Appendix F

Acoustical Assessment

Acoustical Assessment
Ashley Expansion Project
City of Colton, California

Prepared by:

Kimley-Horn and Associates, Inc.

3880 Lemon Street, Suite 420
Riverside, California 92501
Contact: Mr. Alex Pohlman
951.543.9868

December 2022

TABLE OF CONTENTS

LIST OF ABBREVIATED TERMS

APN	Assessor's Parcel Number
ADT	average daily traffic
dBA	A-weighted sound level
CEQA	California Environmental Quality Act
CNEL	community equivalent noise level
L_{dn}	day-night noise level
dB	decibel
du/ac	dwelling units per acre
L_{eq}	equivalent noise level
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HVAC	heating ventilation and air conditioning
Hz	hertz
HOA	homeowner's association
in/sec	inches per second
L_{max}	maximum noise level
µPa	micropascals
L_{min}	minimum noise level
PPV	peak particle velocity
RMS	root mean square
VdB	vibration velocity level

1 INTRODUCTION

This report documents the results of an Acoustical Assessment completed for the Ashley Expansion Project ("Project" or "proposed Project"). The purpose of this Acoustical Assessment is to evaluate the potential construction and operational noise and vibration levels associated with the Project and determine the level of impact the Project would have on the environment.

1.1 Project Location and Setting

The Project site is located along Ashley Way, in the City of Colton (City), County of San Bernardino, California, on Assessor Parcel Numbers (APNs) 0276-131-92 and 0276-131-90. The Project is generally located in the eastern portion of the City, west of Interstate 215 (I-215), east of East Cooley Drive, approximately 0.43 miles south of Interstate 10 (I-10), and north of commercial and vacant land. Refer to Exhibit 1, Regional Location Map and Exhibit 2, Local Vicinity Map.

The Project site is an approximately 8.56-acre site composed of two parcels. The Project site consists of two existing buildings located at 855 Ashley Way (southern building) and 755 Ashley Way (northern building) and is bounded by light industrial uses and East Cooley Drive to the north and west; Ashley Way, undeveloped land, and commercial uses to the south; and Ashley Way, I-215, and single-family residential uses to the east.

The Project site at the is zoned as General Commercial (C-2) at the 855 Ashley Way Building Lot and Light Industrial (M-1) at the 755 Ashley Way Building Lot. The 855 Ashley Way Building Lot has a General Plan land use designation of General Commercial and the 755 Ashley Way Building Lot has a General Plan land use designation of Light Industrial. The Project site is also located within the Business District Sign (BDS) Overlay.

1.2 Project Description

The proposed Project includes a 35,000 square foot addition to the existing 855 Ashley Way building which would result in a new total building area of 100,154 square feet. The Project would also require a lot line adjustment and partial demolition of two service bays at 755 Ashley Way. The 855 and 755 Ashley Way combined lot area is approximately 8.56 acres. Both buildings on the Project site are owned and operated by the Project Applicant. Refer to Exhibit 3, Conceptual Site Plan.

Site Access

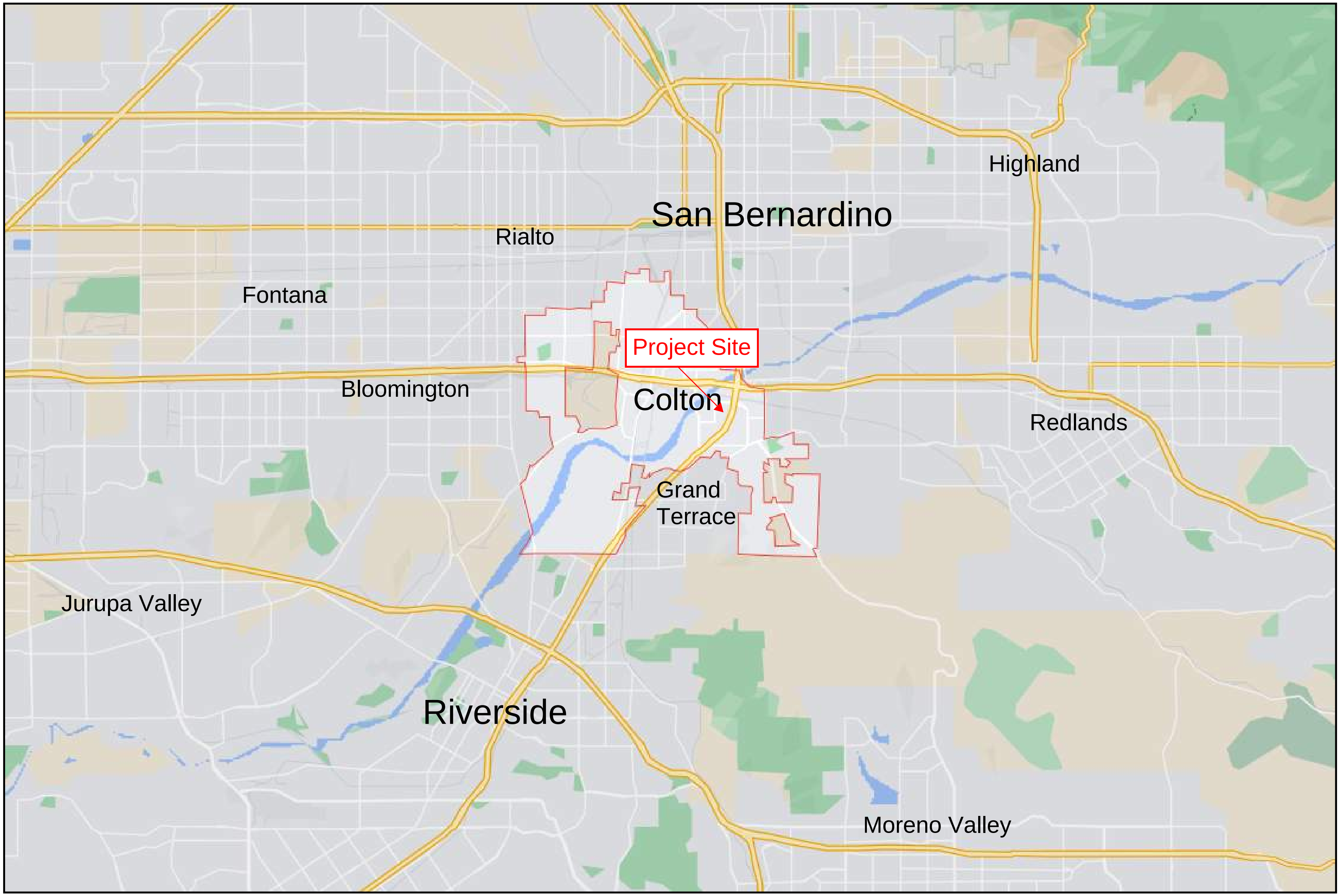
Vehicular egress and ingress to the Project site would occur via four driveways, one existing 30-foot-wide ingress and egress driveway on Ashley Way; one existing ingress and egress driveway on Ashley Way, south of the existing building at 855 Ashley Way; and two proposed driveways via Ashley way. Both existing buildings would have a shared parking and access agreement.

