3.10 Noise

3.10.1 Introduction

This section evaluates the potential effects on noise levels in the project area associated with development and operation of the Yosemite Avenue-Gardner Avenue to Hatch Road Annexation Project (proposed project). This section describes the existing noise conditions around the project site; outlines applicable federal, state, and regional regulations pertaining to noise; and identifies potential project-specific and cumulative impacts on noise and measures to minimize these impacts. The ambient noise environment is described on the basis of short-term (i.e., less than one hour in duration) measurements completed in the vicinity of the project site, the results of which are presented in Appendix F. The analysis and findings are based on noise and vibration modeling, which can also be found in Appendix F. As discussed in the Initial Study prepared to define the scope of this EIR (Appendix B), the project site is more than 4 miles from the nearest airport and is not located within any Airport Influence Area or Noise Compatibly Zones. Therefore, implementation of the proposed project would result in a less-than-significant impact related to air traffic noise and this issue is not further evaluated in this EIR.

As discussed in Chapter 1, Introduction, a Notice of Preparation (NOP) for this Environmental Impact Report (EIR) was initially published in December 2016 based on the original project applications. In 2019, the project applicant submitted revised applications and site plans, increasing the number of residential units from 330 to 540 and increasing the amount of onsite parking. The City issued a revised NOP in May 2020 to disclose these project revisions. Three commenters responding to the NOPs expressed concern that the proposed residential and commercial uses could expose existing residents north of the site to increased noise levels due to on-site activities and off-site vehicle traffic. Both NOPs and the comments received in response to them are provided in Appendix A.

Resources referenced to prepare this section include the Merced Vision 2030 General Plan (City of Merced 2012), proposed project plans, the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM) (FHWA 2008) and the FHWA Traffic Noise Model (TNM 2.5) (FHWA 2004) used to estimate project noise emissions, the California Department of Transportation (CalTrans) Technical Noise Supplement to the Traffic Noise Analysis Protocol (Caltrans 2013), and Federal Transit Authority (FTA) Transit Noise And Vibration Impact Assessment (FTA 2018).

3.10.2 Environmental Setting

This section summarizes background information and terminology relevant to noise and vibration assessment and then describes the existing ambient noise environment encompassing the project site and adjacent properties.

Noise Background and Terminology

Fundamentals of Environmental Noise

Vibrations, traveling as waves through air from a source, exert a force perceived by the human ear as sound. Sound pressure level (referred to as sound level) is measured on a logarithmic scale in decibels (dB) that represent the fluctuation of air pressure above and below atmospheric pressure. Frequency, or pitch, is a physical characteristic of sound and is expressed in units of cycles per second or hertz (Hz). The normal frequency range of hearing for most people extends from about 20 to 20,000 Hz. The human ear is more sensitive to middle and high frequencies, especially when the noise levels are quieter. As noise levels get louder, the human ear starts to hear the frequency spectrum more evenly. To accommodate for this phenomenon, a weighting system to evaluate how loud a noise level is to a human was developed. The frequency weighting called "A" weighting is typically used for quieter noise levels which de-emphasizes the low frequency components of the sound in a manner similar to the response of a human ear. This A-weighted sound level is called the "noise level" and is referenced in units of dBA.

Community noise sources can vary continuously, being the product of many noise sources at various distances, all of which constitute a relatively stable background or ambient noise environment. The background, or ambient, noise level gradually changes throughout a typical day, corresponding to distant noise sources, such as traffic volume, as well as changes in atmospheric conditions.

Noise levels are generally higher during the daytime and early evening when traffic (including airplanes), commercial, and industrial activity is the greatest. However, noise sources experienced during nighttime hours when background levels are generally lower can be potentially more conspicuous and irritating to the receiver. In order to evaluate noise in a way that considers periodic fluctuations experienced throughout the day and night, a concept termed "community noise equivalent level" (CNEL) was developed, wherein noise measurements are weighted, added, and averaged over a 24-hour period to reflect magnitude, duration, frequency, and time of occurrence. A complete definition of CNEL and other terminology used to describe noise is provided in Table 3.10-1.

Table 3.10.1
Definitions of Acoustical Terminology

Term	Definition
Decibel (dB)	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of two like quantities.

Table 3.10.1
Definitions of Acoustical Terminology

Term	Definition
Sound Pressure Level (SPL)	10 times the logarithm to the base 10 of the ratio between the square of the sound to the square of the reference sound pressure of 20 µPascals. Sound pressure level is the quantity that is directly measured by a sound level meter and expressed in dB.
Frequency (Hz)	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz.
A-Weighted Sound Level (dBA)	SPL in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes low and high frequency components of frequency components of sound in a manner similar to the frequency response of the human ear and correlates well with subjective response to sound. All sound levels in this report are A-weighted.
Noise	Unwanted sound.
Equivalent Sound Level (Leq)	The sound level corresponding to a steady state sound level and containing the same total energy as a time varying signal over a given sample period. Leq is designed to average all of the loud and quiet sound levels occurring over a specific time period. Also known as the “Average Sound Level”. For this CEQA evaluation, Leq refers to a one-hour period unless otherwise stated.
Lmax, Lmin	The maximum and minimum A-weighted sound level during the measurement period.
L01, L10, L50, L90	The A-weighted sound levels that are exceeded l%, l0%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level (Ldn)	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to the hourly Leq levels measured during the night between 10 pm and 7 am.
Community Noise Equivalent Level (CNEL)	The average A-weighted sound level during a 24-hour day, obtained after addition of 5 decibels to the hourly Leq levels in the evening from 7 p.m. to 10 p.m. and after addition of 10 decibels to the hourly Leq levels during the night between 10 p.m. and 7 a.m.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Impulsive Noise	Noise loud enough to disrupt normal activities and usually lasting less than one second.

Perception of Loudness

Since sound is measured on a logarithmic scale, a doubling of sound energy results in a 3 dBA increase in the noise level. “It is generally accepted that the average healthy ear…can barely perceive a noise level change of 3 dB” (Caltrans 2013). A change of 5 dBA is readily perceptible, and a change of 10 dBA is perceived as twice or half as loud (Caltrans 2013).

The perceived loudness of sounds and corresponding reactions to noise are dependent on many factors, including sound pressure level, duration of intrusive sound, frequency of occurrence, time of occurrence, and frequency content. As mentioned above; however, within the usual range of environmental noise levels, perception of loudness is relatively predictable, and can be approximated by weighing the frequency response of a sound level meter by means of the standardized A-weighing network. Table 3.10.2 shows examples of noise levels for several common noise sources and environments.

Table 3.10.2
Typical Sound Levels in the Environment and Industry

Common Outdoor Activities	Noise Level (dB)	Common Indoor Activities
—	110	Rock band
Jet flyover at 300 meters (1,000 feet)	100	—
Gas lawn mower at 1 meter (3 feet)	90	—
Diesel truck at 15 meters (50 feet), at 80 kph (50 mph)	80	Food blender at 1 meter (3 feet) Garbage disposal at 1 meter (3 feet)
Noisy urban area, daytime gas lawn mower at 30 meters (100 feet)	70	Vacuum cleaner at 3 meters (10 feet)
Commercial area, heavy traffic at 90 meters (300 feet)	60	Normal speech at 1 meter (3 feet)
Quiet urban daytime	50	Large business office Dishwasher, next room
Quiet urban nighttime	40	Theater, large conference room (background)
Quiet suburban nighttime	30	Library
Quiet rural night time	20	Bedroom at night, concert hall (background)
—	10	Broadcast/recording studio
Lowest threshold of human hearing	0	Lowest threshold of human hearing

Source: Caltrans 2013
Notes: kph = kilometers per hour; mph = miles per hour

Exterior Noise Attenuation

Noise sources are generally classified into two forms: (1) point sources, such as stationary equipment or a group of construction vehicles and equipment working within a spatially limited area at a given time, and (2) line sources, such as a roadway. Sound generated by a point source typically diminishes (attenuates) at a rate of 6.0 dBA for each doubling of distance from the source to the receptor at acoustically "hard" sites and at a rate of 7.5 dBA for each doubling of distance from source to receptor at acoustically "soft" sites. Sound generated by a line source typically attenuates at a rate of 3 dBA and 4.5 dBA per doubling distance, for hard and soft sites, respectively. For the purpose of sound attenuation discussion, a "hard" or reflective site does not provide any excess ground-effect attenuation and is characteristic of asphalt or concrete ground surfaces, as well as very hard-packed soils. An acoustically "soft" or absorptive site is characteristic of unpaved loose soil or vegetated ground.

