Noise Study

Cherokee Court Single-Family Residential Development
San Dimas, CA

Prepared for:

Development 1 Group
2011 E. Financial Way, Suite 202
Glendora, CA 91741

Prepared by:

ENTECH CONSULTING GROUP
PLANNING • ENVIRONMENTAL • CONSTRUCTION MANAGEMENT

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Executive Summary

A noise analysis was prepared for the Cherokee Court Residential Development (Project) to support the City of Simas Development Application guidelines to demonstrate compliance with the City of San Dimas Municipal Code. The project area is located on Cherokee Court in the City of San Dimas, in Los Angeles County. Specifically, the project area encompasses 1.4 acres and intersects Baseline Road to the south. The project site consists of seven (7) single-family residential parcels along Cherokee Court. The project site parcels are zoned as single-family residential with agriculture uses or single-family. The City of San Dimas Municipal Code requires that noise standards be met when the project can change noise levels at the property boundaries of sensitive land uses.

Characterization of the Existing Environment

The existing environment was characterized by a 24-hour noise measurement within the project vicinity to determine the existing Community Noise Level of 67 CNEL and 60 dBA L_{eq}. This noise level is within the conditionally acceptable category for Land Use Compatibility for Community Noise Environments. The dominant noise source within the project area that contributes to this noise level is vehicular traffic traveling along Baseline Road.

Mobile Source Construction Noise (less than significant)

Although the project's construction schedule has not been developed, construction activities involving stationary and mobile equipment will occur longer than 10 days. A worst-case scenario was developed to predict the maximum noise level based on typical mobile equipment usage during residential development construction. The maximum noise levels of mobile construction equipment published by the Federal Highway Administration were used for each piece of equipment operating in the following four construction phases: grading, building construction, paving, and architectural coating. It was assumed that all construction equipment within a given phase would be operating simultaneously. Noise levels were presented for each construction phase. The highest noise level experienced at the property boundary is 83 dBA L_{eq} during the grading phase. This noise level will exceed the existing noise level of 60 dBA $L_{eq.}$ The City of San Dimas does not have an established construction noise limit. However, construction impacts are mitigated by limiting construction hours to after 7:00 a.m. and before 8:00 p.m. Construction activities are excluded on Sundays and holidays. Therefore, limiting the construction hours will reduce this impact to less than significant.

Mobile Source Operational Noise

The Project's increase in traffic would result in noise increases on Project area roadways. In general, a traffic noise increase of 3 dBA is barely perceptible to people, while a 5-dBA increase is readily noticeable. Traffic volumes on Project area roadways would have to approximately double for the resulting traffic noise levels to increase by 3 dBA. The project would generate new vehicle trips, increasing traffic on area roadways. The CalEEMod model was used to determine the number of generated vehicle trips using the Institute of Transportation Engineers (ITE) trip rates for residential land uses. It was determined that the project would generate 66 daily trips (CalEEMod, 2020).

The project would generate new vehicle trips, thereby contributing to traffic on area roadways. Caltrans identifies Baseline Road as a major connector segment near the project site with an approximately ADT of 10,000. Adding 66 daily vehicle trips generated by the project to the nearest segment of Baseline Road would increase traffic along this roadway by less than 1 percent. Therefore, the proposed Project would not generate enough traffic to result in a permanent 3-dBA increase in

ambient noise levels, and traffic noise would not exceed any local standards. Impacts would be less than significant in this regard.

Vibration (less than significant)

Vibration impacts are generally associated with activities such as train operations, construction, and heavy truck movements. The project's operation does not contain sources that would generate noticeable vibration that would exceed the vibration perception threshold of 0.05 in/sec; therefore, vibration levels during the project's operation will be less than significant.

Vibration impacts from construction were assessed by selecting the maximum reference vibration levels provided by the FTA during grading activities. A large bulldozer represents the peak vibration source with a reference level of 0.089 in/sec at a distance of 25 feet. The vibration was evaluated at the project's closest property boundary to land uses, which would occur near the residential land use 60 feet south of the project site. It was estimated that construction vibration levels would approach 0.024 in/sec, and the predicted construction vibration level is below the vibration threshold of 0.05 in/sec. Moreover, construction at the Project site will be restricted to daytime hours after 7:00 a.m. and before 8:00 p.m. on weekdays Monday through Friday, eliminating potential vibration impact during the sensitive nighttime hours. Therefore, construction vibration impacts at the project's property boundary are less than significant.

Construction Mitigation Measures

The following mitigation measures would reduce any noise level increases produced by the construction equipment to the nearby noise-sensitive land uses:

- *MM1: Prior to approval of grading plans and/or issuance of building permits, plans shall include a note indicating that noise-generating Project construction activities shall only occur between the hours of 7:00 a.m. and 8:00 p.m. on weekdays only, Monday through Saturday. Construction is prohibited on Sundays and holidays.*

- *MM2: During all project site construction, the construction contractors shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers, consistent with manufacturers' standards. The construction contractor shall place all stationary equipment, so that emitted noise is directed away from the noise-sensitive receivers nearest the Project site.*

- *MM3: The construction contractor shall limit haul truck deliveries to the same hours specified for construction equipment (between the hours of 7:00 a.m. and 8:00 p.m. only Monday through Saturday. Construction is prohibited on Sunday and holidays).*

- *MM4: Construction staging areas for each project phase shall be as far as possible from sensitive receptors as possible.*

1.0 INTRODUCTION

This noise study describes the existing ambient noise environment, identifies applicable rules and regulations, evaluates potential noise impacts of the proposed project, and where applicable, includes measures to mitigate or minimize noise associated with the proposed project.

1.1. Project Location and Existing Setting

The project area is located on Cherokee Court in the City of San Dimas, in Los Angeles County. Specifically, the project area encompasses 1.4 acres and intersects Baseline Road to the south. **Figure 1** shows the project study area. The project site consists of seven (7) single-family residential parcels along Cherokee Court, as shown in **Figure 2**. The project site parcels are zoned as single-family residential with agriculture uses or single-family.

1.2. Project Location Description

The Cherokee Court Residential Development Project consists of constructing (7) seven single-family residential properties on lots ranging in size from 8,800 to 11,000 square feet. The total net acreage of the site is 1.4 acres and 61,014 square feet. The single-family residential homes will range from 3,000 to 4,000 square feet.

