NOISE ASSESSMENT

Riverside and Lincoln Commercial Development
15209 Lincoln Street
City of Lake Elsinore, CA

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Project: 19-53 Riverside and Lincoln Noise

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GLOSSARY OF COMMON TERMS

Sound Pressure Level (SPL): a ratio of one sound pressure to a reference pressure (L_{ref}) of 20 µPa. Because of the dynamic range of the human ear, the ratio is calculated logarithmically by 20 log (L/L_{ref}).

A-weighted Sound Pressure Level (dBA): Some frequencies of noise are more noticeable than others. To compensate for this fact, different sound frequencies are weighted more.

Minimum Sound Level (L_{min}): Minimum SPL or the lowest SPL measured over the time interval using the A-weighted network and slow time weighting.

Maximum Sound Level (L_{max}): Maximum SPL or the highest SPL measured over the time interval the A-weighted network and slow time weighting.

Equivalent sound level (L_{eq}): the true equivalent sound level measured over the run time. Leq is the A-weighted steady sound level that contains the same total acoustical energy as the actual fluctuating sound level.

Day Night Sound Level (Ldn): Representing the Day/Night sound level, this measurement is a 24 –hour average sound level where 10 dB is added to all the readings that occur between 10 pm and 7 am. This is primarily used in community noise regulations where there is a 10 dB "Penalty" for nighttime noise. Typically, Ldn's are measured using A weighting.

Community Noise Exposure Level (CNEL): The accumulated exposure to sound measured in a 24-hour sampling interval and artificially boosted during certain hours. For CNEL, samples taken between 7 pm and 10 pm are boosted by 5 dB; samples taken between 10 pm and 7 am are boosted by 10 dB.

Octave Band: An octave band is defined as a frequency band whose upper band-edge frequency is twice the lower band frequency.

Third-Octave Band: A third-octave band is defined as a frequency band whose upper band-edge frequency is 1.26 times the lower band frequency.

Response Time (F,S,I): The response time is a standardized exponential time weighting of the input signal according to fast (F), slow (S) or impulse (I) time response relationships. Time response can be described with a time constant. The time constants for fast, slow and impulse responses are 1.0 seconds, 0.125 seconds and 0.35 milliseconds, respectively.

EXECUTIVE SUMMARY

This noise study has been completed to determine the noise levels from the proposed Riverside and Lincoln Commercial Development. The proposed Project site is located within the City of Lake Elsinore. The Project proposes to construct 39,463 square feet of self-storage, 4,456 square feet of fast-food restaurant with drive-thru, a 16 fueling position super convenience market/gas station, and an automated car wash.

Construction Noise

Project construction is expected to occur at the site for more than 10 days, the construction will be scheduled with the City through grading and building permits. Per the City's Municipal Code, where technically and economically feasible, construction activities shall be conducted in such a manner that the maximum noise levels at affected properties will not exceed those listed in Table 3-1 above for mobile equipment and in Table 3-2 above for stationary equipment. As can be seen in Table 4-1 the mobile equipment is anticipated to comply with the City 75 dBA Lmax threshold. Stationary equipment typically involves the use of small generators and compressors. These stationary pieces of equipment typically have a sound level of 65-70 dBA hourly due to duty-cycles (turning on and off). Therefore, to comply with the City's stationary 60 dBA Lmax threshold the equipment should be staged 200 feet or more from the single-family property lines and 150 feet from multi-family property lines to comply with the 65 dBA Lmax threshold. If the stationary needs to be closer, than the equipment should be shielded with barriers constructed using materials such as half inch plywood, mass loaded vinyl or sound blankets.

To further minimize construction noise at adjacent land uses, the following measures should be taken:

1. Construction should occur during the permissible hours as defined in the Municipal Code.
2. During construction, the contactor shall ensure all construction equipment is equipped with appropriate noise attenuating devices.
3. The contractor should locate equipment staging areas that will create the greatest distance between construction-related noise/vibration sources and sensitive receptors nearest the project site during all project construction.
4. Idling equipment should be turned off when not in use.

Construction Vibration

The nearest vibration-sensitive uses are the residences located 25 feet or more from the nearest proposed construction and would experience vibration levels below the City's thresholds at the sensitive land uses from the temporary construction activities. Therefore, vibration impacts would be less than significant.

Offsite Transportation Noise

The Project's direct contributions to off-site roadway noise increases will not cause any significant impacts to any existing or future noise sensitive land uses.

Operational Noise

The overall cumulative noise level complies with the City's most restrictive daytime threshold. The only operational noise sources that will occur during the nighttime hours would be from the fast food speakers and the HVAC units. The nighttime cumulative noise levels also comply with the City's most restrictive nighttime.

It should be noted: the RV Park and most of the residential uses surrounding the project site are not single-family residential and the daytime and nighttime thresholds would be higher than what was analyzed. This analysis uses the lower single-family daytime threshold of 50 dBA and nighttime threshold of 40 dBA, so the multifamily units are analyzed very conservatively. Additionally, based on the project traffic study there are over 20,000 ADT existing along Riverside Drive which would increase the ambient noise conditions and increased the allowable noise levels as described in the City's Municipal Code Section 17.

1.0 PROJECT INTRODUCTION

1.1 Purpose of this Study

The purpose of this Noise study is to determine potential noise impacts (if any) created from the proposed construction and operations and to determine potential noise impacts (if any) to the site generated from offsite sources. Should impacts be determined, the intent of this study would be to recommend suitable mitigation measures to bring those impacts to a level that would be considered less then significant.

