

5.4 NOISE

This section of the Subsequent Draft Environmental Impact Report (SDEIR) discusses the fundamentals of sound; examines federal, state, and local noise guidelines, policies, and standards; reviews noise levels at existing receptor locations; evaluates potential noise impacts associated with the Crown City Medical Center project (proposed project); and provides mitigation to reduce noise impacts at sensitive residential locations. This evaluation uses procedures and methodologies specified by the US Environmental Protection Agency (EPA), the California Department of Transportation (Caltrans), the Federal Highway Administration (FHWA), and the Federal Transit Administration (FTA). Noise modeling datasheets are included as Appendix E to this SDEIR.

5.4.1 Environmental Setting

Noise is most often defined as unwanted sound. Although sound can easily be measured, the perception of noise and the physical response to sound complicate the analysis of its impact on people. People judge the relative magnitude of sound sensation in subjective terms such as “noisiness” or “loudness.”

The following are brief definitions of terminology used in this chapter:

- **Sound.** A disturbance created by a vibrating object, which, when transmitted by pressure waves through a medium such as air, is capable of being detected by a receiving mechanism, such as the human ear or a microphone.
- **Noise.** Sound that is loud, unpleasant, unexpected, or otherwise undesirable.
- **Decibel (dB).** A unitless measure of sound on a logarithmic scale.
- **A-Weighted Decibel (dBA).** An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.
- **Equivalent Continuous Noise Level (L_{eq}).** The mean of the noise level averaged over the measurement period, regarded as an average level.
- **Day-Night Level (L_{dn}).** The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the sound levels occurring during the period from 10 PM to 7 AM.
- **Community Noise Equivalent Level (CNEL).** The energy average of the A-weighted sound levels occurring during a 24-hour period with 5 dB added to the levels occurring from 7 PM to 10 PM and 10 dB added to the sound levels occurring from 10 PM to 7 AM.

L_{dn} and CNEL values rarely differ by more than 1 dB. As a matter of practice, L_{dn} and CNEL values are considered to be equivalent and are treated as such in this assessment.

Characteristics of Sound

When an object vibrates, it radiates part of its energy as acoustical pressure in the form of a sound wave. Sound can be described in terms of amplitude (loudness), frequency (pitch), or duration (time). The human hearing system is not equally sensitive to sound at all frequencies. Sound waves below 16 Hertz (Hz) are not heard at all and are “felt” more as a vibration. Similarly, while people with extremely sensitive hearing can hear sounds as high as 20,000 Hz, most people cannot hear above 15,000 Hz. In all cases, hearing acuity falls off rapidly above about 10,000 Hz and below about 200 Hz. Since the human ear is



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not equally sensitive to sound at all frequencies, a special frequency-dependent rating scale is usually used to relate noise to human sensitivity. The A-weighted decibel scale (dBA) performs this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear. That is, an A-weighted noise level deemphasizes low and very high frequencies of sound similar to the human ear's deemphasis of these frequencies. The normal range of human hearing extends from approximately 0 dBA to 140 dBA

Unlike linear units such as inches or pounds, decibels (dB) are measured on a logarithmic scale, representing points on a sharply rising curve. Because of the physical characteristics of noise transmission and noise perception, the relative loudness of sound does not closely match the actual amounts of sound energy. Changes of 1 to 3 dB are detectable under quiet, controlled conditions, and changes of less than 1 dBA are usually indiscernible. A 3 dB change in noise levels is considered the minimum change that is detectable with human hearing in outside environments. A change of 5 dB is readily discernible to most people in an exterior environment, whereas a 10 dBA change is perceived as a doubling (or halving) of the sound. Table 5.4-1, *Change in Sound Pressure Level*, presents the subjective effect of changes in sound pressure levels.

Change in Apparent Loudness	
± 3 dB	Threshold of human perceptibility
± 5 dB	Clearly noticeable change in noise level
± 10 dB	Half or twice as loud
± 20 dB	Much quieter or louder

Source: Bies and Hansen, *Engineering Noise Control*, 1988.

Sound dissipates exponentially with distance from the noise source. This phenomenon is known as “spreading loss.” For a single point source, sound levels decrease by approximately 6 dB for each doubling of distance from the source. This drop-off rate is appropriate for noise generated by onsite operation of stationary equipment or activity at a project site. If noise is produced by a line source, such as highway traffic, the sound decreases by 3 dB for each doubling of distance in a hard site environment. Line-source noise in a relatively flat environment with absorptive vegetation decreases by 4.5 dB for each doubling of distance.

When sound is measured for distinct time intervals, the statistical distribution of the overall sound level during that period can be obtained. The energy-equivalent sound level (L_{eq}) is the most common parameter associated with such measurements. The L_{eq} metric is a single-number noise descriptor that represents the average sound level over a given period of time. For example, the L_{50} noise level represents the noise level that is exceeded 50 percent of the time. This level is also representative of the level that is exceeded 30 minutes in an hour. Similarly, the L_{02} , L_{08} , and L_{25} values represent the noise levels that are exceeded 2, 8, and 25 percent of the time, or 1, 5, and 15 minutes per hour. Other values typically noted during a noise survey are the L_{min} and L_{max} . These values represent the minimum and maximum root-mean-square noise levels obtained over the measurement period.

Because community receptors are more sensitive to unwanted noise intrusion during the evening and at night, state law requires that, for planning purposes, an artificial dB increment be added to quiet-time noise levels in a 24-hour noise descriptor, either the Community Noise Equivalent Level (CNEL) or Day-Night Noise Level (L_{dn}).

Psychological and Physiological Effects of Noise

Physical damage to human hearing begins at prolonged exposure to noise levels higher than 85 dBA. Exposure to high noise levels affects our entire system, with prolonged noise exposure in excess of 75 dBA increasing body tensions and thereby affecting blood pressure, functions of the heart, and the nervous system. In comparison, extended periods of noise exposure above 90 dBA could result in permanent hearing damage. When the noise level reaches 120 dBA, a tickling sensation occurs in the human ear even with short-term exposure. This level of noise is called the threshold of feeling. As the sound reaches 140 dBA, the tickling sensation is replaced by pain in the ear. This is called the threshold of pain. A sound level of 160 to 165 dBA will result in dizziness or loss of equilibrium. A sound level of 190 dBA will rupture the eardrum and permanently damage the inner ear. Table 5.4-2 shows typical noise levels from various noise sources.

*Table 5.4-2
Typical Noise Levels from Noise Sources*

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110	Rock Band
Jet Flyover at 1,000 feet		
	100	
Gas Lawn Mower at three feet		
	90	
Diesel Truck at 50 feet, at 50 mph		Food Blender at 3 feet Garbage Disposal at 3 feet
	80	
Noisy Urban Area, Daytime		
	70	Vacuum Cleaner at 10 feet Normal speech at 3 feet
Commercial Area Heavy Traffic at 300 feet		
	60	
		Large Business Office Dishwasher Next Room
Quiet Urban Daytime	50	
Quiet Urban Nighttime Quiet Suburban Nighttime		Theater, Large Conference Room (background)
	40	
		Library
Quiet Rural Nighttime	30	
		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 1998, Table 9-2136.2.



