3.11 - Noise

3.11.1 - Introduction

This section describes existing conditions related to noise and vibration in the project area as well as the regulatory framework. This section also evaluates the possible impacts related to noise and vibration that could result from implementation of the proposed project. Information included in this section is based on the City of Antioch General Plan, the City of Antioch Code of Ordinances, the project-specific traffic analysis report included in Appendix K, and project-specific noise analysis report provided in Appendix I. No public comments were received during the Environmental Impact Report (EIR) scoping period related to noise.

3.11.2 - Environmental Setting

Characteristics of Noise

Noise is generally defined as unwanted or objectionable sound. Sound becomes unwanted when it interferes with normal activities, when it causes actual physical harm or when it has adverse effects on health. The effects of noise on people can include general annoyance, interference with speech communication, sleep disturbance, and in the extreme, hearing impairment. Noise effects can be caused by pitch or loudness. *Pitch* is the number of complete vibrations or cycles per second of a wave that result in the range of tone from high to low; higher-pitched sounds are louder to humans than lower-pitched sounds. *Loudness* is the intensity or amplitude of sound.

Sound is produced by the vibration of sound pressure waves in the air. Sound pressure levels are used to measure the intensity of sound and are described in terms of decibels. The decibel (dB) is a logarithmic unit, which expresses the ratio of the sound pressure level being measured to a standard reference level. The 0 point on the dB scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Changes of less than 3 dB are only perceptible in laboratory environments. Audible increases in noise levels generally refer to a change of 3 dB or more, as this level has been found to be barely perceptible to the human ear in outdoor environments. Only audible changes in existing ambient or background noise levels are considered potentially significant.

The human ear is not equally sensitive to all frequencies within the audible sound spectrum, so sound pressure level measurements can be weighted to better represent frequency-based sensitivity of average healthy human hearing. One such specific "filtering" of sound is called "A-weighting." A-weighted decibels (dBA) approximate the subjective response of the human ear to a broad frequency noise source by discriminating against very low and very high frequencies of the audible spectrum. They are adjusted to reflect only those frequencies that are audible to the human ear. Because decibels are logarithmic units, they cannot be added or subtracted by ordinary arithmetic means. For example, if one noise source produces a noise level of 70 dB, the addition of another noise source with the same noise level would not produce 140 dB; rather, they would combine to produce a noise level of 73 dB.

As noise spreads from a source, it loses energy so that the farther away the noise receiver is from the noise source, the lower the perceived noise level. Noise levels diminish or attenuate as distance from the source increases based on an inverse square rule, depending on how the noise source is physically configured. Noise levels from a single-point source, such as a single piece of construction equipment at ground level, attenuate at a rate of 6 dB for each doubling of distance (between the single-point source of noise and the noise-sensitive receptor of concern). Heavily traveled roads with few gaps in traffic behave as continuous line sources and attenuate roughly at a rate of 3 dB per doubling of distance.

Table 3.11-1 shows some representative noise sources and their corresponding noise levels in dBA.

Table 3.11-1: Typical A-Weighted Noise Levels

Indoor Noise Source	Noise Level (dBA)	Outdoor Noise Sources
(Threshold of Hearing in Laboratory)	0	—
Library	30	Quiet Rural Nighttime
Refrigerator Humming	40	Quiet Suburban Nighttime
Quiet Office	50	Quiet Urban Daytime
Normal Conversation at 3 feet	60	Normal Conversation at 3 feet
Vacuum Cleaner at 10 feet	70	Gas Lawn Mower at 100 feet
Hair Dryer at 1 foot	80	Freight Train at 50 feet
Food Blender at 3 feet	90	Heavy-duty Truck at 50 feet
Inside Subway Train (New York)	100	Jet Takeoff at 2,000 feet
Smoke Detector Alarm at 3 feet	110	Unmuffled Motorcycle
Rock Band near stage	120	Chainsaw at 3 feet
—	130	Military Jet Takeoff at 50 feet
—	140	(Threshold of Pain)
Source: Compiled by FCS 2018.		

Noise Descriptors

There are many ways to rate noise for various times, but an appropriate rating of ambient noise affecting humans also accounts for the annoying effects of sound. Equivalent continuous sound level (L_{eq}) is the total sound energy of time-varying noise over a sample period. However, the predominant rating scales for human communities in the State of California are the L_{eq} and community noise equivalent level (CNEL) or the day-night average level (L_{dn}) based on dBA. CNEL is the time-varying noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly L_{eq} for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours) and a 10 dBA weighting factor applied to noise occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours). L_{dn} is similar to the CNEL scale but without the adjustment for events occurring during the evening hours. CNEL and L_{dn} are within one dBA of each other and are normally exchangeable. The noise adjustments are added to the noise events occurring during the more sensitive hours.

Other noise rating scales of importance when assessing the annoyance factor include the maximum noise level (L_{max}), which is the highest exponential time-averaged sound level that occurs during a stated time period. The noise environments discussed in this analysis are specified in terms of maximum levels denoted by L_{max} for short-term noise impacts. L_{max} reflects peak operating conditions and addresses the annoying aspects of intermittent noise.

Noise Propagation

From the noise source to the receiver, noise changes both in level and frequency spectrum. The most obvious is the decrease in noise as the distance from the source increases. The manner in which noise reduces with distance depends on whether the source is a point or line source, as well as ground absorption, atmospheric conditions (wind, temperature gradients, and humidity) and refraction, and shielding by natural and manmade features. Sound from point sources, such as an air conditioning condenser, a piece of construction equipment, or an idling truck, radiates uniformly outward as it travels away from the source in a spherical pattern.

The attenuation or sound drop-off rate is dependent on the conditions of the land between the noise source and receiver. To account for this ground-effect attenuation (absorption), two types of site conditions are commonly used in noise models: soft-site and hard-site conditions. Soft-site conditions account for the sound propagation loss over natural surfaces such as normal earth and ground vegetation. For point sources, a drop-off rate of 7.5 dBA per each doubling of the distance (dBA/DD) is typically observed over soft ground with landscaping, as compared with a 6 dBA/DD drop-off rate over hard ground such as asphalt, concrete, stone and very hard packed earth. For line sources, such as traffic noise on a roadway, a 4.5 dBA/DD is typically observed for soft-site conditions compared to the 3 dBA/DD drop-off rate for hard-site conditions. Table 3.11-2 briefly defines these measurement descriptors and other sound terminology used in this section.

Table 3.11-2: Sound Terminology

Term	Definition
Sound	A vibratory disturbance created by a vibrating object which, when transmitted by pressure waves through a medium such as air, can be detected by a receiving mechanism such as the human ear or a microphone.
Noise	Sound that is loud, unpleasant, unexpected, or otherwise undesirable.
Ambient Noise	The composite of noise from all sources near and far in a given environment.
Decibel (dB)	A unitless measure of sound on a logarithmic scale, which represents the squared ratio of sound-pressure amplitude to a reference sound pressure. The reference pressure is 20 micropascals, representing the threshold of human hearing (0 dB).
A-Weighted Decibel (dBA)	An overall frequency-weighted sound level that approximates the frequency response of the human ear.

Table 3.11-2 (cont.): Sound Terminology

Term	Definition
Equivalent Noise Level (L_{eq})	The average sound energy occurring over a specified time period. In effect, L_{eq} is the steady-state sound level that in a stated period would contain the same acoustical energy as the time-varying sound that actually occurs during the same period.
Maximum and Minimum Noise Levels (L_{max} and L_{min})	The maximum or minimum instantaneous sound level measured during a measurement period.
Day-Night Level (DNL or L_{dn})	The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring between 10 p.m. and 7 a.m. (nighttime).
Community Noise Equivalent Level (CNEL)	The energy average of the A-weighted sound levels occurring during a 24-hour period, with 5 dB added to the A-weighted sound levels occurring between 7 p.m. and 10 p.m. and 10 dB added to the A-weighted sound levels occurring between 10 p.m. and 7 a.m.
Source: Compiled by FCS 2019.	

Traffic Noise

The level of traffic noise depends on the three primary factors: (1) the volume of the traffic, (2) the speed of the traffic, and (3) the number of trucks in the flow of traffic. Generally, the loudness of traffic noise is increased by heavier traffic volumes, higher speeds, and greater number of trucks. Vehicle noise is a combination of the noise produced by the engine, exhaust, and tires. Because of the logarithmic nature of noise levels, a doubling of the traffic volume (assuming that the speed and truck mix do not change) results in a noise level increase of 3 dBA. Based on the Federal Highway Administration (FHWA) community noise assessment criteria, this change is “barely perceptible;” for reference, a doubling of perceived noise levels would require an increase of approximately 10 dBA. The truck mix on a given roadway also has an effect on community noise levels. As the number of heavy trucks increases and becomes a larger percentage of the vehicle mix, adjacent noise levels increase.

Stationary Noise

A stationary noise producer is any entity in a fixed location that emits noise. Examples of stationary noise sources include machinery, engines, energy production, and other mechanical or powered equipment and activities such as loading and unloading or public assembly that may occur at commercial, industrial, manufacturing, or institutional facilities. Furthermore, while noise generated by the use of motor vehicles over public roads is preempted from local regulation, although the use of these vehicles is considered a stationary noise source when operated on private property such as at a construction site, a truck terminal, or warehousing facility. The emitted noise from the producer can be mitigated to acceptable levels either at the source or on the adjacent property through the use of proper planning, setbacks, block walls, acoustic-rated windows, dense landscaping, or by changing the location of the noise producer.

