HEMET 30 RESIDENTIAL PROJECT
COUNTY OF RIVERSIDE, CALIFORNIA

Noise and Vibration Impact Study

Prepared for
DDE, Hemet, LLC
3470 Wilshire Blvd., Suite 1020
Los Angeles, CA 90010

June 2022

ESA

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Executive Summary

DDE, Hemet, LLC is proposing to construct 144 single-family dwelling units of residential uses. The Proposed Project will be located on the south side of SR-74 to the southeast of the intersection of 4 Seasons Boulevard and SR-74 in unincorporated Riverside County (County). The purpose of this Noise and Vibration Impact Study is to assess and discuss the impacts of potential noise and vibration impacts that may occur with the implementation of the proposed project. The analysis describes the existing noise environment in the project area, estimates future projected noise levels at the noise-sensitive receptors proposed on the project site, and identifies the potential for significant noise and vibration impacts.

Project Construction

Construction of the Project would not result in noise exposure at adjacent residences to reach or exceed the 85 dBA L_{eq} threshold established by the National Institute for Occupational Safety and Health (NIOSH), no significant construction noise impacts would occur. No mitigation measures are required for construction noise. No mitigation measures are required for vibration associated with Project construction.

Project Operations

No mitigation measures are required for stationary noise sources associated with project operations. The following noise abatement measures are recommended for the proposed residences on the Project Site during project operation:

1. Residential buildings that are located within 618 feet of the centerline of SR-74 and are directly exposed to traffic on the SR-74 require mechanical ventilation, such as air conditioning, to ensure that windows can remain closed for prolonged periods of time.
2. Rear yard walls, a minimum of 6 feet in height, consisting of either all block or a block and glass combination, shall be constructed along the rear property line of the residential lots closest to future SR-79.
3. Residential buildings that are located with 372 feet of the centerline of SR-79 and are directly exposed to traffic on the SR-79 require mechanical ventilation, such as air conditioning, to ensure that windows can remain closed for prolonged periods of time.

No vibration mitigation measures would be necessary for project operation.

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HEMET 30 RESIDENTIAL PROJECT

Noise and Vibration Impact Study

1. Introduction

This Noise and Vibration Impact Study is prepared by ESA to support a proposal for the Hemet 30 Residential project, in the unincorporated Riverside County, California.

The project-specific analysis provided in this report assesses whether the implementation of the proposed project would have potentially significant noise impacts on existing residential uses adjacent to the project site. In addition, for future residential uses proposed on the project site, the County's Noise Element in its Appendix I: Noise Element Data, Determining and Mitigating Traffic Noise Impacts to Residential Structures Memo, specifies the interior noise level in residential dwellings exterior noise level in outdoor active use areas. This noise impact analysis also includes potential noise impacts and associated mitigation measures on the future residential uses proposed on the project site.

1.1 Project Location

The project is located on the south side of State Route (SR) 74 to the southeast of the intersection of 4 Seasons Boulevard and SR-74 in unincorporated Riverside County, California (refer to **Figure 1**; all figures are provided in **Appendix A**).

1.2 Existing Conditions

The Project Site is bordered by SR-74 to the north with residences beyond, residential neighborhood to the south and southeast, and vacant land to the west. SR-79 is planned to pass through the southern end of the project site.

1.3 Project Description

The project site is vacant and proposed to include 144 single-family dwelling units. **Figure 2** shows the project's site plan. Access to the project site will be provided at Perimeter Road and SR-74 and will be restricted to right-in/right out access. Access will also be provided via the west-leg of the existing intersection at Joel Drive and Donald Street. Figure 2 illustrates the site access locations for the proposed project.

Project Design Features for Noise Abatement

The following Project Design Features measures apply to the proposed project and will help to reduce and avoid potential impacts related to noise:

PDF 2-1: **Control of Construction Hours.** Construction activities occurring as part of the project shall be subject to the limitations which states that construction activities may occur between 6:00 a.m. and 6:00 p.m. during the months of June through September, and between 7:00 a.m. and 6 p.m. during the months of October through May.

PDF 2-2: Prior to issuance of grading permits, the County/project applicant shall incorporate the following measures as a note on the grading plan cover sheet to ensure that the greatest distance between noise sources and sensitive receptors during construction activities have been achieved.

- Construction equipment, fixed or mobile, shall be equipped with properly operating and maintained noise mufflers consistent with manufacturers' standards.
- Construction staging areas shall be located away from off-site sensitive uses during project construction.
- The project contractor shall place all stationary construction equipment so that emitted noise is directed away from sensitive receptors nearest the project site, whenever feasible.

2. Noise Impact Study

2.1 Fundamentals of Noise

2.1.1 Noise Principles and Descriptors

Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium (e.g., air). Noise is generally defined as unwanted sound (i.e., loud, unexpected, or annoying sound). Acoustics is defined as the physics of sound. In acoustics, the fundamental scientific model consists of a sound (or noise) source, a receiver, and the propagation path between the two. The loudness of the noise source and obstructions, or atmospheric factors affecting the propagation path to the receiver determines the sound level and characteristics of the noise perceived by the receiver. Acoustics addresses primarily the propagation and control of sound.[1]

Sound, traveling in the form of waves from a source, exerts a sound pressure level (referred to as sound level) that is measured in decibels (dB), which is the standard unit of sound amplitude measurement. The dB scale is a logarithmic scale that describes the physical intensity of the pressure vibrations that make up any sound, with 0 dB corresponding roughly to the threshold of human hearing and 120 to 140 dB corresponding to the threshold of pain. Pressure waves traveling through air exert a force registered by the human ear as sound.[2]

Sound pressure fluctuations can be measured in units of hertz (Hz), which correspond to the frequency of a particular sound. Typically, sound does not consist of a single frequency, but rather a broad band of frequencies varying in levels of magnitude, with audible frequencies of the sound spectrum ranging from 20 to 20,000 Hz. The sound pressure level, therefore, constitutes the additive force exerted by a sound corresponding to the sound frequency/sound power level spectrum.[3] The typical human ear is not equally sensitive to this frequency range. As a consequence, when assessing potential noise impacts, sound is measured using an electronic filter that deemphasizes the frequencies below 1,000 Hz and above 5,000 Hz in a manner corresponding to the human ear's decreased sensitivity to these extremely low and extremely high frequencies. This method of frequency filtering, or weighting, is referred to as A-weighting, expressed in units of A-weighted decibels (dBA), which is typically applied to community noise measurements.[4] Some representative common outdoor and indoor noise sources and their corresponding A-weighted noise levels are shown in **Figure 3**.

2.1.2 Noise Exposure and Community Noise

An individual's noise exposure is a measure of noise over a period of time; a noise level is a measure of noise at a given instant in time, as presented Figure 3. However, noise levels rarely persist at one level over a long period of time. Rather, community noise varies continuously over a period of time with respect to the sound sources contributing to the community noise

[1] M. David Egan, *Architectural Acoustics* (1988), Chapter 1.
[2] M. David Egan, *Architectural Acoustics* (1988), Chapter 1.
[3] M. David Egan, *Architectural Acoustics* (1988), Chapter 1.
[4] M. David Egan, *Architectural Acoustics* (1988), Chapter 1.

environment. Community noise is primarily the product of many distant noise sources, which constitute a relatively stable background noise exposure, with many of the individual contributors unidentifiable. The background noise level changes throughout a typical day, but does so gradually, corresponding with the addition and subtraction of distant noise sources, such as changes in traffic volume. What makes community noise variable throughout a day, besides the slowly changing background noise, is the addition of short-duration, single-event noise sources (e.g., aircraft flyovers, motor vehicles, sirens), which are readily identifiable to the individual.[5]

These successive additions of sound to the community noise environment change the community noise level from instant to instant, requiring the noise exposure to be measured over periods of time to legitimately characterize a community noise environment and evaluate cumulative noise impacts. The following noise descriptors are used to characterize environmental noise levels over time, which are applicable to the project.[6]

L_{eq}: The equivalent sound level, is used to describe noise over a specified period of time in terms of a single numerical value; the L_{eq} of a time-varying signal and that of a steady signal are the same if they deliver the same acoustic energy over a given time. The L_{eq} may also be referred to as the average sound level.

L_{max}: The maximum, instantaneous noise level experienced during a given period of time.

L_{min}: The minimum, instantaneous noise level experienced during a given period of time.

L_x: The noise level exceeded a percentage of a specified time period. For instance, L_{50} and L_{90} represent the noise levels that are exceeded 50 percent and 90 percent of the time, respectively.

L_{dn}: The average A-weighted noise level during a 24-hour day, obtained after an addition of 10 dB to measured noise levels between the hours of 10 p.m. to 7 a.m. to account nighttime noise sensitivity. The L_{dn} is also termed the day-night average noise level (DNL).

CNEL: The Community Noise Equivalent Level (CNEL) is the average A-weighted noise level during a 24-hour day that is obtained after an addition of 5 dB to measured noise levels between the hours of 7 p.m. to 10 p.m. and after an addition of 10 dB to noise levels between the hours of 10 p.m. to 7 a.m. to account for noise sensitivity in the evening and nighttime, respectively. CNEL and L_{dn} are close to each other, with CNEL being more stringent and generally 1 dB higher than L_{dn}.

5 California Department of Transportation, *Technical Noise Supplement (TeNS)* (September 2013), Section 2.2.2.1.
6 California Department of Transportation, *Technical Noise Supplement (TeNS)* (September 2013), Section 2.2.2.2.

2.1.3 Effects of Noise on People

Noise is generally loud, unpleasant, unexpected, or undesired sound that is typically associated with human activity that is a nuisance, or disruptive. The effects of noise on people can be placed into four general categories:

- Subjective effects (e.g., dissatisfaction, annoyance);
- Interference effects (e.g., communication, sleep, and learning interference);
- Physiological effects (e.g., startle response); and
- Physical effects (e.g., hearing loss).