Structural Noise Attenuation

Structures can provide noise reduction by insulating interior spaces from outdoor noise. The outside-to-inside noise attenuation provided by typical structures in California ranges between 17 to 30 dBA with open and closed windows, respectively, as shown in Table 3.10.3.

Table 3.10.3
Outside-to-Inside Noise Attenuation (dBA)

Building Type	Open Windows	Closed Windows[a]
Residences	17	25
Schools	17	25
Churches	20	30
Hospitals/Offices/Hotels	17	25
Theaters	17	25

Source: Caltrans 2013

Fundamentals of Vibration

Vibration is an oscillatory motion that can be described in terms of displacement, velocity, or acceleration. The response of humans to vibration is very complex. However, it is generally accepted that human response is best approximated by the vibration velocity level associated with the vibration occurrence.

Heavy equipment operation, including stationary equipment that produces substantial oscillation or construction equipment that causes percussive action against the ground surface, may be

perceived by building occupants as perceptible vibration. It is also common for ground-borne vibration to cause windows, pictures on walls, or items on shelves to rattle. Although the perceived vibration from such equipment operation can be intrusive to building occupants, the vibration is seldom of sufficient magnitude to cause even minor cosmetic damage to buildings.

When evaluating human response, ground-borne vibration is usually expressed in terms of root mean square (RMS) vibration velocity. RMS is defined as the average of the squared amplitude of the vibration signal. As for sound, it is common to express vibration amplitudes in terms of dB defined as:

$$L_v = 20 \log \left(\frac{v_{rms}}{v_{ref}} \right)$$

where vrms is the RMS vibration velocity amplitude in inches/second and vref is the dB reference of $1x10^{-6}$ inches per second (in/sec).

To avoid confusion with sound decibels, the abbreviation VdB is used for vibration decibels. The vibration threshold of perception for most people is around 65 VdB (which is equivalent to 0.0018 in/sec RMS). Vibration levels in the 70 to 75 VdB range are often noticeable but generally deemed acceptable, and levels in excess of 80 VdB are often considered unacceptable (FTA 2018).

Vibration impacts to buildings are generally discussed in terms of peak particle velocity (PPV) that describes particle movement over time (in terms of physical displacement of mass, expressed as in/sec). Groundborne vibration generated by construction projects is usually highest during pile driving, rock blasting, soil compacting, jack hammering, and demolition-related activities. Next to pile driving and soil compacting, grading activity has the greatest potential for vibration impacts if large bulldozers, large trucks, or other heavy equipment are used. A conservative maximum vibration level standard is 0.2 in/sec PPV for the prevention of structural damage to sensitive structures (i.e., historic) while 0.5 in/sec PPV applies for the prevention of damage to typical residential buildings (FTA 2018).

Existing Noise Conditions

Noise-Sensitive Receptors

Several categories of land uses are considered to be noise-sensitive because excessive noise levels could cause adverse effects such as annoyance and interference with typical activities and operations. For example, excessive daytime noise levels can interfere with communication in residential, educational, commercial, and religious land uses while excessive nighttime noise can interrupt a resident's sleep patterns.

Noise-sensitive land uses in the project vicinity include single-family residences to the west (across Gardner Avenue), to the south (across East Yosemite Avenue), and within the Remainder Area, as well as Yosemite Church and Stoneridge Christian School within the Remainder Area of the project site, and the medical office/surgery center in the southwest quadrant of the Gardner/East Yosemite Avenue intersection. The nearest noise-sensitive receptor is the residence immediately east of the Crossings portion of the site, within the Remainder Area. This home is approximately 45 feet from the project site boundary. The next nearest sensitive receptors are approximately 75 feet from the project site boundary; these include the residences within the Remainder Area immediately north of the proposed commercial area of The Crossings as well as the residences within the City limits to the west and south. The nearest building corner of the medical office/surgery center to the southwest is approximately 350 feet from the project site boundary and the nearest buildings at Yosemite Church and Stoneridge Christian School are approximately 450 feet away.

Project Area Noise Levels

Roadway traffic is often a primary contributor to the noise environment in rural, suburban, and urban settings. This is true at the project site, where existing on-site noise levels are influenced by traffic along adjacent roadways and activities occurring on agricultural properties in the general vicinity.

Short-term noise measurements were conducted at three locations, as shown on Figure 3.10-1, Noise Measurement Locations. This included measurement locations proximate to each of the adjacent roadways (locations M1 and M2) to determine ambient traffic noise levels. The results of short-term noise measurements along with manual traffic counts completed during the sound level measurements are presented in Table 3.10.4. Refer to Appendix F for field data sheets containing all of the noise measurement data as well as information regarding the type of noise monitoring equipment used. No agricultural activity noise was observed at the time the noise measurements were conducted.

The noise measurements were obtained in December 2016, which was concurrent with preparation of the original NOP for this project. No major land development projects have been constructed since that time and no other changes in the community have resulted in substantial increases in traffic volumes on the roadways adjacent to the project site. Thus, this data remains applicable for defining existing conditions within the project area and evaluating potential noise level increases associated with the proposed project.

Table 3.10.4
Short Term Sound Level Measurements and Traffic Counts

Site	Description	Date/Time	L_{eq}[1]	Cars	Bus
M1	Gardner Avenue, 22 feet from centerline	12/19/2016 2:33 p.m. to 2:48 p.m.	63 dBA	23	1
M2	East Yosemite Avenue, 11 feet from edge of pavement	12/19/2016 2:53 p.m. to 3:08 p.m.	70 dBA	101	0
M3	Center of project site	12/19/2016 3:16 p.m. to 3:21 p.m.	43 dBA	n/a	n/a

Note:
1 Equivalent Continuous Sound Level (Time-Average Sound Level)
Source: Appendix F

The measured average noise level for the short-term measurement along Gardner Avenue (measurement location M1 at the western edge of the project site boundary, 22 feet from the roadway centerline) was 63 dBA. Along East Yosemite Avenue (measurement location M2 at the southern edge of the project site boundary, 11 feet from the edge of pavement), the measured average noise level was 70 dBA. At measurement location M3, near the center of the project site, the measured average noise level was 43 dBA.

Traffic noise is generally assessed using software provided by the FHWA, the current version of which is the TNM 2.5 (FHWA 2004). Dudek modeled the existing traffic noise (CNEL) associated with Gardner Avenue and East Yosemite based upon data for existing traffic trips on these roadways as provided by DKS Associates (Appendix M). Thus, the measured minimum, maximum, and average noise levels as well as traffic data from DKS Associates were used as inputs to the TNM 2.5 model. The modeled existing traffic noise level at M1 is 68 dBA CNEL and the modeled existing traffic noise level at M2 is 71 dBA CNEL. The modelled noise levels at the property boundaries along Gardner Avenue and East Yosemite Avenue are 63 and 66 dBA CNEL, respectively.

3.10.3 Regulatory Setting

Federal Regulations

Federal Transit Administration and Federal Railroad Administration Standards

Although the FTA standards are intended for federally funded mass transit projects, the impact assessment procedures and criteria included in the FTA Transit Noise and Vibration Impact Assessment Manual (FTA 2018) are routinely used for projects proposed by local jurisdictions.