Vibration Fundamentals

Vibration is an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. Vibration is normally associated with sources such as railroads, but can also be associated with construction equipment such as jackhammers, pile drivers, and hydraulic hammers. Vibration displacement is the distance that a point on a surface moves away from its original position. The instantaneous speed that a point on a surface moves is the

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velocity and the rate of change of the speed is the acceleration. Each of these descriptors can be used to correlate vibration to human response, building damage, and acceptable equipment vibration levels.

The three main wave types of concern in the propagation of groundborne vibrations are surface or Rayleigh waves, compression or P-waves, and shear or S-waves.

- Surface or Rayleigh waves travel along the ground surface. They carry most of their energy along an expanding cylindrical wave front, similar to the ripples produced by throwing a rock into a lake. The particle motion is more or less perpendicular to the direction of propagation (known as retrograde elliptical).
- Compression or P-waves are body waves that carry their energy along an expanding spherical wave front. The particle motion in these waves is longitudinal, in a push-pull motion. P-waves are analogous to airborne sound waves.
- Shear or S-waves are also body waves, carrying their energy along an expanding spherical wave front. Unlike P-waves, however, the particle motion is transverse, or perpendicular to the direction of propagation.

The peak particle velocity (PPV) or the root mean square (RMS) velocity is usually used to describe vibration amplitudes. PPV is defined as the maximum instantaneous peak of the vibration signal and RMS is defined as the square root of the average of the squared amplitude of the signal. PPV is more appropriate for evaluating potential building damage, whereas RMS is typically more suitable for evaluating human response.

The units for PPV and RMS velocity are normally inches per second (in/sec). Often, vibration is presented and discussed in dB units in order to compress the range of numbers required to describe the vibration. All PPV and RMS velocities are in in/sec and all vibration levels in this study are in dB relative to one microinch per second (abbreviated as VdB). The threshold of perception is approximately 65 VdB. Typically, groundborne vibration generated by human activities attenuates rapidly with distance from the source of the vibration. Even the more persistent Rayleigh waves decrease relatively quickly as they move away from the source of the vibration. Manmade vibration problems are, therefore, usually confined to short distances (500 feet or less) from the source.

Construction operations generally include a wide range of activities that can generate groundborne vibration. In general, blasting and demolition of structures generate the highest vibrations. Vibratory compactors or rollers, pile drivers, and pavement breakers can generate perceptible amounts of vibration at distances within 200 feet of the vibration sources. Heavy trucks can also generate groundborne vibrations, which vary depending on vehicle type, weight, and pavement conditions. Potholes, pavement joints, discontinuities, differential settlement of pavement, etc., all increase the vibration levels from vehicles passing over a road surface. Construction vibration is normally of greater concern than vibration of normal traffic on streets and freeways with smooth pavement conditions. Trains generate substantial quantities of vibration due to their engines, steel wheels, and heavy loads.

Regulatory Framework

To limit population exposure to physically and/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.

State of California Building Code

The State of California's noise insulation standards are codified in the California Code of Regulations, Title 24, Building Standards Administrative Code, Part 2, California Building Code. These noise standards are applied to new construction in California for the purpose of 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 60 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 residential buildings, schools, and hospitals, the acceptable interior noise limit for new construction is 45 dBA CNEL.

City of Pasadena Noise Standards

The City of Pasadena Comprehensive General Plan and Municipal Code provide regulations governing land use which are intended to guide future growth and development within the City. The General Plan is the fundamental planning policy document of the City, providing a blueprint for the identification of the location of land uses, and the basic design and function of circulation, open space and infrastructure policies as well as public service needs. Zoning is used by the City to regulate where specific uses may be located, and controls the size and types of such uses.

The City of Pasadena, through its General Plan, has adopted standards for noise compatibility for land uses. The guidelines, shown in Table 5.4-3, provide urban planners with a tool to gauge the compatibility of new land uses relative to existing and future noise levels. This table identifies clearly acceptable, normally acceptable, conditionally acceptable, and normally unacceptable noise levels for various land uses. General Plan Policies that are applicable to the project are listed below:

- | | |
|------------------|--|
| <i>Policy 2a</i> | <i>The City will encourage noise-compatible land uses along major roadways.</i> |
| <i>Policy 2b</i> | <i>The City will encourage site planning and traffic control measures that minimize the effects of traffic noise in residential zones.</i> |
| <i>Policy 2c</i> | <i>The City will encourage the use of alternative transportation modes as stipulated in the Mobility Element (walking, bicycling, transit use, electric vehicles) to minimize traffic noise in the City.</i> |
| <i>Policy 6a</i> | <i>The City will encourage automobile and truck access to industrial and commercial properties abutting residential zones to be located at the maximum practical distance from residential zones.</i> |
| <i>Policy 6b</i> | <i>The City will limit the use of motorized landscaping equipment, parking lot sweepers, and other high-noise equipment on commercial properties if their activity will result in noise that adversely affects residential zones.</i> |
| <i>Policy 6c</i> | <i>The City will encourage limitations on the hours of truck deliveries to industrial and commercial properties abutting residential zones unless there is no feasible alternative or there are substantial transportation benefits for scheduling deliveries at another hour.</i> |
| <i>Policy 7b</i> | <i>The City will encourage limitations on construction activities adjacent to sensitive noise receptors as defined in Figure 1 [See Table 5.4-3, below].</i> |
| <i>Policy 7c</i> | <i>The City will encourage construction and landscaping activities that employ techniques to minimize noise.</i> |



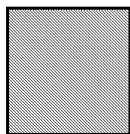
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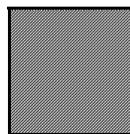
Table 5.4-3
Community Noise and Land Use Compatibility

Land Uses	CNEL (dBA)					
	55	60	65	70	75	80
Residential – Low Density Single Family, Duplex, Mobile Homes	Clearly Acceptable	Clearly Acceptable	Clearly Acceptable	Clearly Acceptable	Clearly Acceptable	Clearly Unacceptable
Residential – Multiple Family and Mixed Use Commercial/Residential Use	Clearly Acceptable	Clearly Acceptable	Clearly Acceptable	Clearly Acceptable	Clearly Unacceptable	Clearly Unacceptable
Transient Lodging – Motels, Hotels	Clearly Acceptable	Clearly Acceptable	Clearly Acceptable	Clearly Acceptable	Clearly Unacceptable	Clearly Unacceptable
Schools, Libraries, Churches, Hospitals, Nursing Homes	Clearly Acceptable	Clearly Acceptable	Clearly Acceptable	Clearly Acceptable	Clearly Unacceptable	Clearly Unacceptable
Auditoriums, Concert Halls, Amphitheaters	Clearly Acceptable	Clearly Acceptable	Clearly Acceptable	Clearly Acceptable	Clearly Unacceptable	Clearly Unacceptable
Sports Arena, Outdoor Spectator Sports	Clearly Acceptable	Clearly Acceptable	Clearly Acceptable	Clearly Acceptable	Clearly Unacceptable	Clearly Unacceptable
Playground, Neighborhood Parks	Clearly Acceptable	Clearly Acceptable	Clearly Acceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable
Golf Courses, Riding Stables, Water Recreation, Cemeteries	Clearly Acceptable	Clearly Acceptable	Clearly Acceptable	Clearly Acceptable	Clearly Unacceptable	Clearly Unacceptable
Office Buildings, Business Commercial and Professional	Clearly Acceptable	Clearly Acceptable	Clearly Acceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable
Industrial, Manufacturing, Utilities, Agricultural	Clearly Acceptable	Clearly Acceptable	Clearly Acceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable

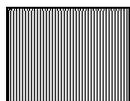
Explanatory Notes



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



Conditionally Unacceptable:
If new construction or development proceeds, an analysis of the noise reduction requirements should be made and needed noise insulation features included in the design.



