3.10 Noise

This section evaluates the potential for noise and groundborne vibration impacts to result from implementation of the proposed Enhanced Watershed Management Program (EWMP). This includes the potential for the proposed program to result in impacts associated with a substantial temporary and/or permanent increase in ambient noise levels in the vicinity of the proposed program; exposure of people in the vicinity of the proposed program to excessive noise and groundborne vibration levels; and whether this exposure is in excess of applicable, established standards in the EWMP areas of Los Angeles County (County). Mitigation measures to reduce potential noise and vibration impacts are identified, where warranted.

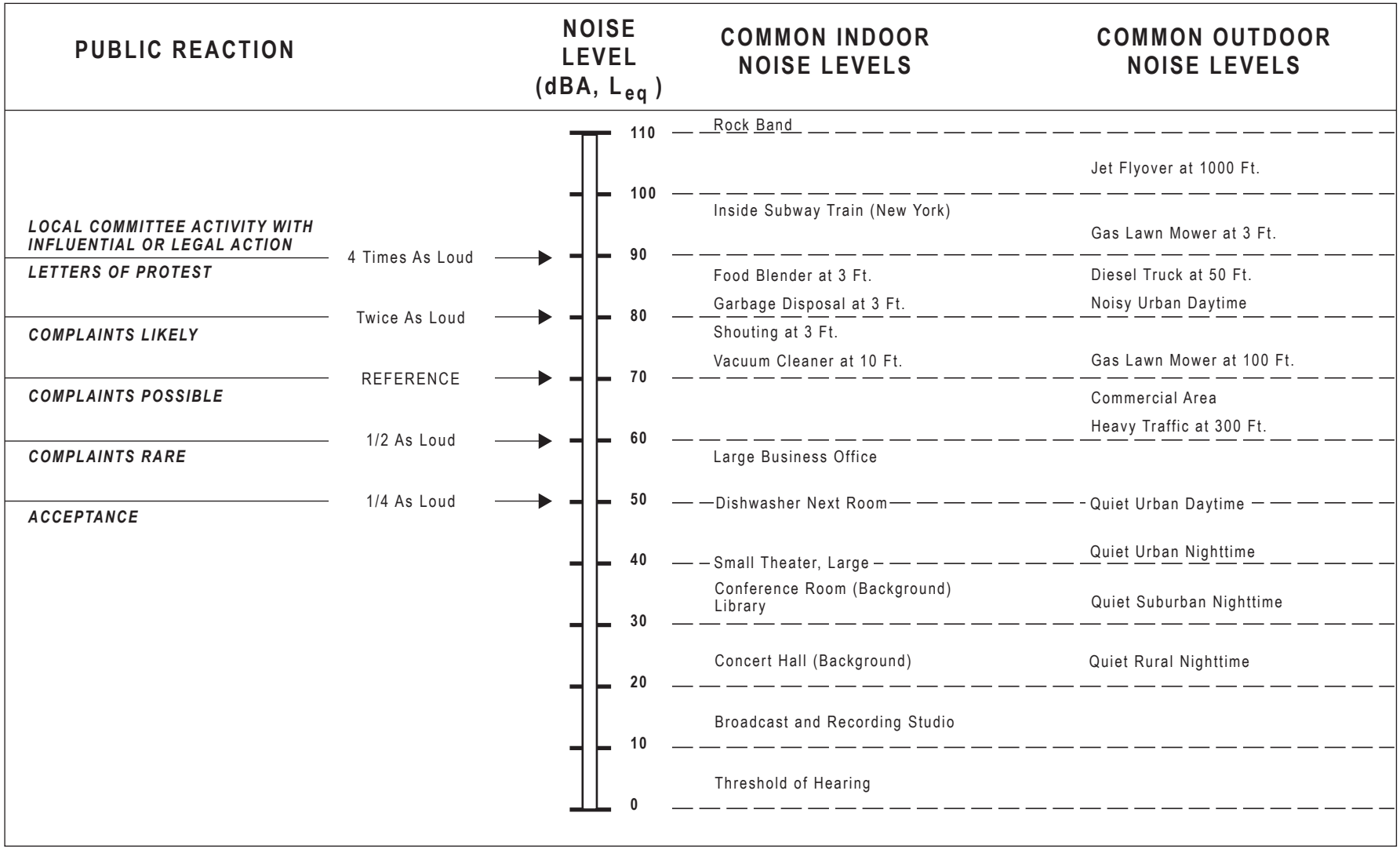
3.10.1 Principles of Noise and Vibration

Noise Principles and Descriptors

Noise is generally defined as unwanted sound, traveling in the form of waves from a source and exerting a sound pressure level (referred to as sound level) that is measured in decibels (dB), which is the standard unit of sound amplitude measurement. The dB scale is a logarithmic scale that describes the physical intensity of the pressure vibrations that make up any sound, with 0 dB corresponding roughly to the threshold of human hearing and 120 to 140 dB corresponding to the threshold of pain. Pressure waves traveling through air exert a force registered by the human ear as sound.

Sound pressure fluctuations can be measured in units of hertz (Hz), which correspond to the frequency of a particular sound. Typically, sound does not consist of a single frequency, but rather a broad band of frequencies varying in levels of magnitude. When all the audible frequencies of a sound are measured, a sound spectrum is plotted consisting of a range of frequency spanning 20 to 20,000 Hz. The sound pressure level, therefore, constitutes the additive force exerted by a sound corresponding to the sound frequency/sound power level spectrum.

The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum. As a consequence, when assessing potential noise impacts, sound is measured using an electronic filter that deemphasizes the frequencies below 1,000 Hz and above 5,000 Hz in a manner corresponding to the human ear's decreased sensitivity to extremely low and extremely high frequencies. This method of frequency weighting is referred to as A-weighting and is expressed in units of A-weighted decibels (dBA). A-weighting follows an international standard methodology of frequency deemphasis and is typically applied to community noise measurements. Some representative noise sources and their corresponding A-weighted noise levels are shown in **Figure 3.10-1**.



SOURCE: ESA

LA County PEIR EWMP . 140474

Figure 3.10-1
Effects of Noise on People

Noise Exposure and Community Noise

An individual's noise exposure is a measure of noise over a period of time. A noise level is a measure of noise at a given instant in time. The noise levels presented in Figure 3.10-1 are representative of measured noise at a given instant in time; however, they rarely persist consistently over a long period of time. Rather, community noise varies continuously over a period of time with respect to the contributing sound sources of the community noise environment. Community noise is primarily the product of many distant noise sources, which constitute a relatively stable background noise exposure, with the individual contributors unidentifiable. The background noise level changes throughout a typical day, but does so gradually, corresponding with the addition and subtraction of distant noise sources such as traffic. What makes community noise constantly variable throughout a day, besides the slowly changing background noise, is the addition of short duration, single-event noise sources (e.g., aircraft flyovers, motor vehicles, sirens), which are readily identifiable to the individual.

