Tentative Tract No. 36911

NOISE IMPACT ANALYSIS

CITY OF MENIFEE

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LIST OF ABBREVIATED TERMS

(1)	Reference
ADT	Average Daily Traffic
ANSI	American National Standards Institute
Calveno	California Vehicle Noise
CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
dBA	A-weighted decibels
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
I-215	Interstate 215
INCE	Institute of Noise Control Engineering
Leq	Equivalent continuous (average) sound level
Lmax	Maximum level measured over the time interval
Lmin	Minimum level measured over the time interval
mph	Miles per hour
PPV	Peak Particle Velocity
Project	Tentative Tract No. 36911
REMEL	Reference Energy Mean Emission Level
RMS	Root-mean-square
VdB	Vibration Decibels

EXECUTIVE SUMMARY

Urban Crossroads, Inc. has prepared this noise study to determine the noise exposure and the necessary noise abatement measures for the proposed Tentative Tract No. 36911 development ("Project"). The Project site is located at the intersection of Valley Boulevard and Chambers Avenue in the City of Menifee. It is our understanding that the Project is proposed to include the development of up to 75 single-family detached residential dwelling units. This noise impact analysis was prepared to satisfy the City of Menifee noise level standards and ensure that adequate noise abatement measures are incorporated into the Project's development.

ON-SITE TRAFFIC NOISE ANALYSIS

To satisfy the City of Menifee 65 dBA CNEL exterior noise level standards for residential land use, the construction of 6-foot high noise barriers for lots 41 to 75 adjacent to Valley Boulevard is required. With the recommended noise barriers shown on Exhibit ES-A, the mitigated future exterior noise levels will range from 58.1 to 62.3 dBA CNEL. This noise analysis shows that the recommended noise barriers will satisfy the City of Menifee 65 dBA CNEL exterior noise level standards for residential land use. The effective noise barrier height recommendations represent the minimum wall and/or berm combination height required to satisfy the City of Menifee exterior noise level standards.

The planned noise control barriers shall be constructed so that the top of each wall and /or berm combination extends to the recommended height above the pad elevation of the lot it is shielding. When the road is elevated above the pad elevation, the barrier shall extend to the recommended height above the highest point between the residential home and the road. The barrier shall provide a weight of at least 4 pounds per square foot of face area with no decorative cutouts or line-of-sight openings between shielded areas and the roadways, and a minimum transmission loss of 20 dBA. (1) The noise barrier shall be constructed using the following materials:

- Masonry block
- Stucco veneer over wood framing (or foam core), or 1-inch-thick tongue and groove wood of sufficient weight per square foot
- Glass (1/4-inch-thick), or other transparent material with sufficient weight per square foot capable of providing a minimum transmission loss of 20 dBA.
- Earthen berm
- Any combination of these construction materials

The barrier shall consist of a solid face from top to bottom. Unnecessary openings or decorative cutouts shall not be made. All gaps (except for weep holes) should be filled with grout or caulking.

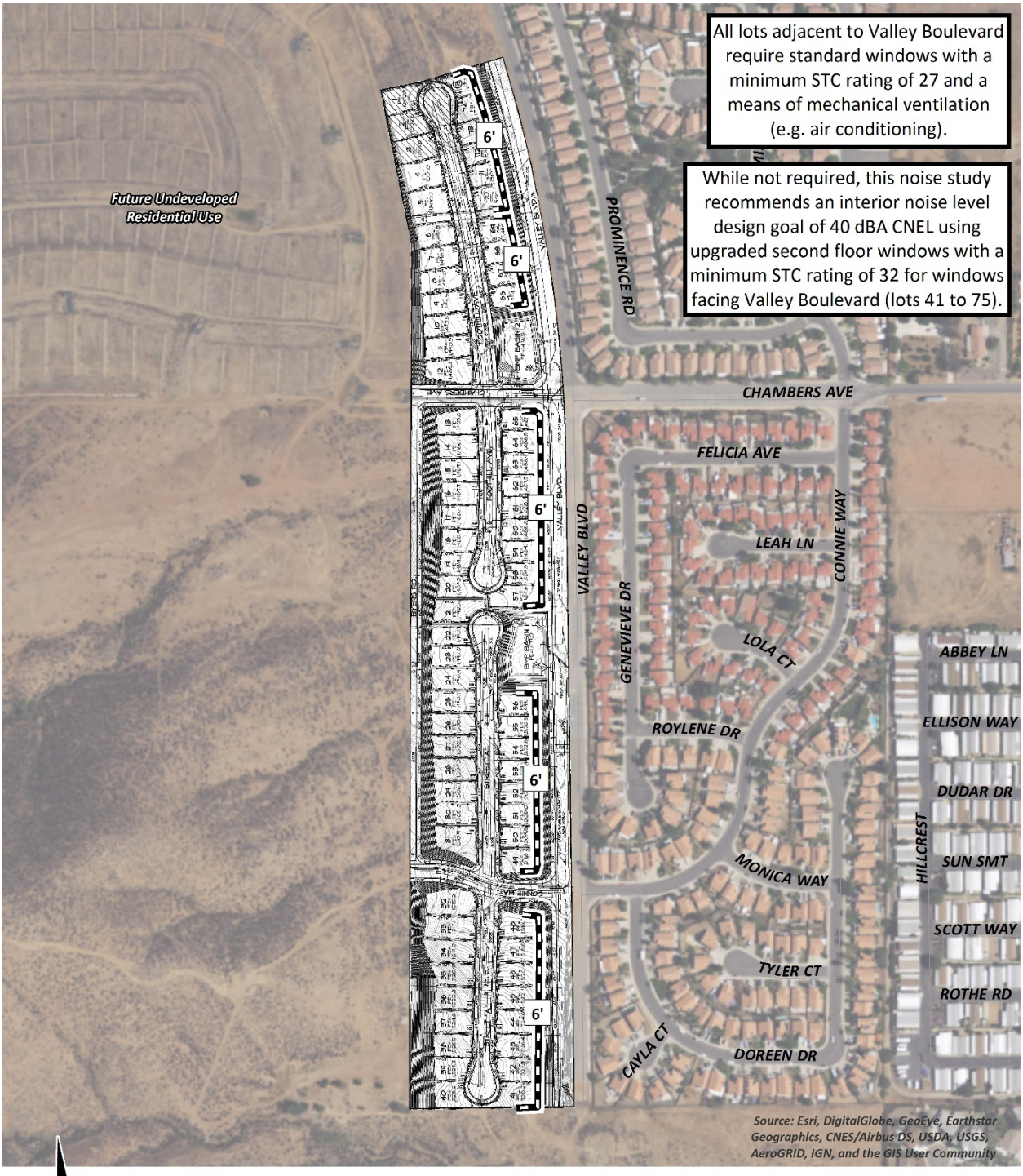
INTERIOR NOISE ABATEMENT

To satisfy the City of Menifee 45 dBA CNEL interior noise level criteria, lots adjacent to Valley Boulevard will require a Noise Reduction (NR) of up to 23.5 dBA and a windows closed condition requiring a means of mechanical ventilation (e.g. air conditioning). To meet the City of Menifee 45 dBA CNEL interior noise standards for residential land use the Project shall provide the following or equivalent noise abatement measures:

- Windows: All windows and sliding glass doors shall be well fitted, well weather-stripped assemblies and shall have a minimum sound transmission class (STC) rating of 27.
- Doors: All exterior doors shall be well weather-stripped and have minimum STC ratings of 25. Well-sealed perimeter gaps around the doors are essential to achieve the optimal STC rating. (2)
- Walls: At any penetrations of exterior walls by pipes, ducts, or conduits, the space between the wall and pipes, ducts, or conduits shall be caulked or filled with mortar to form an airtight seal.
- Residential Roofs: Roof sheathing of wood construction for all lots shall be well fitted or caulked plywood of at least one-half inch thick. Ceilings shall be well fitted, well-sealed gypsum board of at least one-half inch thick. Insulation with at least a rating of R-19 shall be used in the attic space.
- Ventilation: Arrangements for any habitable room shall be such that any exterior door or window can be kept closed when the room is in use and still receive circulated air. A forced air circulation system (e.g. air conditioning) or active ventilation system (e.g. fresh air supply) shall be provided which satisfies the requirements of the Uniform Building Code.

With the interior noise abatement measures provided in this study, the proposed Project is expected to satisfy the City of Menifee 45 dBA CNEL interior noise level standards for residential development. While not required, this noise study recommends an interior noise level design goal of 40 dBA CNEL using upgraded second floor windows with a minimum STC rating of 32 for windows facing Valley Boulevard of lots 41 to 75, as shown on Exhibit ES-A.

EXHIBIT ES-A: SUMMARY OF RECOMMENDATIONS



CONSTRUCTION NOISE AND VIBRATION ANALYSIS

Construction noise represents a short-term increase on the ambient noise levels. Construction-related noise impacts are expected to create temporary and intermittent high-level noise conditions at receivers surrounding the Project site when certain activities occur at the Project site boundary. Using sample reference noise levels to represent the planned construction activities of the Tentative Tract No. 36911 site, this analysis estimates the Project-related construction noise levels at nearby sensitive receiver locations. The construction noise analysis shows that the unmitigated daytime construction activities will satisfy the National Institute for Occupational Safety and Health 85 dBA Leq noise level threshold at all receiver locations, and therefore, the noise level impacts will be *less than significant*.

Construction activity can result in varying degrees of ground vibration, depending on the equipment and methods used, distance to the affected structures and soil type. It is expected that ground-borne vibration from Project construction activities would cause only intermittent, localized intrusion. Based on the reference vibration levels provided by the Federal Transit Administration (FTA), a large bulldozer represents the peak source of vibration with a reference velocity of 87 VdB at 25 feet. At distances ranging from 70 to 761 feet from the Project construction activities, construction vibration velocity levels are expected to approach 73.6 VdB. Based on the FTA vibration standards, the proposed Project site will not include or require equipment, facilities, or activities that would result in a *barely perceptible* human response (annoyance) for infrequent events.

Further, vibration levels at the site of the closest sensitive receiver are unlikely to be sustained during the entire construction period, but will occur rather only during the times that heavy construction equipment is operating close to the Project site perimeter. Moreover, construction at the Project site will be restricted to daytime hours consistent with City requirements thereby eliminating potential vibration impacts during the sensitive nighttime hours.

CONSTRUCTION NOISE AND VIBRATION ABATEMENT MEASURES

Though construction noise is temporary, intermittent and of short duration, and will not present any long-term impacts, the following practices would reduce noise level increases generated by the construction equipment to the nearby noise-sensitive residential land uses.

- Prior to approval of grading plans and/or issuance of building permits, plans shall include a note indicating that noise-generating Project construction activities shall only occur between the hours of 6:00 a.m. and 6:00 p.m. from June to September, and 7:00 a.m. to 6:00 p.m. from October to May, with no activity allowed on Sundays and nationally recognized holidays (Section 9.09.030(B) of the City of Menifee Municipal Code).
- During all Project site construction, the construction contractors shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers, consistent with manufacturers' standards. The construction contractor shall place all stationary construction equipment so that emitted noise is directed away from the noise sensitive receptors nearest the Project site.

- The construction contractor shall locate equipment staging in areas that will create the greatest distance between construction-related noise sources and noise-sensitive receivers nearest the Project site during all Project construction (i.e., to the center).
- The construction contractor shall limit haul truck deliveries to the same hours specified for construction equipment (between the hours of 6:00 a.m. and 6:00 p.m. from June to September, and 7:00 a.m. to 6:00 p.m. from October to May, with no activity allowed on Sundays and nationally recognized holidays). The contractor shall design delivery routes to minimize the exposure of sensitive land uses or residential dwellings to delivery truck-related noise.