Although exposure to high noise levels has been demonstrated to cause physical and physiological effects, the principal human responses to typical environmental noise exposure are related to subjective effects and interference with activities. Interference effects interrupt daily activities and include interference with human communication activities, such as normal conversations, watching television, telephone conversations, and interference with sleep. Sleep interference effects can include both awakening and arousal to a lesser state of sleep.[7]

With regard to the subjective effects, the responses of individuals to similar noise events are diverse and influenced by many factors, including the type of noise, the perceived importance of the noise, the appropriateness of the noise to the setting, the duration of the noise, the time of day and the type of activity during which the noise occurs, and individual noise sensitivity. Overall, there is no completely satisfactory way to measure the subjective effects of noise, or the corresponding reactions of annoyance and dissatisfaction on people. A wide variation in individual thresholds of annoyance exists, and different tolerances to noise tend to develop based on an individual's past experiences with noise. Thus, an important way of predicting a human reaction to a new noise environment is the way it compares to the existing environment to which one has adapted (i.e., comparison to the ambient noise environment). In general, the more a new noise level exceeds the previously existing ambient noise level, the less acceptable the new noise level will be judged by those hearing it. With regard to increases in A-weighted noise level, the following relationships generally occur:[8]

- Except in carefully controlled laboratory experiments, a change of 1 dBA in ambient noise levels cannot be perceived;
- Outside of the laboratory, a 3 dBA change in ambient noise levels is considered to be a barely perceivable difference;
- A change in ambient noise levels of 5 dBA is considered to be a readily perceivable difference; and
- A change in ambient noise levels of 10 dBA is subjectively heard as doubling of the perceived loudness.

7 California Department of Transportation, *Technical Noise Supplement (TeNS)* (September 2013), Section 2.2.1.
8 California Department of Transportation, *Technical Noise Supplement (TeNS)* (September 2013), Section 2.2.1.

These relationships occur in part because of the logarithmic nature of sound and the decibel scale. The human ear perceives sound in a non-linear fashion; therefore, the dBA scale was developed. Because the dBA scale is based on logarithms, two noise sources do not combine in a simple additive fashion, but rather logarithmically. Under the dBA scale, a doubling of sound energy corresponds to a 3 dBA increase. In other words, when two sources are each producing sound of the same loudness, the resulting sound level at a given distance would be approximately 3 dBA higher than one of the sources under the same conditions. For example, if two identical noise sources produce noise levels of 50 dBA, the combined sound level would be 53 dBA, not 100 dBA. Three sources of equal loudness together produce a sound level of approximately 5 dBA louder than one source, and 10 sources of equal loudness together produce a sound level of approximately 10 dBA louder than the single source.[9]

2.1.4 Noise Attenuation

When noise propagates over a distance, the noise level reduces with distance depending on the type of noise source and the propagation path. Noise from a localized source (i.e., point source) propagates uniformly outward in a spherical pattern, referred to as "spherical spreading." Stationary point sources of noise, including stationary mobile sources such as idling vehicles, attenuate (i.e., reduce) at a rate between 6 dBA for acoustically "hard" sites and 7.5 dBA for "soft" sites for each doubling of distance from the reference measurement, as their energy is continuously spread out over a spherical surface (e.g., for hard surfaces, 80 dBA at 50 feet attenuates to 74 at 100 feet, 68 dBA at 200 feet, etc.). Hard sites are those with a reflective surface between the source and the receiver, such as asphalt, or concrete, surfaces, or smooth bodies of water. No excess ground attenuation is assumed for hard sites and the reduction in noise levels with distance (drop-off rate) is simply the geometric spreading of the noise from the source. Soft sites have an absorptive ground surface, such as soft dirt, grass, or scattered bushes and trees, which in addition to geometric spreading, provides an excess ground attenuation value of 1.5 dBA (per doubling distance).[10]

Roadways and highways consist of several localized noise sources on a defined path, and hence are treated as "line" sources, which approximate the effect of several point sources. Noise from a line source propagates over a cylindrical surface, often referred to as "cylindrical spreading."[11] Line sources (e.g., traffic noise from vehicles) attenuate at a rate between 3 dBA for hard sites and 4.5 dBA for soft sites for each doubling of distance from the reference measurement.[12] Therefore, noise due to a line source attenuates less with distance than that of a point source with increased distance.

Additionally, receptors located downwind from a noise source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lowered noise levels. Atmospheric temperature inversion (i.e., increasing temperature with elevation) can increase

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9 California Department of Transportation, *Technical Noise Supplement (TeNS)* (September 2013), Section 2.2.1.1.
10 California Department of Transportation, *Technical Noise Supplement (TeNS)* (September 2013), Section 2.1.4.2.
11 California Department of Transportation, *Technical Noise Supplement (TeNS)* (September 2013), Section 2.1.4.1.
12 California Department of Transportation, *Technical Noise Supplement (TeNS)* (September 2013), Section 2.1.4.1.

sound levels at long distances (e.g., more than 500 feet). Other factors such as air temperature, humidity, and turbulence can also have significant effects on noise levels.[13]

2.2 Existing Conditions

Some land uses are considered more sensitive to ambient noise levels than others are, due to the amount of noise exposure (in terms of both exposure duration and insulation from noise) and the types of activities typically involved. Residential areas are considered to be the most sensitive type of land use to noise and industrial/commercial areas are considered to be the least sensitive. Existing noise sensitive uses on the project site and in the immediate vicinity include:

- On-site: vacant land
- To the north: SR-74, then residential uses; 100 feet
- To the south: Future SR-79, then residential uses; 100 feet
- To the west: Vacant land; 50 feet
- To the east: Residential uses; 100 feet

2.2.1 Ambient Noise Levels

The predominant existing noise source on the Project Site and surrounding areas is traffic noise from SR-74 and other secondary streets.

On Thursday, February 13, 2020, short-term (15-minute duration) daytime ambient noise measurements were conducted at locations shown in **Figure 4** that represent the ambient noise environment at or in the vicinity of the nearby noise sensitive receptors. A summary of noise measurements is provided in **Table 2-1**, *Summary of Ambient Noise Measurements*, and details are included in Appendix A of this report.

TABLE 2-1
SUMMARY OF AMBIENT NOISE MEASUREMENTS

Location, Duration, Existing Land Uses, and Date of Measurements	Duration	Average L_{eq}
R1, 2/13/20 (9:45 a.m. to 10 a.m.)	15 minutes	55.5
R2, 2/13/20 (9:20 a.m. to 9:40 a.m.)	15 minutes	52.9
R3, 2/13/20 (9:05 a.m. to 9:20 a.m.)	15 minutes	54.9
R4, 2/13/20 (9:26 a.m. to 9:41 a.m.)	15 minutes	72.3
R5, 2/13/20 (8:44 a.m. to 8:59 a.m.)	15 minutes	45.6
R6, 2/13/20 (9:02 a.m. to 9:18 a.m.)	15 minutes	45.1

SOURCE: ESA, 2020

NOTE:

The ambient noise measurements were conducted using the Larson-Davis 820 Precision Integrated Sound Level Meter, which is a Type 1 standard instrument as defined in the American National Standard Institute S1.4. All instruments were calibrated and operated according to the applicable manufacturer specifications. The microphone was placed at a height of 5 feet above the local grade at the following locations.

[13] California Department of Transportation, *Technical Noise Supplement (TeNS)* (September 2013), Section 2.1.4.3.

The representative ambient noise locations (R1 through R6), shown in Figure 4, are described as follows:

- Measurement Location R1: Existing noise environment to the northwest the project site along SR-74, and is next to the existing residences.
- Measurement Location R2: Existing residences north of SR-74 and the project site.
- Measurement Location R3: Existing residences to the northeast of the project site, north of SR-79 and west of California Avenue.
- Measurement Location R4: Existing noise environment of the residential use located on the east side of California Avenue, between SR-74 and Donald Street.
- Measurement Location R5: Existing residences to the east of the project site, south of Donald Street and north of Lyn Avenue.
- Measurement Location R6: Existing residences south of the project site, south of Lyn Avenue.

A summary of noise measurement data is provided in Table 2-1, and details are included in Appendix A of this report. Average noise levels range from 45.1 dBA to 72.3 dBA L_{eq}.

Among the six noise measurement sites, R4 was along California Avenue that had a decent amount of high-speed traffic passing including large trucks, and the peak level registered reached 95.4 dBA.

2.3 Regulatory Setting

A number of statutes, regulations, plans, and policies that address noise concerns have been adopted. Below is a discussion of the relevant regulatory setting and noise regulations, plans, and policies.

2.3.1 Federal

The National Institute for Occupational Safety and Health (NIOSH) establishes Recommended Exposure Limits (REL) for noise based on the best available science and practice. The NIOSH REL for noise is 85 decibels, using the A-weighted frequency response (dBA) over an 8-hour average, usually referred to as Time-Weighted Average (TWA). Exposures at or above this level are considered hazardous.

2.3.2 State of California

California Code of Regulations (CCR) Title 24 establishes the California Building Code (CBC). The most recent building standard adopted by the legislature and used throughout the state is the 2016 version, which took effect on January 1, 2017. The State of California's noise insulation standards are codified in the CBC (Title 24, Part 2, Chapter 12). These noise standards are for new construction in California for the purposes of interior compatibility with exterior noise sources. The regulations specify that acoustical studies must be prepared when noise-sensitive structures, such as residences, schools, or hospitals, are near major transportation noises, and where such noise sources create an exterior noise level of 60 dBA CNEL, or higher. Acoustical studies that accompany building plans 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.

2.3.3 Local

The proposed project is located within the unincorporated County of Riverside. Applicable County of Riverside noise standards and policies are described below.

2.3.3.1 County of Riverside

Noise Element of the General Plan. The California Government Code Section 65302(g) requires that a noise element be included in the General Plan of each county and city in the State. The Noise Element of the County of Riverside General Plan is intended to provide a systematic approach to identifying and appraising noise problems in the community; quantifying existing and projected noise levels; addressing excessive noise exposure; and community planning for the regulation of noise.

The County's primary goal with regard to community noise is to ensure that noise-producing land uses would be compatible with adjacent land uses. To this end, the Noise Element establishes noise/land use compatibility guidelines based on cumulative noise criteria for outdoor noise. These guidelines are based, in part, on the community noise compatibility guidelines established by the DHS for use in assessing the compatibility of various land use types with a range of noise levels. The County's noise/land use compatibility guidelines are shown in **Table 2-2**.

The County of Riverside General Plan Noise Element contains various policies to address countywide noise issues. The following are relevant to the proposed project:

> **Policy N 1.1.** Protect noise-sensitive land uses from high levels of noise by restricting noise-producing land uses from these areas. If the noise-producing land use cannot be relocated, then noise buffers such as setbacks, landscaping, or blockwalls shall be used.
>
> **Policy N 1.5.** Prevent and mitigate the adverse impacts of excessive noise exposure on the residents, employees, visitors, and noise-sensitive uses of Riverside County.
>
> **Policy N 13.1.** Minimize the impacts of construction noise on adjacent uses within acceptable practices.
>
> **Policy N 13.2.** Ensure that construction activities are regulated to establish hours of operation in order to prevent and/or mitigate the generation of excessive or adverse noise impacts on surrounding areas.
>
> **Policy N 13.4.** Require that all construction equipment utilizes noise reduction features (e.g., mufflers and engine shrouds) that are no less effective than those originally installed by the manufacturer.

