NOISE IMPACT ANALYSIS
Banquet Hall & Restaurant Project
City of Riverside

Lead Agency:

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ACRONYMS AND ABBREVIATIONS

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

1.0 INTRODUCTION

1.1 Purpose of Analysis and Study Objectives

This Noise Impact Analysis has been prepared to determine the noise impacts associated with the proposed Tyler Village Banquet Facility (proposed project). The formal entitlements associated with the proposed project include: P18-0956 (Conditional Use Permit), P18-0957 (Design Review), and P19-0252 (Variance). Pursuant to the request stated in *Banquet Facility - 10170 INDIANA AVENUE,* provided by the City of Riverside Community & Economic Development Department on July 18, 2018 that stated the following:

- Acoustical Analysis. The analysis shall demonstrate how existing or proposed soundproofing will be sufficient to prevent noise and vibrations from penetrating into surrounding properties or buildings. The analysis shall be prepared by a qualified design professional or acoustical engineer.

1.2 Site Location and Study Area

The project site is located in the Tyler Village Shopping Center at 10170 Indiana Avenue in the City of Riverside (City). The project site consists of an approximately 20,000 square foot vacant commercial retail building that has attached commercial retail buildings on the west and east sides, a parking lot on the north side, and an alleyway on the south side. The Tyler Village Shopping Center is bounded by Indiana Avenue to the north, a self-storage facility to the east, the BNSF Railroad that consists of two rail lines to the south, and commercial retail uses to the west. In addition, State Route 91 is as near as 480 feet north of the project site. The project study area is shown in Figure 1.

Sensitive Receptors in Project Vicinity

The nearest sensitive receptors to the project site are single-family homes located as near as 170 feet to the south of the project site, on the south side of the BNSF Railroad and on the south side of a flood control channel. The nearest school to the project site is Harrison Elementary School, which is located as near as 0.5 mile east of the project site.

1.3 Proposed Project Description

The proposed project would consist of tenant improvements to approximately 20,000 square feet of existing building space. The proposed tenant improvements would consist of development of a restaurant and banquet hall facility. Approximately 5,300 square feet would be utilized for the proposed restaurant that would have approximately 40 seats and would include a restaurant, kitchen, restrooms, utility and service area, lobby, bar and office. The banquet hall would occupy the remaining approximately 14,700 square feet and would have approximately 382 seats, of which 2,404 square feet would be used as a lobby and 440 square feet would be used as storage.

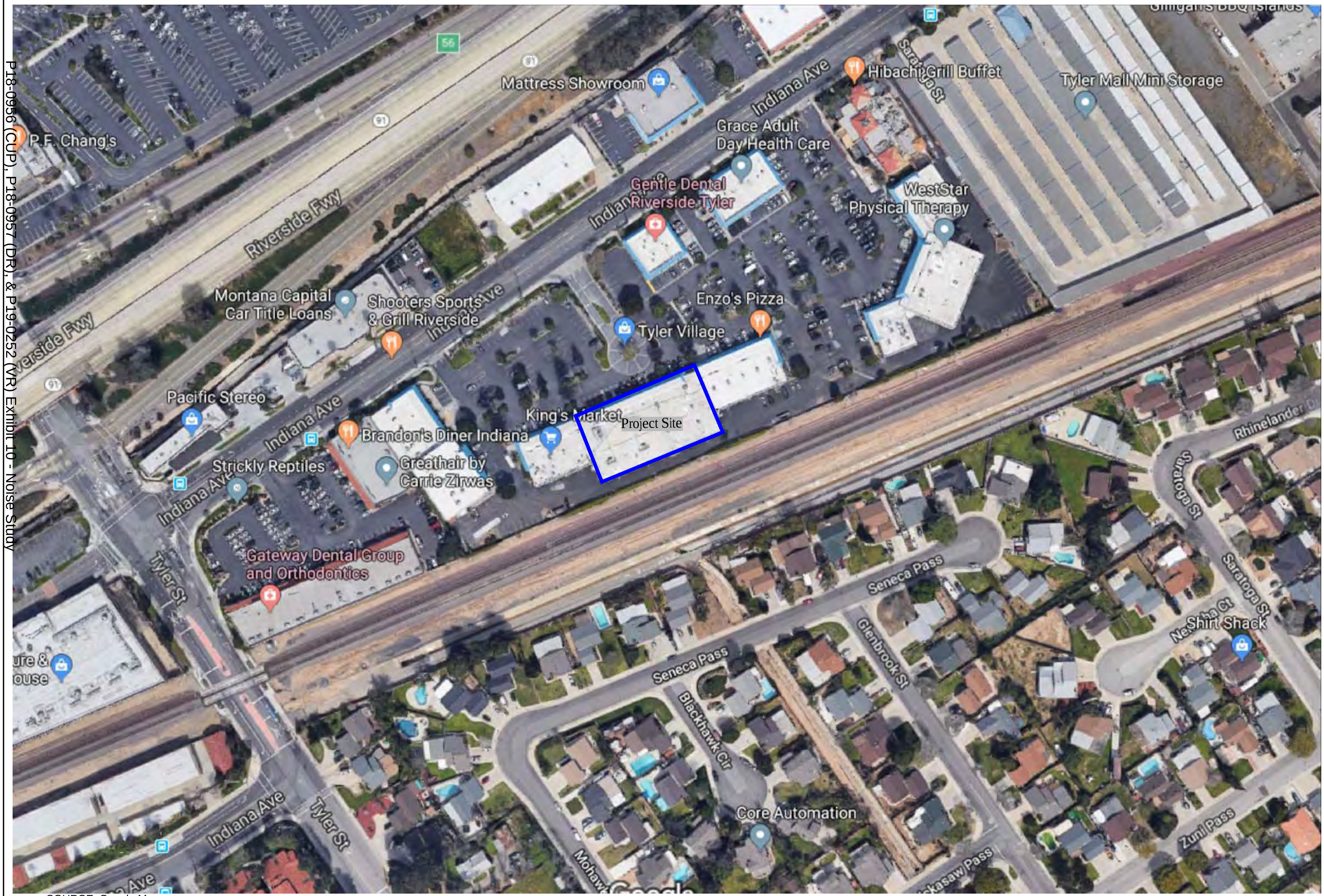
The proposed restaurant would operate seven days per week, from 11:00 a.m. to 10:00 p.m. and the proposed banquet hall would operate Monday through Friday from 7:00 p.m. to midnight and on Saturday and Sunday from 1:00 p.m. to 1:00 a.m.. The proposed site plan is shown in Figure 2.