2.0 FUNDAMENTALS OF SOUND

Sound is mechanical energy transmitted by pressure waves in a compressible medium such as air. Noise is generally defined as unwanted or excessive sound, which can vary in intensity by over one million times within the range of human hearing; therefore, a logarithmic scale, known as the decibel scale (dB), is used to quantify sound intensity.

Sound is characterized by both its amplitude and frequency (or pitch). The human ear does not hear all frequencies equally, and in particular, the ear deemphasizes low and very high frequencies. The A-weighted decibel scale (dBA) has been developed to better approximate human hearing sensitivity. On this scale, the human hearing range extends from approximately 3 dBA to around 140 dBA. **Table 1** includes A-weighted noise levels from common indoor and outdoor activities.

Table 1. Typical A-Weighted Noise Levels

Common Outdoor Noise	Noise Level (dBA)	Common Indoor Noise
	— 110 —	Rock band (noise to some, music to others)
Jet fly-over at 1000 feet		
	— 100 —	
Gas lawn mower at 3 feet		
	— 90 —	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	— 80 —	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	**— 70 —**	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	**— 60 —**	
		Large business office
Quiet urban daytime	**— 50 —**	Dishwasher in neighboring room
Quiet urban nighttime	**— 40 —**	Theater, large conference room (background)
Quiet suburban nighttime		
	— 30 —	Library
Quiet rural nighttime		Bedroom at night
	— 20 —	
		Broadcast/recording studio
	— 10 —	
Lowest threshold of human hearing	**— 0 —**	Lowest threshold of human hearing

SOURCE: Caltrans 1998.

Sound levels from two or more sources cannot be directly added together to determine the overall sound level using the decibel scale. Rather, the combination of two sounds at the same level yields an increase of 3 dBA. The smallest recognizable change in sound levels is approximately 1 dBA. A 3-dBA increase is generally perceptible, whereas a 5-dBA increase is readily perceptible. Most people judge a 10-dBA increase as an approximate doubling of the sound loudness.

Two of the primary factors that reduce levels of environmental sounds are increasing the distance between the sound sources to the receiver and having intervening obstacles such as walls, buildings, or terrain features between the sound source and the receiver. Factors that increase the loudness of environmental sounds include moving the sound source closer to the receiver, sound enhancements caused by reflections, and focusing caused by various meteorological conditions.

A number of metrics are used to characterize community noise exposure, which constantly fluctuates over time. One such metric, the equivalent sound level (L_{eq}), represents a constant sound that, over the specified period, has the same sound energy as the time-varying sound.

Noise exposure over a more extended period of time is often evaluated based on the Community Noise Level (CNEL). CNEL is a 24-hour average L_{eq} that accounts for the sensitivity to noise during

evening and nighttime hours. CNEL is calculated by adding 5 dBA to sound levels in the evening (7:00 p.m. to 10:00 p.m.) and adding 10 dBA to sound levels at night (10:00 p.m. to 7:00 a.m.).

2.1. Fundamentals of Vibration

Vibration is energy transmitted in waves through the ground or man-made structures. These energy waves generally dissipate with distance from the vibration source. Common sources of groundborne vibration are trains, buses on rough roads, and construction activities such as blasting, pile-driving, and operation of heavy earth-moving equipment.

The effects of groundborne vibration include movement of the building floors, the rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. In extreme cases, the vibration can cause damage to buildings. Building damage is not a factor for most projects, with the occasional exception of blasting and pile-driving during construction. Annoyance from vibration often occurs when the vibration levels exceed the perception threshold by only a small margin. A vibration level that annoys will be well below the damage threshold for normal buildings.

The peak particle velocity (PPV) is most frequently used to describe vibration impacts to buildings. The root mean square (RMS) amplitude is most frequently used to describe the effect of vibration on the human body. The RMS amplitude is defined as the average of the squared amplitude of the signal. Decibel notation (VdB) is commonly used to measure RMS. The FTA measure of the threshold of architectural damage for conventional sensitive structures is 0.2 in/sec PPV (FTA, 2006). The vibration velocity level threshold of perception for humans is approximately 65 VdB. A vibration velocity level of 75 VdB is considered the approximate dividing line between barely perceptible and distinctly perceptible levels for many people (FTA 2006).