These successive additions of sound to the community noise environment change the community noise level from instant to instant, thus requiring that noise exposure be measured over a period of time to legitimately characterize a community noise environment and evaluate cumulative noise impacts. This time-varying characteristic of environmental noise is described using statistical noise descriptors. The most frequently used noise descriptors are summarized below:

L_{eq}: The L_{eq}, or equivalent sound level, is used to describe noise over a specified period of time in terms of a single numerical value; the L_{eq} of a time-varying signal and that of a steady signal are the same if they deliver the same acoustic energy over a given time. The L_{eq} may also be referred to as the average sound level.

L_{max}: The maximum, instantaneous noise level experienced during a given period of time.

L_{min}: The minimum, instantaneous noise level experienced during a given period of time.

L_{50}: The noise level that is equaled or exceeded 50 percent of the specified time period. The L_{50} represents the median sound level.

L_{90}: The noise level that is equaled or exceeded 90 percent of the specified time period. The L_{90} is generally considered to be representing the background or ambient level of a noise environment.

L_{dn}: Also termed the day-night average noise level (DNL), the L_{dn} is the average A-weighted noise level during a 24-hour day, obtained after an addition of 10 dBA to measured noise levels between the hours of 10:00 P.M. and 7:00 A.M. to account nighttime noise sensitivity.

CNEL: CNEL, or Community Noise Equivalent Level, is the average A-weighted noise level during a 24-hour day that is obtained after an addition of 5 dBA to measured noise levels between the hours of 7:00 P.M. and 10:00 P.M. and after an addition of 10 dBA to noise levels between the hours of 10:00 P.M. and 7:00 A.M. to account for noise sensitivity in the evening and nighttime, respectively.

Effects of Noise on People

Noise is generally loud, unpleasant, unexpected, or undesired sound that is typically associated with human activity that is a nuisance or disruptive. The effects of noise on people can be placed into four general categories:

- Subjective effects (e.g., dissatisfaction, annoyance)
- Interference effects (e.g., communication, sleep, and learning interference)
- Physiological effects (e.g., startle response)
- Physical effects (e.g., hearing loss)

Although exposure to high noise levels has been demonstrated to cause physical and physiological effects, the principal human responses to typical environmental noise exposure are related to subjective effects and interference with activities. Interference effects of environmental noise refer to those effects that interrupt daily activities and include interference with human communication activities, such as normal conversations, watching television, telephone conversations, and interference with sleep. Sleep interference effects can include both awakening and arousal to a lesser state of sleep. With regard to the subjective effects, the responses of individuals to similar noise events are diverse and are influenced by many factors, including the type of noise, the perceived importance of the noise, the appropriateness of the noise to the setting, the duration of the noise, the time of day and the type of activity during which the noise occurs, and individual noise sensitivity.

Overall, there is no completely satisfactory way to measure the subjective effects of noise, or the corresponding reactions of annoyance and dissatisfaction on people. A wide variation in individual thresholds of annoyance exists, and different tolerances to noise tend to develop based on an individual's past experiences with noise. Thus, an important way of predicting a human reaction to a new noise environment is the way it compares to the existing environment to which one has adapted (i.e., comparison to the ambient noise environment). In general, the more a new noise level exceeds the previously existing ambient noise level, the less acceptable the new noise level will be judged by those hearing it. With regard to increases in A-weighted noise level, the following relationships generally occur:

- Except in carefully controlled laboratory experiments, a change of 1 dBA cannot be perceived.
- Outside of the laboratory, a 3 dBA change in noise levels is considered to be a barely perceivable difference.
- A change in noise levels of 5 dBA is considered to be a readily perceivable difference.
- A change in noise levels of 10 dBA is subjectively heard as doubling of the perceived loudness.

These relationships occur in part because of the logarithmic nature of sound and the decibel system. The human ear perceives sound in a nonlinear fashion; hence, the decibel scale was developed.

Because the decibel scale is based on logarithms, two noise sources do not combine in a simple additive fashion, but rather logarithmically. For example, if two identical noise sources produce noise levels of 50 dBA, the combined sound level would be 53 dBA, not 100 dBA.

Noise Attenuation

Stationary point sources of noise, including stationary mobile sources such as idling vehicles, attenuate (lessen) at a rate between 6 dBA for hard sites and 7.5 dBA for soft sites for each doubling of distance from the reference measurement. Hard sites are those with a reflective surface between the source and the receiver, such as asphalt or concrete surfaces or smooth bodies of water. No excess ground attenuation is assumed for hard sites and the change in noise levels with distance (drop-off rate) is simply the geometric spreading of the noise from the source. Soft sites have an absorptive ground surface such as soft dirt, grass, or scattered bushes and trees. In addition to geometric spreading, an excess ground attenuation value of 1.5 dBA (per doubling distance) is normally assumed for soft sites. Line sources (such as traffic noise from vehicles) attenuate at a rate between 3 dBA for hard sites and 4.5 dBA for soft sites for each doubling of distance from the reference measurement (Caltrans, 1998).

Fundamentals of Vibration

As described in the Federal Transit Administration's (FTA's) *Transit Noise and Vibration Impact Assessment* (FTA, 2006), groundborne vibration can be a serious concern for nearby neighbors of a transit system route or maintenance facility, causing buildings to shake and rumbling sounds to be heard. In contrast to airborne noise, groundborne vibration is not a common environmental problem. It is unusual for vibration from sources such as buses and trucks to be perceptible, even in locations close to major roads. Some common sources of groundborne vibration are trains, buses on rough roads, and construction activities such as blasting, pile-driving, and operation of heavy earthmoving equipment.

There are several different methods that are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts to buildings. The root mean square (RMS) amplitude is most frequently used to describe the effect of vibration on the human body. The RMS amplitude is defined as the average of the squared amplitude of the signal. Decibel notation (VdB) is commonly used to measure RMS. The relationship of PPV to RMS velocity is expressed in terms of the "crest factor," defined as the ratio of the PPV amplitude to the RMS amplitude. PPV is typically a factor of 1.7 to 6 times greater than RMS vibration velocity (FTA, 2006). The decibel notation acts to compress the range of numbers required to describe vibration. Typically, groundborne vibration generated by man-made activities attenuates rapidly with distance from the source of the vibration. Sensitive receptors for vibration include structures (especially older masonry structures), people (especially residents, the elderly, and sick), and vibration-sensitive equipment.