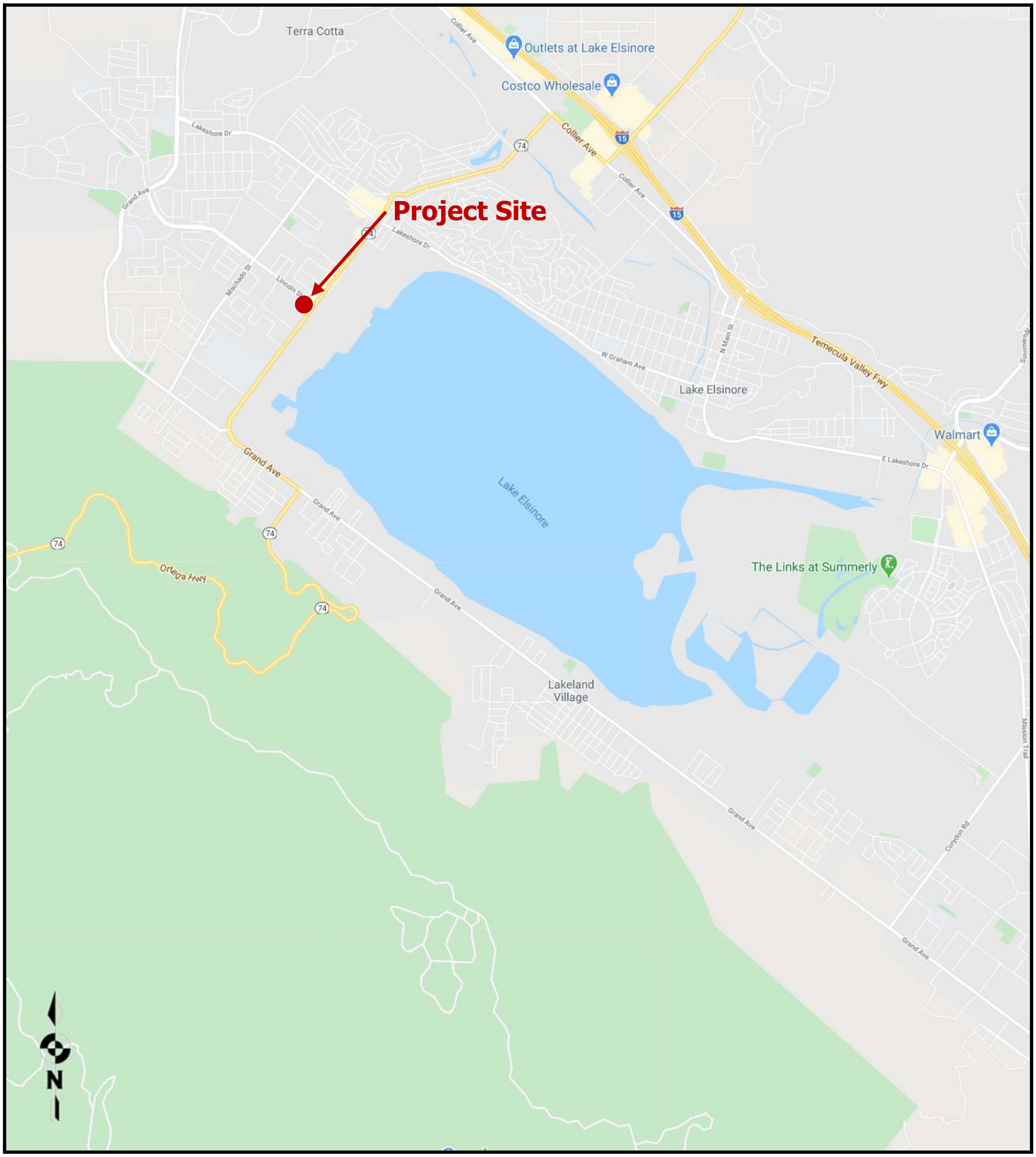
1.2 Project Location

The 5.86-acre project site is located northwest corner of Lincoln Street and Riverside Drive in the City of Lake Elsinore, California. The project is located at 15209 Lincoln Street within the City. A general project vicinity map is shown in Figure 1-A.