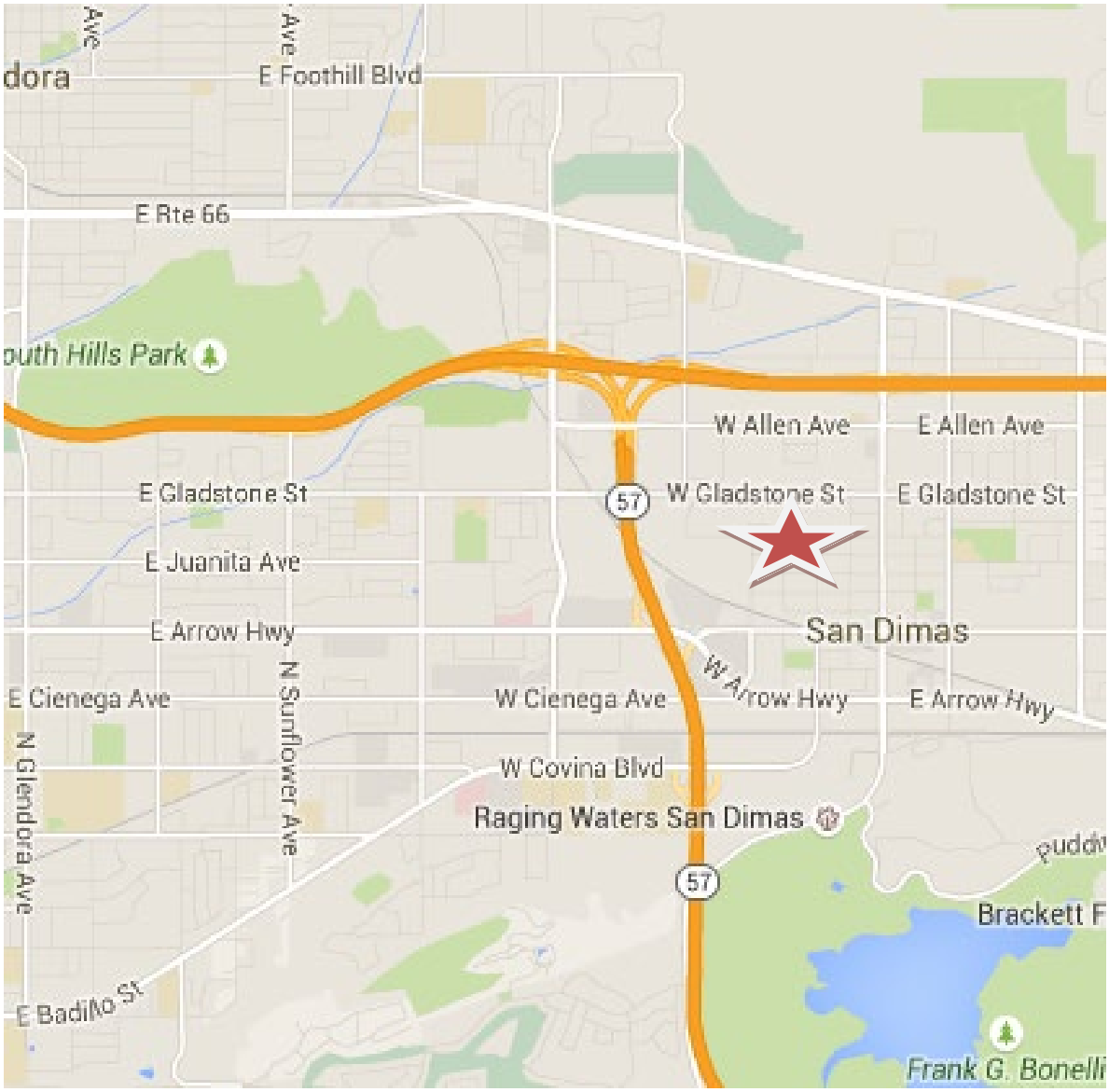

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Figure 1. Regional Map of Project

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Figure 2. Project Vicinity Map Location

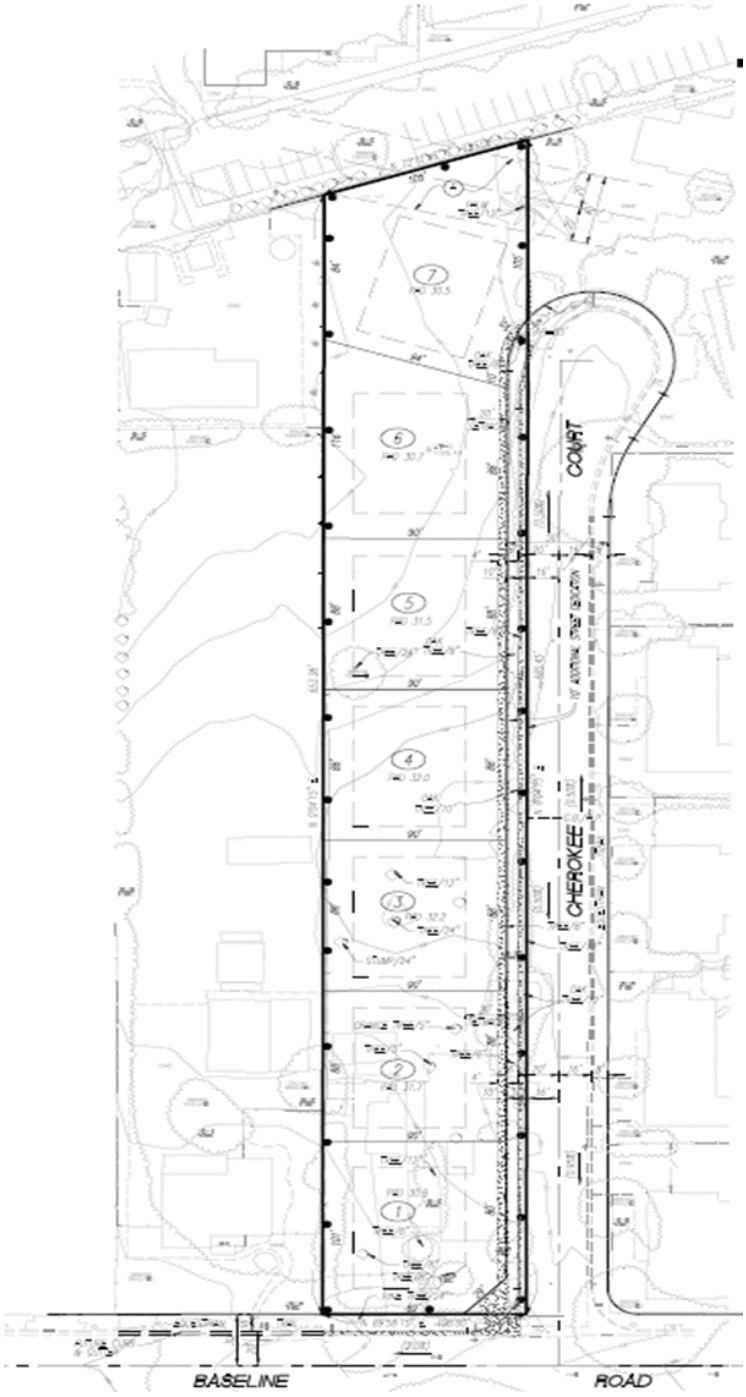

Figure 3. Project Site Plan

3.0 EXISTING NOISE ENVIRONMENT

3.1 Sensitive Land Uses

Noise sensitive land uses are generally defined to include places where people sleep, such as residences, hospitals, and hotels; institutional land uses where it is important to avoid interference with speech or reading, including schools, libraries, and churches; and outdoor areas where quiet is fundamental to its specific use (i.e., amphitheaters and National Parks). The closest noise-sensitive land uses to the project area are the single-family residences, the closest of which is approximately 60 feet south of the project boundary. Construction and operation of the proposed project can potentially impact these sensitive receivers.

3.2 Noise Measurements and Existing Ambient Noise

Traffic along Baseline Road is the dominant source of ambient noise in the project vicinity. One long-term and two 15-minute short-term noise measurements were taken in the vicinity of the project area on January 12, 2022. The purpose of the measurements was to characterize existing noise levels adjacent to the project area and at sensitive receptors. **Figure 4** provides an aerial photograph showing the ambient noise measurement and sensitive receiver locations, and **Table 2** provides the existing ambient noise at these sites.

