
Section 4-7

Noise

This section includes a summary of applicable regulations, a description of ambient noise conditions, and an analysis of potential noise impacts of the proposed project. Traffic noise modeling is included in Appendix G. Mitigation measures are recommended, as necessary, to reduce significant noise impacts.

4-7.1 STUDY METHODS

Evaluation of noise-related impacts associated with the proposed project included assessment of short-term (i.e., construction) and long-term (i.e., operational) noise impacts. Short-term noise impacts were assessed based on noise levels typically associated with construction equipment. The evaluation of long-term noise impacts included evaluation of proposed onsite noise-generating land uses and increased traffic noise levels along area roadways. The significance of noise-related impacts was evaluated in comparison to applicable City and County noise standards.

4-7.1.1 Acoustic Fundamentals

“Noise” is generally defined as sound that is loud, disagreeable, or unexpected. “Sound”, as described in more detail below, is mechanical energy transmitted in the form of a wave because of a disturbance or vibration.

4-7.1.1.1 Amplitude

“Amplitude” is the difference between the ambient air pressure and the peak pressure of the sound wave. Amplitude is measured in decibels (dB) on a logarithmic scale. For example, a 65-dB source of sound, such as a truck, when joined by another 65-dB source results in sound amplitude of 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by 3 dB). Amplitude is interpreted by the ear as corresponding to different degrees of loudness. Laboratory measurements correlate a 10-dB increase in amplitude with a perceived doubling of loudness and establish a 3-dB change in amplitude as the minimum audible difference perceptible to the average person.

4-7.1.1.2 Frequency

“Frequency” is the number of fluctuations of the pressure wave per second. The unit of frequency is the hertz (Hz). One Hz equals one cycle per second. The human ear is not equally sensitive to sound of different frequencies. Sound waves below 16 Hz or above 20,000 Hz cannot be heard at all, and the ear is

more sensitive to sound in the higher portion of this range than in the lower. To approximate this sensitivity, environmental sound is usually measured in A-weighted decibels (dBA). On this scale, the normal range of human hearing extends from about 10 dBA to about 140 dBA.

4-7.1.1.3 Characteristics of Sound Propagation and Attenuation

Noise can be generated by a number of sources, including mobile sources such as automobiles, trucks, and airplanes, and stationary sources such as construction sites, machinery, and industrial operations. Noise generated by mobile sources typically attenuates at a rate between 3.0 and 4.5 dBA per doubling of distance. The rate depends on the ground surface and the number or type of objects between the noise source and the receiver. For mobile transportation sources such as highways, hard and flat surfaces such as concrete or asphalt have an attenuation rate of 3.0 dBA per doubling of distance. Soft surfaces such as uneven or vegetated terrain have an attenuation rate of about 4.5 dBA per doubling of distance from the source. Noise generated by stationary sources typically attenuates at a rate of approximately 6.0– 7.5 dBA per doubling of distance from the source.

Sound levels can be reduced by placing barriers between the noise source and the receiver. In general, barriers contribute to decreasing noise levels only when the structure breaks the “line of sight” between the source and the receiver. Buildings, concrete walls, and berms can act as effective noise barriers. Wooden fences or broad areas of dense foliage can also reduce noise, but are less effective than solid barriers.

4-7.1.1.4 Noise Descriptors

The selection of a proper noise descriptor for a specific source is dependent on the spatial and temporal distribution, duration, and fluctuation of the noise. The noise descriptors most often encountered when dealing with traffic, community, and environmental noise are defined below:

- Maximum Noise Level (L_{\max}): The maximum instantaneous noise level during a specific period of time.
- Minimum Noise Level (L_{\min}): The minimum instantaneous noise level during a specific period of time.
- Energy Equivalent Noise Level (L_{eq}): The energy mean (average) noise level. The instantaneous noise levels during a specific period of time in dBA are converted to relative energy values. From the sum of the relative energy values, an average energy value (in dBA) is calculated.
- Day-Night Noise Level (L_{dn}): The 24-hour L_{eq} with a 10-dBA “penalty” for noise events that occur during the noise-sensitive hours between 10:00 p.m. and 7:00 a.m. In other words, 10 dBA is “added” to noise events that occur in the nighttime hours to account for increased sensitivity to noise during these hours.
- Community Noise Equivalent Level (CNEL): The CNEL is similar to the L_{dn} described above, but with an additional 5-dBA “penalty” added to noise events that occur between the hours of 7:00 p.m. and 10:00 p.m. The calculated CNEL is typically approximately 0.5 dBA higher than the calculated L_{dn} .