The FTA has published guidelines for assessing the impacts of ground-borne vibration associated with construction; specifically, a damage threshold of 0.2 inch/second peak particle velocity (PPV) applies for vibration that could affect sensitive structures (i.e., historic structures), and 0.5 inch/second PPV applies for vibration affecting contemporary conventional construction.

State Regulations

California Noise Control Act of 1973

Sections 46000 through 46080 of the California Health and Safety Code, known as the California Noise Control Act of 1973, declares that excessive noise is a serious hazard to the public health and welfare and that exposure to certain levels of noise can result in physiological, psychological, and economic damage. It also identifies a continuous and increasing bombardment of noise in the urban, suburban, and rural areas. The California Noise Control Act declares that the State of California has a responsibility to protect the health and welfare of its citizens by the control, prevention, and abatement of noise. It is the policy of the State to provide an environment for all Californians free from noise that jeopardizes their health or welfare.

California Noise Insulation Standards (CCR Title 24)

In 1974, the California Commission on Housing and Community Development adopted noise insulation standards for hotels, motels, dormitories, and multi-family residential buildings (CCR Title 24, Part 2). Title 24 establishes standards for interior room noise (attributable to outside noise sources). The regulations also specify that acoustical studies must be prepared whenever a multi-family residential building or structure is proposed to be located in an area with CNEL (or Ldn) of 60 dBA or greater. Such acoustical analysis must demonstrate that the residence has been designed to limit intruding noise to an interior CNEL (or Ldn) of at least 45 dBA (California's Title 24 Noise Standards, Chap. 2-35).

Local Regulations

City of Merced Vision 2030 General Plan

The following Policies and Implementing Actions from the City's Vision 2030 General Plan, Chapter 10 Noise, are relevant to the assessment of noise effects associated with the proposed project.

Policy N-1.2 Reduce surface vehicle noise.

Implementing Actions

1.2.c New development of noise-sensitive land uses may not be permitted in areas exposed to existing or projected levels of noise from transportation noise sources which exceed the levels specified in Table N-3, unless the project design includes effective mitigation measures to reduce exterior noise and noise level in interior spaces to the levels specified in Table N-3. [General Plan Table N-3 is reproduced below as Table 3.10.5]

1.2.e It is anticipated that roadway improvement projects will be needed to accommodate build-out of the General Plan. Therefore, existing noise-sensitive uses may be exposed to increased noise levels due to roadway improvement projects as a results of increased roadway capacity, increases in travel speeds, etc. It may not be practical to reduce increased traffic noise levels consistent with those contained Table N-3. Therefore, as an alternative, the following criteria may be used for roadway improvement projects:

- Where existing traffic noise levels are less than 60 dB Ldn at the outdoor activity areas of noise-sensitive uses, a +5 dB Ldn increase in noise levels due to roadway improvement projects should be mitigated to the extent feasible; and,
- Where existing traffic noise levels range between 60 and 65 dB Ldn at the outdoor activity areas of noise-sensitive uses, a +3 dB Ldn increase in noise levels due to roadway improvement projects should be mitigated to the extent feasible; and,
- Where existing traffic noise levels are greater than 65 dB Ldn at the outdoor activity areas of noise-sensitive uses, a +1.5 dB Ldn increase in noise levels due to roadway improvement projects should be mitigated to the extent feasible.

Table 3.10.5
Maximum Allowable Noise Exposure - Transportation Noise Sources

(Table N-3 of General Plan Chapter 10 Noise)

Land Use	Outdoor Activity Areas [1] Ldn/CNEL, dB			Interior Spaces	
	Roadways	***Railroads***	***Aircraft***	***Ldn/CNEL, dB***	***Ldn dB [2]***
Residential	60 / 65 [3]	65 [5]	60 [3]	45	- -
Transient Lodging	65 [4,5]	65 [4,5]	65 [4,5]	45	- -
Hospitals, Nursing Homes	60 [3]	65 [5]	60 [3]	45	- -
Theaters, Auditoriums, Music Halls	- -			- -	35
Churches, Meeting Halls	60 [3]	65 [5]	60 [3]	- -	40
Office Buildings	- -			- -	45
Schools, Libraries, Museums	- -			- -	45
Playgrounds, Neighborhood Parks	70		75	- -	- -

[1] Where the location of outdoor activity areas is unknown, the exterior noise level standard shall be applied to the property line of the receiving land use. Where it is not practical to mitigate exterior noise levels at patio or balconies of apartment complexes, a common area such as a pool or recreation area may be designated as the outdoor activity area.

[2] As determined for a typical worst-case hour during periods of use.

[3] Where it is not possible to reduce noise in outdoor activity areas to 60 dB Ldn/CNEL or less using a practical application of the best-available noise reduction measures, an exterior noise level of up to 65 dB Ldn/CNEL may be allowed provided that available exterior noise level reduction measures have been implemented and interior noise levels are in compliance with this table. For residential uses located adjacent to major roadways such as S.R. 99, S.R. 59, and S.R. 140, the normally acceptable exterior noise level is 65 dB Ldn/CNEL.

[4] In the case of hotel/motel facilities or other transient lodging, outdoor activity areas such as pool areas may not be included in the project design. In these cases, only the interior noise level criterion will apply.

[5] Where it is not possible to reduce noise in outdoor activity areas to 65 dB Ldn/CNEL or less using a practical application of the best-available noise reduction measures, an exterior noise level of up to 70 dB Ldn/CNEL may be allowed provided that available exterior noise level reduction measures have been implemented and interior noise levels are in compliance with this table.

The above Implementing Actions will be used in the City development process in order to ensure that noise impacts are mitigated to the greatest extent feasible by incorporating noise abatement into project conditions and mitigation measures.

Policy N-1.3 Reduce equipment noise levels.

Implementing Actions

1.3.a Limit operating hours for noisy construction equipment used in the City of Merced.

Policy N-1.4 Reduce noise levels at the receiver where noise reduction at the source is not possible.

Implementing Actions

1.4.a Require new residential projects to meet acceptable noise level standards as follows:

- A maximum of 45 dB Ldn/CNEL for interior noise level for residential projects.
- A maximum of 65 dB Ldn/CNEL for exterior noise level for residential projects proximate to major road way and railroad corridors. For other arterial, collector and local streets a maximum of 60 dB Ldn/CNEL exterior noise with a maximum of 65 dB Ldn/CNEL when all the best available noise-reduction techniques have been exhausted without achieving 60 dB, and the strict application of such maximum becomes a hindrance to development needed or typical for an area.

Policy N-1.5 Coordinate planning efforts so that noise-sensitive land uses are not located near major noise sources.

Implementing Actions

1.5.a New development of noise-sensitive uses should not be allowed where the noise level due to noise sources will exceed the exterior noise level standards of Table N-1 as measured immediately within the property line or within a designated outdoor activity area (at the discretion of the Director of Development Services) of the new development, unless effective noise mitigation measures have been incorporated into the development design to achieve the standards specified in Table N-1.

1.5.b Noise created by new proposed non-transportation noise sources should be mitigated to the extent feasible so as not to exceed the exterior noise level standards of Table N-1 as measured immediately within the property line of lands designated for noise-sensitive uses.

1.5.c The City of Merced shall also apply an interior maximum nighttime noise level criterion (Lmax) of 50 dB in bedrooms for new residential uses affected by a non-transportation noise sources.

Policy N-1.6 Mitigate all significant noise impacts as a condition of project approval for sensitive land uses.

Implementing Actions

1.6.a Where noise mitigation measures are required to achieve the standards of Table N-1 and N-3, the emphasis of such measures should be placed upon site planning on project design. The use of noise barriers should be considered a means of achieving the noise standards only after all other practical design-related noise mitigation measures have been integrated into the project.