The effects of groundborne vibration include movement of the building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. In extreme cases, the vibration can cause damage to buildings. Building damage is not a factor for most

projects, with the occasional exception of blasting and pile-driving during construction. Annoyance from vibration often occurs when the vibration levels exceed the threshold of perception by only a small margin. A vibration level that causes annoyance will be well below the damage threshold for normal buildings. The FTA measure of the threshold of architectural damage for conventional sensitive structures is 0.2 in/sec PPV (FTA, 2006).

In residential areas, the background vibration velocity level is usually around 50 VdB (approximately 0.0013 in/sec PPV). This level is well below the vibration velocity level threshold of perception for humans, which is approximately 65 VdB. A vibration velocity level of 75 VdB is considered to be the approximate dividing line between barely perceptible and distinctly perceptible levels for many people (FTA, 2006).

3.10.2 Environmental Setting

Existing Noise Sources

As the EWMP areas are located throughout Los Angeles County, existing noise levels in the EWMP areas would consist of various noise sources typically associated with highly urbanized environments. These noise sources commonly include, but are not limited to, traffic, construction work, commercial operations, human activities, emergency vehicles, aircraft overflights, etc. Of these sources, transportation-related noise associated with vehicular traffic is generally the constant, dominating noise source that comprises an urban environment's ambient noise levels. Vehicular traffic creates noise on roads and highways in residential, commercial, industrial, and mixed-use areas. Aside from vehicular traffic on roadways, other transportation-related noise sources include rail/urban transit systems and airports, which are also located throughout the County. Noise generated by stationary sources in an urban environment are generally associated with heating, ventilating, and air conditioning (HVAC) equipment for residential and commercial uses as well as other similar and larger mechanical stationary equipment for industrial uses. The use of larger-capacity stationary mechanical equipment by industrial uses generally results in higher noise levels in industrial-zoned areas when compared with residential or retail areas.

Existing Groundborne Vibration Levels

Aside from periodic construction work that may occur throughout the County where the EWMP areas are located, other sources of groundborne vibration in the County include heavy-duty vehicular travel (e.g., refuse trucks, delivery trucks, and transit buses) on local roadways. Trucks and buses traveling at a distance of 50 feet typically generate groundborne vibration velocity levels of around 63 VdB (approximately 0.006 in/sec PPV), and these levels could reach 72 VdB (approximately 0.016 in/sec PPV) where trucks pass over bumps in the road (FTA, 2006). In terms of PPV levels, a heavy-duty vehicle traveling at a distance of 50 feet can result in a vibration level of approximately 0.001 inch per second.

Sensitive Receptors

Noise-sensitive receptors are locations where people reside or where the presence of unwanted sound could adversely affect or disrupt the types of activities associated with the land use at the

location. Land uses such as residences, hotels, schools, rest homes, libraries, churches, and hospitals are generally more sensitive to noise than commercial and industrial land uses. As such, these types of land uses are considered to be noise-sensitive receptors. Given that the majority of the County is highly urbanized with a variety of land use types (e.g., open space, residential, commercial, mixed-use, public and semi-public, and industrial uses), and that the proposed program would be located in various watersheds across the County that span multiple jurisdictions, existing noise-sensitive uses such as residences, schools, guest lodging, hospitals, churches, parks, etc. would be located within and in proximity to the EWMP areas. As described in Section 3.9, *Land Use and Agriculture,* of this Program Environmental Impact Report (PEIR), many of the EWMP areas, including Ballona Creek, Beach Cities, Dominguez Channel, and Marina del Rey, have residential uses as the predominant land use.

3.10.3 Regulatory Setting

Federal

Federal Noise Standards

There are no federal noise standards that directly regulate environmental noise related to the construction or operation of the proposed program. With regard to noise exposure and workers, the Office of Safety and Health Administration (OSHA) regulations safeguard the hearing of workers exposed to occupational noise. Federal regulations also establish noise limits for medium and heavy trucks (more than 4.5 tons, gross vehicle weight rating) under 40 Code of Federal Regulations (CFR), Part 205, Subpart B. The federal truck pass-by noise standard is 80 dBA at 15 meters from the vehicle pathway centerline. These controls are implemented through regulatory controls on truck manufacturers.

Federal Transit Authority Vibration Standards

The FTA has adopted vibration standards that are used to evaluate potential building damage impacts related to construction activities. The vibration damage criteria adopted by the FTA are shown in **Table 3.10-1**.

TABLE 3.10-1
CONSTRUCTION VIBRATION DAMAGE CRITERIA

Building Category	PPV (in/sec)
I. Reinforced concrete, steel or timber (no plaster)	0.5
II. Engineered concrete and masonry (no plaster)	0.3
III. Non-engineered timber and masonry buildings	0.2
IV. Buildings extremely susceptible to vibration damage	0.12

SOURCE: FTA, 2006.

In addition, the FTA has also adopted standards associated with human annoyance for groundborne vibration impacts for the following three land-use categories: Vibration Category 1 – High Sensitivity, Vibration Category 2 – Residential, and Vibration Category 3 – Institutional.

The FTA defines Category 1 as buildings where vibration would interfere with operations within the building, including vibration-sensitive research and manufacturing facilities, hospitals with vibration-sensitive equipment, and university research operations. Vibration-sensitive equipment includes, but is not limited to, electron microscopes, high-resolution lithographic equipment, and normal optical microscopes. Category 2 refers to all residential land uses and any buildings where people sleep, such as hotels and hospitals. Category 3 refers to institutional land uses such as schools, churches, other institutions, and quiet offices that do not have vibration-sensitive equipment, but still have the potential for activity interference.

Under conditions where there are an infrequent number of events per day, the FTA has established thresholds of 65 VdB for Category 1 buildings, 80 VdB for Category 2 buildings, and 83 VdB for Category 3 buildings.[1] Under conditions where there are an occasional number of events per day, the FTA has established thresholds of 65 VdB for Category 1 buildings, 75 VdB for Category 2 buildings, and 78 VdB for Category 3 buildings.[2] No thresholds have been adopted or recommended for commercial and office uses.

State

California Department of Health Services Noise Standards

The California Department of Health Services (DHS) has established guidelines for evaluating the compatibility of various land uses as a function of community noise exposure. These guidelines for land use and noise exposure compatibility are shown in **Table 3.10-2**. In addition, Section 65302(f) of the California Government Code requires each county and city in the State to prepare and adopt a comprehensive long-range general plan for its physical development, with Section 65302(g) requiring a noise element to be included in the general plan. The noise element must: (1) identify and appraise noise problems in the community; (2) recognize Office of Noise Control guidelines; and (3) analyze and quantify current and projected noise levels.

