# Appendix E
# Noise Report

# 5200 Lone Tree Way United Pacific Gas Station Project

Noise Report

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City of Antioch

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# Table of Contents

# Acronyms and Abbreviations

| | |
|---|---|
| CalGreen | California Green Building Standards Code |
| CEQA | California Environmental Quality Act |
| CNEL | Community Noise Equivalent Level |
| dB | Decibels |
| dB(A) | Decibels A-Weighted |
| EPA | United Stated Environmental Protection Agency |
| FHWA | Federal Highway Administration |
| FTA | Federal Transit Administration |
| Hz | Hertz (Frequency) |
| Ldn / DNL | Day-Night Noise Level |
| Leq | Equivalent Noise Level |
| Lmax | Maximum Noise Level |
| Lmin | Minimum Noise Level |
| OITC | Outside-Inside Transmission Class |
| PPV | Peak Particle Velocity |
| RCNM | Roadway Construction Noise Model |
| STC | Sound Transmission Class |

# 1.0 PROJECT DESCRIPTION

The proposed project consists of a new United Pacific convenience store of 3,200 sf, attached car wash of 1,125 sf, a fuel canopy with eight fuel dispensers, three underground storage tanks, and related site improvements and landscaping on an approximately 2.0-acre lot. The proposed project proposes right-in/right-out ingress and egress from Lone Tree Way and Vista Grande Drive. The proposed project would provide nineteen parking stalls and landscaping which would consist of drought-tolerant species, including shade canopy trees. The car wash drive lane would provide adequate stacking away from areas of ingress/egress from public right-of-way. Additionally, the proposed project would include the widening of Lone Tree Way to accommodate a 270-foot deceleration lane taper along eastbound Lone Tree Way to the proposed 30-foot driveway.

# 2.0 ENVIRONMENTAL SETTING

## 2.1 NOISE FUNDAMENTALS AND TERMINOLOGY

Noise is generally defined as unwanted sound that annoys or disturbs people and potentially causes an adverse psychological or physiological effect on human health. Because noise is an environmental pollutant that can interfere with human activities, evaluation of noise is necessary when considering the environmental impacts of a proposed project.

Sound is mechanical energy (vibration) transmitted by pressure waves over a medium such as air or water. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). In particular, the sound pressure level is the most common descriptor used to characterize the loudness of an existing sound level.

Although the decibel (dB) scale, a logarithmic scale, is used to quantify sound intensity, it does not accurately describe how sound intensity is perceived by human hearing. The perceived loudness of sound is dependent upon many factors, including sound pressure level and frequency content. The human ear is not equally sensitive to all frequencies in the entire spectrum, so noise measurements are weighted more heavily for frequencies to which humans are sensitive in a process called A-weighting, written as dB(A) and referred to as A-weighted decibels. There is a strong correlation between A-weighted sound levels and community response to noise. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment. Table 1 summarizes typical A-weighted sound levels for different common noise sources.

## Table 2.11. Typical A-Weighted Sound Levels

| Common Outdoor Activities | Noise Level (dBA) | Common Indoor Activities |
|---|---|---|
| | -110- | Rock band |
| Jet flyover at 1,000 Feet | | |
| | -100- | |
| Gas lawnmower at 3 Feet | | |
| | -90- | |
| Diesel truck at 50 Feet at 50 MPH | | Food blender at 3 Feet |
| Noisy urban area, daytime | -80- | Garbage Disposal at 3 Feet |
| Gas lawnmower, 100 Feet | | |
| Commercial area | -70- | Vacuum Cleaner at 10 Feet |
| Heavy traffic at 300 Feet | | Normal Speech at 3 Feet |
| | -60- | |
| Quiet urban daytime | | Large business office |
| | -50- | Dishwasher in next room |
| Quiet urban nighttime | | |
| Quiet suburban nighttime | -40- | Theater, large conference room (Background) |
| Quiet rural nighttime | -30- | |
| | | Library |
| | -20- | Bedroom at night, concert hall (Background) |
| | -10- | |
| | | Broadcast/recording studio |
| | -0- | |

Source: Caltrans, Technical Noise Supplement Traffic Noise Analysis Protocol, September 2013

Different types of measurements are used to characterize the time-varying nature of sound. These measurements include the equivalent sound level (Leq), the minimum and maximum sound levels (Lmin and Lmax, respectively), percentile-exceeded sound levels (such as L10, L20), the day-night sound level (Ldn), and the community noise equivalent level (CNEL). Ldn and CNEL values often differ by less than 1 dB. As a matter of practice, Ldn and CNEL values are considered to be equivalent and are treated as such in this assessment. Table 2 defines sound measurements and other terminology used in this report.

## Table 2. Definition of Sound Measurements

| Sound Measurements | Definition |
|---|---|
| Decibel (dB) | A unitless measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-pascals. |
| A-Weighted Decibel (dB(A)) | An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear. |
| Maximum Sound Level (Lmax) | The maximum sound level measured during the measurement period. |
| Minimum Sound Level (Lmin) | The minimum sound level measured during the measurement period. |

| Sound Measurements | Definition |
|---|---|
| Equivalent Sound Level (Leq) | The equivalent steady state sound level that in a stated period of time would contain the same acoustical energy. |
| Percentile-Exceeded Sound Level (Lxx) | The sound level exceeded xx % of a specific time period. L10 is the sound level exceeded 10% of the time. L90 is the sound level exceeded 90% of the time. L90 is often considered to be representative of the background noise level in a given area. |
| Day-Night Level (Ldn) | The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring during the period from 10:00 p.m. to 7:00 a.m. |
| Community Noise Equivalent Level (CNEL) | The energy average of the A-weighted sound levels occurring during a 24-hour period with 5 dB added to the A-weighted sound levels occurring during the period from 7:00 p.m. to 10:00 p.m. and 10 dB added to the A-weighted sound levels occurring during the period from 10:00 p.m. to 7:00 a.m. |
| Peak Particle Velocity (PPV) | A measurement of ground vibration defined as the maximum speed (measured in inches per second) at which a particle in the ground is moving relative to its inactive state. PPV is usually expressed in inches/second. |
| Frequency: Hertz (Hz) | The number of complete pressure fluctuations per second above and below atmospheric pressure. |

Source: Federal Highway Administration Construction Noise Handbook (FHWA 2006)

With respect to how humans perceive and react to changes in noise levels, a 1 dB(A) increase is imperceptible, a 3 dB(A) increase is barely perceptible, a 5 dB(A) increase is clearly noticeable, and a 10 dB(A) increase is subjectively perceived as approximately twice as loud. These subjective reactions to changes in noise levels were developed on the basis of test subjects' reactions to changes in the levels of steady-state pure tones or broadband noise and to changes in levels of a given noise source. These statistical indicators are thought to be most applicable to noise levels in the range of 50 to 70 dB(A), as this is the usual range of voice and interior noise levels. Numbers of agencies and municipalities have developed or adopted noise level standards, consistent with these and other similar studies to help prevent annoyance and to protect against the degradation of the existing noise environment.

For a point source such as a stationary compressor or construction equipment, sound attenuates based on geometry at a rate of 6 dB per doubling of distance. For a line source such as free-flowing traffic on a freeway, sound attenuates at a rate of 3 dB per doubling of distance. Atmospheric conditions including wind, temperature gradients, and humidity can change how sound propagates over distance and can affect the level of sound received at a given location. The degree to which the ground surface absorbs acoustical energy also affects sound propagation. Sound that travels over an acoustically absorptive surface, such as grass, attenuates at a slightly greater rate than sound that travels over a hard surface, such as pavement. The increased attenuation is typically in the range of 1–2 dB per doubling of distance. Barriers, such as buildings and topography that block the line of sight between a source and receiver, also increase the attenuation of sound over distance.