1.6.b Where noise-sensitive land uses are proposed in areas exposed to existing or projected exterior noise levels exceeding the levels specified in Table N-3 or the performance standards or Table N-1, an acoustical analysis may be required as part of the environmental review process so that noise mitigation may be included in the project design. [General Plan Table N-1 is reproduced below as Table 3.10.6]

Table 3.10.6
Exterior Noise Level Performance Standards for New Projects Affected by or Including Non-Transportation Noise Sources

(Table N-1 of General Plan Chapter 10 Noise)

Noise Level Descriptor	Daytime (7a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)
Hourly Leq, dB	55	45

City of Merced Code of Ordinances

The City of Merced Code of Ordinances mentions noise in various sections but does not have a full section focused on noise. The references to noise in the Code include discussions of noise from parties, use of landscaping to attenuate noise, and noise from industrial zones. Because the Code does not identify specific noise standards, the impact analysis presented in this section relies on the City of Merced General Plan standards to determine the significance of potential project impacts.

Merced County Code - Chapter 10.60 Noise Control

Although the project proposes to annex the project site to the City of Merced, and thus noise levels within the project site would be subject to the City's noise standards, the properties to the north and east of the project site are located within Merced County. Therefore, noise generated

by the project and experienced at nearby residential properties would be subject to the County Code noise limits. The following text presents the Merced County Code noise level limits as defined in County Code Chapter 10.60 Noise Control.

A. No person shall cause, suffer, allow, or permit the operation of any sound source on private property in such a manner as to create a sound level that results in any of the following, when measured at or within the real property line of the receiving property:

    1. Exceeds the background sound level by at least ten (10) dBA during daytime hours (seven a.m. to ten p.m.) and by at least five dBA during nighttime hours (ten p.m. to seven a.m.). The background sound level for purposes of this section shall be determined as set forth in Section 10.60.060; or

    2. Exceeds sixty-five (65) dBA Ldn on residential real property or seventy (70) dBA Ldn on nonresidential real property; or

    3. Exceeds seventy-five (75) dBA Lmax on residential real property or eighty (80) dBA Lmax on nonresidential real property.

B. The following are exempt from the sound level limits of Section 10.60.030(A):

    1. Noise from emergency signaling devices;

    2. Noise from an exterior burglar alarm of any building provided such burglar alarm shall terminate its operation within five minutes of its activation;

    3. Noise from domestic power tools, lawn mowers, and agricultural equipment when operated between seven a.m. and eight p.m. on weekdays and between eight a.m. and eight p.m. on weekends and legal holidays, provided they generate less than eighty-five (85) dBA at or within any real property line of a residential property;

    4. Sound from church bells and chimes when a part of a religious observance or service;

    5. Noise from construction activity, provided that all construction in or adjacent to urban areas shall be limited to the daytime hours between seven a.m. and six p.m., and all construction equipment shall be properly muffled and maintained.

C. When the source being analyzed is a stereo system with low frequency signals as part of its output, the stereo shall not cause a C-weighted level of ten (10) dB or greater above the C-weighted ambient level at a distance of ten (10) feet from the source, or the complainant's real property line, whichever is greater. (Ord. 1869 § 2, 2009; Ord. 1726 § 1, 2004).

3.10.4 Impacts

Methods of Analysis

The analysis of the existing and future noise environments is based on observations, noise level measurements, published data, and computer modeling. Existing noise levels were monitored in the vicinity of the site using an ANSI Type I sound level meter. Traffic noise modeling involved calculation of existing and future traffic noise levels along roadway sections to which the project would substantially contribute traffic trips (Gardner Avenue and East Yosemite Avenue, as shown in Appendix M), using the FHWA TNM 2.5 modeling software. Vibration from transportation sources was not evaluated in detail because it is not common for vibration from motor vehicles traveling on paved roads to cause disturbance or substantial annoyance.

On-site stationary noise sources, primarily associated with heating, ventilation, and air conditioning (HVAC) equipment was modelled using an excel-based noise prediction model (Dudek noise tool). The Dudek noise tool uses the same International Organization of Standardization 9613-2 sound propagation algorithms and reference data utilized by commercially available software like CadnaA.

Construction noise and vibration levels were determined using equipment noise and vibration reference levels developed by the FTA. For construction noise, a concept called the “acoustic center” is useful in describing average noise levels across the entire construction period for adjacent receivers. The acoustic center is the idealized point from which the energy sum of all construction activity noise within the site would originate, and it is derived by taking the square root of the product of the shortest distance multiplied by the furthest distance.

For construction vibration, this analysis uses the FTA’s vibration impact thresholds for annoyance within residences. In summary, these thresholds are: for damage, in existing and/or planned residential and commercial structures, vibration PPV greater than 0.5 in/sec; for annoyance, 80 VdB at residences and buildings where people normally sleep, for infrequent events.

Items Addressed in the Initial Study

As discussed in the Initial Study (Appendix B), the project site is more than 4 miles from the nearest airport and is not located within any Airport Influence Area or Noise Compatibly Zones. Therefore, implementation of the proposed project would result in a less-than-significant impact related to air traffic noise and this issue is not further evaluated in this EIR.

Thresholds of Significance

Consistent with Appendix G of the CEQA Guidelines, the City's General Plan, and professional judgment, a significant impact would occur if development of the proposed project would do any of the following:

- Result in construction that occurs outside the daytime hours between seven a.m. and six p.m. daily (in accordance with Merced County Code); or
- Result in residential exterior noise levels greater than 55 dBA L_{eq} (daytime – 7 a.m. to 10 p.m.) or 45 dBA L_{eq} (nighttime – 10 p.m. to 7 a.m.) at residences within the City of Merced;
- Result in residential exterior noise levels greater than 65 dBA Ldn or 75 dBA L_{max} at residences within Merced County;
- Result in noise levels within Merced County that exceed background noise levels by at least 10 dBA during daytime hours (7 a.m to 10 p.m) or by at least 5 dBA during nightime hours (10 p.m to 7 a.m.);
- Result in off-site traffic noise increases greater than 3 dBA CNEL which represents a noticeable increase for the average community member;
- Expose existing residences to vibration peak-particle velocities greater than 0.5-inch per second or vibration levels greater than 80 VdB due to project construction and/or operation.

Impacts and Mitigation Measures

Impact 3.10-1: Noise from construction of the project could impact existing noise sensitive uses in the project vicinity, resulting in a *potentially significant* impact.

The Crossings

Construction of the proposed project would generate noise that could expose nearby sensitive receptors to elevated noise levels that may disrupt routine activities. The magnitude of the impact depends on the type of construction activity, construction equipment used, duration of the construction phase, distance between the noise source and receiver, and the presence or absence of intervening structures (which can provide noise attenuation). Noise from construction equipment generally exhibits point source acoustical characteristics. As described in the Exterior Noise Distance Attenuation section above, a point source sound is attenuated (reduced) at a rate of 6 dB per doubling of distance from the source for "hard site" conditions and at 7.5 dB per doubling of distance for "soft site" conditions. These rules apply to the propagation of sound waves

with no obstacles between source and receivers, such as topography (ridges or berms) or structures.

The range of maximum noise levels for various types of construction equipment is depicted in Table 3.10.7. These levels reflect a single piece of equipment operating at maximum power. Actual noise levels from a given piece of equipment usually fluctuate because typical operating cycles for construction equipment often involves two minutes of full power, followed by three or four minutes at lower levels. The noise levels shown in Table 3.10.7 are based on surveys conducted by the United States Environmental Protection Agency in 1971. In the time since 1971, regulations have been adopted to reduce noise generated by certain types of equipment to meet worker noise exposure standards. Also, because of stringent air quality emissions standards, newer, cleaner, and quieter equipment is used on most construction projects in California. Thus, the construction equipment noise levels indicated in Table 3.10.7 represent "worst-case" conditions.

