Appendix J

Noise Impact Analysis

NOISE IMPACT ANALYSIS
KASSAB TRAVEL CENTER PROJECT
CITY OF LAKE ELSINORE

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ACRONYMS AND ABBREVIATIONS

ANSI	American National Standards Institute
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
dB	Decibel
dBA	A-weighted decibels
DOT	Department of Transportation
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
EPA	Environmental Protection Agency
Hz	Hertz
Ldn	Day-night average noise level
Leq	Equivalent sound level
Lmax	Maximum noise level
ONAC	Federal Office of Noise Abatement and Control
OSHA	Occupational Safety and Health Administration
PPV	Peak particle velocity
RMS	Root mean square
SEL	Single Event Level or Sound Exposure Level
STC	Sound Transmission Class
UMTA	Federal Urban Mass Transit Administration

1.0 INTRODUCTION

1.1 Purpose of Analysis and Study Objectives

This Noise Impact Analysis has been prepared to determine the noise impacts associated with the proposed Kassab Travel Center project (proposed project). The following is provided in this report:

- A description of the study area and the proposed project;
- Information regarding the fundamentals of noise;
- Information regarding the fundamentals of vibration;
- A description of the local noise guidelines and standards;
- An evaluation of the current noise environment;
- An analysis of the potential short-term construction-related noise impacts from the proposed project; and,
- An analysis of long-term operations-related noise impacts from the proposed project.

1.2 Site Location and Study Area

The project site is located in the northern portion of the City of Lake Elsinore (City) on the west corner of Riverside Drive and Collier Avenue at 29301 Riverside Drive. The approximately 2.84-acre project site is located on a vacant parcel that is bounded by commercial uses to the northwest, Collier Avenue and commercial uses to the northeast, Riverside Drive and vacant land to the southeast, and vacant land to the southwest. The project location is shown in Figure 1.

Sensitive Receptors in Project Vicinity

The nearest offsite sensitive receptors to the project site consist of workers at the commercial uses located as near as 100 feet northwest of the project site. There are also single-family homes located as near as 1,700 feet west of the project site. The nearest school to the project site is Temescal Canyon High School that is located as near as 0.5 mile north of the project site.

1.3 Proposed Project Description

The proposed project would consist of the development of an 18-vehicle fueling position gasoline and diesel station with two canopies that total 6,092 square feet, an 8,360 square foot convenience store, and a 2,543 square foot fast food restaurant with a drive thru window. The proposed project would also include multiple parking areas with a total of 78-spaces. The proposed site plan is shown in Figure 2.

1.4 Standard Noise Regulatory Conditions

The proposed project will be required to comply with the following regulatory conditions from the City of Lake Elsinore and State of California.

City of Lake Elsinore Municipal Code

<u>Section 17.176.080(A) – Maximum Permissible Sound Levels</u>

Section 17.176.060(A) of the Municipal Code limits onsite noise sources to 65 dBA between 7:00 a.m. and 10:00 p.m. and 60 dBA between 10:00 p.m. and 7:00 a.m. at the nearby commercial properties

located as near as 60 feet northwest of the project site. Compliance with this regulation will reduce the operations-related noise impacts to the nearby receptors.

Section 17.176.080(F) – Construction Noise Limits

Section 17.176.080(F)(1) of the City's Municipal Code restricts construction activities from occurring between the weekday hours of 7:00 p.m. and 7:00 a.m., or at any time on weekends or holidays. Section 17.176.080(F)(2) of the City's Municipal Code limits construction noise that occurs at the nearby business uses to 85 dBA from mobile equipment and 75 dBA from stationary equipment and at the nearby single-family homes to 75 dBA for mobile equipment and 60 dBA for stationary equipment. Compliance with this regulation will reduce the construction-related noise impacts to the nearby receptors.

Section 17.176.080(G) – Vibration Limits

Section 17.176.080(G) of the City's Municipal Code restricts the operation of any device that creates a vibration which is above the vibration threshold of any individual at or beyond the property boundary of the source. Compliance with this regulation will reduce the construction-related vibration impacts to the nearby sensitive receptors.

State of California Rules

The following lists the State of California rules that are applicable to all non-residential projects in the State.

California Vehicle Code Section 27200-27207 – On-Road Vehicle Noise

California Vehicle Code Section 27200-27207 provides noise limits for vehicles operated in California. For vehicles over 10,000 pounds noise is limited to 88 dB for vehicles manufactured before 1973, 86 dB for vehicles manufactured before 1975, 83 dB for vehicles manufactured before 1988, and 80 dB for vehicles manufactured after 1987. All measurements are based at 50 feet from the vehicle.

California Vehicle Section 38365-38380 – Off-Road Vehicle Noise

California Vehicle Code Section 38365-38380 provides noise limits for off-highway motor vehicles operated in California. 92 dBA for vehicles manufactured before 1973, 88 dBA for vehicles manufactured before 1975, 86 dBA for vehicles manufactured before 1986, and 82 dBA for vehicles manufactured after December 31, 1985. All measurements are based at 50 feet from the vehicle.

1.5 Summary of Analysis Results

The following is a summary of the proposed project's impacts with regard to the State CEQA Guidelines noise checklist questions.

Expose persons to noise levels in excess of standards?

Potentially significant impact. Implementation of Mitigation Measures 1 and 2 would reduce the impact to less than significant levels.

Expose persons to excessive groundborne vibration?

Potentially significant impact. Implementation of Mitigation Measure 3 would reduce the impact to less than significant levels.

~~Less than significant impact.~~

Result in a substantial permanent increase in ambient noise levels above existing levels without the proposed project?

Potentially significant impact. Implementation of Mitigation Measure 2 would reduce the impact to less than significant levels.

Result in a substantial temporary increase in ambient noise levels above existing levels without the proposed project?

Potentially significant impact. Implementation of Mitigation Measure 1 would reduce the impact to less than significant levels.

Expose persons to excessive noise levels from aircraft?

Less than significant impact.

1.6 Mitigation Measures Required for the Proposed Project

This analysis found that through adherence to the noise and vibration regulations detailed in Section 1.4 above and through implementation of the following mitigation all noise and vibration impacts would be reduced to less than significant levels.

Mitigation Measure 1:

The project applicant shall restrict the use of any stationary equipment from operating within 50 feet of the northwest and southwest property lines and require that construction of the proposed sound wall detailed in Mitigation Measure 2 to be constructed prior to the start of site preparation or grading activities for the proposed project.~~any construction contractor that needs to use stationary construction equipment within 50 feet of the project's northwest property line to place a temporary sound barrier between the stationary equipment and nearest sensitive receptors.~~

Mitigation Measure 2:

The project applicant shall construct a minimum 8-foot high masonry wall that is free of cutouts or openings along the northwest and southwest property lines of the project site. The portions of the walls that are within the setbacks of Riverside Drive and Collier Avenue shall be limited to 3 feet in height per the wall height limitations detailed in Sections 17.112.070 and 17.112.090 of the City of Lake Elsinore Municipal Code.

Mitigation Measure 3:

The project applicant shall restrict the operation of the following equipment within the listed distances from the shared property lines with the adjacent commercial uses during construction of the proposed project:

- Large Bulldozer - 50 feet from shared property line;
- Loaded Truck (on dirt road) – 43 feet from shared property line;
- Jackhammer – 23 feet from shared property line; and
- Small Bulldozer – 2.5 feet from shared property line.

SOURCE: Google Earth.

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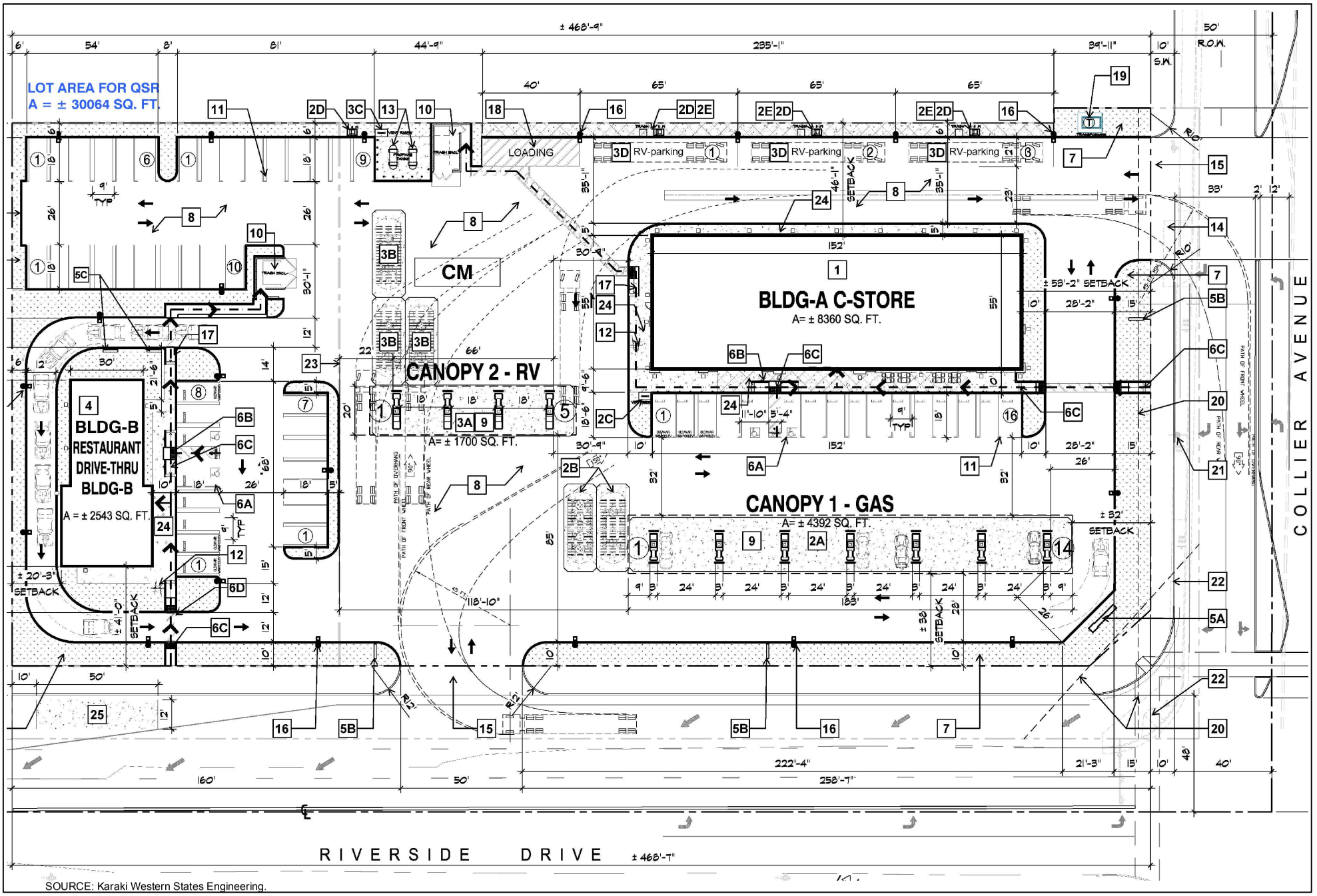
VISTA ENVIRONMENTAL