## 2.2 DECIBEL ADDITION

Because decibels are logarithmic units, sound pressure levels cannot be added or subtracted through ordinary arithmetic. On the dB scale, a doubling of sound energy corresponds to a 3 dB increase. In other words, when two identical sources are each producing sound of the same loudness, their combined sound level at a given distance would be 3 dB higher than one source under the same conditions. For example, if one source produces a sound pressure level of 70 dB(A), two identical sources would combine to produce 73 dB(A). The cumulative sound level of any number of sources can be determined using decibel addition.

## 2.3 VIBRATION STANDARDS

Vibration is like noise such that noise involves a source, a transmission path, and a receiver. While related to noise, vibration differs in that noise is generally considered to be pressure waves transmitted through air, whereas vibration usually consists of the excitation of a structure or surface. As with noise, vibration consists of an amplitude and frequency. A person's perception to vibration depends on their individual sensitivity to vibration, as well as the amplitude and frequency of the source and the response of the system that is vibrating.

Vibration can be measured in terms of acceleration, velocity, or displacement. A common practice is to monitor vibration in terms of peak particle velocity (PPV) in inches per second. Standards pertaining to perception as well as damage to structures have been developed for vibration levels defined in terms of PPV.

Human and structural response to different vibration levels is influenced by a number of factors, including ground type, distance between source and receptor, duration, and the number of perceived vibration events. Table 3 notes the general threshold at which human annoyance could occur is 0.1 PPV for continuous/frequent sources. Table 4 indicates the threshold for damage to typical residential and commercial structures ranges from 0.3 to 0.5 PPV for continuous/frequent sources.

**Table 1. Guideline Vibration Annoyance Potential Criteria**

| Human Response | Maximum Peak Particle Velocity (inches/second) | |
|---|---|---|
| | Transient Sources | Continuous/Frequent Sources |
| Barely perceptible | 0.035 | 0.012 |
| Distinctly perceptible | 0.24 | 0.035 |
| Strongly perceptible | 0.90 | 0.10 |
| Severe | 2.0 | 0.40 |

Notes: Transient sources create a single isolated vibration event, such as blasting or drop balls.
Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seal equipment, vibratory pile drivers, and vibratory compaction equipment.
Source: Caltrans Transportation and Construction Vibration Guidance Manual (Caltrans 2020)

## Table 2. Guideline Vibration Damage Potential Criteria

| Structure and Condition | Maximum Peak Particle Velocity (inches/second) | |
|---|---|---|
| | Transient Sources | Continuous/Frequent Sources |
| Extremely fragile historic buildings, ruins, ancient monuments | 0.12 | 0.08 |
| Fragile buildings | 0.30 | 0.12 |
| Historic and some old buildings | 0.50 | 0.20 |
| Older residential structure | 0.70 | 0.30 |
| New residential structures | 1.2 | 0.50 |
| Modern industrial/commercial buildings | 2.0 | 0.50 |

Notes: Transient sources again create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seal equipment, vibratory pile drivers, and vibratory compaction equipment.
Source: Caltrans Transportation and Construction Vibration Guidance Manual (Caltrans 2020)

The operation of heavy construction equipment, particularly pile driving and other impact devices, such as pavement breakers, create seismic waves that radiate along the surface of the ground and downward into the earth. These surface waves can be felt as ground vibration. Vibration from the operation of this equipment can result in effects ranging from annoyance of people to damage of structures. Varying geology and distance will result in different vibration levels containing different frequencies and displacements. In all cases, vibration amplitudes will decrease with increasing distance. Perceptible groundborne vibration is generally limited to areas within a few hundred feet of construction activities.

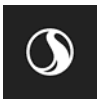
Table 7-4 “Vibration Source Levels for Construction Equipment” in the 2018 Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment Manual lists vibration source levels for the construction equipment most likely to generate high levels of ground vibration (FTA 2018). The equipment listed in the FTA table includes impact and sonic pile drivers, clam shovel drops, hydromills, vibratory rollers, hoe rams, large and small bulldozers, caisson drilling, loaded trucks, and jackhammers. Table 5 below summarizes typical reference vibration levels generated by select construction equipment proposed for this project.

## Table 3. Vibration Source Levels for Construction Equipment

| Equipment | Peak Particle Velocity at 25 Feet |
|---|---|
| Vibratory roller | 0.210 |
| Large bulldozer | 0.089 |
| Loaded trucks | 0.076 |
| Small bulldozer | 0.003 |

Source: Federal Transit Administration Transit Noise and Vibration Impact Assessment Manual (FTA 2018)

Vibration amplitude attenuates over distance and is a complex function of how energy is imparted into the ground and the soil conditions through which the vibration is traveling. The following equation can be



used to estimate the vibration level at a given distance for typical soil conditions (FTA 2018). “PPVref” is the reference PPV from Table 5 and “Distance” is the distance between the source and the receptor:

PPV = PPVref x (25/Distance)^1.5

# 3.0 REGULATORY SETTING

Federal, state, and local agencies regulate different aspects of environmental noise. Generally, the federal government sets standards for transportation-related noise sources closely linked to interstate commerce. These include aircraft, locomotives, and trucks. No federal noise standards are directly applicable to this project. The state government sets standards for transportation noise sources such as automobiles, light trucks, and motorcycles. Noise sources associated with industrial, commercial, and construction activities are generally subject to local control through noise ordinances and general plan policies. Local general plans identify general principles intended to guide and influence development plans.

## 3.1 STATE REGULATIONS

### 3.1.1 California Green Building Standards (CalGreen)

The 2016 California Green Building Standards Code (CalGreen) establishes interior noise insulation standards for non-residential occupied buildings. CalGreen Section 5.507 “Environmental Comfort”, states the following:

*5.507.4.1 Exterior noise transmission. Wall and roof-ceiling assemblies exposed to the noise source making up the building or addition envelope or altered envelope shall meet a composite STC rating of at least 50 or a composite OITC rating of no less than 40, with exterior windows of a minimum STC of 40 or OITC of 30 in the following locations:*

1. *Within the 65 CNEL noise contour of an airport*

*Exceptions:*

1. *Ldn or CNEL for military airports shall be determined by the facility Air Installation Compatible Land Use Zone (AICUZ) plan.*
2. *Ldn or CNEL for other airports and heliports for which a land use plan that has not been developed shall be determined by the local general plan noise element.*
3. *Within the 65 CNEL or Ldn noise contour of a freeway or expressway, railroad, industrial source or fxed-guideway notice source as determined by the Noise Element of the General Plan.*

*5.507.4.1.1 Noise exposure where noise contours are not readily available. Buildings exposed to a noise level of 65 dB Leq-1-hr during any hour of operation shall have building, addition or alteration exterior wall and roof-ceiling assemblies exposed to the noise source meeting a composite STC rating of at least 45 (or OITC 35), with exterior windows of a minimum STC of 40 (or OITC 30).*

*5.507.4.2 Performance method. For buildings located as defined in Section 5.507.4.1 or 5.507.4.1.1, wall and roof-ceiling assemblies exposed to the noise source making up the building or addition envelope or altered envelope shall be constructed to provide an interior noise environment attributable to exterior sources that does not exceed an hourly equivalent noise level (Leq -1Hr) of 50 dBA in occupied areas during any hours of operations*

*5.507.4.2.1 Site features. Exterior features such as sound walls or earth berms may be utilized as appropriate to the building, addition or alteration project to mitigate sound migration to the interior.*

*5.507.4.2.2 Documentation of compliance. An acoustical analysis documenting complying interior sound levels shall be prepared by personnel approved by the architect or engineer of record.*

*5.507.4.3 Interior sound transmission. Wall and floor-ceiling assemblies separating tenant spaces and tenant spaces and public places shall have an STC of at least 40.*

## 3.2 LOCAL REGULATIONS

### 3.2.1 City of Antioch General Plan[1]

The General Plan sets forth noise and land use compatibility standards to guide development, as well as noise goals and policies to protect citizens from the harmful and annoying effects of excessive noise. The following noise objectives and policies are applicable to the proposed project.