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1 INTRODUCTION

This noise analysis has been completed to determine the noise impacts associated with the development of the proposed Tentative Tract No. 36911 ("Project"). This noise study describes the proposed Project, provides information regarding noise fundamentals, outlines the local regulatory setting, provides the study methods and procedures for traffic noise analysis, and evaluates the future exterior noise environment. In addition, this study includes an analysis of the potential Project-related short-term construction noise and vibration impacts.

1.1 SITE LOCATION

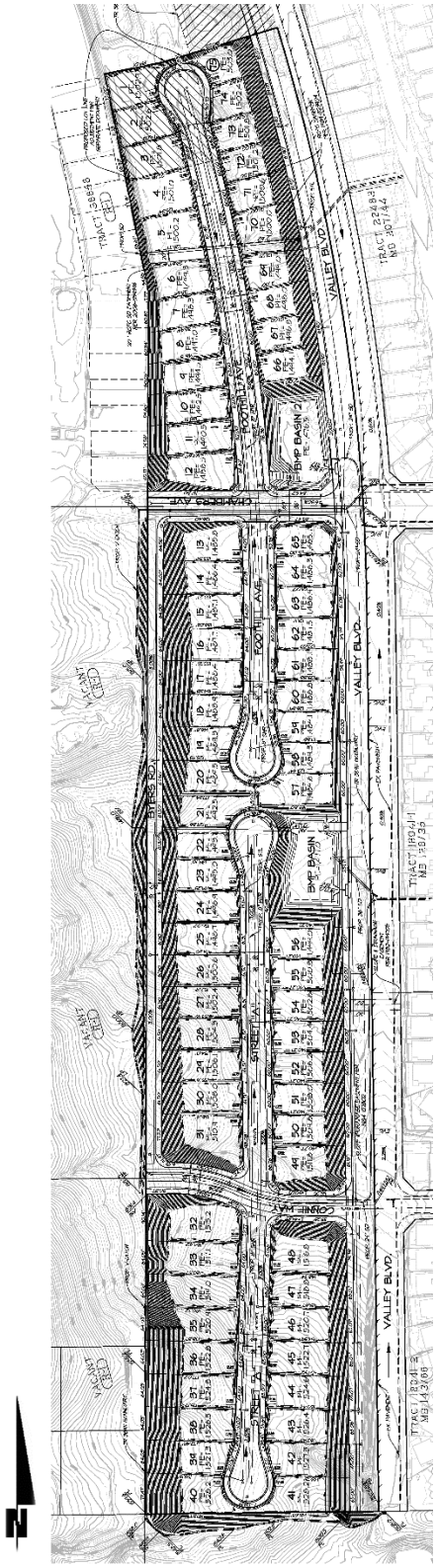
The proposed Tentative Tract No. 36911 Project is located at the intersection of Valley Boulevard and Chambers Avenue in the City of Menifee, as shown on Exhibit 1-A. The Project site is currently vacant. Residential land uses are located east of the Project site. The vacant land uses located north, south, and west of the Project site are designated as Residential. Interstate 215 (I-215) is located approximately 1.3 miles east of the Project site.

1.2 PROJECT DESCRIPTION

It is our understanding that the Project is proposed to include the development of up to 75 single-family detached residential dwelling units, as shown on Exhibit 1-B.

EXHIBIT 1-A: LOCATION MAP

EXHIBIT 1-B: SITE PLAN



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2 FUNDAMENTALS

Noise has been simply defined as "unwanted sound." Sound becomes unwanted when it interferes with normal activities, when it causes actual physical harm or when it has adverse effects on health. Noise is measured on a logarithmic scale of sound pressure level known as a decibel (dB). A-weighted decibels (dBA) approximate the subjective response of the human ear to broad frequency noise source by discriminating against very low and very high frequencies of the audible spectrum. They are adjusted to reflect only those frequencies which are audible to the human ear. Exhibit 2-A presents a summary of the typical noise levels and their subjective loudness and effects that are described in more detail below.

EXHIBIT 2-A: TYPICAL NOISE LEVELS

COMMON OUTDOOR ACTIVITIES	COMMON INDOOR ACTIVITIES	A - WEIGHTED SOUND LEVEL dBA	SUBJECTIVE LOUDNESS	EFFECTS OF NOISE
THRESHOLD OF PAIN		140	INTOLERABLE OR DEAFENING	HEARING LOSS
NEAR JET ENGINE		130		
		120		
JET FLY-OVER AT 300m (1000 ft)	ROCK BAND	110		
LOUD AUTO HORN		100	VERY NOISY	
GAS LAWN MOWER AT 1m (3 ft)		90		
DIESEL TRUCK AT 15m (50 ft), at 80 km/hr (50 mph)	FOOD BLENDER AT 1m (3 ft)	80		SPEECH INTERFERENCE
NOISY URBAN AREA, DAYTIME	VACUUM CLEANER AT 3m (10 ft)	70	LOUD	
HEAVY TRAFFIC AT 90m (300 ft)	NORMAL SPEECH AT 1m (3 ft)	60		
QUIET URBAN DAYTIME	LARGE BUSINESS OFFICE	50	MODERATE	SLEEP DISTURBANCE
QUIET URBAN NIGHTTIME	THEATER, LARGE CONFERENCE ROOM (BACKGROUND)	40		
QUIET SUBURBAN NIGHTTIME	LIBRARY	30	FAINT	NO EFFECT
QUIET RURAL NIGHTTIME	BEDROOM AT NIGHT, CONCERT HALL (BACKGROUND)	20		
	BROADCAST/RECORDING STUDIO	10	VERY FAINT	
LOWEST THRESHOLD OF HUMAN HEARING	LOWEST THRESHOLD OF HUMAN HEARING	0		

Source: Environmental Protection Agency Office of Noise Abatement and Control, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety (EPA/ONAC 550/9-74-004) March 1974.

2.1 RANGE OF NOISE

Since the range of intensities that the human ear can detect is so large, the scale frequently used to measure intensity is a scale based on multiples of 10, the logarithmic scale. The scale for measuring intensity is the decibel scale. Each interval of 10 decibels indicates a sound energy ten times greater than before, which is perceived by the human ear as being roughly twice as loud. (3) The most common sounds vary between 40 dBA (very quiet) to 100 dBA (very loud). Normal conversation at three feet is roughly at 60 dBA, while loud jet engine noises equate to 110 dBA

at approximately 100 feet, which can cause serious discomfort. (4) Another important aspect of noise is the duration of the sound and the way it is described and distributed in time.

2.2 NOISE DESCRIPTORS

Environmental noise descriptors are generally based on averages, rather than instantaneous, noise levels. The most commonly used figure is the equivalent level (Leq). Equivalent sound levels are not measured directly but are calculated from sound pressure levels typically measured in A-weighted decibels (dBA). The equivalent sound level (Leq) represents a steady state sound level containing the same total energy as a time varying signal over a given sample period and is commonly used to describe the "average" noise levels within the environment.

Peak hour or average noise levels, while useful, do not completely describe a given noise environment. Noise levels lower than peak hour may be disturbing if they occur during times when quiet is most desirable, namely evening and nighttime (sleeping) hours. To account for this, the Day-Night Average Noise Level (LDN) and the Community Noise Equivalent Level (CNEL), representing a composite 24-hour noise level is utilized. The LDN and CNEL are weighted averages of the intensity of a sound, with corrections for time of day, and averaged over 24 hours. The LDN time of day corrections include the addition of 10 decibels to dBA Leq sound levels at night between 10:00 p.m. and 7:00 a.m. The CNEL time of day corrections require the addition of 5 decibels to dBA Leq sound levels in the evening from 7:00 p.m. to 10:00 p.m., in addition to the corrections for the LDN. These additions are made to account for the noise sensitive time periods during the evening and night hours when sound appears louder. LDN and CNEL do not represent the actual sound level heard at any time, but rather represent the total sound exposure. The City of Menifee relies on the 24-hour CNEL level to assess land use compatibility with transportation related noise sources, and therefore, this analysis uses the CNEL noise level to apply the more conservative evening hour corrections to the 24-hour noise levels.

2.3 SOUND PROPAGATION

When sound propagates over a distance, it changes in level and frequency content. The way noise reduces with distance depends on the following factors.

2.3.1 GEOMETRIC SPREADING

Sound from a localized source (i.e., a stationary point source) propagates uniformly outward in a spherical pattern. The sound level attenuates (or decreases) at a rate of 6 dB for each doubling of distance from a point source. Highways consist of several localized noise sources on a defined path and hence can be treated as a line source, which approximates the effect of several point sources. Noise from a line source propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of 3 dB for each doubling of distance from a line source. (5)

2.3.2 GROUND ABSORPTION

The propagation path of noise from a highway to a receptor is usually very close to the ground. Noise attenuation from ground absorption and reflective wave canceling adds to the attenuation associated with geometric spreading. Traditionally, the excess attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is usually sufficiently accurate for distances of less than 200 ft. For acoustically hard sites (i.e., sites with a reflective surface between the source and the receptor, such as a parking lot or body of water), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface between the source and the receptor such as soft dirt, grass, or scattered bushes and trees), an excess ground attenuation value of 1.5 dB per doubling of distance is normally assumed. When added to the cylindrical spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 dB per doubling of distance from a line source. (6)

2.3.3 ATMOSPHERIC EFFECTS

Receptors located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lowered noise levels. Sound levels can be increased at large distances (e.g., more than 500 feet) due to atmospheric temperature inversion (i.e., increasing temperature with elevation). Other factors such as air temperature, humidity, and turbulence can also have significant effects. (5)

2.3.4 SHIELDING

A large object or barrier in the path between a noise source and a receptor can substantially attenuate noise levels at the receptor. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Shielding by trees and other such vegetation typically only has an “out of sight, out of mind” effect. That is, the perception of noise impact tends to decrease when vegetation blocks the line-of-sight to nearby resident. However, for vegetation to provide a substantial, or even noticeable, noise reduction, the vegetation area must be at least 15 feet in height, 100 feet wide and dense enough to completely obstruct the line-of sight between the source and the receiver. This size of vegetation may provide up to 5 dBA of noise reduction. The FHWA does not consider the planting of vegetation to be a noise abatement measure. (6)

2.4 NOISE CONTROL

Noise control is the process of obtaining an acceptable noise environment for an observation point or receptor by controlling the noise source, transmission path, receptor, or all three. This concept is known as the source-path-receptor concept. In general, noise control measures can be applied to any and all of these three elements.