Figure 1
Project Location Map



SOURCE: Karaki Western States Engineering.

VISTA ENVIRONMENTAL

Figure 2
Proposed Site Plan

2.0 NOISE FUNDAMENTALS

Noise is 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. Sound is produced by the vibration of sound pressure waves in the air. Sound pressure levels are used to measure the intensity of sound and are described in terms of decibels. The decibel (dB) is a logarithmic unit which expresses the ratio of the sound pressure level being measured to a standard reference level. A-weighted decibels (dBA) approximate the subjective response of the human ear to a broad frequency noise source by discriminating against very low and very high frequencies of the audible spectrum. They are adjusted to reflect only those frequencies which are audible to the human ear.

2.1 Noise Descriptors

Noise 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. The peak traffic hour Leq is the noise metric used by California Department of Transportation (Caltrans) for all traffic noise impact analyses.

The Day-Night Average Level (Ldn) is the weighted average of the intensity of a sound, with corrections for time of day, and averaged over 24 hours. The time of day corrections require the addition of ten decibels to sound levels at night between 10 p.m. and 7 a.m. While the Community Noise Equivalent Level (CNEL) is similar to the Ldn, except that it has another addition of 4.77 decibels to sound levels during the evening hours between 7 p.m. and 10 p.m. These additions are made to the sound levels at these time periods because during the evening and nighttime hours, when compared to daytime hours, there is a decrease in the ambient noise levels, which creates an increased sensitivity to sounds. For this reason the sound appears louder in the evening and nighttime hours and is weighted accordingly. The City of Lake Elsinore relies on the Ldn noise standard to assess transportation-related impacts on noise sensitive land uses.

2.2 Tone Noise

A pure tone noise is a noise produced at a single frequency and laboratory tests have shown that humans are more perceptible to changes in noise levels of a pure tone. For a noise source to contain a "pure tone," there must be a significantly higher A-weighted sound energy in a given frequency band than in the neighboring bands, thereby causing the noise source to "stand out" against other noise sources. A pure tone occurs if the sound pressure level in the one-third octave band with the tone exceeds the average of the sound pressure levels of the two contiguous one-third octave bands by:

- 5 dB for center frequencies of 500 hertz (Hz) and above
- 8 dB for center frequencies between 160 and 400 Hz
- 15 dB for center frequencies of 125 Hz or less

2.3 Noise Propagation

From the noise source to the receiver, noise changes both in level and frequency spectrum. The most obvious is the decrease in noise as the distance from the source increases. The manner in which noise reduces with distance depends on whether the source is a point or line source as well as ground absorption, atmospheric effects and refraction, and shielding by natural and manmade features. Sound from point sources, such as air conditioning condensers, radiate uniformly outward as it travels away

from the source in a spherical pattern. The noise drop-off rate associated with this geometric spreading is 6 dBA per each doubling of the distance (dBA/DD). Transportation noise sources such as roadways are typically analyzed as line sources, since at any given moment the receiver may be impacted by noise from multiple vehicles at various locations along the roadway. Because of the geometry of a line source, the noise drop-off rate associated with the geometric spreading of a line source is 3 dBA/DD.

2.4 Ground Absorption

The sound drop-off rate is highly dependent on the conditions of the land between the noise source and receiver. To account for this ground-effect attenuation (absorption), two types of site conditions are commonly used in traffic noise models, soft-site and hard-site conditions. Soft-site conditions account for the sound propagation loss over natural surfaces such as normal earth and ground vegetation. For point sources, a drop-off rate of 7.5 dBA/DD is typically observed over soft ground with landscaping, as compared with a 6.0 dBA/DD drop-off rate over hard ground such as asphalt, concrete, stone and very hard packed earth. For line sources a 4.5 dBA/DD is typically observed for soft-site conditions compared to the 3.0 dBA/DD drop-off rate for hard-site conditions. Caltrans research has shown that the use of soft-site conditions is more appropriate for the application of the Federal Highway Administration (FHWA) traffic noise prediction model used in this analysis.

3.0 GROUND-BORNE VIBRATION FUNDAMENTALS

Ground-borne vibrations consist of rapidly fluctuating motions within the ground that have an average motion of zero. The effects of ground-borne vibrations typically only cause a nuisance to people, but at extreme vibration levels damage to buildings may occur. Although ground-borne vibration can be felt outdoors, it is typically only an annoyance to people indoors where the associated effects of the shaking of a building can be notable. Ground-borne noise is an effect of ground-borne vibration and only exists indoors, since it is produced from noise radiated from the motion of the walls and floors of a room and may also consist of the rattling of windows or dishes on shelves.

3.1 Vibration Descriptors

There are several different methods that are used to quantify vibration amplitude such as the maximum instantaneous peak in the vibrations velocity, which is known as the peak particle velocity (PPV) or the root mean square (RMS~~rms~~) amplitude of the vibration velocity. Due to the typically small amplitudes of vibrations, vibration velocity is often expressed in decibels and is denoted as (L_v) and is based on the RMS~~rms~~ velocity amplitude. A commonly used abbreviation is "VdB", which in this text, is when L_v is based on the reference quantity of 1 micro inch per second.

3.2 Vibration Perception

Typically, developed areas are continuously affected by vibration velocities of 50 VdB or lower. These continuous vibrations are not noticeable to humans whose threshold of perception is around 65 VdB. Off-site sources that may produce perceptible vibrations are usually caused by construction equipment, steel-wheeled trains, and traffic on rough roads, while smooth roads rarely produce perceptible ground-borne noise or vibration.

3.3 Vibration Propagation

The propagation of ground-borne vibration is not as simple to model as airborne noise. This is due to the fact that noise in the air travels through a relatively uniform median, while ground-borne vibrations travel through the earth which may contain significant geological differences. There are three main types of vibration propagation; surface, compression, and shear waves. Surface waves, or Rayleigh waves, travel along the ground's surface. These waves carry most of their energy along an expanding circular wave front, similar to ripples produced by throwing a rock into a pool of water. P-waves, or compression waves, are body waves that carry their energy along an expanding spherical wave front. The particle motion in these waves is longitudinal (i.e., in a "push-pull" fashion). P-waves are analogous to airborne sound waves. S-waves, or shear waves, are also body waves that carry energy along an expanding spherical wave front. However, unlike P-waves, the particle motion is transverse or "side-to-side and perpendicular to the direction of propagation."

As vibration waves propagate from a source, the vibration energy decreases in a logarithmic nature and the vibration levels typically decrease by 6 VdB per doubling of the distance from the vibration source. As stated above, this drop-off rate can vary greatly depending on the soil but has been shown to be effective enough for screening purposes, in order to identify potential vibration impacts that may need to be studied through actual field tests.

4.0 REGULATORY SETTING

The project site is located in the City of Lake Elsinore. Noise regulations are addressed through the efforts of various federal, state, and local government agencies. The agencies responsible for regulating noise are discussed below.

4.1 Federal Regulations

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

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

The Federal Office of Noise Abatement and Control (ONAC) was initially tasked with implementing the Noise Control Act. However, the ONAC has since been eliminated, leaving the development of federal noise policies and programs to other federal agencies and interagency committees. For example, the Occupational Safety and Health Administration (OSHA) agency prohibits exposure of workers to excessive sound levels. The Department of Transportation (DOT) assumed a significant role in noise control through its various operating agencies. The Federal Aviation Administration (FAA) regulates noise of aircraft and airports. Surface transportation system noise is regulated by a host of agencies, including the Federal Transit Administration (FTA). Transit noise is regulated by the federal Urban Mass Transit Administration (UMTA), while freeways that are part of the interstate highway system are regulated by the Federal Highway Administration (FHWA). Finally, the federal government actively advocates that local jurisdictions use their land use regulatory authority to arrange new development in such a way that "noise sensitive" uses are either prohibited from being sited adjacent to a highway or, alternately that the developments are planned and constructed in such a manner that potential noise impacts are minimized.

Although the proposed project is not under the jurisdiction of the FTA, the FTA is the only agency that has defined what constitutes a significant noise impact from implementing a project. The FTA standards are based on extensive studies by the FTA and other governmental agencies on the human effects and reaction to noise and a summary of the FTA findings are provided below in Table A.