TABLE 2-2
COUNTY OF RIVERSIDE LAND USE COMPATIBILITY FOR COMMUNITY NOISE EXPOSURE LEVEL (CNEL)

Land Use	Normally Acceptable[a]	Conditionally Acceptable[b]	Normally Unacceptable[c]	Clearly Unacceptable[d]
Single-Family, Duplex, Mobile Homes	50–60	55–70	70–75	above 75
Multifamily Homes	50–65	60–70	70–75	above 75
Schools, Libraries, Churches, Hospitals, Nursing Homes	50–70	60–70	70–80	above 80
Transient Lodging – Motels, Hotels	50–65	60–70	70–80	above 80
Auditoriums, Concert Halls, Amphitheaters	—	50–70	above 65	—
Sports Arena, Outdoor Spectator Sports	—	50–75	above 70	—
Playgrounds, Neighborhood Parks	50–70	—	68–75	above 74
Golf Courses, Riding Stables, Water Recreation, Cemeteries	50–75	—	70–80	above 80
Office Buildings, Business, Commercial, and Professional	50–70	68–77	—	above 75
Industrial, Manufacturing, Utilities, Agriculture	50–75	70–80	—	above 75

SOURCE: County of Riverside, 2013.

NOTES:

All CNEL (or L_{dn}) measurements are expressed in dBA.

[a] Normally Acceptable: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction without any special noise insulation requirements.
[b] Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice. Outdoor environment will seem noisy.
[c] Normally Unacceptable: New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design. Outdoor areas must be shielded.
[d] Clearly Unacceptable: New construction or development should generally not be undertaken. Construction costs to make the indoor environment acceptable would be prohibitive and the outdoor environment would not be usable.

The County's Noise Element in its Appendix I: Noise Element Data, Determining and Mitigating Traffic Noise Impacts to Residential Structures Memo, states that, the interior noise level in residential dwellings shall not exceed 45 dBA L_{dn}/CNEL. The exterior noise level shall not exceed 65 dBA L_{dn}/CNEL in outdoor active use areas.

Municipal Code. With respect to residential and recreational open space uses, County of Riverside Ordinance 847.1, Section 4 (County of Riverside, 2007) identifies the following general sound level standards as shown in **Table 2-3**. These sound level standards apply to sound emanating from all noise sources.

TABLE 2-3
COUNTY OF RIVERSIDE SOUND LEVEL STANDARDS

Land Use	Maximum Decibel Level (dB L_{max})
Community Development Residential	
10 p.m. to 7 a.m.	45
7 a.m. to 10 p.m.	55
Open Space Recreation	
10 p.m. to 7 a.m.	45
7 a.m. to 10 p.m.	45

SOURCE: County of Riverside Ordinance 847.1 Section 4, 2007

Section 9.52.020 of the County Code lists several sources that are exempt from the noise provisions of Chapter 9.52 Regulation, which include the following construction activities:

H. Private construction projects located one-quarter of a mile or more from an inhabited dwelling;

I. Private construction projects located within one-quarter of a mile from an inhabited dwelling, provided that:

1. Construction does not occur between the hours of six p.m. and six a.m. during the months of June through September, and
2. Construction does not occur between the hours of six p.m. and seven a.m. during the months of October through May;

Section 9.52.070 Exceptions of the County Code lists several exemptions to the above standards, which includes noise associated with construction. Based on County of Riverside County Code Section 9.52.070, the project shall request exceptions to the standards set forth in County Code Section 9.52.040 and 9.52.060 for construction-related events, to be approved by the County's Building and Safety Department.

Once the exceptions for construction has been granted, construction noise would be exempt from the standards set forth in County Code Section 9.52.040 and 9.52.060. No mitigation measures for vibration impacts are required during project construction.

County of Riverside Ordinance No. 847 – Regulating Noise

The intent of Ordinance No. 847 is intended to establish county-wide noise standards for regulating noise for different General Plan land use designations. The ordinance also exempts certain agencies and/or uses from the general established noise standards including facilities owned or operated by or for a government agency.

For planning purposes, the 24-hour average sound levels (CNEL) are roughly equivalent to L_{eq} measurements plus 5 dBA when traffic is the dominant noise source (Office of Noise Control, 1976:21).

2.4 Significance Thresholds

Pursuant to *CEQA Guidelines* Appendix G, the project would result in a significant impact related to noise and vibration if it would expose people to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

For the purposes of this analysis and consistency with *CEQA Guidelines* Appendix G, applicable local plans, and agency and professional standards, the project would have a significant impact to noise and/or groundborne vibration if it would:

- Generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Generate excessive groundborne vibration or groundborne noise levels; or
- Expose people residing or working in the project area to excessive noise levels (for a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport) (refer to Environmental Checklist 13c in Appendix A, *Initial Study*).

The proposed project would result in no impacts relevant to airport land use plans, airports, or private airstrips; therefore, these issues do not require further analysis in this study.

2.5. Methodology

Construction of the Project would generate noise levels higher than the current ambient noise levels. Construction noise levels are estimated using the equipment noise levels provided in the Federal Highway Administration (FHWA) Roadway Construction Noise Model User's Guide (FHWA, January 2006). The National Institute for Occupational Safety and Health (NIOSH) establishes a Recommended Exposure Level (REL) of 85 dBA over an 8-hour average Exposures at or above this level are considered hazardous.

During operation of the project site, noise levels would be generated from offsite mobile noise sources such as vehicular traffic. The noise levels generated by these mobile noise sources are assessed in this study with the Federal Highway Administration (FHWA) approved traffic noise source noise modeling guidelines. For Project-related traffic noise, the Project causes the ambient noise levels measured at the property line of affected uses to increase by 3 dBA CNEL to or within the "normally unacceptable" or "clearly unacceptable" categories; or the Project causes the ambient noise levels measured at the property line of affected uses to increase by 5 dBA CNEL or more within the "normally acceptable" or "conditionally acceptable" categories.

2.6. Environmental Impacts

The project would not result in the 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. *(Less-than-Significant Impact)*

2.6.1 Project Construction

This section includes an overview of the typical methods, equipment, and work force that would be used for construction of the Proposed Project. Construction of the Proposed Project will be conducted by a construction contractor and is anticipated to take approximately 24 to 30 months total to complete. Construction is currently anticipated to begin in mid-2022 and will take 2 to 2.5 years to complete. Unless otherwise noted, construction activities are anticipated to occur between the hours of 6 a.m. and 6 p.m., during the months of June through September, and 7 a.m. to 6 p.m. during the months of October through May, consistent with the County of Riverside Noise Ordinance.

Construction Phasing

Site preparation and grading activities will typically include the following construction equipment:[14]

- Dozer, Grader, Scraper, Jack hammer, Compactor, Work trucks, Haul/dump trucks, and Water trucks.

Below-grade construction activities will typically include the following construction equipment:

- Excavator, Backhoe, Cement truck, Work trucks, Haul/dump trucks, and Water trucks.

Above-grade construction activities will typically include the following construction equipment:

- Bucket truck or manlift, Line truck, Large Crane, Stringing rig, Portable generator, Work trucks, and Water trucks.

Typical Construction Equipment Noise levels from on-site construction activities for the proposed project may range up to 62 dBA L_{max} at the closest residential uses in the vicinity of the project site for very limited times when construction occurs near the project's boundary.

Short-term noise impacts would be associated with excavation, grading, paving, and underground construction during construction of the proposed project. Construction-related short-term noise levels would be higher than existing ambient noise levels in the project area today but would no longer occur once conversion of the project is completed.

Construction crew commutes and the transport of construction equipment and materials to the site for the proposed project would incrementally increase noise levels on access roads leading to the site. Although there would be a relatively high single-event noise-exposure potential causing intermittent noise nuisance (passing trucks at 50 feet would generate up to a maximum of 87 dBA L_{max}), the effect on longer-term (hourly or daily) ambient noise levels would be small. Therefore, short-term construction-related impacts associated with worker commute and equipment transport to the project site would be less than significant.

[14] Not all equipment would necessarily be needed, and not all equipment would be used simultaneously.

The second type of short-term noise impact is related to noise generated during site preparation and onsite construction on the project site. Construction is completed in discrete steps, each of which has its own mix of equipment, and consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated on the site, and therefore, the noise levels surrounding the site as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. **Table 2-4** lists typical construction equipment noise levels recommended for noise impact assessments, based on a distance of 50 feet between the equipment and a noise receptor, taken from the FHWA Roadway Construction Noise Model (RCNM) (FHWA 2006).

Construction of the proposed project is expected to require the use of various equipment that would be used on the project site. Based on the information in Table 2-4, the maximum noise level generated by each piece of equipment that could be used on the proposed project site is shown below:

- **Bulldozer:** 82 dBA L_{max} at 50 feet
- **Water and pickup trucks:** 75 dBA L_{max} at 50 feet
- **Concrete pump truck:** 81 dBA L_{max} at 50 feet
- **Excavators:** 81 dBA L_{max} at 50 feet
- **Concrete mix truck:** 79 dBA L_{max} at 50 feet
- **Front-end loader:** 79 dBA L_{max} at 50 feet
- **Backhoe:** 78 dBA L_{max} at 50 feet
- **Forklift:** 75 dBA L_{max} at 50 feet
- **Grader:** 85 dBA L_{max} at 50 feet
- **Scraper:** 84 dBA L_{max} at 50 feet
- **Jack hammer:** 89 dBA L_{max} at 50 feet
- **Compactor:** 83 dBA L_{max} at 50 feet
- **Truck-mounted crane:** 75 dBA L_{max} at 50 feet
- **Large crane:** 81 dBA L_{max} at 50 feet
- **Portable generator:** 73 dBA L_{max} at 50 feet

