NOISE ASSESSMENT

Serrano Oaks Multi-Family Development
City of Jurupa Valley

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Project: 21-133 Serrano Oaks 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 and vibration impacts to and from the proposed residential project. The project area is located in the southern portion of the Mission de Anza Specific Plan within the City of Jurupa Valley CA. The project is located east of Van Buren Boulevard and south of Limonite Avenue, along the east side of Clay Street.

Construction Noise

Project construction noise levels are considered exempt within one-fourth mile from an occupied residence if activities occur within the hours specified in the City of Jurupa Valley Municipal Code, Section 11.05.020 of 6:00 a.m. and 6:00 p.m. from June to September, and 7:00 a.m. to 6:00 p.m. from October to May.

At the time of this analysis, no nighttime Project construction activity was planned. Therefore, no impacts are anticipated and no mitigation is required during construction of the proposed Project. Additionally, all equipment should be properly fitted with mufflers and all staging and maintenance should be conducted as far away for the existing residence as possible.

Construction Vibration

The Federal Transit Administration (FTA) has determined vibration levels that would cause annoyance to a substantial number of people and potential damage to building structures. The FTA criterion for vibration induced structural damage is 0.20 in/sec for the peak particle velocity (PPV). The FTA criterion for infrequent vibration induced annoyance is 80 Vibration Velocity (VdB) for residential uses.

The nearest vibration-sensitive uses are the residences located to the east, 50 feet or more from the proposed construction. The average vibration levels that would be experienced at the nearest vibration sensitive land uses to the east from temporary construction activities were found to be below 0.2 in/sec. Project construction activities would result in PPV levels below the FTA's criteria for vibration induced structural damage. Therefore, Project construction activities would not result in vibration induced structural damage to residential buildings near the demolition and construction areas. Construction activities were found to generate levels of vibration below 80 VdB and would not exceed the FTA criteria for nuisance for nearby residential uses. Therefore, vibration impacts would be less than significant.

Onsite Transportation Noise

It was determined from the combined roadway and train activities that the outdoor use areas were found to comply with the City of Jurupa Valley Noise standards of 65 dBA CNEL without mitigation measures.

Additionally, a final noise assessment is required prior to the issuance of the first building permit since the building facades are above 60 dBA CNEL. This final report would identify the interior noise requirements based upon architectural and building plans. It should be noted; interior noise levels of 45 dBA CNEL can easily be obtained with conventional building construction methods and providing a closed window condition requiring a means of mechanical ventilation (e.g., air conditioning) for each building and upgraded windows for all sensitive rooms (e.g., bedrooms and living spaces).

Offsite Transportation Noise

The Project does not create a direct and cumulative noise increase of more than 3 dBA CNEL on the nearby roadways. 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.

Onsite Train Vibration

Train vibration depends on the weight of the train, travel speed, the condition of the track and soil characteristics. The proposed project buildings would be more than 700 feet from the centerline of the tracks. Federal Transit Administration Transit Noise and Vibration Impact Assessment Manual (Federal Transit Administration, 2018) predicts that freight train vibration levels are as high as 73 VdB at 175 feet from the track centerline for a locomotive-powered freight train traveling at speeds of 50 MPH and up to 62 VdB for commuter rail train events at that speed.

Therefore, the infrequent freight train activities will be below the 80 VdB, infrequent event for the freight train and the frequent commuter train activities will be below the 72 VdB frequent event annoyance thresholds as identified by the FTA. Additionally, due to the close proximity of the Transit Center, the commuter trains will be traveling at a slower speed of approximately 15 MPH, which would reduce the vibration levels 8 VdB and the freight train travel at speeds of 30 MPH or less which would reduce the vibration levels at least 4 VdB. Therefore, the train activities would have a less than significant impact on the proposed project.

1.0 PROJECT INTRODUCTION

1.1 Purpose of this Study

The purpose of this Noise study is to determine any potential noise impacts due to the proposed construction of the proposed project and also to determine potential noise impacts (if any) to the proposed project 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.