Table A – FTA Project Effects on Cumulative Noise Exposure

Existing Noise Exposure (dBA Leq or Ldn)	Allowable Noise Impact Exposure dBA Leq or Ldn		
	Project Only	Combined	Noise Exposure Increase
45	51	52	+7
50	53	55	+5
55	55	58	+3
60	57	62	+2
65	60	66	+1
70	64	71	+1
75	65	75	0

Source: Federal Transit Administration, 2006.

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

4.2 State Regulations

Noise Standards

California Department of Health Services Office of Noise Control

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

California Noise Insulation Standards

Title 24, Chapter 1, Article 4 of the California Administrative Code (California Noise Insulation Standards) requires noise insulation in new hotels, motels, apartment houses, and dwellings (other than single-family detached housing) that provides an annual average noise level of no more than 45 dBA CNEL. When such structures are located within a 60-dBA CNEL (or greater) noise contour, an acoustical analysis is required to ensure that interior levels do not exceed the 45-dBA CNEL annual threshold. In addition, Title 21, Chapter 6, Article 1 of the California Administrative Code requires that all habitable rooms, hospitals, convalescent homes, and places of worship shall have an interior CNEL of 45 dB or less due to aircraft noise.

Government Code Section 65302

Government Code Section 65302 mandates that the legislative body of each county and city in California adopt a noise element as part of its comprehensive general plan. The local noise element must recognize the land use compatibility guidelines published by the State Department of Health Services. The guidelines rank noise land use compatibility in terms of normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable.

Vibration Standards

Title 14 of the California Administrative Code Section 15000 requires that all state and local agencies implement the California Environmental Quality Act (CEQA) Guidelines, which requires the analysis of exposure of persons to excessive groundborne vibration. However, no statute has been adopted by the state that quantifies the level at which excessive groundborne vibration occurs.

Caltrans issued the *Transportation- and Construction-Induced Vibration Guidance Manual* in 2004. The manual provides practical guidance to Caltrans engineers, planners, and consultants who must address vibration issues associated with the construction, operation, and maintenance of Caltrans projects. However, this manual is also used as a reference point by many lead agencies and CEQA practitioners throughout California, as it provides numeric thresholds for vibration impacts. Thresholds are established for continuous (construction-related) and transient (transportation-related) sources of vibration, which found that the human response becomes distinctly perceptible at 0.25 inch per second PPV for transient sources and 0.04 inch per second PPV for continuous sources.

4.3 Local Regulations

The City of Lake Elsinore General Plan and Municipal Code establishes the following applicable policies related to noise and vibration.

City of Lake Elsinore General Plan

The following applicable goals and policies to the proposed project are from the Noise Element of the General Plan.

Goal 7 **Maintain an environment for all City residents and visitors free of unhealthy, obtrusive, or otherwise excessive noise.**

Policies:

7.1 Apply the noise standards set forth in the Lake Elsinore Noise and Land Use Compatibility Matrix (see Table B) and Interior and Exterior Noise Standards (see Table C) when considering all new development and redevelopment proposed within the City.

Table B – City of Lake Elsinore Noise and Land Use Compatibility Matrix

		Day-Night Noise Level (L_{dn})						
Land Use Categories	**Uses**	**<55**	**55-60**	**60-65**	**65-70**	**70-75**	**75-80**	**>80**
Residential	Single-Family, Duplex, Multiple-Family	A	A	B	B	C	D	D
	Mobile Homes	A	A	B	C	C	D	D
Commercial Regional District	Hotel, Motel, Transient Lodging	A	A	B	B	C	C	D
Commercial Regional Village, District Special	Commercial, Retail, Bank, Restaurant, Movie Theatre	A	A	A	A	B	B	C
Commercial Industrial Institutional	Office Building, Research and Development, Professional Offices, City Office Building	A	A	A	B	B	C	D
Commercial Regional Institutional Civic Center	Amphitheatre, Concert Hall, Auditorium, Meeting Hall	B	B	C	C	D	D	D
Commercial Recreation	Children's Amusement Park, Miniature Golf Course, Go-cart Track, Equestrian Center, Sports Club	A	A	A	B	B	D	D
Commercial General, Special Industrial Institutional	Automobile Service Station, Auto Dealership, Manufacturing, Warehousing, Wholesale, Utilities	A	A	A	A	B	B	B
Institutional General	Hospital, Church, Library, Schools, Classroom	A	A	B	C	C	D	D
Open Space	Parks	A	A	A	B	C	D	D
	Golf Course, Cemeteries, Nature Centers, Wildlife Reserves, Wildlife Habitat	A	A	A	A	B	C	C

Land Use Categories	Uses	Day-Night Noise Level (L_{dn})						
		<55	55-60	60-65	65-70	70-75	75-80	>80
Agriculture	Agriculture	A	A	A	A	A	A	A

Interpretation:

Zone A: Clearly Compatible. Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction without any special noise insulation requirements.

Zone B: Normally Compatible. New construction or development should be undertaken only after detailed analysis of the noise reduction requirements are made and needed noise insulation features in the design are determined. Conventional construction, with closed windows and fresh air supply systems or air conditioning, will normally suffice.

Zone C: Normally Incompatible. New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of noise reduction requirements must be made and needed noise insulation features included in the design.

Zone D: Clearly Incompatible. New construction or development should generally not be undertaken.

Source: City of Lake Elsinore General Plan, 2011.

Table C – City of Lake Elsinore Interior and Exterior Noise Standards

Land Use Categories	Uses	Energy Average L_{dn}	
		Interior[(1)]	Exterior[(2)]
Residential	Single-Family, Duplex, Multiple-Family	45[(3,5)]	60
	Mobile Homes	--	60[(4)]
Commercial, Institutional	Hotel, Motel, Transient Lodging	45[(5)]	--
	Hospital, School's Classroom	45	--
	Church, Library	45	--

Interpretation:
[1] Indoor environment excluding: bathrooms, toilets, closets, corridors.
[2] Outdoor environment limited to: private yard of single-family, multi-family private patio or balcony which is served by a means of exit from inside, Mobile Home Park.
[3] Noise level requirement with closed windows. Mechanical ventilation system or other means of natural ventilation shall be provided as of Chapter 12, Section 1205 of UBC.
[4] Exterior noise level should be such that interior noise level will not exceed 45 CNEL.
[5] As per California Administrative Code, Title 24, Part 6, Division T25, Chapter 1, Subchapter 1, Article 4, Section T25-28.
Source: City of Lake Elsinore General Plan, 2011.

City of Lake Elsinore Municipal Code

The Lake Elsinore Municipal Code establishes the following applicable standards related to noise.

17.112.090 Gasoline Dispensing Establishments.

The provisions of this section shall apply to all new construction, reconstruction, and addition or conversion of use for service stations and other places where motor vehicle fuels are dispensed to the public.

H. Walls. A decorative masonry wall a minimum of six feet in height shall be constructed and maintained along all interior property lines abutting residential property. Where such walls abut or are adjacent to commercial/office uses they shall be not less than five feet in height. A minimum five-foot planter shall be provided adjacent to the wall. Walls may be waived where the gasoline dispensing facility and

abutting commercial or industrial use share a common driveway. Said wall shall be reduced to 36 inches within required yards adjacent to a public right-of-way.

17.176.020 Definitions.

"Vibration perception threshold" means the minimum ground- or structure-borne vibration motion necessary to cause a normal person to be aware of the vibration by such direct means as, but not limited to, sensation by touch or visual observation of moving objects. The perception threshold shall be presumed to be a motion velocity of 0.01 inches per second over the range of one to 100 Hz.

17.176.060 Exterior Noise Limits.

A. Maximum Permissible Sound Levels by Receiving Land Use.

1. The noise standards for the various categories of land use identified by the Noise Control Office(r) as presented in Table 1 (see Table D) shall, unless otherwise specifically indicated, apply to all such property within a designated zone.

2. No person shall operate, or cause to be operated, any source of sound at any location within the incorporated City or allow the creation of any noise on property owned, leased, occupied, or otherwise controlled by such person, which causes the noise level when measured on any other property, either incorporated or unincorporated to exceed:

    a. The noise standard for that land use as specified in Table 1 for a cumulative period of more than 30 minutes in any hour; or

    b. The noise standard plus five dB for a cumulative period of more than 15 minutes in any hour; or

    c. The noise standard plus 10 dB for a cumulative period of more than five minutes in any hour; or

    d. The noise standard plus 15 dB for a cumulative period of more than one minute in any hour; or

    e. The noise standard plus 20 dB or the maximum measured ambient level, for any period of time.

3. If the measured ambient level differs from that permissible within any of the last four noise limit categories above, the allowable noise exposure standard shall be adjusted in five dB increments in each category as appropriate to encompass or reflect said ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under this category shall be increased to reflect the maximum ambient noise level.

4. If the measurement location is on a boundary between two different zones, the noise level limit applicable to the lower noise zone plus six dB shall apply.

Table D – City of Lake Elsinore Exterior Noise Limits

Receiving Land Use Category	Time Period	Noise Level (dBA)
Single-Family Residential	10:00 p.m. – 7:00 a.m.	40
	7:00 a.m. – 10:00 p.m.	50
Multiple Dwelling Residential	10:00 p.m. – 7:00 a.m.	45
	7:00 a.m. – 10:00 p.m.	50
Public Space		
Limited Commercial and Office	10:00 p.m. – 7:00 a.m.	55
	7:00 a.m. – 10:00 p.m.	60
General Commercial	10:00 p.m. – 7:00 a.m.	60
	7:00 a.m. – 10:00 p.m.	65
Light Industrial	Anytime	70
Heavy Industrial	Anytime	75

Source: City of Lake Elsinore Municipal Code Section 17.176.060.