Table 3.10.7
Construction Equipment Noise Emission Levels

Equipment	Typical Maximum Sound Level (dB) at 50 feet from Source
All Other Equipment > 5 HP	85
Auger Drill Rig	84
Backhoe	78
Compressor (air)	78
Concrete Pump Truck	81
Crane	81
Dozer	82
Dump Truck	76
Excavator	81
Flat Bed Truck	74
Front End Loader	79
Generator	81
Generator (<25KVA, VMS signs)	73
Man Lift	75
Pickup Truck	75
Pneumatic Tools	85
Pumps	81
Roller	80

Table 3.10.7
Construction Equipment Noise Emission Levels

Equipment	Typical Maximum Sound Level (dB) at 50 feet from Source
Sand Blasting (Single Nozzle)	96
Scraper	84
Welder / Torch	74

Source: FHWA RCNM 2008

Construction scenario assumptions, including phasing, equipment mix, and vehicle trips, were based on project development information and values generated in the air quality modeling completed using the California Emissions Estimator Model (CalEEMod) Version 2016.3.2 (CAPCOA 2017). Complete detailed construction assumptions are included in Appendix F. Implementation of the proposed project would include construction of 540-unit apartment village including a 13,700 square foot clubhouse and associated outdoor recreation space. The Crossings also includes five mixed-use buildings consisting of 66,000 square feet of retail space on the ground level and 45,000 square feet of residential space on the second level, totaling 30 additional units (12 apartments and 18 extended stay units), and 1,223 parking spaces.

The types of construction equipment assumed to be used onsite are shown in Table 3.10.8. Because specific information regarding the construction equipment fleet is unknown at the time of this analysis, the analysis is based on the default construction equipment fleet provided by CalEEMod, based on the project information summarized above. As described in Section 3.3 Air Quality, construction is expected to take approximately 27 months in several discrete phases.

Table 3.10.8
Construction Equipment List by Phase

Construction Phase	Equipment	Quantity
Demolition	Concrete Saw	1
	Excavators	3
	Rubber Tired Dozers	2
Site Preparation	Rubber Tired Dozers	3
	Tractors/Backhoes	4

Table 3.10.8
Construction Equipment List by Phase

Construction Phase	Equipment	Quantity
Grading	Excavators	2
	Graders	1
	Rubber Tired Dozers	1
	Scrapers	2
	Tractors/Backhoes	2
Building Construction	Cranes	1
	Forklifts/Gradealls	3
	Generator Sets	1
	Tractors/Loaders/Backhoes	3
	Welders	1
Paving	Pavers	2
	Paving Equipment	2
	Rollers	2
Architectural Coating	Air Compressors	3

The nearest point of construction activities to the closest noise-sensitive receivers (residences located to the north within the Remainder Area and offsite to the west and south) would be approximately 75 feet and the furthest would be approximately 1,425 feet. Thus, the distance to the nearest construction activities would be approximately 75 feet, but average construction noise levels at the closest residential receivers would be approximated by the acoustic center (as defined in the Methods of Analysis section above) 325 feet away, because equipment would be operated across the whole site rather than remaining only along the closest boundary to adjacent receivers.

The FHWA RCNM (FHWA 2008) was used to estimate construction noise levels at these noise-sensitive land uses. RCNM is often used for non-roadway projects because the same types of construction equipment used for roadway projects are also used to construct other project types. Input variables for RCNM consist of the receiver/land use types, the equipment type and number of each (e.g., two graders, a loader, a tractor), the duty cycle for each piece of equipment (e.g., percentage of each hour the equipment typically works per day), and the distance between the construction activity and noise-sensitive receivers. Given the relatively flat project site and limited number of structures adjacent to The Crossings component of the site, no topographical or structural shielding was assumed in the modeling of construction noise (i.e., the receivers are modelled with no obstacles impeding the travel of sound between the construction activity and

receiver location). The noise levels from the proposed construction activities are summarized in Table 3.10.9. The complete set of RCNM input and output data for construction noise is provided in Appendix F.

As shown in Table 3.10.9, noise levels at the nearest receptors would range from approximately 75 to 84 dBA L_{eq} when construction is taking place at or near the project site boundary. More typical construction noise levels (represented by the noise levels based on the distance to the acoustic center) at the closest sensitive receptors would range from approximately 62 to 71 dBA L_{eq}. As the table shows, the highest noise levels are expected to occur during the grading and building construction phases of project implementation.

Table 3.10.9
Outdoor Construction Noise Levels at Exteriors of Nearest Residences and Construction Phase Duration

Construction Phase	Adjacent Residences 75 Feet (dBA L_{eq})	Acoustic Center 325 Feet (dBA L_{eq})	Approximate Duration
Demolition	82	70	1.5 months
Site Prep	81	68	1 month
Grading	84	71	2 months
Building Construction	83	70	20 months
Paving	78	65	1.5 months
Architectural Coating	75	62	Periodic during building construction

Source: RCNM, Appendix F

As shown in Table 3.10.3, the exterior noise levels shown in Table 3.10.9 would be reduced by approximately 25 dBA when windows in nearby residences are closed. Thus, the nearest existing residences would experience maximum interior noise levels ranging between 50 dBA L_{eq} and 59 dBA L_{eq} and average noise levels ranging between 37 dBA L_{eq} and 46 dBA L_{eq} The phase with the highest average noise level is grading, which is estimated to require 2 months to complete. During all other phases, the average interior noise level would be 45 dBA L_{eq} or less. Although these noise levels would not interfere with conversations or other typical residential activities during the daytime, they could result in sleep disruption if construction were to occur during the nighttime. The potential for nighttime construction to result in sleep disruption or interference with relaxation in the evening period, would be a **potentially significant impact**.

Remainder Area

Future development that would be allowed in the Remainder Area after annexation to the City would be anticipated to involve construction activities using a suite of heavy construction equipment that is similar in intensity to The Crossings component. The nearest sensitive receptors to the Remainder Area are the residences west of Gardner Avenue, which are approximately 75 feet from the Remainder Area, and the residences east of Hatch Road, the closest of which is approximately 90 feet from the Remainder Area. Thus, the distance between construction activities and the nearest sensitive receptors would be the same as for the Crossings component, and therefore construction noise levels at sensitive receptors would be similar. The impact would be **potentially significant** due to the potential for nighttime construction to result in sleep disruption or interference.

Mitigation Measures

Implementation of Mitigation Measures 3.10a through 3.10c would reduce construction noise effects on adjacent residents from development of The Crossings component, making the impact to sensitive receptors **less than significant** and implementation of Mitigation Measures 3.10d and 3.10e would reduce construction noise impacts from development of the Remainder Area upon adjacent residents to **less than significant.**

The Crossings

3.10a Noise generating construction activities for the project (including demolition, excavation, and building construction), shall be restricted to the hours between 7 a.m. and 6 p.m. daily unless attenuation measures are implemented to reduce exterior noise levels at the nearest sensitive receptors to a maximum of 65 dBA L_{eq}.

3.10b All construction equipment employing an internal combustion engine shall be equipped with suitable exhaust and intake silencers which are in good working order.

3.10c Stationary construction equipment such as generators or compressors shall be located on-site as far away from adjacent residential property boundaries as is practicable.

Remainder Area

3.10d Prior to approval of any discretionary entitlements for the Remainder Area, the applicant shall submit a site-specific construction noise evaluation that determines the likely maximum and average construction noise levels at the nearest sensitive

receptors and identifies noise attenuation measures where necessary to ensure that exterior noise levels at the nearest sensitive receptor would remain below a maximum of 85 dBA L_{eq} and remain below an average, as measured by determining the acoustic center of the construction area, of 75 dBA L_{eq}.

3.10e Prior to issuance of permits for building demolition, grading, and/or construction for any future project within the Remainder Area, the City of Merced shall ensure that construction plans demonstrate that Mitigation Measures 3.10a, 3.10b, and 3.10c will be implemented throughout all construction activities.