Objective 11.6.1 Noise Objective. Achieve and maintain exterior noise levels appropriate to planned land uses throughout Antioch as described below:

- Residential
  - Single-Family: 60 dBA CNEL within rear yards
  - Multifamily: 60 dBA CNEL within exterior open space
- Schools
  - Classrooms: 65 dBA CNEL
  - Play and Sports Areas: 70 dBA CNEL
- Hospitals, Libraries: 60 dBA CNEL
- Commercial/Industrial: 70 dBA CNEL at the front setback

11.6.2 Noise Policies

a. Implementation of the noise objective contained in Section 11.6.1 and the policies contained in 11.6.2 of the Environmental Hazards Element shall be based on noise data contained in Section 4.9 of the General Plan EIR, unless a noise analysis conducted

[1] https://www.antiochca.gov/fc/community-development/planning/Antioch_Adopted_General_Plan.pdf, last accessed October 29, 2021.

pursuant to the City's development and environmental review process provides more up-to-date and accurate noise predictions, as determined by the City.

b. Maintain a pattern of land uses that separates noise sensitive land uses from major noise sources to the extent possible, and guide noise-tolerant land uses into the noisier portions of the Planning Area.

c. Minimize motor vehicle noise in residential areas through proper route location and sensitive roadway design.

- Provide planned industrial areas with truck access routes separated from residential areas to the maximum feasible extent.

- Where needed, provide traffic calming devices to slow traffic speech within residential neighborhoods.

d. Where new development (including construction and improvement of roadways) is proposed in areas exceeding the noise levels identified in the General Plan Noise Objective, or where the development of proposed uses could result in a significant increase in noise, require a detailed noise attenuation study to be prepared by a qualified acoustical engineer to determine appropriate mitigation and ways to incorporate such mitigation into project design and implementation.

e. When new development incorporating a potentially significant noise generator is proposed, require noise analyses to be prepared by a qualified acoustical engineer. Require the implementation of appropriate noise mitigation when the proposed project will cause new exceedances of General Plan noise objectives, or an audible (3.0 dB(A)) increase in noise in areas where General Plan noise objectives are already exceeded as the result of existing development.

f. In reviewing noise impacts, utilize site design and architectural design features to the extent feasible to mitigate impacts on residential neighborhoods and other uses that are sensitive to noise. In addition to sound barriers, design techniques to mitigate noise impacts may include, but are not limited to:

- Increased building setbacks to increase the distance between the noise source and sensitive receptor.

- Orient buildings which are compatible with higher noise levels adjacent to noise generators or in clusters to shield more noise sensitive areas and uses.

- Place noise tolerant use, such as parking areas, and noise tolerant structures, such as garages, between the noise source and sensitive receptor.

- Cluster office, commercial, or multifamily residential structures to reduce noise levels within interior open space areas.

- Provide double glazed and double paned windows on the side of the structure facing a major noise source, and place entries away from the noise source to the extent possible.

g. Where feasible, require the use of noise barriers (walls, berms, or a combination thereof) to reduce significant noise impacts.

- Noise barriers must have sufficient mass to reduce noise transmission and high enough to shield the receptor from the noise source.

- To be effective, the barrier needs to be constructed without cracks or openings.

- The barrier must interrupt the line of sight between the noise sources and the noise receptor.

- The effects of noise "flanking" the noise barrier should be minimized by bending the end of the barrier back from the noise source.

- Require appropriate landscaping treatment to be provided in conjunction with noise barriers to mitigate their potential aesthetic impacts.

h. Continue enforcement of California Noise Insulation Standards (Title 25, Section 1092, California Administrative Code).

i. Ensure that construction activities are regulated as to hours of operation in order to avoid or mitigate noise impacts on adjacent noise-sensitive land uses.

j. Require proposed development adjacent to occupied noise sensitive land uses to implement a construction-related noise mitigation plan. This plan would depict the location of construction equipment storage and maintenance area, and document methods to be employed to minimize noise impacts on adjacent noise sensitive land uses.

k. Require that all construction equipment utilize noise reduction features (e.g., mufflers and engine shrouds) that are no less effective than those originally installed by the manufacturer.

m. Prior to the issuance of any grading plans, the City shall condition approval of subdivisions and non-residential development adjacent to any developed/occupied noise-sensitive land uses by requiring applicants to submit a construction-related noise

mitigation plan to the City for review and approval. The plan should depict the location of construction equipment and how the noise from this equipment will be mitigated during construction of the project through the use of such methods as:

- The construction contractor shall use temporary noise-attenuation fences, where feasible, to reduce construction noise impacts on adjacent noise sensitive land uses.
- During all project site excavation and grading on-site, 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 construction equipment so that emitted noise is directed away from sensitive receptors nearest the project site.
- The construction contractor shall locate equipment staging in areas that will create the greatest distance between construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction.
- The construction contractor shall limit all construction-related activities that would result in high noise levels to between the hours of 7:00 a.m. and 7:00 p.m. Monday through Saturday. No construction shall be allowed on Sundays and public holidays.

n. The construction-related noise mitigation plan required shall also specify that haul truck deliveries be subject to the same hours specified for construction equipment. Additionally, the plan shall denote any construction traffic haul routes where heavy trucks would exceed 100 daily trips (counting those both to and from the construction site). To the extent feasible, the plan shall denote haul routes that do not pass sensitive land uses or residential dwellings. Lastly, the construction-related noise mitigation plan shall incorporate any other restrictions imposed by the City.

(City of Antioch 2003a)

### 3.2.2 City of Antioch Code of Ordinances[2]

Article 19 "Noise Attenuation Requirements", Section 9-5.1901 "Noise Attenuation Requirements" provides the following noise attenuation requirements for proposed development.

A. Stationary noise sources. Uses adjacent to outdoor living areas (e.g., backyards for single-family homes and patios for multifamily units) and parks shall not cause an increase in background ambient noise which will exceed 60 CNEL.

B. Mobile noise sources.

[2] https://codelibrary.amlegal.com/codes/antioch/latest/antioch_ca/0-0-0-29353, last accessed October 29, 2021.

1) Arterial and street traffic shall not cause an increase in background ambient noise which will exceed 60 CNEL.

D. Noise attenuation. The City may require noise attenuation measures be incorporated into a project to obtain compliance with this section. Measures outlined in the noise policies of the General Plan should be utilized to mitigate noise to the maximum feasible extent.

Section 5-17.04 "Heavy Construction Equipment Noise" states it shall be unlawful for any person to operate heavy construction equipment during the hours specified below:

1) On weekdays prior to 7:00 a.m. and after 6:00 p.m.

2) On weekdays within 300 feet of occupied dwelling space, prior to 8:00 a.m. and after 5:00 p.m.

3) On weekends and holidays, prior to 9:00 a.m. and after 5:00 p.m., irrespective of the distance from the occupied dwelling.

"Heavy Construction Equipment" is defined as equipment used in grading and earth moving, including diesel engine equipped machines used for that purpose, except pickup trucks of one ton or less. "Operate" includes the starting, warming-up, and idling of heavy construction equipment engines or motors.

Section 5-17.05 "Construction Activity Noise" states it shall be unlawful for any person to be involved in construction activity during the hours specified below:

1) On weekdays prior to 7:00 a.m. and after 6:00 p.m.