4-7.1.1.5 Human Response to Noise

The human response to environmental noise is subjective and varies considerably from individual to individual. Noise in the community has often been cited as a health problem, not in terms of actual physiological damage, such as hearing impairment, but in terms of inhibiting general well-being and contributing to undue stress and annoyance. The health effects of noise in the community arise from interference with human activities, including sleep, speech, recreation, and tasks that demand concentration or coordination. Hearing loss can occur at the highest noise intensity levels. When community noise interferes with human activities or contributes to stress, public annoyance with the noise source increases. The acceptability of noise and the threat to public well-being are the basis for land use planning policies preventing exposure to excessive community noise levels.

Unfortunately, there is no completely satisfactory way to measure the subjective effects of noise or of the corresponding reactions of annoyance and dissatisfaction. This is primarily because of the wide variation in individual thresholds of annoyance and habituation to noise over differing individual experiences with noise. Therefore, an important way of determining a person's subjective reaction to a new noise is by comparing it to the existing environment to which one has adapted—the so-called “ambient” environment. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged. Regarding increases in A-weighted noise levels, knowledge of the following relationships will be helpful in understanding this analysis:

- Except in carefully controlled laboratory experiments, a change of 1 dB cannot be perceived by humans.
- Outside of the laboratory, a 3-dB change is considered a just-perceivable difference.
- A change in level of at least 5 dB is required before any noticeable change in community response would be expected. An increase of 5 dB is typically considered substantial.
- A 10-dB change is subjectively heard as an approximate doubling in loudness and would almost certainly cause an adverse change in community response.

4-7.2 ENVIRONMENTAL SETTING

4-7.2.1 Noise-Sensitive Land Uses

Noise-sensitive land uses generally include those uses where exposure to noise would result in adverse effects, as well as uses where “quiet” is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels. Other noise-sensitive land uses include hospitals, convalescent facilities, parks, hotels, churches, libraries, and other uses where low interior noise levels are essential.

Noise-sensitive land uses located in the vicinity of the proposed detention basins consist predominantly of rural residential dwellings. In the vicinity of the proposed Alamo Creek detention basin, the nearest residential dwellings are located approximately 175 feet to the north, 400 feet to the southeast and south, and approximately 200 feet to the west. In the vicinity of the proposed Ulati Creek detention basin, the

nearest residential dwellings are located west of the Ulatis site, across Bucktown Lane. The nearest of these residential dwellings is located approximately 135 feet from the western boundary of the Ulatis site. Additional nearby residential dwellings are located approximately 1,000 feet to the north, 1,700 feet to the east, and 350 feet to the south of the Ulatis site.

4-7.2.2 Ambient Noise Survey

An ambient noise survey was conducted on July 16, 2009, to document the existing noise environment at the proposed detention basin sites. Noise measurements were conducted using a Larson Davis Type I, Model 820 sound level meter placed at an average height of 4.5 feet above ground level. Measured ambient noise levels are summarized in Table 4-7.1.

The dominant noise source identified during the noise survey was vehicle traffic on area roadways. Based on the measurements conducted, daytime average-hourly noise levels (in dBA L_{eq}) at the project sites typically range from the mid- to upper-40's, depending on distance from area roadways.

Table 4-7.1 Ambient Noise Levels

Measurement Location	Measured Noise Levels (dBA)	
	L_{eq}	L_{max}
Proposed Alamo Creek Detention Basin, Eastern Site Boundary	43.8	48.6
Proposed Ulatis Creek Detention Basin, Western Site Boundary	45.4	49.5

Note: Ambient noise measurements conducted on July 16, 2009. Measurements conducted at a height of approximately 4.5 feet above ground level.

4-7.3 REGULATORY SETTING

The following discusses the federal, state, and local regulations and policies as they pertain to noise and as applicable to the Proposed Project.

4-7.3.1 Federal Regulations

No federal plan, policies, regulations, or laws pertaining to noise are applicable to the Proposed Project.