1.4 Project Design Features Incorporated into the Proposed Project

This analysis was based on implementation of the following project design feature.

Project Design Feature 1

The project applicant shall require that all exterior doors for the banquet hall, except one door for employee use, shall be labelled "Emergency Exit Only – Alarm will Sound if Opened". The one exterior door for employee use shall be labelled "Employees Only". In addition, all exterior doors shall be installed with self closing hinges.



SOURCE: Google Maps.

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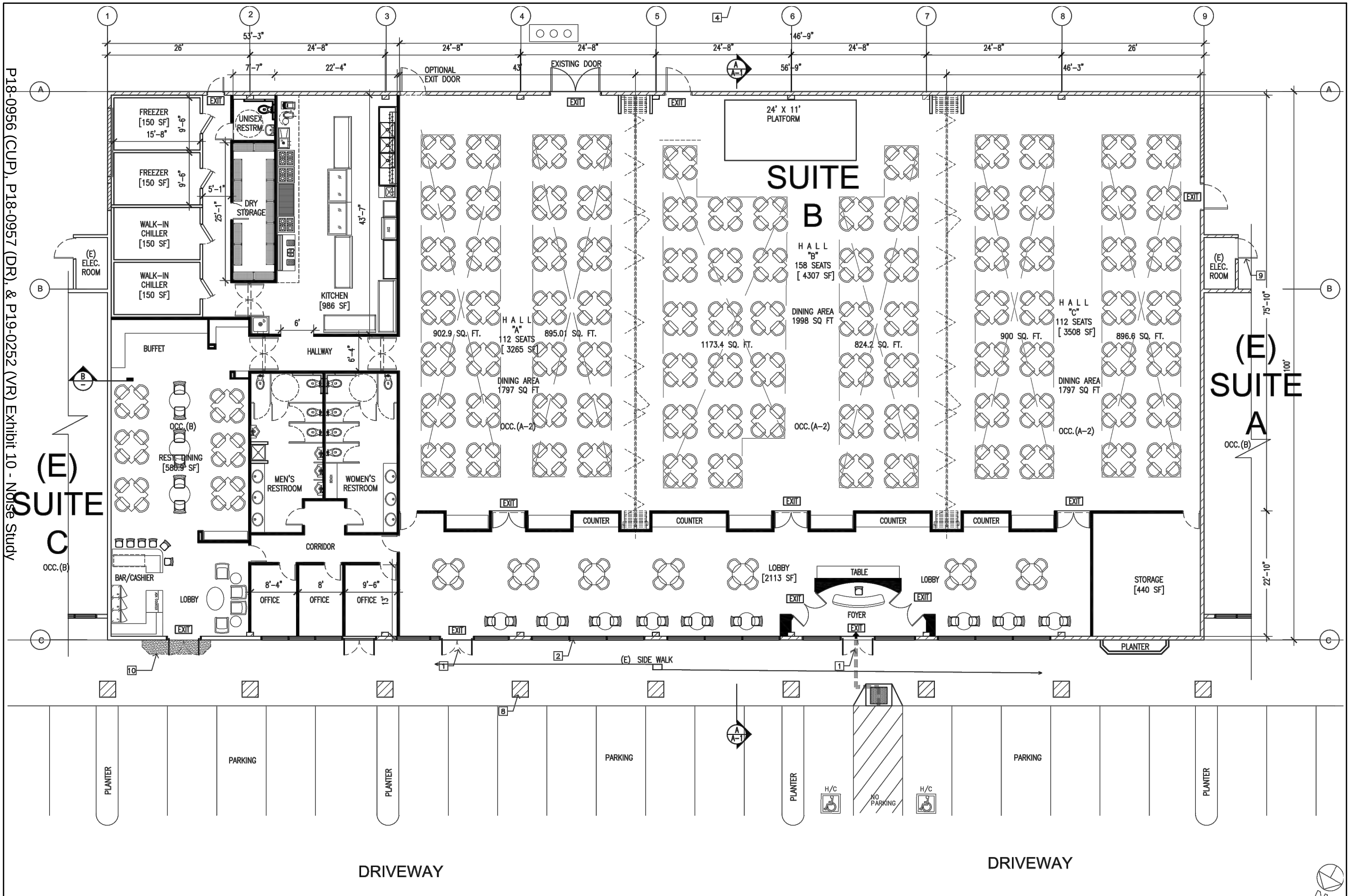
Figure 1
Project Location Map



SOURCE: Design Concepts.