Normally Acceptable:
New construction or development should be undertaken after an analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.



Normally Unacceptable:
New construction or development should generally not be undertaken, unless it can be demonstrated that an interior level of 45 dBA can be achieved.

Source: City of Pasadena General Plan.

Policy 7d *The City will enforce noise level restrictions contained in the City of Pasadena Noise Regulations (Chapter 9.36 of the Municipal Code), except during federal, State, or local emergencies (such as power generators required for energy emergencies).*

City of Pasadena Noise Standards

Stationary Noise Standard

The City of Pasadena regulates stationary source noise in Chapter 9.36 of the City's Municipal Code. Noise regulations are based on the increment of noise that a source generates above the ambient background noise level. Section 9.36.050 of the City's Municipal Code establishes a noise increase limit of 5 dB above the ambient noise environment. Similarly, Section 9.36.090 prohibits machinery, equipment, and fan and air conditioning units from generating noise that increases the ambient noise level by 5 dB at the property line of any property. Under the City's Municipal Code, ambient is defined as the actual measured ambient noise level.

Construction Hours and Noise Limit

The City of Pasadena through Section 9.36.070 of the Municipal Code limits construction activities within 500 feet of a residential district to the hours from 7:00 AM to 7:00 PM, Monday through Friday, and from 8:00 AM to 5:00 PM on Saturday. Construction and repair work is prohibited on Sunday and holidays. In addition, Section 9.36.080 of the City Municipal Code prohibits noise from operation of any powered construction equipment from exceeding 85 dBA within a radius of 100 feet.

Vibration Standards

Vibration is a trembling, quivering, or oscillating motion of the earth. Vibration is similar to noise in its transmission in that it is transmitted in noise-like waves through the earth and solid objects. A substantial amount of research has been completed to compare vibrations from single events such as dynamite blasts with architectural and structural damage. For example, the U.S. Bureau of Mines has set a safe limit of 0.5 inches per second peak particle velocity to avoid structure damage in residential structures (U.S. Bureau of Mines 1980). Below this level, there is virtually no risk of building damage. Similar to dynamite blasts, pile driving can cause significant ground vibration under certain circumstances. The Federal Transit Administration (FTA) has established vibration criteria to determine when vibration annoyance impacts are considered significant.

FTA Vibration Criteria

Vibration Annoyance

Groundborne noise is the vibration of floors and walls that may cause rattling of items such as windows or dishes on shelves, or a rumbling noise. The rumbling is created by the motion of the room surfaces, which act like a giant loudspeaker. The FTA provides criteria for acceptable levels of groundborne vibration based on the relative perception of a vibration event for vibration-sensitive land uses (see Table 5.4-4).

Vibration-Related Architectural Damage

The level at which groundborne vibration is strong enough to cause architectural damage has not been determined conclusively. The most conservative estimates are reflected in the FTA standards, shown in Table 5.4-5.



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Table 5.4-4

Groundborne Vibration and Noise Impact Criteria: Human Annoyance

Land Use Category	Max L_v (VdB) ¹	Description
Workshop	90	Distinctly felt vibration. Appropriate to workshops and nonsensitive areas
Office	84	Felt vibration. Appropriate to offices and nonsensitive areas.
Residential – Daytime	78	Barely felt vibration. Adequate for computer equipment.
Residential – Nighttime	72	Vibration not felt, but groundborne noise may be audible inside quiet rooms.

Source: FTA 2006.

¹ As measured in 1/3-octave bands of frequency over the frequency ranges of 8 to 80 Hz.

Table 5.4-5

Groundborne Vibration and Noise Impact Criteria: Architectural Damage

Building Category	PPV (in/sec)	VdB
I. Reinforced concrete, steel, or timber (no plaster)	0.5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
III. Nonengineered timber and masonry buildings	0.2	94
IV. Buildings extremely susceptible to vibration damage	0.12	90

Source: FTA 2006

Note: RMS velocity calculated from vibration level (VdB) using the reference of one microinch/second.

Vibration-related problems generally occur because structures amplify groundborne vibration. Wood-frame buildings, such as typical residential structures, are more easily excited by ground vibration than heavier buildings. According to the Caltrans's Transportation Related Earthborne Vibration (2002), extreme care must be taken when sustained pile driving occurs within 25 feet of any building; the threshold at which there is a risk of architectural damage to normal houses with plastered walls and ceilings is 0.2 in/sec, and 0.5 in/sec for structures constructed of reinforced steel and concrete.

Existing Noise Environment

The City of Pasadena is impacted by a multitude of noise sources, many of them directly connected with major arterials that divide the City. Mobile sources of noise, especially cars and trucks, are the most common and significant sources of noise in most communities. Noise from motor vehicles is generated by engine vibrations, the interaction between tires and the road, and the exhaust system. Reducing the average motor vehicle speed reduces the noise exposure of receptors adjacent to the road. Each reduction of five miles per hour reduces noise by about 1 dB.

To assess the potential for mobile-source noise impacts, it is necessary to determine the noise currently generated by vehicles traveling through the project area. Noise modeling of existing traffic noise levels was conducted using FHWA's Highway Traffic Noise Prediction model and the average daily traffic (ADT) volumes based on the traffic study prepared by Iteris (2012). Table 5.4-6 lists the weekday noise levels on roadways in the vicinity of the project site at 50 feet from the centerline of the roadway. The results of this modeling indicate that average 24-hour noise levels along roadways currently range from approximately 59 dBA to 75 dBA CNEL as calculated at a distance of 50 feet from the centerline of the roadway.