1.3 Project Description

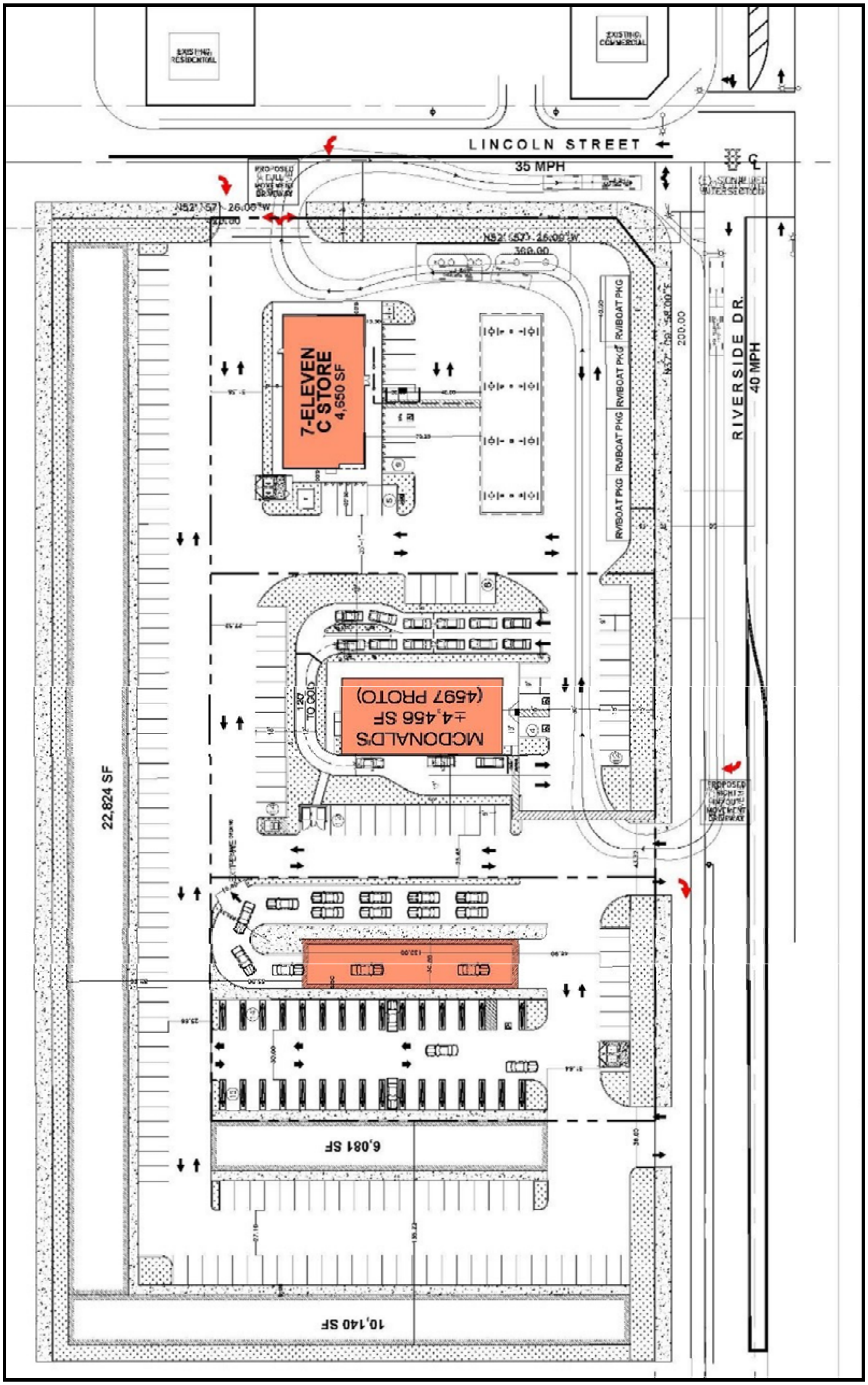
The Project proposes to construct 39,463 square feet of self-storage, 4,456 square feet of fast-food restaurant with drive-thru, a 16 fueling position super convenience market/gas station, and an automated car wash. Construction would begin early 2021 and be completed roughly 13 months later. A site development plan is shown in Figure 1-B.

Figure 1-A: Project Vicinity Map



Source: Google, 2020

Figure 1-B: Site Plan Map



Source: Golcheh Group, 2019

2.0 FUNDAMENTALS

2.1 Acoustical Fundamentals

Noise is defined as unwanted or annoying sound which interferes with or disrupts normal activities. Exposure to high noise levels has been demonstrated to cause hearing loss. The individual human response to environmental noise is based on the sensitivity of that individual, the type of noise that occurs and when the noise occurs. Sound is measured on a logarithmic scale consisting of sound pressure levels known as a decibel (dB). The sounds heard by humans typically do not consist of a single frequency but of a broadband of frequencies having different sound pressure levels. The method for evaluating all the frequencies of the sound is to apply an A-weighting to reflect how the human ear responds to the different sound levels at different frequencies. The A-weighted sound level adequately describes the instantaneous noise whereas the equivalent sound level depicted as Leq represents a steady sound level containing the same total acoustical energy as the actual fluctuating sound level over a given time interval.

The Community Noise Equivalent Level (CNEL) is the 24 hour A-weighted average for sound, with corrections or penalties for evening and nighttime hours. The corrections require an addition of 5 decibels to sound levels in the evening hours between 7 p.m. and 10 p.m. and an addition of 10 decibels to sound levels at nighttime hours between 10 p.m. and 7 a.m. These additions are made to account for the increased sensitivity during the evening and nighttime hours when sounds appears louder.

A vehicles noise level is from a combination of the noise produced by the engine, exhaust and tires. The cumulative traffic noise levels along a roadway segment are based on three primary factors: the amount of traffic, the travel speed of the traffic, and the vehicle mix ratio or number of medium and heavy trucks. The intensity of traffic noise is increased by higher traffic volumes, greater speeds and increased number of trucks.

Because mobile/traffic noise levels are calculated on a logarithmic scale, a doubling of the traffic noise or acoustical energy results in a noise level increase of 3 dBA. Therefore, the doubling of the traffic volume, without changing the vehicle speeds or mix ratio, results in a noise increase of 3 dBA. Mobile noise levels radiant in an almost oblique fashion from the source and drop off at a rate of 3 dBA for each doubling of distance under hard site conditions and at a rate of 4.5 dBA for soft site conditions. Hard site conditions consist of concrete, asphalt and hard pack dirt while soft site conditions exist in areas having slight grade changes, landscaped areas and vegetation. On the other hand, fixed/point sources radiate outward uniformly as it travels away from the source. Their sound levels attenuate or drop off at a rate of 6 dBA for each doubling of distance.

The most effective noise reduction methods consist of controlling the noise at the source, blocking the noise transmission with barriers or relocating the receiver. Any or all of these methods may be required to reduce noise levels to an acceptable level.

2.2 Vibration Fundamentals

Vibration is a trembling or oscillating motion of the ground. Like noise, vibration is transmitted in waves, but in this case through the ground or solid objects. Unlike noise, vibration is typically felt rather than heard. Vibration can be either natural as in the form of earthquakes, volcanic eruptions, or manmade as from explosions, heavy machinery, or trains. Both natural and manmade vibration may be continuous, such as from operating machinery; or infrequent, as from an explosion.