Parking

The partial parking lot demolition/revisions would shift two existing site access aisles to accommodate the new parking layout. The Project would provide 363 parking spaces which also includes 17 compact parking spaces and eight handicap-accessible parking spaces.

Project Phasing and Construction

The Project is anticipated to be developed in one phase. Should the Project be approved, construction is anticipated to occur over a period of approximately 12 months.



Source: Google Maps

Exhibit 1: Regional Location Map

City of Colton

Ashley Expansion Project

Not to Scale

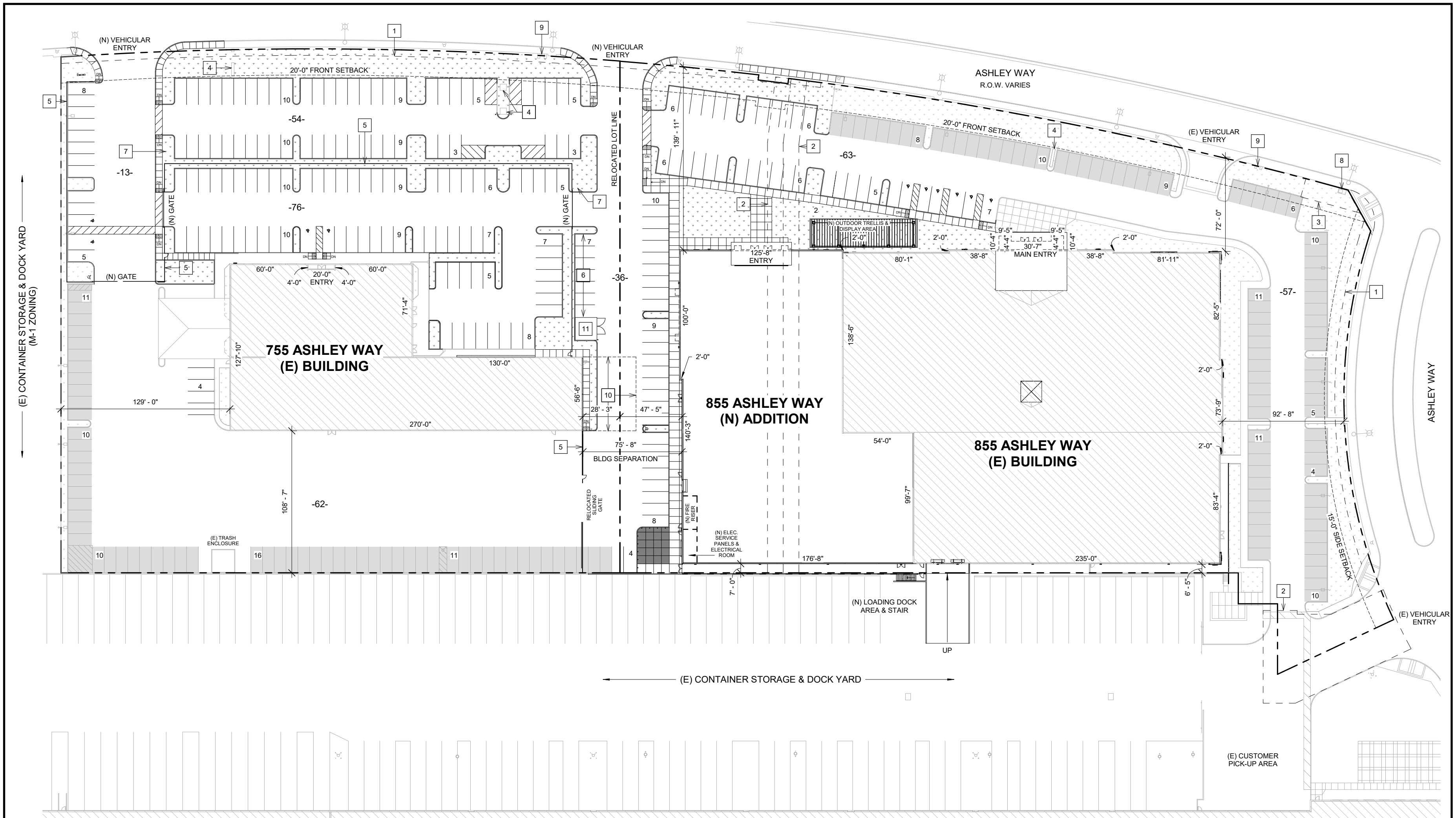
Kimley»Horn

Source: San Bernardino County Parcel Viewer

Exhibit 2: Local Vicinity Map
City of Colton
Ashley Expansion Project

Not to Scale

Kimley»Horn



PROPOSED LOT SIZES

855 ASHLEY WAY LOT =	220,482 SF (~5.06 ACRES)
755 ASHLEY WAY LOT =	152,335 SF (~3.50 ACRES)
COMBINED LOT AREA =	372,817 SF (~8.56 ACRES)

PARKING CALCULATIONS

(E) BUILDING AREA =	65,154 SF
(N) ADDITION AREA =	35,000 SF
TOTAL BUILDING AREA =	100,154 SF
REQUIRED PARKING = (1/250 SF PARKING RATIO)	400 SPACES
(10% REDUCTION ALLOWED BY AHJ) =	- 40 SPACES

TOTAL REQUIRED PARKING = 360 SPACES

TOTAL PARKING PROVIDED = 363 SPACES

COMPACT PARKING SPACES ALLOWED = 72 SPACES MAX
(20% OF REQUIRED PARKING)

COMPACT PARKING SPACES PROVIDED = 17 SPACES

ACESSIBLE PARKING REQUIRED = 8 SPACES
(2% OF TOTAL REQUIRED PARKING)

ACESSIBLE PARKING PROVIDED = 8 SPACES

LANDSCAPE AREA

COMBINED LOT AREA =	372,817 SF (~8.56 ACRES)
REQUIRED LANDSCAPE AREA = (15% OF LOT AREA)	55,923 SF
TOTAL LANDSCAPE AREA PROVIDED =	**49,904 SF (13.4% OF LOT AREA)**

Source: Architecture Design Collaborative. (2022). Proposed Site Plan

Exhibit 3: Conceptual Site Plan

City of Colton

Ashley Expansion Project

Not to Scale

Kimley»Horn

2 ACOUSTIC FUNDAMENTALS

2.1 Sound and Environmental Noise

Acoustics is the science of sound. Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a medium (e.g. air) to human (or animal) ear. If the pressure variations occur frequently enough (at least 20 times per second), they can be heard and are called sound. The number of pressure variations per second is called the frequency of sound and is expressed as cycles per second, or hertz (Hz).