4-7.3.2 State Regulations

No state plan, policies, regulations, or laws pertaining to noise are applicable to the Proposed Project.

4-7.3.3 Local Plans and Policies

The following local goals, policies, and regulations are applicable to the noise issues analyzed in this EIR.

4-7.3.3.1 Solano County General Plan

The Public Health and Safety Element of the County of Solano General Plan identifies land use compatibility noise standards for noise-sensitive land uses affected by transportation and non-transportation noise sources. For noise-sensitive land uses, including residential land uses, that are affected by transportation noise sources, the “normally acceptable” exterior and interior noise level is 65 dBA $L_{dn}/CNEL$ and 45 dBA $L_{dn}/CNEL$, respectively. The County’s exterior noise standards for residential uses exposed to non-transportation noise sources are 55 dBA L_{eq} and 70 dBA L_{max} during daytime hours and 50 dBA L_{eq} and 65 dBA L_{max} during nighttime hours. Maximum acceptable interior noise standards for residential uses exposed to non-transportation noise sources are 35 dBA L_{eq} and 55 dBA L_{max} (Solano County 2008).

4-7.3.3.2 City of Vacaville General Plan

The Noise Element of the City of Vacaville General Plan identifies land use compatibility noise standards for noise-sensitive land uses affected by transportation and non-transportation noise sources. For noise-sensitive land uses, including residential land uses, that are affected by transportation noise sources, the “normally acceptable” exterior and interior noise level is 60 dBA $L_{dn}/CNEL$ and 45 dBA $L_{dn}/CNEL$, respectively. Exterior noise levels of up to 75 dBA $L_{dn}/CNEL$ for residential land uses is considered “conditionally acceptable” provided needed noise mitigation measures have been incorporated and interior noise levels are maintained within “normally acceptable” levels. The City’s exterior noise standards for residential uses exposed to non-transportation noise sources are 50 dBA L_{eq} and 70 dBA L_{max} during daytime hours and 45 dBA L_{eq} and 65 dBA L_{max} during nighttime hours. Maximum acceptable interior noise standards for residential uses exposed to non-transportation noise sources are 45 dBA L_{eq} during the daytime hours and 35 dBA L_{eq} during the nighttime hours (City of Vacaville 2007).

4-7.3.3.3 City of Vacaville Noise Ordinance

The City of Vacaville Land Use & Development Code (Title 14, Section 14.09.127.120) establishes maximum noise exposure standards for sensitive land uses. The standards contained in the Noise Ordinance are consistent with those from the City’s General Plan Noise Element, as discussed above. The City’s Public Health Code (Title 8, Section 8.10.030-19) limits construction-equipment operation and outdoor construction or repair work within 500 feet of occupied residences to between the hours of x:00* a.m. and 10:00 p.m. on Monday through Saturday, and from 8:00 a.m. and 10:00 p.m. on Sunday. Interior construction work is exempt from these hourly restrictions provided noise from such work would not “create noise or disturbance noticeable to a reasonable person of normal sensitivity in the surrounding neighborhood” (City of Vacaville 2009).

*The 2011 Final EIR indicates this hour as 6:00 a.m. City ordinances as of 2018 limits construction to no earlier than 7:00 a.m.

4-7.4 SIGNIFICANCE CRITERIA

The following significance thresholds used for the assessment of noise-related impacts are based on California Environmental Quality Act (CEQA) Guidelines. The Proposed Project would be considered to have a significant impact if it would:

- Expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Permanently increase ambient noise levels in the project vicinity above levels existing without the project;
- Temporarily increase ambient noise levels in the project vicinity above levels existing without the project; or
- Expose persons to or generate excessive ground-borne vibration or ground-borne noise levels.

The CEQA Guidelines do not define the levels at which a “substantial increase” would occur. For purposes of this analysis, a “substantial increase” is defined as an increase of 3 dB or greater. As previously discussed, this level is generally defined as the minimum level perceptible to the human ear.

The CEQA Guidelines also do not define the levels at which ground-borne vibration levels would be considered “excessive”. This analysis relies on recommended thresholds identified by the California Department of Transportation (Caltrans). For the protection of fragile, historic, and residential structures, Caltrans recommends a threshold of 0.2 inch per second (in/sec) peak particle velocity (ppv). This same threshold would represent the level at which vibrations would be potentially annoying to people in buildings (Caltrans 2002).