VISTA ENVIRONMENTAL

Figure 2
Proposed Site Plan

2.0 NOISE FUNDAMENTALS

Noise is defined as unwanted sound. Sound becomes unwanted when it interferes with normal activities, when it causes actual physical harm or when it has adverse effects on health. Sound is produced by the vibration of sound pressure waves in the air. Sound pressure levels are used to measure the intensity of sound and are described in terms of decibels. The decibel (dB) is a logarithmic unit which expresses the ratio of the sound pressure level being measured to a standard reference level. A-weighted decibels (dBA) approximate the subjective response of the human ear to a broad frequency noise source by discriminating against very low and very high frequencies of the audible spectrum. They are adjusted to reflect only those frequencies which are audible to the human ear.

2.1 Noise Descriptors

Noise Equivalent sound levels are not measured directly, but are calculated from sound pressure levels typically measured in A-weighted decibels (dBA). The equivalent sound level (Leq) represents a steady state sound level containing the same total energy as a time varying signal over a given sample period. The peak traffic hour Leq is the noise metric used by California Department of Transportation (Caltrans) for all traffic noise impact analyses.

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

2.2 Tone Noise

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

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

2.3 Noise Propagation

From the noise source to the receiver, noise changes both in level and frequency spectrum. The most obvious is the decrease in noise as the distance from the source increases. The manner in which noise reduces with distance depends on whether the source is a point or line source as well as ground absorption, atmospheric effects and refraction, and shielding by natural and manmade features. Sound from point sources, such as air conditioning condensers, radiate uniformly outward as it travels away from the source in a spherical pattern. The noise drop-off rate associated with this geometric spreading is 6 dBA per each doubling of the distance (dBA/DD). Transportation noise sources such as roadways are typically analyzed as line sources, since at any given moment the receiver may be impacted by noise from multiple vehicles at various locations along the roadway. Because of the geometry of a line source, the noise drop-off rate associated with the geometric spreading of a line source is 3 dBA/DD.

2.4 Ground Absorption

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

3.0 GROUND-BORNE VIBRATION FUNDAMENTALS

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

3.1 Vibration Descriptors

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

3.2 Vibration Perception

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

3.3 Vibration Propagation

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

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

4.0 REGULATORY SETTING

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

4.1 Federal Regulations

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

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

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

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

4.2 State Regulations

Noise Standards

<u>California Department of Health Services Office of Noise Control</u>

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

<u>California Noise Insulation Standards</u>

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

Government Code Section 65302

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

Vibration Standards

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

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

4.3 Local Regulations

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

City of Riverside General Plan

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

Objective N-1

Minimize noise levels from point sources throughout the community and, wherever possible, mitigate the effects of noise to provide a safe and healthful environment.

Policies

N-1.1 Continue to enforce noise abatement and control measures particularly within residential neighborhoods.

N-1.2 Require the inclusion of noise-reducing design features in development consistent with standards in Figure N-10 (Noise/Land Use Compatibility Criteria) [see Figure 3], Title 24 California Code of Regulations and Title 7 of the Municipal Code.

N-1.3 Enforce the City of Riverside Noise Control Code to ensure that stationary noise and noise emanating from construction activities, private developments/residences and special events are minimized.

Objective N-4

Minimize ground transportation-related noise impacts.

Policies

N-4.1 Ensure that noise impacts generated by vehicular sources are minimized through the use of noise reduction features (e.g., earthen berms, landscaped walls, lowered streets, improved technology).

City of Riverside Municipal Code

The City of Riverside Municipal Code establishes the following applicable standards related to noise.

Section 7.25.010 Exterior sound level limits

A. Unless a variance has been granted as provided in this chapter, it shall be unlawful for any person to cause or allow the creation of any noise which exceeds the following:

1. The exterior noise standard of the applicable land use category, up to five decibels, for a cumulative period of more than thirty minutes in any hour; or
2. The exterior noise standard of the applicable land use category, plus five decibels, for a cumulative period of more than fifteen minutes in any hour; or
3. The exterior noise standard of the applicable land use category, plus ten decibels, for a cumulative period of more than five minutes in any hour; or
4. The exterior noise standard of the applicable land use category, plus fifteen decibels, for a cumulative period of more than one minute in any hour; or
5. The exterior noise standard of the applicable land use category, plus twenty decibels or the maximum measured ambient noise level, for any period of time.

B. If the measured ambient noise level exceeds that permissible within any of the first four noise limit categories, the allowable noise exposure standard shall be increased in five decibel increments in each category as appropriate to encompass the ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level.

Table A – City of Riverside Exterior Noise Standards

Land Use Category	Time Period	Noise Level
Residential	Night (10 p.m. to 7 a.m.) Day (7 a.m. to 10 p.m.)	45 dBA 55 dBA
Office/commercial	Any time	65 dBA
Industrial	Any time	70 dBA
Community support	Any time	60 dBA
Public recreation facility	Any time	65 dBA
Nonurban	Any time	70 dBA

Source: City of Riverside Municipal Code, Section 7.25.010 Table 7.25.010A.

Table B – City of Riverside Land Use Category/Zoning Matrix

Land Use Category	Underlying Zone
Residential	RE, RA-5 RR, RC, R-1-1/2 acre, R-1-1300, R-1-10500, R-1-8500, R-1-7000, R-3-2500, R-3-4000, R-3-3000, R-3-2000, R-3-1500, R-4
Office/commercial	O, CRC, CR-NC, CR, CG
Industrial	BMP, I, AIR
Community support	Any permitted zone
Nonurban	Any permitted zone.