As with noise, vibration can be described by both its amplitude and frequency. Amplitude may be characterized in three ways: displacement, velocity, and acceleration. Particle displacement is a measure of the distance that a vibrated particle travels from its original position and for the purposes of soil displacement is typically measured in inches or millimeters. Particle velocity is the rate of speed at which soil particles move in inches per second or millimeters per second. Particle acceleration is the rate of change in velocity with respect to time and is measured in inches per second or millimeters per second. Typically, particle velocity (measured in inches or millimeters per second) and/or acceleration (measured in gravities) are used to describe vibration. Table 2-1 shows the human reaction to various levels of peak particle velocity.

Vibrations also vary in frequency and this affects perception. Typical construction vibrations fall in the 10 to 30 Hz range and usually occurring around 15 Hz. Traffic vibrations exhibit a similar range of frequencies; however, due to their suspension systems, it is less common, to measure traffic frequencies above 30 Hz.

Propagation of ground-borne vibrations is complicated and difficult to predict because of the endless variations in the soil through which the waves travel. 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 dropping an object into water. P-waves, or compression waves, are waves that carry their energy along an expanding spherical wave front. The particle motion in these waves is longitudinal. 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 energy is spread over an ever-increasing area such that the energy level is reduced with the distance from the energy source. This geometric spreading loss is inversely proportional to the square of the distance. Wave energy is also reduced with distance as a result of material damping in the form of internal friction, soil layering, and special voids. The amount of attenuation provided by material damping varies with soil type and condition as well as the frequency of the wave.

Table 2-1: Human Reaction to Typical Vibration Levels

Vibration Level Peak Particle Velocity (in/sec)	Human Reaction	Effect on Buildings
0.006–0.019	Threshold of perception, possibility of intrusion	Vibrations unlikely to cause damage of any type
0.08	Vibrations readily perceptible	Recommended upper level of vibration to which ruins and ancient monuments should be subjected
0.10	Level at which continuous vibration begins to annoy people	Virtually no risk of "architectural" (i.e., not structural) damage to normal buildings
0.20	Vibrations annoying to people in buildings	Threshold at which there is a risk to "architectural" damage to normal dwelling – houses with plastered walls and ceilings
0.4–0.6	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Vibrations at a greater level than normally expected from traffic, but would cause "architectural" damage and possibly minor structural damage
Source: Caltrans, Division of Environmental Analysis, *Transportation Related Earthborne Vibration, Caltrans Experiences*, Technical Advisory, Vibration, TAV-02-01-R9601, 2002.		

3.0 SIGNIFICANCE THRESHOLDS AND STANDARDS

3.1 Construction Noise

The City has set restrictions to control noise impacts associated with the construction of the proposed Project. Section 17.176.080(F), Construction/Demolition indicates that operating or causing the operation of any tools or equipment used in construction, drilling, repair, alteration or demolition work between the 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, except for emergency work by public service utilities or by variance issued by the City. The Municipal Code requires construction activities to be conducted in such a manner that the maximum (Lmax) noise levels at affected residential and commercial properties will not exceed the mobile and stationary equipment noise standards provided below on Tables 3-1 and 3-2.

Table 3-1: Mobile Equipment Noise Level Limits

Type	Land Use Category	Time Period	Maximum Noise Levels (dBA Lmax)*
I	Single-Family Residential	Daytime (7:00 a.m. - 7:00 p.m.)	75
		Nighttime (7:00 p.m. - 7:00 a.m.)	60
II	Multi-Family Residential	Daytime (7:00 a.m. - 7:00 p.m.)	80
		Nighttime (7:00 p.m. - 7:00 a.m.)	65
III	Semi-Residential/ Commercial	Daytime (7:00 a.m. - 7:00 p.m.)	85
		Nighttime (7:00 p.m. - 7:00 a.m.)	70

*Maximum noise levels for nonscheduled, intermittent, short-term operation (less than 10 days) of mobile equipment, Municipal Code 17.176.080 (F)

Table 3-2: Stationary Noise Level Limits

Type	Receiving Land Use Category	Time Period	Maximum Noise Levels (dBA Lmax)*
I	Single-Family Residential	Daytime (7:00 a.m. - 7:00 p.m.)	60
		Nighttime (7:00 p.m. - 7:00 a.m.)	50
II	Multi-Family Residential	Daytime (7:00 a.m. - 7:00 p.m.)	65
		Nighttime (7:00 p.m. - 7:00 a.m.)	55
III	Semi-Residential/ Commercial	Daytime (7:00 a.m. - 7:00 p.m.)	70
		Nighttime (7:00 p.m. - 7:00 a.m.)	60

*Maximum noise levels for repetitively scheduled and relatively long-term operation (period of 10 days or more) of stationary equipment, Municipal Code 17.176.080 (F)

3.2 Operational Noise Standards

The City of Lake Elsinore outlines their noise regulations and standards within the Noise Element from the General Plan and the Noise Ordinance from the Municipal Code. Applicable policies and standards governing environmental noise in the City are set forth in the General Noise Element. To control stationary source (non-transportation related) noise impacts, the City of Lake Elsinore has adopted guidelines as part of a noise control ordinance. For the purpose of this project, the noise impacts associated with stationary sources are controlled by the City's Noise Ordinance. Chapter 17.176.070 of the City's noise control standards are shown in Table 3-3.

Table 3-3: Allowable Exterior Noise Level

Type of Land Use	Allowed Equivalent Noise Level (Leq)	
	7:00 a.m. to 10:00 p.m.	10:00 p.m. to7:00 a.m.
Single-Family Residential	50 dBA	40 dBA
Multifamily Residential	55 dBA	45 dBA
Limited Commercial	60 dBA	55 dBA
General Commercial	65 dBA	60 dBA

3.3 Vibration Standards

The Municipal Code, Section 17.176.080(G), states that 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 from the source if on public space or public right-of- way is prohibited. The Municipal Code defines the vibration perception threshold to be a motion velocity of 0.01 in/sec over the range of one to 100 Hz.