TABLE 2-4
RCNM DEFAULT NOISE EMISSION REFERENCE LEVELS AND USAGE FACTORS

Equipment Description	Impact Device?	Acoustical Usage Factor	Spec. 721.560 L_{max} at 50 Feet (dBA, slow)	Actual Measured L_{max} at 50 Feet (dBA, slow)	Number of Actual Data Samples (Count)
All other equipment >5 HP	No	50	85	N/A	0
Auger drill rig	No	20	85	84	36
Backhoe	No	40	80	78	372
Bar bender	No	20	80	N/A	0
Blasting	Yes	N/A	94	N/A	0
Boring jack power unit	No	50	80	83	1
Chain saw	No	20	85	84	46
Clam shovel (dropping)	Yes	20	93	87	4
Compactor (ground)	No	20	80	83	57
Compressor (air)	No	40	80	78	18
Concrete batch plant	No	15	83	N/A	0
Concrete mixer truck	No	40	85	79	40
Concrete pump truck	No	20	82	81	30
Concrete saw	No	20	90	90	55
Crane	No	16	85	81	405
Dozer	No	40	85	82	55
Drill rig truck	No	20	84	79	22
Drum mixer	No	50	80	80	1
Dump truck	No	40	84	76	31
Excavator	No	40	85	81	170
Flatbed truck	No	40	84	74	4
Frontend loader	No	40	80	79	96
Generator	No	50	82	81	19
Generator (<25 kVA, variable-message signs)	No	50	70	73	74
Gradall	No	40	85	83	70
Grader	No	40	85	N/A	0
Grapple (on backhoe)	No	40	85	87	1
Horizontal boring hydraulic jack	No	25	80	82	6
Hydra break ram	Yes	10	90	N/A	0
Impact derive	Yes	20	95	101	11
Jackhammer	Yes	20	85	89	133
Man lift	No	20	85	75	23
Mounted impact hammer (hoe ram)	Yes	20	90	90	212
Pavement scarifier	No	20	85	90	2
Paver	No	50	85	77	9
Pickup truck	No	40	55	75	1
Pneumatic tools	No	50	85	85	90

TABLE 2-4
RCNM DEFAULT NOISE EMISSION REFERENCE LEVELS AND USAGE FACTORS

Equipment Description	Impact Device?	Acoustical Usage Factor	Spec. 721.560 L_{max} at 50 Feet (dBA, slow)	Actual Measured L_{max} at 50 Feet (dBA, slow)	Number of Actual Data Samples (Count)
Pumps	No	50	77	81	17
Refrigerator unit	No	100	82	73	3
Rivet buster/chipping gun	Yes	20	85	79	19
Rock drill	No	20	85	81	3
Roller	No	20	85	80	16
Sand blasting (single nozzle)	No	20	85	96	9
Scraper	No	40	85	84	12
Sheers (on backhoe)	No	40	85	96	5
Slurry plant	No	100	78	78	1
Slurry trench machine	No	50	82	80	75
Soil mix drill rig	No	50	80	N/A	0
Tractor	No	40	84	N/A	0
Vacuum excavator (vac-truck)	No	40	85	85	149
Vacuum street sweeper	No	10	80	82	19
Ventilation fan	No	100	85	79	13
Vibrating hopper	No	50	85	87	1
Vibratory concrete mixer	No	20	80	80	1
Vibratory pile driver	No	20	95	101	44
Warning horn	No	5	85	83	12
Welder/torch	No	40	73	74	5

SOURCE: Federal Highway Administration, *Highway Construction Noise Handbook* (2006), Table 9.1.
dBA = A-weighted decibels; HP = horsepower; N/A = not applicable

The site preparation phase tends to generate the highest noise levels because the noisiest construction equipment is earthmoving equipment. Earthmoving equipment includes excavating machinery such as back-fillers, bulldozers, and front loaders. Earthmoving and compacting equipment include compactors, scrapers, and graders. Typical operating cycles for these types of construction equipment may involve 1 or 2 minutes of full-power operation followed by 3 or 4 minutes at lower power settings. While the operating cycles may involve 1 or 2 minutes of full power operation (generating the maximum sound levels identified in Table 2-4), the equipment would be moving around and would not stay at a specific location for the entire cycle. Therefore, adjacent receivers would be exposed to the maximum noise level intermittently rather than continuously.

Site preparation and grading activities will typically include the following construction equipment: Dozer (82 dBA at 50 feet), Grader (85 dBA), Scraper (84 dBA), Jack hammer (89 dBA), Compactor (83 dBA), Work trucks (75 dBA), Haul/dump trucks (79 dBA), and Water trucks (75 dBA).

It is anticipated that up to six pieces of equipment would be in operation on the project site at the same time, even though not all six pieces of equipment would be operating at full power at the same time due to individual usage factor. Each doubling of the sound sources with equal strength increases the noise level by 3 dBA. Assuming that each piece of construction equipment operates at some distance from the other equipment, the worst-case combined noise level during this phase of construction would be (79 + 82 + 83 + 84 + 85 + 89=) 93 dBA L_{max} at a distance of 50 feet from the active construction area.

Existing noise sensitive uses (residences) in the immediate vicinity include:

- To the north: 100 feet
- To the south: 100 feet
- To the east: 100 feet

As stated previously, sound levels are generated from a source, and their decibel level decreases as the distance from that source increases. Sound dissipates exponentially with distance from the noise source. For a single point source, sound levels decrease approximately 6 dBA for each doubling of distance from the source. This drop-off rate is appropriate for noise generated by stationary equipment. If noise is produced by a line source, such as highway traffic or railroad operations, the sound decreases 3 dBA for each doubling of distance in a hard site environment. Line source noise in a relatively flat environment with absorptive vegetation decreases 4.5 dBA for each doubling of distance. Each of these existing residential uses are located 100 feet (-6 dBA relative to the noise level at 50 feet) from the project site boundary.

Construction on the project site would expose the nearest noise-sensitive uses in the project vicinity to noise levels reaching 69 to 79 dBA L_{max} from individual construction equipment and up to 87 dBA L_{max} when a total of six pieces of equipment operates at the same time in the same area nearest its boundary for the existing residences in the project vicinity. During other construction phases, noise associated with on-site activity would be lower than those during the grading period. Each piece of the construction has an acoustical usage factor (AUF) ranging from 20 to 50 percent. With the worst-case scenario of every piece of the equipment having a 50 percent of AUF, the noise exposure level from the six pieces of equipment over an hour or eight hours would result in a noise level of 80 dBA Leq.

As stated earlier, The NIOSH REL for noise is 85 dBA over an 8-hour average. Exposures at or above this level are considered hazardous. Since construction of the Project would not result in noise exposure at adjacent residences to reach or exceed the 85 dBA Leq threshold established by NIOSH, no significant construction noise impacts would occur. No mitigation measures are required for construction noise.

No mitigation measures for vibration impacts are required during project construction.

2.6.2 Project Operations

This section describes the activities relating to operation of the Proposed Project; including project-related vehicular traffic and any onsite noise-generating equipment and activity.

Stationary Source Noise Impacts on Off-Site Land Uses

The proposed on-site residential uses would not generate any high noise levels from operational activities. Mechanical heating, ventilating, and air conditioning units will be installed to comply with the County's noise ordinance. No other outdoor noise sources are proposed for the residences and therefore would not result in any noise impact to adjacent sensitive uses, including residences to the north, east, and south. Therefore, no significant noise impacts from stationary noise sources associated with project operations would occur. No mitigation measures are required for stationary noise sources.

Traffic Noise Impacts on Off-Site Land Uses

To characterize the project area's future day/night noise environment, the noise levels attributed to future traffic volumes on local roadways were estimated using a spreadsheet model developed based on the methodologies provided in FHWA Traffic Noise Model (TNM) Technical Manual.[15] In addition, the Caltrans Technical Noise Supplement (TeNS) document states that the peak hour traffic noise level would be equivalent to the L_{dn} level based on the assumptions of (1) the peak hour traffic volume would be 10 percent of the average daily traffic volume, and (2) the split of daytime and nighttime average daily traffic volume is 85/15 percent.[16] Further, the CNEL level would be 0.3 dBA higher than L_{dn} level based on the assumption of 80 percent in daytime and 5 percent in evening time.

Table 2-5 lists the existing baseline traffic noise levels. **Table 2-6** lists the existing baseline plus project traffic noise levels. Adding the Project traffic to the existing conditions would result in changes in the traffic noise levels from no measurable change compared to the corresponding baseline traffic noise level along most of the roadway segments analyzed, except along California Avenue south of SR-74 (4.3 dBA increase) and along Donald Street between Project boundary and California Avenue (7.4 dBA increase). Along these two roadway segments, only Donald Street has existing residences on the south side of the road. The existing baseline plus project traffic noise levels along these two roadway segments would continue to remain low, with the 60 dBA L_{dn}/CNEL confined to within the roadway right-of-way and would not impact existing residences along Donald Street. Other roadway segments that have noise level changes less than the 3 dBA increase normally considered to have potentially significant noise impact would not have any project-related traffic noise impacts. Therefore, no significant traffic noise impact would occur from the implementation of the Project.

Table 2-7 lists the future baseline plus project traffic noise levels. Adding the Project traffic to the future conditions would result in changes in the traffic noise levels from no measurable change compared to the corresponding baseline traffic noise level along most of the roadway segments analyzed, except along California Avenue south of SR-74 (3.8 dBA increase) and along Donald Street between Project boundary and California Avenue (7.1 dBA increase). Along these two roadway segments, only Donald Street has existing residences on the south side of the road.

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[15] FHWA, *Federal Highway Administration's Traffic Noise Model, Version 1.0 Technical Manual* (February 1998). https://www.fhwa.dot.gov/environment/noise/traffic_noise_model/old_versions/tnm_version_10/tech_manual/index.cfm.

[16] California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol* (September 2013). http://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013B.pdf.

The future baseline plus project traffic noise levels along these two roadway segments would continue to remain low, with the 60 dBA L_{dn}/CNEL confined to within the roadway right-of-way and would not impact existing residences along Donald Street. Other roadway segments that have noise level changes less than the 3 dBA increase normally considered to have potentially significant noise impact would not have any project-related traffic noise impacts. Therefore, no significant traffic noise impact would occur from the implementation of the Project.

TABLE 2-5
EXISTING BASELINE ROADWAY NOISE LEVELS

Roadway Segment	Traffic Noise Levels (dBA CNEL) Existing (2019)[a]
California Ave s/o SR-74	51.7
Donald St between Project Boundary and California Ave	46.0
Four Seasons Blvd n/o SR-74	56.5
SR-74 between Briggs Rd and SR-79	74.2
SR-74 between Four Seasons Blvd and Perimeter Rd	75.0
SR-74 between Menifee Rd and Briggs Rd	74.8
SR-74 between Perimeter Rd and California Ave	75.0
SR-74 between SR-79 and Four Seasons Blvd	75.1
SR-74 e/o California Ave	74.0
SR-74 w/o Menifee Rd	73.8
SR-79 s/o SR-74	71.0

SOURCE: ESA 2020

NOTES:

Decibel levels were calculated at a distance of 30 feet from the roadway centerline.