Source: City of Riverside Municipal Code, Section 7.25.010 Table 7.25.010B.

<u>Section 7.35.010 General noise regulations</u>

A. Notwithstanding the sound level meter standards described in this ordinance, it is nonetheless unlawful for any person to make, continue, or cause to be made or continued any disturbing, excessive or offensive noise which causes discomfort or annoyance to reasonable persons of normal sensitivity. The factors which should be considered in determining whether a violation of this section exists, including the following:

1. The sound level of the objectionable noise.
2. The sound level of the ambient noise.
3. The proximity of the noise to residential sleeping facilities.
4. The zoning of the area.
5. The population density of the area.
6. The time of day or night.
7. The duration of the noise.
8. Whether the noise is recurrent, intermittent, or constant.
9. Whether the noise is produced by a commercial or noncommercial activity.
10. Whether the nature of the noise is usual or unusual.
11. Whether the noise is natural or unnatural.

B. It is unlawful for any person to make, continue, or cause to be made or continued any disturbing, excessive or offensive noise which causes discomfort or annoyance to reasonable persons of normal sensitivity. The following acts, among others, are declared to be disturbing, excessive and offensive noises in violation of this section:

5. Construction: Operating or causing the operation of any tools or equipment used in construction, drilling, repair, alteration, grading or demolition work between the hours of 7:00 p.m. and 7:00 a.m. on week days and between 5:00 p.m. and 8:00 a.m. on Saturdays or at any time on Sunday or federal holidays.

Section 7.35.020 Exemptions

The following activities shall be exempt from the provisions of this title:

G. Noise sources associated with construction, repair, remodeling, or grading of any real property; provided a permit has been obtained from the City are required; and provided said activities do not take place between the hours of 7:00 p.m. and 7:00 a.m. on weekdays, between the hours of 5:00 p.m. and 8:00 a.m. on Saturdays, or at any time on Sunday or a federal holiday.

5.0 EXISTING NOISE CONDITIONS

To determine the existing noise levels, noise measurements have been taken in the vicinity of the project site. The field survey noted that noise within the proposed project area is generally characterized by vehicle traffic on State Route 91, which is as near as 480 feet north of the project site and the BNSF Railroad adjacent to the south side of the project site. The following describes the measurement procedures, measurement locations, noise measurement results, and the modeling of the existing noise environment.

5.1 Noise Measurement Equipment

The noise measurements were taken using two Extech Model 407780 Type 2 integrating sound level meters. All sound level meters were programed in "slow" mode. The noise meters recorded the sound pressure level at 3-second intervals and recorded noise levels in "A" weighted form. In addition, the L_{eq} averaged over the entire measuring time and L_{max} were recorded with all sound level meters. The sound level meters and microphones were mounted on a tree and on a fence approximately six feet above the ground and were equipped with windscreens during all measurements. The Extech sound level meters were calibrated before and after the monitoring using an Extech calibrator, Model 407766. The noise level measurement equipment meets American National Standards Institute specifications for sound level meters (S1.4-1983 identified in Chapter 19.68.020.AA).

Noise Measurement Location

The noise monitoring locations were selected in order to obtain noise levels in the vicinity of the north side of the project site as well as in the proximity of the nearest single-family homes, located south of the project site. Descriptions of the noise monitoring sites are provided below in Table C. Appendix A includes a photo index of the study area and noise level measurement locations.

Noise Measurement Timing and Climate

The noise measurements were recorded between 11:45 a.m. on Saturday, February 9, 2019 and 10:21 a.m. on Sunday, February 10, 2019. When the noise measurements were started the sky was partly cloudy, the temperature was 57 degrees Fahrenheit, the humidity was 54 percent, barometric pressure was 29.17 inches of mercury, and the wind was blowing around four miles per hour. Overnight, the sky was partly cloudy and the temperature dropped to 38 degrees Fahrenheit. At the conclusion of the noise measurements, the sky was cloudy with a light rain, the temperature was 50 degrees Fahrenheit, the humidity was 89 percent, barometric pressure was 29.19 inches of mercury, and the wind was blowing around three miles per hour. It should be noted that the noise measurements were ended prior to a full 24-hours due to the rain.