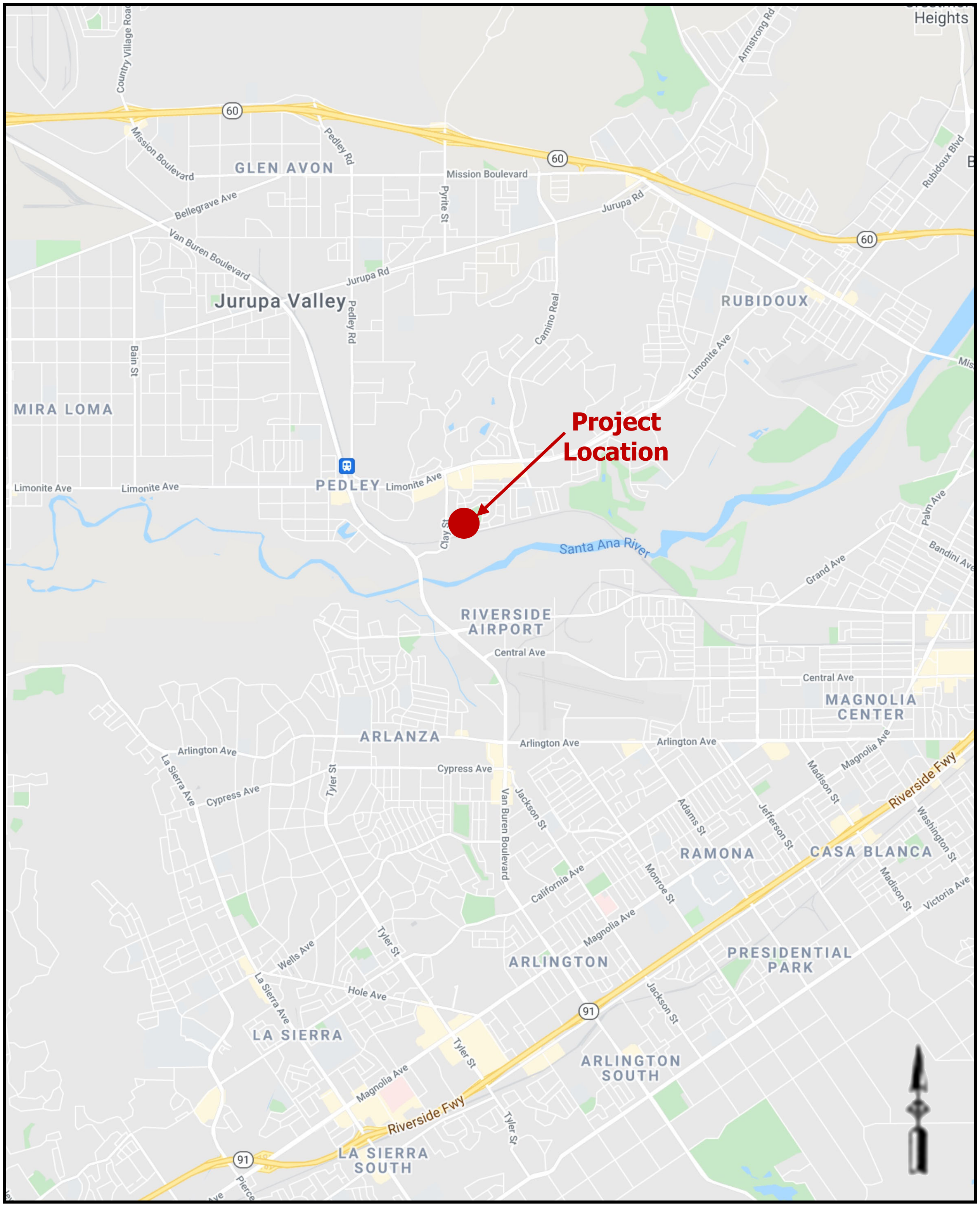
1.2 Project Location

The Project site is located in the City of Jurupa Valley, in the northwest portion of Riverside County. A general project vicinity map is shown in Figure 1-A. The project area is generally located east of Van Buren Boulevard and south of Limonite Avenue in the Mission De Anza Specific Plan within the City of Jurupa Valley. The project site is bounded on the west by Clay Street, on the north by an existing senior living facility, on the east by existing single family residential, and on the south by an existing fast-food restaurant. Existing retail uses are located further north along Clay Street and Limonite Avenue. Light commercial uses are located further south of the project site.

1.3 Project Description and Purpose

The proposed project will consist of 66 attached multi-family townhomes across 13 buildings as shown in the Project site configuration provided in Figure 1-B. The homes will range from approximately 1,400 square feet (s.f.) to 1,500 s.f. and feature three or four bedrooms, depending on the home plan and layout, with attached two-car garages. The attached homes will be two stories with a maximum building height of 29 feet.