17.176.080 Prohibited acts.

No person shall unnecessarily make, continue, or cause to be made or continued, any noise disturbance. The following acts, and the causing or permitting thereof, are declared to be in violation of this chapter:

B. Using or operating for any purpose any loudspeaker, loudspeaker system, or similar device between the hours of 10:00 p.m. and 7:00 a.m., such that the sound therefrom creates a noise disturbance across a residential real property line, or at any time violates the provisions of LEMC 17.176.060(A), except for any noncommercial public speaking, public assembly or other activity for which a variance has been issued by the City.

E. Loading, unloading, opening, closing or other handling of boxes, crates, containers, building materials, garbage cans, or similar objects between the hours of 10:00 p.m. and 7:00 a.m. in such a manner as to cause a noise disturbance across a residential real property line or at any time to violate the provisions of LEMC

F. Construction/Demolition

1. Operating or causing the operation of any tools or equipment used in construction, drilling, repair, alteration, or demolition work between weekday hours of 7:00 p.m. and 7:00 a.m., or at any time on weekends or holidays, such that the sound therefrom creates a noise disturbance across a residential or commercial real property line, except for emergency work of public service utilities or by variance issued by the City.

2. Noise Restrictions at Affected Properties. Where technically and economically feasible, construction activities shall be conducted in such a manner the maximum noise levels at affected properties will not exceed those listed in the following schedule: (see Table E for Residential Properties)

Table E – City of Lake Elsinore Construction Noise Standards at Residential Properties

Time Interval	Type I Areas Single-Family Residential	Type II Areas Multifamily Residential	Type III Areas Semi-Residential/ Commercial
Mobile Equipment			
Daily, except Sundays and Legal Holidays 7:00 a.m. to 7:00 p.m.	75 dBA	80 dBA	85 dBA
Daily, 7:00 p.m. to 7:00 a.m. and all day Sunday and Legal Holidays	60 dBA	65 dBA	70 dBA
Stationary Equipment			
Daily, except Sundays and Legal Holidays 7:00 a.m. to 7:00 p.m.	60 dBA	65 dBA	70 dBA
Daily, 7:00 p.m. to 7:00 a.m. and all day Sunday and Legal Holidays	50 dBA	55 dBA	60 dBA

Source: City of Lake Elsinore Municipal Code Section 17.176.080.

AT BUSINESS PROPERTIES:

Mobile Equipment

Maximum noise levels for nonscheduled, intermittent, short-term operation of mobile equipment:

Daily, including Sundays and Legal Holidays, all hours: maximum of 85 dBA.

Stationary Equipment

Maximum noise levels for repetitive scheduled and relatively long-term operation of stationary equipment:

Daily, including Sundays and Legal Holidays, all hours: maximum of 75 dBA.

3. All mobile or stationary internal combustion engine powered equipment or machinery shall be equipped with suitable exhaust and air intake silencers in proper working order.

G. Operating or permitting the operation of any device that creates a vibration which is above the vibration perception threshold of any individual at or beyond the property boundary of the source if on private property or at 150 feet (46 meters) from the source if on public space or public right-of-way.

5.0 EXISTING NOISE CONDITIONS

To determine the existing noise level environment, noise measurements have been taken in the vicinity of the project site. The field survey noted that noise within the area of the project site is generally characterized by vehicular traffic on Riverside Drive and Collier Avenue. The following describes the measurement procedures, measurement locations, noise measurement results, and the modeling of the existing noise environment.

5.1 Noise Measurement Equipment

The short-term noise measurements were taken using a Larson-Davis Model 831 Type 1 precision sound level meter programmed in "slow" mode to record noise levels in "A" weighted form as well as the frequency spectrum of the noise broken down into 1/3 octaves. The sound level meter and microphone were mounted on a tripod five feet above the ground and were equipped with a windscreen during all measurements. The sound level meter was calibrated before and after the monitoring using a Larson-Davis calibrator, Model CAL 200. The accuracy of the calibrator is maintained through a program established through the manufacturer and is traceable to the National Bureau of Standards. The unit meets the requirements of ANSI Standard S1.4-1984 and IEC Standard 942: 1988 for Class 1 equipment. All noise level measurement equipment meets American National Standards Institute (ANSI) specifications for sound level meters (S1.4-1983 identified in Chapter 19.68.020.AA).

Noise Measurement Location

The noise monitoring locations were selected in order to obtain noise measurements of the current noise levels in the project study area and to provide a baseline for any potential noise impacts that may be created by development of the proposed project. The noise measurement sites were selected to provide a representative sampling of the noise levels created by nearby noise sources. Descriptions of the noise monitoring sites are provided below in Table F. Appendix A includes a photo index of the study area and noise level measurement locations.

Noise Measurement Timing and Climate

The noise measurements were recorded between 11:34 a.m. and 12:01 p.m. on Tuesday, March 28, 2017. During the noise measurements the sky was clear, the temperature was 72 degrees Fahrenheit, the humidity was 20 percent, barometric pressure was 30 inches of mercury, and the wind was blowing around 12 miles per hour.

All traffic noise measurement durations were measured according to the standards stated in Section N-3320 of Caltrans Technical Noise Supplement (TeNS), which specifies that the measurements be a duration of at least 10 minutes and shall be continued past 10 minutes until the fluctuations in the displayed L_{eq} is less than 0.5 dBA.

5.2 Noise Measurement Results

The results of the noise level measurements are presented in Table F and the noise monitoring data printouts are included in Appendix B. Table F shows the existing noise levels in the project vicinity ranges between 57.0 dBA L_{eq} and 62.3 dBA L_{eq}.

Table F – Existing (Ambient) Noise Level Measurements

Site No.	Description	Primary Noise Source	Start Time of Measurement	Noise Level (dBA L_{eq}/L_{max})
1	Located on the project site, approximately 140 feet northwest of Riverside Drive center line and 300 feet southwest of Collier Avenue center line.	Riverside Drive	11:34 a.m.	62.3/86.0
2	Located at nearest home approximately 1,700 feet west of the project site.	Riverside Drive	11:51 a.m.	57.0/95.5

Source: Noise measurements taken with a Larson Davis Model 831 Type 1 precision sound level meter on Tuesday, March 28, 2017.

6.0 MODELING PARAMETERS AND ASSUMPTIONS

6.1 Construction Noise

The noise impacts from construction of the proposed project have been analyzed through use of the FHWA's Roadway Construction Noise Model (RCNM). The FHWA compiled noise measurement data regarding the noise generating characteristics of several different types of construction equipment used during the Central Artery/Tunnel project in Boston. Table G ~~G G~~ below provides a list of the construction equipment anticipated to be used for each phase of construction as detailed in *Air Quality and Greenhouse Gas Emissions Impact Analysis Kassab Travel Center Project*, prepared by Vista Environmental, Revised September 25, 2018.

Table G – Construction Equipment Noise Emissions and Usage Factors

Equipment Description	Number of Equipment	Acoustical Use Factor[1] (percent)	Spec 721.560 Lmax at 50 feet[2] (dBA, slow[3])	Actual Measured Lmax at 50 feet[4] (dBA, slow[3])
Site Preparation				
Grader	1	40	85	83
Scraper	1	40	85	84
Tractor, Loader or Backhoe[5]	1	40	84	N/A
Grading				
Grader	1	40	85	83
Rubber Tired Dozer	1	40	85	82
Tractor, Loader or Backhoe[5]	2	40	84	N/A
Building Construction				
Crane	1	16	85	81
Forklift (Gradall)	2	40	85	83
Generator	1	50	82	81
Welder	2	40	73	74
Tractor, Loader or Backhoe[5]	1	40	84	N/A
Paving				
Cement & Mortar Mixer	1	40	85	79
Paver	2	50	85	77
Paving Equipment	2	50	85	77
Roller	2	20	85	80
Architectural Coating				
Air Compressor	1	40	80	78

Notes:
[1] Acoustical use factor is the percentage of time each piece of equipment is operational during a typical workday.
[2] Spec 721.560 is the equipment noise level utilized by the RCNM program.
[3] The "slow" response averages sound levels over 1-second increments. A "fast" response averages sound levels over 0.125-second increments.
[4] Actual Measured is the average noise level measured of each piece of equipment during the Central Artery/Tunnel project in Boston, Massachusetts primarily during the 1990s.
[5] For the tractor/loader/backhoe, the tractor noise level was utilized, since it is the loudest of the three types of equipment.
Source: Federal Highway Administration, 2006 and CalEEMod default equipment mix.

Table G ~~G G~~ also shows the associated measured noise emissions for each piece of equipment from the RCNM model and measured percentage of typical equipment use per day. Construction noise impacts to the nearby sensitive receptors have been calculated according to the equipment noise levels and usage factors listed in Table G~~Table G~~Table G and through use of the RCNM. Due to the small size of the project site (2.84-acres), it is anticipated that the off-road equipment utilized during site preparation and

grading activities would operate over the entire site during each day of site preparation and grading activities. As such the off-road equipment for the site preparation and grading activities were modeled based on placement in the middle of the project site. The building construction and architectural coating phases were analyzed based on the distance to the middle of the nearest structure, since daily off-road equipment activity would operate on all sides of the proposed structures. The paving phase was analyzed based on the off-road equipment placed in the center of the project site, since daily off-road paving equipment would operate over the entire site.