The effects of stationary noise depend on factors such as characteristics of the equipment and operations, distance and pathway between the generator and receptor, and weather. Stationary noise sources may be regulated at the point of manufacture (e.g., equipment or engines), with limitations on the hours of operation, or with provision of intervening structures, barriers or topography.

Construction activities are a common source of stationary noise. Construction-period noise levels are higher than background ambient noise levels but eventually cease once construction is complete. Construction is performed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated on each construction site and, therefore, would change the noise levels as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction related noise ranges to be categorized by work phase. Table 3.11-3 shows typical noise levels of construction equipment as measured at a distance of 50 feet from the operating equipment.

Table 3.11-3: Typical Construction Equipment Maximum Noise Levels, L_{max}

Type of Equipment	Specification Maximum Sound Levels for Analysis (dBA at 50 feet)
Impact Pile Driver	95
Auger Drill Rig	85
Vibratory Pile Driver	95
Jackhammer	85
Pneumatic Tool	85
Pump	77
Scraper	85
Crane	85
Portable Generator	82
Roller	85
Bulldozer	85
Tractor	84
Front-End Loader	80
Backhoe	80
Excavator	85
Grader	85
Air Compressor	80
Dump Truck	84
Concrete Mixer Truck	85
Pickup Truck	55
Source: FHWA 2006. Highway Construction Noise Handbook, August.	

Noise from Multiple Sources

Because sound pressure levels in decibels are based on a logarithmic scale, they cannot be added or subtracted in the usual arithmetical way. Therefore, sound pressure levels in decibels are logarithmically added on an energy summation basis. In other words, adding a new noise source to an existing noise source, both producing noise at the same level, will not double the noise level. Instead, if the difference between two noise sources is 10 dBA or more, the louder noise source will dominate and the resultant noise level will be equal to the noise level of the louder source. In general, if the difference between two noise sources is 0–1 dBA, the resultant noise level will be 3 dBA higher than the louder noise source, or both sources if they are equal. If the difference between two noise sources is 2–3 dBA, the resultant noise level will be 2 dBA above the louder noise source. If the difference between two noise sources is 4–10 dBA, the resultant noise level will be 1 dBA higher than the louder noise source.

Characteristics of Vibration

Groundborne vibration consists of rapidly fluctuating motion through a solid medium, specifically the ground, which has an average motion of zero and in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. The effects of groundborne vibration typically only causes a nuisance to people, but in extreme cases, excessive groundborne vibration has the potential to cause structural damage to buildings. Although groundborne vibration can be felt outdoors, it is typically only an annoyance to people indoors where the associated effects of the shaking of a building can be notable. Groundborne noise is an effect of groundborne vibration and only exists indoors, since it is produced from noise radiated from the motion of the walls and floors of a room, and may consist of the rattling of windows or dishes on shelves.

Several different methods are used to quantify vibration amplitude such as the maximum instantaneous peak in the vibrations velocity, which is known as the peak particle velocity (PPV) or the root mean square (rms) amplitude of the vibration velocity. Because of the typically small amplitudes of vibrations, vibration velocity is often expressed in decibels—denoted as LV—and is based on the reference quantity of 1 micro inch per second. To distinguish vibration levels from noise levels, the unit is written as "VdB."

Although groundborne vibration can be felt outdoors, it is typically only an annoyance to people indoors where the associated effects of the shaking of a building can be notable. When assessing annoyance from groundborne vibration, vibration is typically expressed as rms velocity in units of decibels of 1 micro-inch per second, with the unit written in VdB. Typically, developed areas are continuously affected by vibration velocities of 50 VdB or lower. Human perception to vibration starts at levels as low as 67 VdB. Annoyance due to vibration in residential settings starts at approximately 70 VdB.

Off-site sources that may produce perceptible vibrations are usually caused by construction equipment, steel-wheeled trains, and traffic on rough roads, while smooth roads rarely produce perceptible groundborne noise or vibration. Construction activities, such as blasting, pile driving and operating heavy earthmoving equipment, are common sources of groundborne vibration. Construction vibration impacts on building structures are generally assessed in terms of PPV. Typical vibration source levels from construction equipment are shown in Table 3.11-4.[1]

Table 3.11-4: Vibration Levels of Construction Equipment

Construction Equipment	PPV at 25 Feet (inches/second)	RMS Velocity in Decibels (VdB) at 25 Feet
Bulldozer–Small	0.003	58
Jackhammer	0.035	79
Loaded Trucks	0.076	86
Bulldozer–Large	0.089	87
Caisson Drilling	0.089	87
Clam Shovel Drop	0.202	94
Vibratory Roller–Large	0.210	94
Pile Driver (impact-typical)	0.644	104
Pile Driver (impact-upper range)	1.518	112
Source: Federal Transit Administration (FTA). 2018. Transit Noise and Vibration Impact Assessment Manual. September.		

The propagation of groundborne vibration is not as simple to model as airborne noise. This is because noise in the air travels through a relatively uniform medium, while groundborne vibrations travel through the earth, which may contain significant geological differences. Factors that influence groundborne vibration include:

- **Vibration source:** Type of activity or equipment, such as impact or mobile, and depth of vibration source;
- **Vibration path:** Soil type, rock layers, soil layering, depth to water table, and frost depth; and
- **Vibration receiver:** Foundation type, building construction, and acoustical absorption.

Among these factors that influence groundborne vibration, there are significant differences in the vibration characteristics when the source is underground compared to at the ground surface. In addition, soil conditions are known to have a strong influence on the levels of groundborne vibration. Among the most important factors are the stiffness and internal damping of the soil and the depth to bedrock. Vibration propagation is more efficient in stiff clay soils than in loose sandy soils, and shallow rock seems to concentrate the vibration energy close to the surface, and can result in groundborne vibration problems at large distance from the source. Factors such as layering of the soil and depth to the water table can have significant effects on the propagation of groundborne vibration. Soft, loose, sandy soils tend to attenuate more vibration energy than hard, rocky materials. Vibration propagation through groundwater is more efficient than through sandy soils. There are three main types of vibration propagation: surface, compression, and shear waves. Surface waves, or

[1] Federal Highway Administration (FHWA). 2006. Highway Construction Noise Handbook. August.

Rayleigh waves, travel along the ground's surface. These waves carry most of their energy along an expanding circular wave front, similar to ripples produced by throwing a rock into a pool of water. P-waves, or compression waves, are body waves that carry their energy along an expanding spherical wave front. The particle motion in these waves is longitudinal (i.e., in a "push-pull" fashion). P-waves are analogous to airborne sound waves. S-waves, or shear waves, are also body waves that carry energy along an expanding spherical wave front. However, unlike P-waves, the particle motion is transverse, or side-to-side and perpendicular to the direction of propagation.

As vibration waves propagate from a source, the vibration energy decreases in a logarithmic nature and the vibration levels typically decrease by 6 VdB per doubling of the distance from the vibration source. As stated above, this drop-off rate can vary greatly depending on the soil type, but it has been shown to be effective enough for screening purposes, in order to identify potential vibration impacts that may need to be studied through actual field tests. The vibration level (calculated below as "PPV") at a distance from a point source can generally be calculated using the vibration reference equation:

$$PPV = PPV_{ref} * (25/D)^n \text{ (in/sec)}$$

Where:

PPV_{ref} = reference measurement at 25 feet from vibration source
D = distance from equipment to the receptor
n = vibration attenuation rate through ground

According to Chapter 12 of the Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment Manual, an "n" value of 1.5 is recommended to calculate vibration propagation through typical soil conditions.[2] The FTA Guidance Manual is a nationally accepted guidance manual for construction vibration impact assessment for a wide variety of soil conditions.

Existing Noise Levels

Ambient Noise

The existing noise environment in the vicinity of the project site was documented through a long-term noise monitoring effort performed at the project site, as documented in the project-specific Environmental Noise Analysis report included in Appendix I. No new development or changes in the noise environment have occurred on the project site, or in the immediate vicinity of the project site since the time of these measurements. Therefore, they are still accurate representations of the existing ambient noise environment on the project site. The noise monitoring locations are shown in Exhibit 3.11-1, and the noise measurement data outputs are contained in Appendix I.

Two short-term ambient noise measurements were conducted at the northern project boundary, approximately 555-feet west of Deer Valley Road. The location is shown on Exhibit 3.11-1. The noise measurement ST-1 was taken on May 27, 2015, at 1:30 p.m., and ST-2 was taken on May 28, 2015, at 4:10 p.m. These noise measurements document the daytime ambient noise conditions at the project

[2] Federal Transit Administration (FTA). 2018. Transit Noise and Vibration Impact Assessment Manual. September.

site's northern boundary, adjacent to the existing single-family residential development. The results are summarized in Table 3.11-5.