[A] Traffic study prepared for the proposed project identified 2019 traffic volumes as existing conditions.

Table 2-8 lists the cumulative baseline plus project traffic noise levels. Adding the Project traffic to the cumulative conditions would result in changes in the traffic noise levels from no measurable change compared to the corresponding baseline traffic noise level along most of the roadway segments analyzed, except along Donald Street between Project boundary and California Avenue (3.8 dBA increase). Along Donald Street there are existing residences on the south side of the road. The cumulative baseline plus project traffic noise levels along this roadway segment would continue to remain low, with the 60 dBA L_{dn}/CNEL confined to within the roadway right-of-way and would not impact existing residences along Donald Street. The County's exterior noise standard of 65 dBA L_{dn}/CNEL would not be exceeded in outdoor active use areas for these existing residences along Donald Street. Other roadway segments that have noise level changes less than the 3 dBA increase normally considered to have potentially significant noise impact would not have any project-related traffic noise impacts. Therefore, no significant traffic noise impact would occur from the implementation of the Project.

TABLE 2-6
EXISTING ROADWAY WITH PROJECT NOISE LEVELS

Roadway Segment	Traffic Noise Levels (dBA CNEL)			
	Existing (2019)[a]	Existing (2019) with Project	Increase over Existing	Significant Increase?
California Ave s/o SR-74	51.7	56.0	4.3	**Yes**
Donald St between Project Boundary and California Ave	46.0	53.4	7.4	**Yes**
Four Seasons Blvd n/o SR-74	56.5	56.5	0.0	No
SR-74 between Briggs Rd and SR-79	74.2	74.3	0.1	No
SR-74 between Four Seasons Blvd and Perimeter Rd	75.0	75.1	0.2	No
SR-74 between Menifee Rd and Briggs Rd	74.8	74.8	0.1	No
SR-74 between Perimeter Rd and California Ave	75.0	75.1	0.1	No
SR-74 between SR-79 and Four Seasons Blvd	75.1	75.2	0.2	No
SR-74 e/o California Ave	74.0	74.0	0.1	No
SR-74 w/o Menifee Rd	73.8	73.8	0.0	No
SR-79 s/o SR-74	71.0	71.0	0.1	No

SOURCE: ESA 2020

NOTES:

Decibel levels were calculated at a distance of 30 feet from the roadway centerline.

A Traffic study prepared for the proposed project identified 2019 traffic volumes as existing conditions.

TABLE 2-7
FUTURE ROADWAY WITH PROJECT NOISE LEVELS

Roadway Segment	Traffic Noise Levels (dBA CNEL)			
	Future Baseline (2022)	Future (2022) with Project	Increase over Future Baseline	Significant Increase?
California Ave s/o SR-74	51.8	55.6	3.8	Yes
Donald St between Project Boundary and California Ave	46.3	53.4	7.1	Yes
Four Seasons Blvd n/o SR-74	56.7	56.7	0.0	No
SR-74 between Briggs Rd and SR-79	74.4	74.5	0.1	No
SR-74 between Four Seasons Blvd and Perimeter Rd	75.2	75.4	0.2	No
SR-74 between Menifee Rd and Briggs Rd	75.0	75.1	0.1	No
SR-74 between Perimeter Rd and California Ave	75.2	75.3	0.1	No
SR-74 between SR-79 and Four Seasons Blvd	75.3	75.5	0.1	No
SR-74 e/o California Ave	74.2	74.3	0.1	No
SR-74 w/o Menifee Rd	74.0	74.1	0.0	No
SR-79 s/o SR-74	71.2	71.3	0.1	No

SOURCE: ESA 2020

NOTE: Decibel levels were calculated at a distance of 30 feet from the roadway centerline.

Traffic Noise Impacts on On-site Land Uses

The project proposes residential uses on the project site that could be exposed to traffic noise from vehicular traffic on SR-74 between Perimeter Road and California Avenue. As shown in Table 2-8, under the Cumulative Roadway with Project scenario, traffic noise level along this segment of SR-74 would be the highest, with the 76.6 dBA L_{dn}/CNEL extending to 30 feet from the roadway centerline. Based on a line source propagation, the 65 dBA L_{dn}/CNEL would extend to 178 feet from the roadway centerline of SR-74. The 69 dBA L_{dn}/CNEL contour would extend to 98 feet from the centerline of SR-74 without any intervening structure/barrier. The 57 dBA L_{dn}/CNEL contour would extend to 618 feet from the centerline of SR-74 without any intervening structure/barrier.

TABLE 2-8
CUMULATIVE ROADWAY WITH PROJECT NOISE LEVELS

	Traffic Noise Levels (dBA CNEL)			
Roadway Segment	**Cumulative Baseline (2022)**	**Cumulative with Project**	**Increase over Cumulative Baseline**	**Significant Increase?**
California Ave s/o SR-74	54.9	57.5	2.6	No
Donald St between Project Boundary and California Ave	51.1	54.8	3.8	Yes
Four Seasons Blvd n/o SR-74	57.7	57.7	0.0	No
SR-74 between Briggs Rd and SR-79	76.3	76.3	0.0	No
SR-74 between Four Seasons Blvd and Perimeter Rd	76.6	76.6	0.1	No
SR-74 between Menifee Rd and Briggs Rd	76.6	76.7	0.1	No
SR-74 between Perimeter Rd and California Ave	76.6	76.6	0.1	No
SR-74 between SR-79 and Four Seasons Blvd	76.5	76.7	0.1	No
SR-74 e/o California Ave	74.9	76.0	1.2	No
SR-74 w/o Menifee Rd	75.8	75.8	0.0	No
SR-79 s/o SR-74	73.3	73.4	0.1	No

SOURCE: ESA 2020

NOTE: Decibel levels were calculated at a distance of 30 feet from the roadway centerline.

Based on the U.S. EPA Levels Document, standard buildings in warm climate areas would provide a 24 dBA exterior-to-interior noise attenuation with windows and doors closed, and 12 dBA noise attenuation with windows open. In order to meet the 45 dBA L_{dn} interior noise standard for residential uses, residences proposed within the impact zone of 57 dBA L_{dn} should be equipped with mechanical ventilation (e.g., air conditioning) to ensure that windows can remain closed for prolonged periods of time. For residences proposed within the impacts zone of 69 dBA L_{dn}, building façade upgrades (e.g., windows upgrades with sound transmission class ratings higher than the STC-28 standard building design would provide) would be required. Based on the above analysis, future residences in the area south of SR-74 would be required to have mechanical ventilation provided as either a standard feature or a mitigation.

Based on the final layout of the proposed site plan, there will be a temp channel and basin between the proposed residences and the State right-of-way of SR-74. The shortest distance between the proposed onsite residences and the centerline of SR-74 would be approximately 350 feet.

The following summarizes noise abatement measures recommended for future residences along the SR-74:

1. 65 dBA L_{dn}/CNEL would extend to 178 feet from the roadway centerline of SR-74 without any intervening structure/barrier. Because the nearest residential use area would be 350 feet from the SR-74 centerline and would be exposed to traffic noise levels of 61.5 dBA L_{dn}/CNEL or lower, no outdoor active use areas associated with these future residences would be exposed to traffic noise exceeding the 65 dBA L_{dn}/CNEL exterior noise standard identified by the County. No mitigation measures would be required.
2. 69 dBA L_{dn}/CNEL contour would extend to 98 feet from the centerline of SR-74 without any intervening structure/barrier. Since no residential structure would be located within 350 feet of the SR-74 centerline, no buildings would be exposed to exterior noise level exceeding the 69 dBA L_{dn}/CNEL, and therefore, no building façade upgrades (e.g., windows upgrades with sound transmission class ratings higher than the STC-28 standard building design would provide) would be required.
3. 57 dBA L_{dn}/CNEL contour would extend to 618 feet from the centerline of SR-74 without any intervening structure/barrier. Since the proposed residential buildings along SR-74 that are located with 618 feet of the centerline of SR-74 would be exposed to interior noise level exceeding the 45 dBA L_{dn}/CNEL standard, with windows open, mechanical ventilation, such as air conditioning, would be required to ensure that windows can remain closed for prolonged periods of time.

Table 2-8 shows, under the Cumulative Roadway with Project scenario, traffic noise level along the segment of future SR-79 south of SR-74 would have the 73.4 dBA L_{dn}/CNEL extending to 30 feet from the roadway centerline. Based on a line source propagation, the 65 dBA L_{dn}/CNEL would extend to 109 feet from the roadway centerline of SR-79. The 69 dBA L_{dn}/CNEL contour would extend to 59 feet from the centerline of SR-79 without any intervening structure/barrier. The 57 dBA L_{dn}/CNEL contour would extend to 372 feet from the centerline of SR-79 without any intervening structure/barrier.

Based on the final layout of the proposed site plan, there will be a slope area between the proposed residences and the State right-of-way of SR-79. The shortest distance between the proposed onsite residences and the centerline of SR-79 would be approximately 70 feet.

The following summarizes potential noise abatement measures recommended for future residences along the SR-79:

1. 65 dBA L_{dn}/CNEL would extend to 109 feet from the roadway centerline of SR-79 without any intervening structure/barrier. Because the nearest residential use area would be 70 feet from the SR-74 centerline and would be exposed to traffic noise levels of 68 dBA L_{dn}/CNEL, all outdoor active use areas associated with these future residences would be exposed to traffic noise exceeding the 65 dBA L_{dn}/CNEL exterior noise standard identified by the County. Rear yard walls, a minimum of 6 feet in height, consisting of either all block or a

block and glass combination, shall be constructed along the rear property line of the residential lots closest to future SR-79.

2. 69 dBA L_{dn}/CNEL contour would extend to 59 feet from the centerline of SR-79 without any intervening structure/barrier. Since the frontline residential structure would be located at 70 feet or more from the SR-79 centerline, these frontline residential buildings would not be exposed to exterior noise level exceeding the 69 dBA L_{dn}/CNEL, and therefore, no building façade upgrades (e.g., windows upgrades with sound transmission class ratings higher than the STC-28 standard building design would provide) would be required.
3. 57 dBA L_{dn}/CNEL contour would extend to 372 feet from the centerline of SR-79 without any intervening structure/barrier. Since the proposed frontline residential buildings along SR-79 that are located with 372 feet of the centerline of SR-79 would be exposed to interior noise level exceeding the 45 dBA L_{dn}/CNEL standard, with windows open, mechanical ventilation, such as air conditioning, would be required to ensure that windows can remain closed for prolonged periods of time.