Impact 3.10-2: Operational noise from roof-mounted mechanical equipment within The Crossings component would not result in noise levels at adjacent residential properties that exceed exterior noise exposure limits, however operational equipment noise levels from the Remainder Area cannot be determined and the impact is *potentially significant.*

The Crossings

The primary mechanical equipment for the proposed project that could affect exterior noise levels on adjacent properties is roof-mounted HVAC equipment. Each of the residential structures would include 27 residences. Each residential apartment is expected to have one HVAC unit. Although specific units and their placement has not been determined, and the City of Merced Municipal Code prohibits roof-top HVAC units for multi-family dwellings within a Planned Development zone, Dudek assumed a 3-ton capacity HVAC unit for each apartment (Carrier 036-30) and a total of 27 of these HVAC units mounted on the roof-top of each residential structure to ensure a conservative analysis. For the mixed-use buildings proposed for the western portion of the project site, one 48-ton capacity HVAC unit was assumed for each building (Carrier 48TC-06). Dudek used published sound power ratings for these representative HVAC package units.

Dudek used the project site plan and noise specifications for the HVAC equipment assumed to be installed within the project site to create an Excel-based model of the operational noise levels from the HVAC equipment at the nearest noise sensitive receivers (the Dudek noise tool). The model uses the published sound level for each piece of equipment; standard outdoor distance attenuation rates for point sources and hard-site conditions (most conservative), the distance between each equipment location and the receiver locations, and the logarithmic sum of individual equipment noise levels at each receiver point. The modeling determined the operational noise exposures for the nearest sensitive receptors shown in Table 3.10.10.

Table 3.10.10
Operational Equipment Noise Summary

Receiver Location, Description	Sound Pressure Levels at Receivers (dBA L_{eq})
Residences west of Gardner Avenue	38
Residences south East Yosemite Avenue	41
Closest residences east of the site, across Hatch Road	42

Source: Appendix F

The results in Table 3.10.10 show that the predicted operational noise would be less than the most restrictive City noise level standard of 45 dBA L_{eq} at the nearest noise-sensitive receptors (the nighttime limit between 10:00 p.m. to 7:00 a.m., City of Merced 2012). Calculated operational noise would also be less than the ambient sound levels associated with roadways adjacent to the project site. Additionally, the maximum operational noise level at and adjacent to the project boundary would be 50 dBA (Appendix F). While this analysis focuses on noise exposure for residences within the City of Merced, it also demonstrates that noise levels for residences within Merced County would remain at acceptable levels because the County's maximum acceptable exterior noise levels are 65 dBA L_{dn} and 75 dBA L_{max}, and residences within Merced County are located further from the project site than the nearest residences which are located in the City or within the project site, which is proposed for annexation to the City.

Because operational noise levels would be within the limits prescribed by the City General Plan Noise Element and within the limits prescribed by the Merced County Code of Ordinances, and because operational noise levels would not represent a substantial increase compared to ambient noise levels, operational noise is considered to be a **less-than-significant** impact.

Remainder Area

Portions of the 40.2-acre Remainder Area are currently developed with rural residences, a church, and private school. Under-developed or vacant land within the remainder area currently supports agriculture practices, which often can be a substantial noise source in the community.

The project proposes to pre-zone the Remainder Area with approximately 19.4 acres of Urban Transition (U-T) and approximately 20.8 acres of Low Density Residential (R-1-10). No new development within the Remainder Area is proposed at this time, however the portion of the Remainder Area that is proposed to be zoned R-1-10 could support single-family residential lots with a minimum size of 10,000 square feet. The portion of the Remainder Area zoned U-T would only allow new agricultural development unless further rezoning is approved, and thus the proposed project would not result in the potential for new development to occur on that portion of the site.

As discussed above, The Crossings component of the project, which includes multi-family residential and commercial development, is not expected to generate noise that would exceed the City's thresholds. The residential development possible within the portion of the Remainder Area proposed to be designated R-1-10 would be less dense than that of The Crossings but would likely require mechanical equipment that is of similar sizes to that assumed for the multi-family apartments portion of The Crossings. Thus future residential development within the Remainder Area would be expected to generate noise levels that are similar to or less than those of The Crossings component and this future development within the Remainder Area would be unlikely to result in noise levels that exceed the adopted standards of either the City or the County. However, depending on the specific details of proposed uses and site layout, in particular the distance between noise sources and nearby sensitive receptors, there is a potential for noise levels to exceed the City's standards, thus this impact is considered **potentially significant.**

Mitigation Measures

The Crossings

No mitigation measures are required.

Remainder Area

3.10f Prior to approval of any discretionary entitlements for the Remainder Area, the applicant shall submit a site-specific operational noise evaluation that determines the likely maximum operational noise levels at the nearest sensitive receptors and identifies noise attenuation measures where necessary to ensure that exterior noise levels at the nearest sensitive receptor would remain below a maximum of 55 dBA L_{eq} during daytime (7 a.m. to 10 p.m.) and 45 dBA L_{eq} during nighttime (10 p.m. to 7 a.m.).

Impact 3.10-3: Project vehicle trip generation from The Crossings project component would not result in off-site roadway noise level increases that impact noise sensitive land uses located along such roadways. Vehicle trip generation from future residential development under the proposed zoning designations for the Remainder Area would be less than the traffic generated by The Crossings component and thus would also not result in off-site roadway noise level increases that impact noise sensitive land uses located along such roadways. The impact is *less than significant.*

The Crossings

Typically, the primary off-site noise-related effect from development of residential and commercial land uses is due to increases in traffic. Project-related traffic noise levels were examined along the roadways to which the project would principally contribute traffic trips and for which DKS provided trip volume calculations (Appendix M), including Gardner Avenue and East Yosemite Avenue.

The FHWA TNM 2.5 noise prediction model was employed to model roadway traffic noise levels for the following scenarios: Existing, Existing Plus Project, Year 2030 (General Plan Build-out), and Year 2030 Plus Project. Inputs for the TNM 2.5 model include the posted vehicle speed, average daily traffic volumes for each scenario, and the estimated vehicle mix (i.e., automobiles, medium and heavy trucks). The model assumed “pavement” propagation conditions, or a hard surface site. Noise levels are indicated at the back of sidewalk for each road segment, which is generally either the location of the closest property boundary for residences along the roadways or is slightly closer to the roadway than the property boundary, and thus provides a conservative assessment of maximum noise exposure for those residences. Noise levels at greater distances from the roadway centerline would be lower due to attenuation provided by increased distance from the noise source. Generally, noise from heavily traveled roadways would experience a decrease of approximately 3 dBA for every doubling of distance from the roadway. The noise model does not take into account the sound-attenuating effect of intervening structures, barriers, vegetation, or topography. Therefore, the noise levels predicted by the model are conservative with respect to potential exterior exposure levels at noise-sensitive uses located along these roadways. Future increases in traffic with and without the proposed project are provided in Table 3.10.11.

Table 3.10.11
Project Related Traffic Noise Levels

Roadway Segment	Existing Conditions			General Plan Buildout		
	Current dBA CNEL	***Plus Project dBA CNEL***	***Change due to project***	***Year 2030 dBA CNEL***	***Plus Project dBA CNEL***	***Change due to project***
West side of Gardner Avenue, north of East Yosemite	65.1	65.3	0.2	68.4	68.5	0.1
East side of Gardner Avenue, south of East Yosemite	62.7	62.8	0.1	66.0	66.0	0.0
North side of East Yosemite Avenue, west of Gardner	66.3	67.1	0.8	65.6	66.1	0.6
South side of East Yosemite Avenue, east of Gardner	63.6	64.3	0.7	68.4	68.9	0.5

Source: Appendix F

Ordinarily dBA values are reported as whole numbers, because the human ear cannot distinguish between noise levels that are less than 1 dBA apart, even in a controlled lab environment. But for the purpose of illustrating the small change in noise levels attributed to project-related traffic, the values in Table 3.10.11 are reported to the tenths level.