Noise is defined as loud, unexpected, or annoying sound. The fundamental acoustics model consists of a noise source, a receptor, and the propagation path between the two. The loudness of the noise source, obstructions, or atmospheric factors affecting the propagation path, determine the perceived sound level and noise characteristics at the receptor. Acoustics deal primarily with the propagation and control of sound. A typical noise environment consists of a base of steady background noise that is the sum of many distant and indistinguishable noise sources. The sound from individual local sources is superimposed on this background noise. These sources can vary from an occasional aircraft or train passing by to continuous noise from traffic on a major highway. Perceptions of sound and noise are highly subjective from person to person.

Measuring sound directly in terms of pressure would require a large range of numbers. To avoid this, the decibel (dB) scale was devised. The dB scale uses the hearing threshold of 20 micropascals (μPa) as a point of reference, defined as 0 dB. Other sound pressures are then compared to this reference pressure, and the logarithm is taken to keep the numbers in a practical range. The dB scale allows a million-fold increase in pressure to be expressed as 120 dB, and changes in levels correspond closely to human perception of relative loudness. Table 1: Typical Noise Levels provides typical noise levels.

Table 1: Typical Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	– 110 –	Rock Band
Jet fly-over at 1,000 feet		
	– 100 –	
Gas lawnmower at 3 feet		
	– 90 –	
Diesel truck at 50 feet at 50 miles per hour		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 –	
Lowest threshold of human hearing	**– 0 –**	Lowest threshold of human hearing

Source: California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, September 2013.

Noise Descriptors

The dB scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. Several rating scales have been developed to analyze the adverse effect of community noise on people. Because environmental noise fluctuates over time, these scales consider that the effect of noise on people is largely dependent on the total acoustical energy content of the noise, as well as the time of day when the noise occurs. Most commonly, environmental sounds are described in terms of the equivalent noise level (L_{eq}) that has the same acoustical energy as the summation of all the time-varying events. While L_{eq} represents the continuous sound pressure level over a given period, the day-night noise level (L_{dn}) and Community Equivalent Noise Level (CNEL) are measures of energy average during a 24-hour period, with dB weighted sound levels from 7:00 p.m. to 7:00 a.m. Each is applicable to this analysis and defined in Table 2: Definitions of Acoustical Terms.

Table 2: Definitions of Acoustical Terms

Term	Definitions
Decibel (dB)	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in μPa (or 20 micronewtons per square meter), where 1 pascals is the pressure resulting from a force of 1 newton exerted over an area of 1 square meter. The sound pressure level is expressed in dB as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e.g. 20 μPa). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency (Hz)	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level (dBA)	The sound pressure level in dB as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level (L_{eq})	The average acoustic energy content of noise for a stated period of time. Thus, the L_{eq} of a time-varying noise and that of a steady noise are the same if they deliver the same acoustic energy to the ear during exposure. For evaluating community impacts, this rating scale does not vary, regardless of whether the noise occurs during the day or the night.
Maximum Noise Level (L_{max}) Minimum Noise Level (L_{min})	The maximum and minimum dBA during the measurement period.
Exceeded Noise Levels (L_{01}, L_{10}, L_{50}, L_{90})	The dBA values that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day-Night Noise Level (L_{dn})	A 24-hour average L_{eq} with a 10 dBA weighting added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for noise sensitivity at nighttime. The logarithmic effect of these additions is that a 60 dBA 24-hour L_{eq} would result in a measurement of 66.4 dBA L_{dn}.
Community Noise Equivalent Level (CNEL)	A 24-hour average L_{eq} with a 5 dBA weighting during the hours of 7:00 a.m. to 10:00 a.m. and a 10 dBA weighting added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for noise sensitivity in the evening and nighttime, respectively. The logarithmic effect of these additions is that a 60 dBA 24-hour L_{eq} would result in a measurement of 66.7 dBA CNEL.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends on its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Because sound levels can vary markedly over a short period of time, a method for describing either the average character (L_{eq}) or the variations' statistical behavior (L_{XX}) must be utilized. The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The predicted models' accuracy depends on various factors, such as the distance between the noise receptor and noise source, the character of the ground surface (e.g., hard or soft), and the presence or absence of structures (e.g., walls or buildings) or topography, and how well model inputs reflect these conditions.

A-Weighted Decibels

The perceived loudness of sounds is dependent on many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable and can be approximated by dBA values. There is a strong correlation between dBA and the way the human ear perceives sound. For this reason, the dBA has become the standard tool of environmental noise assessment. All noise levels reported in this document are in terms of dBA, but are expressed as dB, unless otherwise noted.

Addition of Decibels

The dB scale is logarithmic, not linear, and therefore sound levels cannot be added or subtracted through ordinary arithmetic. Two sound levels 10 dB apart differ in acoustic energy by a factor of 10.[1] When the standard logarithmic dB is A-weighted, an increase of 10 dBA is generally perceived as a doubling in loudness.[2] For example, a 70-dBA sound is half as loud as an 80-dBA sound and twice as loud as a 60-dBA sound. When two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dBA higher than one source under the same conditions. Under the dB scale, three sources of equal loudness together would produce an increase of 5 dBA.[3]

Sound Propagation and Attenuation

Sound spreads (propagates) uniformly outward in a spherical pattern, and the sound level decreases (attenuates) at a rate of approximately 6 dB for each doubling of distance from a stationary or point source.[4] Sound from a line source, such as a highway, propagates outward in a cylindrical pattern. Sound levels attenuate at a rate of approximately 3 dB for each doubling of distance from a line source, such as a roadway, depending on ground surface characteristics.[5] No excess attenuation is assumed for hard surfaces like a parking lot or a body of water. Soft surfaces, such as soft dirt or grass, can absorb sound, so an excess ground-attenuation value of 1.5 dB per doubling of distance is normally assumed. For line sources, an overall attenuation rate of 3 dB per doubling of distance is assumed in this report.

Noise levels may also be reduced by intervening structures; generally, a single row of buildings between the receptor and the noise source reduces the noise level by about 5 dBA, while a solid wall or berm can reduce noise levels by 5 to 15 dBA.[6] The way older homes in California were constructed generally provides a reduction of exterior-to-interior noise levels of about 20 to 25 dBA with closed windows. The exterior-to-interior reduction of newer residential units is generally 30 dBA or more.

---

1 California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, September 2013.
2 Ibid.
3 Ibid.
4 Ibid.
5 Ibid.
6 Federal Highway Administration, *Highway Traffic and Construction Noise - Problem and Response*, April 2006.

Human Response to Noise

The human response to environmental noise is subjective and varies considerably from individual to individual. Noise in the community has often been cited as a health problem, not in terms of actual physiological damage, such as hearing impairment, but in terms of inhibiting general well-being and contributing to undue stress and annoyance. The health effects of noise in the community arise from interference with human activities, including sleep, speech, recreation, and tasks that demand concentration or coordination. Hearing loss can occur at the highest noise intensity levels.