The long-term noise measurement, shown on Exhibit 3.11-1, was conducted within the eastern portion of the project site, adjacent to Snodgrass Lane approximately 530 feet west of Deer Valley Road and 720 feet northwest of the closest single-family residence located adjacent to the project's southern boundary. The noise measurement started at 11:00 a.m. on Wednesday, May 27, 2015, and ended at 11:00 a.m. on Thursday, May 28, 2015. This long-term ambient noise measurement provides a baseline of existing noise conditions on the project site. The resulting measurement determined that ambient noise levels at this location averaged 52 dBA CNEL. Daytime ambient noise levels at this location, between the hours of 7:00 a.m. and 10:00 p.m., were 50 dBA L_{eq}, 41 dBA L_{50}, and 63 dBA L_{max}. Nighttime ambient noise levels at this location, between the hours of 10:00 p.m. and 7:00 a.m., were 43 dBA L_{eq}, 40 dBA L_{50}, and 58 dBA L_{max}. The long-term measurement results are summarized in Table 3.11-5.

Table 3.11-5: Existing Noise Level Measurement in the Vicinity of the Project Site

Site ID No.	Location Description	Date	CNEL, dBA	L_{eq}, dBA (daytime/nighttime)	L_{max}, dBA (daytime/nighttime)
LT-1	On existing Snodgrass Lane, approximately 530-feet west of Deer Valley Road.	May 27–28, 2015	52	50/43	63/58
ST-1	Adjacent to northern project boundary, approximately 550-feet west of Deer Valley Road.	May 27, 2015	NA	57/NA	76/NA
ST-2	Adjacent to northern project boundary, approximately 550-feet west of Deer Valley Road.	May 28, 2015	NA	59/NA	75/NA

Note:
The Site ID corresponds to locations shown in Exhibit 3.11-1. Daytime represents the hours of 7:00 a.m. and 10:00 p.m.; nighttime represents the hours between 10:00 p.m. and 7:00 a.m.
NA = Not applicable as this noise metric was not recorded for this measurement.
Source: FCS 2019.

Traffic Noise

In addition to the ambient noise measurements, existing traffic noise on local roadways in the areas surrounding the project site was calculated to quantify existing traffic noise levels, based on the existing traffic volumes included in Appendix K. Existing traffic noise levels along selected roadway segments in the project vicinity (specifically, Dallas Ranch Road, which dead-ends at the northern boundary of the project site, and Deer Valley Road, which runs adjacent to the eastern boundary of the project site) were modeled using the FHWA Traffic Noise Prediction Model (FHWA-RD-77-108). Site-specific information is entered, such as roadway traffic volumes, roadway active width, source-to-receiver distances, travel speed, noise source and receiver heights, and the percentages of automobiles, medium trucks, and heavy trucks that the traffic is made up of throughout the day, amongst other variables. The modeled average daily traffic (ADT) volumes were obtained by multiplying the PM peak-hour intersection traffic volumes from the project-specific traffic study by a factor of 10.[3] The model inputs and outputs,

[3] Fehr & Peers. 2019. The Ranch Draft Final Transportation Impact Assessment. November.

including the 60 dBA, 65 dBA, and 70 dBA L_{dn} traffic noise contour distances, are provided in Appendix I. A summary of the modeling results is shown in Table 3.11-6. The modeling results show that existing traffic noise levels on roadway segments adjacent to the project site range up to 66.5 dBA CNEL as measured at 50 feet from the centerline of the outermost travel lane.

Table 3.11-6: Existing Traffic Noise Levels in the Vicinity of the Project Site

Roadway Segment	ADT	Centerline to 70 CNEL (feet)	Centerline to 65 CNEL (feet)	Centerline to 60 CNEL (feet)	CNEL (dBA) 50 feet from Centerline of Outermost Lane
Dallas Ranch Road—north of Prewett Ranch Road	7,400	< 50	65	133	64
Dallas Ranch Road—south of Prewett Ranch Road	1,800	< 50	< 50	56	58
Deer Valley Road—Lone Tree Way to Prewett Ranch Road	12,900	< 50	91	191	67
Deer Valley Road—Prewett Ranch Road to Wellness Way	12,000	< 50	87	182	66
Deer Valley Road—Wellness Way to Sand Creek Road	9,900	< 50	76	160	66

Note:
ADT = Average Daily Traffic
Modeling results do not take into account mitigating features such as topography, vegetative screening, fencing, building design, or structure screening. Rather it assumes a worst case of having a direct line of site on flat terrain.
Source: FCS 2019.

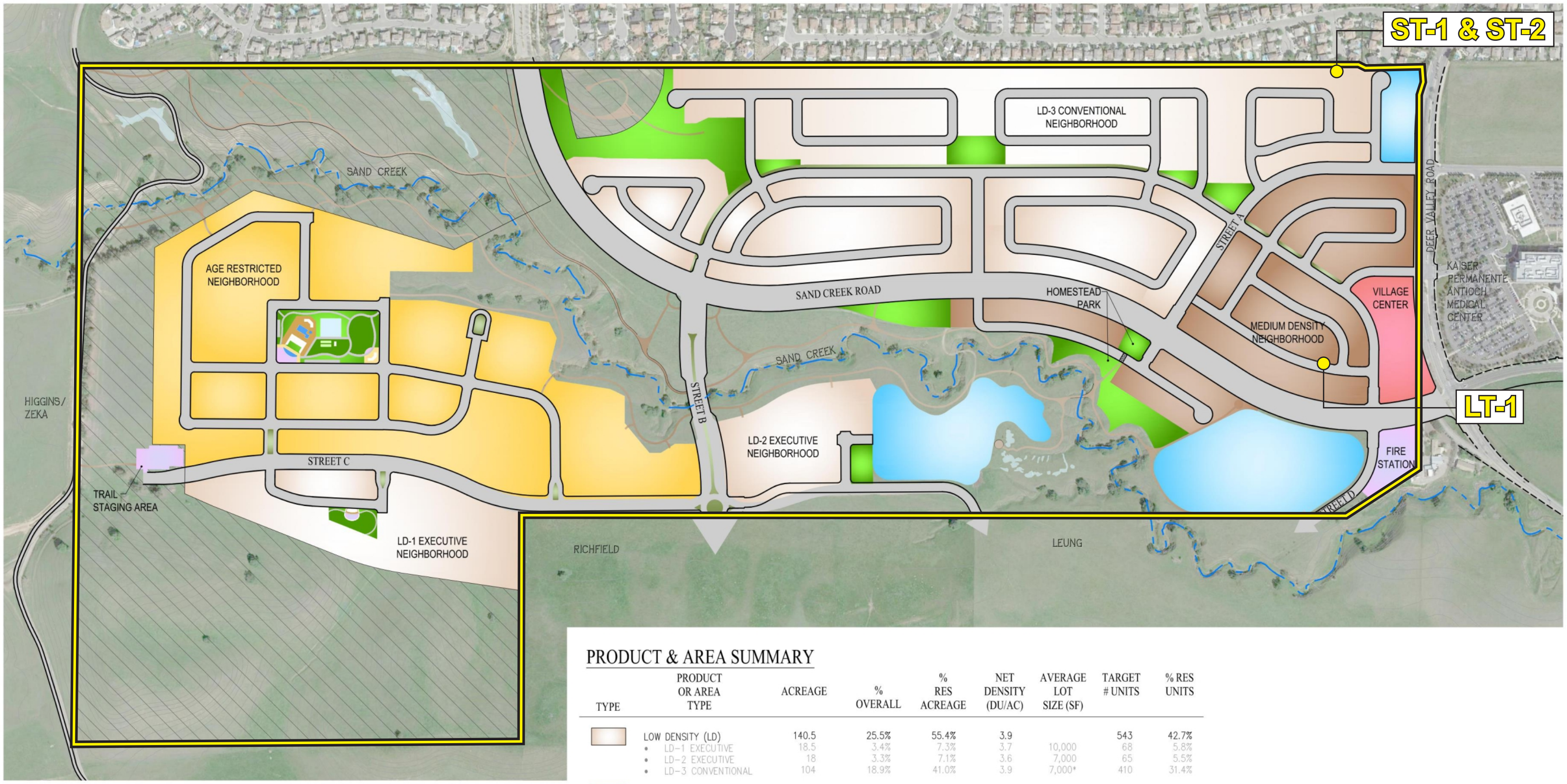
Existing Stationary Noise Levels

Residential land uses to the north of the project site, and the medical center land use to the east of the project site, generate noise from mechanical ventilation systems, and landscaping and maintenance equipment activities. These activities are point sources of noise that affect the existing noise environment. The parking areas associated with the medical center east of the project site is another stationary noise source affecting the ambient noise environment in the project vicinity.

The existing ambient noise measurement results described above, with documented noise levels of 52 dBA CNEL, and daytime hourly average noise levels of 50 dBA L_{eq}, captured all stationary and mobile source noise levels at the noise monitoring location.

Noise-Sensitive Land Uses

Noise-sensitive land uses generally consist of those uses where exposure to noise would result in adverse effects, as well as uses for which 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 typical noise-sensitive land uses include hospitals, convalescent facilities, hotels, religious institutions, libraries, and other uses where low noise levels are essential.