The State of California also establishes noise limits for vehicles licensed to operate on public roads. For heavy trucks, the State pass-by standard is consistent with the federal limit of 80 dBA. The State pass-by standard for light trucks and passenger cars (less than 4.5 tons, gross vehicle rating) is also 80 dBA at 15 meters from the centerline. These standards are implemented through controls on vehicle manufacturers and by legal sanction of vehicle operators by state and local law enforcement officials.

1 "Infrequent events" is defined by the FTA as being fewer than 30 vibration events of the same kind per day.
2 "Occasional events" is defined by the FTA as between 30 and 70 vibration events of the same source per day.

TABLE 3.10-2
COMMUNITY NOISE EXPOSURE (L_{dn} OR CNEL)

Land Use	Normally Acceptable[a]	Conditionally Acceptable[b]	Normally Unacceptable[c]	Clearly Unacceptable[d]
Single-family, Duplex, Mobile Homes	50 - 60	55 - 70	70 - 75	above 75
Multi-Family Homes	50 - 65	60 - 70	70 - 75	above 75
Schools, Libraries, Churches, Hospitals, Nursing Homes	50 - 70	60 - 70	70 - 80	above 80
Transient Lodging – Motels, Hotels	50 - 65	60 - 70	70 - 80	above 75
Auditoriums, Concert Halls, Amphitheaters	---	50 - 70	---	above 70
Sports Arena, Outdoor Spectator Sports	---	50 - 75	---	above 75
Playgrounds, Neighborhood Parks	50 - 70	---	67 - 75	above 75
Golf Courses, Riding Stables, Water Recreation, Cemeteries	50 - 75	---	70 - 80	above 80
Office Buildings, Business and Professional Commercial	50 - 70	67 - 77	above 75	---
Industrial, Manufacturing, Utilities, Agriculture	50 - 75	70 - 80	above 75	---

[a] Normally Acceptable: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction without any special noise insulation requirements.

[b] Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

[c] Normally Unacceptable: New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

[d] Clearly Unacceptable: New construction or development should generally not be undertaken.

SOURCE: Office of Planning and Research, State of California Genera Plan Guidelines, October 2003 (in coordination with the California Department of Health Services).

State Vibration Standards

There are no state vibration standards applicable to the proposed program. Moreover, according to the California Department of Transportation's (Caltrans') *Transportation and Construction Vibration Guidance Manual* (2013), there are no official Caltrans standards for vibration. However, this manual provides guidelines for assessing vibration damage potential to various types of buildings, ranging from 0.08 to 0.12 in/sec PPV for extremely fragile historic buildings, ruins, and ancient monuments to 0.50 to 2.0 in/sec PPV for modern industrial/commercial buildings. The vibration criteria for structural damage and human annoyance established in Caltrans' *Transportation and Construction Vibration Guidance Manual* (2013) are shown in **Tables 3.10-3** and **3.10-4**, respectively.

TABLE 3.10-3
CALTRANS VIBRATION DAMAGE POTENTIAL THRESHOLD CRITERIA

	Maximum PPV (in/sec)	
Structure and Condition	**Transient Sources**	**Continuous/Frequent Intermittent Sources**
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

NOTE: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile-drivers, pogo-stick compactors, crack and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

SOURCE: Caltrans, Transportation and Construction Vibration Guidance Manual, September 2013.

TABLE 3.10-4
CALTRANS VIBRATION ANNOYANCE POTENTIAL CRITERIA

	Maximum PPV (in/sec)	
Structure and Condition	**Transient Sources**	**Continuous/Frequent Intermittent Sources**
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.9	0.10
Severe	2.0	0.4

NOTE: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile-drivers, pogo-stick compactors, crack and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

SOURCE: Caltrans, Transportation and Construction Vibration Guidance Manual, September 2013.

Local

County of Los Angeles General Plan Noise Element

The California Government Code Section 65302(g) requires that a noise element be included in the General Plan of each county and city in the state. The Noise Element of the County of Los Angeles General Plan was established as a planning tool to develop strategies and action programs that address the multitude of noise sources and issues throughout the County. The noise guidelines used by the County are based on the community noise compatibility guidelines established by the State of California DHS (refer to Table 3.10-2), as described above. Specific regulations that implement these guidelines are set forth in the Los Angeles County Municipal Code as discussed below.

County of Los Angeles Municipal Code

Chapter 12.08, Noise Control, of the County of Los Angeles Municipal Code serves as the Noise Ordinance for the County and establishes noise standards to control unnecessary, excessive, and annoying noise and vibration in the County. Within Chapter 12.08 of the Los Angeles County Code, Section 12.08.380 assigned the following noise zones for receptor properties in the County:

1. Noise Zone 1 – Noise-sensitive areas
2. Noise Zone 2 – Residential properties
3. Noise Zone 3 – Commercial properties
4. Noise Zone 4 – Industrial properties

With respect to operational noise, Section 12.08.390 of the Noise Ordinance established exterior noise levels that should be applied to all receptor properties within a designated noise zone in the County. These exterior noise levels are shown in **Table 3.10-5**.

TABLE 3.10-5
COUNTY OF LOS ANGELES EXTERIOR NOISE STANDARDS BY NOISE ZONES

Noise Zone	Designated Noise Zone Land Use (Receptor Property)	Time Interval	Exterior Noise Level (dBA)
I	Noise-sensitive area	Anytime	45
II	Residential properties	10:00 P.M. to 7:00 A.M. (nighttime)	45
		7:00 A.M. to 10:00 P.M. (daytime)	50
III	Commercial properties	10:00 P.M. to 7:00 A.M. (nighttime)	55
		7:00 A.M. to 10:00 P.M. (daytime)	60
IV	Industrial properties	Anytime	70

SOURCE: County of Los Angeles Ordinance No. 11743, Section 12.08.390.

The exterior noise levels shown in Table 3.10-5 are meant to be further applied as noise standards based on the duration of the noise; i.e., the louder the noise, the shorter the time it is allowed to last. The Noise Ordinance uses a number of noise metrics to define the permissible noise levels. These metrics include L_{50}, L_{25}, $L_{8.3}$, $L_{1.7}$, and L_{max}, and are based upon a 1-hour timeframe which indicates exceedances of 50, 25, 8.3, and 1.7 percent of the time, plus the maximum sound level during that time period. The following noise standards should be applied to the exterior noise levels provided in Table 3.10-5:

- Standard No. 1 shall be the exterior noise level that may not be exceeded for a cumulative period of more than 30 minutes in any hour. Standard No. 1 shall be the applicable noise

level from Table 3.10-5; or, if the ambient L_{50} exceeds the forgoing level, then the ambient L_{50} becomes the exterior noise level for Standard No. 1.

