4.10 NOISE

4.10.1 INTRODUCTION

The Noise chapter of the EIR discusses the existing noise environment in the immediate project vicinity and identifies potential noise-related impacts and mitigation measures associated with the proposed project. Specifically, this chapter analyzes potential noise impacts due to and upon development within the project site relative to applicable noise criteria and to the existing ambient noise environment. Information presented in this chapter is primarily drawn from the *Environmental Noise Assessment* prepared specifically for the proposed project by j.c. brennan & associates, Inc. (see Appendix J)[1] and the *City of Antioch General Plan.*[2]

4.10.2 EXISTING ENVIRONMENTAL SETTING

The following section provides a discussion of acoustical terminology, the effects of noise on people, existing sensitive receptors in the project vicinity, existing sources and noise levels in the project vicinity, and vibration.

Acoustical Terminology

Sound is the mechanical energy of a vibrating object transmitted by pressure waves through a medium to human (or animal) ears. If the pressure variations occur frequently enough, 20 times per second, they can be heard and are called sound. The number of pressure variations per second is called the frequency of sound and is expressed as cycles per second called Hertz (Hz). Noise is typically defined as (airborne) sound that is loud, unpleasant, unexpected or undesired, and may therefore be classified as a more specific group of sounds. Perceptions of sound and noise are highly subjective from person to person.

Measuring sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid awkwardness, the decibel scale was devised. The decibel scale uses the hearing threshold (20 micropascals or vibrations per second), as a point of reference, defined as zero dB. Other sound pressures are then compared to the reference pressure, and the logarithm is taken to keep the numbers in a practical range. The decibel scale allows a million-fold increase in pressure to be expressed as 120 dB, and changes in levels (dB) correspond closely to human perception of relative loudness.

The perceived loudness of sounds is dependent upon many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable, and can be approximated by A-weighted sound levels. A

1 j.c. brennan & associates, Inc. *Environmental Noise Assessment, The Ranch*. November 30, 2017.
2 City of Antioch. *City of Antioch General Plan*. Updated November 24, 2003.

strong correlation exists between A-weighted sound levels (expressed as dBA) and the way the human ear perceives sound. Accordingly, the A-weighted sound level has become the standard tool of environmental noise assessment. All noise levels reported in this Noise chapter are in terms of A-weighted levels, but are expressed as dB, unless otherwise noted. Because the decibel scale is logarithmic, when the standard logarithmic decibel is A-weighted, an increase of 10 dBA is generally perceived as a doubling in loudness. For example, a 70 dBA sound is half as loud as an 80 dBA sound, and twice as loud as a 60 dBA sound.

Community noise is commonly described in terms of the ambient noise level, which is defined as the all-encompassing noise level associated with a given environment. A common statistical tool to measure the ambient noise level is the average, or equivalent, sound level (L_{eq}), which corresponds to a steady-state A-weighted sound level containing the same total energy as a time varying signal over a given time period (usually one hour). The L_{eq} is the foundation of the composite noise descriptor, the day/night average level (L_{dn}), and shows very good correlation with community response to noise. The L_{dn} is based upon the average noise level over a 24-hour day, with a +10 decibel weighing applied to noise occurring during nighttime (10:00 PM to 7:00 AM) hours. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures. Because L_{dn} represents a 24-hour average, short-term variations in the noise environment tend to get disguised.

Because sensitivity to noise increases during the evening and at night, due to excessive noise interfering with the ability to sleep, 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The Community Noise Equivalent Level (CNEL) is a measure of the cumulative noise exposure in a community, with a five dB penalty added to evening (7:00 PM to 10:00 PM) and a 10 dB addition to nocturnal (10:00 PM to 7:00 AM) noise levels. L_{dn} is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during 7:00 PM and 10:00 PM are grouped into the daytime period. Table 4.10-1 provides a list of several examples of the noise levels associated with common activities.

Effects of Noise on People

The effects of noise on people can be placed in the following three categories:

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

Environmental noise typically produces effects in the first two categories. Workers in industrial plants can experience noise in the last category. A completely satisfactory way to measure the subjective effects of noise or the corresponding reactions of annoyance and dissatisfaction does not exist. 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 the new noise environment compares to the existing environment to which one has adapted (i.e., the ambient noise level). In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise would be judged by those hearing the noise.

Table 4.10-1
Typical Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	--110--	Rock Band
Jet Fly-Over at 300 m (1,000 ft)	--100--	
Gas Lawn Mower at 1 m (3 ft)	--90--	
Diesel Truck at 15 m (50 ft), at 80 km/hr (50 mph)	--80--	Food Blender at 1 m (3 ft) Garbage Disposal at 1 m (3 ft)
Noisy Urban Area, Daytime Gas Lawn Mower, 30 m (100 ft)	--70--	Vacuum Cleaner at 3 m (10 ft)
Commercial Area Heavy Traffic at 90 m (300 ft)	--60--	Normal Speech at 1 m (3 ft)
Quiet Urban Daytime	--50--	Large Business Office Dishwasher in Next Room
Quiet Urban Nighttime	--40--	Theater, Large Conference Room (Background)
Quiet Suburban Nighttime	--30--	Library
Quiet Rural Nighttime	--20--	Bedroom at Night, Concert Hall (Background)
	--10--	Broadcast/Recording Studio
Lowest Threshold of Human Hearing	--0--	Lowest Threshold of Human Hearing
Source: Caltrans, November, 2009.[3]		

With regard to increases in A-weighted noise levels, the following relationships occur:

- Except in carefully controlled laboratory experiments, a change of one dB cannot be perceived;
- Outside of the laboratory, a three dB change is considered a barely perceivable difference;
- A change in level of at least five dB is required before any noticeable change in human response would be expected; and
- A 10 dB change is subjectively heard as approximately a doubling in loudness, and would typically cause an adverse response.

Stationary point sources of noise – including stationary mobile sources such as idling vehicles – attenuate (lessen) at a rate of approximately six dB per doubling of distance from the source, depending on environmental conditions (i.e., atmospheric conditions and either vegetative or manufactured noise barriers, etc.). Widely distributed noises, such as a large industrial facility spread over many acres, or a street with moving vehicles, would typically attenuate at a lower rate.

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3 Caltrans. *Technical Noise Supplement, Traffic Noise Analysis Protocol.* November 2009.

Existing Sensitive Receptors

Certain land uses are more sensitive to noise levels than others due to the amount of noise exposure (in terms of both exposure time and shielding from noise sources) and the type of activities typically involved. Residences, schools, libraries, churches, hospitals, nursing homes, auditoriums, parks, and outdoor recreation areas are generally more sensitive to noise than are commercial and industrial land uses. Accordingly, such land uses are referred to as sensitive receptors.

In the vicinity of the project site, sensitive land uses consist of existing single-family residential uses located adjacent the project site to the north, two single-family residences directly south of the proposed Sand Creek Road, along Deer Valley Road, and the existing Kaiser Permanente Medical Center to the east. However, the nearest receptors are located approximately 50 feet or further to the north from any areas of the project site that might require grading or paving.

Existing Ambient Noise Levels

To quantify the existing ambient noise environment in the project vicinity, short-term ambient noise level measurements and continuous (24-hour) noise level measurements previously conducted for the former Cowan Ranch project in May 2015 (see Figure 4.10-1). Noise level measurements conducted in July 2014 for the approved Aviano Residential project east of the project site, were also used to quantify the existing noise environment. The ambient noise levels measured are presented in Table 4.10-2. The maximum value (L_{max}) represents the highest noise level measured during the interval. The average value (L_{eq}) represents the energy average of all of the noise measured during the interval. The median value (L_{50}) represents the sound level exceeded 50 percent of the time during the interval.

Existing Roadway Noise Levels

Traffic noise levels are predicted at the sensitive receptors located at 75-feet from the centerline along each project-area roadway segment. In some locations sensitive receptors may be located at distances which vary from the assumed calculation distance and may experience shielding from intervening barriers or sound walls. However, the traffic noise analysis is representative of the majority of sensitive receptors located closest to the project-area roadway segments analyzed in this EIR.

The actual distances to noise level contours may vary from the distances predicted by the FHWA model due to roadway curvature, roadway grade, shielding from local topography, sound walls or structures. The distances reported in Table 4.10-3 are generally considered to be conservative estimates of noise exposure along the project-area roadways. Table 4.10-3 shows the existing traffic noise levels in terms of CNEL at 75-feet from the centerline along each roadway segment, and the distances to existing traffic noise contours.

Figure 4.10-1
Noise Measurement Locations

Source: j.c. brennan & associates, Inc., 2015.