PRODUCT & AREA SUMMARY

TYPE	PRODUCT OR AREA TYPE	ACREAGE	% OVERALL	% RES ACREAGE	NET DENSITY (DU/AC)	AVERAGE LOT SIZE (SF)	TARGET # UNITS	% RES UNITS
	LOW DENSITY (LD)	140.5	25.5%	55.4%	3.9		543	42.7%
	• LD-1 EXECUTIVE	18.5	3.4%	7.3%	3.7	10,000	68	5.8%
	• LD-2 EXECUTIVE	18	3.3%	7.1%	3.6	7,000	65	5.5%
	• LD-3 CONVENTIONAL	104	18.9%	41.0%	3.9	7,000*	410	31.4%
	AGE RESTRICTED (AR)	75	13.6%	29.6%	5.6	5,000	422	38.2%
	MEDIUM DENSITY (MD)	38	6.9%	15.0%	5.6	4,500	212	18.0%
	RESIDENTIAL TOTAL	253.5	46.0%	100.0%	4.6		1,177	100.0%
	VILLAGE CENTER	5	0.9%					
	PUBLIC USE (PQ)	3	0.5%					
	• FIRE STATION (PQ-F)	2	0.4%					
	• TRAIL STAGING AREA (PQ-S)	1	0.2%					
	PARKS (P)	20	3.6%					
	LANDSCAPE (L)	2.5	0.5%					
	OPEN SPACE (OS)	229.5	41.6%					
	MAJOR ROADWAYS	38	6.9%					
	TOTAL	551.5	100%					

Project Site

PROPOSED RESTRICTED DEVELOPMENT AREA

LT-1: Long-term noise measurement location

ST-1 & ST-2: Short-term noise measurement locations

0' 300' 900' 1,200'

SCALE: 1" = 300'

Source: CBG Civil Engineers, June 4, 2019.

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Exhibit 3.11-1
Noise Monitoring Location Map

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Noise-sensitive land uses in the vicinity of the project site include a single-family residential subdivision and the Kaiser Permanente Antioch Medical Center, a full-service medical care facility operating 24-hours a day. The residential subdivision is adjacent to the northern boundary of the project site. The medical center is located approximately 490 feet east of the project site, across Deer Valley Road and the medical center parking lot. There are also two rural single-family residences located south of the project site, adjacent to Deer Valley Road.

The only noise-sensitive land use within the project site boundaries is a single-family residence which will be removed with implementation of the proposed project.

3.11.3 - Regulatory Framework

Federal

Noise Control Act

The adverse impact of noise was officially recognized by the federal government in the Noise Control Act of 1972, which serves three purposes:

- Promulgating noise emission standards for interstate commerce
- Assisting State and local abatement efforts
- Promoting noise education and research

The Federal Office of Noise Abatement and Control (ONAC) was initially tasked with implementing the Noise Control Act. However, the ONAC has since been eliminated, leaving the development of federal noise policies and programs to other federal agencies and interagency committees.

Among the agencies now regulating noise are the Occupational Safety and Health Administration (OSHA), which limits noise exposure of workers to 90 dB L_{eq} or less for 8 continuous hours or 105 dB L_{eq} or less for 1 continuous hour; the United States Department of Transportation (USDOT), which assumed a significant role in noise control through its various operating agencies; and the Federal Aviation Administration (FAA), which regulates noise of aircraft and airports. Surface transportation system noise is regulated by a host of agencies, including the FTA. Transit noise is regulated by the federal Urban Mass Transit Administration, while freeways that are part of the interstate highway system are regulated by the FHWA. Finally, the federal government actively advocates that local jurisdictions use their land use regulatory authority to arrange new development in such a way that “noise sensitive” uses are either prohibited from being sited adjacent to a highway, or alternatively, that developments are planned and constructed in such a manner that minimize potential noise impacts.

Since the federal government has preempted the setting of standards for noise levels that can be emitted by transportation sources, local jurisdictions are limited to regulating the noise generated by the transportation system through nuisance abatement ordinances and land use planning.

Federal Transit Administration Standards and Guidelines

The FTA has established industry accepted standards for vibration impact criteria and impact assessment. These guidelines are published in its Transit Noise and Vibration Impact Assessment

Manual. The FTA Guidelines include thresholds for construction vibration impacts for various structural categories as shown in Table 3.11-7.

Table 3.11-7: Federal Transit Administration Construction Vibration Impact Criteria

Building Category	PPV (in/sec)	Approximate VdB
I. Reinforced Concrete, Steel, or Timber (no plaster)	0.5	102
II. Engineered Concrete and Masonry (no plaster)	0.3	98
III. Non-engineered Timber and Masonry Buildings	0.2	94
IV. Buildings Extremely Susceptible to Vibration Damage	0.12	90
Source: Federal Transit Administration (FTA). 2018. Transit Noise and Vibration Impact Assessment Manual. September.		

State

California General Plan Guidelines

Established in 1973, the California Department of Health Services Office of Noise Control was instrumental in developing regulatory tools to control and abate noise for use by local agencies. One significant model is the "Land Use Compatibility for Community Noise Environments Matrix," which allows the local jurisdiction to delineate compatibility of sensitive uses with various incremental levels of noise.[4]

Government Code Section 65302 mandates that the legislative body of each county and city in California adopt a noise element as part of its comprehensive general plan. The local noise element must recognize the land use compatibility guidelines published by the State Department of Health Services. The guidelines rank noise/land use compatibility in terms of normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable. The proposed project is also subject to review under the State of California Environmental Quality Act (CEQA). Appendix G of the CEQA Guidelines provides impact thresholds for potential noise and vibration impacts.

California Building Standards Code

The State of California has established noise insulation standards for new hotels, motels, apartment houses, and dwellings (other than single-family detached housing). These requirements are provided in the 2016 California Building Standards Code (CBC) (California Code of Regulations [CCR], Title 24).[5] As provided in the CBC, the noise insulation standards set forth an interior standard of 45 dBA CNEL as measured from within the structure's interior. When such structures are located within a 65-dBA CNEL (or greater) exterior noise contour associated with a traffic noise along a roadway, an acoustical analysis is required to ensure that interior levels do not exceed the 45-dBA CNEL threshold. Title 24 standards are typically enforced by local jurisdictions through the building permit application process.

4 California Department of Health, Office of Noise Control, "Land Use Compatibility for Community Noise Environments Matrix," 1976.
5 California Building Standards Commission. 2017. California Building Standards Code (California Code of Regulations, Title 24), January 1.

Local

The City of Antioch General Plan

Noise Element

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 10.5.1c:** 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 11.6.2a:** 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 11.6.2b:** 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 11.6.2c:** Minimize motor vehicle noise in residential areas through proper route location and sensitive roadway design.
  -Provide panned industrial areas with truck access routes separated from residential areas to the maximum feasible extent.
  - -Where needed, provide traffic calming devices to slow traffic speed within residential neighborhoods.
- **Policy 11.6.2d:** Where new development (including construction and improvement of roadways) is proposed in areas exceeding the noise levels identified in the General Plan Noise Objective, or where the development of proposed uses could result in a significant increase in noise, require a detailed noise attenuation study to be prepared by a qualified acoustical engineer to determine appropriate mitigation and ways to incorporate such mitigation into project design and implementation.

- **Policy 11.6.2e:** 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 11.6.2f:** 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 that 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 11.6.2g:** Where feasible, require the use of noise barriers (walls, berms, or a combination thereof) to reduce significant noise impacts.
  -Noise barriers must have sufficient mass to reduce noise transmitting 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 11.6.2h:** Continue enforcement of California Noise Insulation Standards (Title 25, Section 1092, California Administrative Code).
- **Policy 11.6.2i:** 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 11.6.2j:** 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 11.6.2k:** 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 11.6.2m:** 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 a.m. and 7:00 p.m. Monday through Saturday. No construction shall be allowed on Sundays and public holidays.

- **Policy 11.6.2n:** 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.

City of Antioch Code of Ordinances

Chapter 5. Zoning

Section 9-5.1901. Noise Attenuation Requirements

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.

1. 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.

Chapter 17. Disturbing the Peace

Section 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 a.m. and after 6:00 p.m.
    (2) On weekdays within 300 feet of occupied dwellings, prior to 8:00 a.m. and after 5:00 p.m.
    (3) On weekends and holidays, prior to 9:00 a.m. and after 5:00 p.m., irrespective of the distance from the occupied dwellings.

3.11.4 - Impacts and Mitigation Measures

Significance Criteria

According to 2019 CEQA Guidelines Appendix G, to determine whether impacts related to noise and vibration are significant environmental effects, the following questions are analyzed and evaluated. Would the proposed project:

a) Generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

b) Generate excessive groundborne vibration or groundborne noise levels?

c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

Approach to Analysis

Noise Measurement Methodology

The sound level meter was programmed to record the maximum, median, and average noise levels at each site 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 meter was calibrated before and after use with an LDL Model CAL200 acoustical calibrator to ensure the accuracy of the measurement. The equipment used meets all pertinent specifications of the American National Standards Institute for Type 1 sound level meters (ANSI S1.4).

Traffic Noise Modeling Methodology

The level of traffic noise depends on the three primary factors: (1) the volume of the traffic, (2) the speed of the traffic, and (3) the number of trucks in the flow of traffic. Generally, the loudness of traffic noise is increased by heavier traffic volumes, higher speeds, and greater number of trucks. Vehicle noise is a combination of the noise produced by the engine, exhaust, and tires. Because of the logarithmic nature of traffic noise levels, a doubling of the traffic volume (assuming that the speed and truck mix do not change) results in a noise level increase of 3 dBA. Based on the FHWA community noise assessment criteria, this change is "barely perceptible;" for reference a doubling of perceived noise levels would require an increase of approximately 10 dBA. The truck mix on a given roadway also has an effect on community noise levels. As the number of heavy trucks increases and becomes a larger percentage of the vehicle mix, adjacent noise levels increase.