2) On weekdays within 300 feet of occupied dwellings, prior to 8:00 a.m. and after 5:00 p.m.

3) On weekends and holidays, prior to 9:00 a.m. and after 5:00 p.m., irrespective of the distance from the occupied dwellings.

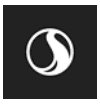
"Construction Activity" means the process or manner of constructing, building, refurbishing, remodeling or demolishing a structure, delivering supplies thereto and includes, but is not limited to, hammering, sawing, drilling, and other construction activities when the noise or sound therefrom can be heard beyond the perimeter of the parcel where such work is being performed. The term "Construction Activity" also includes the testing of any audible device such as a burglar or fire alarm or loudspeaker. "Construction Activity" does not include floor covering installation or painting when done with non-powered equipment.

(City of Antioch 2015b)

# 4.0 EXISTING NOISE ENVIRONMENT

## 4.1 SENSITIVE RECEPTORS

Some land uses are more tolerant of noise than others. For example, schools, hospitals, churches, and residences are considered to be more sensitive to noise intrusion than commercial or industrial activities. Ambient noise levels can also affect the perceived desirability or livability of a development.

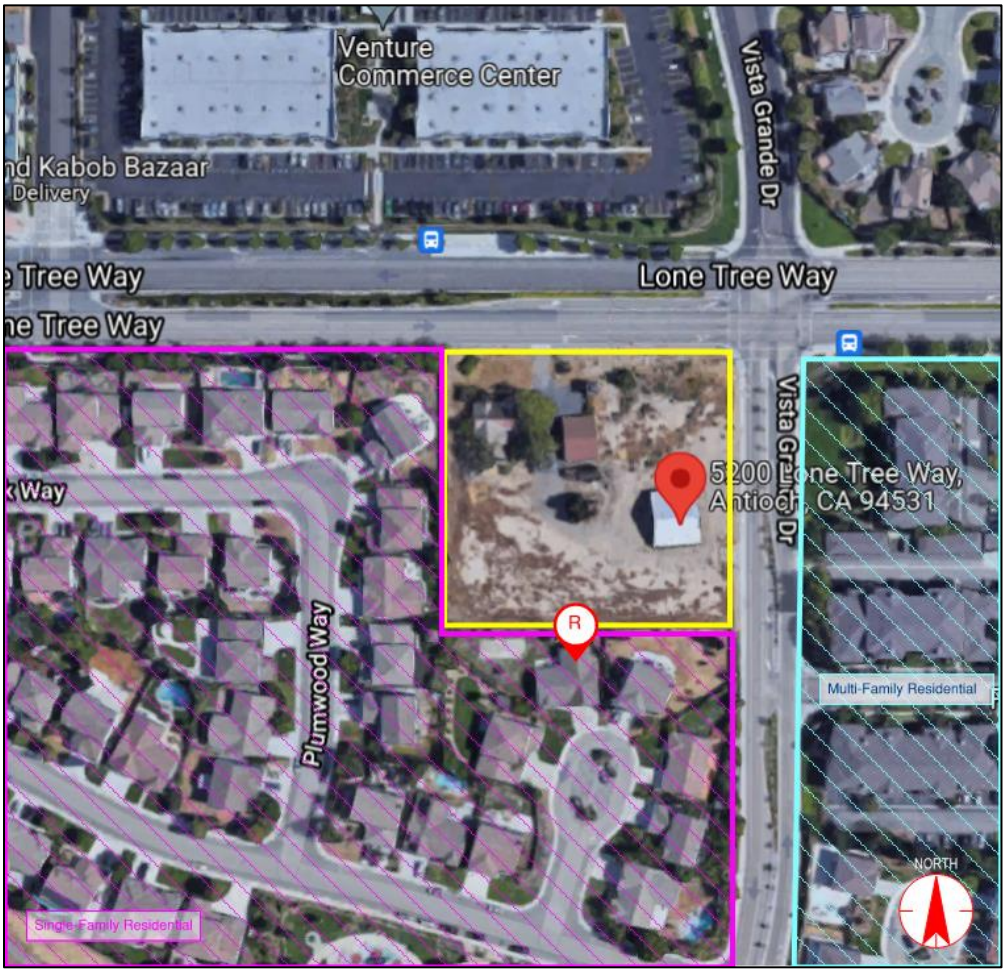


The project site is in southeast Antioch and is currently occupied by a single-story residential structure, a single-story barn structure, a single-story three car garage structure, two seatrain storage containers, two small sheds, and a domestic water tower structure. The rest of the project site consists of land utilized for vehicle and equipment storage for a paving company. The area surrounding the project site consists of commercial, office and residential uses.

As shown in Figure 2, the project site (within the yellow square) is on the southwest corner of Lone Tree Way and Vista Grande Drive. Land use across Lone Tree Way, north of the project site, consists of office and commercial uses. Land use across Vista Grande Drive, to the east of the site, consists of multi-family residential apartments (aqua hatched area in Figure 2). The project site is bordered by one- to two-story single family residential homes to the south and west. State Route 4 is located approximately 0.6 miles east of the project site.

The closest noise-sensitive receptors to the project site are the single-family residential homes along Plumwood Way and Hollowglen Court (pink hatched area in Figure 2). According to the April 19, 2021 Preliminary Not for Construction drawing set, the south edge of the project site will be as close as 16' from the residential home at 5002 Hollowglen Court (red pin in Figure 2).

**Figure 2: Project Site and Neighboring Sensitive Receptors**



## 4.2 EXISTING AMBIENT NOISE LEVELS

The existing noise environment in a project area is characterized by the area's general level of development because the level of development and ambient noise levels tend to be closely correlated. Areas that are not urbanized are typically relatively quiet, while areas that are more urbanized are noisier as a result of roadway traffic, industrial activities, and other human activities.

The City as a whole is exposed to noise generated by traffic on major freeways, such as SR 4, and to a lesser extent along major arterial roads, such as Lone Tree Way. The ambient noise levels at and around the 5200 Lone Tree Way gas station project were estimated using the published noise contours in Tables 4.9.C "Existing Traffic Noise" and 4.9.E "Projected Maximum Noise Contours at Build Out" in the Draft General Plan Update Environmental Impact Report for the City of Antioch. Table 4.9.C notes the following noise contour lines for Lone Tree Way south of James Donlon Boulevard:

- 70 dB(A) CNEL – 71' from the roadway centerline
- 65 dB(A) CNEL – 142' from the roadway centerline
- 60 dB(A) CNEL – 301' from the roadway centerline

Table 4.9.E lists the following future noise contours for arterial roadways:

- 70 dB(A) CNEL – 86' from the roadway centerline
- 65 dB(A) CNEL – 242' from the roadway centerline
- 60 dB(A) CNEL – 583' from the roadway centerline
- 55 dB(A) CNEL – 1,318' from the roadway centerline

The gas station project site is located 51' to 347' from the centerline of Lone Tree Way. Using Table 4.9.E in the draft EIR, ambient noise levels are estimated between 68 dB(A) to 71 dB(A). The residential home closest to Lone Tree Way is 114' from the roadway centerline. Estimated ambient noise levels from Lone Tree Way could be up to 69 dB(A) at the home. The single-family home at 5002 Hollowglen Court is about 362' from the centerline of Lone Tree Way. Estimated ambient noise levels at this home are around 63 dB(A).

Therefore, ambient noise levels at the project site should be at the 70 dB(A) CNEL level recommended for commercial/industrial sites in paragraph 11.6.1 "Noise Objective" in the City of Antioch General Plan. The ambient noise level at the existing residential homes may already be above the recommended 60 dB(A) CNEL level listed in the general plan.

