Section 3

Generation of Noise

This chapter discusses the existing ambient noise conditions in the City of Modesto and evaluates the potential noise impacts of building out future land uses anticipated in the *City of Modesto Urban Area General Plan* (UAGP) (the "Project") on the City's noise environment.

A. Environmental Setting

The following information is provided in accordance with Section 15125 of the California Environmental Quality Act (CEQA) Guidelines. The environmental setting described herein provides the baseline for determining whether an impact of the UAGP is significant.

1. Study Area for Direct Impacts

The study area for noise-related direct impacts is the UAGP planning area.

2. Study Area for Cumulative Impacts

This analysis will be based on the plan or projection approach to examining cumulative effects, as provided under State CEQA Guidelines Section 15130(b)(1)(B). Analysis will utilize growth and development projections contained in the UAGP. The cumulative impact study area is the Modesto UAGP area.

3. Terminology

Noise: Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound could be caused by its *pitch* or its *loudness*. *Pitch* is the height or depth of a tone or sound, depending on the relative rapidity (*frequency*) of the vibrations by which it is produced. Higher pitched signals sound louder to humans than sounds with a lower pitch. *Loudness* is intensity of sound waves combined with the reception characteristics of the ear. Intensity may be compared with the height of an ocean wave in that it is a measure of the amplitude of the sound wave.

In addition to the concepts of pitch and loudness, there are several noise measurement scales which are used to describe noise in a particular location. A *decibel (dB)* is a unit of measurement which indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of ten decibels represents a ten-fold increase in acoustic energy, while 20 decibels is 100 times more intense, 30 decibels is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each ten-decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 1.

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level (dBA)*. This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This *energy-equivalent sound / noise* descriptor is called L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

The scientific instrument used to measure noise is the *sound level meter*. Sound level meters can accurately measure environmental noise levels to within about plus or minus one dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends upon the distance the receptor is from the noise source. Close to the noise source, the models are accurate to within about plus or minus one to two dBA.

Since the sensitivity to noise increases during the evening and at night – because excessive noise interferes with the ability to sleep – 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level (CNEL)* is a measure of the cumulative noise exposure in a community, with a five (5) dB penalty added to evening (7:00 pm - 10:00 pm) and a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels. The *Day/Night Average Sound Level (L_{dn} or DNL)* is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

Effects of noise on humans:

<u>Hearing Loss</u>

While physical damage to the ear from an intense noise impulse is rare, a degradation of auditory acuity can occur even within a community noise environment. Hearing loss occurs mainly due to chronic exposure to excessive noise, but may be due to a single event such as an explosion. Natural hearing loss associated with aging may also be accelerated from chronic exposure to loud noise.

The Occupational Safety and Health Administration (OSHA) has established a noise exposure standard which is set at the noise threshold where hearing loss may occur from long-term exposures. The maximum allowable level is 85 dBA averaged over eight hours. If the noise is above 85 dBA, the allowable exposure time is correspondingly shorter.

<u>Sleep and Speech Interference</u>

The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noise of sufficient intensity (above 35 dBA) and fluctuating noise levels above about 45 dBA have been shown to affect sleep. Typically, the highest steady traffic noise level during the daytime is about equal to the L_{dn} and nighttime levels are ten (10) dBA lower. The standard is designed for sleep and speech protection and most jurisdictions apply the same criterion for all residential uses. Typical structural attenuation is 12-17 dBA with open windows. With closed windows in good condition, the noise attenuation factor is around 20 dBA for an older structure and 25 dBA for a newer dwelling. Sleep and speech interference is therefore possible when exterior noise levels are about 57-62 dBA L_{dn} with open windows and 65-70 dBA L_{dn} if the windows are closed. Levels of 55-60 dBA are common along collector streets and secondary arterials, while 65-70 dBA is a typical value for a primary/major arterial. Levels of 75-80 dBA are normal noise levels at the first row of development outside a freeway right-of-way. In order to achieve an acceptable interior noise environment, bedrooms facing secondary roadways need to be able to have their windows closed; those facing major roadways and freeways typically need special glass windows with Sound Transmission Class ratings greater than 30 STC.

Annoyance

Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that the causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The L_{dn} as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. When measuring the percentage of the population highly annoyed, the threshold for ground vehicle noise is about 55 dBA L_{dn}. At an L_{dn} of about 60 dBA, approximately two percent of the population is highly annoyed. When the L_{dn} increases to 70 dBA, the percentage of the population highly annoyed increases to about 12 percent (12%) of the population. Therefore, there is an increase in annoyance due to ground vehicle noise of about one percent per dBA between a L_{dn} of 60-70 dBA. Between a L_{dn} of 70-80 dBA, each decibel increase increases the percentage of the population highly annoyed by about two percent (2%). People appear to respond more adversely to aircraft noise. When the L_{dn} due to aircraft noise is 60 dBA, approximately ten percent (10%) of the population is believed to be highly annoyed. Each decibel increase to 70 dBA adds about two percentage points to the number of people highly annoyed. Above 70 dBA, each decibel increase in aircraft noise results in about a three percent increase in the percentage of the population highly annoyed.

TABLE V.3.1. Definition of Acoustical Terms Used in this Report

Term	Definition
Decibel, dB	A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base ten of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20 micro Pascals.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where one Pascal is the pressure resulting from a force of one Newton exerted over an area of one square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e. g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
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. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded one, ten, 50, and 90 percent of the time during the measurement period.
Day/Night Noise Level, L_{dn} or DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of ten decibels to levels measured in the night between 10:00 pm and 7:00 am.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of five decibels in the evening from 7:00 pm to 10:00 pm and after addition of 10 decibels to sound levels measured in the night between 10:00 pm and 7:00 am.
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.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Handbook of Acoustical Measurements and Noise Control, Harris, 1998.

TABLE V.3.2 Typical Noise Levels in the Environment

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110 dBA	Rock band
Jet fly-over at 1,000 feet		
	100 dBA	
Gas lawn mower at three feet		
	90 dBA	
Diesel truck at 50 feet at 50 mph		Food blender at three feet
	80 dBA	Garbage disposal at three feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	70 dBA	Vacuum cleaner at ten feet
Commercial area		Normal speech at three feet
Heavy traffic at 300 feet	60 dBA	
		Large business office
Quiet urban daytime	50 dBA	Dishwasher in next room
Quiet urban nighttime	40 dBA	Theater, large conference room
Quiet suburban nighttime		
	30 dBA	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20 dBA	
		Broadcast / recording studio
	10 dBA	
	0 dBA	

Source: Technical Noise Supplement (TeNS), California Department of Transportation, September 2013.

Ground-borne Vibration. Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One is the Peak Particle Velocity (PPV) and another is the Root Mean Square (RMS) velocity. The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. The RMS velocity is defined as the average of the squared amplitude of the signal. The PPV and RMS vibration velocity amplitudes are used to evaluate human response to vibration. In this report, a PPV descriptor with units of mm/sec or in/sec is used to evaluate construction generated vibration for building damage and human complaints.

Effects of Ground-borne Vibration. Table V.3.3 displays the reactions of people and the effects on buildings that continuous vibration levels produce. The annoyance levels shown in Table 3 should be interpreted with care since vibration may be found to be annoying at much lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying.

Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage. In high noise environments, which are more prevalent where Ground-borne vibration approaches perceptible levels, this rattling phenomenon may also be produced by loud airborne environmental noise causing induced vibration in exterior doors and windows.

Construction activities can cause vibration that varies in intensity depending on several factors. The use of pile driving and vibratory compaction equipment typically generates the highest construction related Ground-borne vibration levels. Because of the impulsive nature of such activities, the use of the PPV descriptor has been routinely used to measure and assess Ground-borne vibration and almost exclusively to assess the potential of vibration to induce structural damage and the degree of annoyance for humans.

The two primary concerns with construction-induced vibration, the potential to damage a structure and the potential to interfere with the enjoyment of life, are evaluated against different vibration limits. Studies have shown that the threshold of perception for average persons is in the range of 0.008 to 0.012 in/sec PPV. Human perception to vibration varies with the individual and is a function of physical setting and the type of vibration. Persons exposed to elevated ambient vibration levels such as people in an urban environment may tolerate a higher vibration level.

Structural damage can be classified as cosmetic only, such as minor cracking of building elements, or may threaten the integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher and there is no general consensus as to what amount of vibration may pose a threat for structural damage to the building. Construction-induced vibration that can be detrimental to the building is very rare and has only been observed in instances where the structure is at a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

Railroad operations are potential sources of substantial ground vibration depending on distance, the type and the speed of trains, and the type of railroad track. Human response to ground vibration has been correlated best with the RMS velocity level of the ground. The velocity of the ground is expressed on the decibel scale. The reference velocity is one (1) x 10-6 in/sec RMS, which equals zero (0) VdB, and one (1) in/sec equals 120 VdB. Although not a universally accepted notation, the abbreviation "VdB" is used in this document for vibration levels in decibels to reduce the potential for confusion with airborne sound levels in decibels.

Typical background vibration levels in residential areas are usually 50 VdB or lower, well below the threshold of perception for most humans (60 to 70 VdB). Perceptible vibration levels inside residences are attributed to the operation of heating and air conditioning systems, door slams and foot traffic. Construction activities, train operations, and heavy truck traffic are some of the most common external sources of vibration that can be perceptible inside residences. Table V.3.4 illustrates some common sources of vibration and the association to human perception or the potential for structural damage.

TABLE V.3.3 Reaction of People and Damage to Buildings from Continuous or Frequent Intermittent Vibration Levels

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
0.1	Strongly perceptible	Virtually no risk of damage to normal buildings
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential dwellings such as plastered walls or ceilings
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to newer residential structures

Source: Transportation and Construction Vibration Guidance Manual, California Department of Transportation, September 2013.

TABLE V.3.4 Typical Levels of Ground-borne Vibration

Human/Structural Response	Velocity Level, VdB	Typical Events (50-foot setback)
Threshold, minor cosmetic damage	100	Blasting, pile driving, vibratory compaction equipment
		Heavy tracked vehicles (Bulldozers, cranes, drill rigs)
Difficulty with tasks such as reading a video or computer screen	90	
		Commuter rail, upper range
Residential annoyance, infrequent events	80	Rapid transit, upper range
Residential annoyance, occasional events		Commuter rail, typical Bus or truck over bump or on rough roads
Residential annoyance, frequent events	70	Rapid transit, typical
Approximate human threshold of perception to vibration		Buses, trucks and heavy street traffic
	60	
		Background vibration in residential settings in the absence of activity
Lower limit for equipment ultra-sensitive to vibration	50	

Source: Transit Noise and Vibration Impact Assessment, US Department of Transportation Federal Transit Administration, May 2006.

4. Existing Physical Setting in the Project Area

1. Noise Sources in Modesto

The major types of noise sources in the City of Modesto are described below.

a. Roadways

Major roadways are the primary sources of ambient noise in Modesto. State Route 99 (SR 99) runs generally northwest and southeast through the city and State Route 132 (SR 132) generally runs east and west through the city. Primary major local roadways include McHenry Avenue, Oakdale Road, Claus Road, Kiernan Avenue/Claribel Road, Pelandale

Avenue, Standiford Avenue, and Briggsmore Avenue. Dale Road, Prescott Road, Carpenter Road, Tully Road, Coffee Road, Orangeburg Avenue, Maze Boulevard, and Yosemite Boulevard are secondary major roadways and also contribute to residential noise exposure.

b. Railroads

Rail operations along the Burlington Northern and Santa Fe Railroad (BNSF), the Modesto & Empire Traction Company (M&ET), and along Union Pacific Railroad (UPRR) rights-of-way also are substantial sources of noise in some areas of the City. Day-night average noise levels vary throughout the community depending on the number of trains operating along a given rail line per day, the timing and duration of train passby events, and whether or not trains must sound their warning whistles near "at-grade" crossings. Amtrak train schedules are fairly consistent on weekdays and weekends. The number of freight trains passing through Modesto varies on a daily basis depending on the specific rail line and local demand. Day-night average noise levels commonly range from 65 to 75 dBA L_{dn} at land uses adjoining a railroad right-of-way. When railroad trains approach a passenger station or "at-grade" crossing, they are required to sound their warning whistle. When giving a warning to people and/or animals, they are required to produce a succession of sounds with the whistle. Trains are required to sound a long signal followed by a short signal when approaching stations, curves, or other points where view may be obscured, and when approaching passenger or freight trains. When passing a standing train, the moving train is required to sound two long signals followed by a short signal followed by a long signal, the same requirement when signaling for at-grade crossings. Train warning whistles typically generate maximum noise levels of approximately 105 dBA at 100 feet. The day/night average noise level at locations immediately adjacent to "at-grade" crossings and exposed to multiple train passby events during a day can exceed 85 dBA L_{dn}.

c. Industrial and Commercial Uses

Industrial operations are the primary stationary noise sources that make a significant local contribution to community noise levels. In general, these stationary noise sources (e.g. fabrication, large mechanical equipment, and loading areas) are often located in primarily commercial and industrial areas and are isolated from noise sensitive land uses. However, sensitive development has encroached on some of these stationary noise sources resulting in some land use conflicts.