4.0 CONSTRUCTION NOISE AND VIBRATION

4.1 Construction Noise Prediction Methodology

Construction noise represents a short-term impact on the ambient noise levels. Noise generated by construction equipment includes haul trucks, water trucks, graders, dozers, loaders and scrapers can reach relatively high levels. Grading activities typically represent one of the highest potential sources for noise impacts. The most effective method of controlling construction noise is through local control of construction hours and by limiting the hours of construction to normal weekday working hours.

The U.S. Environmental Protection Agency (U.S. EPA) has compiled data regarding the noise generating characteristics of specific types of construction equipment. Noise levels generated by heavy construction equipment can range from 60 dBA to in excess of 100 dBA when measured at 50 feet. However, these noise levels diminish rapidly with distance from the construction site at a rate of approximately 6 dBA per doubling of distance. For example, a noise level of 75 dBA measured at 50 feet from the noise source to the receptor would be reduced to 69 dBA at 100 feet from the source to the receptor, and reduced to 63 dBA at 200 feet from the source.

Using a point-source noise prediction model, calculations of the expected construction noise impacts were completed. The essential model input data for these performance equations include the source levels of each type of equipment, relative source to receiver horizontal and vertical separations, the amount of time the equipment is operating in a given day, also referred to as the duty-cycle and any transmission loss from topography or barriers.

The equipment needed for the development will consist of two large bulldozers, two rubber tire dozers, three tractors/loaders, a water truck, a medium sized excavator and a small to medium sized road grader. Based on the EPA noise emissions, empirical data and the amount of equipment needed, worst case noise levels from the construction equipment for site preparation would occur during the grading operations.

4.2 Grading Activities Noise Findings and Mitigation

Overall construction of the site is anticipated to take just over one year to complete and the grading activities are anticipated to take approximately one month, with building construction occurring for about ten months and then paving and landscaping for the last month. The grading equipment will be spread out over the project site from distances near the property lines to distances of 450 feet. Based upon the site plan the grading operations, on average, will occur more than 200 feet from the property lines. This means that most of the time the average distance from all the equipment to the same property line, is 200 feet or more. As can be seen in Table 4-1, at an average distance of 200 feet from the construction activities to the nearest property line would result in a noise attenuation of -12 dBA without shielding.

Table 4-1: Construction Noise Levels

Equipment Type	Quantity Used	Source @ 50 Feet (dBA Lmax)[1]	Cumulative Noise Level @ 50 Feet (dBA Lmax)
Tractor/Backhoe	3	72	76.8
Dozer	2	74	74.0
Grader	2	73	76.0
Excavator	1	75	75.0
Water Truck	1	70	70.0
		Cumulative Level	82.7
		Distance to Sensitive Use	200
		Noise Reduction due to Distance	-12.0
		Property Line Noise Level	**70.7**

[1] Includes a duty-cycle/usage factor of 40%

Grading activities typically have the highest noise levels when compared to building construction, utilities and paving activities. Therefore, the higher noise levels will be utilized in this analysis. Mobile equipment is expected to be used within the Project site during the grading, utilities and underground, building construction, and paving phases of construction. To account for the potential mobile equipment construction noise impacts, the Municipal Code standards specifically identify maximum noise level limits for equipment noise level impacts at residential properties.

Although Project construction is expected to occur at the Project site for more than 10 days, the construction will be scheduled with the City through grading and building permits. Per the City's Municipal Code, where technically and economically feasible, construction activities shall be conducted in such a manner that the maximum noise levels at affected properties will not exceed those listed in Table 3-1 above for mobile equipment and in Table 3-2 above for stationary equipment. As can be seen in Table 4-1 the mobile equipment is anticipated to comply with the City 75 dBA Lmax threshold. Stationary equipment typically involves the use of small generators and compressors. These stationary pieces of equipment typically have a sound level of 65-70 dBA hourly due to duty-cycles (turning on and off). Therefore, to comply with the City's stationary 60 dBA Lmax threshold the equipment should be staged 200 feet or more from the single-family property lines and 150 feet from multi-family property lines to comply with the 65 dBA Lmax threshold. If the stationary needs to be closer, than the equipment should be shielded with barriers constructed using materials such as half inch plywood, mass loaded vinyl or sound blankets.

To further minimize construction noise at adjacent land uses, the following measures should be taken:

5. Construction should occur during the permissible hours as defined in the Municipal Code.
6. During construction, the contactor shall ensure all construction equipment is equipped with appropriate noise attenuating devices.
7. The contractor should locate equipment staging areas that will create the greatest distance between construction-related noise/vibration sources and sensitive receptors nearest the project site during all project construction.
8. Idling equipment should be turned off when not in use.

4.3 Construction Vibration Findings and Mitigation

The Municipal Code, Section 17.176.080(G), states that 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 from the source if on public space or public right-of- way is prohibited. The Municipal Code defines the vibration perception threshold to be a motion velocity of 0.01 in/sec over the range of one to 100 Hz.

The nearest vibration-sensitive uses are the residences on the western and northern property lines. The main construction activities would be located 100 feet or more from the residential structures with infrequent equipment usage along the property lines. Table 4-2 lists the average vibration levels that would be experienced at the nearest vibration sensitive land uses from the temporary construction activities. Construction activities would generate levels of vibration that would not exceed the City criteria for nearby residential uses. Therefore, vibration impacts would be less than significant.