# 5.0 METHODOLOGY FOR ANALYSIS

In accordance with the requirements of CEQA, the noise analysis evaluates the project's noise sources to determine the impact of the proposed project on the existing ambient noise environment. As noted above, noise contours listed in Table 4.9.E "Projected Maximum Noise Contours at Build Out" in the Draft General Plan Update Environmental Impact Report for the City of Antioch were used to provide baseline noise conditions at nearby sensitive receptors and within the project site vicinity. For the purpose of this analysis, potential sensitive receptors were determined by reviewing current aerial photography.

Impacts from future project-related traffic were estimated using the impact analysis contained within the traffic report, prepared by Stantec.

Noise from the project's mechanical systems would operate regularly and are therefore required to comply with the policies and restrictions listed in the General Plan and Code of Ordinances.

The Federal Highway Administration Roadway Construction Noise Model (RCNM) was used to estimate the impact from short-term construction activities. The RCNM is used as the Federal Highway Administration's national standard for predicting noise generated from construction. The RCNM analysis includes the calculation of noise levels at a defined distance for a variety of construction equipment. The spreadsheet inputs include acoustical use factors and distance to receptors and calculates the expected Lmax and Leq values at a selected receptor.

## 5.1 EPA GUIDELINES

The EPA has established guidelines (EPA 1973) for assessing the impact of an increase in noise levels. These guidelines have been used as industry standard for several years to determine the potential impact of noise increases on communities. Most people will tolerate a small increase in background noise (up to about 5 dB(A)) without complaint, especially if the increase is gradual over a period of years (such as from gradually increasing traffic volumes). Increases greater than 5 dB(A) may cause complaints and interference with sleep. Increases above 10 dB(A) (heard as a doubling of judged loudness) are likely to cause complaints and should be considered a serious increase. Table 6 defines each of the traditional impact descriptions, their quantitative range, and the qualitative human response to changes in noise levels.

**Table 1. U.S. Environmental Protection Agency (EPA) Impact Guidelines**

| Increase over Existing or Baseline Sound Levels | Impact Per EPA Region Guidelines | Qualitative Human Perception of Difference in Sound Levels |
|---|---|---|
| 0 decibels (dB) to 5 dB | Minimum Impact | Imperceivable or Slight Difference |
| 6 dB to 10 dB | Significant Impact | Significant Noticeable Difference – Complaints Possible |
| Over 10 dB | Serious Impact | Loudness Changes by a Factor of Two or Greater. Clearly Audible Difference – Complaints Likely |

# 6.0 ENVIRONMENTAL ANALYSIS

## 6.1 EXTERIOR TRAFFIC NOISE

The level of traffic noise experienced at a location depends primarily on traffic speed (tire noise increases with speed) and the proportion of truck traffic on the road. Trucks generate engine, exhaust, and wind noise in addition to tire noise.

Changes in traffic volumes can also have an impact on overall noise levels. For example, it takes 25 percent more traffic volume to produce an increase of only 1 dB(A) in the ambient noise level. For roads already heavy with traffic volume, an increase in traffic numbers could even reduce noise because the heavier volumes could slow down the average speed of the vehicles. A doubling of traffic volume results in a 3 dB(A) increase in noise levels.

In Section 3.17 “Transportation” in the initial study document, it is stated that the project does not conflict with the General Plan Circulation Element, any program plan, ordinance, or policy addressing the circulation system. The project does not propose to amend or adjust roadway classifications, the roadway network, transit routes, or bicycle network as identified in the General Plan. Since the project does not conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system, the impact of noise produced from the traffic associated with this project is also anticipated to be less than significant.

## 6.2 INTERIOR TRAFFIC NOISE

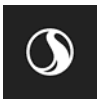
CalGreen states if an occupied non-guestroom space is exposed to a noise level of 65 dB(A) Leq 1-hr during any hour of operation, the exterior façade design is required to incorporate features to reduce noise inside the spaces to a maximum of 50 dBA Leq 1-hr. Given the convenience store on the project site would be exposed to noise levels up to 71 dB(A) CNEL/Ldn, a 1-hour noise level of 65 dB(A) Leq or greater is possible, and the project would be required to comply with the CalGreen requirements.

The April 19, 2021 Preliminary Not for Construction drawing set shows a hard-surfaced floor, exposed metal deck ceiling, and about 562 square feet of exterior glazing in the front wall of the convenience store. Using these assumptions, windows with a minimum Outside-Inside Transmission Class (OITC) rating of OITC 20 would be required to help achieve the code-dictated maximum 50 dB(A) 1-hour Leq noise level. A typical 1” thick insulating glass unit constructed of ¼” glass – ½” airspace – ¼” glass has an expected rating of OITC 26. Therefore, standard construction should be acceptable for the convenience store to achieve the CalGreen code requirements and traffic noise levels would have a less than significant impact.

## 6.3 PROJECT FIXED-SOURCE AND OPERATIONAL NOISE

### 6.3.1 Fixed-Source Noise

The roof plan contained in the April 19, 2021 Preliminary Not for Construction drawing set shows two rooftop units, one exhaust fan, and three condensing units on top of the convenience store.



There is also a car wash tunnel located on the east side of the convenience store. Vehicles will enter the car wash tunnel from the south and exit to the north. Typical car wash tunnels will have blowers at the end to dry cars as the exit the tunnel. The single-family residential homes along Plumwood Way should be well-shielded from the car wash tunnel by the convenience store and by an existing block wall at the property line of the project site. The multi-family residential units across Vista Grande Drive will experience shielding of noise from the car wash from the east wall of the car wash tunnel itself. The single-family residential homes around Hollowglen Court will be separated from the car wash tunnel by the existing block wall only.

Both the rooftop equipment and the car wash operation will generate noise that will radiate to the neighboring properties. The noise from this equipment would be obliged to comply with the requirements in Policy 11.6.2.e in the General Plan and the maximum noise level limits listed in Section 9-5.1901, Paragraph A in the City of Antioch Code of Ordinances.

When the actual on-site equipment is selected, including the car wash blowers, a noise analysis will be prepared by a qualified acoustical engineer and the equipment will be designed to incorporate measures as needed, such as shielding, barriers, and/or attenuators to reduce noise levels that may affect nearby properties. Noise levels from the project's fixed-source equipment will either be designed to achieve 60 dB(A) Ldn at the outdoor living areas of the existing residential receptors or will not cause an audible (3.0 dB(A)) increase in noise in areas where General Plan noise objectives are already exceeded as the result of existing development.

With the requirements listed in Policy 11.6.2.e in the General Plan and Section 9-5.1901, Paragraph A, the impact of fixed-source noise to the neighboring properties would be less than significant.

### 6.3.2 Operational Noise

When the project is completed, noise will be generated from the operation of the new gas station, including parking lot activity, noise from gas pump kiosks, and potential background music. Noise from patrons visiting the convenience store would consist of driving to the store and parking lot activity. Noise from parking lot activity includes elements, such as car doors closing and conversation. These activities will be very short in duration and much quieter than the existing traffic experienced on the local roads. For example, from Table 2 above, normal conversation at 3 feet is 65 dB(A). The closest noise-sensitive receptors are about 85 feet away from the convenience store. Using distance attenuation of 6 dB per doubling of distance, normal conversation at the gas station would only be 36 dB(A) at the closest residential receptors and would be well below the noise level generated from current street traffic. Therefore, operation of the proposed project would have a less than significant impact on neighboring properties.

### 6.3.3 Trash Enclosure

The April 19, 2021 Preliminary Not for Construction drawing set shows a trash enclosure located on the west side of the parking lot, approximately 106' from the closest residential receptors along Plumwood Way. The trash enclosure will be completely closed by concrete walls on the north, south, and west sides of the dumpsters to shield them from the neighboring residential homes.