Figure 1-A: Project Vicinity Map



Source: Google Maps

Figure 1-B: Project Configuration

Source: Summa Architecture, 2022

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 appear louder.

A vehicles noise level is generated from a combination of 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 occur 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, 2020 (Caltrans, 2020).

3.0 SIGNIFICANCE THRESHOLDS AND STANDARDS

3.1 Construction Noise

To control noise impacts associated with the construction of the proposed Project, the City has established limits to the hours of operation. Section 11.05.020 of the City's Municipal Code indicates that private construction projects, located within one-quarter of a mile from an occupied residence, are considered exempt from the Municipal Code noise standards if they occur within the permitted hours of 6:00 a.m. and 6:00 p.m. from June to September, and 7:00 a.m. to 6:00 p.m. from October to May.

3.2 Transportation Noise Standards

To control transportation related noise sources such as arterial roads, freeways, airports and railroads, the City of Jurupa Valley has established guidelines for acceptable community noise levels in the Noise Element of the General Plan. For noise sensitive low density single family, duplex, and mobile homes, the City Noise Element requires an exterior noise level of less than 60 dBA CNEL for outdoor usable areas. For multi-family developments the standard is 65 dBA CNEL and a standard of 70 dBA CNEL is typically applied to commercial uses. The City has also established an interior noise limit of 45 dBA CNEL for all residential uses.

The Riverside County Airport Land Use Compatibility Plan (RC ALUCP) establishes compatibility criteria for land uses in relation to the noise contour boundaries of airports within the City of Jurupa Valley. Table 2B Supporting Compatibility Criteria: Noise of the RC ALUCP indicates that residential, commercial, and recreational uses, such as those within the Project, are considered clearly acceptable when located within the 50 to 55 dBA CNEL noise contour of an airport.

3.3 Construction Vibration Standards

The City of Jurupa Valley has not identified or adopted vibration standards. However, the United States Department of Transportation Federal Transit Administration (FTA) provides guidelines for maximum-acceptable vibration criteria for different types of land uses. These guidelines allow 80 VdB for human annoyance and 90 VdB for building damage at noise-sensitive uses and buildings where people normally sleep. Construction activity can result in varying degrees of ground-borne vibration, depending on the equipment and methods used, distance to the affected structures and soil type. Construction vibration is generally associated with pile driving and rock blasting. Occasionally large bulldozers and loaded trucks can cause perceptible vibration levels at close proximity. While not enforceable regulations within the City of Jurupa Valley, the FTA guidelines of 80 VdB for annoyance and 90 VdB for building damage at sensitive land uses provide the basis for determining the relative significance of potential Project-related vibration impacts.

4.0 CONSTRUCTION NOISE AND VIBRATION

4.1 Construction Noise 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. Additionally, sound levels are logarithmic not linear, so adding two sources of 68 dBA plus 68 dBA is equal to 71 dBA not 136 dBA.

Using a point-source noise prediction methodology, calculations of the expected construction noise impacts were completed using the equation below. 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.

$$L = 10 * Log\left(\sum_{i=1}^{n} 10^{\left(\frac{L_i}{10}\right)}\right)$$

For the grading phase, the equipment needed for the development will consist of a medium sized crawler type excavator, a small to medium sized road grader, a large rubber tired bulldozer, and three tractors/loaders/backhoes. 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 Findings and Mitigation for Grading Activities

The grading activities will consist of the preparation of internal roadways, parking and the finished pads. The equipment will be spread out over the project site from distances near the occupied property lines to distances of 200 feet or more away. The nearest sensitive receptors are the residential land uses adjacent to the eastern property line. Proposed buildings are located adjacent to the residential property line to the east and several pieces of construction equipment could be working simultaneously as close as 50 feet from the property line. Although all the equipment will not likely be working along the property line at the same time, to be conservative, combined noise levels were calculated at 50 feet. As can be seen in Table 4-1, at an average distance of 50 feet from the construction activities to the nearest residential property line would result in a cumulative noise level of 80 dBA without shielding.