Noise sources that affect sensitive receptors within the community would also include commercial land uses or those normally associated with and/or secondary to residential development. These include nightclubs, outdoor dining areas, gas stations, car washes, fire stations, drive-throughs, air conditioning units, swimming pool pumps, school playgrounds, athletic and music events, and public parks.

d. Construction Activities

Construction is a temporary source of noise for residences and businesses located near construction sites. Construction noise can be significant for short periods of time at any particular location as a result of public improvement projects, private development projects, remodeling, etc. The highest construction noise levels are normally generated during grading and excavation, with lower noise levels occurring during building construction. Large pieces of earth-moving equipment, such as graders, scrapers, and bulldozers, generate maximum noise levels of 85 to 90 dBA at a distance of 50 feet. Typical hourly average construction-generated noise levels are about 80 to 85 dBA measured at a distance of 50 feet from the site during busy construction periods. Some construction techniques, such as impact pile driving, can generate very high levels of noise (105 dBA L_{max} at 50 feet) that are difficult to control. Construction activities can elevate noise levels at adjacent businesses and residences by 15 to 20 dBA or more.

e. Airport

The Modesto City–County Airport is located in the southeastern portion of the city. Residential areas are adjacent to the airport to the west and northwest within the City of Modesto and to the south across the Tuolumne River in the City of Ceres. The airport serves general aviation pilots (light and ultralight planes), as well as scheduled daily commercial service. The airport had an annual total of 84,185 operations in 2007 and is forecast to have 141,000 annual operations in the future (Stanislaus County Airport Land Use Compatibility Plans, October 2016). Residences are currently located within the 60 dBA CNEL noise contour of the airport, but not within the 65 dBA CNEL noise contour.

2. Ground-borne Vibration Sources in Modesto

a. Railroads

Ground-borne vibration occurs in areas adjacent to fixed rail lines when railroad trains pass through Modesto. Ground vibration levels along the railroad corridors are proportional to the speed and weight of the trains as well as the condition of the tracks and train engine and car wheels. Vibration levels resulting from railroad trains vary by site, but are generally perceptible within 100 feet of the tracks.

b. Construction

Construction activities such as demolition, site preparation work, excavation, and foundation work can generate Ground-borne vibration at land uses adjoining construction sites. Impact pile driving has the potential of generating the highest ground vibration levels and is of primary concern for structural damage. Other project construction activities, such as caisson drilling, the use of jackhammers, rock drills, and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles, compactors, etc.), can generate substantial vibration levels in the immediate vicinity.

3. Sensitive Receptors

Sensitive receptors in the City of Modesto include residences, hospitals, parks, churches, and schools. Hospitals in Modesto include Doctors Medical Center, Memorial Medical Center, Modesto Rehabilitation Hospital, English Oaks Convalescent Hospital, Stanislaus Surgery Center, and Stanislaus Behavioral Health Center. The larger parks in Modesto include Davis Park, Thousand Oaks Park, and Legion Park. The high schools in Modesto include Fred C. Beyer, Grace Davis, Thomas Downey, Peter Johansen, Modesto, Robert Elliot Alternative, James C. Enochs, Central Catholic, Modesto Christian, and Joseph A. Gregori. Colleges within the City include Modesto Junior College, which has two campuses, Chapman University, Humphreys College, and Andon College.

4. Noise Measurement Survey

A noise measurement survey was completed to establish existing noise levels in the City of Modesto. The survey included 8 long-term (24+ hour) noise measurements and 10 short-term (10 minute) noise measurements. Long-term (LT) measurements, made hour by hour over a period of 24 hours or more, provide information on how noise levels vary throughout the day and night and may vary from day to day. Short-term (ST) measurements are attended, allowing the technician to identify the noise sources occurring during the measurement and note the level of noise associated with these identifiable events. This assists in quantitatively and qualitatively characterizing the noise environments along the major roadways and also in the quieter areas of the City.

The noise survey was from the morning of Tuesday, March 3, 2015 to the afternoon of Friday, March 6, 2015. Noise measurement locations are shown on Figure 1. During the noise survey, weather conditions were moderate in terms of temperature and wind. The noise survey was conducted with Larson Davis Laboratories Type 820 precision sound level meters. Instrumentation was calibrated at the beginning of the noise survey and post calibrated at the end of the survey. No calibration corrections were necessary. During the survey, the microphones were fitted with windscreens. Long-term noise measurement data is shown in the Appendix A of this report.

Measurement LT-1 was 100 feet south of the center of Pelandale Avenue, west of Prescott Road. The measurement position was representative of setbacks of residential homes along Pelandale Avenue on both sides of the roadway. Vehicular traffic on Pelandale Avenue was the dominant noise source affecting the noise measurement. The measured day/night average noise level at this location was up to 69 dBA L_{dn}. Typical daytime hourly average noise levels ranged from 65 to 69 dBA L_{eq} and typical nighttime hourly average noise levels ranged from 55 to 64 dBA L_{eq}.

Measurement LT-2 was 110 feet from the center of McHenry Avenue, south of Sylvan Avenue. The measurement was positioned directly across McHenry Avenue from a carwash, with the exit of the carwash facing McHenry Avenue. The dominant source of noise was vehicular traffic on McHenry Avenue with the car wash as a substantial contributor. The measured day / night noise level at this location ranged from 70 to 72 dBA L_{dn}, with an L_{dn} of 70 dBA attributable to traffic noise along McHenry Avenue. Typical daytime L_{eq} noise levels ranged from 64 to 71 dBA and typical nighttime L_{eq} noise levels ranged from 57 to 62 dBA.

Noise measurement LT-3 was approximately 130 feet southwest of the center of SR 99 and 105 feet north of Kansas Avenue. The measurement position was about 25 feet above the surface of SR 99 and about 11 feet above ground-level relative to the base elevation of Kansas Avenue. Vehicular traffic along SR 99 was the major source of noise at this location. The day/night average noise level was measured to be up to 82 dBA L_{dn}. Typical daytime L_{eq} noise levels ranged from 74 to 81 dBA and typical nighttime L_{eq} noise levels ranged from 72 to 77 dBA.

Measurement location LT-4 was 30 feet from the centerline of 8th Street, 175 feet northwest of G Street, 60 feet from the center of UPRR railroad tracks, and 110 feet from feed store equipment. Train passbys along the UPRR tracks were the major sources of noise at this location and typically generated maximum instantaneous noise levels in the range of 105 to

112 dBA L_{max}. Approximately 20 trains passed by the site on each measurement day during daytime and nighttime hours. The day/night average noise level at this site was measured to be from 87 to 89 dBA L_{dn}, depending on the frequency of the train passbys. Hourly average L_{eq} noise levels ranged from 77 to 87 dBA during hours with train passby events and were as low as 56 to 67 L_{eq} dBA during periods without train passbys.

Noise measurement LT-5 was approximately 30 feet south of the center of the M&ET rail line and 20 feet west of the center of Santa Ana Avenue. Approximately eight to ten train passby events occurred each day including overnight and early morning trains between the hours of 11:00 pm and 10:00 am and evening trains between the hours of 2:00 pm and 6:00 pm. Train passby events resulted in hourly average noise levels in the range of 78 to 85 dBA L_{eq} with maximum noise levels typically in the range of 109 to 114 dBA L_{max}. During periods without train passby events, vehicular traffic along Center Avenue was the predominant source of noise at this location, generating hourly average noise levels in the range of 50 to 60 dBA L_{eq}. The day/night average noise level was measured to be 85 to 87 dBA L_{dn}, depending on the number and timing of train passby events.

Measurement LT-6 was approximately 25 feet from the center of the nearest train tracks running along E Street at 1st Street. Maximum noise levels generated during train passby events were typically in the range of 100 to 115 dBA L_{max}. Approximately 20 to 22 train passby events occurred each day during daytime and nighttime hours. Daytime L_{eq} noise levels ranged from 61 to 86 dBA, with the lower noise levels occurring during intervals without train passby events. Nighttime L_{eq} noise levels were as low as 52 dBA during intervals without train passby events. The day/night average noise level at this location ranged from 86 to 88 dBA L_{dn}.

Noise measurement LT-7 was approximately 190 feet north of the center of Maze Boulevard (SR 132) along the neighborhood road of Meadow Lane, east of Carpenter Road. Vehicular traffic along Maze Boulevard and local residential streets were the major sources of noise at this location. Typical daytime L_{eq} noise levels ranged from 57 to 68 dBA and typical nighttime L_{eq} noise levels ranged from 52 to 62 dBA. The day/night average noise level was measured to be from 65 to 66 dBA L_{dn}.

Noise measurement LT-8 was approximately 55 feet north of Hatch Road and 105 feet west of the center of Crows Landing Road. The measurement position located approximately 12 feet above ground, at the setback of adjacent commercial buildings. Vehicular traffic on the roadways was the dominant noise source affecting the noise measurement. Typical daytime L_{eq} noise levels ranged from 69 to 75 dBA and typical nighttime L_{eq} noise levels ranged from 60 to 69 dBA. The measured day/night average noise level at this location was 74 dBA L_{dn}.

Short-term noise measurements were conducted during the day on March 5, 2015 and March 6, 2015. The measured data are summarized in Table V.3.5.