Table 4-2: Vibration Levels from Construction Activities (Residential Receptors)

Equipment	Approximate Velocity Level at 25 Feet (VdB)	Approximate RMS Velocity at 25 Feet (in/sec)	Approximate RMS Velocity at 100 Feet (in/sec)
Large bulldozer	87	0.003	0.01
Jackhammer	79	0.035	0.004
Loaded trucks	86	0.076	0.01
Small bulldozer	58	0.089	0.0004
		City Criteria	0.01
		Significant Impact?	**No**

[1] PPV at Distance D = PPVref x $(25/D)^{1.5}$

5.0 TRANSPORTATION NOISE

The off-site Project related roadway segment noise levels projected in this report were calculated using the methods in the Highway Noise Model published by the Federal Highway Administration (FHWA Highway Traffic Noise Prediction Model, FHWA-RD-77-108, December, 1978). The FHWA Model uses the traffic volume, vehicle mix, speed, and roadway geometry to compute the equivalent noise level. A spreadsheet calculation was used which computes equivalent noise levels for each of the time periods used in the calculation of CNEL. Weighting these equivalent noise levels and summing them gives the CNEL for the traffic projections. The noise contours are then established by iterating the equivalent noise level over many distances until the distance to the desired noise contour(s) are found.

Because mobile/traffic noise levels are calculated on a logarithmic scale, a doubling of the traffic noise or acoustical energy results in a noise level increase of 3 dBA. Therefore, the doubling of the traffic volume, without changing the vehicle speeds or mix ratio, results in a noise increase of 3 dBA. Mobile noise levels radiant in an almost oblique fashion from the source and drop off at a rate of 3 dBA for each doubling of distance under hard site conditions and at a rate of 4.5 dBA for soft site conditions. Hard site conditions consist of concrete, asphalt and hard pack dirt while soft site conditions exist in areas having slight grade changes, landscaped areas and vegetation.

Community noise level changes greater than 5 dBA are often identified as readily perceivable and considered potential significant, while changes greater than 3 dBA are often identified as audible and can be significant depending on the ambient conditions and less than 1 dBA will not be discernible to most people. In the range of 1 to 3 dBA, residents who are very sensitive to noise may perceive a slight change. There is no scientific evidence available to support the use of 3 dBA as the significance threshold. Community noise exposures are typically over a long time period rather than the immediate comparison made in a laboratory situation. Therefore, the level at which changes in community noise levels become discernible is likely greater than 1 dBA and 3 dBA appears to be appropriate for most people. Conservatively, for the purposes for this analysis a project related noise impact would be considered significant if the project increases noise levels for a noise sensitive land use by 3 dBA CNEL and if the project increases noise levels above an unacceptable noise level per the City's General Plan in the area adjacent to the roadway segment.

Direct Noise Impacts

To determine if direct off-site noise level increases associated with the development of the Project will create noise impacts. The noise levels for the existing conditions were compared with the noise level increase from the Project. Utilizing the Project's traffic assessment (Source: Ganddini Group, 2020) noise levels were developed for the following traffic scenarios:

Existing: Current day noise conditions without construction of the project.

Existing Plus Project: Current day noise conditions plus the completion of the project.

Existing vs. Existing Plus Project: Comparison of the direct project related noise level increases in the vicinity of the project site.

The noise levels at 50 feet for the roadways in the vicinity of the Project site are given in Table 5-1 for the Existing Scenario and in Table 5-2 for the Existing Plus Project Scenario. Note that the values given do not take into account the effect of any noise barriers or topography that may affect ambient noise levels. Table 5-3 presents the comparison of the Existing Year with and without Project related noise levels. The overall roadway segment noise levels will increase 1.7 dBA CNEL with the development of the Project. The Project does not create a direct noise increase of more than 3 dBA CNEL on any roadway segment. Therefore, the Project's direct contributions to off-site roadway noise increases will not cause any significant impacts to any existing or future noise sensitive land uses.

Table 5-1: Existing Noise Levels

Roadway	Roadway Segment	ADT[1]	Vehicle Speeds (MPH)[1]	Noise Level @ 50-Feet (dBA CNEL)
Lincoln Street	Machado Street to Riverside Drive	8,200	30	65.4
Riverside Drive	West of Lincoln Street to Lincoln Street	21,900	40	71.5
	Lincoln Street to Joy Street	25,000	40	72.1
	Joy Street to Lakeshore Drive	27,200	40	72.5
[1] Source: Project Traffic study prepared Ganddini Group, 2020				

Table 5-2: Existing + Project Noise Levels

Roadway	Roadway Segment	ADT[1]	Vehicle Speeds (MPH)[1]	Noise Level @ 50-Feet (dBA CNEL)
Lincoln Street	Machado Street to Riverside Drive	12,100	30	67.1
Riverside Drive	West of Lincoln Street to Lincoln Street	23,000	40	71.7
	Lincoln Street to Joy Street	27,100	40	72.4
	Joy Street to Lakeshore Drive	29,000	40	72.7
[1] Source: Project Traffic study prepared by Ganddini Group, 2020				

Table 5-3: Existing vs. Existing + Project Noise Levels

Roadway	Roadway Segment	Existing Noise Level (dBA CNEL)	Existing Plus Project Noise Level (dBA CNEL)	Project Related Noise Increase (dBA CNEL)
Lincoln Street	Machado Street to Riverside Drive	65.4	67.1	1.7
Riverside Drive	West of Lincoln Street to Lincoln Street	71.5	71.7	0.2
	Lincoln Street to Joy Street	72.1	72.4	0.4
	Joy Street to Lakeshore Drive	72.5	72.7	0.3

<u>Cumulative Noise Impacts</u>

To determine if cumulative off-site noise level increases associated with the development of the Project and other planned or permitted projects in the vicinity will create noise impacts. The noise levels for the near-term Project Buildout and other planned and permitted projects were compared with the existing conditions. Utilizing the Project's traffic assessment (Source: Ganddini Group, 2020) noise contours were developed for the following traffic scenarios:

> <u>Existing Plus Cumulative Projects Plus Project</u>: Current day noise conditions plus the completion of the project and the completion of other permitted, planned projects or approved ambient growth factors.
>
> <u>Existing vs. Existing Plus Cumulative Plus Project</u>: Comparison of the existing noise levels and the related noise level increases from the combination of the project and all other planned or permitted projects in the vicinity of the site.