The FHWA highway traffic noise prediction model (FHWA RD-77-108) was used to evaluate traffic-related noise conditions in the vicinity of the project site. Model input data includes without- and with-project average daily traffic volumes on adjacent roadway segments, day/night percentages of autos, medium and heavy trucks, vehicle speeds, ground attenuation factors, and roadway widths. The roadway speeds are based on the posted speed limits along each modeled roadway segment. Traffic modeling was performed using the data obtained from the project-specific traffic study conducted by Fehr & Peers.[6] The resultant noise levels were weighed and summed over a 24-hour period to determine the CNEL values.

The roadway traffic noise model assumptions and outputs are provided in Appendix I.

Vibration Methodology

The City of Antioch has not adopted criteria for construction groundborne vibration impacts. Therefore, the FTA's vibration impact criteria are utilized to evaluate potential vibration impacts resulting from construction activities. The FTA has established industry accepted standards for vibration impact criteria and impact assessment. These guidelines are published in its Transit Noise and Vibration Impact Assessment Manual,[7] and are summarized in Table 3.11-7 in the regulatory discussion above.

Impact Evaluation

Substantial Noise Increase in Excess of Standards

Impact NOI-1:	**The proposed project could generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.**

Construction

For temporary construction noise, a significant impact would occur if construction activities would result in a substantial temporary increase in ambient noise levels outside of the permissible hours for construction (7:00 a.m. to 6:00 p.m., or 8:00 a.m. to 5:00 p.m. if within 300 feet of occupied

[6] Fehr & Peers. 2019. The Ranch Draft Final Transportation Impact Assessment. November.
[7] Federal Transit Administration (FTA). 2018. Transit Noise and Vibration Impact Assessment Manual. September.

dwellings, Monday through Friday, and 9:00 a.m. to 5:00 p.m. on weekends and holidays, irrespective of the distance from occupied dwellings) that would result in annoyance or sleep disturbance of nearby sensitive receptors.

Noise impacts from construction activities associated with the proposed project would be a function of the noise generated by construction traffic, construction equipment, equipment location, sensitivity of nearby land uses, and the timing and duration of the construction activities. A discussion of the potential impacts associated with each of these types of activities is provided below.

Construction Traffic Noise

One type of noise impact that could occur during project construction would result from the increase in traffic flow on local streets, associated with the transport of workers, equipment, and materials to and from the project site. The transport of workers and construction equipment and materials to the project site would incrementally increase noise levels on access roads leading to the site. Because project construction workers and construction equipment would use existing routes, noise from passing trucks would be similar to existing vehicle-generated noise on these local roadways. In addition, these trips would not result in a doubling of daily traffic volumes on any of the local roadways in the project vicinity and would thus not result in a perceptible change in existing traffic noise levels. For this reason, intermittent noise from construction trips would be minor when averaged over a longer time-period and would not be expected to result in a perceptible increase in hourly- or daily-average traffic noise levels in the project vicinity. Therefore, construction-related noise impacts associated with the transportation of workers and equipment to the project site would be less than significant.

Construction Equipment Noise

Construction is performed in discrete steps, each of which entails its own mix of equipment, and consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated on-site. Thus, the noise levels vary as construction progresses. Despite the variety in the types and sizes of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction noise ranges to be categorized by work phase. Table 3.11-3 lists the maximum noise levels recommended for noise impact assessments for typical construction equipment based on a distance of 50 feet between the equipment and a noise receptor.

The site preparation phase, which includes excavation and grading activities, tend to generate the highest noise levels, because the noisiest construction equipment is earthmoving equipment. Earthmoving equipment includes excavating machinery and compacting equipment, such as bulldozers, draglines, backhoes, front loaders, roller compactors, scrapers, and graders. Typical operating cycles for these types of construction equipment may involve 1 or 2 minutes of full power operation followed by 3 or 4 minutes at lower power settings. Operating cycles for these types of construction equipment may involve 1 or 2 minutes of full power operation followed by 3 or 4 minutes at lower power settings.

Construction of the proposed project is expected to require the use of scrapers, bulldozers, water trucks, haul trucks, and pickup trucks. The foundation would involve spread footings, so impact equipment such as pile drivers is not expected to be used during construction of the project. Based on the information provide in Table 3.11-3, the maximum noise level generated by each scraper is assumed to be 85 dBA L_{max} at 50 feet from this equipment. Each bulldozer would generate 85 dBA L_{max} at 50 feet. The maximum noise level generated by graders is approximately 85 dBA L_{max} at 50 feet. Each doubling of sound sources with equal strength increases the noise level by 3 dBA. Assuming that each piece of construction equipment operates at some distance from the other equipment, a reasonable worst-case combined noise level during this phase of construction would be 90 dBA L_{max} at a distance of 50 feet from the acoustic center of a construction area. This would result in a reasonable worst-case hourly average of 86 dBA L_{eq}. The acoustic center reference is used, because construction equipment must operate at some distance from one another on a project site, and the combined noise level as measured at a point equidistant from the sources would (acoustic center) be the worst-case maximum noise level. The effect on sensitive receptors is evaluated below.

The nearest off-site noise-sensitive receptors to the project site are the single-family residential land uses located north of the project site, which could be located as close as 80 feet from the acoustic center of construction activity where multiple pieces of heavy machinery would operate. Again, the acoustic center refers to a point equidistant from multiple pieces of equipment operating simultaneously which would produce the worst-case maximum noise level. At this distance, construction noise levels at the exterior facade of this nearest residential home would be expected to range up to approximately 86 dBA L_{max}, with a worst-case hourly average of approximately 82 dBA L_{eq}, intermittently, when multiple pieces of heavy construction equipment operate simultaneously at the nearest construction footprint. These noise levels would be intermittent and would be reduce as equipment moves over the project site further from adjacent sensitive receptors.

Although there could be a relatively high single event noise exposure potential causing an intermittent noise nuisance, the effect of project-related construction noise levels on longer-term (hourly or daily) ambient noise levels would be small but could result in annoyance or sleep disturbances at nearby sensitive receptors if construction activities are not limited to the permissible construction hours established by the City of Antioch Code of Ordinances. Compliance with the permissible construction hours would reduce the potential impacts from construction noise that could result in annoyance or sleep disturbances at nearby sensitive receptors. The City's Code of Ordinances limits noise producing construction activities during the hours of 7:00 a.m. to 6:00 p.m., or 8:00 a.m. to 5:00 p.m. if within 300 feet of occupied dwellings, Monday through Friday, and 9:00 a.m. to 5:00 p.m. on weekends and holidays. Restricting construction activities to these time-periods and implementing the best management noise reduction techniques and practices outlined in Mitigation Measure (MM) NOI-1a, would ensure that construction noise levels would not result in a substantial temporary increase in ambient noise levels that would result in annoyance or sleep disturbance of nearby sensitive receptors. Therefore, temporary construction noise impacts would be less than significant with implementation of MM NOI-1a.

Operation

The proposed project will result in an increase in traffic on local roadway segments in the project vicinity. In addition, implementation of the proposed project would introduce new stationary noise sources to the ambient noise environment in the project vicinity, including new mechanical ventilation equipment, parking lot activities, and delivery trucks. For operational noise, a significant impact would occur if the proposed project would cause the CNEL to increase by 5 dBA or more even if the CNEL would remain below normally acceptable levels for a receiving land use (60 dBA CNEL, as measured in the rear yards of residential homes); or by 3 dBA or more, thereby causing the CNEL in the project vicinity to exceed normally acceptable levels and result in noise levels that would be considered conditionally acceptable for a receiving land use. A doubling of traffic volume generally results in a 3 dBA increase in noise. The potential for a substantial increase in ambient noise levels resulting from these noise sources is analyzed below.

Traffic Noise

The highest traffic noise level increase with implementation of the proposed project would occur along Dallas Ranch Road south of Prewett Ranch Road under existing plus project conditions. Along this roadway segment, the proposed project would result in traffic noise levels ranging up to approximately 62.7 dBA CNEL as measured at 50 feet from the centerline of the nearest travel lane, representing an increase of 4.8 dBA over existing conditions for this roadway segment. The calculated traffic noise levels as measured in the rear yards of adjoining residential land uses would be below 56 dBA CNEL due to shielding provided by existing soundwalls. Therefore, the substantial increase standard would be a 5 dBA increase. As this greatest increase in traffic noise levels would be a 4.8 dBA increase, the impact related to operational traffic noise proximate to Dallas Ranch Road would be less than significant.

No other modeled roadway segment would experience an increase of 3 dBA or greater under any of the plus project traffic scenarios. Therefore, project-related traffic noise level would result in less than significant increases in traffic noise levels along modeled roadway segments in the project site vicinity. Therefore, the impact related to operational noise proximate to other roadway segments would be a less than significant impact.

A significant impact would also occur if the project would introduce new land uses to traffic noise levels that are in excess of the City's adopted land use compatibility standards. For new single-family residential land use developments, ambient noise levels are restricted to 60 dBA CNEL or less, as measured in the rear yards of residential homes.