2.5 NOISE BARRIER ATTENUATION

Effective noise barriers can reduce noise levels by 10 to 15 dBA, cutting the loudness of traffic noise in half. A noise barrier is most effective when placed close to the noise source or receptor. Noise barriers, however, do have limitations. For a noise barrier to work, it must be high enough and long enough to block the path of the noise source. (6)

2.6 LAND USE COMPATIBILITY WITH NOISE

Some land uses are more tolerant of noise than others. For example, schools, hospitals, churches and residences are more sensitive to noise intrusion than are commercial or industrial developments and related activities. As ambient noise levels affect the perceived amenity or livability of a development, so too can the mismanagement of noise impacts impair the economic health and growth potential of a community by reducing the area's desirability as a place to live, shop and work. For this reason, land use compatibility with the noise environment is an important consideration in the planning and design process. The FHWA encourages State and Local government to regulate land development in such a way that noise-sensitive land uses are either prohibited from being located adjacent to a highway, or that the developments are planned, designed, and constructed in such a way that noise impacts are minimized. (7)

2.7 COMMUNITY RESPONSE TO NOISE

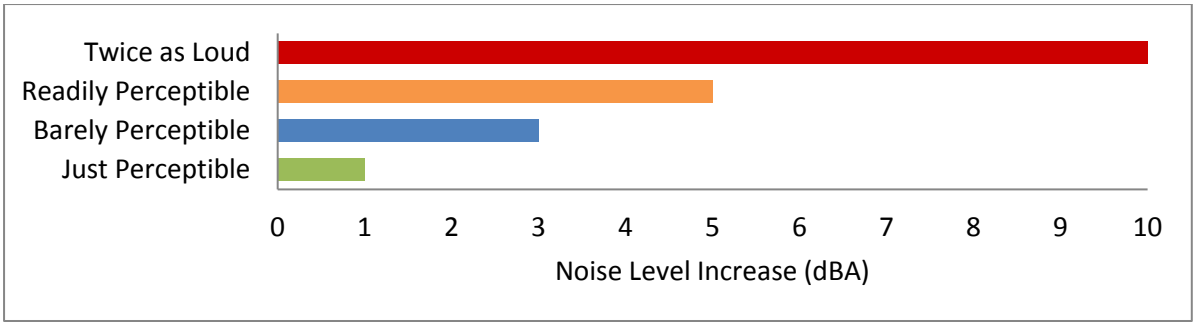
Community responses to noise may range from registering a complaint by telephone or letter, to initiating court action, depending upon each individual's susceptibility to noise and personal attitudes about noise. Several factors are related to the level of community annoyance including:

- Fear associated with noise producing activities;
- Socio-economic status and educational level;
- Perception that those affected are being unfairly treated;
- Attitudes regarding the usefulness of the noise-producing activity;
- Belief that the noise source can be controlled.

Approximately ten percent of the population has a very low tolerance for noise and will object to any noise not of their making. Consequently, even in the quietest environment, some complaints will occur. Another twenty-five percent of the population will not complain even in very severe noise environments. Thus, a variety of reactions can be expected from people exposed to any given noise environment. (8) Surveys have shown that about ten percent of the people exposed to traffic noise of 60 dBA will report being highly annoyed with the noise, and each increase of one dBA is associated with approximately two percent more people being highly annoyed. When traffic noise exceeds 60 dBA or aircraft noise exceeds 55 dBA, people may begin to complain. (8)

Despite this variability in behavior on an individual level, the population can be expected to exhibit the following responses to changes in noise levels as shown on Exhibit 2-B. An increase or decrease of 1 dBA cannot be perceived except in carefully controlled laboratory experiments, a change of 3 dBA are considered *barely perceptible*, and changes of 5 dBA are considered *readily perceptible*. (6)

EXHIBIT 2-B: NOISE LEVEL INCREASE PERCEPTION



2.8 EXPOSURE TO HIGH NOISE LEVELS

The Occupational Safety and Health Administration (OSHA) sets legal limits on noise exposure in the workplace. The permissible exposure limit (PEL) for a worker over an eight-hour day is 90 dBA. The OSHA standard uses a 5 dBA exchange rate. This means that when the noise level is increased by 5 dBA, the amount of time a person can be exposed to a certain noise level to receive the same dose is cut in half. The National Institute for Occupational Safety and Health (NIOSH) has recommended that all worker exposures to noise should be controlled below a level equivalent to 85 dBA for eight hours to minimize occupational noise induced hearing loss. NIOSH also recommends a 3 dBA exchange rate so that every increase by 3 dBA doubles the amount of the noise and halves the recommended amount of exposure time. (9)

OSHA has implemented requirements to protect all workers in general industry (e.g. the manufacturing and the service sectors) for employers to implement a Hearing Conservation Program where workers are exposed to a time weighted average noise level of 85 dBA or higher over an eight-hour work shift. Hearing Conservation Programs require employers to measure noise levels, provide free annual hearing exams and free hearing protection, provide training, and conduct evaluations of the adequacy of the hearing protectors in use unless changes to tools, equipment and schedules are made so that they are less noisy and worker exposure to noise is less than the 85 dBA. This noise study does not evaluate the noise exposure of workers within a project or construction site based on CEQA requirements, and instead, evaluates Project-related operational and construction noise levels at the nearby sensitive receiver locations in the Project study area. Further, periodic exposure to high noise levels in short duration, such as Project construction, is typically considered an annoyance and not impactful to human health. It would take several years of exposure to high noise levels to result in hearing impairment. (10)

2.9 VIBRATION

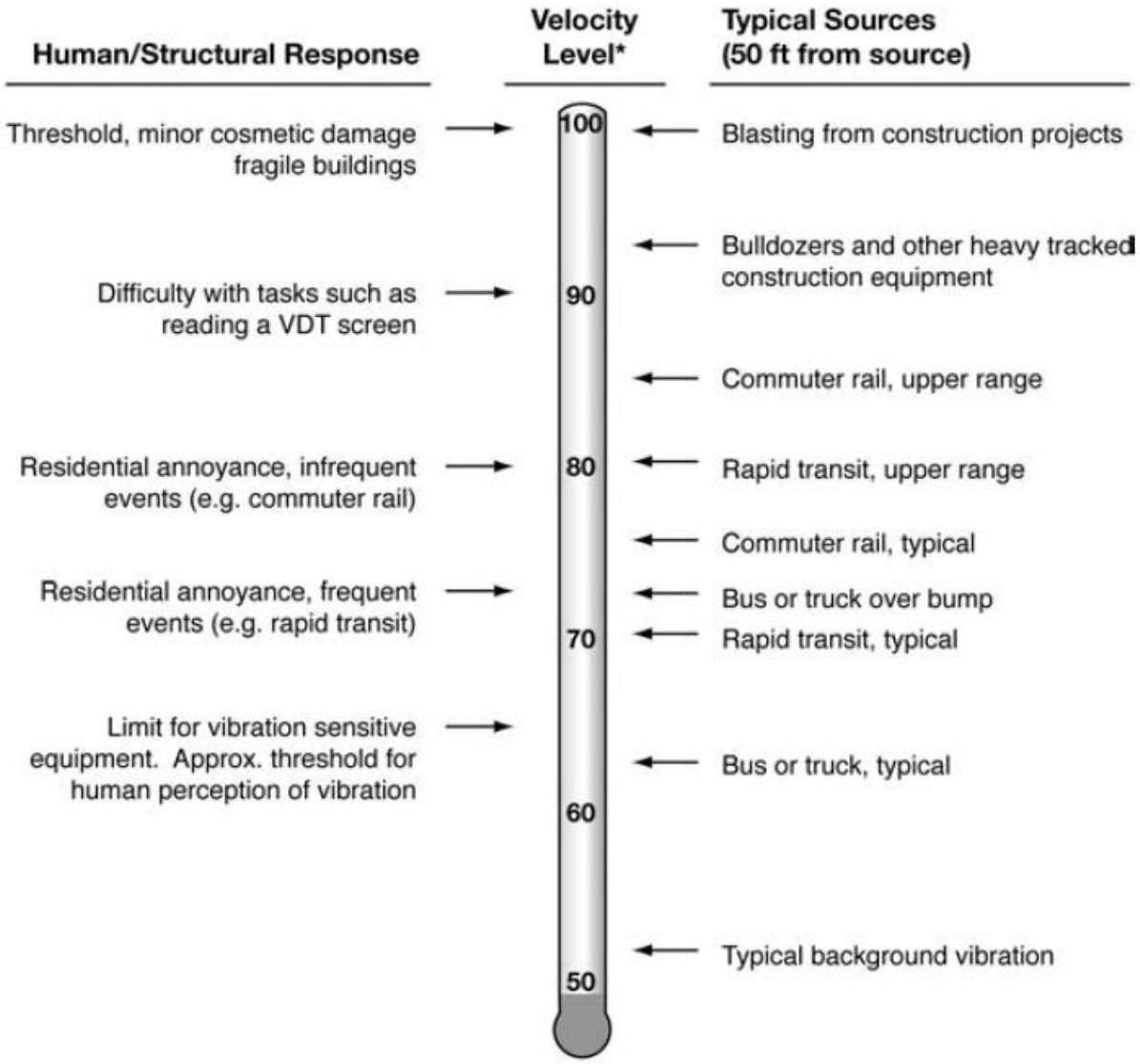
According to the Federal Transit Administration (FTA) *Transit Noise Impact and Vibration Assessment* (11), vibration is the periodic oscillation of a medium or object. The rumbling sound caused by the vibration of room surfaces is called structure-borne noise. Sources of ground-borne vibrations include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) or human-made causes (e.g., explosions, machinery, traffic, trains, construction equipment). Vibration sources may be continuous, such as factory machinery, or transient, such

as explosions. As is the case with airborne sound, ground-borne vibrations may be described by amplitude and frequency.

There are several different methods that are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts to buildings, but is not always suitable for evaluating human response (annoyance) because it takes some time for the human body to respond to vibration signals. Instead, the human body responds to average vibration amplitude often described as the root mean square (RMS). The RMS amplitude is defined as the average of the squared amplitude of the signal, and is most frequently used to describe the effect of vibration on the human body. Decibel notation (VdB) is commonly used to measure RMS. Decibel notation (VdB) serves to reduce the range of numbers used to describe human response to vibration. Typically, ground-borne vibration generated by man-made activities attenuates rapidly with distance from the source of the vibration. Sensitive receivers for vibration include structures (especially older masonry structures), people (especially residents, the elderly, and sick), and vibration-sensitive equipment.

The background vibration-velocity level in residential areas is generally 50 VdB. Ground-borne vibration is normally perceptible to humans at approximately 65 VdB. For most people, a vibration-velocity level of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels. Typical outdoor sources of perceptible ground-borne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the ground-borne vibration is rarely perceptible. The range of interest is from approximately 50 VdB, which is the typical background vibration-velocity level, to 100 VdB, which is the general threshold where minor damage can occur in fragile buildings. Exhibit 2-C illustrates common vibration sources and the human and structural response to ground-borne vibration.

EXHIBIT 2-C: TYPICAL LEVELS OF GROUND-BORNE VIBRATION



** RMS Vibration Velocity Level in VdB relative to 10^{-6} inches/second*

Source: Federal Transit Administration (FTA) Transit Noise Impact and Vibration Assessment.

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3 REGULATORY SETTING

To limit population exposure to physically and/or psychologically damaging as well as intrusive noise levels, the federal government, the State of California, various county governments, and most municipalities in the state have established standards and ordinances to control noise. In most areas, automobile and truck traffic is the major source of environmental noise. Traffic activity generally produces an average sound level that remains constant with time. Air and rail traffic, and commercial and industrial activities are also major sources of noise in some areas. Federal, state, and local agencies regulate different aspects of environmental noise. Federal and state agencies generally set noise standards for mobile sources such as aircraft and motor vehicles, while regulation of stationary sources is left to local agencies.

3.1 STATE OF CALIFORNIA NOISE REQUIREMENTS

The State of California regulates freeway noise, sets standards for sound transmission, provides occupational noise control criteria, identifies noise standards and provides guidance for local land use compatibility. State law requires that each county and city adopt a General Plan that includes a Noise Element which is to be prepared per guidelines adopted by the Governor's Office of Planning and Research. (12) The purpose of the Noise Element is to *limit the exposure of the community to excessive noise levels*. In addition, the California Environmental Quality Act (CEQA) requires that all known environmental effects of a project be analyzed, including the potential environmental noise impacts.