The existing noise levels at 50 feet for the roadways in the vicinity of the Project site are given in Table 5-1 above for the Existing Scenario. The near-term cumulative noise conditions are provided in Table 5-4. No noise barriers or topography that may affect noise levels were incorporated in the calculations.

Table 5-5 presents the comparison of the Existing Year and the Near-Term Cumulative noise levels. The overall roadway segment noise levels will increase 1.8 dBA CNEL with the development of the Project and proposed cumulative projects. The cumulative noise increase is less than 3 dBA CNEL and the Project is not the main reason for the overall increase. Therefore, the Project's contributions to off-site roadway noise increases will not cause any significant impacts to any existing or future noise sensitive land uses.

Table 5-4: Existing + Project + Cumulative Noise Levels

Roadway	Roadway Segment	ADT[1]	Vehicle Speeds (MPH)[1]	Noise Level @ 50-Feet (dBA CNEL)
Lincoln Street	Machado Street to Riverside Drive	12,400	30	67.2
Riverside Drive	West of Lincoln Street to Lincoln Street	23,900	40	71.9
	Lincoln Street to Joy Street	28,100	40	72.6
	Joy Street to Lakeshore Drive	30100	40	72.9
[1] Source: Project Traffic study prepared by Ganddini Group, 2020				

Table 5-5: Existing vs. Existing + Project + Cumulative Noise Levels

Roadway	Roadway Segment	Existing Noise Level (dBA CNEL)	Existing Plus Project Noise Level (dBA CNEL)	Project Related Noise Increase (dBA CNEL)
Lincoln Street	Machado Street to Riverside Drive	65.4	67.2	1.8
Riverside Drive	West of Lincoln Street to Lincoln Street	71.5	71.9	0.4
	Lincoln Street to Joy Street	72.1	72.6	0.5
	Joy Street to Lakeshore Drive	72.5	72.9	0.4

<u>6.0 OPERATIONAL ACTIVITIES</u>

6.1 Potential Noise Impacts

This section examines the potential stationary noise source impacts associated with the development and operation of the proposed project. The project site is designed for commercial/retail uses and therefore may utilize noise-producing equipment including rooftop mechanical ventilation units and truck activities. The cumulative noise level from all equipment will vary at the property line depending on the location and orientation of the equipment, the amount of each type of equipment and the size of each type of equipment.

6.2 Potential Noise Conditions

Fixed or point sources radiate outward uniformly as sound travels away from the source. Their sound levels attenuate or drop off at a rate of 6 dBA for each doubling of distance. Using a point-source noise prediction model, calculations of the expected operational noise impacts were completed. The essential model input data for these performance equations include the source levels of each type of equipment, relative source to receiver horizontal and vertical separations, the amount of time the equipment is operating in a given day (also referred to as the duty-cycle) and any transmission loss from topography or barriers. Noise levels drop 3 decibels each time the duration of the source is reduced in half. Therefore, an hourly noise level over a 15 minute period would be reduced by 6 decibels based on the limited time of operation.

The existing residential uses to the west, north and east are closest to the proposed operations. Commercial use is located to the east as well with an RV Park across Riverside Drive to the south. Based on a review of the site plan, the proposed self-storage units will act as barrier to the residential use to the north and west. The main noise source on the eastern portion of the site is the gas station. Therefore, the worst-case potentially affected property line is the RV Park use to the south due to the proposed carwash. The noise level projections were calculated based on the site plan provided by Golcheh Group, 2019, showing the location of the proposed uses and the property lines.

<u>Carwash</u>

In order to examine the potential stationary noise source impacts associated with the operation of the proposed carwash, reference noise levels were used for a typical air dryer unit (*Source: Ryko ThrustPro Air Dryer with Noise Reduction Unit).* Additionally, sound level measurements of a similar existing carwash were taken for the proposed vacuum unit. The short-term noise measurement was taken at a distance of four-feet using a Larson-Davis Model LxT Type 1 precision sound level meter, programmed, in "slow" mode, to record noise levels in "A" weighted form. The sound level meter was calibrated before and after the monitoring using a Larson-Davis calibrator, Model CAL 200. The reference noise level of the air dryer and the results of the noise measurements at a similar vacuum unit are shown in Table 6-1.

During the duration of the measurements taken, the total run time for the similar drive thru car wash was approximately 5 minutes. Depending on the carwash package, this includes a wash cycle of approximately 3 to 4 minutes plus the air dryer running for approximately 1 minute and 30 seconds. During this time, the vacuum unit could also operate for approximately 2-3 minutes.

Table 6-1: Project Related Operational Noise Sources

Quantity	Equipment Description	Related Sound Level Distance (ft)	Noise Level (dBA)
1	Air Dryer w/Noise Reduction Unit	10	80.0
1	Vacuum Unit (Unshielded)	4	73.6
[1]*Source: Ryko ThrustPro Air Dryer with Noise Reduction Unit*			

Therefore, it was determined that at peak demand, a worst-case of 12 carwash operations could occur within an hour. Accounting for the peak hour trip volume of 12 vehicles per hour, a maximum run time of the equipment is shown in Table 6-2. Utilizing the maximum amount, the equipment can be operating, an adjusted noise level for the air dryer was calculated to be 74.8 dBA at 10 feet and the vacuum unit would result in a calculated noise level of 71.4 dBA at a distance of 4 feet. The noise level reductions are shown in Table 6-2.