~~For each phase of construction, the nearest piece of equipment was placed at the shortest distance of the proposed activity to the nearest sensitive receptor and each subsequent piece of equipment was placed an additional 50 feet away~~

6.2 Operations-Related Noise

The proposed project would result in increases in traffic noise to the nearby roadways as well as introduce new sensitive receptors to the project site. The project noise impacts to the offsite roadways were analyzed through use of the FHWA Traffic Noise Prediction Model - FHWA-RD-77-108 (FHWA Model). The following section provides a discussion of the software and modeling input parameters used in this analysis and a discussion of the resultant existing noise model.

FHWA Model Methodology

In order to quantify the potential noise impacts created by vehicular traffic generated by the proposed project and compare them to the without project noise levels, the roadway noise environment was modeled using the FHWA Model. The FHWA Model arrives at a predicted noise level through a series of adjustments to the Reference Energy Mean Emission Level (REMEL). Adjustments are then made to the reference energy mean emission level to account for: 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) and the percentage of ADT which flows during the day, evening and night, the travel speed, the vehicle mix on the roadway, which is a percentage of the volume of automobiles, medium trucks and heavy trucks, the roadway grade, the angle of view of the observer exposed to the roadway and site conditions ("hard" or "soft" relates to the absorption of the ground, pavement or landscaping). The following section provides a discussion of the software and modeling input parameters used in this analysis and a discussion of the resultant existing noise model.

FHWA Model Traffic Noise Prediction Model Inputs

The roadway parameters used for this study are presented in Table H. The roadway classifications are based on the City's General Plan Circulation Element. The roadway speeds are based on the posted speed limits. The distance to the nearest sensitive receptor was determined by measuring the distance from the roadway centerline to the nearest residence. Since the study area is located in a suburban environment and landscaping or natural vegetation exists along the sides of all analyzed roadways, soft site conditions were modeled.

Table H – FHWA Model Roadway Parameters

Roadway	Segment	General Plan Classification	Vehicle Speed (MPH)	Distance to Nearest Receptor[1] (feet)
Central Avenue (SR-74)	East of Dexter Avenue	Augmented Urban Arterial	55	70
Riverside Drive (SR-74)	West of Gunnerson Street –	Urban Arterial	40	60

Roadway	Segment	General Plan Classification	Vehicle Speed (MPH)	Distance to Nearest Receptor[1] (feet)
	Strickland Avenue			
Riverside Drive (SR-74)	East of Lakeshore Drive	Urban Arterial	40	60
Riverside Drive (SR-74)	West of Lakeshore Drive	Urban Arterial	40	55
Lakeshore Drive	North of Riverside Drive (SR-74)	Urban Arterial	40	60
Lakeshore Drive	South of Riverside Drive (SR-74)	Urban Arterial	40	140

Notes:
[1] Distance measured from nearest structure to centerline of roadway.
Source: Dudek, 2018; and City of Lake Elsinore, 2011.

The existing and the existing plus ambient plus cumulative without project and with project average daily traffic (ADT) volumes on the study area roadways were obtained from the *Traffic Impact Study Kassab Travel Center, City of Lake Elsinore, CA*, prepared by prepared by Dudek, revised August 31, 2018. The existing plus ambient and cumulative ADT volumes were calculated based on the existing plus ambient plus cumulative volumes. The ADT volumes were calculated by multiplying the PM peak hour volumes by 12. The ADT volumes have been provided for both without the project and with project conditions for the existing, existing plus ambient, and cumulative scenarios. The ADT volumes used in this analysis are shown in Table I.

Table I – Average Daily Traffic Volumes

		Average Daily Traffic Volumes					
Roadway	Segment	Existing	Existing + Project	Existing + Ambient	Existing + Ambient + Project	Cumulative	Cumulative + Project
Central Avenue (SR-74)	East of Dexter Avenue	41,100	41,360	45,590	45,850	62,140	62,400
Riverside Drive (SR-74)	West of Gunnerson Street – Strickland Avenue	21,020	21,290	21,890	22,160	31,270	31,540
Riverside Drive (SR-74)	East of Lakeshore Drive	21,050	21,310	21,930	22,190	31,350	31,610
Riverside Drive (SR-74)	West of Lakeshore Drive	24,180	24,300	25,190	25,310	29,840	29,960
Lakeshore Drive	North of Riverside Drive (SR-74)	14,760	16,920	15,480	17,640	17,900	20,060
Lakeshore Drive	South of Riverside Drive (SR-74)	13,760	13,860	14,350	14,450	16,810	16,910

Source: Dudek, 2018; and City of Lake Elsinore, 2011.

The vehicle mix used in the FHWA-RD-77-108 Model is shown in Table J. the State Route 74 distribution was obtained from the *2015 Annual Average Daily Truck Traffic on the California State Highway System* (Caltrans, 2016) for State Route 74 west of Interstate 15, which is the nearest available measured vehicle mix to the project site. The vehicle mix provides the hourly distribution percentages of automobiles, medium trucks, and heavy trucks for input into the FHWA model.

Table J – Roadway Vehicle Mix

Vehicle Type	Traffic Flow Distributions			
	Day (7 a.m. to 7 p.m.)	Evening (7 p.m. to 10 p.m.)	Night (10 p.m. to 7 a.m.)	Overall
Automobiles	62.99%	12.91%	15.10%	91.00%
Medium Trucks	3.74%	0.68%	1.89%	6.31%
Heavy Trucks	1.47%	0.14%	1.08%	2.69%

Source: Caltrans, 2016.

FHWA Model Source Assumptions

To assess the roadway noise generation in a uniform manner, all vehicles are analyzed at the single lane equivalent acoustic center of the roadway being analyzed. In order to determine the height above the road grade where the noise is being emitted from, each type of vehicle has been analyzed independently with autos at road grade, medium trucks at 2.3 feet above road grade, and heavy trucks at 8 feet above road grade. These elevations were determined through a noise-weighted average of the elevation of the exhaust pipe, tires and mechanical parts in the engine, which are the primary noise emitters from a vehicle.

6.3 Vibration

Construction activity can result in varying degrees of ground vibration, depending on the equipment used on the site. Operation of construction equipment causes ground vibrations that spread through the ground and diminish in strength with distance. Buildings in the vicinity of the construction site respond to these vibrations with varying results ranging from no perceptible effects at the low levels to slight damage at the highest levels. The Federal Transit Administration (Federal Transit Administration, 2006) has done extensive research into vibration created by construction equipment and has quantified typical vibrates created by different types of construction equipment that is shown in Table K. ~~gives approximate vibration levels for particular construction activities~~. The data in Table K provides a reasonable estimate of vibration levels for a wide range of soil conditions. Since the City of Lake Elsinore utilizes the root mean square (RMS) amplitude descriptor (see Section 17.176.020 Definitions of the Municipal Code), the RMS values were also shown in Table K and were calculated by dividing the peak particle velocity (PPV) by a crest factor of 4, which is the same crest factor utilized by the FTA to convert between PPV and dBV or L_v.

Table K – Vibration Source Levels for Construction Equipment

Equipment		Peak Particle Velocity at 25 feet (inches/second)	Approximate Vibration Level (L_v) at 25 feet[1]	Root Mean Square Velocity at 25 feet[2] (inches/second)
Pile driver (impact)	Upper range	1.518	112	0.380
	Typical	0.644	104	0.161
Pile driver (sonic)	Upper range	0.734	105	0.184
	typical	0.170	93	0.043
Clam shovel drop (slurry wall)		0.202	94	0.051

Equipment		Peak Particle Velocity at 25 feet (inches/second)	Approximate Vibration Level (L_v) at 25 feet[1]	Root Mean Square Velocity at 25 feet[2] (inches/second)
Hydromill (slurry wall)	In soil	0.008	66	0.002
	In rock	0.017	75	0.004
Vibratory Roller		0.210	94	0.053
Hoe Ram		0.089	87	0.022
Large bulldozer		0.089	87	0.022
Caisson drill		0.089	87	0.022
Loaded trucks		0.076	86	0.019
Jackhammer		0.035	79	0.009
Small bulldozer		0.003	58	0.001

Notes:
[1] RMS velocity in decibels (VdB) re 1 micro-inch/second
[2] Root Mean Square Velocity (RMS) calculated by dividing the Peak Particle Velocity by a crest factor of 4.
Source: Federal Transit Administration, May 2006.

The construction-related and operational vibration impacts have been calculated through the vibration levels shown above in Table K and through typical vibration propagation rates. The equipment assumptions were based on the equipment lists provided above in Table G~~Table G~~~~Table G~~.

7.0 IMPACT ANALYSIS

7.1 CEQA Thresholds of Significance

Consistent with the California Environmental Quality Act (CEQA) and the State CEQA Guidelines, a significant impact related to noise would occur if a proposed project is determined to result in:

- 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;
- Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;
- A substantial permanent increase in ambient noise levels in the project vicinity above existing levels without the proposed project;
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above noise levels existing without the proposed project; or
- Exposure of persons residing or working in the project area to excessive noise levels from aircraft.

7.2 Generation of Noise Levels in Excess of Standards

The proposed project would not expose persons to or generate noise levels in excess of standards established in the General Plan or Noise Ordinance or applicable standards of other agencies. The following section calculates the potential noise emissions associated with the construction and operations of the proposed project and compares the noise levels to the City standards.

Construction-Related Noise

The construction activities for the proposed project are anticipated to include site preparation and grading of the 2.84-acre project site, building construction of the 18-pump, 6,092 square foot gas station, 8,360 square foot convenience store, and a 2,543 square foot fast food restaurant with a drive-thru window, paving of the onsite roads an parking areas, and application of architectural coatings. Noise impacts from construction activities associated with the proposed project would be a function of the noise generated by construction equipment, equipment location, sensitivity of nearby land uses, and the timing and duration of the construction activities. The nearest sensitive receptors to the project site are offsite workers at the commercial uses located adjacent to the~~as near as 100 feet~~ northwest side of the project site. There are also single-family homes located as near as 1,700 feet southwest of the project site.