Table 4.10-2
Summary of Existing Background Noise Measurement Data

Site	Location	Date	CNEL	Average Measured Hourly Noise Levels (dBA)					
				Daytime (7:00AM–10:00PM)			Nighttime (10:00PM–7:00AM)		
				L_{eq}	L_{50}	L_{max}	L_{eq}	L_{50}	L_{max}
Continuous 24-Hour Noise Measurement Sites									
A	530-feet to Deer Valley Road	May 27-28, 2015	52	50	41	63	43	40	58
B	130-feet to Prewett Ranch Road. 520-feet to Hillcrest Avenue	July 15-16, 2014	53	52	46	67	44	42	60
Short-Term Noise Measurement Sites									
1	550-feet to Deer Valley Road	May 27, 2015	N/A	57 dB	54 dB	76 dB	Measurement taken at 1:30 PM		
		May 28, 2015	N/A	59 dB	55 dB	75 dB	Measurement taken at 4:10 PM		
2	280-feet to Stagecoach Way	July 16, 2014	N/A	45 dB	43 dB	57 dB	Measurement taken at 3:05 PM		
3	960-feet to Stagecoach Way		N/A	55 dB	53 dB	64 dB	Measurement taken at 3:17 PM		
4	2,000-feet to Stagecoach Way		N/A	48 dB	45 dB	62 dB	Measurement taken at 3:31 PM		

Source: j.c. brennan & associates, Inc., 2017.

Table 4.10-3
Existing Traffic Noise Levels and Distances to Contours

Roadway	Segment	Typical Setback Distance (feet)	Exterior Noise Level (dBA CNEL)[2]	Distance to Noise Contours(CNEL)[1]		
				70 dB	65 dB	60 dB
Balfour Road	SR 4 – Deer Valley Road	75	68.9	64	137	295
Dallas Ranch Road	Lone Tree Way – Prewett Ranch Road	75	62.8	25	54	115
Dallas Ranch Road	Prewett Ranch Rd. – South	75	51.3	4	9	20
Deer Valley Road	Hillcrest Avenue – Lone Tree Way	75	67.2	49	105	226
Deer Valley Road	Lone Tree Way – Prewett Ranch Road	75	65.3	37	79	170
Deer Valley Road	Prewett Ranch Rd. – Wellness Way	75	65.2	36	77	166
Deer Valley Road	Sand Creek Road – Balfour Road	75	62.5	24	51	110
Hillcrest Avenue	Deer Valley Road – Lone Tree Way	75	66.1	41	89	192
Lone Tree Way	James Donlon Blvd. – Dallas Ranch Road	75	68.7	61	131	283
Lone Tree Way	Dallas Ranch Road – Deer Valley Road	75	66.9	47	101	217
Lone Tree Way	Deer Valley Road – Hillcrest Avenue	75	67.3	50	108	232
Lone Tree Way	Hillcrest Avenue – State Route 4	75	70.4	80	172	371
Lone Tree Way	State Route 4 – East	75	69.8	73	158	340
Sand Creek Road	Deer Valley Road – Hillcrest Avenue	75	58.3	12	27	58
Sand Creek Road	Deer Valley Road – West	75	37.3	0	1	2
State Route 4	Sand Creek Road – Lone Tree Way	75	68.2	57	123	264

Notes:
[1] Distances to traffic noise contours are measured in feet from the centerlines of the roadways.
[2] Traffic noise levels may vary depending on actual setback distances and localized shielding.

Source: j.c. brennan & associates, Inc., 2017.

Vibration

While vibration is similar to noise, both involving a source, a transmission path, and a receiver, vibration differs from noise because noise is generally considered to be pressure waves transmitted through air, whereas vibration usually consists of the excitation of a structure or surface. As with noise, vibration consists of an amplitude and frequency. A person's perception to the vibration depends on their individual sensitivity to vibration, as well as the amplitude and frequency of the source and the response of the system which is vibrating.

Vibration can be measured in terms of acceleration, velocity, or displacement. A common practice is to monitor vibration measures in terms of peak particle velocities (p.p.v.) in inches per second (in/sec). Standards pertaining to perception as well as damage to structures have been developed for vibration levels defined in terms of peak particle velocities.

4.10.3 REGULATORY CONTEXT

In order to limit exposure to damaging noise levels, the State of California, various county governments, and most municipalities in the State have established standards and ordinances to control noise. The following provides a general overview of the existing State, and local regulations established regarding noise that are relevant to the proposed project.

State Regulations

The following are the State environmental laws and policies relevant to noise.

California State Building Codes

The State Building Code, Title 24, Part 2 of the State of California Code of Regulations establishes uniform minimum noise insulation performance standards to protect persons within new buildings that house people, including hotels, motels, dormitories, apartment houses, and dwellings other than single-family dwellings. Title 24 mandates that interior noise levels attributable to exterior sources shall not exceed 45 dB L_{dn} or CNEL in any habitable room. Title 24 also mandates that for structures containing noise-sensitive uses to be located where the L_{dn} or CNEL exceeds 60 dB, an acoustical analysis must be prepared to identify mechanisms for limiting exterior noise to the prescribed allowable interior levels. If the interior allowable noise levels are met by requiring that windows be kept closed, the design for the structure must also specify a ventilation or air conditioning system to provide a habitable interior environment.

Local Regulations

The following are the City of Antioch's environmental policies relevant to noise.

City of Antioch General Plan

The City of Antioch General Plan sets forth noise and land use compatibility standards to guide development, as well as noise goals and policies to protect citizens from the harmful and annoying effects of excessive noise. The following noise objectives and policies are applicable to the proposed project.

Policy 10.5.1.c In designing buffer areas, the following criteria shall be considered and provided for (when applicable) within the buffer areas to avoid or mitigate significant impacts.

- Noise: Will noise generated by the proposed development affect the public's quiet enjoyment of public open space? What are the sensitive noise receptors in open space areas and how can impacts on those sensitive receptors be avoided or mitigated? Can noise-generating uses be located away from noise sensitive areas?

Objective 11.6.1 Achieve and maintain exterior noise levels appropriate to planned land uses throughout Antioch as described below:

- Residential:
  - Single-Family: 60 dBA CNEL within rear yards
  - Multi-Family: 60 dBA CNEL within exterior open space
- Schools
  - Classrooms: 65 dBA CNEL
  - Play and sports areas: 70 dBA CNEL
- Hospitals, Libraries: 60 dBA CNEL
- Commercial/Industrial: 70 dBA CNEL at the front setback

Policy 11.6.2.a Implementation of the noise objective contained in Section 11.6.1 and the policies contained in 11.6.2 of the Environmental Hazards Element shall be based on noise data contained in Section 4.9 of the General Plan EIR, unless a noise analysis conducted pursuant to the City's development and environmental review process provides more up-to-date and accurate noise predictions, as determined by the City.

Policy 11.6.2.b Maintain a pattern of land uses that separates noise-sensitive land uses from major noise sources to the extent possible, and guide noise-tolerant land uses into the noisier portions of the Planning Area.

Policy 11.6.2.e When new development incorporating a potentially significant noise generator is proposed, require noise analyses to be prepared by a qualified acoustical engineer. Require the implementation of appropriate noise mitigation when the proposed project will cause new exceedances of General Plan noise objectives, or an audible (3.0 dBA) increase in noise in areas where General Plan noise objectives are already exceeded as the result of existing development.

Policy 11.6.2.f In reviewing noise impacts, utilize site design and architectural design features to the extent feasible to mitigate impacts on residential neighborhoods and other uses that are sensitive to noise. In addition to sound barriers, design techniques to mitigate noise impacts may include, but are not limited to:

- Increased building setbacks to increase the distance between the noise source and sensitive receptor.
- Orient buildings which are compatible with higher noise levels adjacent to noise generators or in clusters to shield more noise sensitive areas and uses.
- Orient delivery, loading docks, and outdoor work areas away from noise sensitive uses.
- Place noise tolerant use, such as parking areas, and noise tolerant structures, such as garages, between the noise source and sensitive receptor.
- Cluster office, commercial, or multifamily residential structures to reduce noise levels within interior open space areas.
- Provide double glazed and double paned windows on the side of the structure facing a major noise source, and place entries away from the noise source to the extent possible.

Policy 11.6.2.g Where feasible, require the use of noise barriers (walls, berms, or a combination thereof) to reduce significant noise impacts.

- The barrier must have sufficient mass to reduce noise transmission and high enough to shield the receptor from the noise source.
- To be effective, the barrier needs to be constructed without cracks or openings.
- The barrier must interrupt the line-of-sight between the noise source and the receptor.
- The effects of noise "flanking" the noise barrier should be minimized by bending the end of the barrier back from the noise source.

- Require appropriate landscaping treatment to be provided in conjunction with noise barriers to mitigate their potential aesthetic impacts.

Policy 11.6.2.h Continue enforcement of California Noise Insulation Standards (Title 25, Section 1092, California Administration Code).

Policy 11.6.2.i Ensure that construction activities are regulated as to hours of operation in order to avoid or mitigate noise impacts on adjacent noise-sensitive land uses.