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*Table 5.4-6
Existing Traffic Noise Levels*

Segment	Existing				
	ADT Volumes	CNEL (dBA @ 50 ft)	Distance to CNEL Contour (Feet from Centerline)		
			60 (dBA CNEL)	65 (dBA CNEL)	70 (dBA CNEL)
Los Robles Avenue					
n/o Colorado Blvd	18,111	70.6	254	118	55
Btwn Colorado Blvd and Green St	18,133	70.6	255	118	55
s/o Green St	11,111	68.5	184	85	40
n/o Union St	20,976	71.2	281	130	60
Oakland Avenue					
Btwn Union St and Colorado Blvd	1,236	58.9	42	20	9
Btwn Colorado Blvd and Green St	2,320	61.7	65	30	14
s/o Green St	2,300	61.6	64	30	14
n/o Del Mar	653	56.2	28	13	6
s/o Del Mar	904	57.6	34	16	7
Madison Avenue					
Btwn Corson St and Walnut St	1,559	59.9	50	23	11
Btwn Walnut St and Union St	3,857	63.9	91	42	20
Btwn Union St and Colorado Blvd	3,386	63.3	83	39	18
Btwn Colorado Blvd and Green St	3,835	63.9	90	42	19
s/o Green St	2,300	61.6	64	30	14
n/o Del Mar	883	57.5	34	16	7
s/o Del Mar	306	52.9	17	8	4
El Molino Avenue					
n/o Corson St	7,689	66.9	144	67	31
Btwn Corson St and Walnut St	7,989	67.0	147	68	32
Btwn Walnut St and Union St	4,641	64.7	103	48	22
Btwn Union St and Colorado Blvd	6,692	66.3	131	61	28
Btwn Colorado Blvd and Green St	6,027	64.8	104	48	22
s/o Green St	5,921	64.7	103	48	22
Lake Avenue					
n/o Maple St	31,600	73.1	373	173	80
Btwn Maple St and Corson St	37,911	73.9	421	195	91
Btwn Corson St and Walnut St	37,578	73.8	418	194	90
Btwn Walnut St and Union St	34,211	73.4	393	182	85
Btwn Union St and Colorado Blvd	30,844	73.0	367	170	79
s/o Colorado Blvd	23,811	71.9	309	143	66
Maple Street					
w/o Lake Ave	20,344	71.2	278	129	60
e/o Lake Ave	17,411	70.5	250	116	54
Corson Street					
w/o Madison Ave	10,844	68.4	183	85	39
Btwn Madison Ave and El Molino Ave	12,133	68.9	197	91	42
Btwn El Molino Ave and Hudson Ave	11,678	68.8	192	89	41
Btwn Hudson Ave and Lake Ave	32,833	73.3	382	177	82
e/o Lake Ave	22,733	71.7	299	139	64



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Table 5.4-6
Existing Traffic Noise Levels

Segment	Existing				
	ADT Volumes	CNEL (dBA @ 50 ft)	Distance to CNEL Contour (Feet from Centerline)		
			60 (dBA CNEL)	65 (dBA CNEL)	70 (dBA CNEL)
Walnut Street					
w/o El Molino Ave	20,467	71.1	276	128	59
Btwn El Molino Ave and Hudson Ave	20,789	71.2	279	129	60
Btwn Hudson Ave and Lake Ave	22,622	71.6	295	137	64
e/o Lake Ave	20,478	71.1	276	128	60
Union Street					
w/o Oakland Ave	8775	67.5	157	73	34
Btwn Oakland Ave and Madison Ave	8,733	67.4	156	73	34
Btwn Madison Ave and El Molino Ave	8,867	67.5	158	73	34
Btwn El Molino Ave and Hudson Ave	8,678	67.4	156	72	34
Btwn Hudson Ave and Lake Ave	6,944	66.4	134	62	29
e/o Lake Ave	5,667	65.6	117	54	25
w/o Los Robles Ave	8,704	67.4	156	72	34
w/o Euclid Ave	6,878	66.4	133	62	29
w/o Garfield Ave	6,899	66.4	134	62	29
Colorado Boulevard					
w/o Los Robles Ave	20,789	71.3	282	131	61
Btwn Los Robles Ave and Oakland Ave	19,433	71.0	269	125	58
Btwn Oakland Ave and Madison Ave	19,511	71.0	270	125	58
Btwn Madison Ave and El Molino Ave	19,700	71.0	272	126	59
Btwn El Molino and Hudson Ave	20,044	71.1	275	128	59
Btwn Hudson Ave and Lake Ave	21,611	71.4	289	134	62
e/o Lake Ave	21,244	71.4	286	133	62
Green Street					
w/o Los Robles Ave	10,411	68.2	176	82	38
Btwn Los Robles and Oakland Ave	11,911	68.8	192	89	41
Btwn Oakland Ave and Madison Ave	11,933	68.8	193	89	42
Btwn Madison Ave El Molino Ave	12,278	68.9	196	91	42
e/o El Molino Ave	11,511	68.6	188	87	41
Cordova Street					
w/o El Molino Ave	6,666	66.3	131	61	28
w/o Madison Ave	7,113	66.5	136	63	29
w/o Oakland Ave	7,508	66.8	141	66	30
w/o Los Robles Ave	7,533	66.8	142	66	31
Del Mar Boulevard					
w/o El Molino Ave	12,620	69.0	200	93	43
w/o Madison Ave	12,269	68.9	196	91	42
w/o Oakland Ave	12,798	69.1	202	94	43

Source: FHWA Highway Traffic Noise Prediction Model.

Note: Traffic noise modeling is based on traffic volumes and speed limits obtained from the traffic analysis prepared by Iteris (2012).

btwn: between; e/o: east of; w/o: west of; n/o: north of; s/o: south of; n/a: Not Applicable

Sensitive Receptors

Certain land uses are particularly sensitive to noise and vibration. These uses include residential, school, and open space/recreation areas where quiet environments are necessary for enjoyment, public health, and safety. Commercial and industrial uses are typically not considered noise- and vibration-sensitive uses. In the City of Pasadena, sensitive noise receptors are primarily located in residential areas of the City. However, noise-sensitive receptors are also mixed within commercial land uses. Noise-sensitive land uses within the vicinity of the project site include the Trio, Oak Wood, and El Molino apartments to the north across Colorado Boulevard; Madison Apartments to the south; Pasadena Presbyterian Church directly across the project site to the north; and the First United Methodist Church to the west across Oakland Avenue.

5.4.2 Thresholds of Significance

According to Appendix G of the CEQA Guidelines, a project would normally have a significant effect on the environment if the project would result in:

- | | |
|-----|---|
| N-1 | Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies. |
| N-2 | Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels. |
| N-3 | A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project. |
| N-4 | A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project. |
| N-5 | For a project located within an airport land use plan or where such a plan has not been adopted, within two miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels. |
| N-6 | For a project within the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels. |



The Initial Study, included as Appendix A, substantiates that impacts associated with the following thresholds would be less than significant:

- Threshold N-5
- Threshold N-6

These impacts will not be addressed in the following analysis.

City of Pasadena Significance Thresholds

Stationary-Source Noise

Potential noise impacts were evaluated by local criteria established by the City of Pasadena for stationary-source noise control. Section 9.36.090 of the City Municipal Code regulates machinery, equipment, and fans and air conditioning units and prohibits these sources from generating noise that exceeds the ambient noise level by more than 5 dB at the property line of any property.