- Standard No. 2 shall be the exterior noise level that may not be exceeded for a cumulative period of more than 15 minutes in any hour. Standard No. 2 shall be the applicable noise level from Table 3.10-5 plus 5 dB(A); or, if the ambient L_{25} exceeds the forgoing level, then the ambient L_{25} becomes the exterior noise level for Standard No. 2.
- Standard No. 3 shall be the exterior noise level that may not be exceeded for a cumulative period of more than 5 minutes in any hour. Standard No. 3 shall be the applicable noise level from Table 3.10-5 plus 20 dB(A); or, if the ambient $L_{8.3}$ exceeds the forgoing level, then the ambient $L_{8.3}$ becomes the exterior noise level for Standard No. 3.
- Standard No. 4 shall be the exterior noise level that may not be exceeded for a cumulative period of more than one minute in any hour. Standard No. 4 shall be the applicable noise level from Table 3.10-5 plus 15 dB(A); or, if the ambient $L_{1.7}$ exceeds the forgoing level, then the ambient $L_{1.7}$ becomes the exterior noise level for Standard No. 4.
- Standard No. 5 shall be the exterior noise level that may not be exceeded for any period of time. Standard No. 5 shall be the applicable noise level from Table 3.10-5 plus 20 dB(A); or, if the ambient L_0 exceeds the forgoing level, then the ambient L_0 becomes the exterior noise level for Standard No. 5.

Section 12.08.400 of the Noise Ordinance also established interior noise standards for dwelling units in the County based on the allowable interior noise levels shown in **Table 3.10-6**.

TABLE 3.10-6
COUNTY OF LOS ANGELES INTERIOR NOISE STANDARDS FOR DWELLING UNITS

Noise Zone	Designated Land Use	Time Interval	Allowable Interior Noise Level (dBA)
All	Multifamily	10:00 P.M. to 7:00 A.M.	40
	Residential	7:00 A.M. to 10:00 P.M.	45

SOURCE: County of Los Angeles Ordinance No. 11743, Section 12.08.400.

As indicated in Section 12.08.400, no person is allowed to operate or cause to be operated within a dwelling unit any source of sound, or allow the creation of any noise, that causes the noise level when measured inside a neighboring receiving dwelling unit to exceed the following standards:

- Standard No. 1. The applicable interior noise level from Table 3.10-6 for cumulative period of more than 5 minutes in any hour.
- Standard No. 2. The applicable interior noise level from Table 3.10-6 plus 5 dB(A) for a cumulative period of more than 1 minute in any hour.
- Standard No. 3. The applicable interior noise level from Table 3.10-6 plus 10 dB(A) or the maximum measured ambient noise level for any period of time.

With respect to construction noise in the County, Section 12.08.440 of the Noise Ordinance prohibits the operation of any tools or equipment used between weekday hours of 7:00 P.M. and 7:00 A.M., or at any time on Sundays or holidays, that will create a noise disturbance across a residential or commercial real-property line. The only exceptions would be emergency work or public safety projects (Section 12.08.0570, part 5, exemption H, Public Health and Safety Activities) or by variance issued by the health officer. Additionally, both the working hours and maximum levels of equipment and activity noise that are allowable from both mobile and stationary equipment in the County are defined by land use and shown in **Table 3.10-7**.

TABLE 3.10-7
COUNTY OF LOS ANGELES CONSTRUCTION NOISE STANDARDS

Allowable Work Dates & Hours	Residential Structures					
	Single-Family		Multi-Family		Semi-Residential/Commercial	
	Mobile Equipment [a]	Stationary Equipment [b]	Mobile Equipment [a]	Stationary Equipment [b]	Mobile Equipment [a]	Stationary Equipment [b]
Daily 7:00 A.M. to 8:00 P.M.[c]	75 dBA	60 dBA	80 dBA	65 dBA	85 dBA	70 dBA
Daily 8:00 P.M. to 7:00 A.M.[d]	60 dBA	50 dBA	64 dBA	55 dBA	70 dBA	60 dBA
	Business Structures					
Daily[d]	85 dBA					

[a] Represents maximum noise levels for nonscheduled, intermittent, short-term operation (less than 10 days).
[b] Represents maximum noise level for repetitively scheduled and relatively long-term operation (periods of 10 days or more).
[c] Exception for Sundays and legal holidays.
[d] Includes all day Sunday and legal holidays.

SOURCE: County of Los Angeles Ordinance No. 11743, Section 12.08.440.

County of Los Angeles Groundborne Vibration Regulation

With respect to vibration, the County Noise Ordinance identifies a presumed perception threshold of 0.01 inches per second over the range of 1 to 100 hertz . Section 12.08.560 of the County Noise Ordinance prohibits the operation of any device that creates vibration above the vibration perception threshold of any individual at or beyond the property boundary of the source if on private property, or at 150 feet (46 meters) from the source if on a public space or public right-of-way.

City General Plans and Municipal Codes

The EWMP areas associated with the proposed program are located in multiple jurisdictions of Los Angeles County, which aside from the County also includes 46 cities. Each of these cities has their own independent General Plan and municipal code that regulates noise levels from various sources within their jurisdictional boundaries. Given that a project-level analysis for each structural BMP proposed in the EWMPs is beyond the scope of this PEIR, an extensive listing of

the noise policies and regulations of each of the participating Permittees is not provided in this PEIR.

3.10.4 Impact Assessment

The proposed program's potential impacts have been assessed using the California Environmental Quality Act (CEQA) Guidelines Appendix G Checklist. The following sections discuss the key issue areas identified in the CEQA Guidelines with respect to the proposed program's potential effect due to noise and vibration.

Thresholds of Significance

For the purposes of this PEIR and consistency with Appendix G of the CEQA Guidelines, the proposed program would have a significant noise impact if it would:

- Result in exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
- Result in exposure of persons to, or generation of, excessive groundborne vibration or groundborne noise levels.
- Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
- Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.
- For a project located within an airport land use plan area, or, where such a plan has not been adopted, in an area within 2 miles of a public airport or public use airport, expose people residing or working in the area to excessive noise levels.
- For a project located in the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels.

Program Impact Discussion

Noise Levels Standard Exceedance

Impact 3.10-1: The proposed program could result in exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

Structural (Regional, Centralized, and Distributed) BMPs

Construction

Implementation of the proposed program would involve the installation of structural control measures that would be constructed as BMPs to reduce the impact of stormwater and non-stormwater on receiving water quality within the EWMP areas. Construction of the various structural BMPs proposed in the EWMP is anticipated to occur intermittently over the program implementation period. The proposed locations of individual BMPs are subject to change throughout the EWMP planning process. Definitive construction equipment lists, material lists,

construction methods, construction schedules, and workforce details would be developed in the future as specific structural BMP projects are finalized according to the EWMPs.