Table 2. Summary of Short and Long Term Measured Ambient Noise Levels

Receiver	Existing L_{eq} dBA
LT-1	60.1
ST-1	52.2
ST-2	51.5

3.3 Existing Vibration Levels

Aside from periodic construction work that may occur in the vicinity of the project area, other sources of groundborne vibration include heavy-duty vehicular travel (e.g., refuse trucks and delivery trucks) on the roadways adjacent to the project area. Trucks traveling at a distance of 50 feet typically generate groundborne vibration velocity levels of around 63 VdB (approximately 0.006 in/sec PPV), and these levels could reach 72 VdB (approximately 0.016 in/sec PPV) when trucks pass over bumps in the road (FTA, 2006).

Figure 4. Long and Short Term Noise Measurement Locations

4.0 REGULATORY FRAMEWORK

The governing regulatory framework in the proposed project area includes federal, state, and local agencies that enforce noise standards and specific regulations that govern project development.

4.1 Federal Regulations and Standards

There are no federal noise standards that directly regulate environmental noise related to the construction or operation of the proposed project. With regard to noise exposure and workers, the Office of Safety and Health Administration (OSHA) regulations safeguard the hearing of workers exposed to occupational noise. Federal regulations also establish noise limits for medium and heavy trucks (more than 4.5 tons, gross vehicle weight rating) under 40 Code of Federal Regulations (CFR), Part 205, Subpart B. The federal truck pass-by noise standard is 80 dB at 15 meters from the vehicle pathway centerline. These controls are implemented through regulatory controls on truck manufacturers.

Federal Transit Authority Vibration Standards

The FTA has adopted vibration standards to evaluate potential building damage impacts related to construction activities. The vibration damage criteria adopted by the FTA are shown in **Table 3**.

Table 3. Construction Vibration Damage Criteria

Building Category	PPV (in/sec)
I. Reinforced-concrete, steel, or timber (no plaster)	0.5
II. Engineered concrete and masonry (no plaster)	0.3
III. Non-engineered timber and masonry buildings	0.2
IV. Buildings extremely susceptible to vibration damage	0.12
SOURCE: FTA, 2018.	

The FTA has also adopted the following standards for groundborne vibration impacts related to human annoyance: Vibration Category 1 – High Sensitivity, Vibration Category 2 – Residential, and Vibration Category 3 – Institutional. The FTA defines Category 1 as buildings where vibration would interfere with operations, such as vibration-sensitive research and manufacturing facilities, hospitals with vibration-sensitive equipment, and research operations. Category 2 refers to all residential land uses and any buildings where people sleep, such as hotels and hospitals. Category 3 refers to institutional land uses such as schools, churches, other institutions, and quiet offices that do not have vibration-sensitive equipment but still have the potential for activity interference. The vibration thresholds associated with human annoyance for these three land-use categories are shown in **Table 4.** No thresholds have been adopted or recommended for commercial and office uses.

Table 4. Groundborne Vibration Impact Criteria for General Assessment

Land Use Category	Frequent Events [a]	Occasional Events [b]	Infrequent Events [c]
Category 1: Buildings where vibration would interfere with interior operations.	65 VdB[d]	65 VdB[d]	65 VdB[d]
Category 2: Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB
Category 3: Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB

a Frequent Events" is defined as more than 70 vibration events of the same source per day.

b Occasional Events" is defined as between 30 and 70 vibration events of the same source per day.

c Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day.

d This criterion is based on acceptable levels for most moderately sensitive equipment such as optical microscopes.

SOURCE: FTA, 2018.

4.2. State Regulations and Standards

Noise Standards

The California Department of Health Services has established guidelines for land use, and noise exposure compatibility are shown in **Table 5**. In addition, the California Government Code (Section 65302(g)) requires a noise element to be included in general plans and requires that the noise element: (1) identify and appraise noise problems in the community; (2) recognize Office of Noise Control guidelines; and (3) analyze and quantify current and projected noise levels.

Table 5. California Community Noise Exposure (Ldn or CNEL)

Land Use	Normally Acceptable[a]	Conditionally Acceptable[b]	Normally Unacceptable[c]	Clearly Unacceptable[d]
Single-family, Duplex, Mobile Homes	50 - 60	55 - 70	70 - 75	above 75
Multi-Family Homes	50 - 65	60 - 70	70 - 75	above 75
Schools, Libraries, Churches, Hospitals, Nursing Homes	50 - 70	60 - 70	70 - 80	above 80
Transient Lodging – Motels, Hotels	50 - 65	60 - 70	70 - 80	above 75
Auditoriums, Concert Halls, Amphitheaters	---	50 - 70	---	above 70
Sports Arena, Outdoor Spectator Sports	---	50 - 75	---	above 75
Playgrounds, Neighborhood Parks	50 - 70	---	67 - 75	above 75
Golf Courses, Riding Stables, Water Recreation, Cemeteries	50 - 75	---	70 - 80	above 80
Office Buildings, Business, and Professional Commercial	50 - 70	67 - 77	above 75	---
Industrial, Manufacturing, Utilities, Agriculture	50 - 75	70 - 80	above 75	---

a Normally Acceptable: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction without any special noise insulation requirements.

b Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and the design includes necessary noise insulation features. Conventional construction, but with closed windows and fresh air supply systems or air conditioning, will normally suffice.

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

d Clearly Unacceptable: New construction or development should generally not be undertaken.

The state has also established the California Noise Insulation Standards (Title 24, California Code of Regulations) that provide an interior standard of 45 dB Ldn/CNEL for any habitable room. In addition, it requires an acoustical analysis demonstrating how dwelling units have been designed to meet this interior standard where such units are proposed in areas subject to noise levels greater than 60 dB Ldn/CNEL. Local jurisdictions typically enforce title 24 standards through the building permit application process.

Vibration Standards

There are no state vibration standards applicable to the proposed project. In addition, the California Department of Transportation's (Caltrans) *Transportation and Construction Vibration Guidance Manual* (2013) does not provide official Caltrans standards for vibration. However, this manual provides guidelines that can be used as screening tools for assessing the potential for adverse vibration effects related to structural damage and human perception. The manual is meant to guide vibration issues associated with Caltrans projects' construction, operation, and maintenance. The vibration criteria established by Caltrans for assessing structural damage and human perception are shown in **Tables 6** and **7**, respectively.