FIGURE V.3.1 Noise Measurement Locations in Modesto

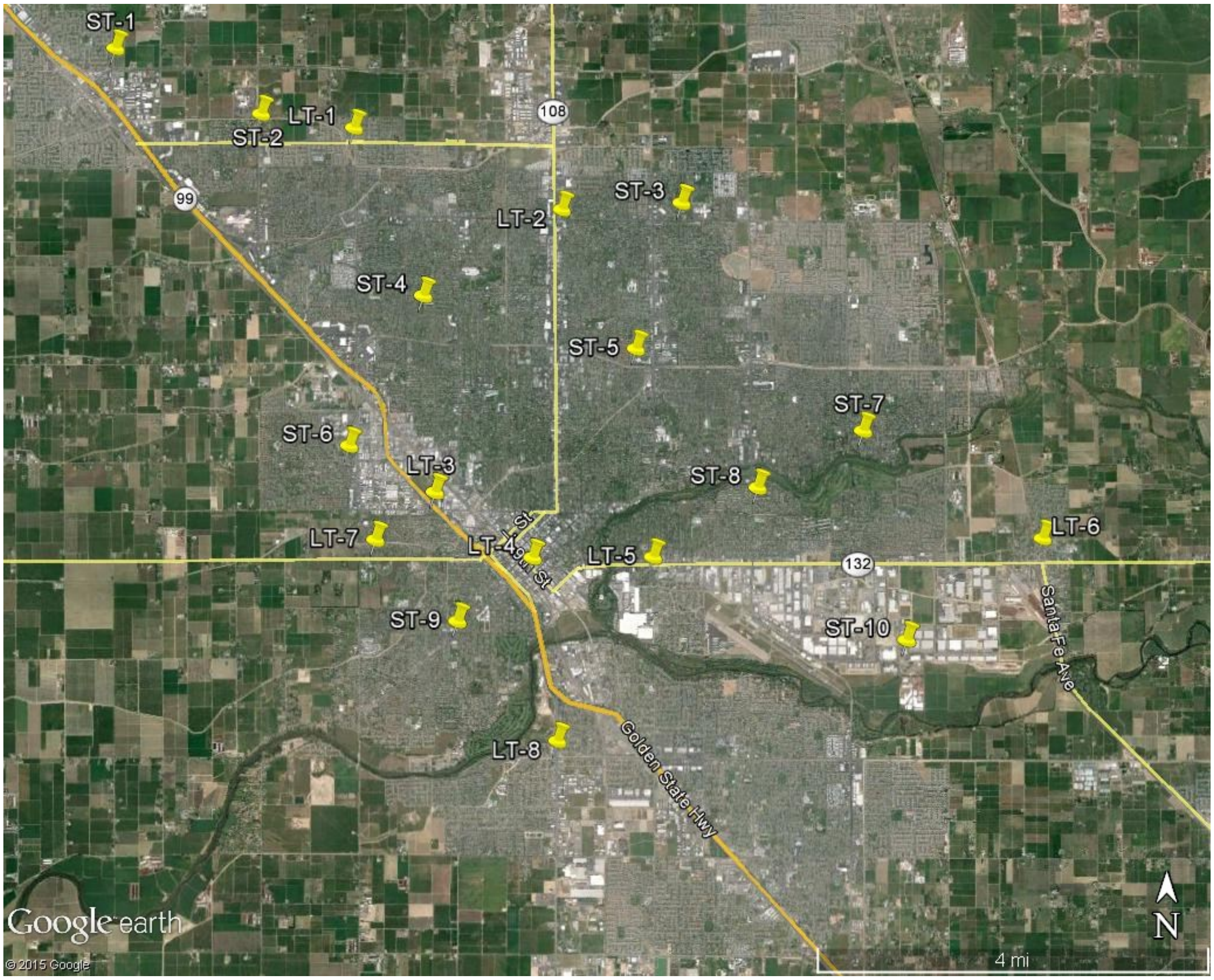


Table V.3.5 Summary of Short-Term Noise Measurement Data

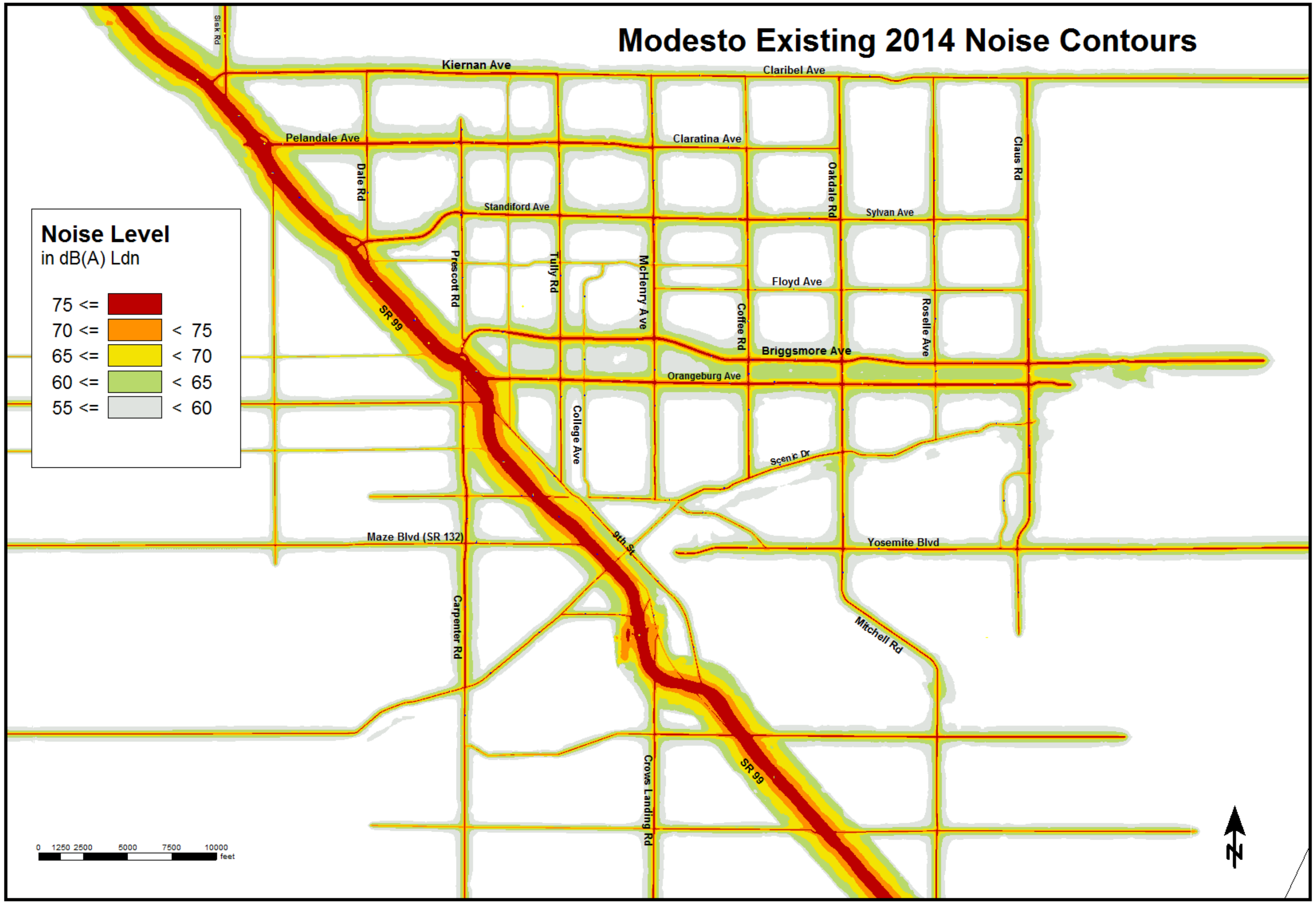
Noise Measurement Location	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	L_{eq}	L_{dn}[1]	Primary Noise Source
ST-1: 50 feet from the center of Sisk Rd, 300 feet from Kiernan Ave. (3/6/2015, 9:40 am-9:50 pm)	80[2]	67	61	53	68[2]	65	Traffic on Sisk Road and Kiernan Avenue (Firetruck)
ST-2: 70 feet from center of Dale Ave at Fleur De Lis Dr. (3/6/2015, 10:00 am-10:10 am)	74	70	64	52	66	68	Traffic on Dale Avenue
ST-3: 115 feet from the center of Sylvan Ave. (3/6/2015, 10:50 am-11:00 am)	68	63	58	52	60	61	Traffic on Sylvan Avenue
ST-4: Earlmar Dr and Wylma Way. (3/5/2015, 5:40 pm-5:50 pm)	57	51	46	44	48	50	Distant traffic and Recreation
ST-5: 100 feet from center of Briggsmore Ave. (3/6/2015, 11:10 am-11:20 am)	72	69	61	55	65	67	Traffic on Briggsmore Avenue
ST-6: 35 feet from center of Woodland Ave. (3/5/2015, 4:35 pm-4:45 pm)	77	71	62	51	67	70	Traffic on Woodland Avenue
ST-7: 65 feet from Scenic Dr. (3/6/15, 11:30 am-11:40 am)	73	69	63	51	65	67	Traffic on Scenic Drive
ST-8: 50 feet from center of El Vista Ave. (3/6/2015, 12:30 pm-12:40 pm)	76	74	70	63	71	73	Traffic on El Vista Avenue
ST-9: 65 feet from center of Paradise Rd, west of MLK Dr. (3/5/2015, 5:00 pm-5:10 pm)	73	69	66	62	67	69	Traffic on Paradise Road
ST-10: 75 feet from center of Finch Rd, 90 feet from center of McClure Rd. (3/6/2015, 12:10 pm-12:20 pm)	75	71	63	57	66	67	Traffic on Finch Road (Heavy Trucks)

[1] L_{dn} approximated by correlating to noise data collected during a corresponding time period at a long-term site.
[2] L_1 and L_{eq} noise levels at ST-1 site were raised due to a firetruck passby occurring during the measurement period.

5. Existing Noise Exposure Maps

SoundPLAN Version V7.3, a three-dimensional ray-tracing computer program, was used to calculate traffic noise levels along major roadways throughout Modesto. Calculations took into account the source of noise, the frequency spectra of the noise source, and the topography of the area. The geometric data used to create the model were based on geographic information system (GIS) information provided by the City of Modesto. Existing average daily trip (ADT) data and travel speeds were also input into the model. For SR 99, traffic volumes and truck mix data input into the model were based on information published by the California Department of Transportation (Caltrans). The predicted noise levels were then compared to measured noise levels for calibration purposes and adjustments were made as necessary to create an accurate model. Noise exposure contours for Existing conditions along the major roadways in the City are depicted in Figure V.3.2.

Figure V.3.2 Existing Traffic Noise Contours



5. Existing Regulatory Setting in the Study Area

The federal government, State of California, and the City of Modesto establish regulatory criteria in the form of guidelines, regulations, and policies that are designed to limit noise exposure at noise sensitive land uses. Federal and State Agencies, Appendix G of the State CEQA Guidelines, Stanislaus County General Plan, Stanislaus County Noise Ordinance, the City of Modesto General Plan, and the City of Modesto Municipal Code present the following:

Federal Regulations

a. Department of Housing and Urban Development (HUD)

HUD environmental criteria and standards are presented in Title 24 of the Code of Federal Regulations, Part 51 (24 CFR Part 51). New residential construction qualifying for HUD financing proposed in high noise areas (exceeding 65 dBA L_{dn}) must incorporate noise attenuation features to maintain acceptable interior noise levels. A goal of 45 dBA L_{dn} is set forth for interior noise levels and attenuation requirements are geared toward achieving that goal. It is assumed that with standard construction any building will provide sufficient attenuation to achieve an interior level of 45 dBA L_{dn} or less if the exterior level is 65 dBA L_{dn} or less. Approvals in a "normally unacceptable noise zone" (exceeding 65 decibels but not exceeding 75 decibels) require a minimum of five decibels additional noise attenuation for buildings if the day-night average is greater than 65 decibels but does not exceed 70 decibels, or minimum of 10 decibels of additional noise attenuation if the day-night average is greater than 70 decibels but does not exceed 75 decibels.

b. Federal Highway Administration (FHWA)

Proposed federal or federal-aid highway construction projects at a new location, or the physical alteration of an existing highway that significantly changes either the horizontal or vertical alignment, or increases the number of through-traffic lanes, requires an assessment of noise and consideration of noise abatement per 23 CFR Part 772, "Procedures for Abatement of Highway Traffic Noise and Construction Noise." FHWA has adopted noise abatement criteria (NAC) for sensitive receivers such as picnic areas, recreation areas, playgrounds, active sport areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals when "worst-hour" noise levels approach or exceed 67 dBA L_{eq}. Caltrans has further defined approaching the NAC to be 1 dBA below the NAC for noise sensitive receivers identified as Category B activity areas (e.g., 66 dBA L_{eq} is considered approaching the NAC).[1]

c. Federal Transit Administration – Train Vibration

The City of Modesto has not identified quantifiable vibration limits that can be used to evaluate the compatibility of land uses with vibration levels experienced at a project site. Although there are no local standards that control the allowable vibration in a new residential development, the U.S. Department of Transportation (DOT) has developed vibration impact assessment criteria for evaluating vibration impacts associated with transit projects.[2] The

[1] Traffic Noise Analysis Protocol, Caltrans Division of Environmental Analysis, May 2011.

[2] U.S. Department of Transportation, Federal Transit Administration, Transit Noise and Vibration Impact Assessment, May 2006, FTA-VA-90-1003-06.

Federal Transit Administration (FTA) has proposed vibration impact criteria, based on maximum overall levels for a single event. The impact criteria for Ground-borne vibration are shown in Table 6. Note that there are criteria for frequent events (more than 70 events of the same source per day), occasional events (30 to 70 vibration events of the same source per day), and infrequent events (less than 30 vibration events of the same source per day).

TABLE V.3.6 Railroad Train Ground-borne Vibration Thresholds

Land Use Category	**Groundborne Vibration Impact Levels (VdB re 1 µinch/sec, RMS)**		
	Frequent Events[1]	**Occasional Events[2]**	**Infrequent Events[3]**
Category 1 Buildings where vibration would interfere with interior operations.	65 VdB[4]	65 VdB[4]	65 VdB[4]
Category 2 Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB
Category 3 Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB

Notes:

1. "Frequent Events" is defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.
2. "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operations.
3. "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail branch lines.
4. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration sensitive manufacturing or research should always require detailed evaluation to define the acceptable vibration levels. Ensuring low vibration levels in a building requires special design of HVAC systems and stiffened floors.

Source: U.S. Department of Transportation, Federal Transit Administration, Transit Noise and Vibration Impact Assessment, May 2006, FTA-VA-90-1003-06.

State of California Policies

a. California Administrative Code Section 65302(f)

California Government Code Section 65302(f) requires that all General Plans include a Noise Element to address noise problems in the community. The Noise Element shall recognize the guidelines established by the Office of Noise Control in the State Department of Health Services and shall analyze and quantify, to the extent practicable, as determined by the legislative body, current and projected noise levels for all of the following sources:

- Highways and freeways.
- Primary arterials and major local streets.
- Passenger and freight on-line railroad operations and ground rapid transit systems.

- Commercial, general aviation, heliport, and military airport operations, aircraft flyovers, jet engine tests stands, and all other ground facilities and maintenance functions related to airport operation.
- Local industrial plants, including, but not limited to, railroad classification yards.
- Other stationary ground noise sources identified by local agencies as contributing to the community noise environment.

Noise contours shall be shown for all of these sources and stated in terms of CNEL or L_{dn}. The noise contours shall be prepared on the basis of noise monitoring or following generally accepted noise modeling techniques for the various sources identified above.

The noise contours shall be used as a guide for establishing a pattern of land uses in the land use element that minimizes the exposure of community residents to excessive noise. The noise element shall include implementation measures and possible solutions that address existing and foreseeable noise problems, if any. The adopted noise element shall serve as a guideline for compliance with the state's noise insulation standards.

b. California Noise Insulation Standards

The current (2013) California Building Code (CBC) does not place limits on interior noise levels attributable to exterior environmental noise sources. The July 1, 2015 Supplement to the 2013 CBC corrects this omission, reinstating limits on interior noise levels attributable to exterior environmental noise sources which had been contained in all prior versions of the CBC dating back to 1974. In keeping with the provisions of the 2015 supplement, this report considers interior noise levels attributable to exterior environmental noise sources to be limited to a level not exceeding 45 dBA L_{dn} in any habitable room for new dwellings other than detached single-family dwellings.

c. Division of Aeronautic Noise Standards

Title 21 of the *California Code of Regulations*[3] sets forth the State's airport noise standards. In the findings described in Section 5006, the standard states the following: "A level of noise acceptable to a reasonable person residing in the vicinity of an airport is established as a CNEL value of 65 dB for purposes of these regulations. This criterion level has been chosen for reasonable persons residing in urban residential areas where houses are of typical California construction and may have windows partially open. It has been selected with reference to speech, sleep, and community reaction." Based on this finding, the airport noise standard as defined in Section 5012 is set at a CNEL of 65 dBA.

d. California Department of Transportation (Caltrans) – Construction Vibration

Caltrans recommends a vibration limit of 0.5 in/sec PPV for buildings structurally sound and designed to modern engineering standards. A conservative vibration limit of 0.25 to 0.30 in/sec PPV has been used for older buildings that are found to be structurally sound but cosmetic damage to plaster ceilings or walls is a major concern. For historic buildings or buildings that are documented to be structurally weakened, a conservative limit of 0.08 in/sec PPV is often used to provide the highest level of protection. All of these limits have been

3 California Code of Regulations Airport Noise Standards, Title 21, Public Works Division 2.5, Division of Aeronautics (Department of Transportation), Chapter 6 Noise Standards, Article 1.General.

used successfully and compliance to these limits has not been known to result in appreciable structural damage. All vibration limits referred to herein apply on the ground level and take into account the response of structural elements (i.e. walls, floors) to ground-borne excitation.