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Substantial Increase in Traffic Noise Levels

The traffic noise thresholds are based on human tolerance to noise and are widely used for assessing traffic noise impacts. In general, people tend to compare intruding noise with the existing background noise. If the new noise is readily identifiable or considerably louder than the background noise level, it has the potential to be objectionable or annoying (Caltrans 1998). Consequently, the threshold for increase in traffic noise levels is based on the potential for traffic noise to become considerably louder than the ambient noise level. The generally accepted level at which a change in community noise levels become perceptible is 3 to 5 dB. A 5.0 dB increase is readily noticeable. The human ear perceives a 10 dB increase in sound level as a doubling of sound. The Noise Ordinance generally limits the generation of noise that exceeds the existing ambient noise level by 5 dB(A). Based on the City's noise compatibility criteria of 60 dBA CNEL for residential uses, the City considers audible increases (i.e., +5 dB or more) in project-related traffic noise to be substantial when the ambient noise environment with the project exceeds 60 dBA CNEL.

A cumulative noise assessment evaluates noise increases that occur over a long period of time. An increase in community noise of 5 dBA is generally accepted as being readily perceptible. The significance threshold for a cumulative offsite traffic noise impact is that the total noise increase must exceed 5 dBA, the future noise level at a sensitive receptor must exceed 60 dBA or 65 dBA CNEL (for single-family and multifamily residential usages, respectively), and the project contribution to the noise increase must exceed 1 dBA.

Construction

The City of Pasadena's noise ordinance regulates the timing of construction activities. No construction is permitted outside of the hours specified under Section 9.36.070 of the City of Pasadena's Municipal Code (7:00 AM to 7:00 PM, Monday through Friday, from 8:00 AM to 5:00 PM on Saturday, and at no time on Sundays or federal holidays) when the activities occur within 500 feet of a residential district. In addition, Section 9.36.080 of the City Municipal Code prohibits noise from operation of any powered construction equipment from exceeding 85 dBA L_{eq} . The City of Pasadena restricts construction activities to the daytime hours. The potential for construction noise impacts to be objectionable depends on the magnitude of noise generated by the construction equipment, the frequency of noise sources during the construction day, and total duration of construction activities.

Vibration

Based on the FTA vibration criteria, vibration annoyance impacts are considered significant when average vibration levels produced by construction equipment would produce perceptible levels of vibration (78 VdB) during the daytime at offsite vibration-sensitive structures. In addition, the vibration level at which there is a risk of architectural damage is based on FTA structural damage criteria (0.2 in/sec for typical wood-framed buildings or 0.5 in/sec for reinforced concrete, steel, or timber).

5.4.3 Environmental Impacts

The following impact analysis addresses thresholds of significance for which the Initial Study disclosed potentially significant impacts. The applicable thresholds are identified in brackets after the impact statement.

5. Environmental Analysis

NOISE

IMPACT 5.4-1: PROJECT IMPLEMENTATION WOULD RESULT IN AN INCREASE IN TRAFFIC VOLUMES AND A CORRESPONDING INCREASE IN LONG-TERM OPERATION-RELATED NOISE THAT WOULD NOT EXCEED LOCAL STANDARDS. [THRESHOLDS N-1 AND N-3]

Impact Analysis: The project would generate noise associated with additional vehicles traveling to and from the project site on local roadways. Using information from the traffic study conducted by Iteris (2012), traffic noise modeling was compiled for existing, buildout year (2015) with project, and cumulative buildout year (2015) with- and without-project conditions. Table 5.4-7 compares the existing traffic noise conditions to the buildout year (2015) with the project's additional traffic contributions. Table 5.4-8 shows the 2015 cumulative conditions with and without the project's contributions.

Table 5.4-7
Project-Related Traffic Noise

Segment	Existing ADT	Existing CNEL (dBA @ 50 feet from centerline)	Increase in ADT Due to Project	2015 With-Project CNEL (dBA @ 50 feet from centerline)	Increase in 2015 CNEL Due to Project
Los Robles Avenue					
n/o Colorado Blvd	18,111	70.6	371	70.7	0.1
Btwn Colorado Blvd and Green St	18,133	70.6	0	70.6	0.0
s/o Green St	11,111	68.5	268	68.6	0.1
n/o Union St.	20,976	71.2	278	71.3	0.1
Oakland Avenue					
Btwn Union St and Colorado Blvd	1,236	58.9	556	60.5	1.6
Btwn Colorado Blvd and Green St	2,320	61.7	1,050	63.3	1.6
s/o Green St	2,300	61.6	350	62.2	0.6
n/o Del Mar	653	56.2	82	56.7	0.5
s/o Del Mar	904	57.6	0	57.6	0.0
Madison Avenue					
Btwn Corson St and Walnut St	1,559	59.9	62	60.1	0.2
Btwn Walnut St and Union St	3,857	63.9	62	64.0	0.1
Btwn Union St and Colorado Blvd	3,386	63.3	556	64.0	0.7
Btwn Colorado Blvd and Green St	3,835	63.9	1,174	65.1	1.2
s/o Green St	2,300	61.6	82	61.8	0.2
n/o Del Mar	883	57.5	0	57.5	0.0
s/o Del Mar	306	52.9	0	52.9	0.0
El Molino Avenue					
n/o Corson St	7,689	66.9	206	67.0	0.1
Btwn Corson St and Walnut St	7,989	67.0	185	67.1	0.1
Btwn Walnut St and Union St	4,641	64.7	206	64.9	0.2
Btwn Union St and Colorado Blvd	6,692	66.3	103	66.4	0.1
Btwn Colorado Blvd and Green St	6,027	64.8	103	64.9	0.1
s/o Green St	5,921	64.7	206	64.8	0.1
Lake Avenue					
n/o Maple St	31,600	73.1	329	73.1	0.0
Btwn Maple St and Corson St	37,911	73.9	432	73.9	0.0
Btwn Corson St and Walnut St	37,578	73.8	535	73.9	0.1
Btwn Walnut St and Union St	34,211	73.4	535	73.5	0.1



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Table 5.4-7
Project-Related Traffic Noise