Project construction noise levels are considered exempt if activities occur within the hours specified in the City of Jurupa Valley Municipal Code, Section 11.05.020 of 6:00 a.m. and 6:00 p.m. from June to September, and 7:00 a.m. to 6:00 p.m. from October to May. At the time of this analysis, no Project construction activity is planned outside of the specified hours. Therefore, no impacts are anticipated and no mitigation is required during construction of the proposed Project. Additionally, all equipment should be properly fitted with mufflers and all staging and maintenance should be conducted as far away for the existing residence as possible.

Table 4-1: Grading Construction Noise Levels

Equipment Type	Quantity Used	Source @ 50 Feet (dBA)	Cumulative Noise Level @ 50 Feet (dBA)
Excavators	1	72	72.0
Graders	1	73	73.0
Rubber Tired Dozers	1	74	74.0
Tractors/Loaders/Backhoes	3	72	76.8
		CUMULATIVE LEVEL @ 50 FEET	**80**

4.3 Findings and Mitigation for Construction Vibration

The nearest vibration-sensitive uses are the residences located to the east of the project site, 50 feet or more from the proposed construction. Table 4-2 lists the average vibration levels that would be experienced at the nearest vibration sensitive land uses to the east from temporary construction activities. Loaded trucks will be traveling along the western portion of the site and were assessed at a minimum distance of 50 feet from to be conservative.

The FTA has determined vibration levels that would cause annoyance to a substantial number of people and potential damage to building structures. The FTA criterion for vibration induced structural damage is 0.20 in/sec for the peak particle velocity (PPV). Project construction activities would result in PPV levels below the FTA's criteria for vibration induced structural damage.

Therefore, Project construction activities would not result in vibration induced structural damage to residential buildings near the construction areas. The FTA criterion for infrequent vibration induced annoyance is 80 Vibration Velocity (VdB) for residential uses. Construction activities would generate levels of vibration that would not exceed the FTA criteria for nuisance 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 Velocity Level at 50 Feet (VdB)[1]	Approximate RMS Velocity at 50 Feet (in/sec)[2]
Small bulldozer	58	0.003	46.0	0.0011
Jackhammer	79	0.035	67.0	0.0124
Loaded trucks	86	0.076	74.0	0.0269
Large bulldozer	87	0.089	75.0	0.0315
		FTA Criteria	80	0.2
		Significant Impact?	**No**	**No**

[1] VdB = VdB(25 feet) – 30log(d/25) provided by the FTA
[2] PPV at Distance D = PPVref x $(25/D)^{1.5}$ provided by the FTA

5.0 TRANSPORTATION NOISE

5.1 Existing Noise Environment Onsite

Noise measurements were taken 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 and microphone were mounted on a tripod, five feet above the ground and 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.