Stanislaus County Policies

a. Stanislaus County General Plan.

Goal Two of the Stanislaus County General Plan Noise Element is to, "Protect the citizens of Stanislaus County from the harmful effects of exposure to excessive noise." Policy Two states, "It is the policy of Stanislaus County to develop and implement effective measures to abate and avoid excessive noise exposure in the unincorporated areas of the County by requiring that effective noise mitigation measures be incorporated into the design of new noise generating and new noise sensitive land uses." The following implementation measure would be applicable to the project:

Noise-1. New development of industrial, commercial or other noise generating land uses will not be permitted if resulting noise levels will exceed 60 L_{dn} (or CNEL) in noise-sensitive areas. Additionally, the development of new noise-generating land uses which are not preempted from local noise regulation will not be permitted if resulting noise levels will exceed the performance standards contained within Table V.3.7 in areas containing residential or other noise sensitive land uses.

Table V.3.7 Maximum Allowable Noise Exposure - Stationary Noise Sources

	Daytime (7:00 am - 10:00 pm)	**Nighttime (10:00 pm - 7:00 am)**
Hourly L_{eq}, dBA	55	45
Maximum level, dBA	75	65

Source: Stanislaus County General Plan

Each of the noise level standards specified in Table V.3.7 shall be reduced by five (5) dBA for pure tone noises, noise consisting primarily of speech or music, or for recurring impulsive noises. The standards in Table 7 should be applied at a residential or other noise-sensitive land use and not on the property of a noise-generating land use. Where measured ambient noise levels exceed the standards, the standards shall be increased to the ambient levels.

Policy Three states, "It is the objective of Stanislaus County to protect areas of the County where noise-sensitive land uses are located." The following implementation measure would be applicable to future projects in Modesto within unincorporated portions of the planning area:

Noise-2. Require the evaluation of mitigation measures for projects that would cause the L_{dn} at noise-sensitive uses to increase by 3 dBA or more and exceed the "normally acceptable" level, cause the L_{dn} at noise-sensitive uses to increase 5 dBA or more and remain "normally acceptable," or cause new noise levels to exceed the noise ordinance limits (after adoption).

b. Stanislaus County Noise Ordinance.

The Stanislaus County Noise Control Ordinance (Chapter 10.46 of the Stanislaus County Code) establishes exterior noise level standards in order to control unnecessary, excessive, and annoying noise in the county. Construction or maintenance activities performed by or at the direction of any public entity or public utility are specifically exempted from these standards in Section 10.46.080 of the Stanislaus County Code.

City of Modesto Policies

The proposed General Plan Amendment Noise policies are as follows:

Noise-3 Construction activities are to comply with Modesto Municipal Code Title 4, Chapter 9.

Noise-4 Implement noise-reducing construction practices as conditions of approval where substantial construction-related noise impacts would be likely to occur, such as with extended periods of pile driving, or where construction is expected to continue or where sensitive receptors would be affected by construction noise. Conditions of approval may include, but are not limited to:

- Require construction equipment, including air compressors and pneumatic equipment to have properly maintained mufflers;
- Require impact tools to be equipped with shrouds or shields;
- Require that the quietest equipment available be used; and,
- Require selection of haul routes that affect the fewest number of people. (UAGP Policy VII-G.3.b)

Noise-5 Implement techniques, where feasible, to reduce noise impacts from new or widened roadways. Such techniques may include, but are not limited to:

- Traffic calming to reduce vehicle speeds, including narrowing travel lanes and limiting the number of motor vehicle lanes;
- Adding bicycle and parking lanes to move the noise source farther away from sensitive receptors; and,
- Use of earthen berms and landscaped walls to channel noise away from sensitive receptors. (UAGP Policy VII-G.3.c)

Noise-6 Use the most recent noise contour map (Figure VII-2) to implement the requirements of Noise Insulation Standards contained in Title 24 of the California Code of Regulations. Developers may be allowed to demonstrate that detailed noise studies and / or mitigation are not necessary due to local conditions, changes in the expected future noise environment, or inapplicable assumptions made in the Master EIR. (UAGP Policy VII-G.3.d)

Noise-7 Incorporate construction practices and acoustic treatment in new residential construction to reduce typical indoor noise levels to 45 dB. Developers of residential buildings within the 65 dBA contours shown in the General Plan Master EIR shall demonstrate that interior noise has been reduced to 45 dB. Other types of development should be protected against noise intrusion at least to the levels indicated on UAGP Table VII-2. (UAGP Policy VII-G.3.e)

Noise-8 For proposed non-transportation noise sources, reduce noise levels so as not to exceed the allowable noise exposure thresholds specified in Table V.3.8, below, at the property line of residential or other noise-sensitive land uses. (UAGP Policy VII-G.3.f)

TABLE V.3.8. Noise Exposure Thresholds – Non-Transportation Noise Sources

	Citywide, excluding Downtown		**Downtown**	
	Daytime (7:00am - 10:00pm)	**Nighttime (10:00pm - 7:00am)**	**Daytime (7:00am - 10:00pm)**	**Nighttime (10:00pm - 7:00am)**
Hourly L_{eq}, dBA	55	45	60	50
Maximum level, dBA	75	65	80	70

* Each of the noise level standards shall be reduced by five (5) dBA for pure tone noises, noise consisting primarily of speech or music, or for recurring impulsive noises. Where measured ambient noise levels exceed the standards, the standards shall be increased to the ambient levels.

** If the existing ambient noise level at the receiving use exceeds the thresholds given in Table V.3.9, then the noise level standards shall be increased to account for the ambient noise level.

Noise-9 At noise-sensitive land uses, increases in noise should not exceed 3 dBA where any other noise threshold or standard would be exceeded, and/or 5 dBA where noise levels would otherwise fall within acceptable limits, for the existing conditions scenario as compared to the buildout scenario. (UAGP Policy VII-G.3.g)

Noise-10 Additional study and/or mitigation for outdoor recreation areas will be required if:

- For single-family dwellings, noise exceeds 65 dBA L_{dn} in one or more backyards;
- For multi-family dwellings, noise exceeds 65 dBA L_{dn} at common recreation areas, such as swimming pools or play areas or at private patios and balconies; or,
- For other uses, noise exceeds the level considered "conditionally acceptable" as shown on Table VII-2 of the General Plan. (UAGP Policy VII-G.3.h)

Noise-11 Limit trucking to specific routes, times, and speeds that avoid or minimize adverse effects on sensitive receptors. (UAGP Policy VII-G.3.i)

Noise-12 Airport and aircraft noise analysis will be conducted in accordance with the Modesto City–County Airport's Master Plan and Federal Aviation Regulation (FAR Part 150). New construction must meet Modesto's noise compatibility standards. As airport operations increase, mitigation will be provided to existing residential and other sensitive uses, either through operations or direct property improvements, in order to meet Title 14 Code of Federal Regulations Part 150 land use compatibility guidelines. (UAGP Policy VII-G.3.j)

Noise-13 Study, analyze and consider establishment of "Quiet Zones" along the rail corridors through downtown, along Yosemite Boulevard and along the east side of the planning area. (UAGP Policy VII-G.3.k)

Noise-14 For new residential development proposed in areas within 200 feet of the center of the near mainline of active rail lines where single-event noise from trains is of concern, demonstrate that the proposed development will incorporate measures to reduce maximum noise levels generated during train passbys to 50 dBA L_{max} or less inside bedrooms and to 55 dBA L_{max} or less inside other noise sensitive occupied areas. (UAGP Policy VII-G.3.l)

Noise-15 For new residential and vibration sensitive commercial development (including but not limited to lodging facilities, hospitals and similar uses) located within 200 feet of the center of the near mainline of active rail lines, demonstrate that the proposed development will incorporate measures to reduce vibration levels generated during train passby events to meet the FTA vibration criteria as shown in Master EIR Table V-3-6. (UAGP Policy VII-G.3.m)

Noise-16 For construction activities involving high-powered vibratory tools or pile driving within 200 feet of an existing structure, demonstrate that project construction would not exceed the Caltrans construction vibration thresholds to ensure that no damage to structures would occur. (UAGP Policy VII-G.3.n)

b. City of Modesto Municipal Code.

Generally the Modesto Municipal Code prohibits any noise that can be deemed "loud and raucous." Determining what noises are "loud and raucous" depends on a number of factors, such as its volume and duration, whether the nature of the noise is usual or unusual, when the noise occurs, and whether it is recurrent, intermittent, or constant. The Municipal Code prohibits "loud and raucous" construction-related noise before 7:00 am or after 9:00 pm daily. It also forbids the loud and raucous operation of many specific types of construction equipment. For example, it prohibits loud and raucous noise from exhaust of any stationary internal combustion engine.

B. CONSIDERATION AND DISCUSSION OF SIGNIFICANT IMPACTS

The following information is provided in accordance with State CEQA Guidelines Section 15126.2.

1. Thresholds of Significance

Thresholds of significance for noise impacts have been established for this assessment based primarily on the CEQA Environmental Checklist found in Appendix G of the State CEQA Guidelines. A proposed subsequent project would result in a significant noise impact if any of the following were to occur as a result of project implementation:

a. Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;

b. Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels;

c. A permanent increase of 3 dBA where any other noise threshold or standard would be exceeded, and/or 5 dBA where noise levels would otherwise fall within acceptable limits, in ambient noise levels in the project vicinity above levels existing without the project;

d. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;

e. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, exposure of people residing or working in the project area to excessive noise levels;

f. For a project within the vicinity of a private airstrip, exposure of people residing or working in the project area to excessive noise levels; or,

g. For new residential development within 200 feet of active rail lines, noise levels generated during train passbys exceed 50 dBA L_{max} inside bedrooms or 55 dBA L_{max} inside other occupied areas.

Pursuant to recent court decisions, the purpose of this report is to identify the significant effects of the Project (the proposed General Plan) on the environment, not the significant effects of the environment on the Project. As a result, the impacts of site constraints such as exposure of the proposed project to excessive levels of noise and vibration identified in Checklist Questions (a), (b), (e), and (f) are not included in the Impacts and Mitigation Section of this report. These items are discussed below in a separate section addressing Noise and Land Use Compatibility for consistency with the policies set forth in the City's General Plan.

2. General Plan Consistency Analysis

Following is a discussion of site constraints of the proposed Plan with respect to the noise environment and addresses Noise and Vibration Land Use Compatibility for consistency with the policies set forth in the City's General Plan.

a) Noise and Land Use Compatibility

GP Noise-1: Existing and future noise levels at the locations of proposed residences and other noise-sensitive developments allowed for under the General Plan could exceed the City's noise thresholds of acceptability.

The primary noise sources in the City of Modesto include ground transportation noise sources, such as roadway traffic and trains, and local stationary noise sources, such as equipment used for industrial operations and aircraft noise. Residential developments, schools, libraries, hospitals, convalescent homes, and places of worship are considered to be the land uses that are the most noise-sensitive because of the quiet nature of the use.

Development facilitated by the Project would include noise-sensitive land uses that would be located in varying noise environments. New noise-sensitive development is planned along major transportation corridors and in the vicinity of stationary noise sources. A site constraint would be identified where noise-sensitive land uses are proposed in areas where existing or future noise levels would exceed the noise and land use compatibility standards established by the City.

Traffic Noise Exposure

The future noise exposure levels were calculated using the existing measured noise levels adjusted upward to account for increased traffic on the roadways due to cumulative development including the build out of the Project, and by modeling noise levels along new roadway segments using the FHWA Traffic Noise Model (TNM) algorithms.

Noise exposure contours for Project Buildout conditions along the major roadways in the City are depicted in Figure 3. More detailed maps are shown in Appendix B. Table 8 presents average noise levels calculated at a reference distance of 75 feet from the center of the near travel lane for roadways in Modesto under Existing and Buildout conditions. Increases over Existing conditions under Buildout conditions are also shown in Table V.3.8, with noise increases of 3 dB or greater highlighted in grey. The distances to the 60, 65, and 70 dBA L_{dn} Buildout traffic noise contours for the major roadways located in Modesto are summarized in Table V.3.9.