Noise environments and consequences of human activities are usually well represented by median noise levels during the day or night or over a 24-hour period. Environmental noise levels are generally considered low when the CNEL is below 60 dBA, moderate in the 60 to 70 dBA range, and high above 70 dBA.[7] Examples of low daytime levels are isolated, natural settings with noise levels as low as 20 dBA and quiet, suburban, residential streets with noise levels around 40 dBA. Noise levels above 45 dBA at night can disrupt sleep. Examples of moderate-level noise environments are urban residential or semi-commercial areas (typically 55 to 60 dBA) and commercial locations (typically 60 dBA). People may consider louder environments adverse, but most will accept the higher levels associated with noisier urban residential or residential-commercial areas (60 to 75 dBA) or dense urban or industrial areas (65 to 80 dBA). Regarding increases in dBA, the following relationships should be noted:[8]

- Except in carefully controlled laboratory experiments, a 1-dBA change cannot be perceived by humans.
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference.
- A minimum 5-dBA change is required before any noticeable change in community response would be expected. A 5-dBA increase is typically considered substantial.
- A 10-dBA change is subjectively heard as an approximate doubling in loudness and would almost certainly cause an adverse change in community response.

Effects of Noise on People

Hearing Loss. While physical damage to the ear from an intense noise impulse is rare, a degradation of auditory acuity can occur even within a community noise environment. Hearing loss occurs mainly due to chronic exposure to excessive noise but may be due to a single event such as an explosion. Natural hearing loss associated with aging may also be accelerated from chronic exposure to loud noise. The Occupational Safety and Health Administration has a noise exposure standard that is set at the noise threshold where hearing loss may occur from long-term exposures. The maximum allowable level is 90 dBA averaged over 8 hours. If the noise is above 90 dBA, the allowable exposure time is correspondingly shorter.[9]

Annoyance. Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The L_{dn} as a measure of noise has been found to provide a valid correlation of noise

7 Compiled from James P. Cowan, *Handbook of Environmental Acoustics,* 1994, and Cyril M. Harris, *Handbook of Noise Control*, 1979.

8 Compiled from California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, September 2013, and Federal Highway Administration, *Noise Fundamentals,* 2017.

9 U.S. Department of Labor, Occupational Safety and Health Standards, *29 CFR 1910* (Occupational Noise Exposure).

level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. A noise level of about 55 dBA L_{dn} is the threshold at which a substantial percentage of people begin to report annoyance.[10]

2.2 Groundborne Vibration

Sources of groundborne vibrations include natural phenomena (earthquakes, volcanic eruptions, sea waves, landslides, etc.) or man-made causes (explosions, machinery, traffic, trains, construction equipment, etc.). Vibration sources may be continuous (e.g. factory machinery) or transient (e.g. explosions). Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One is the peak particle velocity (PPV); another is the root mean square (RMS) velocity. The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave and is expressed in terms of inches-per-second (in/sec). The RMS velocity is defined as the average of the squared amplitude of the signal and is expressed in terms of velocity decibels (VdB). The PPV and RMS vibration velocity amplitudes are used to evaluate human response to vibration.

Table 3: Human Reaction and Damage to Buildings for Continuous or Frequent Intermittent Vibrations**,** displays the reactions of people and the effects on buildings produced by continuous vibration levels. The annoyance levels shown in the table should be interpreted with care since vibration may be found to be annoying at much lower levels than those listed, depending on the level of activity or the individual's sensitivity. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage. In high noise environments, which are more prevalent where groundborne vibration approaches perceptible levels, this rattling phenomenon may also be produced by loud airborne environmental noise causing induced vibration in exterior doors and windows.

Table 3: Human Reaction and Damage to Buildings for Continuous or Frequent Intermittent Vibrations

Maximum PPV (in/sec)	Vibration Annoyance Potential Criteria	Vibration Damage Potential Threshold Criteria	FTA Vibration Damage Criteria
0.008	--	Extremely fragile historic buildings, ruins, ancient monuments	--
0.01	Barely Perceptible	--	--
0.04	Distinctly Perceptible	--	--
0.1	Strongly Perceptible	Fragile buildings	--
0.12	--	--	Buildings extremely susceptible to vibration damage
0.2	--	--	Non-engineered timber and masonry buildings
0.25	--	Historic and some old buildings	--
0.3	--	Older residential structures	Engineered concrete and masonry (no plaster)
0.4	Severe	--	--
0.5	--	New residential structures, Modern industrial/commercial buildings	Reinforced-concrete, steel or timber (no plaster)
PPV = peak particle velocity; in/sec = inches per second; FTA = Federal Transit Administration			
Source: California Department of Transportation, *Transportation and Construction Vibration Guidance Manual*, 2020 and Federal Transit administration, Transit Noise and Vibration Assessment Manual, 2018.			

10 Federal Interagency Committee on Noise, *Federal Agency Review of Selected Airport Noise Analysis Issues*, August 1992.

Ground vibration can be a concern in instances where buildings shake, and substantial rumblings occur. However, it is unusual for vibration from typical urban sources such as buses and heavy trucks to be perceptible. Common sources for groundborne vibration are planes, trains, and construction activities such as earth-moving which requires the use of heavy-duty earth moving equipment. For the purposes of this analysis, a PPV descriptor with units of inches per second (in/sec) is used to evaluate construction-generated vibration for building damage and human complaints.

3 REGULATORY SETTING

To limit population exposure to physically or psychologically damaging as well as intrusive noise levels, the Federal government, the State of California, various county governments, and most municipalities in the state have established standards and ordinances to control noise.

3.1 State of California

California Government Code

California Government Code Section 65302(f) mandates that the legislative body of each county and city adopt a noise element as part of its comprehensive general plan. The local noise element must recognize the land use compatibility guidelines established 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" noise levels for various land use types. Single-family homes are "normally acceptable" in exterior noise environments up to 60 CNEL and "conditionally acceptable" up to 70 CNEL. Multiple-family residential uses are "normally acceptable" up to 65 CNEL and "conditionally acceptable" up to 70 CNEL. Schools, libraries, and churches are "normally acceptable" up to 70 CNEL, as are office buildings and business, commercial, and professional uses.

Title 24 – Building Code

The State's noise insulation standards are codified in the California Code of Regulations, Title 24: Part 1, Building Standards Administrative Code, and Part 2, California Building Code. These noise standards are applied to new construction in California for interior noise compatibility from exterior noise sources. The regulations specify that acoustical studies must be prepared when noise-sensitive structures, such as residential buildings, schools, or hospitals, are located near major transportation noise sources, and where such noise sources create an exterior noise level of 65 dBA CNEL or higher. Acoustical studies that accompany building plans must demonstrate that the structure has been designed to limit interior noise in habitable rooms to acceptable noise levels. For new multi-family residential buildings, the acceptable interior noise limit for new construction is 45 dBA CNEL.