Table 6. Caltrans Vibration Damage Potential Threshold Criteria

	Maximum PPV (in/sec)	
Structure and Condition	**Transient Sources**	**Continuous / Frequent Intermittent Sources**
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Source: Caltrans, 2004.

Table 7. Caltrans Vibration Annoyance Potential Criteria

	Maximum PPV (in/sec)	
Structure and Condition	**Transient Sources**	**Continuous / Frequent Intermittent Sources**
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.9	0.10
Severe	2.0	0.4

Source: Caltrans, 2004.

4.3. Local Regulations and Standards

City of San Dimas General Plan Noise Element

The City of San Dimas General Plan Noise Element includes Exhibit VIII-3, Land Use Compatibility for Noise Environments, which provides noise-land use compatibility guidelines for single-family residential land uses. The Exhibit states that a noise level of 50 to 60 dBA CNEL (Community Noise Equivalent Level) is within the Normally Acceptable range, that noise of 55 to 70 dBA CNEL is Conditionally Acceptable, and that noise of 70 to 75 dBA CNEL is Normally Unacceptable. CNEL is a 24-hour weighted average with sensitivity for the evening and nighttime levels.

City of San Dimas Noise Ordinance

The City of San Dimas Municipal Code Chapter 8.36, Noise Ordinance, sets standards for noise levels citywide and provides the means to enforce the reduction of obnoxious or offensive noises. Regulations that are relevant to the proposed project are listed below.

Section 8.36.040, Noise Level Limit: The allowable noise level or sound level referred to in Section 8.36.030 shall be the higher of the following:

A. Actual measured ambient level; or
B. That noise level limit is determined from **Table 8**.

Table 8. San Dimas Noise Limits

Zone	Time	Sound Level (A-weighted) Decibels
Residential – low and medium density	7:00 a.m. to 6:00 p.m.	50
	6:00 p.m. to 10:00 p.m.	45
	Night	40
Residential – high density	7:00 a.m. to 6:00 p.m.	60
	6:00 p.m. to 10:00 p.m.	55
	Night	50
Commercial	7:00 a.m. to 6:00 p.m.	60
	6:00 p.m. to 10:00 p.m.	55
	Night	50
Industrial	7:00 a.m. to 6:00 p.m.	70
	6:00 p.m. to 10:00 p.m.	60
	Night	55

Note: If the measurement location is on a boundary between two zones, the noise level limit applicable to the lower noise zone shall apply (Ord. 868 Section 1, 1987).

Section 8.36.090, Controlled Hours of Operation: It is unlawful for any person to operate, permit, use or cause to operate, any of the following, other than between the hours of 7:00 a.m. to 8:00 p.m. of any one day:

A. Powered model vehicles.
B. Loading and unloading vehicles such as trash collectors, forklifts, or cranes within five hundred feet of a residence.
C. Domestic power tools.

Section 8.36.100, Construction: It is unlawful for any person to within a residential zone, or within a radius of five hundred feet therefrom, to operate equipment or perform any outside construction or repair work on any building, structure or project, or to operate any pile driver, steam shovel, pneumatic hammer, steam or electric hoist or other construction-type equipment or device between the hours of 8:00 p.m. of one day and 7:00 a.m. of the next day, at any time on Sunday, or at any time on any public holiday in such a manner that a reasonable person of normal sensitivity residing in the area is caused discomfort or annoyance.

5.0 THRESHOLDS OF SIGNIFICANCE

Appendix G of the California Environmental Quality Act (CEQA) Guidelines states that a project could have a significant adverse effect related to noise if any of the following would occur:

- 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 ground-borne vibration or ground-borne noise levels.
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.
- For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels; or
- For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels.

5.1 Noise Criteria

For the purpose of determining whether the proposed project would result in the exposure of persons to or generate noise levels that would exceed established noise standards, construction and stationary operational noise levels associated with the proposed project would result in a significant impact if the City's construction regulations related to work hours are violated.

The *CEQA Guidelines* does not define the levels at which permanent and temporary increases in ambient noise are considered "substantial." Therefore, regarding traffic noise, the significance of the project's noise impacts can be determined by comparing estimated project-related noise levels to existing no-project noise levels. With respect to the community noise environment, the average healthy ear can barely perceive a noise level change of 3 dBA. A change from 3 to 5 dBA may be noticed by some individuals who are sensitive to changes in noise. A 5 dBA increase is readily noticeable, while the human ear perceives a 10 dBA increase as a doubling of sound.

As described above the City's Noise Ordinance sets the exterior noise standard for single-family homes at 50 dBA CNEL. For the project's traffic noise analysis, it is assumed that a significant impact will occur on noise-sensitive land uses (i.e., residential) if the project would cause an increase of 3 dBA CNEL at the property line of a residential land use that currently experiences ambient noise levels at or above 50 dBA CNEL. Where the existing ambient noise level at a residential land use is below 50 dBA CNEL, then a significant impact would occur if project operations would cause an increase of 5 dBA CNEL at the residential land use property line.

5.2 Vibration Criteria

The *CEQA Guidelines* do not define the levels at which groundborne vibration or groundborne noises are considered "excessive." The City does not have a significance threshold to assess vibration

impacts during construction. There are no federal, state, or local vibration regulations or guidelines directly applicable to the proposed project. However, publications of the FTA and Caltrans are two of the seminal works for the analysis of vibration relating to transportation and construction-induced vibration. The proposed project is not subject to FTA or Caltrans regulations; nonetheless, these guidelines serve as a useful tool to evaluate vibration impacts. For this analysis, the vibration criteria for structural damage and human annoyance established in the most recent Caltrans' *Transportation and Construction Vibration Guidance Manual* (2013), which are shown previously in Tables 6 and 7, are used to evaluate the potential vibration impacts of the project on nearby sensitive receptors.

Given that the proposed land uses within the project area would consist of residential, any "excessive" groundborne vibration or noises that would occur at the project area would be those generated during the construction of these uses. The operation of the proposed project would not include or result in the use of any heavy machinery or generate heavy-duty truck trips that are often associated with large industrial uses. During project operations, no sources of "excessive" groundborne vibration or noise levels are anticipated.

6.0 METHODOLOGY

The primary sources of noise associated with residential land uses are construction activities and project-related traffic volumes. Secondary noise sources would include new stationary sources (such as heating, ventilation, and air conditioning units) associated with the new residential uses. The increase in noise levels generated by these activities and other sources related to the construction and operation of single-family residential uses on the proposed project has been quantitatively estimated and compared to the applicable noise standards and thresholds of significance.