Figure V.3.3 Year 2040 Buildout Traffic Noise Contours

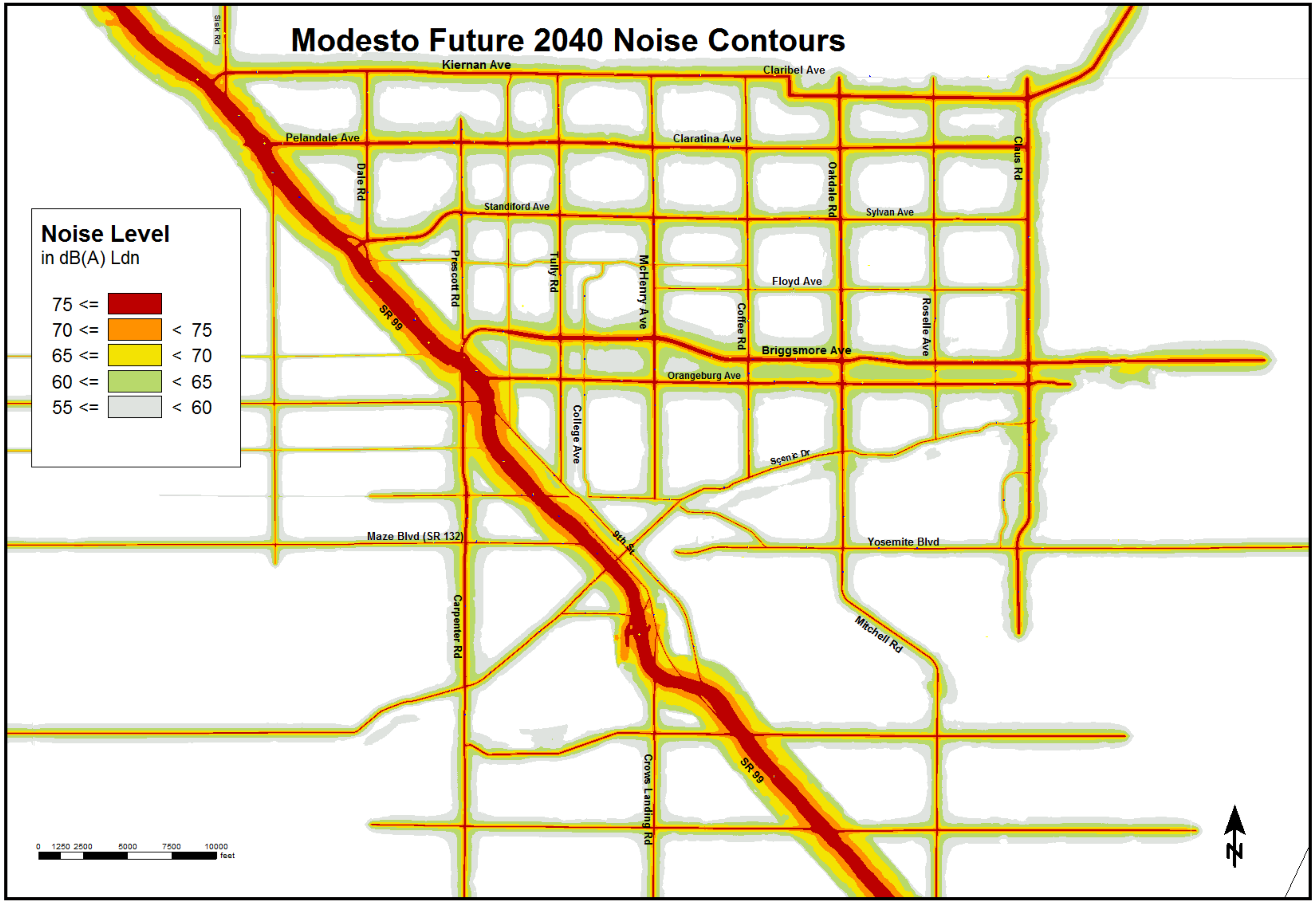


Table V.3.9. Existing and Project Buildout Noise Levels along Modesto Roadways

Roadway	Segment	L_{dn} at 75 feet from Center of Roadway, dBA		L_{dn} Increase Over Existing
		Existing	Project	
7th Street	Paradise Rd to Crows Landing Rd	68	70	2
9th Street	Carpenter Rd to Woodland Ave	70	71	1
	D St to River Rd	68	69	1
	L St to D St	68	69	1
	Needham St to L St	68	69	1
	South of River Rd	68	68	0
	Woodland Ave to Needham St	69	70	1
Briggsmore Avenue	Carver Rd to Tully Rd	75	78	3
	Coffee Rd to Oakdale Rd	74	76	2
	McHenry Ave to Coffee Rd	75	78	3
	Oakdale Rd to Roselle Ave	73	75	2
	Prescott Rd to Carver Rd	71	74	3
	Roselle Rd to Claus Rd	73	75	2
	Sisk Rd to Prescott Rd	73	75	2
	Tully Rd to McHenry Ave	74	78	4
Carpenter Road	SR 99 to Kansas Ave	73	75	2
	Kansas Ave to Maze Blvd	72	74	2
	Maze Blvd to Paradise Rd	72	74	2
	South of Paradise Rd	68	71	3
Carver Road	Briggsmore Ave to Orangeburg Ave	69	71	2
	South of Orangeburg Ave	69	71	2
Claratina Avenue	Tully Rd to McHenry Ave	73	74	1
	McHenry Ave to Coffee Rd	70	75	5
	Coffee Rd to Oakdale Rd	67	73	6
	Oakdale Rd to Roselle Ave (New Alignment)	-	72	N/A
Claribel Road	Coffee Rd to Oakdale Rd	69	75	6
	McHenry Ave to Coffee Rd	69	74	5
	Oakdale Rd to Roselle Ave	68	56	-12*
	Roselle Ave to Claus Rd	68	56	-12*
	East of Coffee Road (New Alignment)	-	76	N/A
Claus Road	Briggsmore Ave to Orangeburg Ave	73	76	3
	Creekwood Dr to Yosemite Blvd	71	74	3
	Floyd Ave to Orangeburg Ave	73	77	4
	North of Sylvan Ave	72	76	4
	Scenic Dr to Creekwood Dr	72	76	4
	South of Orangeburg Ave	72	76	4

Roadway	**Segment**	**L_{dn} at 75 feet from Center of Roadway, dBA**		**L_{dn} Increase Over Existing**
		Existing	**Project**	
	South of Yosemite Blvd	67	75	8
	Sylvan Ave to Floyd Ave	71	76	5
Coffee Road	Briggsmore Ave to Orangeburg Ave	70	71	1
	Claratina Ave to Sylvan Ave	70	70	0
	Floyd Ave to Briggsmore Ave	75	75	0
	South of Orangeburg Ave	70	70	0
	Sylvan Ave to Floyd Ave	70	70	0
College Avenue	Briggsmore Ave to Orangeburg Ave	64	65	1
	North of Briggsmore Ave	63	64	1
	South of Orangeburg Ave	64	65	1
Creekwood Drive	Claus Rd to Yosemite Blvd	63	64	1
Dale Road	Kiernan Ave to Pelandale Ave	69	72	3
	Pelandale Ave to Standiford Ave	69	72	3
Downey Avenue	McHenry Ave to Scenic Dr	66	67	1
El Vista Avenue	Scenic Dr to Yosemite Blvd	70	71	1
Floyd Avenue	Coffee Rd to Oakdale Rd	65	66	1
	McHenry Ave to Coffee Rd	65	66	1
	Oakdale Rd to Roselle Rd	66	67	2
	Roselle Rd to Claus Rd	66	66	0
SR 99	North of Briggsmore Ave	84	86	2
	North of Kiernan Ave	84	85	1
	Pelandale Ave to Standiford Ave	84	85	1
	South of Standiford Ave	84	85	1
	Briggsmore Ave to Kansas Ave	85	86	1
	Kansas Ave to Maze Blvd	84	86	2
	Maze Blvd to Paradise Rd	84	85	1
	Paradise Rd to Crows Landing Rd	84	86	2
	South of Crows Landing Rd	84	85	1
Kansas Avenue	Carpenter Rd to Emerald Ave	67	68	1
	Emerald Ave to Needham	72	73	1
	West of Carpenter Rd	66	67	1
	N. Dakota Rd to Morse Ave	-	54	N/A
Kiernan Avenue	SR 99 to Tully Rd	72	75	3
	Tully Rd to McHenry Ave	69	73	4
La Loma	Scenic Dr to Yosemite Blvd	65	66	1

Roadway	Segment	L_{dn} at 75 feet from Center of Roadway, dBA		L_{dn} Increase Over Existing
		Existing	Project	
Avenue				
Maze Boulevard (132)	West of Carpenter Rd	67	68	1
	Carpenter Rd to Emerald Ave	67	68	1
	Emerald Ave to Needham St	70	71	1
McHenry Avenue	Briggsmore Ave to Orangeburg Ave	70	73	3
	Kiernan Ave to Pelandale Ave	69	70	1
	Pelandale Ave to Standiford Ave	69	70	0
	South of Orangeburg Ave	70	73	3
	Standiford Ave to Briggsmore Ave	72	74	2
Mitchell Road	South of Yosemite Blvd	69	70	1
Needham Street	Kansas Ave to McHenry Ave	67	68	1
Oakdale Road	Briggsmore Ave to Orangeburg Ave	72	75	3
	Claratina Ave to Sylvan Ave	71	74	3
	Floyd Ave to Briggsmore Ave	72	75	3
	South of Orangeburg Ave	71	75	4
	Sylvan Ave to Floyd Ave	71	74	3
Orangeburg Avenue	Briggsmore Ave to Carver Rd	78	74	-4
	Carver Rd to Tully Rd	74	79	5
	Coffee Rd to Oakdale Rd	73	74	1
	Coffee Rd to Rose Ave	68	74	6
	Downey Ave to Coffee Rd	69	69	0
	College Rd to McHenry Ave	74	69	-5
	East of Lakewood Ave	74	74	0
	Lakewood Ave to Claus Rd	63	64	1
	McHenry Ave to Coffee Rd	73	74	1
	Oakdale Rd to Lakewood Ave	67	67	0
	Oakdale Rd to Sonoma Ave	73	74	1
	Rose Ave to Oakdale Rd	69	69	0
	Sonoma Ave to Lakewood Ave	73	74	1
Paradise Road	Beverly Dr to MLK Dr	67	69	2
	Carpenter Rd to Beverly Dr	67	69	2
	MLK Dr to SR 99	69	70	1
	West of Carpenter Rd	67	69	2
Pelandale Avenue	Carver Rd to Tully Ave	74	76	2
	Dale Rd to Prescott Rd	74	75	1
	SR 99 to Sisk Rd	78	79	1

Roadway	Segment	L_{dn} at 75 feet from Center of Roadway, dBA		L_{dn} Increase Over Existing
		Existing	Project	
	Prescott Rd to Carver Rd	73	75	2
	Sisk Rd to Dale Rd	75	76	1
Prescott Road	North of Pelandale Ave	69	71	3
	Pelandale Ave to Standiford Ave	68	71	3
	Standiford Ave to Briggsmore Ave	69	71	2
Roselle Road	North of Sylvan Ave	69	69	0
	Roselle Rd, Sylvan Ave to Floyd Ave	67	69	2
	Briggsmore Ave to Orangeburg Ave	67	69	2
	Floyd Ave to Briggsmore Ave	68	70	2
	South of Orangeburg Ave	66	67	1
Sisk Road	Kiernan Ave to Pelandale Ave	80	82	2
	Sisk Rd, north of Standiford Ave	71	71	1
	Pelandale Ave to Standiford Ave	80	81	1
	Standiford Ave to Briggsmore Ave	81	82	1
Standiford Avenue	Carver Rd to Tully Rd	72	73	1
	Dale Rd to Prescott Rd	74	75	1
	Prescott Rd to Carver Rd	72	73	1
	Tully Rd to McHenry Ave	72	73	1
Sylvan Avenue	Coffee Rd to Oakdale Rd	72	73	1
	McHenry Ave to Coffee Rd	72	73	1
	Oakdale Rd to Roselle Rd	69	71	2
	Roselle Rd to Claus Rd	69	71	2
Tuolumne Boulevard	Paradise Rd to Roselawn Ave	67	67	0
	Roselawn Ave to SR 99	70	70	0
Tully Road	Kiernan Ave to Pelandale Ave	69	70	1
	Pelandale Ave to Standiford Ave	69	70	1
	Standiford Ave to Briggsmore Ave	69	71	2
Yosemite Boulevard	9th St to Santa Rosa Ave	71	70	-1
	East of Claus Rd	71	69	-2
	Empire Ave to Mitchell Rd	71	69	-2
	Lincoln to Claus Rd	71	69	-2
	Mitchell Rd to Riverside Dr	71	69	-2
	Riverside Dr to Lincoln Ave	70	69	-1
	Santa Rosa Ave to Empire Ave	71	70	-1

*Noise reduction due to realignment of Claribel Road.
Source: Illingworth & Rodkin, 2016