3.2 STATE OF CALIFORNIA BUILDING CODE

The State of California's noise insulation standards are codified in the California Code of Regulations, Title 24, Building Standards Administrative Code, Part 2, and the California Building Code. These noise standards are applied to new construction in California for controlling interior noise levels resulting from exterior noise sources. The regulations specify that acoustical studies must be prepared when noise-sensitive structures, such as residential buildings, schools, or hospitals, are developed near major transportation noise sources, and where such noise sources create an exterior noise level of 60 dBA CNEL or higher. Acoustical studies that accompany building plans for noise-sensitive land uses must demonstrate that the structure has been designed to limit interior noise in habitable rooms to acceptable noise levels. For new residential buildings, schools, and hospitals, the acceptable interior noise limit for new construction is 45 dBA CNEL.

3.3 CITY OF MENIFEE GENERAL PLAN NOISE ELEMENT

The City of Menifee has adopted a Noise Element of the General Plan to control and abate environmental noise, and to protect the citizens of City of Menifee from excessive exposure to noise. (13) The Noise Element specifies the maximum allowable unmitigated exterior noise levels for new developments impacted by transportation noise sources such as arterial roads, freeways, airports, and railroads. In addition, the Noise Element identifies several polices to minimize the impacts of excessive noise levels throughout the community, and establishes noise level

requirements for all land uses. To protect City of Menifee residents from excessive noise, the Noise Element contains the following goal related to the Project:

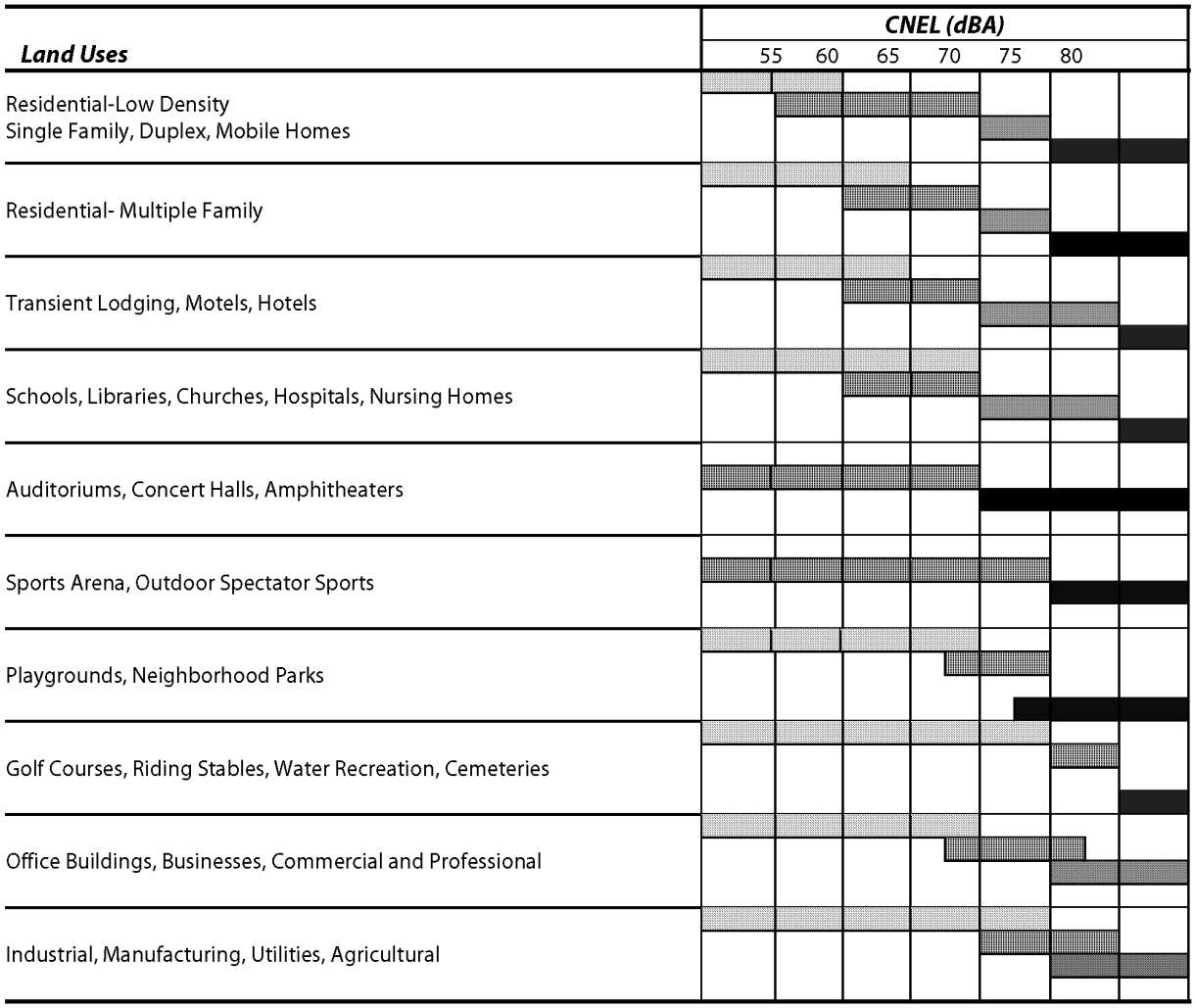
N-1 Noise-sensitive land uses are protected from excessive noise and vibration exposure.

The noise policies specified in the City of Menifee Noise Element provide the guidelines necessary to satisfy this goal. Policy N-1.2 states that new developments are required to *comply with the noise standards of local, regional, and state building code regulations*, including the City's Municipal Code, Title 24 of the California code of Regulations, and the California Green Building Code, and this analysis has been prepared to satisfy the 45 dBA CNEL interior noise level standards of the Title 24 of the California Code of Regulations, previously discussed in Section 3.2. The Noise Element provides Policy N-1.11 to reduce excessive noise impacts from transportation and discourages the siting of noise-sensitive uses in areas in excess of 65 dBA CNEL without appropriate mitigation. (13)

The noise criteria identified in the City of Menifee Noise Element are guidelines to evaluate the land use compatibility of transportation related noise. The compatibility criteria, shown on Exhibit 3-A, provides the City with a planning tool to gauge the compatibility of land uses relative to existing and future exterior noise levels. Per the City's *Noise Element Background Document and Definitions*, *Land Use Compatibility for Community Noise Environments* (Table N-b3), the single-family residential land use within the Project is considered *normally acceptable* with noise levels below 60 dBA CNEL. *Conditionally acceptable* single-family residential land uses experience noise levels approaching 70 dBA CNEL. For *conditionally acceptable* land use, *new construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and the needed noise insulation features are included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.*

Consistent with the land use compatibility guidelines and Noise Element Policy N-1.11, this noise study has been prepared to satisfy an exterior noise level of less than 65 dBA CNEL for single-family residential land use. An interior noise level of less than 45 dBA CNEL shall be required for residential uses within the Project. The 65 dBA CNEL exterior noise standards typically apply to outdoor areas where people congregate. In the case of residential projects, the standards typically apply to private yards of single-family homes and first floor patio areas for multi-family units.

EXHIBIT 3-A: LAND USE COMPATIBILITY FOR COMMUNITY NOISE ENVIRONMENTS



Source: California Office of Noise Control. Guidelines for the Preparation and Content of Noise Elements of the General Plan. February 1976. Adapted from the US EPA Office of Noise Abatement Control, Washington D.C. Community Noise. Prepared by Wyle Laboratories. December 1971.

Source: City of Menifee General Plan, Noise Background Document and Definitions, Table N-b3.

3.4 CONSTRUCTION NOISE STANDARDS

To control noise impacts associated with the construction of the proposed Project, the City has established limits to the hours of operation. Section 9.09.030(B) of the City's Municipal Code indicates that private construction projects, located within one-quarter of a mile from an occupied residence, are considered exempt from the Municipal Code noise standards if they occur within the permitted hours of 6:00 a.m. and 6:00 p.m. from June to September, and 7:00 a.m. to 6:00 p.m. from October to May, with no activity allowed on Sundays and nationally recognized holidays. (14) However, the City's General Plan and Municipal Code do not establish numeric maximum acceptable construction source noise levels at potentially affected receivers, which would allow for a quantified determination of what CEQA constitutes as the *generation of noise levels in excess of standards* or as a *substantial temporary or periodic noise increase*, the following construction noise level thresholds are used in this noise study.

3.4.1 CONSTRUCTION NOISE LEVEL COMPLIANCE THRESHOLD

To evaluate whether the Project will generate potentially significant temporary construction noise levels at off-site sensitive receiver locations, a construction-related noise level threshold is adopted from the *Criteria for Recommended Standard: Occupational Noise Exposure* prepared by the National Institute for Occupational Safety and Health (NIOSH). (15) A division of the U.S. Department of Health and Human Services, NIOSH identifies a noise level threshold based on the duration of exposure to the source. The construction related noise level threshold starts at 85 dBA for more than eight hours per day, and for every 3 dBA increase, the exposure time is cut in half. This results in noise level thresholds of 88 dBA for more than four hours per day, 92 dBA for more than one hour per day, 96 dBA for more than 30 minutes per day, and up to 100 dBA for more than 15 minutes per day. (15) For the purposes of this analysis, the lowest, more conservative construction noise level threshold of 85 dBA Leq is used as an acceptable threshold for construction noise at the nearby sensitive receiver locations. Since this construction-related noise level threshold represents the energy average of the noise source over a given time period, they are expressed as Leq noise levels. Therefore, the noise level threshold of 85 dBA Leq over a period of eight hours or more is used to evaluate the potential Project-related construction noise level impacts at the nearby sensitive receiver locations.

3.4.2 CONSTRUCTION-RELATED HEARING CONSERVATION

The Occupational Safety and Health Administration (OSHA) requires hearing protection be provided by employers in workplaces where the noise levels may, over long periods of exposure to high noise levels, endanger the hearing of their employees. Standard 29 CFR, Part 1910 indicates the noise levels under which a hearing conservation program is required to be provided to workers exposed to high noise levels. (9) This analysis does not evaluate the noise exposure of construction workers within the Project site based on CEQA requirements, and instead, evaluates the Project-related construction noise levels at the nearby sensitive receiver locations in the Project study area. Further, periodic exposure to high noise levels in short duration, such as Project construction, is typically considered an annoyance and not impactful to human health. It would take several years of exposure to high noise levels to result in hearing impairment. (10)

3.5 CONSTRUCTION VIBRATION STANDARDS

The City of Menifee has not identified or adopted vibration standards. However, the United States Department of Transportation Federal Transit Administration (FTA) provides guidelines for maximum-acceptable vibration criteria for different types of land uses. These guidelines allow 80 VdB for residential uses and buildings where people normally sleep. (16)

Construction activity can result in varying degrees of ground-borne vibration, depending on the equipment and methods used, distance to the affected structures and soil type. Construction vibration is generally associated with pile driving and rock blasting. Other construction equipment such as air compressors, light trucks, hydraulic loaders, etc., generates little or no ground vibration. Occasionally large bulldozers and loaded trucks can cause perceptible vibration levels at close proximity. While not enforceable regulations within the City of Menifee, the FTA guidelines of 80 VdB for sensitive land uses provide the basis for determining the relative significance of potential Project-related vibration impacts.

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4 EXISTING NOISE LEVEL MEASUREMENTS

To assess the existing noise level environment, three 24-hour noise level measurements were taken at sensitive receiver locations in the Project study area. The receiver locations were selected to describe and document the existing noise environment within the Project study area. Exhibit 4-A provides the boundaries of the Project study area and the noise level measurement locations. To fully describe the existing noise conditions, noise level measurements were collected by Urban Crossroads, Inc. on Wednesday, June 1st, 2017. Appendix 4.1 includes study area photos.