3.2 Local

City of Colton General Plan

The City of Colton General Plan (Colton GP) Noise Element contains noise standards for mobile noise sources. These standards address noise impacts from adjacent roadways and airports. The Colton GP Noise Element identifies the noise standards related to commercial property, indicating a CNEL value of up to 70 dBA CNEL is considered normally acceptable; while noise levels of up to 78 dBA are conditionally acceptable.

The Colton GP Noise Element includes the following principles relevant to the Project:

- **Principle 1**—Establish criteria defining compatible land uses as a function of the level of noise exposure.
- **Principle 2**—Control noise exposure from future noise generators so the ambient environment will be kept within acceptable limits.

- **Principle 3**—Establish acceptable noise standards consistent with health and quality of life goals.

To enforce these principles, the Colton GP Noise Element specifies the following standards:

- **Standard 1**—Residential structures should be constructed to maintain interior noise levels of not greater than 45 dBA, through the use of sound barrier improvements, building design, construction materials and/or insulating techniques.
- **Standard 2**—Residential growth in Community Noise Exposure Areas greater than 70 dBA should be discouraged, unless on-site noise levels can be reduced to 60 dBA or lower via on- and offsite noise alleviating improvements.
- **Standard 3**—Exterior noise levels should not exceed 65 dBA during the day or 55 dBA at night for commercial land uses, including general business and general merchandising.
- **Standard 4**—Exterior noise levels should not exceed 60 dBA at any time for such areas important to public need, and where the preservation of serenity and quietness is essential if the area is to continue to serve its intended purpose. Such areas could include parks, open spaces, amphitheaters, and other areas dedicated for activities requiring special qualities of serenity.

City of Colton Municipal Code

Colton MC § 18.42.010—This chapter is intended to protect properties in all residential zones and the health and safety of persons from environmental nuisances and hazards and to provide a pleasing environment in keeping with the nature of the residential character. The performance standards provided below set maximum tolerability limits on adverse environmental effects created by any use or development of land.

Colton MC § 18.42.040—The maximum sound level radiated by any use of facility, when measured at the boundary line of the property on which the sound is generated, shall not be obnoxious by reason of its intensity, pitch or dynamic characteristics as determined by the City, and shall not exceed 65 dBA.

Colton MC § 18.42.050—All activities shall be operated so as not to generate ground vibration by equipment other than motor vehicles, trains, or by temporary construction or demolition, which is perceptible without instruments by the average person at or beyond any lot line of the lot containing the activities.

4 EXISTING CONDITIONS

4.1 Existing Noise Sources

The City is impacted by various noise sources. Mobile sources of noise, especially cars, trucks, and trains are the most common and significant sources of noise. Other noise sources are the various land uses (i.e. residential, commercial, institutional, and recreational and parks activities) throughout the City that generate stationary-source noise. Existing noise sources in the project area include noise from traffic on the I-215 Freeway to the east, Ashley Way to the east and south, and East Cooley Drive to the west and north. The primary sources of stationary noise in the project vicinity are urban-related activities (i.e., mechanical equipment, residential/commercial/light industrial uses, parking areas, and pedestrians). The noise associated with these sources may represent a single-event noise occurrence, short-term, or long-term/continuous noise.

4.2 Sensitive Receptors

Noise exposure goals for various types of land uses reflect the varying noise sensitivities associated with those uses. Noise sensitive uses typically include residences, hospitals, schools, childcare facilities, and places of assembly. Vibration sensitive receivers are generally similar to noise sensitive receivers but may also include businesses, such as research facilities and laboratories that use vibration-sensitive equipment. Land uses surrounding the Project consist mostly commercial and light industrial. The nearest sensitive receptors are single family homes located approximately 400 feet (122 meters) to the east of the Project, on the opposite side of I-215. There is also a Kaiser Permanente medical center located approximately 1,250 feet (381 meters) to the west of the Project.

5 SIGNIFICANCE CRITERIA AND METHODOLOGY

5.1 CEQA Thresholds

State California Environmental Quality Act (CEQA) Guidelines Appendix G contains analysis guidelines related to noise and vibration. These guidelines have been used by the City to develop thresholds of significance for this analysis. A project would create a significant environmental impact if it would:

- Generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Generate excessive groundborne vibration or groundborne noise levels; and
- For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, expose people residing or working in the Project area to excessive noise levels.

Thresholds

Construction Noise

The City of Colton's noise ordinance has not established noise performance standards for construction activities. Therefore, this noise study uses the construction noise performance standards found in the County of San Bernardino Development Code which restricts such noise producing construction activity to the hours of 7:00 a.m. and 7:00 p.m. Mondays to Saturday, with no such activity permitted on Sundays or Federal holidays.

Like the City of Colton, the County of San Bernardino does not establish quantitative construction noise standards and only limits the construction activities timeframe; therefore, this analysis conservatively uses the FTA's threshold of 80 dBA (8-hour L_{eq}) for residential uses and 90 dBA (8-hour L_{eq}) for non-residential uses to evaluate construction noise impacts.[11]

Operational Noise

The City General Plan states that exterior noise levels should not exceed 65 dBA during the day and 55 dBA at night. Therefore, onsite noise levels should not exceed these noise levels when measured from the nearest property line.

A significant impact from project-generated traffic would occur if a substantial increase in ambient noise levels occur when compared with those that exist without the proposed project. The City does not define "substantial increase," therefore for purpose of this analysis, a substantial increase is based on the following criteria. A potentially significant impact would occur if the Project would cause ambient noise levels to increase by 3 dBA CNEL or more and the resulting noise falls on a noise-sensitive land use that exceeds the noise and land use compatibility standards (i.e., causing the noise level of a noise sensitive

[11] Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, Table 7-2, Page 179, September 2018.

land use within an area to be categorized as either "Normally Unacceptable" or "Clearly Unacceptable"). Note that noise level changes less than 3 dBA are not detectable by the human ear.

Vibration

The City's Municipal Code regulates vibration by restricting a project's operations so as not to generate ground vibration by equipment (other than motor vehicles, trains or by temporary construction or demolition) which is perceptible without instruments by the average person at or beyond any lot line of the lot containing the activities. The Caltrans 2020 *Transportation and Construction Vibration Guidance Manual* identifies the vibration threshold for human annoyance, vibrations levels of 0.04 in/sec begin to cause annoyance and levels of 0.2 in/sec is used for building damage. Because the City currently does not have a significance threshold to assess vibration impacts the Caltrans threshold is used in this analysis.

5.2 Methodology

Construction

Construction noise levels were based on typical noise levels generated by construction equipment published by the Federal Transit Administration (FTA) and the Federal Highway Administration (FHWA). Construction noise is assessed in dBA Leq. This unit is appropriate because Leq can be used to describe noise level from operation of each piece of equipment separately, and levels can be combined to represent the noise level from all equipment operating during a given period.