2.7 Noise Mitigation Measures

2.7.1 Project Construction

No mitigation measures are required for construction noise. No mitigation measures for vibration impacts are required during project construction.

2.7.2 Project Operations

No mitigation measures are required for stationary noise sources associated with project operations.

The following measures are recommended for the proposed residences on the Project Site during project operation:

1. Residential buildings that are located with 618 feet of the centerline of SR-74 and are directly exposed to traffic on the SR-74 require mechanical ventilation, such as air conditioning, to ensure that windows can remain closed for prolonged periods of time.
2. Rear yard walls, a minimum of 6 feet in height, consisting of either all block or a block and glass combination, shall be constructed along the rear property line of the residential lots closest to future SR-79.
3. Residential buildings that are located with 372 feet of the centerline of SR-79 and are directly exposed to traffic on the SR-79 require mechanical ventilation, such as air conditioning, to ensure that windows can remain closed for prolonged periods of time.

3. Vibration Impact Study

3.1 Fundamentals of Vibration

Vibration refers to groundborne noise and perceptible motion. Groundborne vibration is almost exclusively a concern inside buildings and is rarely perceived as a problem outdoors. The motion may be discernible outdoors, but without the effects associated with the shaking of a building, there is less adverse reaction. Vibration energy propagates from a source through intervening soil and rock layers to the foundations of nearby buildings. The vibration then propagates from the foundation throughout the remainder of the structure. Building vibration may be perceived by the occupants as the motion of building surfaces, the rattling of items moving on shelves or hanging on walls, or as a low-frequency rumbling noise. The rumbling noise is caused by the vibrating walls, floors, and ceilings that are radiating sound waves. However, building damage is not a factor for normal transportation projects, except for occasional blasting and pile driving during construction. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by 10 VdB or less. This is an order of magnitude below the damage threshold for normal buildings.

Typical sources of groundborne vibration are construction activities (e.g., blasting, pile driving, and operating heavy-duty earth-moving equipment), steel-wheeled trains, and occasional traffic on rough roads. Problems with groundborne vibration and noise from these sources are usually localized to areas within approximately 100 feet of the vibration source, although there are examples of groundborne vibration causing interference out to distances greater than 200 feet (FTA 2006). When roadways are smooth, vibration from traffic, even heavy trucks, is rarely perceptible. It is assumed, for most projects, that the roadway surface will be smooth enough that groundborne vibration from street traffic will not exceed the impact criteria; however, construction of the project could result in groundborne vibration that could be perceptible and annoying. Groundborne noise is not likely to be a problem as noise arriving via the normal airborne path usually will be greater than groundborne noise.

Groundborne vibration has the potential to disturb people as well as to damage buildings. Although it is very rare for mobile source-induced groundborne vibration to cause even cosmetic building damage, it is not uncommon for construction processes such as blasting and the pile driving to cause vibration of sufficient amplitudes to damage nearby buildings (FTA 2018). Groundborne vibration is usually measured in terms of vibration velocity, either the root-mean-square (RMS) velocity or peak particle velocity (PPV). RMS is best for characterizing human response to building vibration, and PPV is used to characterize potential for damage. Decibel notation acts to compress the range of numbers required to describe vibration. Vibration velocity level in decibels is defined as:

$$L_v = 20 \log_{10} [V/V_{ref}]$$

where L_v is the VdB, "V" is the RMS velocity amplitude, and "V_{ref}" is the reference velocity amplitude, or 1×10^{-6} inches per second (inch/sec) used in the United States. **Table 3-1** illustrates human response to various vibration levels, as described in the *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).

TABLE 3-1
HUMAN RESPONSE TO DIFFERENT LEVELS OF GROUNDBORNE NOISE AND VIBRATION

Vibration Velocity Level (VdB)	Noise Level (dBA)		Human Response
	Low Frequency[a]	Mid Frequency[b]	
65	25	40	Approximate threshold of perception for many humans. Low-frequency sound usually inaudible, mid-frequency sound excessive for quiet sleeping areas.
75	35	50	Approximate dividing line between barely perceptible and distinctly perceptible. Many people find transit vibration at this level annoying. Low-frequency noise acceptable for sleeping areas, mid-frequency noise annoying in most quiet occupied areas.
85	45	60	Vibration acceptable only if there are an infrequent number of events per day. Low-frequency noise annoying for sleeping areas, mid-frequency noise annoying even for infrequent events with institutional land uses such as schools and churches.

SOURCE: Federal Transit Administration. Table 7-1, *Transit Noise and Vibration Impact Assessment Manual* (2018).

NOTES:

VdB = vibration velocity decibels; dBA = A-weighted decibels

[a] Approximate noise level when vibration spectrum peak is near 30 Hz.
[b] Approximate noise level when vibration spectrum peak is near 60 Hz.

Factors that influence groundborne vibration and noise include the following:

- **Vibration Source:** Vehicle/equipment suspension, wheel types and condition, track/roadway surface, track support system, speed, transit structure, and depth of vibration source
- **Vibration Path:** Soil type, rock layers, soil layering, depth to water table, and frost depth
- **Vibration Receiver:** Foundation type, building construction, and acoustical absorption

Among the factors listed above, there are significant differences in the vibration characteristics when the source is underground compared to at the ground surface. In addition, soil conditions are known to have a strong influence on the levels of groundborne vibration. Among the most important factors are the stiffness and internal damping of the soil and the depth to bedrock.

Experience with groundborne vibration shows that vibration propagation is more efficient in stiff clay soils than in loose sandy soils, and shallow rock seems to concentrate the vibration energy close to the surface, resulting in groundborne vibration problems at large distance from the source. Factors such as layering of the soil and depth to water table can have significant effects on the propagation of groundborne vibration. Soft, loose, sandy soils tend to attenuate more vibration energy than hard, rocky materials. Vibration propagation through groundwater is more efficient than through sandy soils.

3.1.1 Thresholds of Significance for Vibration

Federal Transit Administration and California Department of Transportation

The criteria for environmental impact from groundborne vibration are based on the maximum levels for a single event. **Table 3-2** lists the potential vibration damage criteria associated with construction activities, as suggested in the *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).

TABLE 3-2
CONSTRUCTION VIBRATION DAMAGE CRITERIA

Building Category	PPV (inch/sec)	Approximate L_V[a]
Reinforced-concrete, steel or timber (no plaster)	0.50	102
Engineered concrete and masonry (no plaster)	0.30	98
Non-engineered timber and masonry buildings	0.20	94
Buildings extremely susceptible to vibration damage	0.12	90

SOURCE: Federal Transit Administration. Table 12-3, *Transit Noise and Vibration Impact Assessment Manual* (2018).
NOTES:
PPV = peak particle velocity; L_V = velocity in decibels; inch/sec = inches per second
[a] Root-mean-square velocity in decibels (VdB) re 1 microinch per second.

FTA guidelines show that a vibration level of up to 102 VdB (equivalent to 0.5 inch/sec in RMS) (FTA 2018) is considered safe for buildings consisting of reinforced concrete, steel, or timber (no plaster), and would not result in any construction vibration damage. For a non-engineered timber and masonry building, the construction vibration damage criterion is 94 VdB (0.2 inch/sec in RMS). The RMS values for building damage thresholds referenced above are shown in **Table 3-3**, which is taken from the *Transportation and Construction Vibration Guidance Manual* (Caltrans 2013).

TABLE 3-3
GUIDELINE VIBRATION DAMAGE POTENTIAL THRESHOLD CRITERIA

	Maximum PPV (inch/sec)	
Structure and Condition	Transient Sources[a]	Continuous/Frequent Intermittent Sources[b]
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.20	0.10
Historic and some old buildings	0.50	0.25
Older residential structures	0.50	0.30
New residential structures	1.00	0.50
Modern industrial/commercial buildings	2.00	0.50

SOURCE: California Department of Transportation, *Transportation and Construction Vibration Guidance Manual* (2013), Table 19.
NOTES:
PPV = peak particle velocity; inch/sec = inches per second
[a] Transient sources create a single, isolated vibration event, such as blasting or drop balls.
[b] Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Based on Table 8-3 in the FTA's *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018), interpretation of vibration criteria for detailed analysis is 78 VdB for residential uses during daytime hours. During nighttime hours, the vibration criterion is 72 VdB. For office and office buildings, the FTA guidelines suggest that a vibration level of 84 VdB should be used for detailed analysis.

County of Riverside

The County has not adopted a vibration criteria limit. Therefore, FTA recommended limit of 78 VdB during the daytime is used in this vibration analysis for sensitive receptors such as residences and/or churches.

3.1.2 Construction Vibration Impacts

Because vibration level in RMS is best for characterizing human response to building vibration and vibration level in PPV is best used to characterize potential for damage, this construction vibration impact analysis will discuss the human annoyance using vibration levels in VdB and will assess the potential for building damages using vibration levels in PPV (inch/sec).

Outdoor site preparation for the proposed project is expected to use a bulldozer, loader, a water truck, a concrete truck, and a forklift. It is anticipated that the greatest levels of vibration would occur during the site preparation phase. All other phases are expected to result in lower vibration levels.

Vibration level (VdB) attenuation through soil is represented by the following equation:

$$LvdB\ (D) = LvdB\ (25\ feet) - 30\ Log\ (D/25)$$

Where D is the distance between the vibration source and the receiver. LvdB (25 feet) is the source vibration level measured at 25 feet. A vibration level at 50 feet is 9 VdB lower than the vibration level at 25 feet. Vibration at 100 feet from the source is 18 VdB lower than the vibration level at 25 feet.

Existing noise sensitive uses (residences) in the immediate vicinity include:

- To the north: 100 feet, -18 VdB compared to the vibration level measured at 25 feet
- To the south: 100 feet, -18 VdB compared to the vibration level measured at 25 feet
- To the east: 100 feet, -18 VdB compared to the vibration level measured at 25 feet

Because vibration impacts occur normally within the buildings, the distance to the nearest sensitive uses, for vibration impact analysis purposes, is measured between the nearest off-site sensitive use buildings and the project boundary (assuming the construction equipment would be used at or near the project boundary).The project site contains shallow hard bedrock that needs to be ripped off by large bulldozers. Bulldozers and other heavy-tracked construction equipment generate approximately 87 VdB of groundborne vibration when measured at 25 feet, based on the *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018). This level of groundborne vibration exceeds the threshold of human perception, which is around 65 VdB. Although this range of groundborne vibration levels would result in potential annoyance to residential buildings adjacent to the project site, they would not cause any damage to the buildings. Construction vibration, similar to vibration from other sources, would not have any significant effects on outdoor activities (e.g., those outside the residential buildings in the project vicinity). As shown in Table 3-2, FTA guidelines show that a vibration level of up to 102 VdB (an equivalent to 0.5 inch/sec in RMS) (FTA 2006) is considered safe for buildings consisting of reinforced concrete, steel, or timber (no plaster), and would not result in any construction vibration damage. For a non-engineered timber and masonry building, the construction vibration damage criterion is 94 VdB (0.2 inch/sec in RMS). The RMS values for building damage thresholds referenced in **Table 3-4** were taken from the *Transportation and Construction Vibration Guidance Manual* (Caltrans 2013). Table 3-4 further shows the PPV values at 25 feet from the construction vibration source as well as vibration levels in terms of VdB at 25 feet from the construction vibration source.