Policy 11.6.2.j Require proposed development adjacent to occupied noise sensitive land uses to implement a construction-related noise mitigation plan. This plan would depict the location of construction equipment storage and maintenance areas, and document methods to be employed to minimize noise impacts on adjacent noise sensitive land uses.

Policy 11.6.2.k Require that all construction equipment utilize noise reduction features (e.g., mufflers and engine shrouds) that are no less effective than those originally installed by the manufacturer.

Policy 11.6.2.m Prior to the issuance of any grading plans, the City shall condition approval of subdivisions and non-residential development adjacent to any developed/occupied noise sensitive land uses by requiring applicants to submit a construction-related noise mitigation plan to the City for review and approval. The plan should depict the location of construction equipment and how the noise from this equipment will be mitigated during construction of the project through the use of such methods as:

- The construction contractor shall use temporary noise-attenuation fences, where feasible, to reduce construction noise impacts on adjacent noise sensitive land uses.
- During all project site excavation and grading on-site, the construction contractors shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers, consistent with manufacturers' standards. The construction contractor shall place all stationary construction equipment so that emitted noise is

directed away from sensitive receptors nearest the project site.

- The construction contractor shall locate equipment staging in areas that will create the greatest distance between construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction.
- The construction contractor shall limit all construction-related activities that would result in high noise levels to between the hours of 7:00 AM and 7:00 PM Monday through Saturday. No construction shall be allowed on Sundays and public holidays.

Policy 11.6.2.n The construction-related noise mitigation plan required shall also specify that haul truck deliveries be subject to the same hours specified for construction equipment. Additionally, the plan shall denote any construction traffic haul routes where heavy trucks would exceed 100 daily trips (counting those both to and from the construction site). To the extent feasible, the plan shall denote haul routes that do not pass sensitive land uses or residential dwellings. Lastly, the construction-related noise mitigation plan shall incorporate any other restrictions imposed by the City.

<u>City of Antioch Code of Ordinance</u>

The noise standards contained in the City of Antioch Code of Ordinance are provided below.

Zoning

<u>9-5.1901 Noise Attenuation Requirements</u>

A. Stationary noise sources. Uses adjacent to outdoor living areas (e.g., backyards for single-family homes and patios for multi-family units) and parks shall not cause an increase in background ambient noise which will exceed 60 CNEL.

B. Mobile noise sources. Arterial and street traffic shall not cause an increase in background ambient noise which will exceed 60 CNEL.

D. Noise attenuation. The City may require noise attenuation measures be incorporated into a project to obtain compliance with this section. Measures outlined in the noise policies of the General Plan should be utilized to mitigate noise to the maximum feasible extent.

Disturbing the Peace

5-17.04 Heavy Construction Equipment Noise

A. For the purpose of this chapter, the following definitions shall apply unless the context clearly indicates or requires a different meaning.

HEAVY CONSTRUCTION EQUIPMENT. Equipment used in grading and earth moving, including diesel engine equipped machines used for that purpose, except pickup trucks of one ton or less.

OPERATE. Includes the starting, warming-up, and idling of heavy construction equipment engines or motors.

B. It shall be unlawful for any person to be involved in construction activity during the hours specified below:

1. On weekdays prior to 7:00 AM and after 6:00 PM.
2. On weekdays within 300 feet of occupied dwellings, prior to 8:00 AM and after 5:00 PM.
3. On weekends and holidays, prior to 9:00 AM and after 5:00 PM, irrespective of the distance from the occupied dwellings.

4.10.4 IMPACTS AND MITIGATION MEASURES

The following section describes the standards of significance and methodology utilized to analyze and determine the proposed project's potential impacts related to noise and vibration. A discussion of the project's impacts, as well as mitigation measures, are also presented

Standards of Significance

For the purposes of this EIR, the following standards of significance were adapted from Appendix G of the CEQA Guidelines. Impacts are considered significant if implementation of the proposed project would do any one or more of the following:

- 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. Specifically, 60 dB CNEL in exterior residential rear yard areas and 45 dB CNEL in interior residential areas;
- Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels. Specifically, a limit of 0.1 in/sec p.p.v., as discussed below;
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project. Specifically, an audible (3.0 dBA) increase in noise in areas

where General Plan noise objectives are already exceeded as the result of existing development;[4]

- A substantial temporary or periodic increase in ambient noise levels in the project vicinity. Specifically, an audible (3.0 dBA) increase in noise in areas where General Plan noise objectives are already exceeded as the result of existing development. A substantial temporary or periodic increase in ambient noise levels does not include construction noise which is exempt under the City's Zoning Ordinance during specific hours;
- For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels within two miles of a public airport or public use airport; or
- For a project within the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels.

Additionally, the General Plan EIR included the following discussion regarding increases in ambient noise:

> *"CEQA does not define "substantial increase." Webster's Dictionary defines "substantial" as "considerable in quantity." As noted earlier in the discussion of noise definitions, the human ear can detect changes of 3 dBA and changes of less than 3 dBA, while audible under controlled circumstances, are not readily discernable in an outdoor environment. Thus, a change of 3 dBA is considered a barely audible change. However, CEQA uses "substantial change" as its criterion. Because most people can readily hear a change of 5 dBA L_{dn} in an exterior environment, this value was established for the proposed General Plan as the CEQA criterion for substantial change. As a point of reference, Caltrans defines a noise increase as substantial when the predicted noise level with the project would exceed existing noise levels by 12 dBA L_{eq}."*

Thus, the proposed project could result in potentially significant impacts related to noise if it would exceed any of the thresholds of significance described below.

- An increase in long-term ambient noise by five dBA CNEL/L_{dn} or more, where existing noise levels do not exceed the City's 60 dBA CNEL exterior noise level standard (*General Plan DEIR*), or:

- An increase in long-term ambient noise by 3 dBA CNEL/L_{dn} or more, where existing noise levels exceed the City's 60 dBA CNEL exterior noise level standard (*General Plan Noise Element, Policy E*).

Method of Analysis

Below are descriptions of the methodologies utilized to determine traffic noise, railroad noise, operational noise, construction noise and vibration, and railroad vibration impacts. Further

4 City of Antioch. *City of Antioch General Plan*. Updated November 24, 2003. Page 11-10.

modeling details and calculations are provided in the *Environmental Noise Assessment* (see Appendix J). The results of the noise and vibration impact analyses were compared to the standards of significance discussed above in order to determine the associated level of impact.

Ambient Noise

The sound level meters were programmed to record the maximum, median, and average noise levels at each measuring site location during the survey. The maximum value, denoted L_{max}, represents the highest noise level measured. The average value, denoted L_{eq}, represents the energy average of all of the noise received by the sound level meter microphone during the monitoring period. The median value, denoted L_{50}, represents the sound level exceeded 50 percent of the time during the monitoring period.

Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meters were used for the ambient noise level measurement survey. The meters were calibrated before and after use with an LDL Model CAL200 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all pertinent specifications of the American National Standards Institute for Type 1 sound level meters (ANSI S1.4).

Traffic Noise

To predict existing noise levels due to traffic, the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (RD-77-108) was used. The FHWA model is based upon the noise factors for automobiles, medium trucks and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site. The FHWA model was developed to predict hourly L_{eq} values for free-flowing traffic conditions. To predict L_{dn}/CNEL values, determination of the day/night distribution of traffic and adjustment of the traffic volume input data is necessary to yield an equivalent hourly traffic volume. Traffic volumes for existing conditions were obtained from the traffic study prepared for the project (Fehr & Peers). Truck percentages and vehicle speeds on the local area roadways were estimated from field observations.

Construction Noise and Vibration

Human and structural response to different vibration levels is influenced by a number of factors, including ground type, distance between source and receptor, duration, and the number of perceived vibration events. Table 4.10-4 summarizes the effects of vibration on people and buildings. Table 4.10-4 indicates that the threshold for damage to structures ranges from two to six in/sec p.p.v. One-half this minimum threshold, or one in/sec p.p.v., is considered a safe criterion that would protect against architectural or structural damage. The general threshold at which human annoyance could occur is noted as 0.1 in/sec p.p.v. Construction noise and vibration was analyzed using data compiled for various pieces of construction equipment at distances of 25 feet, 50 feet, and 100 feet.