The construction noise impacts associated with each individual structural BMP project would be short-term in nature and limited to the period of time when construction activity is taking place for that particular project. Construction activity noise levels at and near each structural BMP construction site would fluctuate depending on the particular type, number, and duration of usage of various pieces of construction equipment. Generally, development at each BMP construction site may require the use of heavy construction equipment for activities such as site preparation, grading and excavation, and the physical development of the structural BMP. Development activities could also involve the use of smaller power tools, generators, and other sources of noise. During each stage of development for each individual structural BMP project, there would be a different mix of equipment operating and noise levels would vary based on the amount and type of equipment in operation and the location of the activity.

The USEPA has compiled data for outdoor noise levels for typical construction activities. These data are presented in **Table 3.10-8**. The noise levels shown in Table 3.10-8 represent composite noise levels associated with typical construction activities, which take into account both the number of pieces and spacing of heavy construction equipment that are typically used during each phase of construction. These noise levels would diminish rapidly with distance from the construction site at a rate of approximately 6 dBA per doubling of distance. For example, a noise level of 84 dBA L_{eq} measured at 50 feet from the noise source to the receptor would reduce to 78 dBA L_{eq} at 100 feet from the source to the receptor, and reduce by another 6 dBA L_{eq} to 72 dBA L_{eq} at 200 feet from the source to the receptor. **Table 3.10-9** shows the typical maximum and average noise levels produced by various types of construction equipment.

TABLE 3.10-8
TYPICAL OUTDOOR CONSTRUCTION NOISE LEVELS

Construction Phase	Noise Level (dBA, $_{Leq}$)[a]
Ground Clearing	84
Excavation	89
Foundations	78
Erection	85
Finishing	89

[a] Average noise levels correspond to a distance of 50 feet from the noisiest piece of equipment associated with a given phase of construction and 200 feet from the rest of the equipment associated with that phase.

SOURCE: USEPA, 1971.

TABLE 3.10-9
TYPICAL NOISE LEVELS FROM CONSTRUCTION EQUIPMENT

Construction Equipment	Maximum Noise Level (dBA, L_{max} at 50 feet)	Average Noise Level (dBA, L_{eq} at 50 feet)[a]
Air Compressor	78	74
Backhoe	78	74
Chain Saw	84	77
Compactor (Ground)	83	76
Concrete Mixer Truck	79	75
Concrete Pump Truck	81	74
Concrete Saw	90	83
Crane	81	73
Dozer	82	78
Dump Truck	77	73
Excavator	81	77
Generator	82	79
Flat-Bed Truck	74	70
Front End Loader	79	75
Grader	85	81
Jack Hammer	89	82
Pavement Scarafier	90	83
Paver	77	74
Pneumatic Tool	85	82
Pumps	81	78
Roller	80	73
Scraper	84	80
Tractor	84	80
Vacuum Street Sweeper	82	72
Vibratory Concrete Mixer	80	73
Welder/Torch	74	70

[a] The average noise levels for the construction equipment at 50 feet were calculated from the maximum noise levels using the usage factors for each piece of equipment provided in the FHWA's RCNM.

SOURCE: FHWA, 2006.

As shown in Table 3.10-8, excavation activities can typically generate noise levels of 89 dBA L_{eq} at 50 feet from the construction noise source. Given the urbanized environment of many of the EWMP areas, many of the structural BMP projects would be constructed in proximity or adjacent to existing land uses, including those that are noise-sensitive uses. The construction activities for each structural BMP project would temporarily expose their respective existing off-site surrounding land uses to increased noise levels while construction activities are ongoing. This would be most applicable to the distributed BMPs, which are most likely to be implemented in

high-density urban, commercial, industrial, and transportation areas where they will either replace or improve upon existing stormwater infrastructure. While the larger centralized and regional structural BMP projects (which require a larger footprint than the distributed BMPs) would occur mostly in existing open space areas that may have greater buffer distances to nearby surrounding land uses, there may still be incidences where a proposed centralized or regional structural BMP site could be located directly adjacent to an existing noise-sensitive land use. Where a proposed structural BMP site is located adjacent or in proximity to existing land uses, the construction activities at the structural BMP site would expose these off-site land uses to increased temporary and intermittent noise levels that are substantially greater than existing ambient noise levels in the area.

While construction noise levels may be exempt from the noise regulations of most of the implementing agencies, there may also be instances where some of the implementing agencies have their own established numerical noise standard for construction noise levels, such as the County of Los Angeles, City of Los Angeles, and the City of El Segundo. Although it is generally anticipated that construction of the structural BMPs would comply with such construction noise standards, there may be scenarios where these local numerical noise standards could potentially be exceeded. As a result, under these conditions, construction noise impacts would be potentially significant.

Mitigation Measure NOISE-1 would reduce construction noise impacts, requiring construction activities to be conducted in accordance with the applicable local noise regulations and standards, the implementation of noise reduction devices and techniques during construction activities, and advance notification to the surrounding noise-sensitive receptors of a structural BMP site about upcoming construction activities and their hours of operation. This would serve to reduce the construction-related noise levels at nearby receptors to the maximum extent feasible. However, as discussed previously, for implementing agencies that have established numerical noise standards for construction activities, there may be circumstances where the construction activities for a particular structural BMP project may exceed established thresholds. . Because of the possibility that certain structural BMP projects may exceed noise levels established by their respective local jurisdictions, this impact would be significant and unavoidable.

Operation

As discussed previously, the majority of the distributed, centralized, and regional structural BMPs would operate passively in the sense that they would not require the use of mechanized stationary equipment for their operation; however, it is anticipated that some of the centralized and regional structural BMPs would require the use of irrigation pump stations and associated components to divert the collected stormwater. At these structural BMP sites, operational noise levels would result from operation of the pumps and associated components. However, as a stationary noise source, the pumping equipment used at a structural BMP site would be required to comply with the applicable exterior noise standards and/or regulations established by the implementing agency that has jurisdiction over the site. Additionally, it is anticipated that many of the irrigation pumps would be located belowground and all other noise-producing components (e.g., generators) would be enclosed. As such, the noise levels generated by on-site pumps and associated components at structural BMP sites associated with the project would not exceed or violate noise standards and regulations established by implementing agencies in the EWMP areas. **Mitigation Measure NOISE-2** would be implemented to ensure that the operational noise levels occurring at structural

BMP sites that employ stationary mechanized equipment would be required to adhere and comply with the local noise standards established by the responsible implementing agency. Thus, with implementation of Mitigation Measure NOISE-2, operational noise impacts would be less than significant.

