 dBA L_{eq} Daytime Operations Threshold	45 dBA L_{eq} Nighttime Operations Threshold
Location	Zoning	Total Affected Parcels	Total Affected Parcels
San Joaquin County	Agricultural/Other[a]	7	9

[a] Includes agricultural or unclassified use that permits residential use.

Operation of pumping plants under Alternative 9 would expose persons to noise levels greater than the threshold for project operations. While noise levels in excess of applicable thresholds could occur throughout the affected area, the highest noise levels are expected at those land uses most adjacent to the pumping plants. The effect of exposing noise-sensitive land uses to operational noise levels above thresholds would be adverse. Mitigation Measure NOI-3 is available to reduce this effect.

Noise exposure to workers at conveyance facilities

Impact NOI-3 for Alternative 9 is the same as Impact NOI-3 for Alternative 1A in terms of noise exposure to on-site workers. On-site workers would be protected under OSHA requirements. No adverse impacts would occur to workers.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during pumping plant operations to noise levels above the daytime (50 dBA L_{max}) or nighttime (45 dBA L_{max}) noise thresholds would be significant. Based on reasonable worst-case modeling, 7 agricultural parcels would be affected by daytime noise levels in excess of the operational threshold. The nighttime threshold would be exceeded at 9 agricultural parcels (see Table 23-85). The impact of exposing these receptors to noise increases above thresholds would be significant. Mitigation Measure NOI-3 would reduce operational noise levels below applicable thresholds, thus resulting in a less-than-significant level.

Mitigation Measure NOI-3: Design and Construct Intake Facilities and Other Pump Facilities Such That Operational Noise Does Not Exceed 50 dBA (One-Hour L_{eq}) during Daytime Hours (7:00 A.M. to 10:00 P.M.) or 45 dBA (One-Hour L_{eq}) during Nighttime Hours (10:00 P.M. to 7:00 A.M.) or the Applicable Local Noise Standard (Whichever Is Less) at Nearby Noise Sensitive Land Uses

Please see Mitigation Measure NOI-3 under Impact NOI-3 in the discussion of Alternative 1A.

Impact NOI-4: Exposure of Noise-Sensitive Land Uses to Noise from Implementation of Proposed Conservation Measures 2-10

NEPA Effects: Although locations or target acreages may vary for proposed conservation measures, at the program level of development, the amount and location of restoration actions under this alternative would be the same as Alternative 1A, and therefore the effect would be the same as under Alternative 1A. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-15 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-15 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of

60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet.

The effect of exposing sensitive land uses to increases in construction noise levels above thresholds would be adverse. Mitigation Measures NOI-1a and NOI-1b are available to address this effect.

***CEQA Conclusion*:** The impact of exposing noise-sensitive land uses during construction to noise increases above the daytime (60 dBA L_{eq}) and nighttime (50 dBA L_{max}) thresholds would be significant. Noise levels during implementation of these conservation measures are expected to vary according to the type of construction equipment and techniques used, but are likely to be similar to noise levels shown in Table 23-15 (see Impact NOI-1 in Alternative 1A). The results shown in Table 23-15 indicate that residences within 1,200 feet of an active restoration work area could be exposed to construction noise in excess of the daytime (7 a.m. to 10 p.m.) noise threshold of 60 dBA L_{eq} (1hr). The nighttime threshold of 50 dBA L_{max} would be exceeded within a distance of 2,800 feet. The impact of exposing these receptors to noise increases above thresholds would be significant. Although Mitigation Measures NOI-1a and NOI-1b will reduce the impact, it is not anticipated that feasible measures will be available in all situations to reduce construction noise to levels below the applicable thresholds. This impact would be considered significant and unavoidable.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

23.3.3.17 Cumulative Analysis

Implementation of the BDCP will result in noise and vibration effects associated with construction and operation of new intake and conveyance facilities and conservation measures. To assess the contribution of the BDCP project alternatives to cumulative noise and vibration conditions, noise and vibration from construction and operation of the BDCP is evaluated in conjunction with noise and vibration potentially generated by past, present, and reasonably foreseeable future projects within the Plan Area. The following list includes projects considered for this cumulative effects section; for a complete list of such projects, consult Appendix 3D, *Defining Existing Conditions, No Action Alternative, No Project Alternative, and Cumulative Impact Conditions.*

Table 23-86. Noise Effects from the Plans, Policies, and Programs Considered for Cumulative Analysis

Project/Program	Agency	Project Elements Related to Noise	Potential Noise Effect
Levee Repair-Levee Evaluation Program	California Department of Water Resources	Identification and repair of levee sites throughout the Central Valley.	Increases in short term noise levels during levee repair. Potential increase in short term groundborne vibration.
Oroville Facilities Relicensing	California Department of Water Resources	Relicensing of the Oroville Facilities	Increases in long-term ambient noise levels as a result of continued hydropower operations.