4-7.5 IMPACTS AND MITIGATION MEASURES OF THE PROPOSED PROJECT

4-7.5.1 Potential to Temporarily Increase Ambient Noise Levels in the Project Vicinity above Levels Existing Without the Project

IMPACT 7-1: SHORT-TERM EXPOSURE TO ONSITE CONSTRUCTION NOISE

Construction noise typically occurs intermittently and varies depending on the nature or phase (e.g., demolition/land clearing, grading and excavation, erection) of construction. Equipment required during the construction process would typically include backhoes, dozers, compactors, graders, front-end loaders, and trucks. Additional equipment, such as a portable crane and paving equipment, may also be required on a short-term and intermittent basis. Noise generated by construction equipment can reach high levels. Typical noise levels for individual pieces of construction equipment are summarized in Table 4-7.2. As depicted, individual equipment noise levels typically range from the mid-70s dBA to the upper 80s dBA at 50 feet (Federal Transit Administration [FTA] 2006). Typical operating cycles may involve 2

minutes of full power, followed by 3 or 4 minutes at lower settings. Depending on the activities performed and equipment usage requirements, combined average hourly noise levels at construction sites typically range from approximately 65 to 89 dBA L_{eq} at 50 feet. Actual noise levels would largely depend on the number of pieces of equipment operating at a given location.

Table 4-7.2 Typical Construction Equipment Noise Levels

Type of Equipment	Typical Noise Level (dBA) at 50 feet
Backhoe	80
Compactor	82
Crane, Mobile	83
Dozer	85
Grader	85
Loader	85
Paver	89
Roller	74
Truck	88

Source: FTA 2006

As discussed earlier in this section, noise-sensitive land uses located in the vicinity of the proposed detention basins consist predominantly of rural residential dwellings. The nearest residential dwellings are located approximately 175 feet north of the Alamo site and approximately 135 feet west of the Ulatis site. Assuming a maximum construction noise level of 89 dBA L_{eq} and an average attenuation rate of 6 dBA per doubling of distance from the source, predicted exterior noise levels at these nearest receptors could reach levels of approximately 82 dBA L_{eq} when construction occurs at the nearest site boundary. Assuming an average exterior-to-interior noise reduction of 20 dB, predicted interior construction noise levels would be approximately 62 dBA; however, it is important to note that these projected noise levels are representative of construction activities that would occur near the site boundary, such as during the construction of the outer berm. A majority of the construction activities involving the use of off-road equipment would be associated with onsite grading and excavation activities, in which case construction equipment would be dispersed over a larger area and would typically not be located near the site boundaries for extended periods (i.e., days). Based on the same assumptions noted above and assuming that construction activities would be centered approximately 500 feet from the nearest receptors, predicted exterior and interior noise levels at the nearest residential dwelling would be approximately 69 dBA L_{eq} and 49 dBA L_{eq} , respectively.

Construction-generated noise levels would be anticipated to be highest when site-preparation activities (e.g., grading and excavation) occur within approximately 50 feet of the nearest property line. Predicted interior noise levels at the nearest noise-sensitive receptors could exceed applicable noise standards. With regard to residential dwellings, construction activities occurring during the more noise-sensitive nighttime hours are of particular concern. Construction activities occurring during the nighttime hours may result in increased levels of annoyance and potential sleep disruption to occupants of nearby residential dwellings. Construction-generated noise would, therefore, be considered to result in a potentially *significant* short-term noise impact to nearby noise-sensitive land uses. Implementation of Mitigation Measure 7-1 would limit construction activities to the least noise-sensitive daytime hours. The use of construction equipment mufflers and engine shrouds would reduce equipment noise levels by approximately 10 dBA; however, given that construction activities would be projected to occur over a period of several months, construction-generated noise would remain a *significant and unavoidable* impact.

MITIGATION MEASURE 7-1: LIMIT HOURS OF CONSTRUCTIONS OPERATIONS AND IMPLEMENT NOISE-REDUCTION MEASURES FOR EQUIPMENT

The following measures shall be implemented during construction activities.