Table 6-2: Run Time Adjusted Noise Levels

Equipment Description	Run Time Per Hour (sec)	Decibel Reduction (dBA)	Adjusted Noise Level (dBA)	Related Sound Level Distance (ft)
Air Dryer w/Noise Reduction Unit	1,080	-5.2	74.8	10
Vacuum Unit (Unshielded)	2,160	-2.2	71.4	4

The reductions from the equipment run times were incorporated into the reference noise levels. As stated above, the residential property lines are located over 225 feet and the proposed self-storage buildings would also block direct line of site, shielding the equipment noise from the residence. The RV Park use is located 200 feet to the south across Riverside Drive. Utilizing the adjusted operational times and distance, the anticipated unshielded noise level was determined to be 40 dBA as can be seen in Table 6-3. Per the applicant, hours of operation of the car wash will be 9 AM to 8 PM. Therefore, the proposed operations of the carwash would not exceed the City's most restrictive daytime threshold of 50 dBA. Therefore, no additional noise reductions would be required.

Table 6-3: Project Carwash Noise Levels (Nearest Property Line)

Source	Distance Separation (Feet)	Reference Noise Level (dBA)	Noise Reduction Due to Distance (dBA)	Property Line Noise Level (dBA)
Air Dryer w/Noise Reduction Unit	210	74.8	-26.4	**48**
Vacuum Unit (Unshielded)	285	71.4	-37.1	**34**

Fast Food Restaurant

To examine the potential stationary noise source impacts associated with the operation of the proposed fast food restaurants, reference noise levels were used for the menu board and speaker post (Source: HME Electronics, Inc., HME SPP2 Speaker Post). The reference noise level of the speaker board is 54 dBA CNEL at 32 feet. The future drive-thru speakers are located 295 feet from the RV Park property line to the south and resulting in an anticipated noise level of approximately 35 dBA. Therefore, the proposed operations would not exceed the City's most restrictive daytime threshold of 50 dBA and the most restrictive nighttime threshold of 40 dBA. Therefore, no additional noise reductions would be required.

Mechanical Ventilation

Rooftop mechanical ventilation units (HVAC) will be installed on the proposed buildings. To evaluate the HVAC noise impacts, the analysis utilized reference noise level measurements taken at a Shopping Center in Murrieta, CA in 2010. The unshielded noise levels for the HVAC units were measured at 65.9 dBA Leq at a distance of 6-feet.

To predict the worst-case future noise environment, a continuous reference noise level of 65.9 dBA at 6-feet was used to represent the roof-top mechanical ventilation system for the proposed uses. Even though the mechanical ventilation system will cycle on and off throughout the day, this approach presents the worst-case noise condition. In addition, these units are designed to provide cooling during the peak summer daytime periods, and it is unlikely that all the units will be operating continuously. The noise levels associated with the roof-top mechanical ventilation system will be limited with the proposed parapet walls on each building that will vary in height but will be roughly 1-foot higher than the HVAC units to shield them both visually and acoustically.

Hence, the parapet wall will block the line-of-sight from the adjacent residential units and reduce the noise levels at least 5 decibels. The anticipated noise HVAC noise levels are provided in Table 6-4.

The proposed HVAC operations would not exceed the City's most restrictive daytime threshold of 50 dBA and the most restrictive nighttime threshold of 40 dBA. Therefore, no additional noise reductions would be required. No impacts are anticipated and no mitigation is required. Additionally, most of the HVAC units will be located farther from the residential property line as part of the proposed project.

Table 6-4: Project HVAC Noise Levels (Southern Property Line)

Building	Nearest Distance to Observer Location (Feet)	Hourly Reference Noise Level (dBA)	Noise Source Reference Distance (Feet)	Noise Reduction Due to Distance (dBA)	Quantity	Property Line Cumulative Noise Level (dBA)
Storage	**250**	60.9*	3.0	**-32.4**	4	**35**
Carwash	**275**			**-33.2**	4	**34**
Fast Food	**290**			**-33.7**	4	**33**
Gas Station	**360**			**-35.6**	4	**31**
Combined Cumulative Noise Level at Property Line:						**39**
*65.9 dba minus 5 decibels shielding for parapet.						

6.3 Cumulative Noise Conditions

The cumulative noise levels form all the sources were combined and are provided in Table 6-5. The overall noise level complies with the City's most restrictive daytime threshold of 50 dBA. The only operational noise sources that will occur during the nighttime hours would be from the fast food speakers and the HVAC units. The nighttime cumulative noise levels also comply with the City's most restrictive threshold of 40 dBA and are also provided in Table 6-5.

It should be noted: the RV Park and most of the residential uses surrounding the project site are not single family residential and the daytime threshold would be 55 dBA and the nighttime threshold is 45 dBA. This analysis uses the lower single-family daytime threshold of 50 dBA and nighttime threshold of 40 dBA, so the multifamily units are analyzed very conservatively. Additionally, based on the project traffic study there are over 20,000 ADT existing along Riverside Drive (as shown in Table 5-1 above) which would increase the ambient noise conditions and increase the allowable noise levels as described in Section 3 of this report.

Table 6-5: Cumulative Noise Levels

Source	Daytime Noise Levels (dBA)	Daytime Threshold (dBA)	Nighttime Noise Levels (dBA)	Nighttime Threshold (dBA)
Air Dryer	48	50	35	40
Vacuum	34		34	
Drive thru	35		34	
HVAC	35		33	
HVAC	34		31	
HVAC	33		35	
HVAC	31		34	
Cumulative	**49**	**50**	**40**	**40**