4.1 MEASUREMENT PROCEDURE AND CRITERIA

To describe the existing noise environment, the hourly noise levels were measured during typical weekday conditions over a 24-hour period. By collecting individual hourly noise level measurements, it is possible to describe the daytime and nighttime hourly noise levels and calculate the 24-hour CNEL. The long-term noise readings were recorded using Piccolo Type 2 integrating sound level meter and dataloggers. The Piccolo sound level meters were calibrated using a Larson-Davis calibrator, Model CAL 150. All noise meters were programmed in "slow" mode to record noise levels in "A" weighted form. The sound level meters and microphones were equipped with a windscreen during all measurements. All noise level measurement equipment satisfies the American National Standards Institute (ANSI) standard specifications for sound level meters ANSI S1.4-2014/IEC 61672-1:2013. (17)

4.2 NOISE MEASUREMENT LOCATIONS

The long-term noise level measurements were positioned as close to the nearest sensitive receiver locations as possible to assess the existing ambient hourly noise levels surrounding the Project site. Both Caltrans and the FTA recognize that it is not reasonable to collect noise level measurements that can fully represent any part of a private yard, patio, deck, or balcony normally used for human activity when estimating impacts for new development projects. This is demonstrated in the Caltrans general site location guidelines which indicate that, *sites must be free of noise contamination by sources other than sources of interest. Avoid sites located near sources such as barking dogs, lawnmowers, pool pumps, and air conditioners unless it is the express intent of the analyst to measure these sources*. (5) Further, FTA guidance states, t*hat it is not necessary nor recommended that existing noise exposure be determined by measuring at every noise-sensitive location in the project area. Rather, the recommended approach is to characterize the noise environment for clusters of sites based on measurements or estimates at representative locations in the community*. (11)

Based on recommendations of Caltrans and the FTA, it is not necessary to collect measurements at each individual building or residence, because each receiver measurement represents a group of buildings that share acoustical equivalence. (11) In other words, the area represented by the receiver shares similar shielding, terrain, and geometric relationship to the reference noise source. Receivers represent a location of noise sensitive areas and are used to estimate the future noise level impacts. Collecting reference ambient noise level measurements at the nearby

sensitive receiver locations allows for a comparison of the before and after Project noise levels and is necessary to assess potential noise impacts due to the Project's contribution to the ambient noise levels.

4.3 NOISE MEASUREMENT RESULTS

The noise measurements presented below focus on the average or equivalent sound levels (Leq). The equivalent sound level (Leq) represents a steady state sound level containing the same total energy as a time varying signal over a given sample period. Table 4-1 identifies the hourly daytime (7:00 a.m. to 10:00 p.m.) and nighttime (10:00 p.m. to 7:00 a.m.) noise levels at each noise level measurement location. Appendix 4.2 provides a summary of the existing hourly ambient noise levels described below:

- Location L1 represents the noise levels north of the Project site at the southeast corner of Thornton Avenue and Valley Boulevard near existing residential homes. The noise level measurements collected show an overall 24-hour exterior noise level of 54.4 dBA CNEL. The hourly noise levels measured at location L1 ranged from 42.8 to 58.6 dBA Leq during the daytime hours and from 39.3 to 48.0 dBA Leq during the nighttime hours. The energy (logarithmic) average daytime noise level was calculated at 51.9 dBA Leq with an average nighttime noise level of 45.9 dBA Leq.
- Location L2 represents the noise levels east of the Project site across Valley Boulevard adjacent to existing residential homes. The noise level measurements collected show an overall 24-hour exterior noise level of 59.6 dBA CNEL. The hourly noise levels measured at location L2 ranged from 49.2 to 64.6 dBA Leq during the daytime hours and from 53.3 to 59.9 dBA Leq during the nighttime hours. The energy (logarithmic) average daytime noise level was calculated at 59.6 dBA Leq with an average nighttime noise level of 56.8 dBA Leq.
- Location L3 represents the noise levels east of the Project site across Valley Boulevard adjacent to existing residential homes. The 24-hour CNEL indicates that the overall exterior noise level is 58.5 dBA CNEL. At location L3 the background ambient noise levels ranged from 52.6 to 56.7 dBA Leq during the daytime hours to levels of 44.2 to 55.7 dBA Leq during the nighttime hours. The energy (logarithmic) average daytime noise level was calculated at 55.1 dBA Leq with an average nighttime noise level of 50.4 dBA Leq.

Table 4-1 provides the (energy average) noise levels used to describe the daytime and nighttime ambient conditions. These daytime and nighttime energy average noise levels represent the average of all hourly noise levels observed during these time periods expressed as a single number. Appendix 4.2 provides summary worksheets of the noise levels for each hour as well as the minimum, maximum, L_1, L_2, L_5, L_8, L_{25}, L_{50}, L_{90}, L_{95}, and L_{99} percentile noise levels observed during the daytime and nighttime periods.

The background ambient noise levels in the Project study area are dominated by the transportation-related noise associated with the arterial roadway network. The 24-hour existing noise level measurements shown on Table 4-1 present the existing ambient noise conditions.

TABLE 4-1: 24-HOUR AMBIENT NOISE LEVEL MEASUREMENTS

Location[1]	Distance to Project Boundary (Feet)	Description	Energy Average Hourly Noise Level (dBA Leq)[2]		CNEL
			Daytime	Nighttime	
L1	330'	Located north of the Project site at the southeast corner of Thornton Avenue and Valley Boulevard near existing residential homes.	51.9	45.9	54.4
L2	80'	Located east of the Project site across Valley Boulevard adjacent to existing residential homes.	59.6	56.8	63.8
L3	50'	Located east of the Project site across Valley Boulevard adjacent to existing residential homes.	55.1	50.4	58.5

[1] See Exhibit 5-A for the noise level measurement locations.
[2] Energy (logarithmic) average hourly levels. The long-term 24-hour measurement printouts are included in Appendix 5.2.
"Daytime" = 7:00 a.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.

EXHIBIT 4-A: NOISE MEASUREMENT LOCATIONS

5 METHODS AND PROCEDURES

The following section outlines the methods and procedures used to model and analyze the future traffic noise environment.

5.1 FHWA TRAFFIC NOISE PREDICTION MODEL

The estimated roadway noise impacts from vehicular traffic were calculated using a computer program that replicates the Federal Highway Administration (FHWA) Traffic Noise Prediction Model- FHWA-RD-77-108. (18) The FHWA Model arrives at a predicted noise level through a series of adjustments to the Reference Energy Mean Emission Level (REMEL). In California the national REMELs are substituted with the California Vehicle Noise (Calveno) Emission Levels. (19) Adjustments are then made to the REMEL to account for: the roadway classification (e.g., collector, secondary, major or arterial), the roadway active width (i.e., the distance between the center of the outermost travel lanes on each side of the roadway), the total average daily traffic (ADT), the travel speed, the percentages of automobiles, medium trucks, and heavy trucks in the traffic volume, the roadway grade, the angle of view (e.g., whether the roadway view is blocked), the site conditions ("hard" or "soft" relates to the absorption of the ground, pavement, or landscaping), and the percentage of total ADT which flows each hour throughout a 24-hour period.

5.2 ON-SITE TRAFFIC NOISE PREDICTION MODEL INPUTS

The on-site roadway parameters including the ADT volumes used for this analysis are presented on Table 5-1. Based on the City of Menifee General Plan Circulation Element, Exhibit C-3, Valley Boulevard classified as a 4-lane Arterial. (20) To predict the future on-site noise environment at the Project site, the City of Menifee General Plan Circulation Element Traffic Impact Analysis future daily roadway capacity traffic volumes were used. (21) The traffic volumes shown on Table 5-1 reflect future long-range traffic conditions needed to assess the future on-site traffic noise environment and to identify potential abatement measures (if any) that address the worst-case future conditions. For the purposes of this analysis, soft site conditions were used to analyze the on-site traffic noise impacts for the Project study area. Soft site conditions account for the sound propagation loss over natural surfaces such as normal earth and ground vegetation. Research conducted by Caltrans has shown that the use of soft site conditions is appropriate for the application of the FHWA traffic noise prediction model used in this analysis. (22)

Table 5-2 presents the time of day vehicle splits by vehicle type, and Table 5-3 presents the total traffic flow distributions (vehicle mixes) used for this analysis. The vehicle mix provides the hourly distribution percentages of automobile, medium trucks, and heavy trucks for input into the FHWA Model based on roadway types.

TABLE 5-1: ON-SITE ROADWAY PARAMETERS

Roadway	Lanes	Classification[1]	Average Daily Traffic Volume[2]	Speed Limits (mph)[3]	Site Conditions
Valley Bl.	4	Arterial	35,900	45	Soft

[1] Source: City of Menifee General Plan Circulation Element, Exhibit C-3.
[2] Source: City of Menifee General Plan Circulation Element Traffic Study, Table 2-1.
[3] Speed limit is based on the Ordinance No. 2008-16 speed limit for Valley Boulevard south of McCall Boulevard.

To predict the future noise environment at lots within the Project site, coordinate information was collected to identify the noise transmission path between the noise source and receiver. The coordinate information is based on the Project site plan showing the plotting of the residential lots in relationship to Valley Boulevard as shown in Appendix 5.1.

The exterior noise level impacts at the outdoor living area receivers were placed five feet above the pad elevation and ten feet from the proposed barrier location or at the proposed building façade if less than ten feet from the proposed barrier location. Second floor receiver locations are located at 14 feet above the proposed finish floor elevations.

TABLE 5-2: TIME OF DAY VEHICLE SPLITS

Time Period	Vehicle Type		
	Autos	Medium Trucks	Heavy Trucks
Daytime (7:00 a.m. - 7:00 p.m.)	77.5%	84.8%	86.5%
Evening (7:00 p.m. - 10:00 p.m.)	12.9%	4.9%	2.7%
Nighttime (10:00 p.m. - 7:00 a.m.)	9.6%	10.3%	10.8%
Total:	100.0%	100.0%	100.0%

TABLE 5-3: DISTRIBUTION OF TRAFFIC FLOW BY VEHICLE TYPE (VEHICLE MIX)

Roadway	Total % Traffic Flow			Total
	Autos	Medium Trucks	Heavy Trucks	
All Roadways	97.42%	1.84%	0.74%	100.00%

5.3 VIBRATION ASSESSMENT

This analysis focuses on the potential ground-borne vibration associated with vehicular traffic and construction activities. Ground-borne vibration levels from automobile traffic are generally overshadowed by vibration generated by heavy trucks that roll over the same uneven roadway surfaces. However, due to the rapid drop-off rate of ground-borne vibration and the short duration of the associated events, vehicular traffic-induced ground-borne vibration is rarely

perceptible beyond the roadway right-of-way, and rarely results in vibration levels that cause damage to buildings in the vicinity.

However, while vehicular traffic is rarely perceptible, construction has the potential to result in varying degrees of temporary ground vibration, depending on the specific construction activities and equipment used. Ground vibration levels associated with various types of construction equipment are summarized on Table 5-4. Based on the representative vibration levels presented for various construction equipment types, it is possible to estimate the human response (annoyance) using the following vibration assessment methods defined by the FTA. To describe the human response (annoyance) associated with vibration impacts the FTA provides the following equation (16): $L_{VdB}(D) = L_{VdB}(25\ ft) - 30\log(D/25)$

TABLE 5-4: VIBRATION SOURCE LEVELS FOR CONSTRUCTION EQUIPMENT

Equipment	Vibration Decibels (VdB) at 25 feet
Small bulldozer	58
Jackhammer	79
Loaded Trucks	86
Large bulldozer	87

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

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6 ON-SITE TRANSPORTATION NOISE IMPACTS

An on-site exterior noise impact analysis has been completed to determine the traffic noise exposure and to identify potential necessary noise abatement measures for the proposed Tentative Tract No. 36911 Project. It is expected that the primary source of noise impacts to the Project site will be traffic noise from Valley Boulevard. The Project will also experience some background traffic noise impacts from the Project's internal local streets, however, due to the low traffic volume/speeds, traffic noise from these roads will not make a significant contribution to the noise environment beyond of the right-of-way of the roadways.