Segment	Existing ADT	Existing CNEL (dBA @ 50 feet from centerline)	Increase in ADT Due to Project	2015 With-Project CNEL (dBA @ 50 feet from centerline)	Increase in 2015 CNEL Due to Project
Btwn Union St and Colorado Blvd	30,844	73.0	329	73.0	0.0
s/o Colorado Blvd	23,811	71.9	371	72.0	0.1
Maple Street					
w/o Lake Ave	20,344	71.2	0	71.2	0.0
e/o Lake Ave	17,411	70.5	103	70.5	0.0
Corson Street					
w/o Madison Ave	10,844	68.4	41	68.4	0.0
Btwn Madison Ave and El Molino Ave	12,133	68.9	21	68.9	0.0
Btwn El Molino Ave and Hudson Ave	11,678	68.8	0	68.8	0.0
Btwn Hudson Ave and Lake Ave	32,833	73.3	0	73.3	0.0
e/o Lake Ave	22,733	71.7	103	71.7	0.0
Walnut Street					
w/o El Molino Ave	20,467	71.1	0	71.1	0.0
Btwn El Molino Ave and Hudson Ave	20,789	71.2	0	71.2	0.0
Btwn Hudson Ave and Lake Ave	22,622	71.6	0	71.6	0.0
e/o Lake Ave	20,478	71.1	0	71.1	0.0
Union Street					
w/o Oakland Ave	8,775	67.5	515	67.7	0.2
Btwn Oakland Ave and Madison Ave	8,733	67.4	124	67.5	0.1
Btwn Madison Ave and El Molino Ave	8,867	67.5	556	67.8	0.3
Btwn El Molino Ave and Hudson Ave	8,678	67.4	453	67.6	0.2
Btwn Hudson Ave and Lake Ave	6,944	66.4	453	66.7	0.3
e/o Lake Ave	5,667	65.6	247	65.8	0.2
w/o Los Robles Ave	8,704	67.4	278	67.5	0.1
w/o Euclid Ave	6,878	66.4	278	66.6	0.2
w/o Garfield Ave	6,899	66.4	278	66.6	0.2
Colorado Boulevard					
w/o Los Robles Ave	20,789	71.3	124	71.3	0.0
Btwn Los Robles Ave and Oakland Ave	19,433	71.0	494	71.1	0.1
Btwn Oakland Ave and Madison Ave	19,511	71.0	124	71.0	0.0
Btwn Madison Ave and El Molino Ave	19,700	71.0	618	71.1	0.1
Btwn El Molino and Hudson Ave	20,044	71.1	412	71.2	0.1
Btwn Hudson Ave and Lake Ave	21,611	71.4	412	71.5	0.1
e/o Lake Ave	21,244	71.4	124	71.4	0.0
Green Street					
w/o Los Robles Ave	10,411	68.2	474	68.4	0.2
Btwn Los Robles and Oakland Ave	11,911	68.8	741	69.1	0.3
Btwn Oakland Ave and Madison Ave	11,933	68.8	82	68.8	0.0
Btwn Madison Ave El Molino Ave	12,278	68.9	721	69.1	0.2
e/o El Molino Ave	11,511	68.6	618	68.8	0.2
Cordova Street					
w/o El Molino Ave	6,666	66.3	82	66.4	0.1
w/o Madison Ave	7,113	66.5	82	66.5	0.0
w/o Oakland Ave	7,508	66.8	350	67.0	0.2
w/o Los Robles Ave	7,533	66.8	350	67.0	0.2

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*Table 5.4-7
Project-Related Traffic Noise*

Segment	Existing ADT	Existing CNEL (dBA @ 50 feet from centerline)	Increase in ADT Due to Project	2015 With-Project CNEL (dBA @ 50 feet from centerline)	Increase in 2015 CNEL Due to Project
Del Mar Boulevard					
w/o El Molino Ave	12,620	69.0	41	69.0	0.0
w/o Madison Ave	12,269	68.9	41	68.9	0.0
w/o Oakland Ave	12,798	69.1	41	69.1	0.0

Source: FHWA Highway Traffic Noise Prediction Model.

Note: Traffic noise modeling is based on traffic volumes and speed limits obtained from the Traffic Analysis prepared by Iteris (2012).

btwn: between; e/o: east of; w/o: west of; n/o: north of; s/o: south of; n/a: Not Applicable



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Table 5.4-8
Buildout Year 2015 Project Traffic Noise

Segment	Existing CNEL (dBA @ 50 feet from centerline)	No Project 2015		With Project 2015		Increase from Existing (Cumulative plus Project)	Project Contribution to Cumulative 2015 CNEL
		ADT	CNEL (dBA @ 50 feet from centerline)	ADT	CNEL (dBA @ 50 feet from centerline)		
Los Robles Avenue							
n/o Colorado Blvd	70.6	19,984	71.8	20,355	71.9	1.3	0.1
Btwn Colorado Blvd and Green St	70.6	19,915	71.8	19,915	71.8	1.2	0.0
s/o Green St	68.5	12,298	69.7	12,566	69.8	1.3	0.1
n/o Union St.	71.2	22,372	72.3	22,650	72.3	1.1	0.0
Oakland Avenue							
Btwn Union St and Colorado Blvd	58.9	1,300	59.9	1,856	61.5	2.6	1.6
Btwn Colorado Blvd and Green St	61.7	1,967	61.7	3,017	63.6	1.9	1.9
s/o Green St	61.6	1,844	61.4	2,194	62.2	0.6	0.8
n/o Del Mar	56.2	763	57.6	845	58.0	1.8	0.4
s/o Del Mar	57.6	1,025	58.9	1,025	58.9	1.3	0.0
Madison Avenue							
Btwn Corson St and Walnut St	59.9	2,093	62.0	2,155	62.1	2.2	0.1
Btwn Walnut St and Union St	63.9	4,256	65.1	4,318	65.1	1.2	0.0
Btwn Union St and Colorado Blvd	63.3	3,762	64.5	4,318	65.1	1.8	0.6
Btwn Colorado Blvd and Green St	63.9	4,618	65.4	5,792	66.4	2.5	1.0
s/o Green St	61.6	2,818	63.3	2,900	63.4	1.8	0.1
n/o Del Mar	57.5	1,052	59.0	1,052	59.0	1.5	0.0
s/o Del Mar	52.9	449	55.3	449	55.3	2.4	0.0
El Molino Avenue							
n/o Corson St	66.9	9,263	68.4	9,469	68.5	1.6	0.1
Btwn Corson St and Walnut St	67.0	9,574	68.6	9,759	68.7	1.7	0.1
Btwn Walnut St and Union St	64.7	9,589	68.6	9,795	68.7	4.0	0.1
Btwn Union St and Colorado Blvd	66.3	9,603	68.6	9,706	68.6	2.3	0.0
Btwn Colorado Blvd and Green St	64.8	8,831	67.2	8,934	67.2	2.4	0.0
s/o Green St	64.7	7,708	66.6	7,914	66.7	2.0	0.1
Lake Avenue							
n/o Maple St	73.1	34,658	74.2	34,987	74.3	1.2	0.1
Btwn Maple St and Corson St	73.9	42,197	75.1	42,629	75.1	1.2	0.0
Btwn Corson St and Walnut St	73.8	42,602	75.1	43,137	75.2	1.4	0.1

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Table 5.4-8
Buildout Year 2015 Project Traffic Noise