Activity from garbage truck traffic and trash pickup would remain the same as currently experienced with the residential and commercial uses already around the project site and noise from trash pickup should have a less than significant impact.

## 6.4 SHORT TERM CONSTRUCTION NOISE

Two types of short-term noise impacts could occur during construction. The first type of short-term noise impact is traffic noise from construction crew vehicular commutes on the access roads leading to and from the project site. As stated in Section 3.17 “Transportation” in the initial study document, construction of the proposed project would generate traffic through the transport of workers, equipment, and materials to and from the project site. It is currently anticipated that project construction would take approximately 8 months to complete, starting in June 2022 and ending in January 2023. Construction equipment and materials would be stored onsite. Construction activities are anticipated to be mostly confined to the project site, but the construction of a turn lane into the Project site may require lane closures along Lone Tree Way. Project construction and grading activities would be consistent with the Antioch Municipal Code Section 5-17.05 and would occur on weekdays from 7:00 a.m. - 6:00 p.m., on weekdays within 300 feet of occupied dwellings, 8:00 a.m. - 5:00 p.m., and on weekends and holidays 9:00 a.m. - 5:00 p.m., irrespective of the distance from the occupied dwellings (City of Antioch 2020b). Since construction traffic would be temporary and would be spread across the duration of construction, this impact would be less than significant.

The second type of short-term noise impact is related to noise generated during construction. Construction activities would include demolition, site preparation, grading, building construction, paving, and architectural coating. Each construction stage has its own mix of equipment, and consequently, its own noise characteristics. The various construction operations would change the character of the noise generated at the project site and therefore, the noise level as construction progresses. The loudest stages of construction include the demolition, site preparation, and grading stages, as the noisiest construction equipment is typically earthmoving and grading equipment.

The construction of the 5200 Lone Tree Way United Pacific Gas Station project would be conducted in six stages and each stage will use different construction equipment. The main types of noise-producing equipment for each construction stage are shown in Table 7.

**Table 7. Construction Stage Equipment**

| Construction Stage | Construction Equipment | |
|---|---|---|
| Demolition | • Concrete Saw<br>• Rubber-Tired Dozer<br>• Tractor | • Front-End Loader<br>• Backhoe<br>• Haul Trucks (2) |
| Site Preparation | • Grader<br>• Rubber-Tired Dozer | • Tractor |
| Grading | • Grader<br>• Rubber-Tired Dozer<br>• Tractor | • Front-End Loader<br>• Haul Trucks (3) |

| Construction Stage | Construction Equipment | |
|---|---|---|
| Building Construction | • Crane<br>• Generator<br>• Welders (3) | • Forklift<br>• Tractor |
| Paving | • Cement Mixer<br>• Paver<br>• Paving Equipment | • Roller<br>• Tractor |
| Architectural Coating | • Air Compressor | |

Table 8 lists the types of construction equipment and the maximum and average operational noise level as measured at 16', 36', and 85' from the operating equipment. The 16' distance represents the approximate closest distance between the south edge of the project site and the closest noise-sensitive receptor at 5002 Hollowglen Court. The 16' distance would be applicable during the Demolition, Site Preparation, and Grading stages of construction. The 36' distance is the estimated closest distance between the paving work and the residence at 5002 Hollowglen Court. The 85' distance is the approximate closest distance between the closest residential receptor and the building construction and architectural coating work.

### Table 8. Summary of Construction Equipment Source Levels

| Construction Equipment Source at the Project Site | Distance to Nearest Sensitive Receptor | Sound Level at Receptor | | |
|---|---|---|---|---|
| | | Lmax, dB(A) | Acoustical Use Factor (%) | Leq, dB(A) |
| Backhoe | 16 feet | 87.5 | 40 | 83.5 |
| | 36 feet | 80.4 | | 76.4 |
| | 85 feet | 73.0 | | 69.0 |
| Crane | 16 feet | 90.4 | 16 | 82.5 |
| | 36 feet | 83.4 | | 75.4 |
| | 85 feet | 75.0 | | 68.0 |
| Compressor (air) | 16 feet | 87.6 | 40 | 83.6 |
| | 36 feet | 80.5 | | 76.5 |
| | 85 feet | 73.1 | | 69.1 |
| Concrete Mixer | 16 feet | 88.7 | 40 | 84.7 |
| | 36 feet | 81.7 | | 77.7 |
| | 85 feet | 74.2 | | 70.2 |
| Concrete Saw | 16 feet | 99.5 | 20 | 92.5 |
| | 36 feet | 92.4 | | 85.4 |
| | 85 feet | 85.0 | | 78.0 |
| Dozer | 16 feet | 91.6 | 40 | 87.6 |
| | 36 feet | 84.5 | | 80.5 |
| | 85 feet | 77.1 | | 73.1 |

| Construction Equipment Source at the Project Site | Distance to Nearest Sensitive Receptor | Sound Level at Receptor | | |
|---|---|---|---|---|
| | | Lmax, dB(A) | Acoustical Use Factor (%) | Leq, dB(A) |
| Forklift (Gradall) | 16 feet | 93.3 | 40 | 89.3 |
| | 36 feet | 86.3 | | 82.3 |
| | 85 feet | 78.8 | | 74.8 |
| Front End Loader | 16 feet | 89.0 | 40 | 85.0 |
| | 36 feet | 82.0 | | 78.0 |
| | 85 feet | 74.5 | | 70.5 |
| Generator | 16 feet | 90.5 | 50 | 87.5 |
| | 36 feet | 83.5 | | 80.5 |
| | 85 feet | 76.0 | | 73.0 |
| Grader | 16 feet | 94.9 | 40 | 90.9 |
| | 36 feet | 87.9 | | 83.9 |
| | 85 feet | 80.4 | | 76.4 |
| Haul Truck | 16 feet | 86.4 | 40 | 82.4 |
| | 36 feet | 79.4 | | 75.4 |
| | 85 feet | 71.9 | | 67.9 |
| Paver and Paving Equipment | 16 feet | 87.1 | 50 | 84.1 |
| | 36 feet | 80.1 | | 77.1 |
| | 85 feet | 72.6 | | 69.6 |
| Roller | 16 feet | 89.9 | 20 | 82.9 |
| | 36 feet | 82.9 | | 75.9 |
| | 85 feet | 75.4 | | 68.4 |
| Tractor | 16 feet | 93.9 | 40 | 89.9 |
| | 36 feet | 86.9 | | 82.9 |
| | 85 feet | 79.4 | | 75.4 |
| Welder | 16 feet | 83.9 | 40 | 79.9 |
| | 36 feet | 76.9 | | 72.9 |
| | 85 feet | 69.4 | | 65.4 |

Source: Federal Highway Administration Road Construction Noise Model v1.1 2018

A worst-case condition for construction activity would assume all noise-generating equipment were operating at the same time and at the same distance from the closest noise-sensitive receptor. Using this assumption, the RCNM program calculated the following combined Leq and Lmax noise levels from each stage of construction as shown in Table 9.