Construction noise modeling was conducting using the FHWA Roadway Construction Noise Model (RCNM). Reference noise levels are used to estimate operational noise levels at nearby sensitive receptors based on a standard noise attenuation rate of 6 dB per doubling of distance (line-of-sight method of sound attenuation for point sources of noise). Noise level estimates do not account for the presence of intervening structures or topography, which may reduce noise levels at receptor locations. Therefore, the noise levels presented herein represent a conservative, reasonable worst-case estimate of actual temporary construction noise. The City of Colton does not establish quantitative construction noise standards. As noted above, this analysis conservatively uses the FTA's threshold of 80 dBA (8-hour L_{eq}) for residential uses and 90 dBA (8-hour L_{eq}) for non-residential uses to evaluate construction noise impacts.

Operations

The analysis of on and off-site operational noise generated by the Project is based on empirical observations. Reference noise level data is used to estimate the Project operational noise levels from onsite sources. Noise levels are collected from field noise measurements and other published sources from similar types of activities are used to estimate noise levels expected from the Project. The reference noise levels are used to represent a worst-case noise environment as noise levels can vary throughout the day. Operational noise is evaluated based on the City's Municipal Code and General Plan standards.

A qualitative analysis of the Project's effect on traffic noise conditions at offsite land uses was prepared using the California Department of Transportation's *Technical Noise Supplement to Traffic Noise Analysis Protocol*. Traffic noise is assumed to be significant if the Project would result in noticeable increase in traffic noise. In general, a 3-dBA increase in traffic noise is barely perceptible to people, while a 5-dBA increase is readily noticeable.

Vibration

Ground-borne vibration levels associated with Project construction-related activities were evaluated utilizing typical ground-borne vibration levels associated with construction equipment, obtained from FTA published data for construction equipment. Potential ground-borne vibration impacts related to building/structure damage and interference with sensitive existing operations were evaluated, considering the distance from construction activities to nearby land uses and typically applied criteria.

For a structure built traditionally, without assistance from qualified engineers, the FTA guidelines show that a vibration level of up to 0.20 in/sec is considered safe and would not result in any vibration damage. FTA guidelines show that modern engineered buildings built with reinforced-concrete, steel or timber can withstand vibration levels up to 0.50 in/sec and not experience vibration damage.

6 POTENTIAL IMPACTS AND MITIGATION

6.1 Acoustical Impacts

Threshold 6.1 Would the Project generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

Construction

On-Site Construction Noise

Construction noise typically occurs intermittently and varies depending on the construction activity's nature or phase (e.g. land clearing, grading, excavation, paving). Noise generated by construction equipment, including earth movers, material handlers, and portable generators, can reach high levels. During construction, exterior noise levels could affect noise sensitive receptors near the construction site. However, it is acknowledged that construction activities would occur throughout the Project site and would not be concentrated at a single point near noise sensitive receptors.

Construction activities would include demolition, site preparation, grading, building construction, paving, and architectural coating. Such activities would require:

- Industrial saws, dozers, and tractors during demolition
- Dozers and tractors during site preparation
- Excavators, graders, dozers, scrapers, and tractors during grading
- Cranes, forklifts, generators, tractors, and welders during building construction
- Pavers, rollers, and paving equipment during paving
- Air compressors during architectural coating

Typical operating cycles for these types of construction equipment may involve one or two minutes of full power operation followed by three to four minutes at lower power settings. Other primary sources of acoustical disturbance would be random incidents, which would last less than one minute (such as dropping large pieces of equipment or the hydraulic movement of machinery lifts). Construction equipment noise, including earth movers, material handlers, and portable generators, can reach high levels. Typical noise levels associated with individual construction equipment are listed in Table 4: Typical Construction Noise Levels and includes noise levels at 400 feet, the distance from the Project boundary to the nearest sensitive receptor. It is noted that the noise levels shown in Table 9 are maximum noise levels (i.e., the equipment engine at maximum speed). However, equipment used on construction sites typically operates under less than full power conditions, or part power.

Table 4: Typical Construction Noise Levels

Equipment	Typical Noise Level (dBA) at 50 feet from Source	Typical Noise Level (dBA) at 400 feet from Source[1]
Air Compressor	80	62
Backhoe	80	62
Compactor	82	64
Concrete Mixer	85	67
Concrete Pump	82	64

Table 4: Typical Construction Noise Levels		
Equipment	**Typical Noise Level (dBA) at 50 feet from Source**	**Typical Noise Level (dBA) at 400 feet from Source[1]**
Concrete Vibrator	76	58
Dozer	85	67
Generator	82	64
Grader	85	67
Impact Wrench	85	67
Jack Hammer	88	70
Loader	80	62
Paver	85	67
Pneumatic Tool	85	67
Pump	77	59
Roller	85	67
Saw	76	58
Scraper	85	67
Shovel	82	64
Truck	84	66
1. Calculated using the inverse square law formula for sound attenuation: $dBA_2 = dBA_1 + 20Log(d_1/d_2)$ Where: dBA_2 = estimated noise level at receptor; dBA_1 = reference noise level; d_1 = reference distance; d_2 = receptor location distance		
Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, September 2018.		

Although the construction equipment noise levels in Table 4 are from FTA's 2018 *Transit Noise and Vibration Impact Assessment Manual*, the noise levels are based on measured data from a U.S. Environmental Protection Agency report which uses data from the 1970s,[12] the FHWA Roadway Construction Noise Model uses data from the early 1990s, and other measured data. Since that time, construction equipment has been required to meet more stringent emissions standards and the additional necessary exhaust systems also reduce noise from what is shown in the table.

Project Construction Noise Levels

Table 5: Project Construction Noise Levels shows the exterior construction noise for the Project without accounting for attenuation from existing physical barriers or topography. Construction noise has been calculated with FHWA's Roadway Construction Noise Model (RCNM). The nearest noise sensitive receptors is a residential community 400 feet to the east, on the opposite side of I-215. Construction equipment was assumed to operate simultaneously to represent a worst-case noise scenario as construction activities would routinely be spread throughout the construction site and would operate at different intervals.

The City of Colton does not establish quantitative construction noise standards; therefore, this analysis conservatively uses the FTA's threshold of 80 dBA (8-hour L_{eq}) for residential uses to evaluate construction noise impacts. FTA's construction threshold is an 8-hour L_{eq}, which accounts for the percentage of time each individual piece of equipment operates under full power in that period. Additionally, construction equipment would move throughout the site during that period.

12 U.S. Environmental Protection Agency, *Noise from Construction Equipment and Operations, Building Equipment and Home Appliances*, NTID300.1, December 31, 1971.

Table 5: Project Construction Noise Levels

Construction Phase	Land Use	Receptor Location Relative to Construction Activity			Noise Threshold (dBA L_{eq})[3]	Exceeded?
		Direction	Distance (feet)[1]	Worst Case Modeled Exterior Noise Level (dBA L_{eq})[2]		
Demolition	Residential	East	600	63.7	80	No
Combined Site Preparation, Grading, Building Construction, Paving, and Architectural Coating	Residential	East	600	65.2	80	No

1. Following FTA methodology, all equipment should be assumed to operate at the center of the Project site because equipment would operate throughout the Project site and not at a fixed location for extended periods of time.
2. Modeled noise levels conservatively assume the simultaneous operation of all pieces of equipment.
3. Federal Transit Administration noise threshold of 80 dBA for residences.