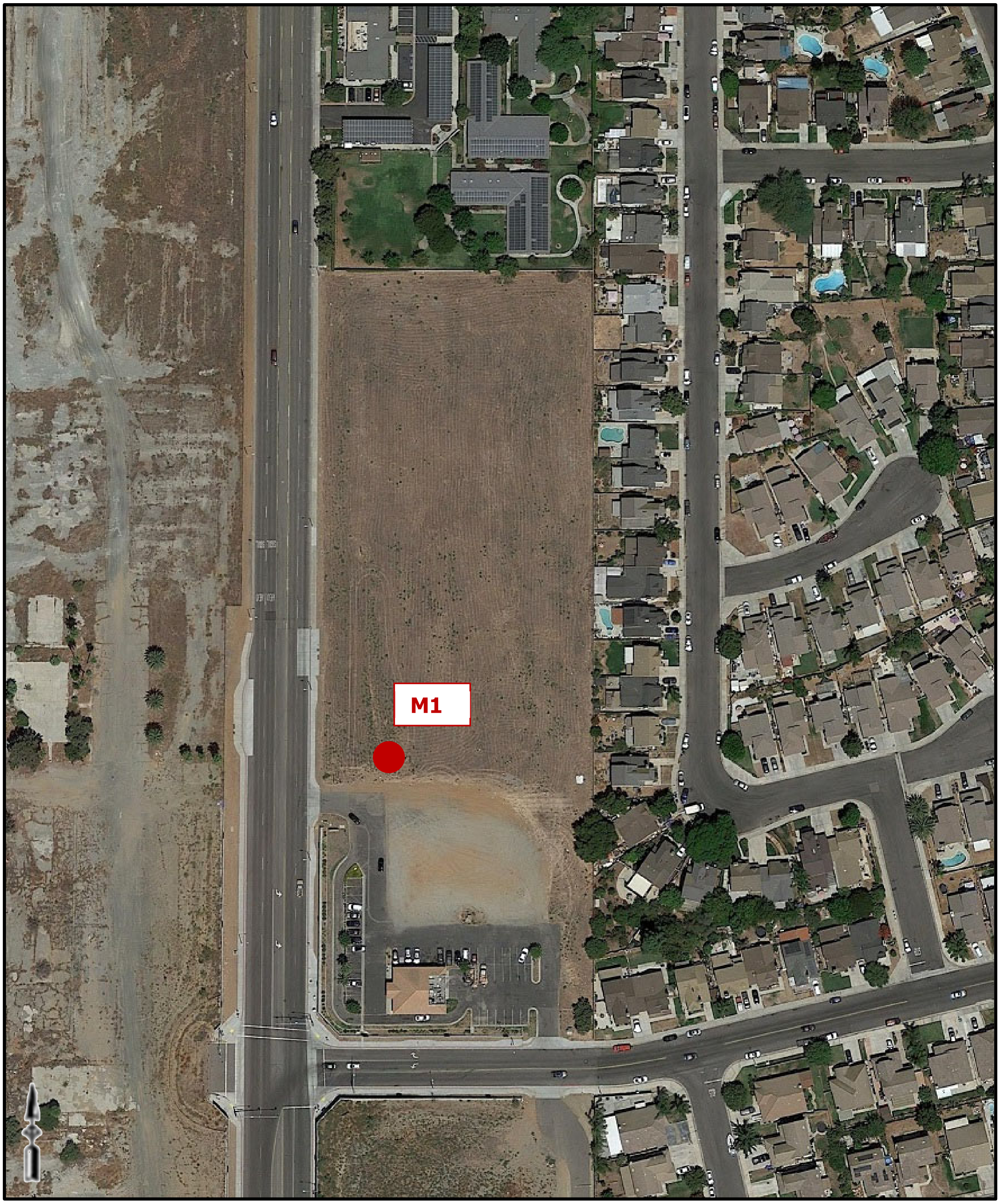
Monitoring location 1 (ML1) was located at the southern portion of the project site. The results of the noise level measurement are presented in Table 5-1.

The noise measurement was monitored for a time period of 15 minutes during typical traffic conditions. The existing noise levels in the project area consisted primarily of traffic from Clay Street. The ambient Leq noise levels measured in the area of the Project during the afternoon hours was found to be 53.4 dBA. The statistical indicators Lmax, Lmin, L10, L50 and L90, are given for the monitoring location. As can be seen from the L90 data, 90% of the time the noise level is approximately 45 dBA from Clay Street. The noise monitoring locations are provided graphically in Figure 5-A.

Table 5-1: Measured Ambient Noise Levels

Measurement Identification	Description	Time	Noise Levels (dBA)					
			Leq_{15}	Lmax	Lmin	L10	L50	L90
M1	Clay Street	12:10 p.m. – 12:25 p.m.	53.4	72.0	42.0	56.1	50.8	45.1
Source: Ldn Consulting October 20, 2021								

Figure 5-A: Ambient Monitoring Locations



5.2 Future Onsite Noise Prediction

To determine the future noise environment and impact potentials the roadway segment noise levels projected in this report were calculated using the methods in the Highway Noise Model published by the Federal Highway Administration (Source: (FHWA, 1978)). The FHWA Model uses the traffic volume, vehicle mix, speed, and roadway geometry to compute the equivalent noise level. The peak hour traffic volumes range between 6-12% of the average daily traffic (ADT) and 10% is generally acceptable for noise modeling. The future traffic volumes are provided by the Traffic Impact Analysis for the proposed residential project located directly west of Clay Street (Linscott Law & Greenspan, 2020). The roadway speeds are based on the posted speed limits. The average daily traffic volumes were calculated by multiplying by 12 the PM peak hour intersection volumes provided in the Traffic Impact Analysis.

Table 5-2 presents the roadway parameters used in the analysis including the peak traffic volumes, vehicle speeds and the hourly traffic flow distribution (vehicle mix). The vehicle mix provides the hourly distribution percentages of automobile, medium trucks and heavy trucks for input into the Model. The traffic volumes shown on Table 5-2 reflect future long-range traffic conditions needed to assess the future on-site traffic noise environment and to identify the appropriate noise mitigation measures that address the worst-case future conditions. The modeled observer locations are represented in Figure 5-B.