Segment	Existing CNEL (dBA @ 50 feet from centerline)	No Project 2015		With Project 2015		Increase from Existing (Cumulative plus Project)	Project Contribution to Cumulative 2015 CNEL
		ADT	CNEL (dBA @ 50 feet from centerline)	ADT	CNEL (dBA @ 50 feet from centerline)		
Btwn Walnut St and Union St	73.4	38,668	74.7	39,203	74.8	1.4	0.1
Btwn Union St and Colorado Blvd	73.0	35,057	74.3	35,386	74.3	1.3	0.0
s/o Colorado Blvd	71.9	28,290	73.4	28,661	73.4	1.5	0.0
Maple Street							
w/o Lake Ave	71.2	22,613	72.4	22,613	72.4	1.2	0.0
e/o Lake Ave	70.5	19,375	71.7	19,478	71.7	1.2	0.0
Corson Street							
w/o Madison Ave	68.4	11,924	69.6	11,965	69.6	1.2	0.0
Btwn Madison Ave and El Molino Ave	68.9	13,336	70.1	13,357	70.1	1.2	0.0
Btwn El Molino Ave and Hudson Ave	68.8	12,847	69.9	12,847	69.9	1.1	0.0
Btwn Hudson Ave and Lake Ave	73.3	36,013	74.4	36,013	74.4	1.1	0.0
e/o Lake Ave	71.7	25,624	72.9	25,727	72.9	1.2	0.0
Walnut Street							
w/o El Molino Ave	71.1	23,060	72.4	23,060	72.4	1.3	0.0
Btwn El Molino Ave and Hudson Ave	71.2	23,403	72.5	23,403	72.5	1.3	0.0
Btwn Hudson Ave and Lake Ave	71.6	25,610	72.9	25,610	72.9	1.3	0.0
e/o Lake Ave	71.1	22,886	72.4	22,886	72.4	1.3	0.0
Union Street							
w/o Oakland Ave	67.5	9,579	68.6	10,094	68.8	1.3	0.2
Btwn Oakland Ave and Madison Ave	67.4	9,814	68.7	9,938	68.8	1.4	0.1
Btwn Madison Ave and El Molino Ave	67.5	9,868	68.7	10,424	69.0	1.5	0.3
Btwn El Molino Ave and Hudson Ave	67.4	9,390	68.5	9,843	68.7	1.3	0.2
Btwn Hudson Ave and Lake Ave	66.4	7,642	67.6	8,095	67.9	1.5	0.3
e/o Lake Ave	65.6	6,197	66.7	6,444	66.9	1.3	0.2
w/o Los Robles Ave	67.4	9,540	68.6	9,818	68.7	1.3	0.1
w/o Euclid Ave	66.4	7,630	67.6	7,908	67.8	1.4	0.2
w/o Garfield Ave	66.4	7,652	67.6	7,930	67.8	1.4	0.2
Colorado Boulevard							
w/o Los Robles Ave	71.3	23,306	72.5	23,430	72.5	1.2	0.0
Btwn Los Robles Ave and Oakland Ave	71.0	21,922	72.3	22,416	72.4	1.4	0.1

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Table 5.4-8
Buildout Year 2015 Project Traffic Noise

Segment	Existing CNEL (dBA @ 50 feet from centerline)	No Project 2015		With Project 2015		Increase from Existing (Cumulative plus Project)	Project Contribution to Cumulative 2015 CNEL
		ADT	CNEL (dBA @ 50 feet from centerline)	ADT	CNEL (dBA @ 50 feet from centerline)		
Btwn Oakland Ave and Madison Ave	71.0	21,811	72.2	21,935	72.3	1.3	0.1
Btwn Madison Ave and El Molino Ave	71.0	22,189	72.3	22,807	72.4	1.4	0.1
Btwn El Molino and Hudson Ave	71.1	22,861	72.4	23,273	72.5	1.4	0.1
Btwn Hudson Ave and Lake Ave	71.4	24,604	72.8	25,016	72.8	1.5	0.0
e/o Lake Ave	71.4	23,676	72.6	23,800	72.6	1.2	0.0
Green Street							
w/o Los Robles Ave	68.2	11,622	69.4	12,096	69.6	1.4	0.2
Btwn Los Robles and Oakland Ave	68.8	13,167	70.0	13,908	70.2	1.4	0.2
Btwn Oakland Ave and Madison Ave	68.8	13,189	70.0	13,271	70.0	1.2	0.0
Btwn Madison Ave El Molino Ave	68.9	13,667	70.1	14,388	70.4	1.5	0.3
e/o El Molino Ave	68.6	13,233	70.0	13,851	70.2	1.6	0.2
Cordova Street							
w/o El Molino Ave	66.3	7,156	67.3	7,238	67.4	1.1	0.1
w/o Madison Ave	66.5	7,624	67.6	7,706	67.6	1.1	0.0
w/o Oakland Ave	66.8	8,117	67.9	8,467	68.1	1.3	0.2
w/o Los Robles Ave	66.8	8,037	67.8	8,387	68.0	1.2	0.2
Del Mar Boulevard							
w/o El Molino Ave	69.0	13,567	70.1	13,608	70.1	1.1	0.0
w/o Madison Ave	68.9	13,200	70.0	13,241	70.0	1.1	0.0
w/o Oakland Ave	69.1	13,754	70.2	13,795	70.2	1.1	0.0

Source: FHWA Traffic Noise Prediction Model.

Notes: Traffic noise modeling is based on traffic volumes and speed limits obtained from the Traffic Analysis prepared by Iteris (June, 2012).

btwn: between; e/o: east of; w/o: west of; n/o: north of; s/o: south of; n/a: Not Applicable

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Project-related noise impacts may occur if there are substantial noise increases (+5 dB or more) due to the project when CNEL is 60 dBA or greater in the vicinity of noise-sensitive land uses. As shown in Table 5.4-7, the highest project-related contribution to existing conditions is 1.6 dBA along the roadway segments Oakland Avenue between Union Street and Green Street (through Colorado Boulevard). Similarly, Table 5.4-8 shows the increase in the cumulative ambient due to the project would be 1.9 dBA along the roadway segment of Oakland Avenue between Colorado Boulevard and Green Street. Although the existing and future conditions for these segments are above 60 dBA CNEL, the project-specific increases are less than 5 dB and are, therefore, less than significant.

For cumulative noise increases due to a combination of area growth plus the project contributions, the highest project-related contribution is El Molino Avenue between Walnut Street and Union Street. Along this segment, whose existing and future CNEL noise environments are above 60 dBA, the total, cumulative increase would be 4.0 dBA (due to general growth in the area). However, the project contribution to that 4.0 dBA increase is only 0.1 dB. While the cumulative increase in ambient noise levels for the buildout year (2015) would be a substantial permanent noise increase due to traffic-related sources, the project-specific contributions to this cumulative increase would be less than significant.

IMPACT 5.4-2: STATIONARY SOURCES OF NOISE WOULD COMPLY WITH THE CITY'S MUNICIPAL CODE AND WOULD NOT SUBSTANTIALLY CONTRIBUTE TO THE AMBIENT NOISE ENVIRONMENT. [THRESHOLD N-3]

Impact Analysis: Stationary-source noise is regulated by the City of Pasadena through Chapter 9.36 of the City's Municipal Code. Development of the medical office building would introduce new stationary-source noise generated from mechanical systems (e.g., heating, ventilation and air conditioning [HVAC] units) loading and unloading activities. Another source of stationary noise would also be from parking. In general, stationary-source noise from commercial uses is not substantial because such sources are controlled through adherence to the Municipal Code and the ambient noise environment is dominated by roadway noise.