As described in the existing noise levels discussion in Section 3.11-2 above, the existing noise environment in the vicinity of the project site was documented through a long-term noise monitoring effort performed at the project site. The long-term noise measurement, shown on Exhibit 3.11-1, was conducted on Snodgrass Lane, approximately 530 feet west of Deer Valley Road. The resulting measurement determined that ambient noise levels at this location averaged 52 dBA CNEL. Daytime ambient noise levels at this location, between the hours of 7:00 a.m. and 10:00 p.m., were 50 dBA L_{eq}, 41 dBA L_{50}, and 63 dBA L_{max}. Nighttime ambient noise levels at this location, between the hours of 10:00 p.m. and 7:00 a.m., were 43 dBA L_{eq}, 40 dBA L_{50}, and 58 dBA L_{max}. These noise levels are below the City's land use compatibility standard of 60 dBA CNEL for new residential land use development.

To further analyze the ambient noise environment of the project site for compatibility with the proposed land use development, traffic noise modeling was performed to document traffic noise levels along roadway segments in the project vicinity. The FHWA highway traffic noise prediction model (FHWA RD-77-108) was used to evaluate existing and future project-related traffic noise conditions along modeled roadway segments in the vicinity of the project site. Traffic modeling was performed using the data obtained from the project-specific traffic impact study included in Appendix K[8]. This traffic impact study provides data for existing, near-term, and cumulative conditions. The resultant traffic noise levels were weighed and summed over a 24-hour period to determine the CNEL values. The traffic noise modeling input and output files—including the 60 dBA, 65 dBA, and 70 dBA CNEL noise contour distances—are included in Appendix I. The following tables show a summary of the traffic noise levels for existing, near term, and cumulative traffic conditions, with and without the proposed project, as measured at 50 feet from the centerline of the outermost travel lane.

Table 3.11-8 shows a summary of the traffic noise levels for existing scenarios with and without project conditions as measured at 50 feet from the centerline of the outermost travel lane.

Table 3.11-8: Existing Traffic Noise Modeling Results Summary

Roadway Segment	CNEL (dBA) 50 feet from Centerline of Outermost Lane		
	Existing without Project	Existing with Project	Increase over Existing (dBA) without Project
Dallas Ranch Road—north of Prewett Ranch Road	64.1	65.5	1.4
Dallas Ranch Road—south of Prewett Ranch Road	57.9	62.7	4.8
Deer Valley Road—Lone Tree Way to Prewett Ranch Road	66.5	67.6	1.1
Deer Valley Road—Prewett Ranch Road to Wellness Way	66.2	67.6	1.4
Deer Valley Road—Wellness Way to Sand Creek Road	65.8	66.6	0.8

Note:
Modeling results do not take into account mitigating features such as topography, vegetative screening, fencing, building design, or structure screening. Rather it assumes a worst case of having a direct line of site on flat terrain.
Source: FCS 2019.

Table 3.11-9 shows a summary of the traffic noise levels for near-term traffic conditions with and without project conditions as measured at 50 feet from the centerline of the outermost travel lane.

Table 3.11-9: Near Term Traffic Noise Modeling Results Summary

Roadway Segment	CNEL (dBA) 50 feet from Centerline of Outermost Lane		
	Near-Term without Project	Near-Term with Project	Increase over Near-Term without Project (dBA)
Dallas Ranch Road—north of Prewett Ranch Road	64.2	65.7	1.5
Dallas Ranch Road—south of Prewett Ranch Road	58.2	62.9	4.7
Deer Valley Road—Lone Tree Way to Prewett Ranch Road	67.5	68.2	0.7

8 Fehr & Peers. 2019. The Ranch Draft Final Transportation Impact Assessment. November.

Table 3.11-9 (cont.): Near Term Traffic Noise Modeling Results Summary

Roadway Segment	CNEL (dBA) 50 feet from Centerline of Outermost Lane		
	Near-Term without Project	Near-Term with Project	Increase over Near-Term without Project (dBA)
Deer Valley Road—Prewett Ranch Road to Wellness Way	66.7	68.1	1.4
Deer Valley Road—Wellness Way to Sand Creek Road	66.5	67.4	0.9
Source: FCS 2019.			

Table 3.11-10 shows a summary of the traffic noise levels for cumulative conditions with and without project conditions as measured at 50 feet from the centerline of the outermost travel lane.

Table 3.11-10: Cumulative Traffic Noise Modeling Summary

Roadway Segment	CNEL (dBA) 50 feet from Centerline of Outermost Lane		
	Cumulative without Project	Cumulative with Project	Increase over Cumulative without Project (dBA)
Dallas Ranch Road—north of Prewett Ranch Road	64.2	65.6	1.4
Dallas Ranch Road—south of Prewett Ranch Road	62.6	64.8	2.2
Deer Valley Road—Lone Tree Way to Prewett Ranch Road	68.4	68.9	0.5
Deer Valley Road—Prewett Ranch Road to Wellness Way	67.1	67.8	0.7
Deer Valley Road—Wellness Way to Sand Creek Road	67.4	67.9	0.5
Source: FCS 2019.			

The highest traffic noise levels that would be experienced at the proposed project would occur on Deer Valley Road between Prewett Ranch Road and Wellness Way under cumulative with project conditions. These traffic noise levels would range up to approximately 67.8 dBA CNEL as measured at 50 feet from the centerline of the nearest travel lane. These noise levels would be in excess of the City's land use compatibility standard as measured within rear yards of new residential land uses. This represents a potentially significant impact.

However, implementation of MM NOI-1b, requiring that a soundwall would be constructed as part of the proposed project along rear yards of residential lots fronting Deer Valley Road would reduce traffic noise levels to below 60 dBA CNEL as measured at the nearest proposed rear yards. The soundwall shall be a minimum of 8-foot high, as measured from the finished grade of the proposed residential pads. The soundwall should be located so as to block the line of sight from rear yards for all proposed residences located within 160 feet of the centerline of Deer Valley Road. This would reduce traffic noise levels at all receiving residential rear yards to below 60 dBA CNEL. As such, with implementation of MM NOI-1b, requiring implementation of the described soundwall, traffic noise levels would be reduced to not exceed the City's land use compatibility standards as measured at the nearest backyards of the proposed residences. Therefore, with implementation of MM NOI-1b, traffic noise impacts would be reduced to less than significant.

Stationary Noise

Implementation of the proposed project would introduce new stationary noise sources to the ambient noise environment in the project vicinity, including new mechanical ventilation equipment at residential homes, and new mechanical ventilation equipment, parking lot activities, and delivery trucks at the proposed Village Center. Other stationary noise sources would include an emergency backup generator and parking lot activities at the proposed fire station.

Residential Stationary Noise

Noise levels from typical mechanical ventilation equipment range up to approximately 60 dBA L_{eq} as measured at a distance of 25 feet. The closest residential receptor is the residence on the west side of the Vallejo Court cul-de-sac, off Mammoth Way, the façade of which is about 5 feet from the project property line. Specific details regarding location of mechanical ventilation systems are not available at the time of this analysis. However, if residential mechanical ventilation systems are located within 15 feet of the project boundary, then operational noise levels could exceed the City's normally acceptable threshold of 60 dBA CNEL as measured in rear yards of existing residential receptors. This would represent a potentially significant impact.

However, MM NOI-1c would require that mechanical ventilation equipment for the proposed homes be located a minimum of 15 feet from the boundary of the project site, or that mechanical ventilation equipment be shielded by a noise-reducing barrier. At this distance, or with a barrier, and with shielding from the existing wood fence along the property line, noise from mechanical ventilation equipment would remain below the City's normally acceptable level of 60 dBA CNEL, as measured in the rear yards of residential homes. Implementation of MM NOI-1c would ensure that mechanical ventilation equipment at the proposed residential homes would not result in a substantial temporary increase in ambient noise levels in excess of 60 dBA CNEL. Therefore, the impact related to operational residential stationary noise would be less than significant with mitigation.

Village Center Stationary Noise

The proposed Village Center is a 5.7-acre neighborhood commercial use. Noise sources could include parking lot activities, delivery trucks, and rooftop mechanical ventilation equipment, which would result in potentially significant impacts to proposed on-site residential receptors as well as to the two existing off-site single-family residential receptors located south of Sand Creek Road, west of Deer Valley Road.

Specific details regarding building or parking lot footprints or location of mechanical ventilation systems are not available at the time of this analysis. However, a general conservative operational noise impact analysis is provided based on typical commercial stationary source reference noise levels.

Parking Lot Activities

Typical parking lot activities, including expected delivery activity for typical deliveries for small commercial land uses, can generate noise levels of approximately 60 dBA to 70 dBA L_{max} at 50 feet.

The closest noise-sensitive receptor to potential parking and delivery areas at the Village Center are the proposed residential land uses that would be developed west of the commercial area. Parking and delivery areas would be separated from the proposed residential land uses by an internal street at a minimum distance of 75 feet. At this distance parking lot activity noise levels would attenuate to 66 dBA L_{max}, with reasonable worst-case hourly average noise levels from these activities averaging approximately 55 dBA L_{eq}. Therefore, when averaged over a 24-hour period these noise levels would not exceed the City's normally acceptable threshold of 60 dBA CNEL as measured in rear yards of residential receptors.

Therefore, the proposed the Village Center parking lot activities would not generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project site in excess of standards established in the local general plan or noise ordinance; and the impact of noise produced by these parking lot activities to the nearest sensitive receptors would be less than significant.