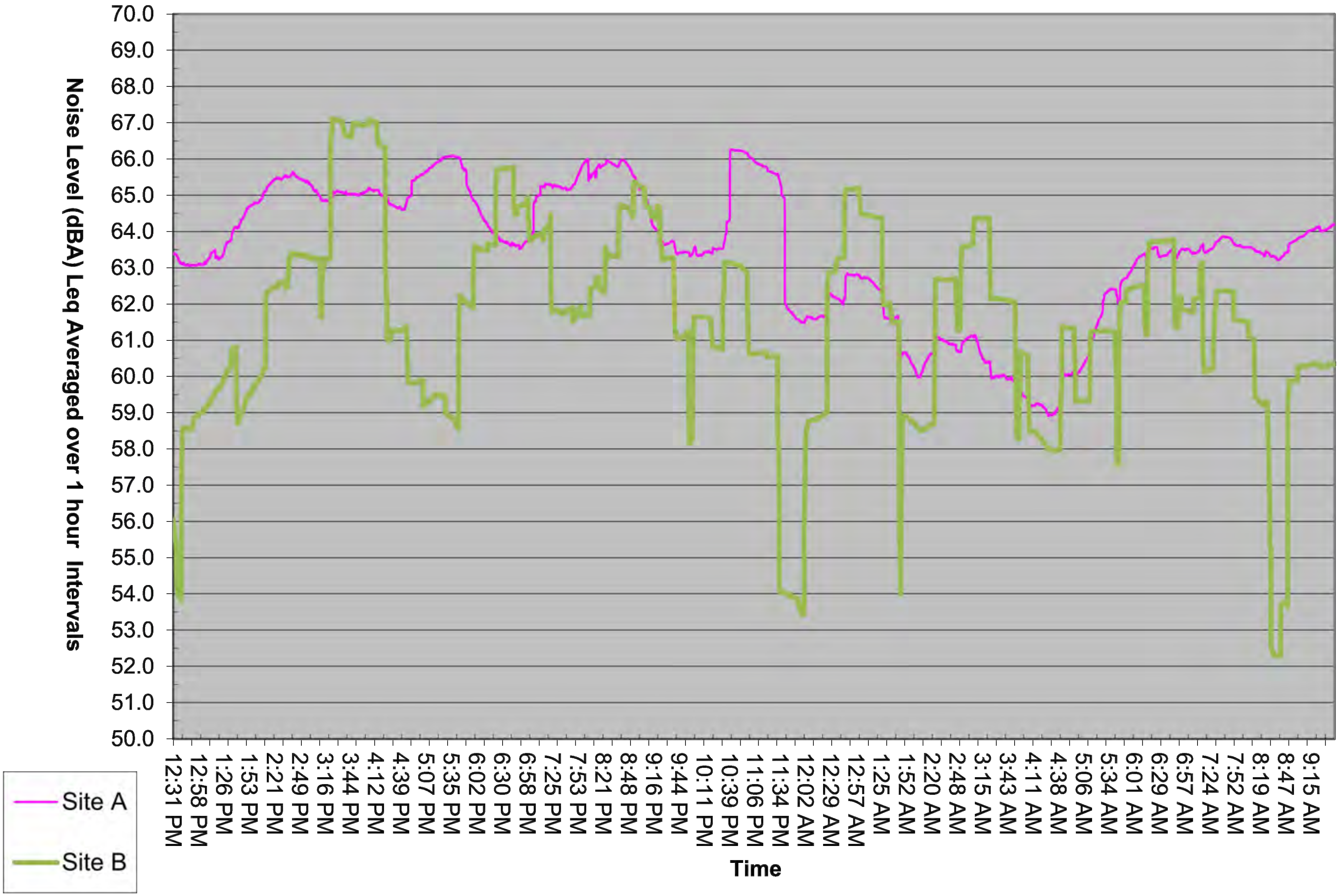
5.2 Noise Measurement Results

The results of the noise level measurements are presented in Table C. The measured sound pressure levels in dBA have been used to calculate the minimum and maximum L_{eq} averaged over 1-hour intervals. Table C also shows the L_{eq}, L_{max}, and CNEL, based on the entire measurement time. The noise monitoring data printouts are included in Appendix B. Figure 3 shows a graph of the noise measurements.

Table C – Existing (Ambient) Noise Level Measurements

Site No.	Site Description	Average (dBA L_{eq})	Maximum (dBA L_{max})	Min. 1-Hour Interval (dBA L_{eq}/Time)	Max. 1-Hour Interval (dBA L_{eq}/Time)	Average (dBA CNEL)
A	Located on a tree near the Entrance to the Proposed Facility (north side of Facility)	63.8	90.8	58.9 4:27 a.m.	66.3 10:40 p.m.	69.8
B	Located on a fence for a flood control channel near the homes located south of the project site.	62.2	90.3	52.3 8:34 a.m.	67.1 3:24 p.m.	68.9

Source: Noise measurements taken with two Extech Model 407780 Type 2 integrating sound level meters between Saturday, February 9, 2019 and Sunday February 10, 2019.



SOURCE: Extech Model 407780 Type 2 Sound Level Meters.

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Figure 3
Field Noise Measurements Graph

6.0 PROJECT IMPACTS

The proposed project would consist of tenant improvements to approximately 20,000 square feet of existing building space. The proposed tenant improvements would consist of development of a restaurant and banquet hall facility. The proposed restaurant would operate seven days per week, from 11:00 a.m. to 10:00 p.m. and the proposed banquet hall would operate Monday through Friday from 7:00 p.m. to midnight and on Saturday and Sunday from 1:00 p.m. to 1:00 a.m..

The primary source of noise and vibration from the proposed restaurant and banquet hall facility would occur from a band performing on the platform that is proposed to be located in the middle of the south side of the banquet hall. Other sources of noise and vibration that may occur from the operation of the proposed facility include the rooftop mechanical equipment, parking lot noise sources and delivery truck noise sources, however all of these noise sources currently exist within the Tyler Village Shopping Center and would occur from any tenant occupying this building space. As such, this analysis has been limited to the noise and vibration sources unique to the proposed project, which consists of the potential of a band performing on the platform in the banquet hall. The noise and vibration impacts have been analyzed separately below.

6.1 Noise Impacts

The operation of the proposed project may generate onsite noise levels that exceed City standards at the existing nearby residential and commercial uses. Section 7.25.010 of the City's Municipal Code limits noise levels at the adjacent commercial properties to 65 dBA at anytime of the day and limits noise levels at the nearby residential properties to 55 dBA between 7:00 a.m. and 10:00 p.m. and 45 dBA between 10:00 p.m. and 7:00 a.m. the following day.

Figure 4 below shows typical noise levels from common indoor activities, which shows that a rock band would create a noise level as high as 110 dB. Although, the proposed banquet hall is not intended to be utilized as a concert hall, it is possible that live bands may perform during weddings and other similar events at the proposed banquet hall. As such, the use of the rock band noise level would represent a worst-case noise impact created by the proposed project.