Project/Program	Agency	Project Elements Related to Noise	Potential Noise Effect
South Delta Temporary Barriers Project	California Department of Water Resources	Installation of four rock barriers across the South Delta channels	Increases in short term noise levels during construction. Potential increase in groundborne vibration.
North Bay Aqueduct Alternative Intake Project	California Department of Water Resources and Solano County Water Agency	Construction and operation of an alternative intake on the Sacramento River	Increases in short term noise levels during construction; increases in long-term ambient noise levels as a result of intake operation.
Altamont Corridor Rail Project	California High Speed Rail Authority and Federal Railroad Administration	Upgrades to the Altamont Commuter Express System as part of the statewide High Speed Rail Initiative on a separate, dedicated passenger track	Increases in short term noise levels during construction; increases in long-term ambient noise levels as a result of increased rail service; increases in groundborne vibration.
California High-Speed Rail System Sacramento to Merced Section	California High Speed Rail Authority and Federal Railroad Administration	Construction of a new rail corridor between Merced and Sacramento, with various alignments under study including alignments adjacent to the existing Union Pacific Railroad and Burlington Northern Santa Fe (BNSF) railroad routes	Increases in short term noise levels during construction; increases in long-term ambient noise levels as a result of increased rail service; increases in groundborne vibration.
Contra Costa Canal Fish Screen Project	Contra Costa Water District	Installation of fish screens at the Rock Slough diversion	Increases in short term noise levels during construction. Potential increase in short term groundborne vibration.
Los Vaqueros Reservoir Expansion Project	Contra Costa Water District and U.S. Bureau of Reclamation	Construction of a new diversion on Old River; increased reservoir capacity to 275,000 acre-feet and addition of a new 470 cfs connection	Increases in short term noise levels during construction. Potential increase in short term groundborne vibration.
Alternative Intake Project	Contra Costa Water District, U.S. Bureau of Reclamation, and California Department of Water Resources	Location of a new drinking water intake at Victoria Canal	Increases in short term noise levels during construction. Potential increase in short term groundborne vibration.
Davis-Woodland Water Supply Project	Davis, Woodland, and University of California, Davis	Construction and operation of a water intake/diversion, conveyance, and water treatment facilities.	Increases in short term noise levels during construction; increases in long-term ambient noise levels as a result of intake operation
Freeport Regional Water Project	Freeport Regional Water Authority and U.S. Bureau of Reclamation	Construction of a new water intake facility/pumping plant and 17-mile underground water pipeline within Sacramento County	Increases in short term noise levels during construction; increases in long-term ambient noise levels as a result of intake operation

Project/Program	Agency	Project Elements Related to Noise	Potential Noise Effect
Eastern San Joaquin Integrated Conjunctive Use Program	Northeastern San Joaquin County Groundwater Banking Authority (NSJCGBA)	Development of approximately 140,000 to 160,000 acre-feet per year (AF/yr) of new surface water supply for the basin	Increases in short term noise levels during construction; increases in long-term ambient noise levels as a result of intake operation
American River Pump Station and Restoration Project	Placer County Water Agency and U.S. Bureau of Reclamation	Includes a permanent pump station to replace a temporary pumping facility on the American River that was installed in anticipation of construction of Auburn Dam.	Increases in short term noise levels during construction; increases in long-term ambient noise levels as a result of pump operation
Sacramento International Airport Master Plan	Sacramento County	Development of facilities at the Airport over the next 20 years	Increases in short term noise levels during construction; increases in long-term ambient noise levels associated with new development; increases in short and long-term groundborne vibration
Delta Water Supply Project	Stockton	Development of a new supplemental water supply for the Stockton Metropolitan Area	Increases in short term noise levels during construction; increases in long-term ambient noise levels associated with new development; potential for increases in short and long-term groundborne vibration
Suisun Bay Channel Operations and Maintenance	U.S. Army Corps of Engineers	Annual maintenance dredging of the main channel from the Carquinez Strait at Martinez to Pittsburg (called Suisun Bay Channel), and maintenance dredging of New York Slough Channel farther upstream to Antioch	Increases in short term noise levels during construction
Suisun Channel (Slough) Operation and Maintenance	U.S. Army Corps of Engineers	Maintenance dredging of an entrance channel in Suisun Bay 200 feet wide and -8 feet deep, and thence a channel 100 to 125 feet wide and -8 feet deep for 13 miles to the head of navigation at City of Suisun, with a turning basin	Increases in short term noise levels during construction
Delta-Mendota Canal/California Aqueduct Intertie	U.S. Bureau of Reclamation	Construction and operations of a pumping plant and pipeline connection between the Delta Mendota Canal (DMC) and the California Aqueduct	Increases in short term noise levels during construction; increases in long-term ambient noise levels as a result of pump operation