6.1 ON-SITE EXTERIOR NOISE ANALYSIS

Using the FHWA traffic noise prediction model and the parameters outlined in Tables 5-1 to 5-3, the expected future exterior noise levels at the outdoor living areas (backyards) of the single-family residential lots were calculated. Table 6-1 presents a summary of future exterior noise level impacts in the outdoor living areas (backyards) of lots facing Valley Boulevard. The on-site traffic noise level impacts indicate that the lots facing Valley Boulevard will experience unmitigated exterior noise levels ranging from 67.1 to 69.4 dBA CNEL. The on-site traffic noise analysis calculations are provided in Appendix 6.1.

To satisfy the City of Menifee 65 dBA CNEL exterior noise level standards for residential land use, the construction of 6-foot high noise barriers for lots 41 to 75 adjacent to Valley Boulevard is required. With the recommended noise barriers shown on Exhibit ES-A, the mitigated future exterior noise levels will range from 58.1 to 62.3 dBA CNEL. This noise analysis shows that the recommended noise barriers will satisfy the City of Menifee 65 dBA CNEL exterior noise level standards for residential land use. The effective noise barrier height recommendations represent the minimum wall and/or berm combination height required to satisfy the City of Menifee exterior noise level standards.

TABLE 6-1: EXTERIOR NOISE LEVELS (CNEL)

Lot Number	Roadway	Unmitigated Noise Level (dBA CNEL)	Mitigated Noise Level (dBA CNEL)	Barrier Height (Feet)	Top of Barrier Elevation (Feet)
42	Valley Bl.	67.1	58.1	6.0'	1533.0'
48	Valley Bl.	67.8	59.1	6.0'	1522.0'
54	Valley Bl.	67.3	58.7	6.0'	1508.0'
62	Valley Bl.	69.4	62.3	6.0'	1493.0'
75	Valley Bl.	67.4	58.9	6.0	1509.0

6.2 ON-SITE INTERIOR NOISE ANALYSIS

To ensure that the interior noise levels comply with the City of Menifee interior noise level standards, future noise levels were calculated at the first and second-floor building facades.

6.2.1 NOISE REDUCTION METHODOLOGY

The interior noise level is the difference between the predicted exterior noise level at the building facade and the noise reduction of the structure. Typical building construction will provide a Noise Reduction (NR) of approximately 12 dBA with "windows open" and a minimum 25 dBA noise reduction with "windows closed." However, sound leaks, cracks and openings within the window assembly can greatly diminish its effectiveness in reducing noise. Several methods are used to improve interior noise reduction, including: (1) weather-stripped solid core exterior doors; (2) upgraded dual glazed windows; (3) mechanical ventilation/air conditioning; and (4) exterior wall/roof assembles free of cut outs or openings.

6.2.2 INTERIOR NOISE LEVEL ASSESSMENT

To provide the necessary interior noise level reduction, Table 6-2 indicates that lots facing Valley Boulevard will require a windows closed condition and a means of mechanical ventilation (e.g. air conditioning). Table 6-2 shows that the future unmitigated noise levels at the first-floor building façade are expected to range from 56.8 to 61.4 dBA CNEL, and standard windows with a minimum STC rating of 27 will satisfy the City of Menifee 45 dBA CNEL interior noise level standards. Table 6-3 shows that the future unmitigated noise levels at the second-floor building façade are expected to range from 66.4 to 68.5 dBA CNEL, and standard windows with a minimum STC rating of 27 will satisfy the City of Menifee 45 dBA CNEL interior noise level standards. The interior noise analysis shows that with the recommended interior noise abatement measures described in the Executive Summary the Project will satisfy the City of Menifee 45 dBA CNEL interior noise level standards for residential development. While not required, this noise study recommends an interior noise level design goal of 40 dBA CNEL using upgraded second floor windows with a minimum STC rating of 32 for windows facing Valley Boulevard of lots 41 to 75, as shown on Exhibit ES-A.

TABLE 6-2: FIRST FLOOR INTERIOR NOISE IMPACTS (CNEL)

Lot Number	Noise Level at Façade[1]	Required Interior Noise Reduction[2]	Estimated Interior Noise Reduction[3]	Upgraded Windows[4]	Interior Noise Level[5]
42	56.8	11.8	25.0	No	31.8
48	57.8	12.8	25.0	No	32.8
54	57.5	12.5	25.0	No	32.5
62	61.4	16.4	25.0	No	36.4
75	57.6	12.6	25.0	No	32.6

[1] Exterior noise level at the facade with a windows closed condition requiring a means of mechanical ventilation (e.g. air conditioning).
[2] Noise reduction required to satisfy the 45 dBA CNEL interior noise standards.
[3] A minimum of 25 dBA noise reduction is assumed with standard building construction.
[4] Does the required interior noise reduction trigger upgraded windows with a minimum STC rating of greater than 27?
[5] Estimated interior noise level with minimum STC rating for all windows.

TABLE 6-3: SECOND FLOOR INTERIOR NOISE IMPACTS (CNEL)

Lot Number	Noise Level at Façade[1]	Required Interior Noise Reduction[2]	Estimated Interior Noise Reduction[3]	Upgraded Windows[4]	Interior Noise Level[5]
42	66.4	21.4	25.0	No	41.4
48	67.0	22.0	25.0	No	42.0
54	66.6	21.6	25.0	No	41.6
62	68.5	23.5	25.0	No	43.5
75	66.6	21.6	25.0	No	41.6

[1] Exterior noise level at the facade with a windows closed condition requiring a means of mechanical ventilation (e.g. air conditioning).
[2] Noise reduction required to satisfy the 45 dBA CNEL interior noise standards.
[3] A minimum of 25 dBA noise reduction is assumed with standard building construction.
[4] Does the required interior noise reduction trigger upgraded windows with a minimum STC rating of greater than 27?
[5] Estimated interior noise level with minimum STC rating for all windows.

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7 RECEIVER LOCATIONS

To assess the potential for short-term construction noise impacts, the following five receiver locations as shown on Exhibit 7-A were identified as representative locations for focused analysis. Sensitive receivers are generally defined as locations where people reside or where the presence of unwanted sound could otherwise adversely affect the use of the land. Noise-sensitive land uses are generally considered to include: schools, hospitals, single-family dwellings, mobile home parks, churches, libraries, and recreation areas. Moderately noise-sensitive land uses typically include: multi-family dwellings, hotels, motels, dormitories, out-patient clinics, cemeteries, golf courses, country clubs, athletic/tennis clubs, and equestrian clubs. Land uses that are considered relatively insensitive to noise include business, commercial, and professional developments. Land uses that are typically not affected by noise include: industrial, manufacturing, utilities, agriculture, natural open space, undeveloped land, parking lots, warehousing, liquid and solid waste facilities, salvage yards, and transit terminals.

Sensitive receivers near the Project site include the existing single-family residential homes located at receiver locations R1 to R4, and future, undeveloped residential use at location R5. Other sensitive land uses in the Project study area that are located at greater distances than those identified in this noise study will experience lower noise levels than those presented in this report due to the additional attenuation from distance and the shielding of intervening structures.

R1: Located approximately 237 feet north of the Project site, R1 represents existing residential homes on Prominence Road.

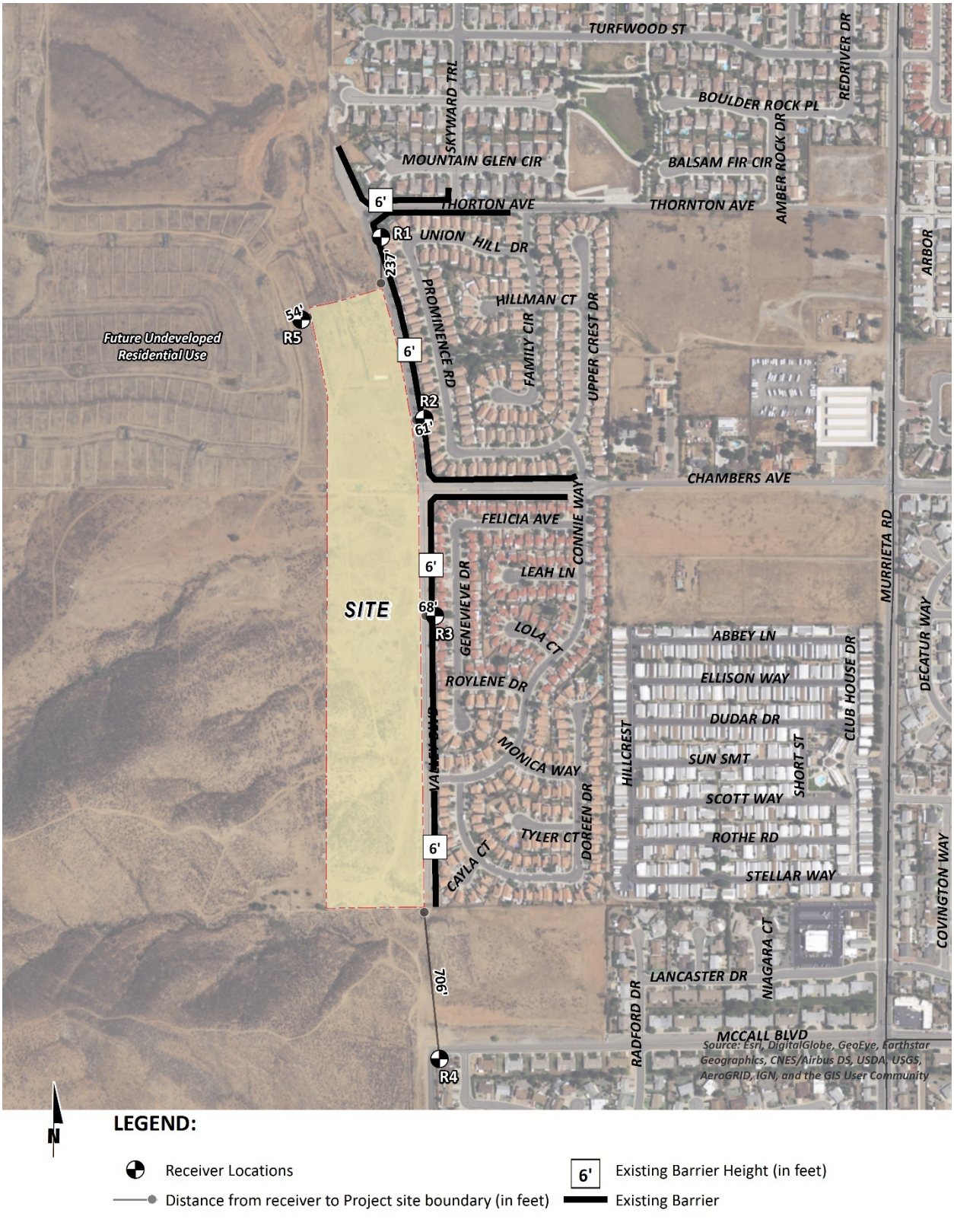
R2: Located approximately 61 feet east of the Project site, R2 represents the existing residential homes on Prominence Road across Valley Boulevard.

R3: Location R3 represents the existing single-family residential homes located roughly 68 feet east of the Project site on Genevieve Drive.

R4: Located approximately 706 feet south of the Project site, R4 represents the existing residential homes south of McCall Boulevard.

R5: Location R5 represents the future, undeveloped single-family residential homes planned roughly 54 feet west of the Project site.