The exterior walls of the structure where the proposed restaurant and banquet hall would be located are constructed of 6-inch wide concrete masonry units with drywall on the inside and paint on the exterior of the structure. According to the *Noise Notebook Sound Transmission Class Guidance,* prepared by the U.S. Department of Housing and Urban Development (see Appendix C), the exterior wall structure provides a sound transmission class (STC) rating of 53 STC, which means that the exterior walls of the proposed facility would provide approximately 53 dB reduction in noise between the inside and outside of the structure.

In order to determine the noise impacts at the adjacent commercial uses and nearby residential uses created by operation of the proposed restaurant and banquet hall, the worst-case source of noise from a rock band operating on the proposed platform in the banquet hall was utilized along with the typical propagation rate of sound that reduces by 6 dB by every doubling of distance between source and receptor. The calculated worst-case operational noise levels at the adjacent commercial uses and nearby residential uses are shown in Table D.

Table D – Worst-Case Operational Noise Levels at the Nearby Receptors

Receptor	Receptor Distance from Platform (feet)	Calculated Noise Level[1] (dBA Leq)		City Noise Standard[3]	Exceed City Standard?
		Without Wall Attenuation	With Wall Attenuation[2]		
Commercial Use on West Side	65	94	41	65	No
Commercial Use on East Side	110	89	36	65	No
Nearest Homes to South	170	85	32	55/45	No

Notes:
[1] The calculated noise level is based on the worst-case noise source of a rock band on the banquet hall platform with a noise level of 110 dB at 10 feet (see Figure 3).
[2] The with wall attenuation accounts for the 53 dB reduction provided by the concrete block exterior wall (see Appendix C).
parking lot was based on a noise measurement 5 feet from a commercial parking lot that produced a noise level of 63.1 dBA Leq
[3] The City Noise Standard is from Section 7.25.010 of the City's Municipal Code. The residential noise standard is 55 dBA between 7:00 a.m. and 10:00 p.m. and 45 dBA between 10:00 p.m. and 7:00 a.m. the following day.

Table D shows that the worst-case operational noise level would be as high as 41 dBA Leq at the adjacent commercial uses and as high as 32 dBA Leq at the nearby residential uses. The calculated operational noise levels would be well below the City's exterior noise standards for both commercial uses and residential uses. It should also be noted that the operational noise level would be well below the measured noise levels of: (1) 63.8 dBA Leq within the Tyler Village Shopping Center; and (2) 62.2 dBA Leq at the nearby homes. Noise impacts from operation of the proposed project would be less than significant.

6.2 Vibration Impacts

The operation of the proposed project may create vibration from the use of loudspeakers associated with bands performing on the platform in the banquet hall. Since neither the City's General Plan nor the Municipal Code provides a quantifiable vibration level, Caltrans guidance provided in the *Transportation- and Construction-Induced Vibration Guidance Manual* in 2004 has been utilized, which found that the human response becomes distinctly perceptible at 0.04 inch per second PPV or 80 VdB for continuous sources of vibration.

According to *Music-Induced Vibrations in a Concert Hall and a Church,* prepared by Sebastian Merchel and Mehmet Altinsoy, June 22, 2012, music-induced vibration levels were measured as high as 100 VdB within the front rows to the stage with the source of the music (approximately 5 feet away). As detailed above in Table D, the nearest sensitive receptor is the commercial use adjacent to the west side of the project site or 65 feet from the proposed platform in the banquet hall. Based on typical vibration propagation rates, the vibration level from music on the platform at 65 feet would be 78 VdB, which is below the distinctly perceptible vibration level of 80 VdB. It should also be noted that the exterior wall of the banquet hall that consists of a concrete block wall would further reduce the music-induced vibration levels. Vibration impacts from operation of the proposed project would be less than significant.

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
	80	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawnmower, 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 next room
Quiet urban nighttime	**40**	Theater, large conference room (background)
Quiet suburban nighttime		
	30	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20	
		Broadcast/recording studio
	10	
	0	

SOURCE: Technical Noise Supplement to the Traffic Noise Analysis Protocol, prepared by Caltrans, September 2013.

Figure 4
Typical Noise Levels from Common Indoor Activities

7.0 REFERENCES

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

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

City of Riverside, *City of Riverside General Plan 2025*, November, 2007.

City of Riverside, *City of Riverside Municipal Code*, March 27, 2018.

Federal Transit Administration, *Transit Noise and Vibration Impact Assessment,* May 2006.

Sebastian Merchel and Mehmet Altinsoy, *Music-Induced Vibrations in a Concert Hall and a Church,* June 22, 2012.