Source: Federal Highway Administration, *Roadway Construction Noise Model,* 2006. Refer to Appendix A for noise modeling results.

Following FTA methodology, when calculating construction noise, all construction equipment is assumed to operate simultaneously at the center of the active construction zone to represent an average distance throughout the day. The distance from the center of the Project site to the nearest sensitive receptor is 600 feet. During construction, equipment would operate throughout the site and not all of the equipment would be operating at the point closest to the sensitive receptors and considering the distance between the center of the Project site and the sensitive receptors is a reasonable assumption.

Based on the construction schedule, it is anticipated that site preparation, grading, building construction, paving, and architectural coating activities would all overlap at some time during construction. Therefore, the noise generated by equipment during these activities have been combined. As such, construction-related noise impacts would not generate a substantial temporary or permanent increase in ambient noise levels in excess of applicable standards and impacts would be less than significant in this regard.

Table 5 shows that the maximum construction noise levels would not exceed the applicable FTA construction threshold. The highest exterior noise level at residential receptors would occur during the demolition phase and would be 65.2 dBA which is below the FTA's 80 dBA threshold. Although receptors may be exposed to elevated noise levels during project construction, these noise levels would be acoustically dispersed throughout the Project site and not concentrated in one area.

Operations

Implementation of the proposed Project would create new sources of noise in the Project vicinity. The major noise sources associated with the Project would include:

- Mechanical equipment (i.e. trash compactors, air conditioners, etc.);
- Slow moving trucks on the Project site, approaching and leaving the loading areas;
- Activities at the loading areas (i.e. maneuvering and idling trucks, equipment noise);
- Parking areas (i.e. car door slamming, car radios, engine start-up, and car pass-by); and
- Off-Site Traffic Noise.

Onsite Operational Noise

Mechanical Equipment

The Project is located in an area surrounded by commercial and light industrial uses. The nearest sensitive receptor to the Project site is approximately 400 feet (122 meters) to the east, on the opposite side of I-215. Potential stationary noise sources related to long-term operation of the Project site would include mechanical equipment. Mechanical equipment (e.g. heating ventilation and air conditioning [HVAC] equipment) typically generates noise levels of approximately 52 dBA at 50 feet[13]. Based on conceptual site plans, the closest mechanical equipment associated with the building expansion could be located to the property boundary would be 145 feet. At this distance, mechanical equipment noise would attenuate to 42.8 dBA.[14]

Truck and Loading Dock Noise

During loading and unloading activities, noise would be generated by the trucks' diesel engines, exhaust systems, and brakes during low gear shifting' braking activities; backing up toward the docks; dropping down the dock ramps; and maneuvering away from the docks. The proposed warehouse building includes dock-high doors for truck loading/unloading and manufacturing/light industrial operations. Typically, heavy truck operations generate a noise level of 64.4 dBA at a distance of 50 feet.[15] The dock-high doors are approximately 380 feet west of the property line. At this distance, truck and loading dock noise would attenuate to 46.8 dBA. Additionally, these noise levels would also be further attenuated by the intervening building expansion. Loading dock doors would also be surrounded with protective aprons, gaskets, or similar improvements that, when a trailer is docked, would serve as a noise barrier between the interior activities and the exterior loading area.

Parking Noise

The existing site has 363 automobile parking stalls. However, the Project would reconfigure two parking aisles to make room from for the building expansion. Based on the Traffic Study for Colton Ashley Furniture Expansion Project (Kimley-Horn, November 2022) (Traffic Study), the Project would generate an additional 20 vehicle trips during the a.m. peak hour and 55 vehicle trips during the p.m. peak hour. Based on maximum peak p.m. traffic, parking lot noise could reach up to 43.8 dBA[16] at the property line.

Total Onsite Operational Noise

Using decibel addition,[17] the total exterior noise levels from the mechanical equipment, truck and loading dock noise, and parking lot noise have been combined. The maximum noise generated by the Project would be 49.6 dBA at the property boundary, therefore exterior noise levels would not exceed the City's 65 dBA standard during the day or the 55 dBA standard at night for commercial land uses, including

13 Elliott H. Berger, Rick Neitzel, and Cynthia A. Kladden, *Noise Navigator Sound Level Database with Over 1700 Measurement Values*, July 6, 2010.

14 Distance Attenuation Formula: $dBA2 = dBA1 + 20\ Log10\left(\frac{d1}{d2}\right)$ where: dBA1 = Reference Noise Level, d_1 = Reference Distance, d_2 = Approximate Receptor Location Distance

15 Loading dock reference noise level measurements conducted by Kimley-Horn on December 18, 2018.

16 Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual, September 2018.

17 $L = 10\ Log10(\sum_{i=1}^{n} 10^{\frac{Li}{10}})$

general business and general merchandising. As such, operational noise impacts would not generate a substantial temporary or permanent increase in ambient noise levels in excess of applicable standards and onsite operational noise impacts would be less than significant.

Off-Site Traffic Noise

Project implementation would result in minimal traffic trips on Project area roadways. As previously discussed, the Traffic Study shows that the Project would result in 700 total daily trips with 20 a.m. peak hour trips and 55 p.m. peak hour trips. In general, a 3-dBA increase in traffic noise is barely perceptible to people, while a 5-dBA increase is readily noticeable. Traffic volumes on project area roadways would have to approximately double for the resulting traffic noise levels to generate a barely perceptible 3-dBA increase.[18] As shown in the Traffic Study, due to the project's low trip generation, the project would not result in any traffic related effects. The traffic associated with the Project is insufficient to double existing traffic volumes, and thus, would not increase traffic noise on Project area roadways. Therefore, off-site traffic noise impacts would not generate a substantial temporary or permanent increase in ambient noise levels in excess of applicable standards and traffic noise impacts would be less than significant.

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

Threshold 6.2 Would the Project generate excessive groundborne vibration or groundborne noise levels?

Construction Vibration

Construction can generate varying degrees of ground vibration, depending on the construction procedures and equipment. Operation of construction equipment generates vibrations that spread through the ground and diminish with distance from the source. Construction on the Project site would have the potential to result in varying degrees of temporary ground-borne vibration, depending on the specific construction equipment used and the operations involved.

The FTA has published standard vibration velocities for construction equipment operations. In general, the FTA architectural damage criterion for continuous vibrations (i.e., 0.2 in/sec) appears to be conservative. The types of construction vibration impacts include human annoyance and building damage. Human annoyance occurs when construction vibration rises significantly above the threshold of human perception for extended periods of time. Building damage can be cosmetic or structural. Ordinary buildings that are not particularly fragile would not experience any cosmetic damage (e.g., plaster cracks) at distances beyond 30 feet. This distance can vary substantially depending on the soil composition and underground geological layer between vibration source and receiver. In addition, not all buildings respond similarly to vibration generated by construction equipment. For example, for a building that is constructed with reinforced concrete with no plaster, the FTA guidelines show that a vibration level of up to 0.20 in/sec is considered safe and would not result in any construction vibration damage.