Table 4.10-4
Effects of Vibration on People and Buildings

Peak Particle Velocity inches/second	Peak Particle Velocity mm/second	Human Reaction	Effect on Buildings
0.15-0.30	0.006-0.019	Threshold of perception; possibility of intrusion	Vibrations unlikely to cause damage of any type
2.0	0.08	Vibrations readily perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
2.5	0.10	Level at which continuous vibrations begin to annoy people	Virtually no risk of "architectural" damage to normal buildings
5.0	0.20	Vibrations annoying to people in buildings (this agrees with the levels established for people standing on bridges and subjected to relative short periods of vibrations)	Threshold at which there is a risk of "architectural" damage to normal dwelling - houses with plastered walls and ceilings. Special types of finish such as lining of walls, flexible ceiling treatment, etc., would minimize "architectural" damage
10-15	0.4-0.6	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Vibrations at a greater level than normally expected from traffic, but would cause "architectural" damage and possibly minor structural damage

Source: Caltrans. Transportation Related Earthborne Vibrations. TAV-02-01-R9601. February 20, 2002.[5]

Project-Specific Impacts and Mitigation Measures

As discussed in Chapter 3 of this EIR, Project Description, two development scenarios for the proposed project are currently being considered: a Multi-Generational Plan and a Traditional Plan. The following discussion of impacts is based on implementation of either of the development scenarios. Where impacts would be similar under both of the development scenarios, the discussion of impacts presented below is applicable for both scenarios. However, where impacts would differ between the two development scenarios, the impacts are discussed separately for each scenario. It should be noted that while potential impacts related to both development scenarios are analyzed, ultimately, only one development scenario would be constructed.

4.10-1 Transportation noise at existing sensitive receptors. Based on the analysis below, the impact is *less than significant.*

Multi-Generational Plan and Traditional Plan

Vehicle trips associated with operation of the proposed project would result in changes to traffic on the existing roadway network within the project vicinity. As a result, project buildout would cause an increase in traffic noise levels on local roadways. To assess noise

5 Caltrans. *Transportation Related Earthborne Vibrations.* TAV-02-01-R9601. February 20, 2002.

impacts due to project-related traffic increases on the existing local roadway network, noise levels have been calculated for the Existing Plus Project and the Near Term Plus Project traffic conditions for both the Multi-Generational Plan and Traditional Plan scenarios.

Traffic noise levels were predicted at the closest typical residential outdoor use area along each project-area roadway segment. A conservative adjustment of -5 dB is assumed where noise barriers are located adjacent to sensitive receptors or where rear yards are shielded by intervening buildings. In some locations, sensitive receptors may not receive full shielding from noise barriers, or may be located at distances which vary from the assumed calculation distance. However, the traffic noise analysis is considered representative of the majority of sensitive receptors located closest to the project area roadway segments analyzed in the noise report.

The actual distances to noise level contours may vary from the distances predicted by the FHWA model due to roadway curvature, grade, shielding from local topography or structures, elevated roadways, or elevated receivers. Table 4.10-5 and Table 4.10-6 show the Existing condition traffic noise levels and the increase in noise levels for the Existing Plus Project condition for both the Multi-Generational Plan and Traditional Plan scenarios. Table 4.10-7 and Table 4.10-8 show the Near Term condition traffic noise levels and the increase in noise levels for the Near Term Plus Project condition for both the Multi-Generational Plan and Traditional Plan scenarios.

The distances reported in Table 4.10-5 through Table 4.10-8 are generally considered to be conservative estimates of noise exposure along the project-area roadways. Table 4.10-5 through Table 4.10-8 indicate that some noise sensitive receptors located along the project-area roadways are currently exposed to exterior traffic noise levels exceeding the City of Antioch 60 dB CNEL exterior noise level standard for residential uses. The aforementioned receptors would continue to experience elevated exterior noise levels with implementation of the proposed project. However, the project is not predicted to cause any new exceedances of the City's 60 dB CNEL exterior noise level standard.

As shown in Table 4.10-5 through Table 4.10-8, and based upon the General Plan EIR and general standards of significance, the project results in an increase in long-term ambient noise by five dBA CNEL/L_{dn} or more, where existing noise levels do not exceed the City's 60 dBA CNEL exterior noise level standard, which are located along the segment of Dallas Ranch Road south of Prewett Ranch Road and along the segment of proposed Sand Creek Road, west of Deer Valley Road. Residences located adjacent to Dallas Ranch Road have existing sound walls which are approximately nine feet in height. The existing nine-foot walls are assumed to anticipate traffic noise levels associated with future development. The nine-foot walls would provide a minimum shielding of nine dB in backyard outdoor activity areas.

Table 4.10-5
Existing and Existing Plus Project Traffic Noise Levels for the Multi-Generational Plan

Roadway	Segment	Traffic Noise Levels CNEL (dBA)[2]				Distance to Noise Level Contours (feet)[1]					
		Typical Setback Distance (feet)	Existing	Existing Plus Project	Change	Existing (CNEL)			Existing Plus Project (CNEL)		
						70 dB	65 dB	60 dB	70 dB	65 dB	60 dB
Balfour Road	SR 4 – Deer Valley Road	75	68.9	69.2	+0.3	64	137	295	67	144	310
Dallas Ranch Road	Lone Tree Way – Prewett Ranch Road	75	62.8	64.4	+1.6	25	54	115	32	68	147
Dallas Ranch Road	Prewett Ranch Rd. – South	75	51.3	56.5	**+5.2**	4	9	20	9	20	44
Deer Valley Road	Hillcrest Avenue – Lone Tree Way	75	67.2	67.3	+0.1	49	105	226	50	107	231
Deer Valley Road	Lone Tree Way – Prewett Ranch Road	75	65.3	66.7	+1.4	37	79	170	45	97	209
Deer Valley Road	Prewett Ranch Rd. – Wellness Way	75	65.2	66.5	+1.3	36	77	166	44	94	203
Deer Valley Road	Sand Creek Road – Balfour Road	75	62.5	63.8	+1.3	24	51	110	29	62	134
Hillcrest Avenue	Deer Valley Road – Lone Tree Way	75	66.1	66.1	+0.0	41	89	192	41	89	192
Lone Tree Way	James Donlon Blvd. – Dallas Ranch Road	75	68.7	69.2	+0.5	61	131	283	66	143	308
Lone Tree Way	Dallas Ranch Road – Deer Valley Road	75	66.9	67.1	+0.2	47	101	217	48	104	223
Lone Tree Way	Deer Valley Road – Hillcrest Avenue	75	67.3	67.9	+0.6	50	108	232	54	117	252
Lone Tree Way	Hillcrest Avenue – State Route 4	75	70.4	70.6	+0.2	80	172	371	82	176	379
Lone Tree Way	State Route 4 – East	75	69.8	69.9	+0.1	73	158	340	74	160	345
Sand Creek Road	Deer Valley Road – Hillcrest Avenue	75	58.3	58.3	+0.0	12	27	58	12	27	58
Sand Creek Road	Deer Valley Road – West	75	37.3	60.0	**+22.7**	0	1	2	16	35	75
State Route 4	Sand Creek Road – Lone Tree Way	75	68.2	68.3	+0.1	57	123	264	58	124	268

Notes:
1 Distances to traffic noise contours are measured in feet from the centerlines of the roadways.
2 Traffic noise levels do not account for shielding from existing noise barriers or intervening structures. Traffic noise levels may vary depending on actual setback distances and localized shielding.
Bold indicates a potential significant increase in traffic noise levels.

Source: j.c. brennan & associates, Inc., 2017.

Table 4.10-6
Existing and Existing Plus Project Traffic Noise Levels for the Traditional Plan

Roadway	Segment	Traffic Noise Levels CNEL (dBA)[2]				Distance to Noise Level Contours (feet)[1]					
		Typical Setback Distance (feet)	Existing	Existing Plus Project	Change	Existing (CNEL)			Existing Plus Project (CNEL)		
						70 dB	65 dB	60 dB	70 dB	65 dB	60 dB
Balfour Road	SR 4 – Deer Valley Road	75	68.9	69.3	+0.4	64	137	295	67	145	313
Dallas Ranch Road	Lone Tree Way – Prewett Ranch Road	75	62.8	64.6	+1.8	25	54	115	33	71	152
Dallas Ranch Road	Prewett Ranch Rd. – South	75	51.3	57.0	**+5.7**	4	9	20	10	22	47
Deer Valley Road	Hillcrest Avenue – Lone Tree Way	75	67.2	67.4	+0.2	49	105	226	50	108	232
Deer Valley Road	Lone Tree Way – Prewett Ranch Road	75	65.3	66.9	+1.6	37	79	170	46	100	215
Deer Valley Road	Prewett Ranch Rd. – Wellness Way	75	65.2	66.7	+1.5	36	77	166	45	97	209
Deer Valley Road	Sand Creek Road – Balfour Road	75	62.5	64.0	+1.5	24	51	110	30	64	138
Hillcrest Avenue	Deer Valley Road – Lone Tree Way	75	66.1	66.1	+0.0	41	89	192	41	89	192
Lone Tree Way	James Donlon Blvd. – Dallas Ranch Road	75	68.7	69.3	+0.6	61	131	283	67	145	312
Lone Tree Way	Dallas Ranch Road – Deer Valley Road	75	66.9	67.1	+0.2	47	101	217	48	104	224
Lone Tree Way	Deer Valley Road – Hillcrest Avenue	75	67.3	68.0	+0.7	50	108	232	55	119	256
Lone Tree Way	Hillcrest Avenue – State Route 4	75	70.4	70.6	+0.2	80	172	371	82	177	380
Lone Tree Way	State Route 4 – East	75	69.8	69.9	+0.1	73	158	340	74	159	342
Sand Creek Road	Deer Valley Road – Hillcrest Avenue	75	58.3	58.3	+0.0	12	27	58	12	27	58
Sand Creek Road	Deer Valley Road – West	75	37.3	60.4	**+23.1**	0	1	2	17	37	80
State Route 4	Sand Creek Road – Lone Tree Way	75	68.2	68.3	+0.1	57	123	264	58	125	269

Notes:
1 Distances to traffic noise contours are measured in feet from the centerlines of the roadways.
2 Traffic noise levels do not account for shielding from existing noise barriers or intervening structures. Traffic noise levels may vary depending on actual setback distances and localized shielding.
Bold indicates a potential significant increase in traffic noise levels.