Project/Program	Agency	Project Elements Related to Noise	Potential Noise Effect
Red Bluff Diversion Dam Fish Passage Project	U.S. Bureau of Reclamation and Tehama Colusa Canal Authority	Modification of the Red Bluff Diversion Dam, including new pumping plant and fish screen	Increases in short term noise levels during construction; increases in long-term ambient noise levels as a result of pump operation
American Basin Fish Screen and Habitat Improvement Project	U.S. Bureau of Reclamation, California Department of Fish and Wildlife, and Natomas Central Mutual Water Company	Modification to the Natomas Mutual's water diversion and distribution system adjacent to the Sacramento River and Natomas Cross Canal in Sacramento and Sutter counties, California.	Increases in short term noise levels during construction; increases in long-term ambient noise levels as a result of pump/intake operation
Folsom Dam Safety and Flood Damage Reduction Project	U.S. Bureau of Reclamation, U.S. Army Corps of Engineers, Sacramento Area Flood Control Agency, and Central Valley Flood Protection Board	Includes the Joint Federal Project Auxiliary Spillway, seismic improvements to the Main Concrete Dam and Mormon Island Auxiliary Dam (MIAD), static improvements to earthen structures, security upgrades, replacement of the Main Concrete Dam spillway gates, and a 3.5-foot (ft) raise to all Folsom Facility structures	Increases in short term noise levels during construction. Potential increase in short term groundborne vibration.
West Sacramento Levee Improvements Program	West Sacramento Area Flood Control Agency and U.S. Army Corps of Engineers	Construction of improvements to the levees protecting West Sacramento to meet local and federal flood protection criteria.	Increases in short term noise levels during levee repair. Potential increase in short term groundborne vibration.
Yolo County General Plan Update	Yolo County	Provides for growth and development in the unincorporated area through 2010	Increases in short term noise levels during construction; increases in long-term ambient noise levels associated with new development; increases in short and long-term groundborne vibration
South Bay Aqueduct Improvement and Enlargement Project	Zone 7 Water Agency and Department of Water Resources	Improvement and expansion of the existing South Bay Aqueduct.	Increases in short term noise levels during construction. Potential increase in short term groundborne vibration.

The above list of related projects evaluated for cumulative impacts includes a number of projects that would affect existing and/or future noise levels in the Plan Area. The proposed BDCP, in conjunction with other projects that affect noise levels, would expose sensitive land uses in the Plan Area to increased noise levels that could exceed applicable thresholds. Increases in ambient noise levels could occur during project construction, or through the long-term operation of new noise-generating facilities (e.g., pumping plants, rail lines, etc.). The actual increase in ambient noise expected as result of the projects shown in Table 23-86 is not known.

Impact NOI-5: Cumulative Effects of Increased Noise and Vibration from Construction Activities and Operation of Conveyance Facilities Occurring Within the Delta

No Action Alternative

Implementation of the BDCP No Action Alternative would result in no project-related noise. Noise effects from Plans, Policies and Programs identified in Table 23-86 would affect noise levels in the Plan Area. There would be no cumulative effect due to noise from the no action alternative.