Proposed project-related traffic noise increases would be less than 1 dBA in each case for Existing versus Existing Plus Project scenarios, well below the perceptible threshold of 3 dBA for all the evaluated roadways. The proposed project would also increase the roadway noise level by less than 1 dBA in the Year 2030 versus Year 2030 Plus Project scenarios. As such, traffic noise level increases for Year 2030 Plus Project scenario would also remain far below the perceptible threshold of 3 dBA for all the evaluated roadways. Therefore, the proposed project would have a **less than significant** impact upon off-site roadway traffic noise levels.

Remainder Area

Portions of the 40.2-acre Remainder Area are currently developed with rural residences, a church, and a private school. These uses contribute to local traffic and associated existing traffic noise

levels. The project proposes to pre-zone the Remainder Area with approximately 19.4 acres of Urban Transition (U-T) and approximately 20.8 acres of Low Density Residential (R-1-10). No new development within the Remainder Area is proposed at this time, however the portion of the Remainder Area that is proposed to be zoned R-1-10 could support single-family residential lots with a minimum size of 10,000 square feet. This would likely increase the traffic generation and associated traffic noise levels from this portion of the Remainder Area. The portion of the Remainder Area zoned U-T would only allow new agricultural development unless further rezoning is approved, and thus the proposed project would not result in the potential for new development to occur on that portion of the site.

As discussed above, The Crossings component of the project includes 570 dwelling and extended stay units as well as commercial uses. The portion of the Remainder Area proposed to be designated R-1-10 could support approximately 90 dwelling units and thus would generate substantially less traffic than The Crossings component. Thus, the contribution of future residential development within the Remainder Area to traffic noise levels would be less than that of The Crossings and this impact is considered **less than significant.**

Mitigation Measures

No mitigation measures are required.

Impact 3.10-4: Vibration from construction of the project would not exceed applicable thresholds and thus would not adversely affect vibration sensitive uses (residences) in the project vicinity. The impact is *less than significant*.

The Crossings

Ground-borne vibration could be produced by heavy duty construction equipment used during demolition, land clearing, and construction activities for the proposed project . The most important equipment relative to generation of vibration, and the vibration levels produced by such equipment, is illustrated in Table 3.10.12.

Table 3.10.12
Vibration Velocities for Typical Construction Equipment

Equipment	PPV at 25 Feet (Inches Per Second)	Approximate Ground Vibration Level 25 feet (VdB)
Large Bulldozer	0.089	87
Loaded Trucks	0.076	86

Table 3.10.12
Vibration Velocities for Typical Construction Equipment

Equipment	PPV at 25 Feet (Inches Per Second)	Approximate Ground Vibration Level 25 feet (VdB)
Drill Rig / Auger	0.089	58
Jackhammer	0.035	87
Small Bulldozer	0.003	79

Source: FTA 2018

As shown in Table 3.10-12, use of heavy equipment (e.g., a large bulldozer) generates vibration levels of 0.089 in/sec PPV at a distance of 25 feet. The nearest residential structures to the project site would be approximately 75 feet from the most substantial and periodic heavy equipment activity and could experience vibration levels of 0.02 in/sec PPV. Vibration levels at these receptors would not exceed the FTA building damage threshold of 0.5 in/sec PPV. A large bulldozer has a vibration level of 87 VdB measured at 25 feet, at the nearest residences (75 feet) this level would be attenuated to approximately 74 VdB, which is less than the FTA threshold of 80 VdB. As such, construction-related vibration associated with the proposed project would result in a **less-than-significant** impact.

Remainder Area

As noted above, no new development other than agricultural activities would be permitted on the portion of the Remainder Area proposed to be zoned U-T while the portion proposed to be zoned R-1-10 could support development of single-family residences. The demolition and construction activities associated with development of single-family residences would be similar to the activities associated with construction of The Crossings component of the project and thus would generate similar levels of vibration. Further, the distance between sensitive receptors and the Remainder Area is the same or larger than the distance between sensitive receptors and The Crossings component. Thus, construction-related vibration associated with future residential development in the Remainder Area would not exceed the FTA building damage threshold and the impact would remain **less than significant.**

Mitigation Measures

No mitigation measures are required.

Impact 3.10-5: Long-term project operations could result in vibration impacts to vicinity residences. Based on the analysis below, the impact is *less than significant*.

The Crossings

The proposed project would not include significant stationary sources of ground-borne vibration, such as industrial equipment, manufacturing operations, or heavy equipment use. Operational ground-borne vibration on-site and in the project vicinity would be generated by vehicular traffic. Project-related off-site traffic-related vibration levels would not be perceptible at sensitive receptors. Heavy-duty vehicles do not typically generate perceptible vibration because of rubber tires and suspension systems (FTA 2006). Most issues associated with heavy-duty vehicle vibration are related to a potholes, bumps, expansion joints, or other discontinuities in the roadway surface. Assuming that on-site paving and the surrounding local roadways are maintained in adequate condition, vibration levels associated with heavy-duty truck deliveries to the project would not be perceptible at sensitive receptors. Thus, project-related operational vibration would result in a **less-than-significant** impact.

Remainder Area

The approximately 22 acres of the Remainder Area located in the eastern portion of the project site are developed with a church, private school, and three rural residential properties. As noted above, no new development other than agricultural activities would be permitted on the portion of the Remainder Area proposed to be zoned U-T while the portion proposed to be zoned R-1-10 could support development of single-family residences. Agriculture is already a permitted use within the Remainder Area thus the project would not increase the potential for agricultural activities requiring the use of heavy-duty trucks or equipment to occur onsite. Potential future development of single-family residential uses within the portion of the Remainder Area proposed to be zoned R-1-10 would also not involve the long-term use of heavy-duty trucks or equipment. Thus, project-related operational vibration would result in a **less-than-significant** impact.

Mitigation Measures

No mitigation measures are required.

3.10.5 Cumulative Impacts

Impact 3.10-6: The proposed project could contribute to cumulative changes in ambient community noise levels in the area but would not create a cumulatively considerable increase in noise levels. The impact is *less than significant*.

The geographic region for consideration of cumulative noise impacts is the area within 2 miles of the project site (which is the approximate distance between the project site and University of California, Merced (UC Merced). This distance was chosen based on several factors, including:

- the expectation that approximately 35% of residential traffic generated by the project would travel to and from UC Merced,
- the proposed project would not contribute substantial traffic volumes to roadways located more than 1.5 miles from the project site (Appendix M),
- noise levels attenuate as the distance from a noise source increases, and
- the onsite operational noise sources would generate noise levels of 50 dB or less at the property boundaries and thus would not contribute to excessive community noise levels beyond the project site.

The land development scenario for consideration of cumulative noise impacts is buildout of the City of Merced General Plan. Properties to the south and west of the project site are currently developed and no major redevelopment projects are reasonably foreseeable in those areas. A single-family residential subdivision and an apartment complex are currently under construction to the southeast of the site, along East Yosemite Avenue, between Perch Lane and Lake Road. These projects are expected to increase traffic volumes on East Yosemite Avenue and other area roadways, as reflected in the Year 2030 analysis included in the project's Traffic Impact Study (Appendix M) and reflected in the Year 2030 noise analysis presented in Impact 3.10-3 above.

Properties to the north and east of the project site are located within the City's Sphere of Influence and currently designated Rural Residential in the General Plan Land Use Diagram (City of Merced 2015). There are no reasonably foreseeable development projects for any of the properties north and east of the project site.