Section 17.176.080(F)(1) of the City's Municipal Code restricts construction activities from occurring between the weekday hours of 7:00 p.m. and 7:00 a.m., or at any time on weekends or holidays. Section 17.176.080(F)(2) of the City's Municipal Code limits daily average construction noise that occurs at the nearest property lines for ~~by~~ business uses to 85 dBA from mobile equipment and 75 dBA from stationary equipment and at the nearby single-family homes to 75 dBA for mobile equipment and 60 dBA for stationary equipment. Since the noise level thresholds provided in Section 17.176.080(F)(2) of the Municipal Code do not detail the noise descriptor, the dBA Leq descriptor has been utilized since the *City of Lake Elsinore General Plan Update Draft Program EIR* (General Plan DEIR), prepared June 2011, utilized the noise descriptor dBA Leq to analyze construction noise (see Table 3.5-11 of the General Plan DEIR).

Construction noise impacts to the nearby sensitive receptors have been calculated through use of the RCNM and the parameters and assumptions detailed in Section 6.1 of this report including Table G~~Table GTable G~~ – Construction Equipment Noise Emissions and Usage Factors. The results are shown below in Table L and the RCNM printouts are provided in Appendix C.

Table L – Worst Case Construction Noise Levels at Nearest Receptors

Construction Phase	Off-Site Workers ~~at~~to Northwest Property Line[1]		Single-Family Homes to Southwest[2]	
	Distance[3] (feet)	Noise Level (dBA Leq)[3]	Distance[3] (feet)	Noise Level (dBA Leq)[3]
Site Preparation	~~100~~115	~~77~~78	~~1,700~~1,850	54
Grading	~~100~~115	~~77~~79	~~1,700~~1,850	55
Building Construction	~~131~~70	~~72~~83	~~1,720~~1,750	54
Paving	~~106~~115	~~72~~76	~~1,706~~1,850	52
Painting	~~131~~70	~~65~~71	~~1,720~~1,750	43
City's Daily Mobile Equipment Threshold		**85**		**75**
City's Daily Stationary Equipment Threshold		**75**		**60**

Notes:
[1] Off-Site Worker noise threshold from Section17.176.080(F)(2) of the Municipal Code for Business Properties.
[2] Residential~~City~~ construction noise threshold from Section 17.176.080(F)(2) of the Municipal Code for Type I Areas.
[3] The distances for Site Preparation, Grading and Paving are based on the distance to the center of the project site and the distances for Building Construction and Painting are based on the distance to the center of the nearest proposed structure.
Source: RCNM, Federal Highway Administration, 2006

Table L shows that the greatest noise impacts at the nearby off-site workers would occur during the ~~site preparation and grading~~ building construction phase~~s~~ of construction, with a noise level as high as 83~~77~~ dBA, which is within the City's mobile equipment threshold for business properties of 85 dBA. However, the site preparation~~, and~~ grading, building construction and paving phases have the potential to exceed the City's stationary equipment threshold of 75 dBA at the nearest off-site workers. This would be considered a significant impact.

Table L also shows that the greatest noise impacts at the nearest home would occur during grading, with a noise level as high as 55 dBA, which is within both the City's mobile equipment threshold of 75 dBA and stationary equipment threshold of 60 dBA.

Mitigation Measure 1 is provided that would require no stationary equipment to be operated within 50 feet of the northwest and southwest property lines and that construction of the proposed sound wall detailed in Mitigation Measure 2 to be completed prior to the start of site preparation or grading activities for the proposed project~~ any stationary construction equipment that is used within 50 feet of the project's northwest property line to place a temporary sound barrier between the stationary equipment and nearby sensitive receptors~~. As detailed in the RCNM User Guide, the loudest stationary equipment utilized during construction would be a generator that creates a noise level at 81 dB Lmax or 78 dBA Leq at 50 feet. A sound wall provides a minimum of 5 dB of attenuation when it is high enough to break the line-of-sight between the noise source and receiver (Caltrans, 2013). As such, implementation of Mitigation Measure 1, would reduce the noise level of stationary equipment to 73 dBA Leq or below, which is within the City's stationary equipment threshold. Therefore w~~W~~ith implementation of Mitigation Measure 1, construction-related noise impacts would be reduced to within the City noise standards.

Operational-Related Noise

The operation of the proposed project may generate onsite noise levels that exceed City standards at the existing nearby sensitive receptors. The operation of the proposed project may create an increase in onsite noise levels from rooftop mechanical equipment, air/water machine, gas fueling activities, parking lot activities, delivery truck activities, and onsite operation of a drive-thru speaker.

Section 17.176.060(A) of the Municipal Code limits onsite noise sources to 65 dBA between 7:00 a.m. and 10:00 p.m. and 60 dBA between 10:00 p.m. and 7:00 a.m. at the adjacent existing commercial property on the northwest side and the proposed commercial property on the southwest side of the project site. Section 8.06.060(A) also provides residential noise standards, however the nearest residential uses are located 1,700 feet to the southwest and due to the distance, no noise impacts are anticipated to the nearby residential uses.

In order to determine the noise impacts from rooftop mechanical equipment, parking lot activities, delivery truck activities, air/water machine, gas fueling activities, and drive thru speakers, reference noise measurements were taken of each noise source and are shown below in Table M~~Table M~~Table M. Table M~~Table M~~Table M also shows the anticipated noise level from each source at the nearest offsite receptors. The onsite noise source calculations and operational reference noise measurements are shown in Appendix D.

Table M – Operational Noise Levels at the Nearby Commercial Uses Prior to Mitigation

	Reference Noise Measurements		Noise Levels at Northwest Property Line		Noise Levels at Southwest Property Line	
Noise Source	Distance of Measurement (feet)	Noise Level (dBA L_{eq})	Distance Receptor to Source (feet)	Noise Level[1] (dBA L_{eq})	Distance Receptor to Source (feet)	Noise Level (dBA L_{eq})
Rooftop Equipment	10	66.6	55	52	25	59
Parking Lot	5	63.1	6	62	6	62
Truck Delivery	30	54.8	6	69	80	46
Air/Water	5	66.9	3	71	135	38
Fueling Pumps	10	61.7	105	41	145	38
Drive Thru Speaker	10	61.2	90	42	30	52
Combined Noise Levels				**74**		**64**
City Noise Standards (Day/Night)[1]				**65/60**		**65/60**
Exceed City Standards (Day/Night)?				**Yes/Yes**		**No/Yes**

Notes:
[1] City noise standards from Section 17.176.060(A)(1) of the Municipal Code.
Source: Noise calculation methodology from Caltrans, 2013.

Table M~~Table M~~Table M shows that the combined noise levels at the adjacent commercial uses would be 74 dBA at the northwest property line and would be 64 dBA at the southwest property line, which are based on the worst-case scenario of the simultaneous occurrence of all noise producing activities from operation of the proposed project. Table M~~Table M~~Table M shows that the combined noise levels would exceed the City's commercial land use daytime noise standard of 65 dBA on the northwest property line and would exceed the commercial use nighttime noise standard of 60 dBA at both the northwest and southwest property lines. This would be considered a significant impact.

Mitigation Measure 2 is provided that would require the project applicant to construct a minimum 8-foot high masonry wall on the northwest and southwest property lines of the project site. The operational

onsite noise levels were recalculated based on implementation of Mitigation Measure 2 and the results are shown in Table NTable NTable N. Table NTable NTable N shows that with implementation of Mitigation Measure 2, the combined noise levels at the adjacent commercial uses would be 58 dBA at the northwest property line and would be 51 dBA at the southwest property line, which are within both the City's daytime and nighttime noise standards for commercial land uses. With implementation of Mitigation Measure 2, operational-related noise impacts would be reduced to within the City noise standards.

Therefore, with implementation of Mitigation Measures 1 and 2, the proposed project would not expose persons to noise levels in excess of standards established in the local general plan or noise ordinance.

Table N – Mitigated Operational Noise Levels at the Nearby Commercial Uses

	Reference Noise Measurements		Noise Levels at Northwest Property Line		Noise Levels at Southwest Property Line	
Noise Source	**Distance of Measurement (feet)**	**Noise Level (dBA L_{eq})**	**Distance Receptor to Source (feet)**	**Noise Level[1] (dBA L_{eq})**	**Distance Receptor to Source (feet)**	**Noise Level[1] (dBA L_{eq})**
Rooftop Equipment	10	66.6	55	47	25	48
Parking Lot	5	63.1	6	46	6	46
Truck Delivery	30	54.8	6	55	80	35
Air/Water	5	66.9	3	54	135	27
Fueling Pumps	10	61.7	105	30	145	27
Drive Thru Speaker	10	61.2	90	31	30	40
Combined Noise Levels				**58**		**51**
City Noise Standards (Day/Night)[2]				**65/60**		**65/60**
Exceed City Standards (Day/Night)?				**No/No**		**No/No**

Notes:
[1] Calculated noise level includes attenuation provided by the 8-foot high wall required per Mitigation Measure 2.
[2] City noise standards from Section 17.176.060(A)(1) of the Municipal Code.
Source: Noise calculation methodology from Caltrans, 2013.

Level of Significance Before Mitigation

Potentially significant impact.