The Delta and vicinity are within a highly active seismic area, with a generally high potential for major future earthquake events along and/or nearby regional faults, with the probability for such events increasing over time. Based on the location, extent and non-engineered nature of many existing levee structures in the Delta area, the potential for significant damage to, or failure of, these structures during a major local seismic event is generally moderate to high. (See Appendix 3E, *Potential Seismic and Climate Change Risks to SWP/CVP Water Supplies* for more detailed discussion). To reclaim land or rebuild levees after a catastrophic event due to climate change or a seismic event would introduce considerable heavy equipment and associated vehicles, including dozers, excavators, pumps, water trucks, and haul trucks, which would create adverse noise effects. While similar risks would occur under implementation of the action alternatives, these risks may be reduced by BDCP-related levee improvements along with those projects identified for the purposes of flood protection in Table 23-86.

Alternatives 1A through 9

NEPA Effects: Implementation of the BDCP action alternatives would involve construction and operation of new facilities related to water extraction and transport including intake facilities, pipelines, tunnels, and canals. The project also includes implementation of conservation measures. Some of these conservation measures include construction activities related to grading, levee modifications, modifications of existing infrastructure, and construction of new infrastructure. As stated in the impact discussion above, construction activities will generate noise and vibration. Operation of facilities related to the extraction and transport of water will also generate noise.

Other past, present, and probable future projects and programs in the region that are identified in Table 20-5 and Appendix 3D, *Defining Existing Conditions, the No Action/No Project Alternative, and Cumulative Impact Conditions* have the potential to adversely affect noise and vibration effects. However, construction noise and vibration are temporary and highly localized effects. This reduces the potential for construction noise and vibration to contribute meaningfully to cumulative noise and vibration effects associated with other projects. Operational noise on the other hand is permanent and thus has more potential to contribute to cumulative noise effects on an on-going basis. However, BMPs for reducing noise related to operation and maintenance would reduce the potential for conveyance facility operations to contribute to cumulative noise effects.

BDCP project components are located primarily in rural agricultural areas including the primary zone of the Delta where there is little potential for project-related construction and operational noise and vibration to occur concurrently with or in proximity to noise and vibration from other development projects. There may, however, be situations in which noise and vibration from one or more projects identified in Table 23-86 could occur concurrently or in proximity to project components. Therefore, there could be a cumulative effect. Implementation of BMPs and other design measures incorporated into the project and Mitigation Measures NOI-1a, NOI-1b, NOI-2, and NOI-3 identified for project-specific effects would reduce noise and vibration impacts from

construction. However, there may be situations where construction noise and vibration effects would remain adverse. If these situations occur concurrently or in proximity to other noise- and vibration-generating projects, the BDCP's incremental contribution to adverse noise and vibration effects would be cumulatively considerable.

***CEQA Conclusion*:** Because implementation of BMPs and other design measures incorporated into the project, and mitigation measures identified for project-specific effects may not reduce significant construction noise and vibration impacts and operational noise impacts to less-than-significant levels in all cases, the project's incremental contribution to significant cumulative noise impacts is cumulatively considerable. This impact would be considered significant and unavoidable. Mitigation Measures NOI-1a, NOI-1b, NOI-2, and NOI-3 are designed to address project-level effects and would reduce the impact, but not to a less-than-significant level.

Mitigation Measure NOI-1a: Employ Noise-Reducing Construction Practices during Construction

Please see Mitigation Measure NOI-1a under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-1b: Prior to Construction, Initiate a Complaint/Response Tracking Program

Please see Mitigation Measure NOI-1b under Impact NOI-1 in the discussion of Alternative 1A.

Mitigation Measure NOI-2: Employ Vibration-Reducing Construction Practices during Construction of Water Conveyance Facilities

Please see Mitigation Measure NOI-2 under Impact NOI-2 in the discussion of Alternative 1A.

Mitigation Measure NOI-3: Design and Construct Intake Facilities and Other Pump Facilities Such That Operational Noise Does Not Exceed 50 dBA (One-Hour L_{eq}) during Daytime Hours (7:00 A.M. to 10:00 P.M.) or 45 dBA (One-Hour L_{eq}) during Nighttime Hours (10:00 P.M. to 7:00 A.M.) or the Applicable Local Noise Standard (Whichever Is Less) at Nearby Noise Sensitive Land Uses

Please see Mitigation Measure NOI-3 under Impact NOI-3 in the discussion of Alternative 1A.

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