Table V.3.10 2040 Buildout Traffic Noise Contours

Roadway	Segment	Distance from Centerline to Buildout Traffic Noise Contours, feet		
		60 L_{dn}	65 L_{dn}	70 L_{dn}
7th Street	Paradise Rd to Crows Landing Rd	260	120	60
9th Street	Carpenter Rd to Woodland Ave	300	140	60
	D St to River Rd	210	100	50
	L St to D St	220	100	50
	Needham St to L St	220	100	50
	South of River Rd	190	90	<50
	Woodland Ave to Needham St	240	110	50
Briggsmore Avenue	Carver Rd to Tully Rd	820	380	180
	Coffee Rd to Oakdale Rd	680	320	150
	McHenry Ave to Coffee Rd	820	380	180
	Oakdale Rd to Roselle Ave	580	270	120
	Prescott Rd to Carver Rd	500	230	110
	Roselle Rd to Claus Rd	540	250	120
	Sisk Rd to Prescott Rd	570	260	120
	Tully Rd to McHenry Ave	810	380	170
Carpenter Road	SR 99 to Kansas Ave	540	250	120
	Kansas Ave to Maze Blvd	500	230	110
	Maze Blvd to Paradise Rd	490	230	110
	South of Paradise Rd	310	140	70
Carver Road	Briggsmore Ave to Orangeburg Ave	290	140	60
	South of Orangeburg Ave	290	130	60
Claratina Avenue	Tully Rd to McHenry Ave	470	220	100
	McHenry Ave to Coffee Rd	580	270	120
	Coffee Rd to Oakdale Rd	400	190	90
	Oakdale Rd to Roselle Ave (New Alignment)	360	170	80
Claribel Road	Coffee Rd to Oakdale Rd	530	240	110
	McHenry Ave to Coffee Rd	460	210	100
	Oakdale Rd to Roselle Ave	<50	<50	<50
	Roselle Ave to Claus Rd	<50	<50	<50
	East of Coffee Road (New Alignment)	630	290	130
Claus Road	Briggsmore Ave to Orangeburg Ave	660	310	140
	Creekwood Dr to Yosemite Blvd	500	230	110
	Floyd Ave to Orangeburg Ave	760	350	160

Roadway	Segment	Distance from Centerline to Buildout Traffic Noise Contours, feet		
		60 L_{dn}	65 L_{dn}	70 L_{dn}
	North of Sylvan Ave	650	300	140
	Scenic Dr to Creekwood Dr	610	290	130
	South of Orangeburg Ave	650	300	140
	South of Yosemite Blvd	510	240	110
	Sylvan Ave to Floyd Ave	620	290	130
Coffee Road	Briggsmore Ave to Orangeburg Ave	280	130	60
	Claratina Ave to Sylvan Ave	260	120	60
	Floyd Ave to Briggsmore Ave	590	270	130
	South of Orangeburg Ave	260	120	60
	Sylvan Ave to Floyd Ave	260	120	60
College Avenue	Briggsmore Ave to Orangeburg Ave	120	60	<50
	North of Briggsmore Ave	110	50	<50
	South of Orangeburg Ave	120	60	<50
Creekwood Drive	Claus Rd to Yosemite Blvd	100	50	<50
Dale Road	Kiernan Ave to Pelandale Ave	330	150	70
	Pelandale Ave to Standiford Ave	340	160	70
Downey Avenue	McHenry Ave to Scenic Dr	160	80	<50
El Vista Avenue	Scenic Dr to Yosemite Blvd	300	140	60
Floyd Avenue	Coffee Rd to Oakdale Rd	130	60	<50
	McHenry Ave to Coffee Rd	140	70	<50
	Oakdale Rd to Roselle Rd	150	70	<50
	Roselle Rd to Claus Rd	140	70	<50
SR 99	North of Briggsmore Ave	2770	1280	600
	North of Kiernan Ave	2640	1230	570
	Pelandale Ave to Standiford Ave	2680	1240	580
	South of Standiford Ave	2520	1170	540
	Briggsmore Ave to Kansas Ave	2900	1340	620
	Kansas Ave to Maze Blvd	2770	1280	600
	Maze Blvd to Paradise Rd	2520	1170	540
	Paradise Rd to Crows Landing Rd	2770	1280	600
	South of Crows Landing Rd	2410	1120	520
Kansas Avenue	Carpenter Rd to Emerald Ave	190	90	<50
	Emerald Ave to Needham	390	180	80

Roadway	Segment	Distance from Centerline to Buildout Traffic Noise Contours, feet		
		60 L_{dn}	65 L_{dn}	70 L_{dn}
	West of Carpenter Rd	170	80	<50
	N Dakota Ave to Morse Rd (New Alignment)	<50	<50	<50
Kiernan Avenue	SR 99 to Tully Rd	520	240	110
	Tully Rd to McHenry Ave	420	190	90
La Loma Avenue	Scenic Dr to Yosemite Blvd	140	60	<50
Maze Boulevard (132)	West of Carpenter Rd	170	80	<50
	Carpenter Rd to Emerald Ave	190	90	<50
	Emerald Ave to Needham St	290	130	60
McHenry Avenue	Briggsmore Ave to Orangeburg Ave	390	180	80
	Kiernan Ave to Pelandale Ave	250	120	50
	Pelandale Ave to Standiford Ave	250	120	50
	South of Orangeburg Ave	390	180	80
	Standiford Ave to Briggsmore Ave	440	200	90
Mitchell Road	South of Yosemite Blvd	260	120	60
Needham Street	Kansas Ave to McHenry Ave	180	80	<50
Oakdale Road	Briggsmore Ave to Orangeburg Ave	530	240	110
	Claratina Ave to Sylvan Ave	500	230	110
	Floyd Ave to Briggsmore Ave	550	260	120
	South of Orangeburg Ave	510	240	110
	Sylvan Ave to Floyd Ave	480	220	100
Orangeburg Avenue	Briggsmore Ave to Carver Rd	450	210	100
	Carver Rd to Tully Rd	970	450	210
	Coffee Rd to Oakdale Rd	470	220	100
	Coffee Rd to Rose Ave	450	210	100
	Downey Ave to Coffee Rd	200	90	<50
	College Rd to McHenry Ave	220	100	50
	East of Lakewood Ave	470	220	100
	Lakewood Ave to Claus Rd	100	<50	<50
	McHenry Ave to Coffee Rd	450	210	100
	Oakdale Rd to Lakewood Ave	160	80	<50
	Oakdale Rd to Sonoma Ave	450	210	100
	Rose Ave to Oakdale Rd	210	100	<50
	Sonoma Ave to Lakewood Ave	450	210	100

Roadway	Segment	Distance from Centerline to Buildout Traffic Noise Contours, feet		
		60 L_{dn}	65 L_{dn}	70 L_{dn}
Paradise Road	Beverly Dr to MLK Dr	220	100	50
	Carpenter Rd to Beverly Dr	220	100	50
	MLK Dr to SR 99	260	120	60
	West of Carpenter Rd	220	100	50
Pelandale Avenue	Carver Rd to Tully Ave	610	290	130
	Dale Rd to Prescott Rd	580	270	120
	SR 99 to Sisk Rd	1080	500	230
	Prescott Rd to Carver Rd	590	270	130
	Sisk Rd to Dale Rd	620	290	130
Prescott Road	North of Pelandale Ave	290	140	60
	Pelandale Ave to Standiford Ave	290	130	60
	Standiford Ave to Briggsmore Ave	290	140	60
Roselle Road	North of Sylvan Ave	220	100	50
	Sylvan Ave to Floyd Ave	220	100	50
	Briggsmore Ave to Orangeburg Ave	210	100	<50
	Floyd Ave to Briggsmore Ave	240	110	50
	South of Orangeburg Ave	160	70	<50
Sisk Road	Kiernan Ave to Pelandale Ave	1500	690	320
	Sisk Rd, north of Standiford Ave	310	140	70
	Pelandale Ave to Standiford Ave	1360	630	290
	Standiford Ave to Briggsmore Ave	1640	760	350
Standiford Avenue	Carver Rd to Tully Rd	420	190	90
	Dale Rd to Prescott Rd	560	260	120
	Prescott Rd to Carver Rd	430	200	90
	Tully Rd to McHenry Ave	410	190	90
Sylvan Avenue	Coffee Rd to Oakdale Rd	380	180	80
	McHenry Ave to Coffee Rd	410	190	90
	Oakdale Rd to Roselle Rd	300	140	60
	Roselle Rd to Claus Rd	290	130	60
Tuolumne Boulevard	Paradise Rd to Roselawn Ave	170	80	<50
	Roselawn Ave to SR 99	260	120	60
Tully Road	Kiernan Ave to Pelandale Ave	270	120	60
	Pelandale Ave to Standiford Ave	270	130	60
	Standiford Ave to Briggsmore Ave	280	130	60
Yosemite Boulevard	9th St to Santa Rosa Ave	260	120	60
	East of Claus Rd	220	100	50

Roadway	Segment	Distance from Centerline to Buildout Traffic Noise Contours, feet		
		60 L_{dn}	65 L_{dn}	70 L_{dn}
	Empire Ave to Mitchell Rd	230	110	50
	Lincoln to Claus Rd	220	100	50
	Mitchell Rd to Riverside Dr	220	100	50
	Riverside Dr to Lincoln Ave	210	100	50
	Santa Rosa Ave to Empire Ave	240	110	50

Source: Illingworth & Rodkin, 2016

As indicated in Table V.3.8, Existing and Buildout noise levels along many roadways in the City of Modesto are calculated to exceed those considered compatible for noise-sensitive land uses (65 dBA L_{dn} for single family residential uses). As such, noise levels at the locations of proposed residential developments and other noise-sensitive land uses allowed for under the Project would exceed the City's noise thresholds of acceptability. Site planning alternatives and noise barriers may be necessary and should be considered during a project's design phase to reduce exterior noise levels to acceptable levels.

Where exterior transportation noise levels would exceed 60 dBA L_{dn} in new residential development, interior levels may exceed 45 dBA L_{dn} assuming that windows and doors are open for ventilation. Interior noise levels within residential units are 20 to 25 decibels lower than exterior noise levels with the windows closed, assuming typical California Building Code construction methods. Where exterior noise levels are 60 to 70 dBA L_{dn}, interior noise levels can typically be maintained below 45 dBA L_{dn} with the incorporation of an adequate forced-air mechanical ventilation system in the residential units to allow residents the option of controlling noise by keeping the windows closed. In areas exceeding 70 dBA L_{dn}, the inclusion of windows and doors with high Sound Transmission Class (STC) ratings, and the incorporation of forced-air mechanical ventilation systems, may be necessary to meet 45 dBA L_{dn}.

Rail Noise Exposure

The City of Modesto is served by three railroads: Burlington Northern and Santa Fe Railroad (BNSF), the Modesto & Empire Traction Company (M&ET), and along Union Pacific Railroad (UPRR). Data regarding daily rail operations is not available, as operations fluctuate as demand for rail services varies. Further, the City has no control over the schedule of rail operations or amount of rail activities that occur within the City. The BNSF Railroad runs adjacent and parallel to Santa Fe Avenue on the eastern edge of Modesto; the UPRR runs adjacent and parallel to 9th Street, Brink Avenue, and SR 99 on the western edge of Modesto; and the M&ET runs primarily in the Beard Industrial District along Yosemite Boulevard on the southern edge of Modesto. Existing residences are located along portions of all of these rail lines and the proposed Plan could facilitate the development of additional noise sensitive uses adjacent to these rail lines.

Future railroad train noises from operations on these tracks were assumed to be similar to existing conditions. Day-night average noise levels vary throughout the community depending on the number of trains operating along a given line per day, the timing and duration of train passby events, and whether or not trains must sound their warning whistles. Based on the noise monitoring survey, train operations generated a noise level of up to 88 dBA L_{dn} at a distance of 75 feet from the center of the UPRR main line running along 8th Street, up to 79 dBA L_{dn} at a distance of 75 feet from the center of the M&ET line running along Yosemite Boulevard, and up to 82 dBA L_{dn} at a distance of 75 feet from the center of the BNSF tracks running along Santa Fe Avenue. Maximum instantaneous noise levels (L_{max}) from train warning whistles typically ranged from approximately 90 to 110 dBA L_{max} at a distance of 75 feet from the tracks.

Stationary and Local Noise Sources

Mixed-use development projects often include residential uses located above or in proximity to commercial uses, and in areas served by bus transit along major roadways. Noise sources associated with commercial uses could include mechanical equipment operations, public address systems, parking lot noise (e.g., opening and closing of vehicle doors, people talking, car alarms), delivery activities (e.g., use of forklifts, hydraulic lifts), trash compactors, and air compressors. These elevated noise levels, which have the potential to be generated by commercial uses within mixed-use developments, would expose nearby noise-sensitive land uses to noise levels that exceed the City's noise standards.

Placement of residential uses within close proximity to industrial uses would also have the potential to expose residents to increased noise levels in exceedance of City noise standards. Conversely, the industrial uses could be subject to new noise standards to ensure noise level compatibility with nearby residential and mixed-use neighborhoods. Industrial uses could be subject to new limitations for noise intensive activities to keep noise levels at nearby residential and mixed-use neighborhoods within City noise level standards.