Source: j.c. brennan & associates, Inc., 2017.

Table 4.10-7
Near Term and Near Term Plus Project Traffic Noise Levels for the Multi-Generational Plan

Roadway	Segment	Traffic Noise Levels CNEL (dBA)[2]				Distance to Noise Level Contours (feet)[1]					
		Typical Setback Distance (feet)	Near Term	Near Term Plus Project	Change	Near Term (CNEL)			Near Term Plus Project (CNEL)		
						70 dB	65 dB	60 dB	70 dB	65 dB	60 dB
Balfour Road	SR 4 – Deer Valley Road	75	67.8	67.8	+0.0	54	116	250	54	116	250
Dallas Ranch Road	Lone Tree Way – Prewett Ranch Road	75	63.0	64.4	+1.4	26	55	119	32	69	148
Dallas Ranch Road	Prewett Ranch Rd. – South	75	51.5	56.4	+4.9	4	9	20	9	20	43
Deer Valley Road	Hillcrest Avenue – Lone Tree Way	75	67.7	67.8	+0.1	52	113	243	54	115	249
Deer Valley Road	Lone Tree Way – Prewett Ranch Road	75	66.3	67.0	+0.7	42	91	197	47	102	220
Deer Valley Road	Prewett Ranch Rd. – Wellness Way	75	65.5	66.4	+0.9	37	81	174	43	93	201
Deer Valley Road	Sand Creek Road – Balfour Road	75	62.9	63.4	+0.5	25	55	118	27	59	127
Hillcrest Avenue	Deer Valley Road – Lone Tree Way	75	66.5	66.5	+0.0	44	94	204	44	94	204
Lone Tree Way	James Donlon Blvd. – Dallas Ranch Road	75	69.5	70.0	+0.5	69	149	321	75	161	347
Lone Tree Way	Dallas Ranch Road – Deer Valley Road	75	68.0	68.2	+0.2	55	119	257	57	122	263
Lone Tree Way	Deer Valley Road – Hillcrest Avenue	75	68.4	68.6	+0.2	59	127	273	61	131	282
Lone Tree Way	Hillcrest Avenue – State Route 4	75	70.9	70.9	+0.0	87	187	402	87	187	402
Lone Tree Way	State Route 4 – East	75	70.7	70.7	+0.0	84	180	389	84	181	389
Sand Creek Road	Deer Valley Road – Hillcrest Avenue	75	61.3	64.0	+2.7	20	42	91	30	64	138
Sand Creek Road	Deer Valley Road – West	75	37.3	62.4	**+25.1**	0	1	2	23	50	108
Sand Creek Road	State Route 4 – Heidorn Ranch Road	75	64.2	65.5	+1.3	31	66	142	37	80	173
State Route 4	Sand Creek Road – Lone Tree Way	75	69.3	69.6	+0.3	68	146	314	70	151	325
Street A	Deer Valley Road - West	75	-	58.3	-	-	-	-	12	27	58

Notes:
1 Distances to traffic noise contours are measured in feet from the centerlines of the roadways.
2 Traffic noise levels do not account for shielding from existing noise barriers or intervening structures. Traffic noise levels may vary depending on actual setback distances and localized shielding.
Bold indicates a potential significant increase in traffic noise levels.

Source: j.c. brennan & associates, Inc., 2017.

Table 4.10-8
Near Term and Near Term Plus Project Traffic Noise Levels for the Traditional Plan

Roadway	Segment	Traffic Noise Levels CNEL (dBA)[2]				Distance to Noise Level Contours (feet)[1]					
		Typical Setback Distance (feet)	Near Term	Near Term Plus Project	Change	Near Term (CNEL)			Near Term Plus Project (CNEL)		
						70 dB	65 dB	60 dB	70 dB	65 dB	60 dB
Balfour Road	SR 4 – Deer Valley Road	75	67.8	67.9	+0.1	54	116	250	54	116	250
Dallas Ranch Road	Lone Tree Way – Prewett Ranch Road	75	63.0	64.7	+1.7	26	55	119	33	71	154
Dallas Ranch Road	Prewett Ranch Rd. – South	75	51.5	56.9	**+5.4**	4	9	20	10	22	47
Deer Valley Road	Hillcrest Avenue – Lone Tree Way	75	67.7	67.8	+0.1	52	113	243	54	116	250
Deer Valley Road	Lone Tree Way – Prewett Ranch Road	75	66.3	67.1	+0.8	42	91	197	48	104	223
Deer Valley Road	Prewett Ranch Rd. – Wellness Way	75	65.5	66.5	+1.0	37	81	174	44	95	205
Deer Valley Road	Sand Creek Road – Balfour Road	75	62.9	63.5	+0.6	25	55	118	28	59	128
Hillcrest Avenue	Deer Valley Road – Lone Tree Way	75	66.5	66.5	+0.0	44	94	204	44	94	204
Lone Tree Way	James Donlon Blvd. – Dallas Ranch Road	75	69.5	70.0	+0.5	69	149	321	75	161	347
Lone Tree Way	Dallas Ranch Road – Deer Valley Road	75	68.0	68.2	+0.2	55	119	257	57	122	263
Lone Tree Way	Deer Valley Road – Hillcrest Avenue	75	68.4	68.6	+0.2	59	127	273	61	131	282
Lone Tree Way	Hillcrest Avenue – State Route 4	75	70.9	70.9	+0.0	87	187	402	87	187	402
Lone Tree Way	State Route 4 – East	75	70.7	70.7	+0.0	84	180	389	84	181	389
Sand Creek Road	Deer Valley Road – Hillcrest Avenue	75	61.3	64.0	+2.7	20	42	91	30	64	138
Sand Creek Road	Deer Valley Road – West	75	37.3	62.4	**+25.1**	0	1	2	23	50	108
Sand Creek Road	State Route 4 – Heidorn Ranch Road	75	64.2	65.5	+1.3	31	66	142	37	80	173
State Route 4	Sand Creek Road – Lone Tree Way	75	69.3	69.6	+0.3	68	146	314	70	151	325
Street A	Deer Valley Road - West	75	-	58.3	-	-	-	-	12	27	58

Notes:
[1] Distances to traffic noise contours are measured in feet from the centerlines of the roadways.
[2] Traffic noise levels do not account for shielding from existing noise barriers or intervening structures. Traffic noise levels may vary depending on actual setback distances and localized shielding.
Bold indicates a potential significant increase in traffic noise levels.

Source: j.c. brennan & associates, Inc., 2017.

Therefore, the predicted increased traffic noise levels would not exceed the 60 dB CNEL standard. The 25.1 dB increase that would result from development under either proposed scenario for the proposed project on Sand Creek Road, west of Deer Valley Road, would not be considered a significant impact because existing noise sensitive receptors on proposed Sand Creek Road, west of Deer Valley Road do not exist. Two existing residences are located directly south of the proposed Sand Creek Road, along Deer Valley Road; however, the traffic noise environment is dominated by traffic along Deer Valley Road, and the Sand Creek Road traffic noise would not contribute at those residences. In addition, the proposed project would not result in an increase in long-term ambient noise by three dBA CNEL/L_{dn} or more, where existing noise levels already exceed the City's 60 dBA CNEL exterior noise level standard. Therefore, traffic-related noise impacts to existing sensitive receptors would be considered ***less than significant***.

Mitigation Measure(s)
None required.

4.10-2 Transportation noise at new sensitive receptors.[6] Based on the analysis below and with implementation of mitigation, the impact would be *less than significant.*

Multi-Generational Plan and Traditional Plan

The proposed project would be constructed in three separate phases. Construction of the project phases would occur sequentially, without overlap between the phases. Phase I of the project would include development of 350 residential units, and 54,000 square feet of commercial space over a total area of approximately 135 acres. Phase II would include construction of 350 residential units over 125 acres, and Phase III would include construction of a maximum of 685 units over 150 acres.