Table 5-2: Future Traffic Parameters

Roadway	Average Daily Traffic (ADT)[1]	Peak Hour Volumes[1]	Modeled Speeds (MPH)[2]	Vehicle Mix %[3]		
				Auto	Medium Trucks	Heavy Trucks
Clay Street	21,900	2,190	45	92	3	5

[1] Source: (Linscott Law & Greenspan, 2020)
[2] Source: County of Riverside, typical vehicle mix for Major Roadways

Additionally, three decibels of attenuation is allowed for the first row of buildings when they block 40 to 65% of the line of sight to the noise source, and three to five decibels of attenuation is allowed when the buildings obstruct more than 65% of the line of sight (Caltrans, 2006). The second row of buildings will be blocked by the proposed structures by more than 40%, therefore a factor of 3 dBA was taken into account. The line of sight to the roadways from the community recreation area is blocked by the proposed structures by more than 65%, therefore a factor of 5 dBA was taken into account.

Figure 5-B: Modeled Receptor Locations

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. Outdoor usable space would be provided by the proposed community recreation area. It was determined that the outdoor noise levels are expected to be as high as 65 dBA CNEL at the recreation area and would comply with the City's 65 dBA CNEL noise standard. The results of the specific noise modeling are provided in Figure 5-C and Table 5-3 below. Therefore, no impact is identified and no mitigation is required.

Figure 5-C: Future Exterior Noise Levels

Project Name:	Serrano Oaks		Date:	17-Jun-22
Project Number:	21-133		Location:	Jurupa Valley

Traffic Volumes, Mix and Speeds

	Autos	Med. Trucks	Heavy Trucks
Mix Ratio by Percent	92.0	3.0	5.0
Propagation Rule	Hard		

Roadway	ADT	Speed MPH	CNEL @ 50 Feet	60 CNEL (Feet)
Clay Street	21,900	45	74.1	1,292

Noise Reduction due to Distance

	Distance	Reduction	Resultant Level
First Row Façade	50	0.00	74.1
Second Row Façade	150	-4.77	69.4
Rec Area	165	-5.19	68.9

Table 5-3: Future Exterior Noise Levels

Receptor Number	Receptor Location	Noise Level @ Receptor (dBA CNEL) [1]	Reduction Due to Shielding (dBA CNEL)	Resultant Noise Level (dBA CNEL)
1	First Row Façade	74	-	74
2	Second Row Façade	69	-3.0	66
3	Community Recreation Area	69	-5.0	64

[1] FHWA Highway Traffic Noise Prediction Model, FHWA-RD-77-108

Additionally, a final noise assessment is required prior to the issuance of the first building permit for all units since the building facades are above 60 dBA CNEL. This final report would identify the interior noise requirements based upon architectural and building plans to meet the City's established interior noise limit of 45 dBA CNEL. It should be noted; interior noise levels of 45 dBA CNEL can easily be obtained with conventional building construction methods and providing a closed window condition requiring a means of mechanical ventilation (e.g., air conditioning) for each building and upgraded windows for all sensitive rooms (e.g., bedrooms and living spaces).

5.3 Onsite Rail Line Noise

The proposed Project is located a minimum of 700 feet from the Union Pacific Railroad to the south consisting of Metrolink commuter rail and freight services. According to the Metrolink train schedule, the Riverside Metrolink line adjacent to the project site has 12 trains per day that stop at the nearby Pedley Station. According to the Amtrak train schedule, Amtrak runs two trains along the portion of track nearby the project site. According to the Riverside County Transportation Department Jurupa Grade Separation project, there are 13 freight trains and 7 switch trains that pass by the project site each day.

Railway calculations were performed using the CREATE Rail Noise Model, developed by Harris Miller Miller & Hanson (2006), which uses Federal Transportation Administration (FTA) procedures, with supplemental calculations of horn noise performed per FTA methodology. Based on the distance from the site to the railroad track centerline, the number of diesel and electric trains in both directions during an average 24-hour day, the fraction of trains that operate during the night, the average number of diesel locomotives, the average length of each train, the average train speed past the site, the rail types, and whether the site is nearby crossings where train whistles or horns are sounded, train noise at the project site is projected to be 61 dBA Ldn.