Aside from noise levels, groundborne vibration would also be generated during residential development construction within the project area by various construction-related activities and equipment. Thus, the groundborne vibration levels generated by these sources have also been quantitatively estimated and compared to applicable thresholds of significance.

6.1 Construction Noise Levels

A worst-case scenario was developed to estimate construction noise levels from the proposed development using USEPA noise levels for land use construction activities at a reference distance of 50 feet. The loudest phase of construction was selected and assumed to be operating continuously. The maximum noise level for this construction phase was predicted at distances representative of locations of nearby residential homes using the sound propagation principle that states noise levels would 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 84 dBA L_{eq} measured at 50 feet from the noise source to the receptor would reduce to 78 dBA L_{eq} at 100 feet from the source to the receptor. The nearest sensitive receivers were identified around the project site, and construction noise levels were predicted.

6.2 Roadway Noise Levels

The project would generate vehicle trips, thereby increasing traffic on area roadways. The CalEEMod model was used to determine the number of generated vehicle trips using the Institute of Transportation Engineers (ITE) trip rates for residential land uses. Roadway noise impacts were assessed on Baseline Road because this roadway would provide vehicle access to the project site.

6.3 Groundborne Vibration from Construction and Operation

Groundborne vibration levels resulting from construction activities within the project area were estimated using data published by the FTA in its *Transit Noise and Vibration Impact Assessment* (2018) document. Potential vibration levels resulting from construction activities of the proposed project are identified at the nearest off-site sensitive receptor location, which consists of the adjacent single-family residential uses.

7.0 NOISE ASSESSMENT

This noise impact assessment is conducted to determine the significance of the impact created by the proposed project's short-term construction and long-term operation on the noise-sensitive land uses in the surrounding area. Construction may affect ambient noise due to construction equipment and vehicles traveling to/from the project area by construction workers. Operation-related impacts would be generated primarily from vehicle trips and onsite residential equipment, such as HVAC units.

7.1 Construction Impacts

CEQA Appendix G Noise Threshold 1 Would the proposed project generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance or applicable standards of other agencies? *(Less Than Significant)*

Construction of residential land uses requires heavy equipment that would increase noise levels in the immediate project area. The noise from construction activity would fluctuate depending on the particular type, number, and duration of use of construction equipment. **Table 9** provides the average (L_{eq}) noise levels produced by various construction activities at a distance of 50 feet between the construction activity and receptor.

Table 9. Construction Equipment Noise Levels

Construction Activity	Noise Level at the Nearest Sensitive Receiver at 60 feet (dBA, L_{eq})[1]
Grading	83
Building Construction	80.6
Paving	81.5
Architectural Coating	74.9

[1] Average noise levels correspond to a distance of 50 feet from the nosiest piece of equipment.

Source: USEPA, Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances, Table 1-b Domestic Housing, 1971,

During the construction of the project area, the nearest sensitive receptors would be the single-family residences adjacent to the project area. Due to the proximity of the residences, the proposed project's construction activities would expose the sensitive receptors to increased noise levels. Over a construction day, the highest noise levels would be generated during the grading phase of construction.

A worst-case scenario was developed to predict the maximum noise level based on typical mobile equipment usage during residential development construction. The maximum noise levels of mobile construction equipment published by the Federal Highway Administration were used for each piece of equipment operating in the following four construction phases: grading, building construction, paving,

and architectural coating. It was assumed that all construction equipment within a given phase would be operating simultaneously.

The construction schedule for the project is described below.

As shown in **Table 10**, the estimated construction period for the project is approximately nine months. Construction is anticipated to begin with, grading in January 2022 and end with architectural coatings (painting) in December 2022, as shown in **Table 10**.

Table 10. Construction Schedule

Construction Activity	Start Date	End Date
Grading	1/25/2022	1/28/2022
Building Construction	1/31/2022	11/4/2022
Paving	11/7/2022	11/18/2022
Architectural Coating	11/21/2022	12/2/2022

Table 11 presents the equipment for each construction activity based on engineering estimates and the Applicant.

Table 11. Equipment by Construction Activity

Construction Activity	Off-Road Equipment	Unit Amount
Grading	Graders	1
	Rubber Tired Dozers	1
	Tractors/Loaders/Backhoes	2
Building Construction	Cranes	1
	Forklifts	1
	Generator Sets	1
	Tractors/Loaders/Backhoes	1
	Welders	3
Paving	Cement and Mortar Mixers	1
	Pavers	1
	Paving Equipment	1
	Rollers	1
	Tractors/Loaders/Backhoes	1
Architectural Coatings	Air Compressors	1

The RCNM model was used to determine which phase of construction activity for the project would generate the greatest construction noise level. It was assumed that each construction activity would occur within a distance of 60 feet of the nearest residential receiver. **Table 12** presents the noise levels in L_{eq} for each construction phase. As shown in **Table 12**, the highest noise level that would be experienced at the nearest residential property is 83 dBA L_{eq}. This noise level occurs during the project's grading construction phase.

Table 12. Construction Noise Levels by Construction Phase

Construction Phases	Construction Hourly dBA, Leq[1]
Grading	83
Building Construction	80.6
Paving	81.5
Architectural Coating	74.9
[1]Worst-case construction noise levels evaluated at the nearest residential property line.	

This noise level will exceed the existing noise level of 60 dBA $L_{eq.}$ The City of San Dimas does not have an established construction noise limit.

Consequently, construction that occurs immediately adjacent to these existing off-site receptors would generate noise levels that would be substantially greater than existing noise levels near the project site. However, it should be noted that this noise level is not anticipated to occur throughout the entire course of a construction day, as construction equipment and activities rarely operate continuously for a full day at a construction site. Typically, the operating cycle for construction equipment would involve one or two minutes of full power operation followed by three or four minutes at lower power settings. Additionally, construction equipment engines would likely be intermittently turned on and off over a construction day.

Per Section 8.36.100 of the City's Municipal Code, noise sources associated with construction are exempted from the City's established noise standards as long as they do not take place between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or any time on a Sunday or public holiday. As the project's construction activities would only occur during the allowable construction hours, the proposed project would be consistent with the City's Municipal Code. Thus, the proposed project would comply with the City's construction-related noise standards, and impacts would be less than significant.