Mitigation Measures

Mitigation Measure 1:

The project applicant shall restrict the use of any stationary equipment from operating within 50 feet of the northwest and southwest property lines and require construction of the proposed sound

wall detailed in Mitigation Measure 2 to be constructed prior to the start of site preparation or grading activities for the proposed project~~any construction contractor that needs to use stationary construction equipment within 50 feet of the project's northwest property line to place a temporary sound barrier between the stationary equipment and nearest sensitive receptors~~.

Mitigation Measure 2:
The project applicant shall construct a minimum 8-foot high masonry wall that is free of cutouts or openings along the northwest and southwest property lines of the project site. The portions of the walls that are within the setbacks of Riverside Drive and Collier Avenue shall be limited to 3 feet in height per the wall height limitations detailed in Sections 17.112.070 and 17.112.090 of the City of Lake Elsinore Municipal Code.

Level of Significance After Mitigation

Less than significant impact.

7.3 Generation of Excessive Groundborne Vibration

The proposed project would not expose persons to or generation of excessive groundborne vibration or groundborne noise levels. The following section analyzes the potential vibration impacts associated with the construction and operations of the proposed project.

Construction-Related Vibration Impacts

The construction activities for the proposed project are anticipated to include site preparation and grading of the 2.84-acre project site, building construction of the 18-pump, 6,092 square foot gas station, 8,360 square foot convenience store, and a 2,543 square foot fast food restaurant with a drive-thru window, paving of the onsite roads an parking areas, and application of architectural coatings. The nearest off-site receptors to the project site are the commercial uses located adjacent to the northwest side of the project site~~ as near as 100 feet northwest of the project site~~. There are also single-family homes located as near as 1,700 feet west of the project site.

Section 17.176.080(G) of the City's Municipal Code restricts the operation of any device that creates a vibration which is above the vibration threshold of any individual at or beyond the property boundary of the source. Section 17.176.020 of the Municipal Code defines the "Vibration perception threshold" as motion velocity of 0.01 inch per second over the range of one to 100 Hz. ~~Since the City's Municipal does not provide a quantifiable vibration level, Caltrans guidance that is detailed above in Section 4.2 has been utilized, which defines the threshold of perception from transient sources at 0.25 inch per second PPV.~~

Table K above details typical vibration rates created by the operation of a variety of construction equipment that was developed through extensive research performed by the Federal Transit Administration. In order to determine if construction activities for the proposed project would create a significant vibration impact, the equipment listed in Table K that would be utilized during the proposed project's construction activities are shown below in Table O. Table O also show the vibration levels created from each type of equipment at 25 feet as well as the minimum distance that the equipment would need to be setback from the property line in order to meet the City's vibration threshold of 0.01 inch-per-second rms.

Table O – Project Construction Equipment Vibration Levels and Distances to City Threshold

Equipment	Root Mean Square Velocity at 25 feet[1] (inches/second)	Minimum Distance Required to create a Vibration Level of 0.01 inch-per-second RMS[1] (feet)

Vibratory Roller	0.053	110
Large Bulldozer	0.022	50
Loaded Truck (on dirt road)	0.019	43
Jackhammer	0.009	23
Small Bulldozer	0.001	2.5

Notes:
[1] Calculated based on an attenuation through ground rate of 1.1.
Source: Federal Transit Administration, May 2006.

Table O shows that all listed equipment have the potential to exceed the City's vibration threshold of 0.01 inch-per-second RMS at the adjacent commercial properties. This would be considered a significant impact.

Mitigation Measure 3 is provided that would restrict the operation of the following equipment within the listed distances from the shared property lines with the adjacent commercial uses during construction of the proposed project:

- Large Bulldozer - 50 feet from shared property line;
- Loaded Truck (on dirt road) – 43 feet from shared property line;
- Jackhammer – 23 feet from shared property line; and
- Small Bulldozer – 2.5 feet from shared property line.

Through implementation of Mitigation Measure 3, the construction-related vibration level would be reduced to within threshold of perception as required by Section 17.176.080(G) of the City's Municipal Code. ~~The primary source of vibration during construction would be from the operation of a bulldozer. From Table K above a large bulldozer would create a vibration level of 0.089 inch per second PPV at 25 feet. Based on typical propagation rates, the vibration level at the nearest offsite receptor (100 feet away) would be 0.02 inch per second PPV. The vibration level at the nearest offsite receptor would be within the 0.25 inch per second PPV threshold detailed above.~~ Impacts would be less than significant.

Operations-Related Vibration Impacts

The proposed project would consist of the development of an 18-pump gas station and associated convenience store, a fast food restaurant with a drive-thru window, and a parking lot. The proposed project would result in the operation of semi-trucks on the project site, which are a known source of vibration. The nearest off-site receptors to the proposed project are offsite workers located adjacent to the northwest side of ~~as near as 106 feet from where trucks could potentially operate on~~ the project site.

Section 17.176.080 of the City's Municipal Code limits vibration activities to vibration levels that are not above an individual person's vibration threshold at or beyond the property boundary where the source is located. Section 17.176.020 of the Municipal Code defines the "Vibration perception threshold" as motion velocity of 0.01 inch per second over the range of one to 100 Hz. It should be noted that the 0.01 inch per second RMS vibration level, is equivalent to 68 VdB.

~~Since the onsite operation of semi-truck has the potential to create groundborne vibration that may expose persons to excessive vibration levels. In order to provide a conservative analysis, the operational activities have been analyzed based on the standard of being discernable at the nearest offsite workers, which are located as near as 80 feet from where a truck may operate onsite.~~

Caltrans has done extensive research on vibration level created along freeways and State Routes and their vibration measurements of higways~~roads~~ have never exceeded 0.08 inches per second PPV or 0.02 inch per second RMS or 86 VdB at 15 feet from the center of the nearest lane, with the worst combinations of heavy trucks traveling at highway speeds (Caltrans, 2013). The FTA has also researched the impact of vehicle and train speed in relation to vibration level and found that doubling the speed usually results in a vibration level increase of 4 to 6 dBV (Federal Transit Administration, 2006). Since it is unlikely that any truck operating on the project site would exceed 15 miles per hour, which is approximately one quarter typical highway speeds, it is anticipated that the worst-case onsite vibration level would be 8 VdB lower, which equates to 80 VdB or 0.01 inch per second RMS at 15 feet from the center of the nearest travel lane.

The center of the nearest travel lane for where t~~T~~ruck activities would occur onsite is as near as 25 feet from the nearest shared property line with the adjacent commercial uses~~80 feet from the nearest off-site worker~~. Based on typical propagation rates of groundborne vibration, the vibration level at the nearest shared property line would be 0.006 inch per second RMS. This would be within the City's 0.01 inch per second RMS threshold. ~~offsite worker would by 0.01 inch per second PPV. Caltrans research found that human response to transient sources becomes distinctly perceptible at 0.25 inch per second PPV.~~ Therefore, vibration created from operation of the proposed project would be below the threshold of perception at the nearest offsite worker. Impacts would be less than significant.

Level of Significance Before Mitigation

Potentially significant impact.

Mitigation Measures

Mitigation Measure 3:

The project applicant shall restrict the operation of the following equipment within the listed distances from the shared property lines with the adjacent commercial uses during construction of the proposed project:

- Large Bulldozer - 50 feet from shared property line;
- Loaded Truck (on dirt road) – 43 feet from shared property line;
- Jackhammer – 23 feet from shared property line; and
- Small Bulldozer – 2.5 feet from shared property line.

Level of Significance After Mitigation

Less than significant impact.

~~**Level of Significance**~~

~~Less than significant impact.~~

7.4 Permanent Noise Level Increase

The ongoing operation of the proposed project may result in a potential substantial permanent increase in ambient noise levels in the project vicinity above existing levels without the proposed project. Potential noise impacts associated with the operations of the proposed project would be from project-generated vehicular traffic on the nearby roadways and from onsite activities, which have been analyzed separately below.

Roadway Vehicular Noise

Vehicle noise is a combination of the noise produced by the engine, exhaust and tires. The level of traffic noise depends on three primary factors (1) the volume of traffic, (2) the speed of traffic, and (3) the number of trucks in the flow of traffic. The proposed project does not propose any uses that would require a substantial number of truck trips and the proposed project would not alter the speed limit on any existing roadway so the proposed project's potential offsite noise impacts have been focused on the noise impacts associated with the change of volume of traffic that would occur with development of the proposed project.

Neither the General Plan nor the CEQA Guidelines define what constitutes a "substantial permanent increase to ambient noise levels", as such, this impact analysis has utilized guidance from the Federal Transit Administration for a moderate impact that has been detailed above in Table A.

The potential offsite traffic noise impacts created by the on-going operations of the proposed project have been analyzed through utilization of the FHWA model and parameters described above in Section 6.2 and the FHWA model noise calculation spreadsheets are provided in Appendix E. The proposed project's offsite traffic noise impacts have been analyzed for the existing, existing plus ambient, and cumulative conditions and are discussed below.

Existing Conditions

The proposed project's potential offsite noise impacts have been calculated through a comparison of the Existing scenario to the Existing With Project Scenario. The results of this comparison are shown in Table PTable PTable O.

Table PPO – Existing Year Project Traffic Noise Contributions

Roadway	Segment	dBA Ldn at Nearest Receptor[1]			Increase Threshold
		Existing	Existing With Project	Project Contribution	
Central Avenue (SR-74)	East of Dexter Avenue	74.3	74.3	0.0	+1 dBA
Riverside Drive (SR-74)	West of Gunnerson Street-Strickland Avenue	68.3	68.4	0.1	+1 dBA
Riverside Drive (SR-74)	East of Lakeshore Drive	68.3	68.4	0.1	+1 dBA
Riverside Drive (SR-74)	West of Lakeshore Drive	70.0	70.0	0.0	+1 dBA
Lakeshore Drive	Northwest of Riverside Drive (SR-74)	66.8	67.4	0.6	+1 dBA
Lakeshore Drive	Southeast of Riverside Drive (SR-74)	58.9	58.9	0.0	+3 dBA

Notes:
[1] Distances to nearest residential uses are shown in Table H. The calculated noise levels do not take into account existing noise barriers
[2] Increase Threshold obtained from the FTA's allowable noise impact exposures detailed above in Table A.
Source: FHWA Traffic Noise Prediction Model FHWA-RD-77-108.