5.4 Cumulative Onsite Noise Levels and Findings

The noise levels determined for the roadway and train activities were combined to determine the overall cumulative noise levels at the proposed project. The resultant cumulative noise levels from the traffic and train activities are provided below in Table 5-4. Existing and proposed buildings would provide additional shielding to the railroad, however, to be conservative, no reductions from barriers were included in the analysis. Based on the analysis, the outdoor use areas were found to comply with the City of Jurupa Valley Noise standards of 65 dBA CNEL at the multi-family residences and outdoor useable areas.

Table 5-4: Combined Future Exterior Noise Levels

Receptor Number	Unmitigated Noise Levels from all Sources (dBA CNEL)	Noise Level from Roadway (dBA CNEL)	Noise Level from Train	Resultant Noise Level (dBA CNEL)[1]
1	Building B	74	61	74
2	Building A	66	61	67
3	Rec Area/Pool	64	61	65
[1] Interior Noise Study required per City Guidelines if building façade is above 60 dBA CNEL.				

Additionally, a final noise assessment is required prior to the issuance of the first building permit for first, second and third floors of the units since the building facades are above 60 dBA CNEL. This final report would identify the interior noise requirements based upon architectural and building plans to meet the City's established interior noise limit of 45 dBA CNEL. It should be noted; interior noise levels of 45 dBA CNEL can easily be obtained with conventional building construction methods and providing a closed window condition requiring a means of mechanical ventilation (e.g., air conditioning) for each building and upgraded windows for all sensitive rooms (e.g., bedrooms and living spaces).

5.5 Project Related Offsite Transportation Noise

To determine if direct or cumulative off-site noise level increases associated with the development of the proposed project would create noise impacts. The traffic volumes for the existing conditions were compared with the traffic volume increase of existing plus the proposed project. According to the Project traffic study (Linscott Law & Greenspan, 2020), the project is estimated to only generate 761 daily trips with a peak hour volume of 58 trips. The existing average daily traffic (ADT) volumes on the area roadways are more than several thousand ADT. Typically it requires a project to double (or add 100%) the traffic volumes to have a direct impact of 3 dBA CNEL or be a major contributor to the cumulative traffic volumes. The project will add less than a 5% increase to the exiting roadway volumes and no direct or cumulative impacts are anticipated.

5.6 Airport Noise

The Riverside County Airport Land Use Compatibility Plan (RC ALUCP) establishes compatibility criteria for land uses in relation to the noise contour boundaries of airports within the City of Jurupa Valley. Table 2B Supporting Compatibility Criteria: Noise of the RC ALUCP indicates that residential, commercial, and recreational uses, such as those within the Project, are considered clearly acceptable when located within the 50 to 55 dBA CNEL noise contour of an airport. The Project site is located over 1 mile northwest of the Riverside Municipal Airport. Based on the

Riverside Municipal Airport Ultimate Noise Contour Map, the project is located outside of the airport's 55 dBA CNEL noise contour. Therefore, no impacts due to aircraft activity are anticipated.

5.7 Train Vibration

Train vibration depends on the weight of the train, travel speed, the condition of the track and soil characteristics. The proposed project buildings would be more than 700 feet from the centerline of the tracks. Federal Transit Administration Transit Noise and Vibration Impact Assessment Manual (Federal Transit Administration, 2018) predicts that freight train vibration levels are as high as 73 VdB at 175 feet from the track centerline for a locomotive-powered freight train traveling at speeds of 50 MPH and up to 62 VdB for commuter rail train events at that speed.

Therefore, the infrequent freight train activities will be below the 80 VdB, infrequent event for the freight train and the frequent commuter train activities will be below the 72 VdB frequent event annoyance thresholds. Therefore, the train activities would have a less than significant impact on the proposed project.

6.0 REFERENCES

Caltrans. (2006). *Technical Noise Supplement Section N-5515.* Retrieved from https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/tcvgm-apr2020-a11y.pdf

Federal Transit Administration. (2018). *Transit Noise and Vibration Impact Assessment Manual.*

FHWA. (1978). *Highway Traffic Noise Prediction Model.* FHWA-RD-77-108.

Linscott Law & Greenspan. (2020). *Traffic Impact Analysis Report Clay Street Residential Project.* Retrieved from https://www.jurupavalley.org/DocumentCenter/View/1979/Appendix-N_Noise-Impact-Analysis?bidId=