Mitigation Measures:

NOISE-1: The implementing agencies shall implement the following measures during construction as needed:

- Include design measures necessary to reduce the construction noise levels to where feasible. These measures may include noise barriers, curtains, or shields.
- Place noise-generating construction activities (e.g., operation of compressors and generators, cement mixing, general truck idling) as far as possible from the nearest noise-sensitive land uses.
- Locate stationary construction noise sources as far from adjacent noise-sensitive receptors as possible.
- If construction is to occur near a school, the construction contractor shall coordinate the with school administration in order to limit disturbance to the campus. Efforts to limit construction activities to non-school days shall be encouraged.
- For the centralized and regional BMP projects located adjacent to noise-sensitive land uses, identify a liaison for these off-site sensitive receptors, such as residents and property owners, to contact with concerns regarding construction noise and vibration. The liaison's telephone number(s) shall be prominently displayed at construction locations.
- For the centralized and regional BMP projects located adjacent to noise-sensitive land uses, notify in writing all landowners and occupants of properties adjacent to the construction area of the anticipated construction schedule at least 2 weeks prior to groundbreaking.

NOISE-2: All structural BMPs that employ mechanized stationary equipment that generate noise levels shall comply with the applicable noise standards established by the implementing agency with jurisdiction over the structural BMP site. The equipment shall be designed with noise-attenuating features (e.g., enclosures) and/or located at areas (e.g., belowground) where nearby noise-sensitive land uses would not be exposed to a perceptible noise increase in their noise environment.

Significance Determination: Significant and unavoidable with mitigation for construction; less than significant with mitigation for operations. (The application of these mitigation measures to specific BMP types and categories are identified in Table 3.10-11.)

Non-Structural (Institutional) BMPs

As discussed in Chapter 2.0, *Project Description*, non-structural/institutional BMPs do not include the construction of new facilities. Consequently, there would be no impacts related to construction noise.

Mitigation Measures: None required

Significance Determination: No impact

Groundborne Vibration

Impact 3.10-2: The proposed program could result in exposure of persons to, or generation of, excessive groundborne vibration.

Structural (Regional, Centralized, and Distributed) BMPs

Construction of many of the structural BMP projects would include activities such as site preparation, grading, and excavation, which would have the potential to generate low levels of groundborne vibration. Persons residing and working in an area located in proximity to a structural BMP site could be exposed to some degree of groundborne vibration or groundborne noise levels related to construction activities. Ground vibrations from construction activities only rarely reach the levels that can damage structures, but they can be perceived in the audible range and be felt in buildings very close to a construction site.

Construction activities for the various structural BMP projects would have the potential to impact their respective nearby land uses. Given the urbanized environment of the County, the potential exists for construction of a structural BMP project, especially the distributed structural BMPs that would most likely be implemented in existing high-density areas, to be located within 25 feet of an adjacent noise-sensitive land use. Consequently, existing off-site receptors that are located immediately adjacent to these structural BMP sites could be exposed to some degree of groundborne vibration. The various PPV and RMS velocity (in VdB) levels for the types of construction equipment that could operate during the construction of the structural BMP projects are identified in **Table 3.10-10**. Based on the information presented in Table 3.10-11, vibration velocities could reach as high as approximately 0.089-inch-per-second PPV at 25 feet from the operation of a large bulldozer. This corresponds to an RMS velocity level (in VdB) of 87 VdB at 25 feet from the large bulldozer.

For the types of construction methods required to construct the various structural BMPs, vibration levels at nearby sensitive receptors would not approach the Caltrans damage thresholds presented in Table 3.10-3. Although some vibration may be experienced locally, vibration-related impacts from implementation of structural BMPs would be less than significant.

TABLE 3.10-10
VIBRATION VELOCITIES FOR CONSTRUCTION EQUIPMENT

Construction Equipment	PPV at 25 feet (inches/second)	RMS at 25 feet (VdB)
Large Bulldozer	0.089	87
Loaded Trucks	0.076	86
Jackhammer	0.035	79
Small Bulldozer	0.003	58

SOURCE: FTA, 2006.

Mitigation Measures: None required

Significance Determination: Less than significant

Non-Structural (Institutional) BMPs

As discussed in Chapter 2.0, *Project Description*, non-structural/institutional BMPs do not include the construction of new facilities. Consequently, there would be no impacts related to groundborne vibration or noise.

Mitigation Measures: None required

Significance Determination: No impact

Permanent Ambient Noise Levels Increase

Impact 3.10-3: The proposed program could result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.

Structural (Regional, Centralized, and Distributed) BMPs

Given that the majority of the distributed, centralized, and regional structural BMPs would operate in a passive manner (i.e., would not require the use of mechanized stationary equipment) after their construction, no operational noise levels would be generated by these structural BMPs. However, it is anticipated that that some of the centralized and regional structural BMPs would require the use of irrigation pump stations and associated components to divert the collected stormwater. At these structural BMP sites, noise levels generated from the long-term operation of the pumps and associated components could result in increased noise levels in the surrounding noise environment. However, as discussed under Impact 3.10-1, the pumping equipment used at a structural BMP site would be required to comply with the applicable exterior noise standards and/or regulations established by the implementing agency that has jurisdiction over the site. In addition, many of the irrigation pumps would primarily be located belowground and all other noise-producing components (e.g., generators) would be enclosed. Furthermore, with implementation of **Mitigation Measure NOISE-1**,which would require the stationary mechanized equipment employed at each structural BMP site to comply with the local noise

standards established by the responsible implementing agency with jurisdiction over the site, and for the equipment to be designed and located in a manner such that neighboring sensitive land uses would not be exposed to a perceptible noise increase in their environment (**Mitigation Measure NOISE-2)**, this impact would be less than significant.

Mitigation Measures: Implementation of **Mitigation Measures NOISE-1** and **NOISE-2**

Significance Determination: Less than significant with mitigation (The application of these mitigation measures to specific BMP types and categories are identified in Table 3.10-11.)

Non-Structural (Institutional) BMPs

As discussed in Chapter 2.0, *Project Description*, non-structural/institutional BMPs do not include the operation of new facilities. Consequently, there would be no impacts related to a substantial permanent increase in ambient noise levels resulting from implementation of the non-structural BMPs.