1. Noise-generating construction operations shall be limited to the hours between 7 a.m. and 6 p.m. Monday through Friday, unless an expanded time frame is granted in writing by the City of Vacaville Director of Public Works as necessary to address special construction circumstances or to maintain the construction schedule.
2. Construction equipment shall be properly maintained and equipped with noise-reduction intake and exhaust mufflers and engine shrouds in accordance with manufacturers' recommendations. Equipment engine shrouds shall be closed during equipment operation.
3. When not in use, motorized construction equipment shall not be left idling for periods of greater than 5 minutes.

IMPACT 7-2: SHORT-TERM EXPOSURE TO CONSTRUCTION TRAFFIC NOISE

Short-term construction of the proposed basins would result in a temporary increase in haul truck traffic along area roadways associated with the removal of excavated material from the basin sites. Although the haul-truck routes have not yet been identified, a majority of the haul trucks are anticipated to travel along portions of Vaca Valley Road and Pleasants Valley Road. The nearest existing residential dwellings located along area roadways are approximately 75 feet from the roadway centerline. To a lesser extent, construction employees commuting to and from the Project sites would also contribute to increased traffic noise along area roadways. Potential noise impacts on nearby noise-sensitive land uses associated with increased haul-truck traffic are discussed separately for each of the proposed detention basin, as follows:

ALAMO CREEK DETENTION BASIN

Construction of the Alamo Creek detention basin is estimated to require a maximum of approximately 166 one-way haul trips/day. The number of worker commute trips would vary from day to day, depending on the specific activities being conducted. Worker commute trips would be highest (i.e., approximately 30 one-way trips/day) during site excavation because of the increased number of onsite equipment anticipated to be required for this phase. Based on these estimated trip-generation rates and assuming that construction traffic would be equally distributed during the daytime and nighttime hours, predicted traffic noise levels at 75 feet from the centerline of haul truck routes would be approximately 65 dBA CNEL. Predicted construction traffic noise levels at existing residential dwellings located along area roadways could exceed applicable County or City noise standards. Depending on existing traffic volumes along selected truck haul routes, construction of the proposed detention basin could result in noticeable increases in ambient noise levels. As a result, construction-generated traffic associated with the proposed Alamo Creek detention basin would be considered to have a *potentially significant* impact.

ULATIS CREEK DETENTION BASIN

Construction of the Ulatis Creek detention basin is estimated to require a maximum of approximately 190 one-way haul trips/day. As with the proposed Alamo Creek Detention basin, excavation of the proposed Ulatis Creek detention basin would be anticipated to generate approximately 30 one-way worker commute trips/day. Based on these estimated trip-generation rates and assuming that construction traffic would be equally distributed during the daytime and nighttime hours, predicted traffic noise levels at 75 feet from the centerline of haul-truck routes would be approximately 66 dBA CNEL. Predicted construction traffic noise levels at existing residential dwellings located along area roadways could exceed applicable noise standards. Depending on existing traffic volumes along selected truck-haul routes, construction of the proposed detention basin could result in noticeable increases in ambient noise levels. As a result, construction-generated traffic associated with the proposed Ulatis Creek detention basin would be considered to have a *potentially significant* noise impact.

IMPACT SUMMARY

Construction of the proposed detention basins could contribute to existing traffic noise levels that may exceed applicable noise standards and/or result in noticeable increases in ambient noise levels, particularly if both of the proposed detention basins are constructed simultaneously. As a result, construction-generated traffic associated with the proposed detention basins would be considered to have a *potentially significant* impact.

Mitigation Measure 7-2 would limit traffic noise impacts to the less noise-sensitive daytime hours. With this mitigation measure, construction-generated haul-truck trips would be reduced to approximately 60 dBA CNEL, or less, at 75 feet from the roadway centerline of primary haul routes; however, depending on existing traffic volumes along selected truck haul routes, construction of the proposed detention basin could result in noticeable increases in ambient noise levels and contribute to noise levels in excess of applicable noise standards. Additional measures related to the locating of haul-truck entrances to the Project sites at the farthest practical distance from nearby residences would help to reduce noise levels but would not reduce potential noticeable increases in ambient noise levels to a less-than-significant level. Given that truck hauling activities would be projected to occur over a period of several months, construction-generated traffic noise would be considered to have a *significant and unavoidable* impact.