## Table 9. Calculated Noise Level from Each Construction Stage

| Construction Phase | Distance to Closest Noise Sensitive Receptor (feet) | Calculated Maximum Sound Level in A-Weighted Decibels | Calculated Equivalent Sound Level in A-Weighted Decibels |
|---|---|---|---|
| Demolition | 16 feet | 101.8 | 96.3 |
| Site Preparation | 16 feet | 98.4 | 94.5 |
| Grading | 16 feet | 99.6 | 95.6 |
| Building Construction | 85 feet | 84.3 | 80.1 |
| Paving | 36 feet | 90.2 | 85.9 |
| Architectural Coating | 85 feet | 73.1 | 69.1 |

Although noise levels from construction could exceed the 60-65 dB(A) land use compatibility level for residential properties as defined by the General Plan (Antioch 2003a), increases in noise levels from construction activity would be temporary. All construction activities at the site would also follow the time and noise reduction measure requirements listed in Policies 11.6.2.i, j, k, m, and n in the General Plan and Sections 5-17.04 and 5-17.05 in the City of Antioch Code of Ordinances (Antioch 2015b) as follows:

i. Ensure that construction activities are regulated as to hours of operation in order to avoid or mitigate noise impacts on adjacent noise-sensitive land uses.

j. Require proposed development adjacent to occupied noise sensitive land uses to implement a construction-related noise mitigation plan. This plan would depict the location of construction equipment storage and maintenance area, and document methods to be employed to minimize noise impacts on adjacent noise sensitive land uses.

k. Require that all construction equipment utilize noise reduction features (e.g., mufflers and engine shrouds) that are no less effective than those originally installed by the manufacturer.

m. Prior to the issuance of any grading plans, the City shall condition approval of subdivisions and non-residential development adjacent to any developed/occupied noise-sensitive land uses by requiring applicants to submit a construction-related noise mitigation plan to the City for review and approval. The plan should depict the location of construction equipment and how the noise from this equipment will be mitigated during construction of the project through the use of such methods as:

- The construction contractor shall use temporary noise-attenuation fences, where feasible, to reduce construction noise impacts on adjacent noise sensitive land uses.

- During all project site excavation and grading on-site, 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 construction equipment so that emitted noise is directed away from sensitive receptors nearest the project site.

- The construction contractor shall locate equipment staging in areas that will create the greatest distance between construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction.

- The construction contractor shall limit all construction-related activities that would result in high noise levels to between the hours of 7:00 a.m. and 7:00 p.m. Monday through Saturday. No construction shall be allowed on Sundays and public holidays.

n. The construction-related noise mitigation plan required shall also specify that haul truck deliveries be subject to the same hours specified for construction equipment. Additionally, the plan shall denote any construction traffic haul routes where heavy trucks would exceed 100 daily trips (counting those both to and from the construction site). To the extent feasible, the plan shall denote haul routes that do not pass sensitive land uses or residential dwellings. Lastly, the construction-related noise mitigation plan shall incorporate any other restrictions imposed by the City.

Section 5-17.04 “Heavy Construction Equipment Noise” and Section 5-17.05 “Construction Activity Noise” states it shall be unlawful for any person to operate heavy construction equipment or be involved in construction activity during the hours specified below:

1) On weekdays prior to 7:00 a.m. and after 6:00 p.m.

2) On weekdays within 300 feet of occupied dwelling space, prior to 8:00 a.m. and after 5:00 p.m.

3) On weekends and holidays, prior to 9:00 a.m. and after 5:00 p.m., irrespective of the distance from the occupied dwelling.

In conclusion, construction noise would be short-term and intermittent. Furthermore, the implementation of the mitigation measures and hours restrictions as dictated by the City would reduce construction noise to the closest noise-sensitive receptors to the extent feasible. Therefore, impacts from construction noise would be less than significant with mitigation.

## 6.5 GROUNDBORNE VIBRATION

During construction of the proposed project, equipment such as trucks and bulldozers may be used as close as 16 feet from the nearest sensitive receptor at 5002 Hollowglen Court. Rollers may be used as close as 36 feet from the nearest residential property. Equipment used during project construction could generate vibration levels between 0.0124 and 0.1738 PPV as shown below in Table 10. Although vibration levels from construction could exceed the threshold at which human annoyance could occur, construction activities would be temporary and would be limited to the hours restrictions set in the City of Antioch General Plan and Municipal Code.

All estimated construction vibration levels are expected to be below the limit for building damage as defined by Table 4.

## Table 10. Calculated Vibration Levels for Construction Equipment

| Type of Equipment | Calculated Peak Particle Velocity at Closest Noise-Sensitive Receptor | Threshold at which Human Annoyance Could Occur | Potential for Proposed Project to Exceed Threshold |
|---|---|---|---|
| Large Bulldozer | 0.1738 | 0.10 | Yes |
| Loaded Trucks | 0.1484 | 0.10 | Yes |
| Small Bulldozer | 0.1215 | 0.10 | Yes |
| Vibratory Roller | 0.0124 | 0.10 | None |

Source: Federal Transit Administration Transit Noise and Vibration Impact Assessment Manual (FTA 2018)

Construction activities would again be temporary in nature and would likely occur during normal daytime working hours. The Federal Transit Administration offers the following construction vibration mitigation measures listed in Section 7.2 “Construction Vibration Assessment” in the Transit Noise and Vibration Impact Assessment Manual document (FTA Report No. 0123 September 2018).

Design Considerations and Project Layout

- Route heavily loaded trucks away from residential streets. Select streets with the fewest homes if no alternatives are available.
- Operate earth-moving equipment on the construction lot as far away from vibration-sensitive sites as possible.

Sequence of Operations

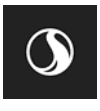
- Phase demolition, earth-moving, and ground-impacting operations so as not to occur in the same time period. Unlike noise, the total vibration level produced could be substantially less when each vibration source operates separately.
- Avoid nighttime activities. Sensitivity to vibration increases during the nighttime hours in residential neighborhoods.

Alternate Construction Methods

- Avoid vibratory rollers and packers near sensitive areas.

Vibration Mitigation Plan

- Describe and commit to a mitigation plan that will be developed and implemented during the engineering and construction phase when the information available during the project development phase will not be sufficient to define specific construction vibration mitigation measures. The objective of the plan should be to minimize construction vibration damage using all reasonable and feasible means available. The plan should include the following components:
    - A procedure for establishing threshold and limiting vibration values for potentially affected structures, based on an assessment of each structure’s ability to withstand the loads and displacements due to construction vibrations.



- A commitment to develop a vibration monitoring plan during the engineering phase and to implement a compliance monitoring program during construction.

Implementation of the recommendations provided by the FTA would make construction vibration impacts less than significant with mitigation incorporated.

# 7.0 CONCLUSION

Noise generation associated with the proposed project is typically attributed to project construction activities. Operational noise generation can be attributed to marginally greater noise from the patrons of the convenience store as well as from typical commercial fixed rooftop and carwash mechanical equipment.

Based on the FHWA RCNM, the proposed project can generate high levels of construction noise which are temporary and would not result in long-term noise increases from construction. While the noise levels presented are a "worst-case" scenario and may at times be audible over traffic-related noise levels surrounding the area, these high levels are not expected to be continuous. Moreover, the highest noise levels would occur only during the hours allowed by the City of Antioch restrictions and should be reduced by the application of measures to control construction noise and vibration at the project site. Noise and vibration control techniques should be implemented to ensure noise and vibration generated from temporary construction activities would not be substantial at nearby sensitive receptors.

The new gas station and convenience store at 5200 Lone Tree Way would follow all requirements of the City of Antioch General Plan and the City of Antioch Code of Ordinances and would incorporate appropriate mitigation measures to limit construction noise and vibration to the neighboring noise-sensitive receptors. Therefore, the project would have a less than significant impact on the surrounding neighborhood.

# 8.0 REFERENCES

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United States Environmental Protection Agency document EPA 550/9-79-100, “Protective Noise Levels Condensed Version of EPA Levels Document, November 1978.