Mitigation Measures: None required

Significance Determination: No impact

Temporary Ambient Noise Levels Increase

Impact 3.10-4: The proposed program could result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

Structural (Regional, Centralized, and Distributed) BMPs

During construction of the distributed, centralized, and regional structural BMPs, temporary or periodic increases in noise levels in and around each structural BMP site would result from the operation of construction equipment. As discussed in Impact 3.10-1, the construction activities for each individual structural BMP project would expose their respective nearby existing land uses to increased noise levels. Where a structural BMP site is located within 25 feet of an existing noise-sensitive land use, the resulting construction noise levels at that existing land use could reach as high as 95 dBA L_{eq} during excavation activities, which would result in a substantial noise increase over existing ambient noise levels at that existing land use. Although implementation of **Mitigation Measure NOISE-1** would reduce construction noise levels associated with the proposed program to the maximum extent feasible, under circumstances where future structural BMP sites are located immediately adjacent to existing sensitive land uses, the noise impacts related to a substantial temporary or periodic increase in ambient noise levels above levels existing without the structural BMPs would remain significant. Therefore, this impact for the proposed program would be significant and unavoidable. The identification of a significant and unavoidable program-level impact in this PEIR for the proposed program, however, does not preclude the finding of future less-than-significant impacts for individual structural BMP projects.

Mitigation Measures: Implementation of **Mitigation Measure NOISE-1**

Significance Determination: Significant and unavoidable with mitigation (The application of this mitigation measure to specific BMP types and categories are identified in Table 3.10-11.)

Non-Structural (Institutional) BMPs

As discussed in Chapter 2.0, *Project Description*, non-structural/institutional BMPs do not include the construction of new facilities. Consequently, there would be no impacts related to a substantial temporary or periodic increase in ambient noise levels resulting from implementation of the non-structural BMPs.

Mitigation Measures: None required

Significance Determination: No impact

Exposure of Excessive Airport Noise Levels

Impact 3.10-5: For a project located within an airport land use plan area, or, where such a plan has not been adopted, in an area within 2 miles of a public airport or public use airport, implementation of the proposed program could expose people residing or working in the area to excessive noise levels.

Structural (Regional, Centralized, and Distributed) BMPs

The Distributed, Centralized, and Regional structural BMPs that would be implemented as part of the proposed program would serve to reduce the impact of stormwater and non-stormwater on receiving water quality and address the water quality priorities as defined by the MS4 Permit. While some of these structural BMPs could potentially occur at paved areas of airports (excluding the landing areas and taxiways, which have specific aircraft support requirements) and the undeveloped buffer zones around airports, no permanent residents or workers would be introduced to these areas under the proposed program. While maintenance and inspection of the structural BMPs would occur, these activities would only occur periodically and would be minimal during project operations. Therefore the proposed program would not introduce permanent future residents or workers to the structural BMP areas and as such would not expose persons to excessive airport-related noise levels. Exposure to airport noise would be a less than significant impact.

Mitigation Measures: None required

Significance Determination: Less than significant

Non-Structural (Institutional) BMPs

As discussed in Chapter 2.0, *Project Description*, non-structural/institutional BMPs do not include the construction of new facilities. Consequently, there would be no impacts related to the exposure of people to excessive noise levels associated with a public airport or public use airport.

Mitigation Measures: None required

Significance Determination: No impact

Exposure of Persons to Excessive Private Airstrip Noise Levels

Impact 3.10-6: For a project located in the vicinity of a private airstrip, the proposed program could expose people residing or working in the project area to excessive noise levels.

Structural (Regional, Centralized, and Distributed) BMPs

As discussed under Impact 3.10-5 above, the proposed program would not introduce permanent future residents or workers to the structural BMP areas. Thus, while future structural BMP sites could be located in the vicinity of private airstrips, no persons would be exposed to excessive airstrip-related noise levels. Exposure to airstrip-related noise would be a less than significant impact.

Mitigation Measures: None required

Significance Determination: Less than significant

Non-Structural (Institutional) BMPs

As discussed in Chapter 2.0, *Project Description*, non-structural/institutional BMPs do not include the construction of new facilities. Consequently, there would be no impacts related to the exposure of people to excessive noise levels associated with a private airstrip.

Mitigation Measures: None required

Significance Determination: No impact

Cumulative Impact Discussion

Structural (Regional, Centralized, and Distributed) BMPs

Noise and vibration are both defined as localized phenomena that significantly reduce in magnitude as distance from the source increases. The structural BMPs associated with the proposed program would be constructed in multiple jurisdictions of Los Angeles County, which aside from the County also includes 46 cities and LACFCD. As such, these structural BMP projects would be generally spread over a large geographic area within the County. These structural BMPs in combination with other current and planned projects in the County would result in an increase in construction-related noise levels, which would temporarily increase the ambient noise levels of the existing noise environment in areas where a construction project would occur. This would result in significant and unavoidable impacts for construction, but less than significant for operation.

Mitigation Measures: Implementation of **Mitigation Measures NOISE-1** and **NOISE-2**

Significance Determination: Significant and unavoidable with mitigation for construction; Less than significant for operation. (The application of these mitigation measures to specific BMP types and categories are identified in Table 3.10-11.)

Non-Structural (Institutional) BMPs

As discussed in Chapter 2.0, *Project Description*, non-structural/institutional BMPs do not include the construction of new facilities. Consequently, there would be no new facilities that would contribute to cumulative noise impacts. As such, no impacts related to cumulative noise would occur.

Mitigation Measures: None required

Significance Determination: No impact

Summary of Impact Assessment

Table 3.10-11 shows a summary of the structural BMPs requiring mitigation.

TABLE 3.10-11
SUMMARY OF NOISE IMPACTS REQUIRING MITIGATION MEASURES

	Thresholds of Significance				
Regional BMPs	**Exceed Noise Standards**	**Vibration**	**Ambient Noise**	**Exposure to Airport Noise**	**Cumulative Impacts**
Applicable Mitigation Measures:	**NOISE-1; NOISE-2**	**None Required**	**NOISE-1**	**None Required**	**NOISE-1; NOISE-2**
Regional Detention and Infiltration	Yes	Yes	Yes	No	Yes
Regional Capture, Detention and Use	Yes	Yes	Yes	No	Yes
Centralized BMP					
Bioinfiltration	Yes	Yes	Yes	No	Yes
Constructed Wetlands	No	No	No	No	No
Treatment/Low Flow Diversions	No	No	No	No	No
Creek, River, Estuary Restoration	No	No	No	No	No
Distributed BMPs					
Site Scale Detention	No	No	No	No	No
LID – Infiltration/Filtration BMPs – Porous Pavement, Green Streets, Bioswale/Filter Strips, downspout disconnects	No	No	No	No	No
LID – Green Infrastructure – Capture and Use – Cisterns, Rain Barrels, Green roofs, Planter Boxes	No	No	No	No	No
Flow through Treatment BMPs	No	No	No	No	No
Source Control Treatment BMPs (catch basin inserts/screens, hydrodynamic separators, gross solids removal devices)	No	No	No	No	No
Low Flow Diversions	No	No	No	No	No

NOTE: These conclusions are based on typical size and function of BMPs.