Mechanical Equipment Operations

The proposed commercial development would include new mechanical ventilation equipment. Noise levels from typical commercial mechanical ventilation equipment range up to approximately 60 dBA L_{eq} at a distance of 25 feet. At a distance of 100 feet, noise generated by mechanical ventilation equipment would attenuate to approximately 48 dBA L_{eq}. When averaged over a 24-hour period these noise levels would not exceed the City's normally acceptable threshold of 60 dBA CNEL as measured in rear yard of this nearest residential receptors. Therefore, the commercial land uses shall be designed so that on-site mechanical equipment (i.e., HVAC units, compressors, generators) are located no closer than 100 feet from the nearest residential dwelling unit or provided shielding from nearby noise sensitive land uses to meet the City's normally acceptable threshold of 60 dBA CNEL. Shielding shall have a minimum height sufficient to completely block line-of-sight between the on-site noise source and the nearest residential dwelling to meet the City's noise standard. Based on the size and placement of the HVAC units (i.e., ground level or roof top), barrier heights may range between three to six feet.

Therefore, with implementation of MM NOI-1d mechanical ventilation equipment operations associated with the Village Center commercial development would not generate a substantial temporary or permanent increase in excess of the City's noise standards as measured at the nearest sensitive receptors. Therefore, the impact related to operational Village Center stationary noise would be less than significant with mitigation.

Fire Station Stationary Noise

The proposed fire station could result in stationary noise sources, including parking lot activities and rooftop mechanical ventilation equipment, which would result in potentially significant impacts to proposed on-site residential receptors and to the two existing off-site single-family residential receptors located south of Sand Creek Road, west of Deer Valley Road. Again, a significant impact would occur if the proposed project would cause the CNEL to increase by 5 dBA or more even if the CNEL would remain below normally acceptable levels for a receiving land use (60 dBA CNEL, as measured in the rear yards of residential homes); or by 3 dBA or more, thereby causing the CNEL in the project vicinity to exceed normally acceptable levels and result in noise levels that would be considered conditionally acceptable for a receiving land use.

The intermittent noise that would result from emergency vehicle sirens are regulated and required pursuant to public health and safety regulations and are therefore exempt from the City's noise performance standards. Furthermore, it should be noted that the Contra Costa County Fire Prevention District will implement Opticom™ Intelligreen Priority software for traffic control at the nearest intersections to minimize emergency vehicle delay (and therefore would minimize the duration of siren noise in the project vicinity). Therefore, with these minimization features and because of the temporary and intermittent nature of emergency vehicle siren noise would not result in a substantial increase in ambient noise levels in the project vicinity and the impact would therefore be less than significant.

Parking Lot Activities

Typical parking lot activities include vehicles cruising at slow speeds, doors shutting, or cars starting, and can generate noise levels of approximately 60 dBA to 70 dBA L_{max} at 50 feet.

The closest noise-sensitive receptor to the proposed fire station parking areas at the project site are the proposed residential land uses located on the north side of Sand Creek Road. The closest of these residences is located approximately 125 feet from the acoustic center of the nearest proposed parking area on the project site. At this distance, parking lot activity would result in intermittent noise levels ranging up to 62 dBA L_{max} at the property line of the nearest residence. Assuming a reasonable worst-case scenario of one parking movement per parking stall within a single hour would result in an hourly average noise level of 45 dBA L_{eq} as measured at this nearest receptor. These noise levels would not exceed existing background ambient noise levels. Furthermore, when averaged over a 24-hour period these noise levels would not exceed the City's normally acceptable threshold of 60 dBA CNEL as measured in rear yards of residential receptors.

Therefore, the proposed fire station parking lot activities would not generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project site in excess of standards established in the local general plan or noise ordinance; and the impact of noise produced by the fire station parking lot activities to sensitive receptors would be less than significant.

Mechanical Equipment Operations

The proposed fire station would include new mechanical ventilation equipment. Noise levels from typical mechanical ventilation equipment range up to approximately 60 dBA L_{eq} at a distance of 25 feet. Proposed mechanical ventilation systems could be located as close as 150 feet from the nearest noise-sensitive receptor, which is the single-family residential home located east of the proposed fire station (south of Sand Creek Road, west of Deer Valley Road). At this distance, noise generated by mechanical ventilation equipment would attenuate to below 45 dBA L_{eq} at this nearest single-family residential receptor. These noise levels would not exceed existing background ambient noise levels. Furthermore, when averaged over a 24-hour period these noise levels would not exceed the City's normally acceptable threshold of 60 dBA CNEL as measured in rear yard of this nearest residential receptors.

Therefore, the proposed fire station mechanical ventilation equipment operations would not generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project site in excess of standards established in the local general plan or noise ordinance; and the impact of noise produced by the proposed fire station mechanical ventilation equipment operations to sensitive receptors would be less than significant.

Standby Generator Operations

The proposed fire station would also include installation of a new emergency standby generator. The proposed generator equipment would be located on the south side of the fire station building. Noise levels from the proposed standby generator equipment (125 kilowatt (KW) diesel fueled Kohler or similar brand) operating at full power typically range up to approximately 107 dB sound pressure level (dB SPL) at 63 hertz at a distance of 3.3 feet in unshielded conditions. It is expected that the generator would be tested for a few minutes during daytime hours on, at most, a monthly basis. Full operation of the standby generator would only occur during loss of power in the project vicinity, and operation would cease once power has been restored to the area.

The generator would be located on the south side of the proposed fire station building. The generator could be located as close as 170 feet from the nearest off-site noise-sensitive receptor, which is the existing residential home located east of the proposed fire station. At this distance, noise generated by the proposed standby generator would be expected to attenuate to less than 73 dB SPL at this nearest sensitive receptor. Ongoing monthly operations of generator testing at full power for up to 30 minutes within an hour would result in a worst-case average hourly noise level of 67 dBA L_{eq}, and a 24-hour average noise level of 60 dBA CNEL, as measured at the nearest sensitive receptor.

Existing background ambient noise levels in the project vicinity are documented to range up to 52 dBA CNEL as measured at long-term noise measurement location LT-1 shown in Exhibit 3.11-1. In addition, existing traffic noise levels on roadway segments adjacent to these nearest receptors are projected to range up to 66 dBA CNEL along Deer Valley Road between Wellness Way and Sand Creek Road. Therefore, operational noise levels generated by scheduled testing of the standby generator equipment would not exceed existing background noise levels in the project vicinity, and operational noise levels generated by the proposed standby generator equipment would have a less than significant impact to off-site noise-sensitive receptors.

Therefore, the proposed fire station emergency standby generator would not generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance; and the impact of noise produced by the proposed fire station emergency standby generator to sensitive receptors would be less than significant.

Overall

Implementation of the proposed project would introduce construction and new operational noise sources to the ambient noise environment in the project site vicinity. However, implementation of

MM NOI-1a through MM NOI-1d would reduce construction and operational noise impacts. Therefore, overall, the impact related to substantial noise increase in excess of standards would be less than significant with mitigation.

Level of Significance Before Mitigation

Potentially Significant

Mitigation Measures

MM NOI-1a Construction Noise Reduction Measure

To reduce potential construction noise impacts, the City shall ensure that the following multi-part mitigation measure is implemented at the project site:

- The construction contractor shall ensure that all equipment driven by internal combustion engines shall be equipped with mufflers, which are in good condition and appropriate for the equipment.
- The construction contractor shall ensure that unnecessary idling of internal combustion engines (i.e., idling in excess of 5 minutes) is prohibited.
- The construction contractor shall utilize “quiet” models of air compressors and other stationary noise sources where technology exists.
- At all times during project grading and construction, the construction contractor shall ensure that stationary noise-generating equipment shall be located as far as practicable from sensitive receptors and placed so that emitted noise is directed away from adjacent residences.
- The construction contractor shall ensure that the construction staging areas shall be located to create the greatest feasible distance between the staging area and noise-sensitive receptors nearest the project site.
- The construction contractor shall designate a “noise disturbance coordinator” who would be responsible for responding to any local complaints about construction noise. The disturbance coordinator would determine the cause of the noise complaint (e.g. starting too early, bad muffler, etc.) and institute reasonable measures warranted to correct the problem. The construction contractor shall conspicuously post a telephone number for the disturbance coordinator at entrances to the construction site.
- The construction contractor shall comply with the City’s permissible hours for construction (7:00 a.m. to 6:00 p.m., or 8:00 a.m. to 5:00 p.m. if within 300 feet of occupied dwellings, Monday through Friday, and 9:00 a.m. to 5:00 p.m. on weekends and holidays).

MM NOI-1b Traffic Noise Reduction Measure

The proposed project shall construct a soundwall along rear yards of residential lots fronting Deer Valley Road. The soundwall shall be a minimum of 8-foot high, as measured from the finished grade of the proposed residential pads. The soundwall should be located so as to block the line of sight from rear yards for all proposed residences located within 160 feet of the centerline of Deer Valley Road.

MM NOI-1c Mechanical Equipment Noise Reduction Measure

To reduce potential operational stationary noise impacts from mechanical ventilation equipment at the proposed residential homes, mechanical ventilation equipment must be located a minimum of 15 feet from the boundary of the project site, or must be shielded by a noise-reducing barrier. If a noise barrier is required, the barrier shall be a minimum of 5 feet in height, extending 2 feet beyond the sides of the equipment and located between the equipment and the receiving property line.