7.2 Operation Impacts

Traffic

The Project's increase in traffic would result in noise increases on Project area roadways. In general, a traffic noise increase of 3 dBA is barely perceptible to people, while a 5-dBA increase is readily noticeable. Traffic volumes on Project area roadways would have to approximately double for the resulting traffic noise levels to increase by 3 dBA. The project would generate new vehicle trips, increasing traffic on area roadways. The CalEEMod model was used to determine the number of generated vehicle trips using the Institute of Transportation Engineers (ITE) trip rates for residential land uses. It was determined that the project would increase traffic by 66 daily trips (CalEEMod, 2020).

The project would generate new vehicle trips, thereby contributing to traffic on area roadways. Caltrans identifies Baseline Road as a major connector segment near the project site with an approximately ADT of 10,000. Adding 66 daily vehicle trips generated by the project to the nearest segment of Baseline Road would increase traffic along this roadway by less than 1 percent. Therefore, the proposed Project would not generate enough traffic to result in a permanent 3-dBA increase in ambient noise levels, and traffic noise would not exceed any local standards. Impacts would be less than significant in this regard.

Stationary Equipment Noise
Heating, Ventilating, and Air Conditioning Equipment Noise

Once the Cherokee Court development is operational, a constant noise source may be generated from the operation of heating, ventilating, and air conditioning (HVAC) systems. However, as an industry practice, the design of the onsite HVAC units and other noise-generating mechanical equipment associated with the Cherokee Court development would typically be installed on the rooftops of residential and located either within an enclosure or behind other intervening structures that would provide a level of noise shielding for nearby noise sensitive uses. Although the operation of this equipment would generate noise, the design of these onsite HVAC units and exhaust fans would be required to comply with the regulations of the City's Municipal Code Section 8.36.030, which states that fixed and mobile equipment or machinery noise is not allowed to exceed the noise limits outlined in Section 8.36.040 (the City's Noise Ordinance listed above). Onsite equipment would be required through the plan check process to be designed and/or installed. It would be sited or shielded to limit noise levels that could affect nearby uses (pursuant to the Municipal Code regulations). In addition, nighttime noise limits would apply to any equipment items required to operate between the hours of 8:00 p.m. and 7:00 a.m. When these design measures are considered with the existing urban noise environment, the noise generated from HVAC systems and other mechanical equipment at the new development site will not increase ambient noise levels by 3 dBA or greater. As a result, noise impacts on the existing and future adjacent residential uses in the area from HVAC or other mechanical equipment would be less than significant.

7.3 Vibration Impacts

CEQA Appendix G Noise Threshold 2 Would the proposed project generate excessive groundborne vibration or groundborne noise levels? *(Less Than Significant)*

Construction

Construction activities for the proposed project would include demolition and grading activities, which can generate low levels of groundborne vibration. Persons residing and working near the project area could be exposed to the generation of excessive groundborne vibration or groundborne noise levels related to construction activities. The results from vibration can range from no perceptible effects at the lowest vibration levels, to low rumbling sounds and perceptible vibrations at moderate levels, to slight structural damage at the highest levels. Ground vibrations from construction activities rarely reach the levels that can damage structures. Still, they can be perceived in the audible range and felt in buildings close to a construction site.

The project would involve the temporary and intermittent use of construction equipment for various construction activities at the project site, resulting in the generation of groundborne vibration levels. Groundborne vibration is a concern when sensitive receptors, such as homes, are in proximity to the vibration sources. No pile driving or blasting, which are major sources of vibration levels, would be required for the proposed project.

The various PPV vibration velocities for several types of construction equipment and their corresponding RMS velocities (in VdB) that can generate perceptible vibration levels are identified in **Table 13**. As shown, vibration velocities could range from approximately 0.003 to 0.089 inch-per-second PPV at 25 feet from the source activity, depending on the type of construction equipment used, which corresponds to RMS velocity levels of 58 to 87 VdB at 25 feet, respectively, from the source activity. For this analysis, the vibration level for a large bulldozer provided in **Table 13** was used to evaluate vibration source levels at the nearest sensitive receptor from project construction.

Table 13. Vibration Source Levels for Construction Equipment at 25 Feet

Equipment	PPV (in/sec)	RMS (VdB)
Large Bulldozer	0.089	87
Caisson Drilling	0.089	87
Loaded Trucks	0.076	86
Jackhammer	0.035	79
Small Bulldozer	0.003	58

SOURCE: FTA, 2018

The construction vibration noise level at the nearest residential residence would be 0.024 in/sec at a distance of 60 feet. The single-family residential structures are considered to be new residential structures per the Caltrans vibration criteria (refer to Table 6). As the existing single-family residences would not be exposed to PPV groundborne vibration levels that exceed the 0.5 in/sec PPV threshold for continuous/frequent intermittent vibration sources, vibration impacts associated with building damage would be less than significant. Additionally, based on Caltrans criteria for human annoyance (refer to Table 7), the vibration levels experienced at the single-family residences would be between distinctly and strongly perceptible (below 0.04 in/sec). However, construction activities would only be temporary. Any construction activities occurring along the project site boundary directly adjacent to the single-family residences would only happen for a short duration in relation to the overall project construction schedule. In addition, project construction would occur according to the permitted construction hours established by the City. Thus, vibration impacts associated with human annoyance would be less than significant.

Operation

The proposed residential land uses would not involve stationary or mobile equipment activities that would result in high vibration levels, which are more typical for large industrial projects that employ heavy machinery. The primary vibration source would likely be vehicle circulation within and adjacent to the project area during project operations. However, the FTA's *Transit Noise and Vibration Impact Assessment* states that it is unusual for vibration from vehicular sources (including buses and trucks) to be perceptible, even in locations close to major roads. As such, no sources of "excessive" groundborne vibration or noise levels are anticipated during operations of either residential area.

7.4 Airport Impacts

CEQA Appendix G Noise Threshold 3 For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the proposed project expose people residing or working in the project area to excessive noise levels? *(No Impact)*

The closest airport to the project area is the Brackett Field Airport, located 4.7 miles southeast of the project area. The project is situated in the Brackett Field Airport Influence Area but is not within the airport's noise contours. Therefore, the proposed project would not expose people in the project area to excessive noise levels. Further, the project area is not located near a private airstrip. Therefore, the proposed project would not expose people working in the area to excessive noise levels associated with a private airstrip.