TABLE 3-4
VIBRATION SOURCE AMPLITUDES FOR CONSTRUCTION EQUIPMENT

	Reference PPV/L_V at 25 Feet	
Equipment	**PPV (inch/sec)**	**L_V (VdB)**
Pile Driver (Impact), Typical	0.644	104
Pile Driver (Sonic), Typical	0.170	93
Vibratory Roller	0.210	94
Hoe Ram	0.089	87
Earth Mover	**0.011**	**69**
Excavator	0.047	81
Fork Lift	**0.047**	**81**
Skid Steer	0.047	81
Wheel Loader	**0.076**	**86**
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: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual* (2018), Table 12-2.
NOTES:
Equipment and associated source vibration levels that are expected to be used on the project site are shown in **bold**.
PPV = peak particle velocity; L_V = velocity in decibels; inch/sec = inches per second; VdB = vibration velocity decibels

Construction Vibration Structural Damages

Residential buildings adjacent to the project site are approximately 100 feet from the nearest construction area on the project site. Based on Table 3-2 and Table 3-3, it would take a vibration PPV level of more than 0.2 inch/sec (or 94 VdB) or 0.5 inch/sec (or 102 VdB) to potentially result in any building damages. The project site contains shallow hard bedrock that needs to be ripped off by heavy bulldozers. Table 3-4 shows that none of the construction activities anticipated on the project site, including large bulldozers, would result in a vibration level that would reach 0.5 inch/sec PPV (or 102 VdB) at 25 feet from each of the project construction equipment and/or activities. At 100 feet, the vibration level would be reduced by 18 VdB. Even under the condition that the site contains shallow hard bedrock that may affect the distance attenuation of the vibration sources, the vibration level from large bulldozer would be lower than the 87 VdB measured at 25 feet. It would definitely be lower than the vibration damage threshold of 94 VdB even if no vibration attenuation is achieved through the shallow hard bedrock on the project site. Other off-site buildings are farther away from the project site and would be exposed to even lower construction vibration levels. Therefore, no building damages would occur as a result of the project construction.

Construction Vibration Human Annoyance

Vibration levels from standard construction equipment are shown below for various pieces of construction equipment that are expected to be used on the project site:

- **Bulldozer:** 87 VdB at 25 feet
- **Water and pickup trucks:** 69 VdB at 25 feet
- **Concrete pump truck:** 69 VdB at 25 feet
- **Excavators:** 81 VdB at 25 feet
- **Concrete mix truck:** 69 VdB at 25 feet
- **Frontend loader:** 86 VdB at 25 feet
- **Backhoe:** 69 VdB at 25 feet
- **Forklift:** 81 VdB at 25 feet
- **Grader:** 75 VdB at 25 feet
- **Scraper:** 69 VdB at 25 feet
- **Jack hammer:** 79 VdB at 25 feet
- **Compactor:** 81 VdB at 25 feet
- **Truck-mounted crane:** 75 VdB at 25 feet
- **Large crane:** 81 VdB at 25 feet
- **Portable generator:** 73 VdB at 25 feet

As previously stated, vibration level (VdB) attenuation through soil is represented by the following equation:

$$LvdB (D) = LvdB (25 \text{ feet}) - 30 \text{ Log } (D/25)$$

Where D is the distance between the vibration source and the receiver. LvdB (25 feet) is the source vibration level measured at 25 feet. A vibration level at 50 feet is 9 VdB lower than the vibration level at 25 feet. Vibration at 100 feet from the source is 18 VdB lower than the vibration level at 25 feet. Therefore, receptors at 50 feet from the construction activity may be exposed to groundborne vibration up to 78 VdB (or 0.030 inch/sec PPV or lower). Receptors at 100 feet from the source may be exposed to groundborne vibration up to 69 VdB.

Table 3-5 lists the projected vibration level from various construction equipment expected to be used on the project site to the sensitive uses in the project vicinity. For the project construction activity, the equipment with the highest vibration generation potential is the large bulldozer, which would generate 87 VdB at 25 feet. With the vibration attenuation through distance divergence, the vibration from project construction would be reduced by 18 VdB at the nearest residential buildings adjacent to the project site. The highest construction vibration levels at residential buildings adjacent to the project site would be 69 VdB or lower. Even under the condition that the site contains shallow hard bedrock that may affect the distance attenuation of the vibration sources, the vibration level from large bulldozer would be lower than the 87 VdB measured at 25 feet, even if no vibration attenuation is achieved through the shallow hard bedrock on the project site.

This range of vibration levels from construction equipment or activity would be below the FTA threshold of 94 VdB (or 0.2 inch/sec PPV) for building damage. No significant construction vibration impacts would occur; therefore, no mitigation measures are required.

As shown in Table 3-5, all construction equipment vibration levels would not exceed the FTA's 78 VdB threshold at the nearest noise-sensitive receiver locations during daytime hours or the FTA's 84 VdB threshold for annoyance of occupants in residential buildings.

TABLE 3-5
SUMMARY OF CONSTRUCTION EQUIPMENT AND ACTIVITY VIBRATION

	Vibration Level (VdB)			
Equipment/Activity	**At 25 Feet**	**Distance Attenuation**	**Maximum Vibration Level**	**Exceed FTA Vibration Threshold (78 VdB)?**
Residences to the South (100 feet)				
Large dozers, front end loaders, grader, backhoe[a]	87	18	69	No
Loaded trucks	86	18	68	No
Jackhammers, forklift	79	18	61	No
Residences to the North (100 feet)				
Large dozers, front end loaders, grader, backhoe[b]	87	18	69	No
Loaded trucks	86	18	68	No
Jackhammers, forklift	79	18	61	No
Residences to the East (100 feet)				
Large dozers, front end loaders, grader, backhoe[b]	87	18	69	No
Loaded trucks	86	18	68	No
Jackhammers, forklift	79	18	61	No

SOURCE: Compiled by ESA (2021).

NOTES:

The FTA recommended building damage threshold is 0.2 inch/sec or approximately 94 VdB at the receiving property structure or building. For noise sensitive residential uses, the annoyance threshold is 78 VdB.

[a] Large bulldozer represents the construction equipment with the highest vibration potential that would be used on site. Other equipment would result in a lower vibration when compared to that of large bulldozers.

Summary of Construction Vibration Impacts

The project site contains shallow hard bedrock that needs to be ripped off by heavy bulldozers. Table 3-5 lists the maximum vibration levels that would result from the on-site construction equipment. The projected maximum construction vibration level during project construction at the nearest noise-sensitive receiver locations would not exceed the FTA's vibration standards of 78 VdB for sensitive uses (residences) or the FTA's 84 VdB threshold for commercial/industrial office buildings. No significant construction vibration impacts would occur.

Mitigation Measures for Construction Vibration Impacts

No mitigation measures for vibration impacts are required during project construction.

3.1.3 Operation Vibration Impacts

The project proposes residential uses that would not generate any substantial ground vibration. No operational vibration impacts would occur.

3.2 Vibration Mitigation Measures

3.2.1 Project Construction

With implementation of the Project Design Features, no vibration mitigation measures would be necessary for the proposed project during construction.

3.2.2 Project Operations

No vibration mitigation measures would be necessary for project operation.

3.3 Summary of Vibration Impact Analysis Results

Operation of the project would not expose persons to, or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies with the implementation of the project design features. Therefore, operation vibration impacts would be less than significant.

4. References

California Code of Regulations, Title 14, Section 15168(c).

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

County of Riverside, Noise Element and County Code.

Federal Highway Administration, *Roadway Construction Noise Model User's Guide*, 2006.

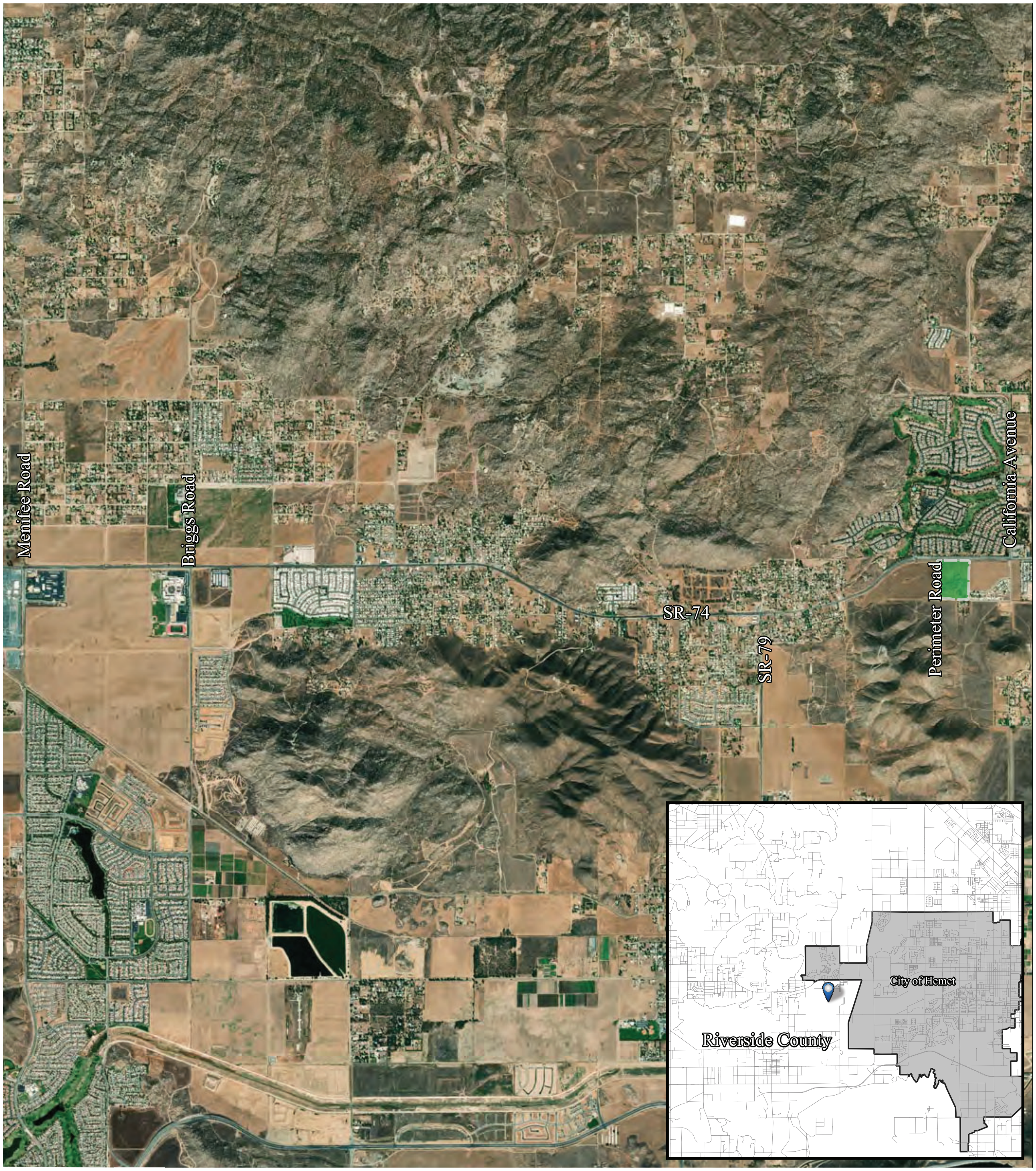
FTA, *Transit Noise and Vibration Impact Assessment Manual*, September 2018.