MM NOI-1d Commercial Operation Noise Reduction Measure

The commercial land uses shall be designed so that on-site mechanical equipment (i.e., HVAC units, compressors, generators) and area-source operations (e.g., parking lots) are located no closer than 100 feet from the nearest residential dwelling unit or provide shielding from nearby noise sensitive land uses to meet the City's normally acceptable threshold of 60 dBA CNEL. Shielding shall have a minimum height sufficient to completely block line-of-sight between the on-site noise source and the nearest residential dwelling to meet the City's noise standards. Based on the size and placement of the HVAC units (i.e., ground level or roof top), barrier heights may range between three to six feet.

Level of Significance After Mitigation

Less Than Significant

Groundborne Vibration/Noise Levels

Impact NOI-2: The project would not result in generation of excessive groundborne vibration or groundborne noise levels.

Construction

A significant impact would occur if the proposed project would generate groundborne vibration or groundborne noise levels in excess of applicable standards. The City of Antioch has/has not adopted criteria for construction or operational groundborne vibration impacts. Therefore, for purposes of this analysis, the FTA's construction vibration impact criteria are utilized. The FTA has established industry accepted standards for vibration impact criteria and impact assessment. These guidelines are published in the agency's Transit Noise and Vibration Impact Assessment Manual.[9] Therefore, for purposes of this analysis, a significant impact would occur if the proposed project would generate groundborne vibration or groundborne noise levels in excess of the FTA impact assessment criteria for construction (0.2 in/sec PPV for non-engineer timber and masonry buildings).

[9] Federal Transit Administration (FTA). 2018. Transit Noise and Vibration Impact Assessment Manual. September.

Groundborne noise is generated when vibrating building components radiate sound, or noise generated by groundborne vibration. In general, if groundborne vibration levels do not exceed levels considered to be perceptible, then groundborne noise levels would not be perceptible in most interior environments. Therefore, this analysis focuses on determining exceedances of groundborne vibration levels.

Construction activity can result in varying degrees of ground vibration, depending on the equipment used on the site. Operation of construction equipment causes vibrations that spread through the ground and diminish in strength with distance. Buildings in the vicinity of a construction site respond to these vibrations with varying results ranging from no perceptible effects at the low levels, to slight damage at the highest levels. As shown in the Setting section above, Table 3.11-4 provides approximate vibration levels for various construction activities.

Impact equipment, such as pile drivers, are not expected to be used during construction of the proposed project. Therefore, of the variety of equipment used during construction of this component of the proposed project, a large bulldozer that could be used in the site preparation phase of construction, and the small vibratory rollers that would be used in the internal roadway improvements phase of construction would produce the greatest groundborne vibration levels. Large bulldozers produce groundborne vibration levels ranging up to 0.089 in/sec PPV at 25 feet from the operating equipment. Small vibratory rollers produce groundborne vibration levels ranging up to 0.101 in/sec PPV at 25 feet from the operating equipment.

The nearest off-site receptor to where the heaviest construction equipment (a large bulldozer) would operate are the single-family residences located 50 feet north of the nearest construction footprint that might require heavy grading using a large bulldozer. As measured at the nearest receptor, operation of a large bulldozer could result in groundborne vibration levels up to 0.031 in/sec PPV. This is well below the FTA's damage threshold criteria of 0.2 PPV for non-engineer timber and masonry buildings (this is the type of construction of the residential buildings north of the project site).

The nearest off-site receptor to where small vibratory roller equipment would operate are the single-family residences located 75 feet from the nearest construction footprint of the proposed roadway improvements. These closest roadway improvement operations would occur at the proposed connection of the future extension of Sand Creek Road to Dallas Ranch Road. As measured at the nearest receptor to this location, operation of a small vibratory roller could result in groundborne vibration levels up to 0.019 in/sec PPV. This is well below the FTA's damage threshold criteria of 0.2 PPV for non-engineer timber and masonry buildings.

Overall, project construction activities would not generate groundborne vibration or groundborne noise levels in excess of the FTA impact assessment criteria for construction-related groundborne vibration. Therefore, construction-related groundborne vibration impacts to existing off-site sensitive land use receptors would be less than significant.

Operation

The City of Antioch has not adopted criteria for operational groundborne vibration impacts. Therefore, for purposes of this analysis, a significant impact would occur if project on-going activities would produce groundborne vibrations that are perceptible without instruments by a reasonable person at the property lines of a project site. Implementation of the proposed project would not include any permanent sources of vibration that would expose persons in the project vicinity to groundborne vibration levels that could be perceptible without instruments at any existing off-site sensitive land use receptors. Therefore, operational groundborne vibration impacts would be less than significant.

Level of Significance

Less Than Significant

Excessive Noise Levels from Airport Activity

Impact NOI-3:	**The proposed project would not expose people residing or working in the project area to excessive noise levels for a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport.**

Construction/Operation

A significant impact would occur if the proposed project would expose people residing or working in the project area to excessive noise levels for a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport.

The project site is not located within the vicinity of a public airport or a private airstrip and is not within an airport land use plan. The closest public airport is the Byron Airport, located approximately 12 miles southeast of the project site. As such, operation of the proposed project would not expose people residing or working at the project site to excessive noise levels associated with public airport or public use airport noise. Therefore, no impact related to exposure of persons residing or working at the project site to excessive noise levels associated with airport activity would occur.

Level of Significance

No Impact

3.11.5 - Cumulative Impacts

The geographic scope of the cumulative noise analysis is the project site vicinity, including surrounding sensitive land use receptors. Noise impacts tend to be localized; therefore, the area near the project site (approximately 0.25-mile radius) would be the area that could be most affected by cumulative projects (including the proposed project) construction and operational activities. Cumulative groundborne vibration impacts are even more localized with potential construction and operational cumulative vibration impacts limited to areas within 100 feet of project construction and operations. There are no known approved cumulative development projects that would lie within these boundaries.

Construction Noise

The proposed project’s loudest phase of construction activity (the site preparation phase) would not overlap with any other current or planned cumulative development projects located within 0.25-

mile of the project site. As such, there would be no possibility of combination of potential construction noise associated with the cumulative projects. Therefore, there would be no cumulative impact related to construction noise.

Operational Traffic Noise

The significance threshold for a cumulative traffic noise impact would be traffic noise levels that would cause the CNEL to increase by 3 dBA or more where the CNEL currently exceeds conditionally acceptable levels.

None of the modeled roadway segments in the project vicinity would have traffic noise levels that would exceed conditionally acceptable noise levels for any adjacent land use. As shown in Table 3.11-10, none of the modeled roadway segments in the project site vicinity would result in a 3 dBA or greater increase under cumulative plus project conditions compared to future cumulative projects traffic noise levels that would exist without the proposed project. However, combined cumulative year traffic noise levels at the project site would exceed noise levels that the City considers acceptable for new residential land uses. As was shown in Impact NOI-1 discussion, implementation of MM NOI-1 would reduce traffic noise levels to meet the City's normally acceptable noise level standards for proposed land uses. Therefore, project-related traffic noise level would result in less than significant increases in traffic noise levels along modeled roadway segments in the project vicinity, and with implementation of MM NOI-1b, would not expose new land uses to traffic noise levels in excess of the City's acceptable land use compatibility standards and the contribution of the proposed project to cumulative projects traffic noise levels would be less than significant.

Given the above information, the proposed project, in conjunction with other existing, planned, and probable future projects, would result in a less than significant cumulative impact related to traffic noise.

Operational Stationary Noise

Implementation of the proposed project would introduce new stationary noise sources to the ambient noise environment in the project vicinity, including new mechanical ventilation equipment at residential homes, new mechanical ventilation equipment, parking lot activities, and delivery trucks at the proposed Village Center, and new mechanical ventilation equipment and parking lot activities at the proposed fire station.

However, implementation of MM NOI-2b and 2c would ensure that project-related stationary noise sources would not exceed the City's normally acceptable noise level thresholds. Therefore, implementation of the proposed project would not combine with any other planned projects in the project vicinity to result in a cumulatively considerable contribution to existing ambient noise conditions in the project site vicinity. Therefore, the cumulative operational stationary noise impact would be less than significant.

Construction Vibration

The proposed project would not result in vibration during construction activity that could overlap with any other current or planned cumulative development projects located within 100 feet of the project site. As such, there would be no possibility of combination of potential construction vibration associated with the cumulative projects. Therefore, there would be no cumulative impact related to construction vibration.

Operational Vibration

Implementation of the proposed project would not include any permanent sources of vibration that would expose persons in the project vicinity to groundborne vibration levels that could be perceptible without instruments at any existing sensitive land use in the vicinity of the project site. The only cumulative contribution to vibration conditions in the vicinity of the project site could result from introduction of new permanent sources of groundborne vibration in the project site vicinity. The only major sources of groundborne vibration in the project vicinity is railroad activity along the light rail line, located approximately 2.75 miles north of the project site. Implementation of the proposed project would not introduce any new permanent sources of groundborne vibration to the project site vicinity and would not increase existing off-site railroad activity. Therefore, implementation of the proposed project would not result in a contribution to cumulative operational groundborne vibration conditions in the project site vicinity. Therefore, the cumulative impact related to project operational vibration would be less than significant.

Level of Significance

Less Than Significant