The City of Merced is currently engaged in a planning and feasibility study evaluating possible annexation of an approximately 7,600-acre area north of the City and the project site. This effort is known as the North Merced Annexation Feasibility Study. The study includes the Yosemite Avenue-Gardner Avenue to Hatch Road Annexation project site and extends to include UC Merced as well as lands north of Old Lake Road and west of Hillcrest Road (City of Merced 2020). The City has received applications for three other annexation and development projects within

the North Merced Annexation Feasibility Study area; these applications are all for properties located 2.5 miles or more from the project site and thus they are beyond the geographic range for consideration of cumulative noise impacts.

The General Plan EIR found that buildout of the General Plan would result in significant and unavoidable impacts due to increased traffic noise on several roadway segments. This includes noise levels on East Yosemite Avenue from Gardner Avenue east to the planned extension of Campus Parkway and Gardner Avenue from East Yosemite Avenue north to Cardella Road. However, as shown in Table 3.10.11, the proposed project would contribute less than 1 dBA to the noise levels associated with these roadways. Because an increase of less than 1 dBA cannot be distinguished by the human ear, the project's contribution to noise levels on these roadways would be less than cumulatively considerable and the project impact would remain **less than significant.**

Mitigation Measures

No mitigation measures are required.

3.10.6 References Cited

Caltrans. 1987. California Vehicle Noise Emission Levels. Report No. FHWA/CA/TL-87/03. January 1987. http://www.dot.ca.gov/hq/env/noise/pub/CA%20Vehicle%20Noise%20Emission%20Levels.pdf.

Caltrans. 2013. *Technical Noise Supplement to the Traffic Noise Analysis Protocol: A Guide for Measuring, Modeling, and Abating Highway Operation and Construction Noise Impacts*. September 2013. http://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013B.pdf.

CAPCOA (California Air Pollution Control Officers Association). 2017. *California Emissions Estimator Model (CalEEMod) User's Guide Version 2016.3.2*. Prepared by BREEZE Software, A Division of Trinity Consultants in collaboration with South Coast Air Quality Management District and the California Air Districts. November 2017. http://www.aqmd.gov/docs/default-source/caleemod/01_user-39-s-guide2016-3-2_15november2017.pdf?sfvrsn=4

City of Merced. 2012. "Chapter 10: Noise" In *Merced Vision 2030 General Plan.* January 2012. https://www.cityofmerced.org/Home/ShowDocument?id=4670.

City of Merced. 2015. *General Plan Land Use Diagram.* August 21, 2015. https://www.cityofmerced.org/Home/ShowDocument?id=5686

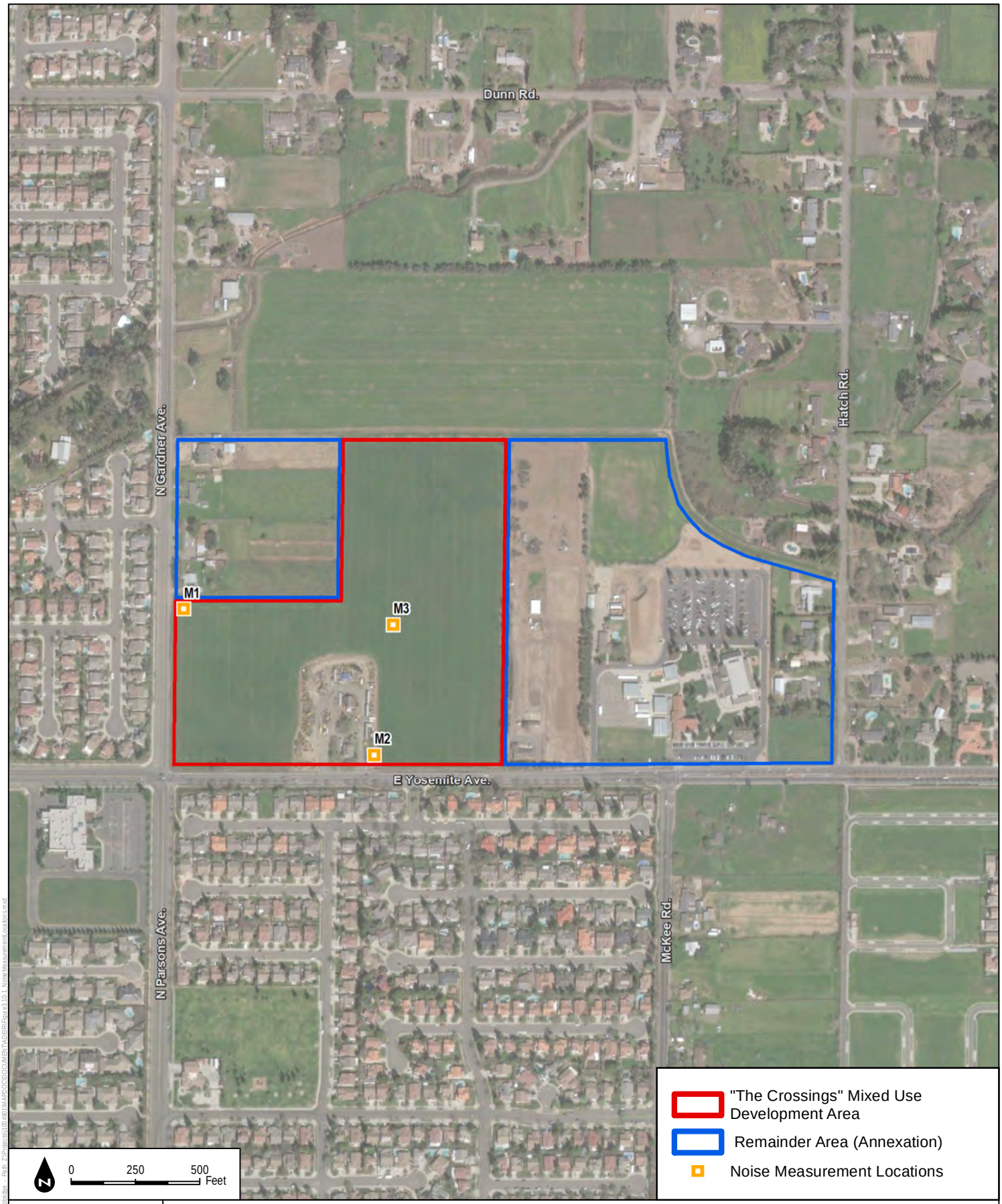
City of Merced. 2020. *Administrative Report: Update on North Merced Annexation Feasibility Study-Annexation Policies and Procedures, Current Annexations, and Performance Standards for Interim Sewer Capacity.* Meeting Date October 17, 2020. https://www.cityofmerced.org/Home/ShowDocument?id=13159

FHWA (Federal Highway Administration). 2006. *FHWA Roadway Construction Noise Model: User's Guide*. Final. FHWA-HEP-05-054. DOT-VNTSC-FHWA-05-01. Cambridge, Massachusetts: U.S. Department of Transportation, Research and Innovative Technology Administration. June 2006.

FHWA. 2008. Roadway Construction Noise Model (RCNM). Version 1.1. Washington, DC: FHWA, Research and Innovative Technology Administration, John A. Volpe National Transportation Systems Center, Environmental Measurement and Modeling Division. December 8, 2008.

FHWA. 2004. FHWA Traffic Noise Model, Version 2.5. Washington D.C.:Office of Environment and Planning. February 2004. Accessed:August 2020. https://www.fhwa.dot.gov/environment/noise/traffic_noise_model/tnm_v25/

FTA (Federal Transit Administration). 2018. *Transit Noise and Vibration Impact Assessment.* FTA-VA-90-1003-06. Washington, DC: FTA, Office of Planning and Environment. September 2018.



SOURCE: Bing Maps 2019, County of Merced 2014

FIGURE 3.10-1

Noise Measurement Locations

Yosemite Avenue - Gardner Avenue to Hatch Road Annexation Project

DUDEK

INTENTIONALLY LEFT BLANK