Report date: 10/29/2021
Case Description: 5200 Lone Tree Way - Demolition

| | | Baselines (dBA) | | ---- Receptor #1 ---- |
|---|---|---|---|---|
| Description | Land Use | Daytime | Evening | Night |
| 5002 Hollowglen Court | Residential | 60 | 60 | 60 |

| Description | Impact Device | Usage(%) | Equipment Spec Lmax (dBA) | Actual Lmax (dBA) | Receptor Distance (feet) | Estimated Shielding (dBA) |
|---|---|---|---|---|---|---|
| Concrete Saw | No | 20 | | 89.6 | 16 | 0 |
| Dozer | No | 40 | | 81.7 | 16 | 0 |
| Tractor | No | 40 | 84 | | 16 | 0 |
| Front End Loader | No | 40 | | 79.1 | 16 | 0 |
| Backhoe | No | 40 | | 77.6 | 16 | 0 |
| Haul Truck | No | 40 | | 76.5 | 16 | 0 |
| Haul Truck | No | 40 | | 76.5 | 16 | 0 |

Results

| | Calculated (dBA) | |
|---|---|---|
| Equipment | Lmax | Leq |
| Concrete Saw | 99.5 | 92.5 |
| Dozer | 91.6 | 87.6 |
| Tractor | 93.9 | 89.9 |
| Front End Loader | 89 | 85 |
| Backhoe | 87.5 | 83.5 |
| Haul Truck | 86.4 | 82.4 |
| Haul Truck | 86.4 | 82.4 |
| **Total** | **101.8** | **96.3** |

Report date: 10/29/2021
Case Description: 5200 Lone Tree Way - Site Preparation

| | | Baselines (dBA) | | ---- Receptor #1 ---- |
|---|---|---|---|---|
| Description | Land Use | Daytime | Evening | Night |
| 5002 Hollowglen Court | Residential | 60 | 60 | 60 |

| Description | Impact Device | Usage(%) | Equipment Spec Lmax (dBA) | Actual Lmax (dBA) | Receptor Distance (feet) | Estimated Shielding (dBA) |
|---|---|---|---|---|---|---|
| Grader | No | 40 | 85 | | 16 | 0 |
| Dozer | No | 40 | | 81.7 | 16 | 0 |
| Tractor | No | 40 | 84 | | 16 | 0 |

Results

| | Calculated (dBA) | |
|---|---|---|
| Equipment | Lmax | Leq |
| Grader | 94.9 | 90.9 |
| Dozer | 91.6 | 87.6 |
| Tractor | 93.9 | 89.9 |
| **Total** | **98.4** | **94.5** |

Report date: 10/29/2021
Case Description: 5200 Lone Tree Way - Grading

| | | Baselines (dBA) | | ---- Receptor #1 ---- |
|---|---|---|---|---|
| Description | Land Use | Daytime | Evening | Night |
| 5002 Hollowglen Court | Residential | 60 | 60 | 60 |

| Description | Impact Device | Usage(%) | Equipment Spec Lmax (dBA) | Actual Lmax (dBA) | Receptor Distance (feet) | Estimated Shielding (dBA) |
|---|---|---|---|---|---|---|
| Grader | No | 40 | 85 | | 16 | 0 |
| Dozer | No | 40 | | 81.7 | 16 | 0 |
| Tractor | No | 40 | 84 | | 16 | 0 |
| Front End Loader | No | 40 | | 79.1 | 16 | 0 |
| Haul Truck | No | 40 | | 76.5 | 16 | 0 |
| Haul Truck | No | 40 | | 76.5 | 16 | 0 |
| Haul Truck | No | 40 | | 76.5 | 16 | 0 |

Results

| | Calculated (dBA) | |
|---|---|---|
| Equipment | Lmax | Leq |
| Grader | 94.9 | 90.9 |
| Dozer | 91.6 | 87.6 |
| Tractor | 93.9 | 89.9 |
| Front End Loader | 89 | 85 |
| Haul Truck | 86.4 | 82.4 |
| Haul Truck | 86.4 | 82.4 |
| Haul Truck | 86.4 | 82.4 |
| **Total** | **99.6** | **95.6** |

Report date: 10/29/2021
Case Description: 5200 Lone Tree Way - Building Construction

| | | Baselines (dBA) | | ---- Receptor #1 ---- |
|---|---|---|---|---|
| Description | Land Use | Daytime | Evening | Night |
| 5002 Hollowglen Court | Residential | 60 | 60 | 60 |

| Description | Impact Device | Usage(%) | Equipment Spec Lmax (dBA) | Actual Lmax (dBA) | Receptor Distance (feet) | Estimated Shielding (dBA) |
|---|---|---|---|---|---|---|
| Crane | No | 16 | | 80.6 | 85 | 0 |
| Gradall | No | 40 | | 83.4 | 85 | 0 |
| Generator | No | 50 | | 80.6 | 85 | 0 |
| Tractor | No | 40 | 84 | | 85 | 0 |
| Welder / Torch | No | 40 | | 74 | 85 | 0 |
| Welder / Torch | No | 40 | | 74 | 85 | 0 |
| Welder / Torch | No | 40 | | 74 | 85 | 0 |

Results

| | | Calculated (dBA) | |
|---|---|---|---|
| Equipment | | Lmax | Leq |
| Crane | | 75.9 | 68 |
| Gradall | | 78.8 | 74.8 |
| Generator | | 76 | 73 |
| Tractor | | 79.4 | 75.4 |
| Welder / Torch | | 69.4 | 65.4 |
| Welder / Torch | | 69.4 | 65.4 |
| Welder / Torch | | 69.4 | 65.4 |
| | **Total** | **84.3** | **80.1** |

Report date: 10/29/2021
Case Description: 5200 Lone Tree Way - Paving

| | | Baselines (dBA) | | ---- Receptor #1 ---- |
|---|---|---|---|---|
| Description | Land Use | Daytime | Evening | Night |
| 5002 Hollowglen Court | Residential | 60 | 60 | 60 |

| | | | Equipment | | | |
|---|---|---|---|---|---|---|
| | Impact | | Spec Lmax | Actual Lmax | Receptor Distance | Estimated Shielding |
| Description | Device | Usage(%) | (dBA) | (dBA) | (feet) | (dBA) |
| Concrete Mixer Truck | No | 40 | | 78.8 | 36 | 0 |
| Paver | No | 50 | | 77.2 | 36 | 0 |
| Paver | No | 50 | | 77.2 | 36 | 0 |
| Roller | No | 20 | | 80 | 36 | 0 |
| Tractor | No | 40 | 84 | | 36 | 0 |

Results

| | Calculated (dBA) | |
|---|---|---|
| Equipment | Lmax | Leq |
| Concrete Mixer Truck | 81.7 | 77.7 |
| Paver | 80.1 | 77.1 |
| Paver | 80.1 | 77.1 |
| Roller | 82.9 | 75.9 |
| Tractor | 86.9 | 82.9 |
| **Total** | **90.2** | **85.9** |

Report date: 10/29/2021
Case Description: 5200 Lone Tree Way - Architectural Coating

| | | Baselines (dBA) | | ---- Receptor #1 ---- |
|---|---|---|---|---|
| Description | Land Use | Daytime | Evening | Night |
| 5002 Hollowglen Court | Residential | 60 | 60 | 60 |

| | | | Equipment | | | |
|---|---|---|---|---|---|---|
| | | | Spec | Actual | Receptor | Estimated |
| | Impact | | Lmax | Lmax | Distance | Shielding |
| Description | Device | Usage(%) | (dBA) | (dBA) | (feet) | (dBA) |
| Compressor (air) | No | 40 | | 77.7 | 85 | 0 |

Results

Calculated (dBA)

| Equipment | Lmax | Leq |
|---|---|---|
| Compressor (air) | 73.1 | 69.1 |
| **Total** | **73.1** | **69.1** |