18 According to the California Department of Transportation, *Technical Noise Supplement to Traffic Noise Analysis Protocol* (September 2013), it takes a doubling of traffic to create a noticeable (i.e., 3 dBA) noise increase.

Table 6: Typical Construction Equipment Vibration Levels lists vibration levels at 25 feet for typical construction equipment. Vibration levels at 15 feet, the nearest that heavy equipment would likely be to the existing onsite buildings, is also included in Table 6. Ground-borne vibration generated by construction equipment spreads through the ground and diminishes in magnitude with increases in distance. As indicated in Table 6, based on FTA data, vibration velocities from typical heavy construction equipment operations that would be used during Project construction range from 0.0007 to 0.192 in/sec PPV at 15 feet from the source of activity.

Table 6: Typical Construction Equipment Vibration Levels

Equipment	Peak Particle Velocity at 25 Feet (in/sec)	Peak Particle Velocity at 15 Feet (in/sec)[1]
Large Bulldozer	0.089	0.192
Caisson Drilling	0.089	0.192
Loaded Trucks	0.076	0.164
Jackhammer	0.035	0.075
Small Bulldozer/Tractors	0.003	0.007

[1] Calculated using the following formula: $PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$, where: PPV_{equip} = the peak particle velocity in in/sec of the equipment adjusted for the distance; PPV_{ref} = the reference vibration level in in/sec from Table 7-4 of the Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, 2018; D = the distance from the equipment to the receiver.

Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, 2018.

Table 6 shows that at 15 feet the vibration velocities from construction equipment would not exceed 0.192 in/sec PPV, which is below the FTA's 0.20 in/sec PPV threshold for building damage. It is also acknowledged that construction activities would occur throughout the Project site and would not be concentrated at the point closest to the nearest structure. Therefore, vibration impacts associated with Project construction would be less than significant.

Operational Vibration

Once operational, the Project would not be a significant source of groundborne vibration. Groundborne vibration surrounding the Project currently result from vehicular travel on the nearby local roadways. Operations of the proposed Project would include truck deliveries. Due to the rapid drop-off rate of ground-borne vibration and the short duration of the associated events, vehicular traffic-induced ground-borne vibration is rarely perceptible beyond the roadway right-of-way, and rarely results in vibration levels that cause damage to buildings in the vicinity. According to the FTA's Transit Noise and Vibration Impact Assessment Manual (2018), trucks rarely create vibration levels that exceed 70 VdB (equivalent to 0.012 inches per second PPV) when they are on roadways. Therefore, trucks operating at the Project site or along surrounding roadways would not exceed FTA thresholds for building damage or annoyance. Impacts would be less than significant in this regard.

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

Threshold 6.3 For a Project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the Project expose people residing or working in the Project area to excessive noise levels?

The nearest airport to the Project site is the San Bernardino International Airport located approximately 3.5 miles to the northeast. The Project is not within 2.0 miles of a public airport or within an airport land use plan. Additionally, there are no private airstrips located within the Project vicinity. Therefore, the Project would not expose people residing or working in the Project area to excessive airport- or airstrip-related noise levels and no mitigation is required.

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

7 REFERENCES

1. Berger, Elliott H.; Neitzel, Rick; and Kladden, Cynthia A.; *Noise Navigator Sound Level Database with Over 1700 Measurement Values*, July 6, 2010.
2. California Department of Transportation, *California Vehicle Noise Emission Levels*, 1987.
3. California Department of Transportation, *Traffic Noise Analysis Protocol*, 2020.
4. California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, 2013.
5. California Department of Transportation, *Transportation and Construction Vibration Guidance Manual*, 2020.
6. City of Colton, *Colton General Plan Noise Element*, 1987.
7. City of Colton, *Municipal Code*, 2022.
8. Cowan, James P., *Handbook of Environmental Acoustics,* 1994.
9. Federal Highway Administration, *Highway Traffic and Construction Noise - Problem and Response***,** April 2006.
10. Federal Highway Administration, *Noise Fundamentals,* 2017.
11. Federal Interagency Committee on Noise, *Federal Agency Review of Selected Airport Noise Analysis Issues*, 1992.
12. Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, 2018.
13. Harris, Cyril M., *Handbook of Noise Control*, 1979.
14. Kimley-Horn, *Traffic Study for: Colton Ashley Furniture Expansion Project*, November 2022.
15. U.S. Department of Labor, Occupational Safety and Health Standards, *29 CFR 1910* (Occupational Noise Exposure).
16. U.S. Environmental Protection Agency, *Protective Noise Levels (EPA 550/9-79-100)*, 1979.

Appendix A

Noise Modeling Data

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/1/2022
Case Description: Ashley Furniture Demo

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Residential	Residential	1	1	1

			Equipment			
Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Saw	No	20		89.6	600	0
Dozer	No	40		81.7	600	0
Tractor	No	40	84		600	0

			Results				
		Calculated (dBA)			Noise Limits (dBA)		
				Day		Evening	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq
Concrete Saw		68	61	N/A	80	N/A	N/A
Dozer		60.1	56.1	N/A	80	N/A	N/A
Tractor		62.4	58.4	N/A	80	N/A	N/A
	Total	68	63.7	N/A	80	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/1/2022
Case Description: Ashley Furniture overlapping activities

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Residential	Residential	1	1	1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	600	0
Concrete Mixer Truck	No	40		78.8	600	0
Crane	No	16		80.6	600	0
Generator	No	50		80.6	600	0
Grader	No	40	85		600	0
Paver	No	50		77.2	600	0
Roller	No	20		80	600	0
Dozer	No	40		81.7	600	0
Tractor	No	40	84		600	0
Welder / Torch	No	40		74	600	0

Results

	Calculated (dBA)		Noise Limits (dBA)			
			Day		Evening	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq
Compressor (air)	56.1	52.1	N/A	80	N/A	N/A
Concrete Mixer Truck	57.2	53.2	N/A	80	N/A	N/A
Crane	59	51	N/A	80	N/A	N/A
Generator	59	56	N/A	80	N/A	N/A
Grader	63.4	59.4	N/A	80	N/A	N/A
Paver	55.6	52.6	N/A	80	N/A	N/A
Roller	58.4	51.4	N/A	80	N/A	N/A
Dozer	60.1	56.1	N/A	80	N/A	N/A
Tractor	62.4	58.4	N/A	80	N/A	N/A
Welder / Torch	52.4	48.4	N/A	80	N/A	N/A
Total	63.4	65.2	N/A	80	N/A	N/A

*Calculated Lmax is the Loudest value.