U.S. Department of Housing and Urban Development, *Noise Notebook Chapter 4 Supplement Sound Transmission Class Guidance.*

APPENDIX A

Field Noise Measurements Photo Index


Noise Measurement Site A - looking north


Noise Measurement Site A - looking northeast


Noise Measurement Site A - looking east


Noise Measurement Site A - looking southeast


Noise Measurement Site A - looking south


Noise Measurement Site A - looking southwest


Noise Measurement Site A - looking west


Noise Measurement Site A - looking northwest

Noise Measurement Site B - looking north

Noise Measurement Site B - looking northeast

Noise Measurement Site B - looking east

Noise Measurement Site B - looking southeast

Noise Measurement Site B - looking south

Noise Measurement Site B - looking southwest

Noise Measurement Site B - looking west

Noise Measurement Site B - looking northwest

APPENDIX B

Field Noise Measurements Printouts

Site A - On Tree in Front (North Side) of Project Site

Date	Time=02/09/19	11:45:00 AM			
Sampling	Time=3	Weighting=A			
Record	Num= 27000	Weighting=Slow	CNEL(24hr)=	69.8	
Leq	63.8 SEL	Value=113.0	Ldn(24hr)=	69.4	
MAX	90.8	Min Leq1hr =	58.9	4:27 AM	
MIN	51.5	Max Leq1hr =	66.3	10:40 PM	

Site A - On Tree in Front (North Side) of Project Site

SPL	Time	Leq (1 hour Avg.)	Ldn	CNEL
64.4	11:45:00		64.4	64.4
66.2	11:45:03		66.2	66.2
65.2	11:45:06		65.2	65.2
62.8	11:45:09		62.8	62.8
62.1	11:45:12		62.1	62.1
63	11:45:15		63	63
63.8	11:45:18		63.8	63.8
62	11:45:21		62	62
63.4	11:45:24		63.4	63.4
62.8	11:45:27		62.8	62.8
62.1	11:45:30		62.1	62.1
63.4	11:45:33		63.4	63.4
67.4	11:45:36		67.4	67.4
64.1	11:45:39		64.1	64.1
64.6	11:45:42		64.6	64.6
63.5	11:45:45		63.5	63.5
62.4	11:45:48		62.4	62.4
62.1	11:45:51		62.1	62.1
68	11:45:54		68	68
67.2	11:45:57		67.2	67.2
65.6	11:46:00		65.6	65.6
61.7	11:46:03		61.7	61.7
68.7	11:46:06		68.7	68.7
62.2	11:46:09		62.2	62.2
70.4	11:46:12		70.4	70.4
72.7	11:46:15		72.7	72.7
73.2	11:46:18		73.2	73.2
72.6	11:46:21		72.6	72.6
67.5	11:46:24		67.5	67.5
66.8	11:46:27		66.8	66.8
65.8	11:46:30		65.8	65.8
68.3	11:46:33		68.3	68.3
69.8	11:46:36		69.8	69.8
69.3	11:46:39		69.3	69.3
67.4	11:46:42		67.4	67.4
71.9	11:46:45		71.9	71.9
70.8	11:46:48		70.8	70.8
69.3	11:46:51		69.3	69.3
64.7	11:46:54		64.7	64.7
66.5	11:46:57		66.5	66.5
65.5	11:47:00		65.5	65.5
67.9	11:47:03		67.9	67.9
72.4	11:47:06		72.4	72.4
65.7	11:47:09		65.7	65.7
67.1	11:47:12		67.1	67.1
70.1	11:47:15		70.1	70.1
65.6	11:47:18		65.6	65.6
65	11:47:21		65	65
68.1	11:47:24		68.1	68.1
67.2	11:47:27		67.2	67.2
64.4	11:47:30		64.4	64.4
68.8	11:47:33		68.8	68.8
66.8	11:47:36		66.8	66.8
72	11:47:39		72	72
64.7	11:47:42		64.7	64.7
63.2	11:47:45		63.2	63.2
63.2	11:47:48		63.2	63.2
63.5	11:47:51		63.5	63.5
63.6	11:47:54		63.6	63.6
63.9	11:47:57		63.9	63.9
63.7	11:48:00		63.7	63.7
63.5	11:48:03		63.5	63.5
66.3	11:48:06		66.3	66.3
63.7	11:48:09		63.7	63.7
64.4	11:48:12		64.4	64.4
65	11:48:15		65	65
64.3	11:48:18		64.3	64.3
64.9	11:48:21		64.9	64.9
64.2	11:48:24		64.2	64.2
66.3	11:48:27		66.3	66.3
66.2	11:48:30		66.2	66.2
66.9	11:48:33		66.9	66.9
65.9	11:48:36		65.9	65.9
66.4	11:48:39		66.4	66.4
65.8	11:48:42		65.8	65.8
66.5	11:48:45		66.5	66.5
67	11:48:48		67	67

Site B - On Fence Near Homes South of Project Site

Date	Time=02/09/19	12:01:00 PM			
Sampling	Time=3	Freq Weighting=A			
Record	Num= 26801	Weighting=Slow	CNEL(24hr)=	68.9	
Leq	62.2 SEL	Value=111.7	Ldn(24hr)=	68.6	
MAX	90.3	Min Leq1hr =	52.3	8:34 AM	
MIN	45	Max Leq1hr =	67.1	3:24 PM	