Exterior Traffic Noise Levels (Experienced at New On-Site Residences)

It should be noted that cumulative noise levels represent the worst-case future noise environment at the proposed project site. Any design for sound walls would need to be based on the worse-case condition. Accordingly, in order to evaluate the impacts of traffic noise on the proposed residential development, the analysis below uses noise levels that would occur under the Cumulative Plus Project Condition for both the Multi-Generational Plan and the Traditional Plan scenarios at the locations of the proposed residences.

The FHWA traffic noise prediction model was used to predict Cumulative Plus Project traffic noise levels for both scenarios. Table 4.10-9 and Table 4.10-10 show the predicted traffic noise levels at the proposed residential uses adjacent to the major project-area arterial roadways. In addition, the table indicates the property line noise barrier heights required to achieve compliance with an exterior noise level standard of 60 dB L_{dn}.

6 CEQA requires the analysis of potential adverse effects of a project *on the environment*. However, under California Building Industry Association v. Bay Area Air Quality Management District, 62 Cal. 4th 369 (2015), CEQA does not require the analysis or mitigation of the potential effects of the existing environment *on a project*.

Table 4.10-9
Transportation Noise Levels at Proposed On-Site Residential Uses for the Multi-Generational Plan

Noise Source	Receptor Description	Approximate Distances to Center of Outdoor Activity Area (feet)[1]	Average Daily Trips	Predicted Noise Levels (dB CNEL)[2]		
				No Wall	6 Foot Wall	8 Foot Wall
Dallas Ranch Rd.	South of Prewett Ranch Rd.	75'	8,790	59 dBA	53 dBA	51 dBA
Deer Valley Rd.	Prewett Ranch Rd. to Sand Creek Rd.	75'	26,360	69 dBA	62 dBA	60 dBA
Deer Valley Rd.	Sand Creek Rd. to Balfour Way	75'	12,060	65 dBA	59 dBA	57 dBA
Sand Creek Rd.	West of Deer Valley Rd.	75'	6,050	57 dBA	51 dBA	49 dBA
Street A	West of Deer Valley Rd.	75'	2,110	52 dBA	46 dBA	44 dBA

Notes:
1 Setback distances are measured in feet from the centerlines of the roadways to the center of residential backyards.
2 The modeled noise barriers assume flat site conditions where roadway elevations, base of wall elevations, and building pad elevations are approximately equivalent.

Source: FHWA-RD-77-108 with inputs from Fehr & Peers and j.c. brennan & associates, Inc. January 20, 2015.

Table 4.10-10
Transportation Noise Levels at Proposed On-Site Residential Uses for the Traditional Plan

Noise Source	Receptor Description	Approximate Distances to Center of Outdoor Activity Area (feet)[1]	Average Daily Trips	Predicted Noise Levels (dB CNEL)[2]		
				No Wall	6 Foot Wall	8 Foot Wall
Dallas Ranch Rd.	South of Prewett Ranch Rd.	75'	9,490	59 dBA	53 dBA	51 dBA
Deer Valley Rd.	Prewett Ranch Rd. to Sand Creek Rd.	75'	26,870	69 dBA	62 dBA	60 dBA
Deer Valley Rd.	Sand Creek Rd. to Balfour Way	75'	12,190	65 dBA	59 dBA	57 dBA
Sand Creek Rd.	West of Deer Valley Rd.	75'	6,890	57 dBA	52 dBA	50 dBA
Street A	West of Deer Valley Rd.	75'	2,530	53 dBA	47 dBA	45 dBA

Notes:
1 Setback distances are measured in feet from the centerlines of the roadways to the center of residential backyards.
2 The modeled noise barriers assume flat site conditions where roadway elevations, base of wall elevations, and building pad elevations are approximately equivalent.

Source: FHWA-RD-77-108 with inputs from Fehr & Peers and j.c. brennan & associates, Inc. January 20, 2015.

The data in Table 4.10-9 and Table 4.10-10 indicate that noise barriers of 6-feet and 8-feet in height would be required to reduce exterior traffic noise levels to 60 dB CNEL or less at the sensitive receptors located along Deer Valley Road. Because grading plans are not currently available, noise barrier height and placement should be reviewed when such plans are available.

Interior Noise Levels

Modern construction typically provides a 25 dB exterior-to-interior noise level reduction with windows closed. Therefore, sensitive receptors exposed to exterior noise of 70 dB CNEL or less would typically comply with the City of Antioch 45 dB CNEL interior noise level standard. Additional noise reduction measures, such as acoustically-rated windows, are generally required for exterior noise levels exceeding 70 dB CNEL.

Exterior noise levels are typically two to three dB higher at second floor locations. Additionally, noise barriers do not reduce exterior noise levels at second floor locations. The proposed residential uses are predicted to be exposed to unmitigated first floor exterior traffic noise levels below the 70 dB CNEL threshold. Therefore, second floor facades are predicted to be exposed to exterior traffic noise levels of up to 72 dB CNEL for the segment between Prewett Ranch Road and Sand Creek Road. Therefore, additional interior noise control measures would be required for traffic noise.

Conclusion

Because residential land uses proposed at the project site would be exposed to noise levels greater than the noise level standards presented in the City of Antioch General Plan without mitigation, noise impacts to proposed on-site sensitive receptors would be considered ***significant***.

<u>Mitigation Measure(s)</u>
Implementation of the following mitigation measures would reduce the above impact to a *less-than-significant* level.

Multi-Generational Plan and Traditional Plan

4.10-2(a) *In conjunction with submittal of Improvement Plans, the applicant shall show on the Improvement Plans that sound walls and/or landscaped berms shall be constructed along Deer Valley Road. The barrier heights shall be 8-feet in height for residences between the northern project boundary and Sand Creek Road. The specific height and location of the noise barrier shall be confirmed based upon the final approved site and grading plans. Noise barrier walls shall be constructed of concrete panels, concrete masonry units, earthen berms, or any combination of these materials. Wood is not recommended due to eventual warping and degradation of acoustical performance. If roadway elevations and building pad elevations are not equal, the barrier heights and locations should be reviewed once grading* *plans are available for these locations. If multi-family residential is proposed along this area, common outdoor activity areas can be shielded by building facades as a means of achieving the exterior noise level standard. The Improvement Plans shall be subject to review and approval by the City Engineer.*

4.10-2(b) *Prior to the approval of the first Tentative Map for The Ranch Project, a detailed project level analysis of interior noise levels for the second-floor facades adjacent to Deer Valley Road shall be conducted to determine if the interior noise levels exceed the City of Antioch noise level standards presented in the City of Antioch General Plan, subject to review and approval by the City Engineer.*

4.10-3 Operational noise from activities on-site post development. Based on the analysis below, even with mitigation, the impact is *significant and unavoidable.*

Multi-Generational Plan and Traditional Plan

Stationary noise sources associated with the project include on-site park uses and the Village Center. The proposed parks are located on the interior of the project site and are considered to be an amenity to the site plan and are not considered to be a potentially significant noise source. In addition, the proposed parks have significant setbacks from existing residential uses. The Village Center, is a 5.7-acre neighborhood commercial use. Potential noise sources include parking lot activities, delivery trucks, and HVAC equipment. Thus, impacts related to operational noise due to on-site activities, as a result of the proposed project, could be considered ***significant***.

Mitigation Measure(s)
Implementation of the following mitigation measure would have the potential to reduce the severity of the above impact. However, considering the present uncertainty regarding future commercial uses within the Village Center, the following mitigation measure cannot be guaranteed to ensure that existing sensitive receptors would not be exposed to on-site noise in excess of the City's noise thresholds. Therefore, the impact related to operational noise from activities on-site post development would remain *significant and unavoidable*.

Multi-Generational Plan and Traditional Plan

4.10-3 *Prior to the approval of the Village Center project, the applicant shall submit a site-specific noise study with an analysis of any significant noise generators and recommended measures to reduce the noise levels at all sensitive receptors to below the City's 60 dB L_{dn} exterior threshold and 45 dB L_{dn}, interior threshold. Potential measures could include, but would not be limited to, inclusion of noise buffers in site design, restriction of two-story homes, or incorporation of noise-insulating building materials such as windows with a sound transmission class rating of 35-38 and resilient channels for walls. The site-specific noise study shall include mitigation* *measures necessary to reduce exterior and interior noise levels to the foregoing thresholds of significance. The site-specific noise study shall be subject to review and approval by the City of Antioch Community Development Department.*

4.10-4 Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels. Based on the analysis below, the impact is *less than significant.*

<u>Multi-Generational Plan and Traditional Plan</u>

The proposed project would include construction of homes, neighborhood commercial uses, roads, water and sewer lines, and related infrastructure, all of which would add to the noise environment in the project vicinity. Both scenarios were assumed to be fully operational by 2033.

Construction vibration impacts include human annoyance and building structural damage. Human annoyance occurs when construction vibration rises significantly above the threshold of perception (0.006 to 0.019 in/sec). Building damage could take the form of cosmetic or structural. Table 4.10-11 shows the typical vibration levels produced by construction equipment.