Aircraft Noise

The Modesto City-County Airport is located in the southeastern portion of the City near the Beard Industrial District. Existing residences are adjacent to the airport to the south, west, and northwest. Based on the Airport Noise Zone Policy Map[4], residences are currently located within the 60 dBA CNEL contour, but not within the 65 dBA CNEL contour. The Project does not propose the development of any new noise sensitive uses within the 60 or 65 dBA CNEL noise contours of the airport. For additional airport-related noise analysis and information, see the Stanislaus County General Plan and Airport Land Use Compatibility Plan Update EIR.

Noise and Land Use Compatibility Policies

The implementation of the following General Plan Noise Policies would reduce the potential for noise and land use compatibility inconsistencies.

Noise-3 Construction activities are to comply with Modesto Municipal Code Title 4, Ch. 9.

Noise-4 Implement noise-reducing construction practices as conditions of approval where substantial construction-related noise impacts would be likely to occur, such as with extended periods of pile driving, or where construction is expected to continue or where sensitive receptors would be affected by construction noise. Conditions of approval may include, but are not limited to:

- Require construction equipment, including air compressors and pneumatic equipment to have properly maintained mufflers;
- Require impact tools to be equipped with shrouds or shields;

[4] Airport Noise Zones Policy Map, Modesto City-County Airport, Stanislaus County Airport Land Use Compatibility Plans, October 2016.

- Require that the quietest equipment available be used; and,
- Require selection of haul routes that affect the fewest number of people.

Noise-5 Implement techniques, where feasible, to reduce noise impacts from new or widened roadways. Such techniques may include, but are not limited to:
- Traffic calming to reduce vehicle speeds, including narrowing travel lanes and limiting the number of motor vehicle lanes;
- Adding bicycle and parking lanes to move the noise source farther away from sensitive receptors; and,
- Use of earthen berms and landscaped walls to channel noise away from sensitive receptors.

Noise-6 Use the most recent noise contour map (General Plan Figure VII-2) to implement the requirements of Noise Insulation Standards contained in Title 24 of the California Code of Regulations. Developers may be allowed to demonstrate that detailed noise studies and / or mitigation are not necessary due to local conditions, changes in the expected future noise environment, or inapplicable assumptions made in the Master EIR.

Noise-7 Incorporate construction practices and acoustic treatment in new residential construction to reduce typical indoor noise levels to 45 dB. Developers of residential buildings within the 65 dBA contours shown in the General Plan Master EIR shall demonstrate that interior noise has been reduced to 45 dB. Other types of development should be protected against noise intrusion at least to the levels indicated on General Plan Table VII-2.

Noise-8 For proposed non-transportation noise sources, reduce noise levels so as not to exceed the allowable noise exposure thresholds specified in Table V.3.8, below, at the property line of residential or other noise-sensitive land uses.

TABLE V.3.11. Noise Exposure Thresholds-Non-Transportation Noise Sources

	Citywide, excluding Downtown		**Downtown**	
	Daytime (7:00am - 10:00pm)	**Nighttime (10:00pm - 7:00am)**	**Daytime (7:00am - 10:00pm)**	**Nighttime (10:00pm - 7:00am)**
Hourly L_{eq}, dBA	55	45	60	50
Maximum level, dBA	75	65	80	70

* Each of the noise level standards shall be reduced by five (5) dBA for pure tone noises, noise consisting primarily of speech or music, or for recurring impulsive noises. Where measured ambient noise levels exceed the standards, the standards shall be increased to the ambient levels.
** If the existing ambient noise level at the receiving use exceeds the thresholds given in Table V.3.9, then the noise level standards shall be increased to account for the ambient noise level.

Noise-9 At noise-sensitive land uses, increases in noise should not exceed 3 dBA where any other noise threshold or standard would be exceeded, and/or 5 dBA where noise levels would otherwise fall within acceptable limits, for the existing conditions scenario as compared to the buildout scenario.

Noise-10 Additional study and/or mitigation for outdoor recreation areas would be required if:

- For single-family dwellings, noise exceeds 65 dBA L_{dn} in any backyard;
- For multi-family dwellings, noise exceeds 65 dBA L_{dn} at common recreation areas (e.g. swimming pools or play areas or at private patios and balconies); or,
- For other uses, noise exceeds the level considered "conditionally acceptable" as shown on General Plan Table VII-2.

Noise-11 Limit trucking to specific routes, times, and speeds that avoid or minimize adverse effects on sensitive receptors.

Noise-12 Airport and aircraft noise analysis will be conducted in accordance with the Modesto City–County Airport's Master Plan and Federal Aviation Regulation (FAR Part 150). New construction must meet Modesto's noise compatibility standards. As airport operations increase, mitigation will be provided to existing residential and other sensitive uses, either through operations or direct property improvements, in order to meet Title 14 Code of Federal Regulations Part 150 land use compatibility guidelines.

Noise-13 Study, analyze and consider establishment of "Quiet Zones" along the rail corridors through downtown, along Yosemite Boulevard and along the east side of the planning area.

Noise-14 For new residential development proposed in areas within 200 feet of the center of the near mainline of active rail lines where single-event noise from trains is of concern, demonstrate that the proposed development will incorporate measures to reduce maximum noise levels generated during train passbys to 50 dBA L_{max} or less inside bedrooms and to 55 dBA L_{max} or less inside other occupied areas.

b) Vibration and Land Use Compatibility

GP Noise-2: Ground vibration levels resulting from railroad train operations could exceed appropriate vibration thresholds and could expose people to excessive Ground-borne vibration.

Railroad trains are a source of Ground-borne vibration when receptors are located close to the tracks. Many factors influence levels of Ground-borne vibration from trains experienced in buildings, including operational factors, geology, building construction, train speed, and track type. The U.S. DOT FTA has developed vibration impact assessment criteria for evaluation vibration impacts associated with rapid transit projects.[5]

There are three existing rail lines in Modesto: the BNSF located adjacent to Santa Fe Boulevard in the eastern portion of the City; the UPRR running adjacent to SR 99; and, the M&ET, which runs through the Beard Industrial District along Yosemite Boulevard in southeast Modesto. Data regarding daily rail operations is not available, as operations fluctuate as demand for rail services varies.

[5] U.S. Department of Transportation, Federal Transit Administration, Transit Noise and Vibration Impact Assessment, FTA-VA-90-1003-06, May 2006.

During the noise monitoring survey, approximately 20 to 22 trains passed along the UPRR and BNSF lines each day and approximately eight to ten trains passed along the M&ET line daily.

Development facilitated by the Project could expose persons to excessive Ground-borne vibration levels attributable to train operations. The proposed locations of buildings and their specific sensitivity to vibration are not known at this time; however, such uses located in close proximity to the tracks could be exposed to ground vibration levels exceeding FTA guidelines.

Rail traffic along the line is not anticipated to increase to 30 trains or more per day and future train activity would be considered "infrequent" with respect to the FTA vibration impact criteria. Since many of these trains pass during evening and nighttime hours when people are normally at rest, the 80 VdB limit is used to characterize the vibration compatibility. Ground-borne vibration levels from train passbys along these rail line are anticipated to range from 79 to 80 VdB at a distance of 50 feet from the center of a main railroad track, 73 to 74 VdB at a distance of 100 feet from the center of main railroad track, and 68 VdB at a distance of 200 feet from the center of main railroad track during freight and passenger train pass-by events. Residences proposed within 45 feet of the center of a main rail line could be exposed to vibration levels exceeding 80 VdB.

Vibration and Land Use Compatibility Policies

Implementation of the following General Plan Noise Mitigation Policies would reduce the potential for vibration and land use compatibility inconsistencies.

Noise-15 For new residential and vibration sensitive commercial development (including but not limited to lodging facilities, hospitals and similar uses) located within 200 feet of the center of the near mainline of active rail lines, demonstrate that the proposed development will incorporate measures to reduce vibration levels generated during train passby events to meet the FTA vibration criteria as shown in Table V-3-6, above.

Noise-16 For construction activities involving high-powered vibratory tools or pile driving within 200 feet of an existing structure, demonstrate that project construction would not exceed the Caltrans construction vibration thresholds to ensure that no damage to sensitive structures would occur.

3. Direct Impacts of Project Buildout

This section discusses the direct impacts of the proposed Plan on the noise environment of Modesto and on the perception of noise by sensitive receptors in the Plan Area.

Noise-A: Increased vehicular traffic and transportation and infrastructure improvements in the plan area would result in a significant permanent increase in ambient noise levels along some roadways.

Development facilitated by the proposed Project would result in increased traffic volumes along roadways throughout Modesto. A significant noise impact would be identified where existing noise-sensitive land uses would be subject to permanent noise level increases of 3 dBA L_{dn} or more where noise levels would equal or exceed the acceptable level (65 dBA L_{dn} for residential uses) or 5 dBA L_{dn} or more where noise levels would remain at or below the acceptable level.

The increased development allowed under the Project would result in an increase in vehicular traffic as development occurs and population increases. These projected increases in traffic would occur over time and would increase noise levels throughout the City of Modesto and its vicinity. Traffic volumes provided by *Fehr & Peers* were reviewed to calculate the change in traffic noise levels attributable to the cumulative growth planned as part of the Modesto General Plan. Traffic volumes under the 2014 Existing and 2040 General Plan Buildout traffic scenarios were compared to calculate the relative increase in traffic noise attributable to the buildout of the Project. Table 8 shows the calculated traffic noise increases along all major roadways in Modesto. Table V.3.9 shows the calculated distances to the 60, 65, and 70 dBA L_{dn} traffic noise level contours under 2040 Buildout Conditions for the major roadways in the City. For reference, the traffic noise level contours under Existing and 2040 Buildout Conditions are shown in Figures V.3.2 and V.3.3.

As indicated in Table V.3.8, substantial noise increases (3 dBA L_{dn} or greater) would occur along portions of Briggsmore Avenue, Carpenter Road, Claratina Road, Claribel Avenue, Claus Road, Dale Road, Kiernan Avenue, McHenry Avenue, Oakdale Road, and Orangeburg Avenue under 2040 General Plan buildout conditions. Existing residential land uses are located within the projected 65 dBA L_{dn} noise contours under 2040 General Plan buildout conditions along portions of all of these existing roadways, with the exception of Kiernan Avenue between Tully Road and McHenry Avenue.

In addition to projected traffic noise increases along existing roadway segments, traffic noise levels would increase in areas adjacent to proposed future roadways and roadway extensions (see Tables 8 and 9). These included Kansas Avenue between N. Dakota Avenue and Morse Road, Claratina Avenue between Oakdale Road and Roselle Avenue, and the new alignment of Claribel Road east of Coffee Road.

General Plan Policies that Reduce Direct Impacts from Noise-A

Implementation of the following General Plan policies would reduce potential impacts associated with traffic noise increases, although such impacts could remain significant and unavoidable if the project-specific circumstances render application of mitigating policies infeasible.

Noise-5 Implement techniques, where feasible, to reduce noise impacts from new or widened roadways. Such techniques may include, but are not limited to:

- Traffic calming to reduce vehicle speeds, including narrowing travel lanes and limiting the number of motor vehicle lanes;
- Adding bicycle and parking lanes to move the noise source farther away from sensitive receptors; and,
- Use of earthen berms and landscaped walls to channel noise away from sensitive receptors.

Noise-9 At noise-sensitive land uses, increases in noise should not exceed 3 dBA where any other noise threshold or standard would be exceeded, and/or 5 dBA where noise levels would otherwise fall within acceptable limits, for the existing conditions scenario as compared to the buildout scenario.

Noise-B: New noise-generating land uses could produce noise levels that would exceed the City's noise thresholds of acceptability at sensitive receptors in the vicinity.

The Modesto Project would facilitate the development of new noise-generating land uses. These new land uses could result in operational noise levels that exceed General Plan noise standards at existing noise sensitive land uses. A significant noise impact would be identified where the operation of noise-generating land uses would create noise levels that exceed the noise and land use compatibility standards as established by the City of Modesto.

Mixed-use development projects often include residential uses located above or in proximity to commercial uses and are typically located in areas served by transit. Office, commercial, retail, or other noise-generating uses developed under the Project could substantially increase noise levels at noise-sensitive land uses.

Future operations at existing and proposed noise-producing land uses are dependent on many variables, and specific information is currently unavailable to allow meaningful projections of noise. Noise conflicts may be caused by noise sources such as outdoor dining areas or bars, mechanical equipment, outdoor maintenance areas, truck loading docks and delivery activities, public address systems, and parking lots (e.g., opening and closing of vehicle doors, people talking, and car alarms). Development under the Project would introduce new noise-generating sources adjacent to existing noise-sensitive areas and new noise-sensitive uses adjacent to existing noise sources.

<u>General Plan Policies that Reduce Direct Impacts from Noise-B</u>
Implementation of the following proposed General Plan amendment policies would reduce potential impacts associated with the development of noise-generating land uses, although such impacts could remain significant and unavoidable if the project-specific circumstances render application of mitigating policies infeasible.

Noise-5 Implement techniques, where feasible, to reduce noise impacts from new or widened roadways. Such techniques may include, but are not limited to:

- Traffic calming to reduce vehicle speeds, including narrowing travel lanes and limiting the number of motor vehicle lanes;
- Adding bicycle and parking lanes to move the noise source farther away from sensitive receptors; and,
- Use of earthen berms and landscaped walls to channel noise away from sensitive receptors.