Table PTable PTable O shows that for the existing conditions, the proposed project's permanent noise increases to the nearby sensitive receptors from the generation of additional vehicular traffic would not exceed the FTA's allowable increase thresholds detailed above. Therefore, the proposed project would not result in a substantial permanent increase in ambient noise levels for the existing conditions. Impacts would be less than significant.

Existing Plus Ambient Conditions

The proposed project's potential offsite noise impacts have been calculated through a comparison of the existing plus ambient without project scenario to the existing plus ambient with project scenario. The results of this comparison are shown in Table QTable QTable P.

Table QQP – Existing Plus Ambient Project Traffic Noise Contributions

Roadway	Segment	dBA Ldn at Nearest Receptor[1]			Increase Threshold
		Existing + Ambient	Existing + Ambient + Project	Project Contribution	
Central Avenue (SR-74)	East of Dexter Avenue	74.6	74.6	0.0	+1 dBA
Riverside Drive (SR-74)	West of Gunnerson Street-Strickland Avenue	68.5	68.5	0.0	+1 dBA
Riverside Drive (SR-74)	East of Lakeshore Drive	68.5	68.5	0.0	+1 dBA
Riverside Drive (SR-74)	West of Lakeshore Drive	70.1	70.2	0.1	+1 dBA
Lakeshore Drive	Northwest of Riverside Drive (SR-74)	67.0	67.5	0.5	+1 dBA
Lakeshore Drive	Southeast of Riverside Drive (SR-74)	59.1	59.1	0.0	+3 dBA

Notes:
[1] Distances to nearest residential uses are shown in Table H. The calculated noise levels do not take into account existing noise barriers.
[2] Increase Threshold obtained from the FTA's allowable noise impact exposures detailed above in Table A.
Source: FHWA Traffic Noise Prediction Model FHWA-RD-77-108.

Table QTable QTable P shows that for the existing plus ambient conditions, the proposed project's permanent noise increases to the nearby sensitive receptors from the generation of additional vehicular traffic would not exceed the FTA's allowable increase thresholds detailed above. Therefore, the proposed project would not result in a substantial permanent increase in ambient noise levels for the existing plus ambient conditions. Impacts would be less than significant.

Cumulative Conditions

The proposed project's potential offsite noise impacts have been calculated through a comparison of the cumulative without project scenario to the cumulative with project scenario. The results of this comparison are shown in Table RTable RTable Q.

Table RRQ – Cumulative Project Traffic Noise Contributions

Roadway	Segment	dBA Ldn at Nearest Receptor[1]			Increase Threshold
		Cumulative No Project	Cumulative With Project	Project Contribution	
Central Avenue (SR-74)	East of Dexter Avenue	76.1	76.1	0.0	+0 dBA
Riverside Drive (SR-74)	West of Gunnerson Street-Strickland Avenue	70.0	70.1	0.1	+1 dBA
Riverside Drive (SR-74)	East of Lakeshore Drive	70.0	70.1	0.1	+1 dBA
Riverside Drive (SR-74)	West of Lakeshore Drive	70.9	70.9	0.0	+1 dBA

Lakeshore Drive	Northwest of Riverside Drive (SR-74)	67.6	68.1	0.5	+1 dBA
Lakeshore Drive	Southeast of Riverside Drive (SR-74)	59.8	59.8	0.0	+3 dBA

Notes:
[1] Distances to nearest residential uses are shown in Table H. The calculated noise levels do not take into account existing noise barriers
[2] Increase Threshold obtained from the FTA's allowable noise impact exposures detailed above in Table A.
Source: FHWA Traffic Noise Prediction Model FHWA-RD-77-108.

Table R~~Table R~~Table Q shows that for the cumulative conditions, the proposed project's permanent noise increases to the nearby sensitive receptors from the generation of additional vehicular traffic would not exceed the FTA's allowable increase thresholds detailed above. Therefore, the proposed project would not result in a substantial permanent increase in ambient noise levels for the cumulative conditions. Impacts would be less than significant.

Onsite Noise Sources

The proposed project would consist of the development of an 18-pump gas station and associated convenience store, a fast food restaurant with a drive-thru window, and a parking lot. The operation of the proposed project may create an increase in onsite noise levels from noise impacts from rooftop mechanical equipment, air/water machine, gas fueling activities, parking lot activities, delivery truck activities, and onsite operation of a drive-thru speaker.

Section 17.176.060(A) of the Municipal Code limits onsite noise sources to 65 dBA between 7:00 a.m. and 10:00 p.m. and 60 dBA between 10:00 p.m. and 7:00 a.m. at the adjacent existing commercial property on the northwest side and the proposed commercial property on the southwest side of the project site. Section 8.06.060(A) also provides residential noise standards, however the nearest residential uses are located 1,700 feet to the southwest and due to the distance, no noise impacts are anticipated to the nearby residential uses.

The analysis provided above in Section 7.2 found that the noise levels from onsite noise sources at the adjacent commercial uses would be 74 dBA at the northwest property line and would be 64 dBA at the southwest property line, which are based on the worst-case scenario of the simultaneous occurrence of all noise producing activities from operation of the proposed project. The analysis provided in Section 7.2 shows that the combined noise levels would exceed the City's commercial land use daytime noise standard of 65 dBA on the northwest property line and would exceed the commercial use nighttime noise standard of 60 dBA at both the northwest and southwest property lines. This would be considered a significant impact.

Mitigation Measure 2 is provided that would require the project applicant to construct a minimum 8-foot high masonry wall on the northwest and southwest property lines of the project site. The operational onsite noise levels were recalculated based on implementation of Mitigation Measure 2 and the results are shown above in Section 7.2, which shows that with implementation of Mitigation Measure 2, the combined noise levels at the adjacent commercial uses would be 58 dBA at the northwest property line and would be 51 dBA at the southwest property line, which are within both the City's daytime and nighttime noise standards for commercial land uses. Therefore, with implementation of Mitigation Measure 2, the proposed project is not anticipated to cause a substantial permanent increase in ambient noise levels from onsite sources. Impacts would be less than significant.

Level of Significance Before Mitigation

Potentially significant impact.

Mitigation Measures

Mitigation Measure 2 provided above in Section 7.2.

Level of Significance After Mitigation

Less than significant impact.

7.5 Temporary Noise Level Increase

The proposed project may create a substantial temporary or periodic increase in ambient noise levels in the project vicinity above noise levels existing without the proposed project. The construction activities for the proposed project are anticipated to include site preparation and grading of the 2.84-acre project site, building construction of the 18-pump, 6,092 square foot gas station, 8,360 square foot convenience store, and a 2,543 square foot fast food restaurant with a drive-thru window, paving of the onsite roads and parking areas, and application of architectural coatings. Noise impacts from construction activities associated with the proposed project would be a function of the noise generated by construction equipment, equipment location, sensitivity of nearby land uses, and the timing and duration of the construction activities. The nearest sensitive receptors to the project site are the commercial uses located as near as 100 feet northwest of the project site. There are also single-family homes located as near as 1,700 feet southwest of the project site.

The construction noise impacts to the nearby sensitive receptors has been previously analyzed above in Section 7.2, which found that that the greatest noise impacts at the nearby off-site workers would occur during the site preparation and grading phases of construction, with a noise level as high as 77 dBA, which is within the City's mobile equipment threshold for business properties of 85 dBA. However, the site preparation and grading phases have the potential to exceed the City's stationary equipment threshold of 75 dBA at the nearest off-site workers. This would be considered a significant impact.

Section 7.2 also shows that the greatest noise impacts at the nearest homes would occur during grading of the project site, with a noise level as high as 55 dBA, which is within both the City's mobile equipment threshold of 75 dBA and stationary equipment threshold of 60 dBA.

Mitigation Measure 1 is provided that would require any stationary construction equipment that is used within 50 feet of the project's northwest property line to place a temporary sound barrier between the stationary equipment and any nearby sensitive receptors. With implementation of Mitigation Measure 1, the proposed project would not create a substantial temporary or periodic increase in ambient noise levels.

Level of Significance Before Mitigation

Potentially significant impact.

Mitigation Measures

Mitigation Measure 1 provided above in Section 7.2.

Level of Significance After Mitigation

Less than significant impact.

7.6 Aircraft Noise

The proposed project would not expose people residing or working in the project area to excessive noise levels from aircraft. The nearest airport is Skylark Airport, located approximately five miles southeast of the project site. The project site is located outside of the 60 dBA CNEL noise contours of this airport and

the site observations during the noise measurements found that although aircraft noise is occasionally audible at the project site, the noise created by the aircraft is not loud enough to measurably increase the ambient noise levels, which is primarily created by Riverside Drive and Collier Avenue. Impacts would be less than significant.

Level of Significance

Less than significant impact.

8.0 REFERENCES

California Department of Transportation, *2015 Annual Average Daily Truck Traffic on the California State Highway System*, 2016.

California Department of Transportation (Caltrans), *Technical Noise Supplement to the Traffic Noise Analytics Protocol*, September 2013.

California Department of Transportation, *Transportation- and Construction-Induced Vibration Guidance Manual*, September 2013.

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