EXHIBIT 7-A: RECEIVER LOCATIONS



8 CONSTRUCTION IMPACTS

This section analyzes potential impacts at the sensitive receiver locations, previously identified in Section 7, resulting from the short-term construction activities associated with the development of the Project.

8.1 CONSTRUCTION NOISE LEVELS

Noise generated by the Project construction equipment will include a combination of trucks, power tools, concrete mixers and portable generators that when combined can reach high levels. The number and mix of construction equipment is expected to occur in the following stages:

- Site Preparation
- Grading
- Building Construction
- Paving
- Architectural Coating

This construction noise analysis was prepared using reference noise level measurements taken by Urban Crossroads, Inc. to describe typical construction activity noise levels. Noise levels generated by heavy construction equipment can approach roughly 80 dBA when measured at 50 feet. Hard site conditions are used in the construction noise analysis which result in noise levels that attenuate (or decrease) at a rate of 6 dBA for each doubling of distance from a point source (construction equipment). For example, a noise level of 80 dBA measured at 50 feet from the noise source to the receiver would be reduced to 74 dBA at 100 feet from the source to the receiver, and would be further reduced to 68 dBA at 200 feet from the source to the receiver. The construction stages used in this analysis are consistent with the data used to support the construction emissions in *Tentative Tract No. 36911 Air Quality Impact Analysis* prepared by Urban Crossroads, Inc. (23)

8.2 CONSTRUCTION REFERENCE NOISE LEVELS

To describe the Project construction noise levels, measurements were collected for similar activities at several construction sites. The short-term reference noise level measurements were collected using Type 1 and Type 2 sound level meters, including a Larson Davis SoundTrack LxT Type 1 precision sound level meter and Piccolo Type 2 sound level meters. Table 8-1 shows the durations of each reference noise level measurement during actual activity of each piece(s) of equipment, and as such, do not include any periods of inactivity for the given construction equipment and/or activity being described. All noise meters were programmed in "slow" mode to record noise levels in "A" weighted form. The sound level meters and microphones were equipped with a windscreen during all measurements. All noise level measurement equipment satisfies the American National Standards Institute (ANSI) standard specifications for sound level meters ANSI S1.4-2014/IEC 61672-1:2013. (17)

TABLE 8-1: CONSTRUCTION REFERENCE NOISE LEVELS

ID	Noise Source	Reference Meas. Duration (h:mm:ss)	Reference Distance From Source (Feet)	Reference Noise Levels @ Reference Distance (dBA Leq)	Reference Noise Levels @ 50 Feet (dBA Leq)[6]
1	Truck Pass-Bys & Dozer Activity[1]	0:01:15	30'	63.6	59.2
2	Dozer Activity[1]	0:01:00	30'	68.6	64.2
3	Construction Vehicle Maintenance Activities[2]	0:01:00	30'	71.9	67.5
4	Foundation Trenching[2]	0:01:01	30'	72.6	68.2
5	Rough Grading Activities[2]	0:05:00	30'	77.9	73.5
6	Residential Framing[3]	0:02:00	30'	66.7	62.3
7	Water Truck Pass-By & Backup Alarm[4]	0:00:45	30'	76.3	71.9
8	Dozer Pass-By[4]	0:00:32	30'	84.0	79.6
9	Two Scrapers & Water Truck Pass-By[4]	0:00:32	30'	83.4	79.0
10	Two Scrapers Pass-By[4]	0:00:30	30'	83.7	79.3
11	Scraper, Water Truck, & Dozer Activity[4]	0:30:00	30'	79.7	75.3
12	Concrete Mixer Truck Movements[5]	0:01:00	50'	71.2	71.2
13	Concrete Paver Activities[5]	0:01:00	30'	70.0	65.6
14	Concrete Mixer Pour & Paving Activities[5]	0:01:00	30'	70.3	65.9
15	Concrete Mixer Backup Alarms & Air Brakes[5]	0:00:20	50'	71.6	71.6
16	Concrete Mixer Pour Activities[5]	1:00:00	50'	67.7	67.7

[1] As measured by Urban Crossroads, Inc. on 10/14/15 at a business park construction site located at the northwest corner of Barranca Parkway and Alton Parkway in the City of Irvine.
[2] As measured by Urban Crossroads, Inc. on 10/20/15 at a construction site located in Rancho Mission Viejo.
[3] As measured by Urban Crossroads, Inc. on 10/20/15 at a residential construction site located in Rancho Mission Viejo.
[4] As measured by Urban Crossroads, Inc. on 10/30/15 during grading operations within an industrial construction site located in the City of Ontario.
[5] Reference noise level measurements were collected from a nighttime concrete pour at an industrial construction site, located at 27334 San Bernardino Avenue in the City of Redlands, between 1:00 a.m. to 2:00 a.m. on 7/1/15.
[6] Reference noise levels are calculated at 50 feet using a drop off rate of 6 dBA per doubling of distance (point source).

8.3 CONSTRUCTION NOISE ANALYSIS

Tables 8-2 to 8-6 show the reference construction equipment noise levels during each stage of Project construction and provides a summary of the noise levels at each of the sensitive receiver locations. Based on the reference construction noise levels, the Project-related construction noise levels when the peak reference noise level is operating at a single point nearest the sensitive receiver location will range from 50.9 to 65.0 dBA Leq at the sensitive receiver locations, as shown on Table 8-7.

TABLE 8-2: SITE PREPARATION EQUIPMENT NOISE LEVELS

Reference Construction Activity[1]	Reference Noise Level @ 50 Feet (dBA Leq)
Truck Pass-Bys & Dozer Activity	59.2
Dozer Activity	64.2
Dozer Pass-By	79.6
Peak Reference Noise Level at 50 Feet (dBA Leq):	79.6

Receiver Location	Distance To Construction Activity (Feet)[2]	Distance Attenuation (dBA Leq)[3]	Estimated Noise Barrier Attenuation (dBA Leq)[4]	Construction Noise Level (dBA Leq)
R1	298'	-15.5	-5.0	59.1
R2	150'	-9.5	-5.0	65.0
R3	152'	-9.7	-5.0	64.9
R4	761'	-23.6	-5.0	50.9
R5	70'	-2.9	-5.0	71.6

[1] Reference construction noise level measurements taken by Urban Crossroads, Inc.
[2] Distance from the nearest point of construction activity to the nearest receiver.
[3] Point (stationary) source drop off rate of 6.0 dBA per doubling of distance.
[4] Estimated barrier/berm attenuation from existing barriers/berms in the Project study area. Future undeveloped residential use at location R5 is anticipated to have a 6-foot high perimeter wall between it and the Project site.

TABLE 8-3: GRADING EQUIPMENT NOISE LEVELS

Reference Construction Activity[1]	Reference Noise Level @ 50 Feet (dBA Leq)
Truck Pass-Bys & Dozer Activity	59.2
Dozer Activity	64.2
Rough Grading Activities	73.5
Dozer Pass-By	79.6
Two Scrapers Pass-By	79.3
Peak Reference Noise Level at 50 Feet (dBA Leq):	79.6

Receiver Location	Distance To Construction Activity (Feet)[2]	Distance Attenuation (dBA Leq)[3]	Estimated Noise Barrier Attenuation (dBA Leq)[4]	Construction Noise Level (dBA Leq)
R1	298'	-15.5	-5.0	59.1
R2	150'	-9.5	-5.0	65.0
R3	152'	-9.7	-5.0	64.9
R4	761'	-23.6	-5.0	50.9
R5	70'	-2.9	-5.0	71.6

[1] Reference construction noise level measurements taken by Urban Crossroads, Inc.
[2] Distance from the nearest point of construction activity to the nearest receiver.
[3] Point (stationary) source drop off rate of 6.0 dBA per doubling of distance.
[4] Estimated barrier/berm attenuation from existing barriers/berms in the Project study area. Future undeveloped residential use at location R5 is anticipated to have a 6-foot high perimeter wall between it and the Project site.

TABLE 8-4: BUILDING CONSTRUCTION EQUIPMENT NOISE LEVELS

Reference Construction Activity[1]	Reference Noise Level @ 50 Feet (dBA Leq)
Construction Vehicle Maintenance Activities	67.5
Foundation Trenching	68.2
Residential Framing	62.3
Peak Reference Noise Level at 50 Feet (dBA Leq):	68.2

Receiver Location	Distance To Construction Activity (Feet)[2]	Distance Attenuation (dBA Leq)[3]	Estimated Noise Barrier Attenuation (dBA Leq)[4]	Construction Noise Level (dBA Leq)
R1	298'	-15.5	-5.0	47.7
R2	150'	-9.5	-5.0	53.6
R3	152'	-9.7	-5.0	53.5
R4	761'	-23.6	-5.0	39.5
R5	70'	-2.9	-5.0	60.2

[1] Reference construction noise level measurements taken by Urban Crossroads, Inc.
[2] Distance from the nearest point of construction activity to the nearest receiver.
[3] Point (stationary) source drop off rate of 6.0 dBA per doubling of distance.
[4] Estimated barrier/berm attenuation from existing barriers/berms in the Project study area. Future undeveloped residential use at location R5 is anticipated to have a 6-foot high perimeter wall between it and the Project site.

TABLE 8-5: PAVING EQUIPMENT NOISE LEVELS

Reference Construction Activity[1]	Reference Noise Level @ 50 Feet (dBA Leq)
Concrete Mixer Truck Movements	71.2
Concrete Paver Activities	65.6
Concrete Mixer Pour & Paving Activities	65.9
Concrete Mixer Backup Alarms & Air Brakes	71.6
Concrete Mixer Pour Activities	67.7
Peak Reference Noise Level at 50 Feet (dBA Leq):	71.6

Receiver Location	Distance To Construction Activity (Feet)[2]	Distance Attenuation (dBA Leq)[3]	Estimated Noise Barrier Attenuation (dBA Leq)[4]	Construction Noise Level (dBA Leq)
R1	298'	-15.5	-5.0	51.1
R2	150'	-9.5	-5.0	57.1
R3	152'	-9.7	-5.0	56.9
R4	761'	-23.6	-5.0	43.0
R5	70'	-2.9	-5.0	63.7

[1] Reference construction noise level measurements taken by Urban Crossroads, Inc.
[2] Distance from the nearest point of construction activity to the nearest receiver.
[3] Point (stationary) source drop off rate of 6.0 dBA per doubling of distance.
[4] Estimated barrier/berm attenuation from existing barriers/berms in the Project study area. Future undeveloped residential use at location R5 is anticipated to have a 6-foot high perimeter wall between it and the Project site.