Noise-7 Incorporate construction practices and acoustic treatment in new residential construction to reduce typical indoor noise levels to 45 dB. Developers of residential buildings within the 65 dBA contours shown in the General Plan Master EIR shall demonstrate that interior noise has been reduced to 45 dB. Other types of development should be protected against noise intrusion at least to the levels indicated on Table VII-2 of the General Plan.

Noise-8 For proposed non-transportation noise sources, reduce noise levels so as not to exceed the allowable noise exposure thresholds specified in Table V.3.8, below, at the property line of residential or other noise-sensitive land uses.

TABLE V.3.12. Noise Exposure Thresholds – Non-Transportation Noise Sources

	Citywide, excluding Downtown		**Downtown**	
	Daytime (7:00am - 10:00pm)	**Nighttime (10:00pm - 7:00am)**	**Daytime (7:00am - 10:00pm)**	**Nighttime (10:00pm - 7:00am)**
Hourly L_{eq}, dBA	55	45	60	50
Maximum level, dBA	75	65	80	70

* Each of the noise level standards shall be reduced by five (5) dBA for pure tone noises, noise consisting primarily of speech or music, or for recurring impulsive noises. Where measured ambient noise levels exceed the standards, the standards shall be increased to the ambient levels.

** If the existing ambient noise level at the receiving use exceeds the thresholds given in Table V.3.9, then the noise level standards shall be increased to account for the ambient noise level.

Noise-11 Limit trucking to specific routes, times, and speeds that avoid or minimize adverse effects on sensitive receptors.

Noise-C: Construction noise would cause a temporary or periodic increase in noise exposure above ambient noise levels.

The proposed Project would facilitate the construction of new projects throughout the City. Residences and businesses located adjacent to development sites would be affected at times by construction noise and vibration.

Noise impacts resulting from construction depend on the noise generated by various pieces of construction equipment, the timing and duration of noise-generating activities, and the distance between construction noise sources and noise-sensitive receptors. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (early morning, evening, or nighttime hours), when construction occurs in areas immediately adjoining noise-sensitive land uses, or when construction durations last over extended periods of time. Major noise-generating construction activities associated with new projects would include removal of existing pavement and structures, site grading and excavation, installation of utilities, the construction of building foundations, cores, and shells, paving, and landscaping.

The highest noise levels are typically generated during the demolition of existing structures when impact tools are used (e.g., jackhammers, hoe rams) and during the construction of building foundations when impact pile driving is required to support the structure. Site grading and excavation activities would also generate high noise levels as these phases often require the simultaneous use of multiple pieces of heavy equipment, such as dozers, excavators, scrapers, and loaders. Lower noise levels result from building construction activities when these activities move indoors and less heavy equipment is required to complete the tasks.

Construction equipment would typically include, but would not be limited to, earth-moving equipment and trucks, pile driving rigs, mobile cranes, compressors, pumps, generators, paving equipment, and pneumatic, hydraulic, and electric tools. Construction noise levels would vary by project and vary within individual project phases based on the amount of equipment in operation and location where the equipment is operating. Typical construction noise levels at a distance of 50 feet are shown in Tables V.3.10 and V.3.11. Table V.3.10 shows the average noise level range by construction phase; Table V.3.11 shows the maximum noise level range for construction equipment.

Table V.3.13 Typical Ranges of Noise Levels at 50 Feet from Construction Sites (dBA L_{eq})

	Domestic Housing		Office Building, Hotel, Hospital, School, Public Works		Industrial Parking Garage, Religious Amusement & Recreations, Store, Service Station		Public Works Roads & Highways, Sewers, and Trenches	
	I	II	I	II	I	II	I	II
Site Clearing	83	83	84	84	84	83	84	84
Excavation	88	75	89	79	89	71	88	78
Foundations	81	81	78	78	77	77	88	88
Erection	81	65	87	75	84	72	79	78
Finishing	88	72	89	75	89	74	84	84

I - All pertinent equipment present at site.
II - Minimum required equipment present at site.
Source: United States Environmental Protection Agency, 1973, Legal Compilation on Noise, Vol. 1, p. 2-104.

TABLE V.3.14 Construction Equipment 50-foot Noise Emission Limits

Equipment Category	L_{max} Level (dBA)[1,2]	Impact/Continuous
Arc Welder	73	Continuous
Auger Drill Rig	85	Continuous
Backhoe	80	Continuous
Bar Bender	80	Continuous
Boring Jack Power Unit	80	Continuous
Chain Saw	85	Continuous
Compressor[3]	70	Continuous
Compressor (other)	80	Continuous
Concrete Mixer	85	Continuous
Concrete Pump	82	Continuous
Concrete Saw	90	Continuous
Concrete Vibrator	80	Continuous
Crane	85	Continuous
Dozer	85	Continuous
Excavator	85	Continuous
Front End Loader	80	Continuous
Generator	82	Continuous

Equipment Category	L_{max} Level (dBA)[1,2]	Impact/Continuous
Generator (25 KVA or less)	70	Continuous
Gradall	85	Continuous
Grader	85	Continuous
Grinder Saw	85	Continuous
Horizontal Boring Hydro Jack	80	Continuous
Hydra Break Ram	90	Impact
Impact Pile Driver	105	Impact
Insitu Soil Sampling Rig	84	Continuous
Jackhammer	85	Impact
Mounted Impact Hammer (hoe ram)	90	Impact
Paver	85	Continuous
Pneumatic Tools	85	Continuous
Pumps	77	Continuous
Rock Drill	85	Continuous
Scraper	85	Continuous
Slurry Trenching Machine	82	Continuous
Soil Mix Drill Rig	80	Continuous
Street Sweeper	80	Continuous
Tractor	84	Continuous
Truck (dump, delivery)	84	Continuous
Vacuum Excavator Truck (vac-truck)	85	Continuous
Vibratory Compactor	80	Continuous
Vibratory Pile Driver	95	Continuous
All other equipment with engines larger than 5 HP	85	Continuous

Notes: [1] Measured at 50 feet from the construction equipment, with a "slow" (1 sec.) time constant.
[2] Noise limits apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation.
[3] Portable Air Compressor rated at 75 cfm or greater and that operates at greater than 50 psi.

As shown in Tables V.3.13 and V.3.14, typical hourly average construction-generated noise levels are about 77 to 89 dBA L_{eq} measured at a distance of 50 feet from the site during busy construction periods. Large pieces of earth-moving equipment, such as graders, scrapers, and dozers, generate maximum noise levels of 85 to 90 dBA L_{max} at a distance of 50 feet. During each stage of construction, there would be a different mix of equipment operating, and noise levels would vary based on the amount of equipment on site and the location of the activity. Construction noise levels drop off at a rate of about 6 dBA per doubling of distance between the noise source and receptor. Intervening structures or terrain would result in lower noise levels at distant receptors.

Noise generated by small infill projects facilitated by the Project would likely have relatively short overall construction durations, with the noisiest phases of construction (e.g., demolition, foundations, project infrastructure, building core, and shell) limited to a timeframe of one year or less. Interior construction, landscaping, and finishing activities would not be expected to result in noise levels in excess of 60 dBA L_{eq} off-site. Large construction projects facilitated by the Project may result in a substantial temporary noise increase at adjacent noise-sensitive land uses.

General Plan Policies that Reduce Direct Impacts from Noise-C

The City of Modesto limits construction to between the hours of 7:00 am and 9:00 pm daily and forbids the loud and raucous operation of many specific types of construction equipment. Implementation of the following proposed General Plan amendment policies, in conjunction with compliance with the Noise Ordinance, would reduce potential impacts associated with temporary construction noise increases – although these impacts could remain significant and unavoidable.

Noise-3 Construction activities are to comply with Modesto Municipal Code Title 4, Chapter 9.

Noise-4 Implement noise-reducing construction practices as conditions of approval where substantial construction-related noise impacts would be likely to occur, such as with extended periods of pile driving, or where construction is expected to continue or where sensitive receptors would be affected by construction noise. Conditions of approval may include, but are not limited to:

- Require construction equipment, including air compressors and pneumatic equipment to have properly maintained mufflers;
- Require impact tools to be equipped with shrouds or shields;
- Require that the quietest equipment available be used; and,
- Require selection of haul routes that affect the fewest number of people.

Noise-D: Demolition and construction activities facilitated by the Plan may expose persons to excessive vibration levels.

Demolition and construction activities required for projects implemented by the Project may generate perceptible vibration levels when heavy equipment or impact tools (e.g. jackhammers, pile drivers, hoe rams) are used in the vicinity of nearby sensitive land uses.

Table 12 presents typical vibration source levels for construction equipment. Heavy tracked vehicles (e.g., bulldozers or excavators) can generate distinctly perceptible Ground-borne vibration levels when this equipment operates within approximately 25 feet of sensitive land uses. Impact pile drivers can generate distinctly perceptible Ground-borne vibration levels at distances up to about 100 feet, and may exceed building damage thresholds within 25 feet of any building, and within 50 to 100 feet of a historical building, or building in poor condition.

TABLE V.3.15 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft. (in/sec)	Approximate L_v at 25 ft. (VdB)
Pile Driver (Impact)	upper range	1.158	112
	typical	0.644	104
Pile Driver (Sonic)	upper range	0.734	105
	typical	0.170	93
Clam shovel drop		0.202	94
Hydromill (slurry wall)	in soil	0.008	66
	in rock	0.017	75
Vibratory Roller		0.210	94

Hoe Ram	0.089	87
Large bulldozer	0.089	87
Caisson drilling	0.089	87
Loaded trucks	0.076	86
Jackhammer	0.035	79
Small bulldozer	0.003	58

Source: Transit Noise and Vibration Impact Assessment, United States Department of Transportation, Office of Planning and Environment, Federal Transit Administration, May 2006.

General Plan Policies that Reduce Direct Impacts from Noise-D

The following General Plan Noise Policy would reduce the potential for structural damage due to vibration from construction, although such impacts could remain significant and unavoidable if compliance with the mitigating policy is not feasible.

Noise-16 For construction activities involving high-powered vibratory tools or pile driving within 200 feet of an existing structure, demonstrate that project construction would not exceed the Caltrans construction vibration thresholds to ensure that no damage to sensitive structures would occur.

4. Significant Cumulative Impacts

CEQA and the State CEQA Guidelines require the disclosure of the significant cumulative environmental effects, whether the project will make a cumulatively considerable contribution to any such effects, and, if so, mitigation measures intended to reduce the project's contribution (CEQA Guidelines 15130). A cumulative effect is one that results from past, present, and probable future projects. A project which has a less than significant direct effect on the environment may nonetheless make a considerable contribution to a cumulative effect.

A cumulative impact analysis first identifies whether there exists a cumulatively significant effect in the given resource area. If so, it determines whether the project will make a considerable contribution to that effect. Where a cumulative impact is severe, even a small contribution may be considerable. Where a project is required to implement or fund its fair share of a mitigation measure designed to alleviate the cumulative impact, its contribution will be rendered less than considerable (CEQA Guidelines 15130).

Traffic from development in the City of Modesto would contribute, along with traffic from development in surrounding region, toward a cumulative increase in roadside noise levels on major roads and highways throughout the County. Traffic analyses and corresponding traffic noise analyses account for cumulative traffic volumes. The traffic study data includes cumulative traffic volumes, which were utilized as inputs for noise modeling analysis.

Noise projections based on the traffic levels anticipated in the UAGP indicate that noise levels would exceed the UAGP and noise ordinance standards. This is a significant cumulative effect. The development allowable under the proposed General Plan amendment would make a considerable contribution to that effect. The impact(s) is significant and unavoidable.

5. Potential Impacts for Which There is Insufficient Information to Support a Full Analysis

The entirety of future airport operations are not sufficiently known to allow full analysis of impacts and the development of specific mitigation measures, compatible with FAA regulations. Airport noise will be addressed through compliance with regulations and plans as identified under policy Noise-12. Airport and aircraft noise analyses will be conducted in accordance with the Modesto City-County Airport's Master Plan and Federal Aviation Regulation (FAR Part 150). New construction must meet Modesto's noise compatibility standards. As airport operations increase, mitigation will be provided to existing residential and other sensitive users, either through operations or direct property improvements, in order to meet Title 14 Code of Federal Regulations Part 150 land use compatibility guidelines.

C. Policies Adopted to Minimize Significant Effects

The following information is provided in accordance with CEQA Guidelines Section 15126.4.

1. Policies That Reduce Impacts

The applicable UAGP policies, listed above in section V-3.B.3, would assist in reducing noise and vibration levels during construction of future individual projects. Specifically, the most relevant policies include Noise-3 through Noise-11, which would serve to reduce noise levels resulting from construction activities and to reduce interior residential noise levels. Noise-15 and Noise-16 would reduce potential impacts from sources of vibration. These policies would minimize both direct and cumulative impacts.

D. Monitoring Policies that Reduce Impacts

The following information is provided in accordance with PRC Section 211081.6. The policies identified in this Master EIR have been drawn from the proposed UAGP amendment, and they are implemented by that plan. City staff provides the City Council with an annual report on UAGP implementation; therefore, no separate mitigation monitoring program is required for the UAGP Master EIR.