Site B - On Fence Near Homes South of Project Site

SPL	Time	Leq (1 hour Avg.)	Ldn	CNEL
63.4	12:01:00		63.4	63.4
55.9	12:01:03		55.9	55.9
61.2	12:01:06		61.2	61.2
55.2	12:01:09		55.2	55.2
66	12:01:12		66	66
55.1	12:01:15		55.1	55.1
53.5	12:01:18		53.5	53.5
52.5	12:01:21		52.5	52.5
52.7	12:01:24		52.7	52.7
54.2	12:01:27		54.2	54.2
55.6	12:01:30		55.6	55.6
60.6	12:01:33		60.6	60.6
57.1	12:01:36		57.1	57.1
62.1	12:01:39		62.1	62.1
65.6	12:01:42		65.6	65.6
64.9	12:01:45		64.9	64.9
62.6	12:01:48		62.6	62.6
60	12:01:51		60	60
68.5	12:01:54		68.5	68.5
58.7	12:01:57		58.7	58.7
62.7	12:02:00		62.7	62.7
59.1	12:02:03		59.1	59.1
58.1	12:02:06		58.1	58.1
59.1	12:02:09		59.1	59.1
63.1	12:02:12		63.1	63.1
68.5	12:02:15		68.5	68.5
62.1	12:02:18		62.1	62.1
63.8	12:02:21		63.8	63.8
69.7	12:02:24		69.7	69.7
62.2	12:02:27		62.2	62.2
62.2	12:02:30		62.2	62.2
54	12:02:33		54	54
52.2	12:02:36		52.2	52.2
52.7	12:02:39		52.7	52.7
53.9	12:02:42		53.9	53.9
52.6	12:02:45		52.6	52.6
52.4	12:02:48		52.4	52.4
51.8	12:02:51		51.8	51.8
51.6	12:02:54		51.6	51.6
54.9	12:02:57		54.9	54.9
54.6	12:03:00		54.6	54.6
53.7	12:03:03		53.7	53.7
54.9	12:03:06		54.9	54.9
51.9	12:03:09		51.9	51.9
55.3	12:03:12		55.3	55.3
52.9	12:03:15		52.9	52.9
53.7	12:03:18		53.7	53.7
55	12:03:21		55	55
50.7	12:03:24		50.7	50.7
49.6	12:03:27		49.6	49.6
50.7	12:03:30		50.7	50.7
62.9	12:03:33		62.9	62.9
60.1	12:03:36		60.1	60.1
61	12:03:39		61	61
54	12:03:42		54	54
65.4	12:03:45		65.4	65.4
64.6	12:03:48		64.6	64.6
63.4	12:03:51		63.4	63.4
68.4	12:03:54		68.4	68.4
72.4	12:03:57		72.4	72.4
59.5	12:04:00		59.5	59.5
62.1	12:04:03		62.1	62.1
72.5	12:04:06		72.5	72.5
71.8	12:04:09		71.8	71.8
62.1	12:04:12		62.1	62.1
65.5	12:04:15		65.5	65.5
65.2	12:04:18		65.2	65.2
63.5	12:04:21		63.5	63.5
58.4	12:04:24		58.4	58.4
58.5	12:04:27		58.5	58.5
61.3	12:04:30		61.3	61.3
58.6	12:04:33		58.6	58.6
57.4	12:04:36		57.4	57.4
57.1	12:04:39		57.1	57.1
72.5	12:04:42		72.5	72.5
64.8	12:04:45		64.8	64.8
60.1	12:04:48		60.1	60.1

APPENDIX C

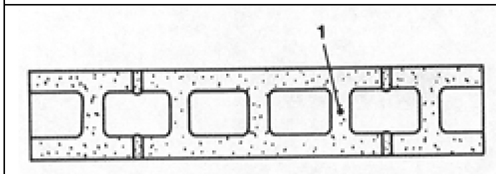
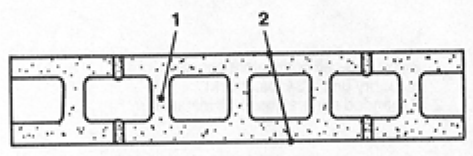
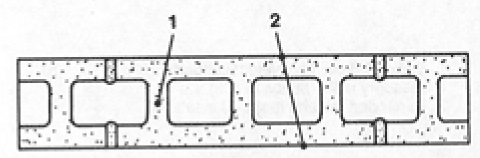
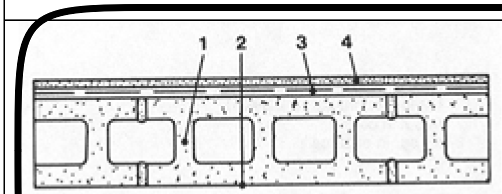
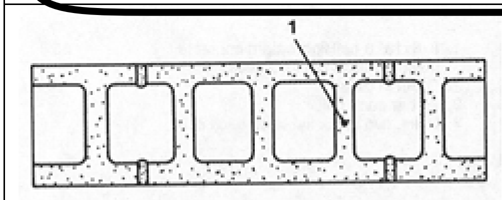
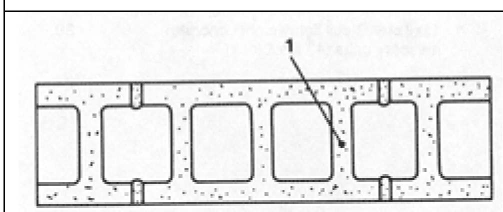
Exterior Wall Structure STC Ratings

U.S. Department of Housing and Urban Development
Office of Community Planning and Development

Noise Notebook

Chapter 4
Supplement

Sound Transmission Class Guidance

Sketch	Brief Description	STC
	1. 6x8x16" 3-cell lightweight concrete masonry units (21 lbs./block).	44
	1. 6x8x16" 3-cell lightweight concrete masonry units (21 lbs./block). 2. Paint both sides with primer-sealer coat and finish coat of latex.	46
	1. 6x8x18" 3-cell dense concrete masonry units (36 lbs./block). 2. Paint both sides with primer-sealer coat and finish coat of latex.	48
	1. 6x8x16" 3-cell lightweight concrete masonry units (21 lbs./block). 2. Paint, primer-sealer coat and finish coat of latex. 3. Resilient channels, 24"o.c. 4. ½" gypsum board screwed to channels.	53
	1. 8x8x16" 3-cell lightweight concrete masonry units (28 lbs./block).	45
	1. 8x8x18" 3-cell lightweight concrete masonry units (34 lbs./block).	49