8.0 REFERENCES

Brackett Field Airport Land Use Compatibility Plan, December 9, 2015. Available online at: http://planning.lacounty.gov/brackett

California Department of Transportation's (Caltrans). 2013. Transportation- and Construction-Induced Vibration Guidance Manual.

Caltrans. 2013. Technical Noise Supplement (TeNS), a Technical Supplement to the Traffic Noise Analysis Protocol.

City of San Dimas General Plan (September 1991, January 2014). Available online at: http://www.cityofsandimas.com/pubdocs.cfm?task=detail&ID=3042

City of San Dimas General Plan Noise Element. Available online at: http://www.cityofsandimas.com/pubdocs.cfm?task=detail&ID=3042

City of San Dimas Municipal Code: Available online at: http://qcode.us/codes/sandimas/

City of San Dimas Municipal Code, Title 8 Health and Safety, Chapter 8.36 Noise Ordinance. Available online at: http://qcode.us/codes/sandimas/view.php?topic=8-8_36

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

Appendix A Noise Monitoring Data

Long Term Site LT-1 - CNEL Values, January 12, 2022					
Background Leq and Hour Averaging DNL					
Hour	**Background L_{eq}**	**Penalty**	**L_{eq} DNL (L_{eq} + 10 or 5)**		**L_{eq} DNL (10^(D/10))**
0	55	10	65	DNL	3162277.66
1	56	10	66	DNL	3981071.706
2	57.3	10	67.3	DNL	5370317.964
3	54.4	10	64.4	DNL	2754228.703
4	54.3	10	64.3	DNL	2691534.804
5	57	10	67	DNL	5011872.336
6	68.1	10	78.1	DNL	64565422.9
7	62.8		62.8		1905460.718
8	56.8		56.8		478630.0923
9	52.2		52.2		165958.6907
10	53		53		199526.2315
11	52.9		52.9		194984.46
12	55.4		55.4		346736.8505
13	65.1		65.1		3235936.569
14	60.5		60.5		1122018.454
15	59.1		59.1		812830.5162
16	57		57		501187.2336
17	59.5		59.5		891250.9381
18	60.6		60.6		1148153.621
19	58.2	5	63.2	CNEL	2089296.131
20	57.6	5	62.6	CNEL	1819700.859
21	59.2	5	64.2	CNEL	2630267.992
22	61.9	10	71.9	DNL	15488166.19
23	60.5	10	70.5	DNL	11220184.54
(Hour 23 is 23:00 to 23:59)				Average=	3162277.66

	10LOG10 of (Average=)	**67.4**

Appendix B RCNM Modeling Results

Roadway Construction Noise Model (RCNM),Version 1.1

Report dat ########
Case Descr GRADING

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
R1	Residentia	56.5	59.7	59.7

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		60	0
Dozer	No	40		81.7	60	0
Tractor	No	40	84		60	0
Tractor	No	40	84		60	0

	Calculated (dBA)		Results		Noise Limits (dBA)			
			Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Grader	83.4	79.4	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	80.1	76.1	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	82.4	78.4	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	82.4	78.4	N/A	N/A	N/A	N/A	N/A	N/A
Total	83.4	84.3	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Noise Limit Exceedance (dBA)					
Day		Evening		Night	
Lmax	Leq	Lmax	Leq	Lmax	Leq
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report dat ########
Case Descr BUILDING CONSTRUCTION

		Baselines (dBA)			---- Receptor #1 ----
Description	Land Use	Daytime	Evening	Night	
R1	Residentia	56.5	59.7	59.7	

			Equipment Spec	Actual	Receptor	Estimated
	Impact		Lmax	Lmax	Distance	Shielding
Description	Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)
Crane	No	16		80.6	60	0
Forklift	No	20		74.7	60	0
Generator (<25KVA, V	No	50		72.8	60	0
Tractor	No	40	84		60	0
Welder / Torch	No	40		74	60	0
Welder / Torch	No	40		74	60	0
Welder / Torch	No	40		74	60	0

			Results					
	Calculated (dBA)		Noise Limits (dBA)					
			Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Crane	79	71	N/A	N/A	N/A	N/A	N/A	N/A
Forklift	73.1	66.1	N/A	N/A	N/A	N/A	N/A	N/A
Generator (<25KVA, V	71.2	68.2	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	82.4	78.4	N/A	N/A	N/A	N/A	N/A	N/A
Welder / Torch	72.4	68.4	N/A	N/A	N/A	N/A	N/A	N/A
Welder / Torch	72.4	68.4	N/A	N/A	N/A	N/A	N/A	N/A
Welder / Torch	72.4	68.4	N/A	N/A	N/A	N/A	N/A	N/A
Total	82.4	80.6	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Noise Limit Exceedance (dBA)					
Day		Evening		Night	
Lmax	Leq	Lmax	Leq	Lmax	Leq
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report dat ########
Case Descr PAVING

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
R1	Residentia	56.5	59.7	59.7

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Mixer Truck	No	40		78.8	60	0
Paver	No	50		77.2	60	0
Paver Equipment	No	50		77.2	60	0
Roller	No	20		80	60	0
Tractor	No	40	84		60	0

	Calculated (dBA)		Results Noise Limits (dBA)					
			Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Concrete Mixer Truck	77.2	73.2	N/A	N/A	N/A	N/A	N/A	N/A
Paver	75.6	72.6	N/A	N/A	N/A	N/A	N/A	N/A
Paver Equipment	75.6	72.6	N/A	N/A	N/A	N/A	N/A	N/A
Roller	78.4	71.4	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	82.4	78.4	N/A	N/A	N/A	N/A	N/A	N/A
Total	82.4	81.5	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

	Noise Limit Exceedance (dBA)				
Day		Evening		Night	
Lmax	Leq	Lmax	Leq	Lmax	Leq
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report dat 1/20/2022
Case Descr ARCHITECTURAL COATING

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
R1	Residential	56.5	59.7	59.7

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Air compressors	No	75		77.7	60	0

Results

Equipment	Calculated (dBA) *Lmax	Leq	Noise Limits (dBA) Day Lmax	Leq	Evening Lmax	Leq	Night Lmax
Air compressors	76.1	74.9	N/A	N/A	N/A	N/A	N/A
Total	76.1	74.9	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

		Noise Limit Exceedance (dBA)				
	Day		Evening		Night	
Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A