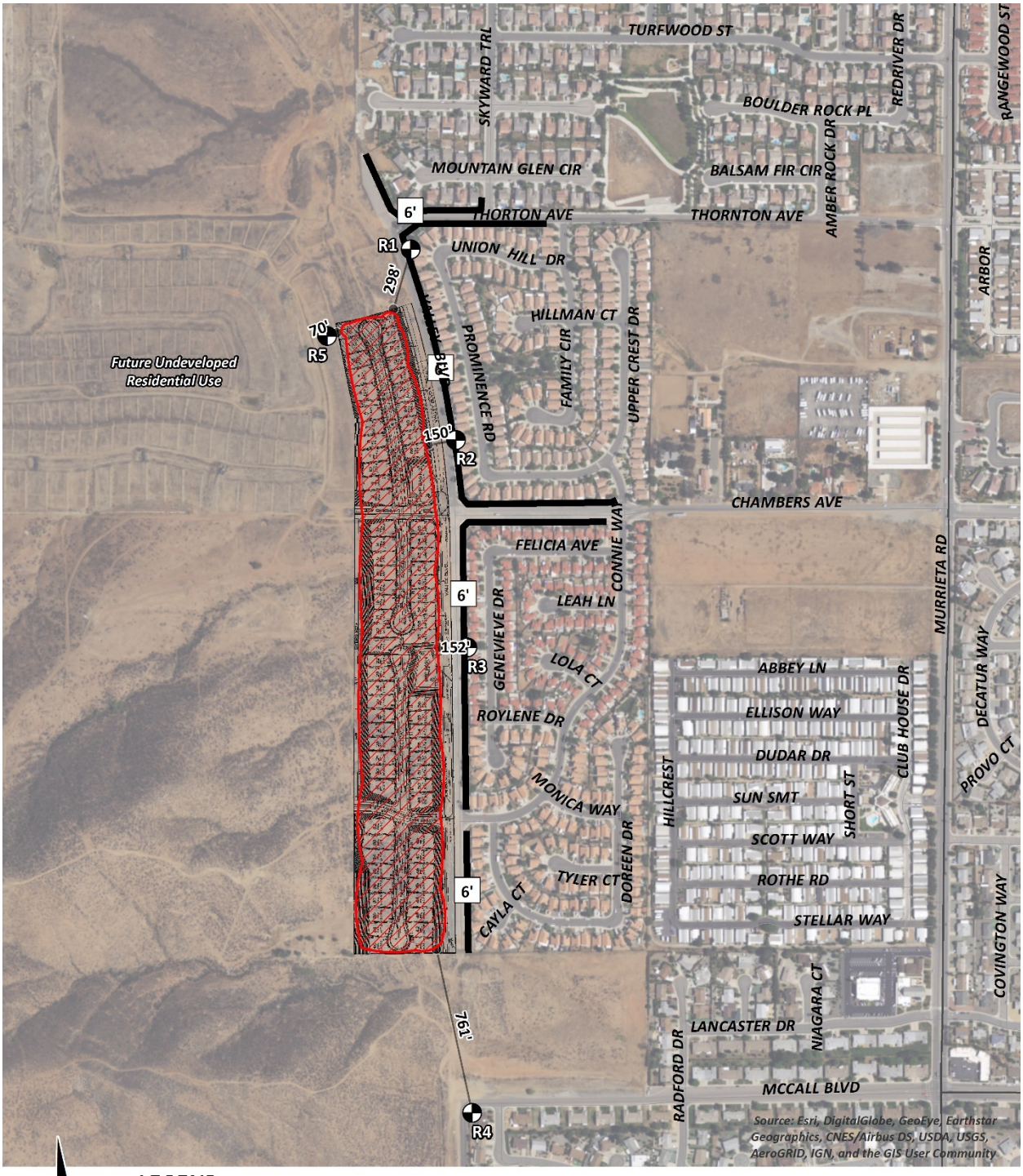
TABLE 8-6: ARCHITECTURAL COATING EQUIPMENT NOISE LEVELS

Reference Construction Activity[1]	Reference Noise Level @ 50 Feet (dBA Leq)
Construction Vehicle Maintenance Activities	67.5
Peak Reference Noise Level at 50 Feet (dBA Leq):	67.5

Receiver Location	Distance To Construction Activity (Feet)[2]	Distance Attenuation (dBA Leq)[3]	Estimated Noise Barrier Attenuation (dBA Leq)[4]	Construction Noise Level (dBA Leq)
R1	298'	-15.5	-5.0	47.0
R2	150'	-9.5	-5.0	52.9
R3	152'	-9.7	-5.0	52.8
R4	761'	-23.6	-5.0	38.8
R5	70'	-2.9	-5.0	59.5

[1] Reference construction noise level measurements taken by Urban Crossroads, Inc.
[2] Distance from the nearest point of construction activity to the nearest receiver.
[3] Point (stationary) source drop off rate of 6.0 dBA per doubling of distance.
[4] Estimated barrier/berm attenuation from existing barriers/berms in the Project study area. Future undeveloped residential use at location R5 is anticipated to have a 6-foot high perimeter wall between it and the Project site.

EXHIBIT 8-A: CONSTRUCTION ACTIVITY AND RECEIVER LOCATIONS



8.4 CONSTRUCTION NOISE LEVEL COMPLIANCE

The construction noise analysis shows that the highest construction noise levels will occur when construction activities take place near the edge of the Project site. As shown on Table 8-7, the unmitigated construction noise levels are expected to range from 50.9 to 65.0 dBA Leq at the sensitive receiver locations, which will satisfy the 85 dBA Leq significance threshold during temporary Project construction activities.

TABLE 8-7: CONSTRUCTION NOISE LEVEL SUMMARY (DBA LEQ)

Receiver Location[1]	Construction Phase Hourly Noise Level (dBA Leq)					
	Site Preparation	Grading	Building Construction	Paving	Architectural Coating	Peak Activity[2]
R1	59.1	59.1	47.7	51.1	47.0	59.1
R2	65.0	65.0	53.6	57.1	52.9	65.0
R3	64.9	64.9	53.5	56.9	52.8	64.9
R4	50.9	50.9	39.5	43.0	38.8	50.9
R5	71.6	71.6	60.2	63.7	59.5	71.6

[1] Noise receiver locations are shown on Exhibit 8-A.
[2] Estimated construction noise levels during peak operating conditions.

8.5 CONSTRUCTION VIBRATION IMPACTS

Construction activity can result in varying degrees of ground vibration, depending on the equipment and methods used, distance to the affected structures and soil type. It is expected that ground-borne vibration from Project construction activities would cause only intermittent, localized intrusion. The proposed Project's construction activities most likely to cause vibration impacts are:

- Heavy Construction Equipment: Although all heavy mobile construction equipment has the potential of causing at least some perceptible vibration while operating close to building, the vibration is usually short-term and is not of sufficient magnitude to cause building damage. It is not expected that heavy equipment such as large bulldozers would operate close enough to any residences to cause a vibration impact.
- Trucks: Trucks hauling building materials to construction sites can be sources of vibration intrusion if the haul routes pass through residential neighborhoods on streets with bumps or potholes. Repairing the bumps and potholes generally eliminates the problem.

Ground-borne vibration levels resulting from construction activities occurring within the Project site were estimated by data published by the Federal Transit Administration. Construction activities that would have the potential to generate low levels of ground-borne vibration within the Project site include grading. Using the vibration source level of construction equipment provided on Table 5-4 and the construction vibration assessment methodology published by the

FTA, it is possible to estimate the Project vibration impacts. Table 8-8 presents the expected Project related vibration levels at each of the sensitive receiver locations.

Based on the reference vibration levels provided by the FTA, a large bulldozer represents the peak source of vibration with a reference velocity of 87 VdB at 25 feet. At distances ranging from 70 to 761 feet from the Project construction activities, construction vibration velocity levels are expected to approach 73.6 VdB, as shown on Table 8-8. Based on the FTA vibration standards, the proposed Project site will not include or require equipment, facilities, or activities that would result in a *barely perceptible* human response (annoyance) for infrequent events.

Further, vibration levels at the site of the closest sensitive receiver are unlikely to be sustained during the entire construction period, but will occur rather only during the times that heavy construction equipment is operating close to the Project site perimeter. Moreover, construction at the Project site will be restricted to daytime hours consistent with City requirements thereby eliminating potential vibration impacts during the sensitive nighttime hours.

TABLE 8-8: CONSTRUCTION EQUIPMENT VIBRATION LEVELS

Receiver Location[1]	Distance to Construction Activity (Feet)	Receiver Vibration Levels (VdB)[2]					Threshold Exceeded?[3]
		Small Bulldozer	Jackhammer	Loaded Trucks	Large Bulldozer	Peak Vibration	
R1	298'	25.7	46.7	53.7	54.7	54.7	No
R2	150'	34.7	55.7	62.7	63.7	63.7	No
R3	152'	34.5	55.5	62.5	63.5	63.5	No
R4	761'	13.5	34.5	41.5	42.5	42.5	No
R5	70'	44.6	65.6	72.6	73.6	73.6	No

[1] Noise receiver locations are shown on Exhibit 8-A.
[2] Based on the Vibration Source Levels of Construction Equipment included on Table 5-4.
[3] Does the Peak Vibration exceed the FTA maximum acceptable vibration standard of 80 VdB?

8.6 CONSTRUCTION NOISE AND VIBRATION ABATEMENT MEASURES

Though construction noise is temporary, intermittent and of short duration, and will not present any long-term impacts, the following practices would reduce noise level increases generated by the construction equipment to the nearby noise-sensitive residential land uses.

- Prior to approval of grading plans and/or issuance of building permits, plans shall include a note indicating that noise-generating Project construction activities shall only occur between the hours of 6:00 a.m. and 6:00 p.m. from June to September, and 7:00 a.m. to 6:00 p.m. from October to May, with no activity allowed on Sundays and nationally recognized holidays (Section 9.09.030(B) of the City of Menifee Municipal Code).
- During all Project site construction, the construction contractors shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers, consistent with manufacturers' standards. The construction contractor shall place all stationary construction equipment so that emitted noise is directed away from the noise sensitive receptors nearest the Project site.
- The construction contractor shall locate equipment staging in areas that will create the greatest distance between construction-related noise sources and noise-sensitive receivers nearest the Project site during all Project construction (i.e., to the center).
- The construction contractor shall limit haul truck deliveries to the same hours specified for construction equipment (between the hours of 6:00 a.m. and 6:00 p.m. from June to September, and 7:00 a.m. to 6:00 p.m. from October to May, with no activity allowed on Sundays and nationally recognized holidays). The contractor shall design delivery routes to minimize the exposure of sensitive land uses or residential dwellings to delivery truck-related noise.

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9 REFERENCES

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2. **Harris, Cyril M.** *Noise Control in Buildings.* s.l. : McGraw-Hill, Inc., 1994.
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4. **Environmental Protection Agency Office of Noise Abatement and Control.** *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.* March 1974. EPA/ONAC 550/9/74-004.
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22. **California Department of Transportation.** *Traffic Noise Attenuation as a Function of Ground and Vegetation Final Report.* June 1995. FHWA/CA/TL-95/23.

23. **Urban Crossroads, Inc.** *Tentative Tract No. 36911 Air Quality Impact Analysis .* May 2017.

10 CERTIFICATION

The contents of this noise study report represent an accurate depiction of the noise environment and impacts associated with the proposed Tentative Tract No. 36911 Project. The information contained in this noise study report is based on the best available data at the time of preparation. If you have any questions, please contact me directly at (949) 336-5979.

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EDUCATION

Master of Science in Civil and Environmental Engineering
California Polytechnic State University, San Luis Obispo • December, 1993

Bachelor of Science in City and Regional Planning
California Polytechnic State University, San Luis Obispo • June, 1992

PROFESSIONAL REGISTRATIONS

PE – Registered Professional Traffic Engineer – TR 2537 • January, 2009
AICP – American Institute of Certified Planners – 013011 • June, 1997–January 1, 2012
PTP – Professional Transportation Planner • May, 2007 – May, 2013
INCE – Institute of Noise Control Engineering • March, 2004

PROFESSIONAL AFFILIATIONS

ASA – Acoustical Society of America
ITE – Institute of Transportation Engineers

PROFESSIONAL CERTIFICATIONS

Certified Acoustical Consultant – County of Orange • February, 2011
FHWA-NHI-142051 Highway Traffic Noise Certificate of Training • February, 2013

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APPENDIX 3.1:

CITY OF MENIFEE MUNICIPAL CODE

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APPENDIX 4.1:

STUDY AREA PHOTOS

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APPENDIX 4.2:

NOISE LEVEL MEASUREMENT WORKSHEETS

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APPENDIX 5.1:

SITE PLAN

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APPENDIX 6.1:

ON-SITE TRAFFIC NOISE CALCULATIONS

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