MITIGATION MEASURE 7-2: POST WARNING SIGNS, LIMIT CONSTRUCTION ACTIVITY TO DAYTIME HOURS, AND LOCATE ENTRY POINTS AND LOADING AREAS AWAY FROM SENSITIVE AREAS

The following measures shall be implemented during construction activities.

1. Install a minimum of two construction warning signs along the haul route at least 30 days in advance of hauling to inform the residents in the area about the project trucking schedule.
2. All truck activity related to removal of excavated materials shall be limited to the hours between 7 a.m. to 6 p.m. Monday through Friday, unless a variance is granted in writing by the City of Vacaville Director of Public Works.

3. When feasible, Haul truck entrances to the construction site and truck loading areas shall be located at the furthest practical distance from nearby noise-sensitive land uses.

4-7.5.2 Potential to Expose Persons to or Generate Noise Levels in Excess of Standards Established in the Local General Plan or Noise Ordinance, or Applicable Standards of Other Agencies, or Potential to Permanently Increase Ambient Noise Levels in the Project Vicinity above Levels Existing Without the Project

IMPACT 7-3: LONG-TERM EXPOSURE TO ONSITE NOISE SOURCES

The long-term operation of the proposed Alamo Creek and Ulatis Creek detention basins would have similar maintenance requirements. The long-term maintenance and/or agricultural activities would be anticipated to require periodic use of tractors, mowers, and pickup trucks. The specific equipment used would vary depending on the end-use ultimately selected; however, it is anticipated that maintenance and/or agricultural uses would require the use of approximately two tractors twice annually, one backhoe or excavator once every 2 years, one tractor approximately 4 days per month during the growing season, and one mower approximately 2 days per week over a period of one month in late spring. There may also be onsite incidental public access activities, which would be anticipated to result in an average of approximately 15 vehicle trips per month. More frequent use may occur during the warmer spring and summer months with less vehicle trips occurring during the colder winter months. The proposed detention basins would not include construction of permanent structures, sports fields, or installation of noise-generating equipment.

Long-term operational noise levels would be primarily associated with the use of onsite equipment for maintenance and/or agricultural uses. As noted under Impact 7-1, Table 4-7.2, off-road equipment such as tractors, backhoes, and trucks can generate noise levels of approximately 80 to 88 dBA L_{eq} . Depending on the specific activities conducted and location of onsite equipment in relation to nearby residential dwellings, onsite maintenance and/or agricultural use activities could result in noise levels that could exceed applicable noise standards. The majority of noise would be generated from agricultural activities that would be similar to the previous agricultural use of the properties and would not be considered to produce an increase in noise associated with operation of the project. Activities occurring during nighttime hours may result in increased levels of annoyance and potential sleep disruption to occupants of nearby residential dwellings and, therefore, any nighttime operations would be considered to have a *potentially significant* impact.

With implementation of Mitigation Measure 7-3, noise levels generated by maintenance and end-use activities would be limited to the less noise-sensitive daytime hours. Noise generated by onsite mowing would be dispersed over a large area and would be somewhat typical for developed areas. Other maintenance activities would require limited operation of onsite equipment (i.e., approximately two tractors twice annually, one backhoe or excavator once every 2 years, one tractor approximately 4 days per month) and, therefore, would not result in the frequent exposure of nearby noise-sensitive land uses to increases in ambient noise levels. With implementation of Mitigation Measure 7-3 and given the limited number of equipment required and duration of activities conducted for maintenance and/or agricultural activities, long-term noise impacts associated with the operation of the proposed detention basins would be reduced to a *less-than-significant* level.

MITIGATION MEASURE 7-3: LIMIT ONSITE NOISE SOURCES

Detention basin maintenance and end-use activities (i.e., agricultural and incidental public access) shall be limited to between the hours of 7:00 a.m. and 6:00 p.m.