Table 4.10-11
Vibration Levels for Varying Construction Equipment

Type of Equipment	Peak Particle Velocity at 25 feet (inches/second)	Peak Particle Velocity at 50 feet (inches/second)	Peak Particle Velocity at 100 feet (inches/second)
Large Bulldozer	0.089	0.031	0.011
Loaded Trucks	0.076	0.027	0.010
Small Bulldozer	0.003	0.001	0.000
Auger/drill Rigs	0.089	0.031	0.011
Jackhammer	0.035	0.012	0.004
Vibratory Hammer	0.070	0.025	0.009
Vibratory Compactor/roller	0.210	0.074	0.026

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment Guidelines, May 2006.

Nearby existing sensitive receptors could be impacted by construction-related vibrations, especially vibratory compactors/rollers. However, the nearest receptors are located approximately 50 feet or further to the north from any areas of the project site that might require grading or paving. As shown in Table 4.10-11, construction vibration levels anticipated for the proposed project would be less than 0.1 in/sec at 50 feet. Accordingly, construction vibrations are not predicted to cause damage to existing buildings or cause annoyance to sensitive receptors and implementation of the proposed project would not expose persons to or generate excessive groundborne vibration levels. Therefore, construction-related vibration impacts would be considered ***less than significant***.

Mitigation Measure(s)
None required.

4.10-5 Substantial temporary or periodic increase in ambient noise levels in the project vicinity. Based on the analysis below and with implementation of mitigation, the impact would be *less than significant.*

Multi-Generational Plan and Traditional Plan

The proposed project would include construction of homes, neighborhood commercial uses, roads, water and sewer lines, and related infrastructure, all of which would add to the noise environment in the project vicinity. Both scenarios were assumed to be fully operational by 2033.

Table 4.10-12 summarizes typical construction equipment noise at a distance of 50 feet, 100 feet, 200 feet, and 400 feet. As shown in Table 4.10-12, activities involved in construction would generate maximum noise levels ranging from 76 to 90 dB at a distance of 50 feet.

Table 4.10-12
Construction Equipment Noise

	Predicted Noise Levels (L_{max} dB)				Distances to Noise Contours (feet)	
Type of Equipment	**Noise Level at 50 feet**	**Noise Level at 100 feet**	**Noise Level at 200 feet**	**Noise Level at 400 feet**	**70 dB L_{max} Contour**	**65 dB L_{max} Contour**
Backhoe	78	72	66	60	126	223
Compactor	83	77	71	65	223	397
Compressor (air)	78	72	66	60	126	223
Concrete Saw	90	84	78	72	500	889
Dozer	82	76	70	64	199	354
Dump Truck	76	70	64	58	100	177
Excavator	81	75	69	63	177	315
Generator	81	75	69	63	177	315
Jackhammer	89	83	77	71	446	792
Pneumatic Tools	85	79	73	67	281	500

Source: Roadway Construction Noise Model User's Guide. Federal Highway Administration. FHWA-HEP-05-054. January 2006.

Noise would also be generated during the construction phase by increased truck traffic on area roadways. In addition, project-generated construction noise would include traffic associated with transport of heavy materials and equipment to and from the construction sites. The noise increase would be of short duration and would likely occur primarily during daytime hours.

Ultimately, construction noise would be exempt from the City's noise standards, per Section 5-17.04 of the City's Zoning Code and any elevated noise levels would be temporary in nature. However, because the nearest sensitive receptor may experience periods of elevated construction noise, mitigation measures shall be employed to alleviate the potential impacts from construction noise.

Construction activities would be temporary in nature, would occur during normal daytime working hours, and would be exempt from noise regulation during the hours listed above. Implementation of the proposed project would not expose persons to or generate excessive groundborne noise levels. However, the nearest existing sensitive receptors are located adjacent to the project site to the north, southeast, and east and may be subject to ***significant*** temporary noise impacts if construction occurs outside normal daytime hours.

Mitigation Measure(s)

Implementation of the following mitigation measures would reduce the above impact to a *less-than-significant* level.

Multi-Generational Plan and Traditional Plan

4.10-5(a) *Noise-generating activities at the construction site or in areas adjacent to the construction site that are associated with the proposed project in any way shall adhere to the requirements of the City of Antioch Zoning Ordinance with respect to hours of operations, subject to review and approval by the City Building Official. Specifically, construction activities shall not occur during the hours specified below:*

- *On weekdays prior to 7:00 AM and after 6:00 PM;*
- *On weekdays within 300 feet of occupied dwellings, prior to 8:00 AM and after 5:00 PM; and*
- *On weekends and holidays, prior to 9:00 AM and after 5:00 PM, irrespective of the distance from the occupied dwellings.*

4.10-5(b) *Prior to issuance of the grading permit, the project contractor shall ensure that all intake and exhaust ports on power construction equipment shall be shrouded or shielded from sensitive receptors according to industry best practices, subject to review and approval by the City Building Official.*

4.10-5(c) *Prior to issuance of the grading permit, the project contractor shall designate a disturbance coordinator and conspicuously post the coordinator's number around the project site and in adjacent public spaces, subject to review and approval by the City Building Official. The disturbance coordinator shall receive any and all public complaints about construction noise disturbances and shall be responsible for determining the cause of the complaint and implementing any feasible measures to be taken to alleviate the problem.*

4.10-5(d) *Prior to the issuance of the grading permit, the applicants shall submit a construction-related noise mitigation plan to the City Building Official for review and approval. The plan shall depict the location of construction equipment and how the noise from this equipment will be mitigated during construction of the project through the use of such methods as:*

- *The construction contractor shall use temporary noise-attenuation fences, where feasible, to reduce construction noise impacts on adjacent noise sensitive land uses.*
- *During all project site excavation and grading on-site, the construction contractors shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers, consistent with manufacturers' standards. The construction contractor shall place all stationary construction equipment so that emitted noise is directed away from sensitive receptors nearest the project site.*
- *The construction contractor shall locate equipment staging in areas that will create the greatest distance between construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction. In addition, the project contractor shall place such stationary construction equipment so that emitted noise is directed away from sensitive receptors nearest the project site.*
- *The construction contractor shall prohibit unnecessary idling of internal combustion engines.*

4.10-6 Aircraft noise. Based on the analysis below, the project would have *no impact.*

<u>Multi-Generational Plan and Traditional Plan</u>

The project area is not located within the vicinity of a public airport or a private airstrip and is not within an airport land use plan. The nearest airport to the project site is the Byron Airport, located approximately 12 miles southeast of the site. Therefore, the proposed project would not be exposed to excessive air traffic noise, and ***no impact*** would occur as a result of the proposed project.

<u>Mitigation Measure(s)</u>
None required.

Cumulative Impacts and Mitigation Measures

The following discussion of impacts is based on the implementation of the proposed project in combination with other proposed and pending projects in the region. Other proposed and pending projects in the region under the cumulative context would include buildout of the City's General Plan, as well as development of the most recent planned land uses within the vicinity of the project area.

4.10-7 Cumulative impacts on noise-sensitive receptors. Based on the analysis below and with implementation of mitigation, the project's contribution to a cumulative impact would be *less than significant*.

Multi-Generational Plan and Traditional Plan

The cumulative context for noise impacts associated with the proposed project would consist of the existing and future noise sources that could affect the project or surrounding uses. Noise generated by construction would be temporary, and would not add to the permanent noise environment or be considered as part of the cumulative context. Cumulative noise impacts would occur primarily as a result of increased traffic on local roadways due to the proposed project and on-site activities resulting from operation of the proposed project.

Cumulative Traffic Noise

Vehicle trips associated with operation of the proposed project would result in changes to traffic on the existing roadway network within the project vicinity. As a result, project buildout would cause an increase in traffic noise levels on local roadways. To assess noise impacts due to project-related traffic increases on the existing local roadway network in addition to other traffic, noise levels have been calculated for the Cumulative Plus Project traffic condition. Table 4.10-13 and Table 4.10-14 show the Cumulative condition traffic noise levels and the increase in noise levels for the Cumulative Plus Project condition for both the Multi-Generational Plan and the Traditional Plan scenarios.

Future cumulative traffic noise conditions at the project site and impacts on the existing and proposed sensitive receptors are discussed in detail below.

Existing Sensitive Receptors

As shown in Table 4.10-13 and Table 4.10-14, cumulative traffic noise would exceed City standards at several locations without the proposed project. The aforementioned receptors would continue to experience elevated exterior noise levels with implementation of either the Multi-Generational Plan or Traditional Plan scenarios. However, both proposed scenarios for the project would not result in an increase in long-term ambient noise by three dBA CNEL/L_{dn} or more, where existing noise levels already exceed the City's 60 dBA CNEL exterior noise level standard.