Khorashadi, Farah, *Hemet 30 Residential Traffic Impact Study*, January 30, 2020.

USEPA, *EPA Identifies Noise Levels Affecting Health and Welfare*, April 1974.

USEPA, Protective Noise Levels, Condensed Version of EPA Levels Document (EPA 550/9-79-100, November 1978).

Appendix A
Project Figures



Legend

Project Boundary

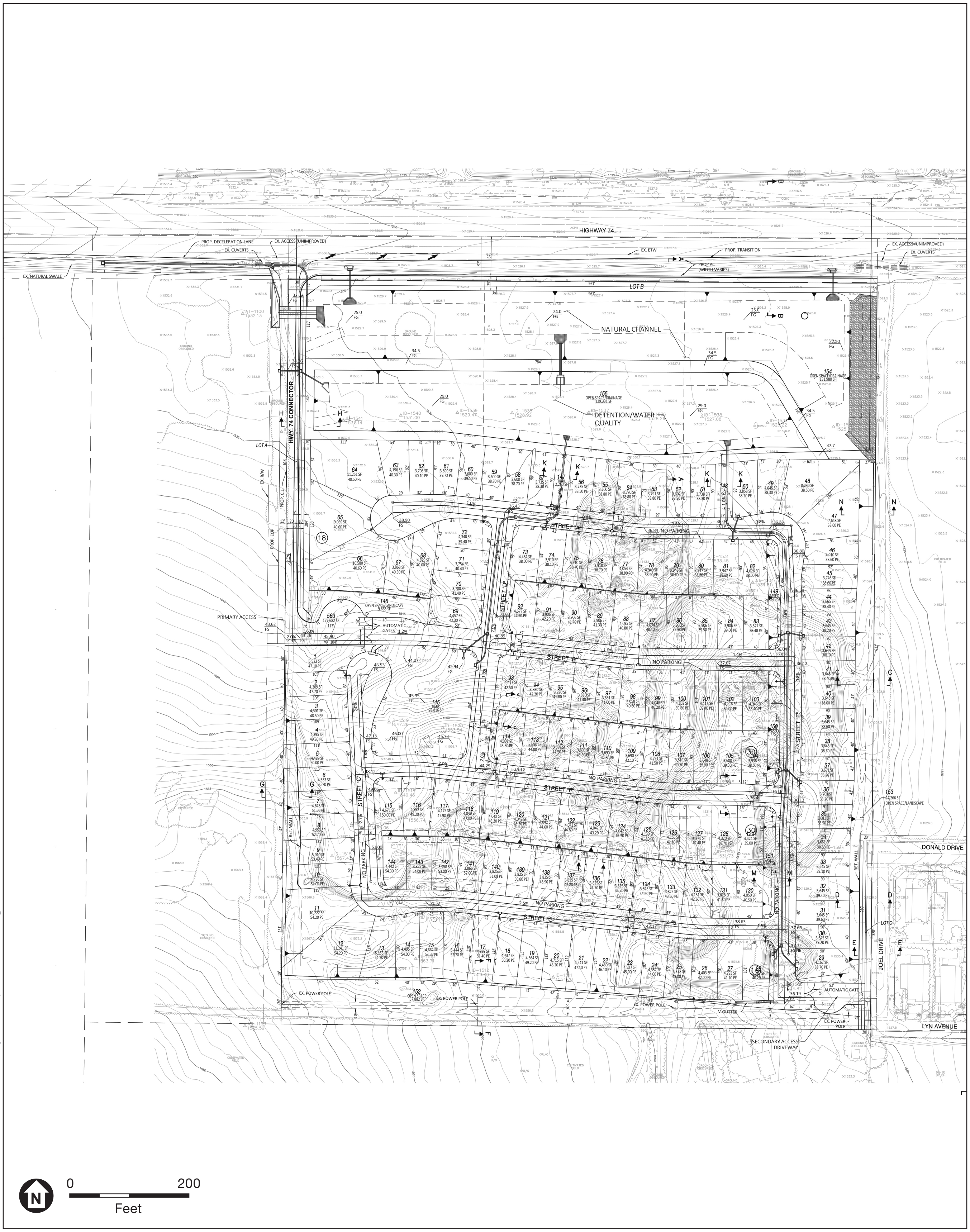
D201901554.00 - Hemet 30 Residential Project\05 Graphics-GIS-Modeling

SOURCE: Translutions, 2019

Hemet 30 Residential

Figure 1
Regional Project Location Map

ESA

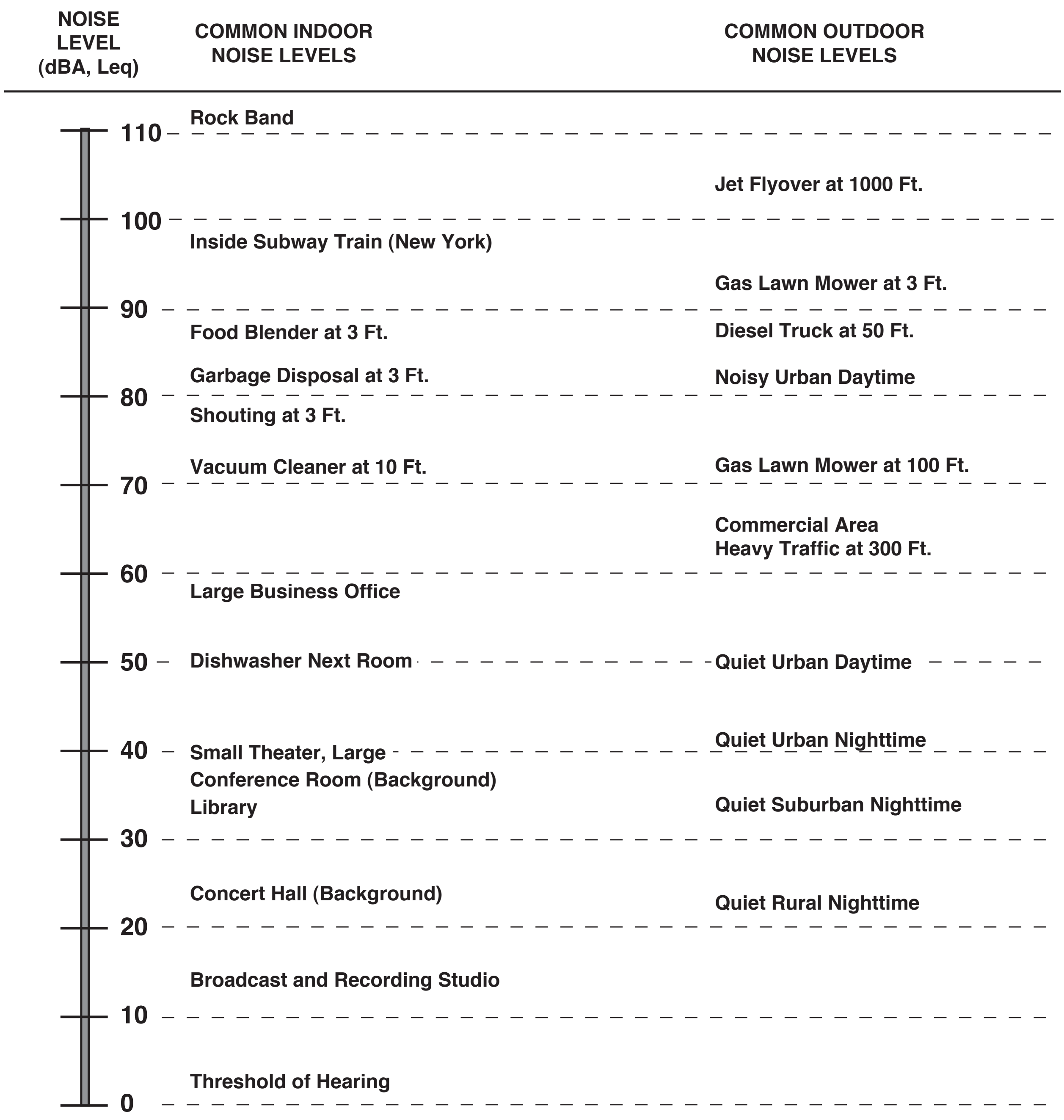


SOURCE: Anderson Consulting Engineers, Inc., 2022

Hemet 30 Residential

Figure 2
Project Layout Plan

ESA



SOURCE: State of California, Department of Transportation (Caltrans), Technical Noise Supplement (TeNS). October 1998. Available: http://www.dot.ca.gov/hq/env/noise/pub/Technical Noise Supplement.pdf

Figure 3
Decibel Scale and Common Noise Sources

SOURCE: Esri; ESA, 2020

Hemet 30 Residential

Figure 4
Noise Measurement Location Map

ESA