IMPACT 7-4: LONG-TERM EXPOSURE TO OPERATIONAL TRAFFIC NOISE

Long-term operation of the proposed basins, including maintenance and end-use activities, would be anticipated to generate a combined total of approximately 36 vehicle trips per month, for an average of approximately two trips per day. Typically, a doubling of vehicle traffic would be required before a noticeable increase (i.e., 3 dBA or greater) in traffic noise levels would occur. Given the low number of vehicle trips associated with the long-term operation of the proposed basins, it is not anticipated that there would be a doubling of vehicle traffic along area roadways. In addition, based on the ambient noise measurements conducted, traffic noise levels along nearby roadways are not projected to exceed applicable noise standards at the nearest noise-sensitive land uses. As a result, long-term operation of the proposed detention basins would not be expected to result in a noticeable increase in ambient noise levels that would exceed applicable noise standards. This impact would be considered *less than significant*.

4-7.5.3 Potential to Expose Persons to or Generate Excessive Ground-borne Vibration or Ground-borne Noise Levels

IMPACT 7-5: EXPOSURE TO EXCESSIVE GROUND BORNE VIBRATION

Ground vibration spreads through the ground and diminishes in strength with distance. The effects of ground vibration can vary from no perceptible effects at the lowest levels, low rumbling sounds and detectable vibrations at moderate levels, and slight damage to nearby structures at the highest levels. At the highest levels of vibration, damage to structures is primarily architectural (e.g., loosening and cracking of plaster or stucco coatings) and rarely results in structural damage. For most structures, a ppv threshold of 0.5 in/sec is sufficient to avoid structural damage, with the exception of fragile historic structures or ruins. For buildings of typical construction, the Caltrans recommends a more conservative threshold of 0.2 inch per second ppv. This same threshold would represent the level at which vibrations would be potentially annoying to people in buildings (Caltrans 2002).

Long-term operational activities associated with the Proposed Project would not involve the use of any equipment or processes that would result in potentially significant levels of ground vibration. Increases in ground-borne vibration levels attributable to the Proposed Project would be primarily associated with activities occurring during the construction of the proposed uses. Construction activities associated with the Proposed Project would most likely require the use of various tractors and trucks.

Representative ground-borne vibration levels associated with construction equipment are summarized in Table 4-7.3. Based on the vibration levels indicated, ground vibration generated by construction equipment would be approximately 0.09 in/sec ppv at 25 feet, or less. Based on Caltrans data, construction-related haul trucks would not be anticipated to exceed 0.10 in/sec ppv at 10 feet (Caltrans 2002). Predicted vibration levels at the nearest offsite structures, which are located in excess of 25 feet from the project sites, would not be anticipated to exceed even the most conservative threshold of 0.2

in/sec ppv. Exposure to ground-borne vibration levels would be considered a *less-than-significant* impact and no mitigation is required.

Table 4-7.3 Representative Vibration Source Levels for Typical Construction Equipment

Equipment	Peak Particle Velocity at 25 Feet (in/sec ppv)
Trackers	0.003-0.089
Loaded truck	0.076

Source: Caltrans 2002, FTA 2006

4-7.6 CUMULATIVE IMPACTS AND MITIGATION MEASURES

The geographic extent of the cumulative setting for noise consists of the Proposed Project areas and the surrounding areas within the County and City. As noted previously, ambient noise levels in the Project areas are influenced primarily by traffic noise emanating from area roadways. The proposed detention basins would not include construction of permanent structures, sports fields, or installation of noise-generating equipment. No major stationary sources of noise or construction projects have been identified in the Proposed Project areas; therefore, the primary factor for cumulative noise impact analysis is the consideration of future traffic noise levels.

IMPACT 7-6: CUMULATIVE CONTRIBUTION TO TRAFFIC NOISE LEVELS

As previously discussed under Impact 7-4, long-term operation of the proposed basins, including maintenance and end-use activities, would be anticipated to generate a combined total of approximately 36 vehicle trips per month, for an average of approximately two trips per day. Typically, a doubling of vehicle traffic would be required before there would be a noticeable increase (i.e., 3 dBA or greater) in traffic noise levels. Given the low number of vehicle trips associated with the long-term operation of the proposed basins, a doubling of vehicle traffic along area roadways would not be anticipated. The Proposed Project's overall contribution to traffic noise levels in future years would be anticipated to continue to decrease as development of surrounding areas and associated vehicle trips increases. Long-term operation of the proposed detention basins would not result in a noticeable increase in ambient noise levels that would exceed applicable noise standards. As a result, the Proposed Project's contribution to cumulative noise conditions would not be considerable and would be considered a *less-than-significant* impact.