Table 4.10-13
Cumulative and Cumulative Plus Project Traffic Noise Levels for the Multi-Generational Plan

Roadway	Segment	Traffic Noise Levels CNEL (dBA)[2]				Distance to Noise Level Contours (feet)[1]					
		Typical Setback Distance (feet)	Cumulative	Cumulative Plus Project	Change	Cumulative (CNEL)			Cumulative Plus Project (CNEL)		
						70 dB	65 dB	60 dB	70 dB	65 dB	60 dB
Balfour Road	SR 4 – Deer Valley Road	75	71.7	71.7	+0.0	97	209	449	97	209	450
Dallas Ranch Road	Lone Tree Way – Prewett Ranch Road	75	65.5	66.5	+0.0	38	81	175	44	94	203
Dallas Ranch Road	Prewett Ranch Rd. – South	75	56.1	58.5	+2.4	9	19	41	13	27	59
Deer Valley Road	Hillcrest Avenue – Lone Tree Way	75	68.1	68.3	+0.2	56	121	261	57	124	266
Deer Valley Road	Lone Tree Way – Prewett Ranch Road	75	66.7	67.4	+0.7	45	98	211	50	108	233
Deer Valley Road	Prewett Ranch Rd. – Wellness Way	75	67.9	68.5	+0.6	54	117	252	59	128	275
Deer Valley Road	Sand Creek Road – Balfour Road	75	64.7	65.1	+0.4	33	72	155	35	76	163
Hillcrest Avenue	Deer Valley Road – Lone Tree Way	75	67.2	67.2	+0.0	49	106	228	49	106	228
Lone Tree Way	James Donlon Blvd. – Dallas Ranch Road	75	69.9	70.9	+1.0	74	160	345	86	186	401
Lone Tree Way	Dallas Ranch Road – Deer Valley Road	75	68.4	68.5	+0.1	59	126	272	60	129	277
Lone Tree Way	Deer Valley Road – Hillcrest Avenue	75	69.6	69.7	+0.1	71	153	329	71	154	331
Lone Tree Way	Hillcrest Avenue – State Route 4	75	71.6	71.6	+0.0	96	206	443	96	206	444
Lone Tree Way	State Route 4 – East	75	70.9	70.9	+0.0	86	185	398	86	185	399
Sand Creek Road	Deer Valley Road – Hillcrest Avenue	75	65.2	66.3	+1.1	36	78	167	42	91	197
Sand Creek Road	Deer Valley Road – West	75	50.3	62.1	**+11.8**	4	8	17	22	48	103
Sand Creek Road	State Route 4 – Heidorn Ranch Road	75	68.8	69.3	+0.5	63	135	292	67	145	311
State Route 4	Sand Creek Road – Lone Tree Way	75	71.0	71.1	+0.1	88	189	407	89	193	415
Street A	Deer Valley Road - West	75	-	57.5	-	-	-	-	11	24	51

Notes:
[1] Distances to traffic noise contours are measured in feet from the centerlines of the roadways.
[2] Traffic noise levels do not account for shielding from existing noise barriers or intervening structures. Traffic noise levels may vary depending on actual setback distances and localized shielding.
Bold indicates a potential significant increase in traffic noise levels.

Source: j.c. brennan & associates, Inc., 2017.

Table 4.10-14
Cumulative and Cumulative Plus Project Traffic Noise Levels for the Traditional Plan

Roadway	Segment	Traffic Noise Levels CNEL (dBA)[2]				Distance to Noise Level Contours (feet)[1]					
		Typical Setback Distance (feet)	Cumulative	Cumulative Plus Project	Change	Cumulative (CNEL)			Cumulative Plus Project (CNEL)		
						70 dB	65 dB	60 dB	70 dB	65 dB	60 dB
Balfour Road	SR 4 – Deer Valley Road	75	71.7	71.7	+0.0	97	209	449	97	209	450
Dallas Ranch Road	Lone Tree Way – Prewett Ranch Road	75	65.5	66.6	+1.1	38	81	175	45	97	208
Dallas Ranch Road	Prewett Ranch Rd. – South	75	56.1	58.8	+2.7	9	19	41	13	29	62
Deer Valley Road	Hillcrest Avenue – Lone Tree Way	75	68.1	68.3	+0.2	56	121	261	58	124	267
Deer Valley Road	Lone Tree Way – Prewett Ranch Road	75	66.7	67.5	+0.8	45	98	211	51	110	236
Deer Valley Road	Prewett Ranch Rd. – Wellness Way	75	67.9	68.5	+0.6	54	117	252	60	129	278
Deer Valley Road	Sand Creek Road – Balfour Road	75	64.7	65.1	+0.4	33	72	155	35	76	164
Hillcrest Avenue	Deer Valley Road – Lone Tree Way	75	67.2	67.2	+0.0	49	106	228	49	106	228
Lone Tree Way	James Donlon Blvd. – Dallas Ranch Road	75	69.9	70.4	+0.5	74	160	345	80	171	369
Lone Tree Way	Dallas Ranch Road – Deer Valley Road	75	68.4	68.5	+0.1	59	126	272	60	129	278
Lone Tree Way	Deer Valley Road – Hillcrest Avenue	75	69.6	69.7	+0.1	71	153	329	71	154	331
Lone Tree Way	Hillcrest Avenue – State Route 4	75	71.6	71.6	+0.0	96	206	443	96	206	444
Lone Tree Way	State Route 4 – East	75	70.9	70.9	+0.0	86	185	398	86	185	399
Sand Creek Road	Deer Valley Road – Hillcrest Avenue	75	65.2	66.5	+1.3	36	78	167	44	94	202
Sand Creek Road	Deer Valley Road – West	75	50.3	62.6	**+12.3**	4	8	17	24	52	112
Sand Creek Road	State Route 4 – Heidorn Ranch Road	75	68.8	69.4	+0.6	63	135	292	68	146	315
State Route 4	Sand Creek Road – Lone Tree Way	75	71.0	71.2	+0.2	88	189	407	90	193	417
Street A	Deer Valley Road - West	75	-	58.3	-	-	-	-	12	27	58

Notes:
[1] Distances to traffic noise contours are measured in feet from the centerlines of the roadways.
[2] Traffic noise levels do not account for shielding from existing noise barriers or intervening structures. Traffic noise levels may vary depending on actual setback distances and localized shielding.
Bold indicates a potential significant increase in traffic noise levels.

Source: j.c. brennan & associates, Inc., 2017.

In addition, as shown in Table 4.10-13 and Table 4.10-14 and based upon the General Plan EIR and general standards of significance, both proposed scenarios for the project result in an increase in long-term ambient noise by five dBA CNEL/L_{dn} or more, where existing noise levels do not exceed the City's 60 dBA CNEL exterior noise level standard, which are located along the segment of Sand Creek Road located west of Deer Valley Road. However, as discussed above, existing noise sensitive receptors on the proposed Sand Creek Road, west of Deer Valley Road do not exist. Therefore, traffic-related noise impacts to existing sensitive receptors would not occur.

Future Sensitive Receptors

As presented above, Table 4.10-9 and Table 4.10-10 show the predicted traffic noise levels at the proposed residential uses adjacent to the major project-area arterial roadways. The data in Table 4.10-9 and Table 4.10-10 indicate that noise barriers of 6-feet and 8-feet in height would be required to reduce exterior traffic noise levels to 60 dB CNEL or less at the sensitive receptors located along Deer Valley Road. However, because grading plans are not currently available, noise barrier height and placement should be reviewed when such plans are available.

Conclusion

Cumulative noise levels at the closest sensitive receptors without the proposed project would exceed City standards at several locations. Because the increase in noise levels associated with implementation of the proposed project would not cause an audible (3.0 dBA) increase in noise in areas where General Plan noise objectives are already exceeded as the result of existing development, the total noise increase associated with the proposed project would be considered a less-than-significant incremental increase to the future noise environment. In addition, as shown above in Table 4.10-13 and Table 4.10-14, both the Multi-Generational Plan and Traditional Plan scenarios would result in an increase by five dBA CNEL/L_{dn} or more, 11.8 dBA and 12.3 dBA respectively, where existing noise levels do not currently exceed the City's 60 dBA CNEL exterior noise level standard, located along the segment of Sand Creek Road located west of Deer Valley Road. However, as discussed above, existing noise sensitive receptors on the proposed Sand Creek Road, west of Deer Valley Road do not exist. Therefore, traffic-related noise impacts to existing sensitive receptors would not occur. Nevertheless, because noise attenuation measures would be required for the proposed sensitive residential receptors adjacent to the major project-area arterial roadways, the cumulative noise impact would be considered ***significant*** without mitigation.

Mitigation Measure(s)
Implementation of the following mitigation measure would reduce the above impact to a *less-than-significant* level.

Multi-Generational Plan and Traditional Plan

4.10-7 Implement Mitigation Measures 4.10-2(a), 4.10-2 (b) and 4.10-5(a-d).