HVAC Systems and Use of Other Mechanical Equipment

Mechanical noise, such as HVAC systems, garbage compactors, and other equipment is regulated by Section 9.36.100 of the City's Municipal Code. The City of Pasadena requires that noise from new stationary sources within the City do not exceed the ambient noise level by more than 5 dB at the property line of any property. To achieve the noise standards of the Municipal Code, HVAC systems and other equipment would be selected based on their noise rating or would be acoustically engineered with mufflers and barriers to ensure that no exceedance of the City's noise standards would occur. Per Section 17.40.150 of the City Municipal Code, mechanical equipment would be required to be screened or located out of view from public rights-of-way. Adherence to the Municipal Code would ensure that stationary-source noise from these types of proposed land uses would not substantially increase the noise environment. Therefore, noise impacts from mechanical systems would be less than significant.

Parking Lot Noise

Typical parking lot noises would be car-door slams, car horns, car audio systems, people talking, engine idling, and car beeps. The most disruptive of these would be car alarms and horns because of the high volume. Additionally, noise from car idling and ingress and egress through the parking lot would contribute to the general parking lot or parking structure noise environment. Since the majority of parking would be provided in the five-level subterranean parking garage, noise related to parking would be fully enclosed and contained. The nominal ground-level parking would be shielded by the surrounding buildings. Further, the project site consists of a surface parking lot today which experiences typical

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parking lot noises that are not within an enclosed area. Therefore, parking lot noise generated from the project would be contained within the garage and impacts would be less than significant.

Truck Idling and Deliveries

Noise from truck loading/unloading activities and refuse collection would be primarily from the back-up warning bells and truck engine noise when backing up to the designated loading and refuse collection areas and from operation of the hydraulic lift. Noise levels from actual unloading and loading activities would be minimal, as activity within the truck interior would be shielded from the exterior environment. The designated loading/unloading and refuse collection areas would also be shielded by the proposed medical office building, the adjacent eight-story office building, and the multistory commercial/office building to the south. In addition, commercial trucks are prohibited from nonessential idling for more than five minutes when they are within 100 feet of any sensitive land use (residential, school, nursing home, etc.) under the California Air Resources Board's In-Use Idling Airborne Toxic Control Measure (CARB Rule 2485). Furthermore, Section 8.60.205 of the City Municipal Code prohibits refuse collection between 5:00 PM and 7:00 AM, which would limit this activity to the daytime hours. Considering these factors and the distance of the surrounding noise-sensitive receptors from the project, noise impacts from deliveries and refuse collection would be less than significant.

IMPACT 5.4-3: THE PROJECT-RELATED CONSTRUCTION ACTIVITIES WOULD GENERATE GROUND-BORNE VIBRATION THAT WOULD EXCEED THE FEDERAL TRANSIT ADMINISTRATION'S THRESHOLD FOR VIBRATION-INDUCED ARCHITECTURAL DAMAGE. [THRESHOLD N-2]

Impact Analysis: Operation of the project would not generate substantial levels of vibration due to the lack of vibration-generating sources, and therefore it is not analyzed below. Construction activities can generate varying degrees of ground vibration, depending on the construction procedures, construction equipment used, and proximity to vibration-sensitive uses. Operation of construction equipment generates vibrations that spread through the ground and diminish in amplitude with distance from the source. Ground vibrations from construction activities rarely reach levels that can damage structures, but can achieve the audible and perceptible ranges in buildings close to a construction site.

Vibration-Induced Architectural Damage

Building damage is not a factor for normal projects, with the exception of blasting and pile-driving during construction (FTA 2006). According to Caltrans, extreme care must be taken when sustained pile driving occurs within 25 feet of any building (Caltrans 2002). The proposed project does not involve rock blasting or pile driving. However, the proposed project would use a caisson drill and other heavy construction equipment within 25 feet of a vibration-sensitive structure, specifically the County of Los Angeles building at 532 East Colorado Boulevard, that could result in minor architectural damage.¹ For commercial buildings such as the County of Los Angeles building abutting the project site's western boundary, the FTA's criteria for architectural damage is 0.5 PPV (inches per second). According to the FTA impact assessment methodologies, this 0.5 PPV threshold may be exceeded by caisson drills, large off-road equipment, hoe rams, and/or loaded trucks, if they are operated at less than approximately eight feet from the receptor building. However, valid quantification at these very close distances is precluded by uncertainties such as the type and depth of topsoil, the compaction factor, the depth of underlying layers and/or bedrock, and the overall transfer mobility (for vibrational energy). Thus, definitive construction

¹ Architectural damage is characterized by minor cracks in plaster or drywall on walls and ceilings, as well as similar cosmetic issues, but not to the point of compromising structural soundness or threatening the basic integrity of the building shell.

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vibration impacts cannot be assessed for heavy equipment operations immediately next to the existing commercial building.

For conservatism, operation of a caisson drill, large off-road equipment, hoe rams, and loaded trucks within eight feet of the adjacent offsite building may result in PPV levels that exceed the FTA's criteria for vibration-induced architectural damage, and caution should be employed for these construction operations. Therefore, vibration-induced architectural impacts are potentially significant. Mitigation Measures are included that will reduce this potential impact to less than significant levels. They are included in Section 5.4.7 of this Chapter.

Vibration Annoyance

Vibration is typically noticed nearby when objects in a building generate noise from rattling windows or picture frames. It is typically not perceptible outdoors (FTA 2006), and therefore impacts are based on the distance to the nearest building. The effect on buildings near a construction site varies depending on soil type, ground strata, and receptor building construction. The generation of vibration can range from no perceptible effects at the lowest vibration levels, to low rumbling sounds and perceptible vibrations at moderate levels, to slight damage at the highest levels.

Vibration would primarily occur during the grading, excavation, and foundation phases of construction. Peak vibration levels occur when construction equipment operates adjacent to the property line. Although the maximum vibration could be perceptible in certain instances, peak vibration events occur infrequently; they occur during the least sensitive portions of the day; and the duration for which equipment would be working in close proximity would be limited. Additionally, construction activities are typically distributed throughout the project site. Table 5.4-9 shows vibration levels from construction equipment operating at the project site nearest to the surrounding sensitive receptors. Maximum vibration levels for the caisson drill and large off-road construction equipment would range from 63 to 73 VdB at the nearest off-site land uses and would not exceed the FTA criterion for vibration annoyance of 78 VdB. Therefore, impacts from vibration annoyance would be less than significant.



*Table 5.4-9
Construction-Related Vibration Annoyance*

Sensitive Land Use	Distance to Construction Area (Feet)³	Velocity Level (VdB)				
		Caisson Drill	Large Off-Road Equipment¹	Small Off-Road Equipment²	Jackhammers	Loaded Trucks
Pasadena Presbyterian Church	125	73	73	44	65	72
Oak Wood Apartments	315	65	65	36	57	64
Trio Apartments	415	63	63	34	55	62
Significance Threshold (VdB)	n/a	78	78	78	78	78
Exceeds Significance Thresholds?	n/a	No	No	No	No	No

Source: Based on methodology from FTA 2006.

Avg=Average

¹ Vibration levels equivalent to a large bulldozer or a hoe ram.

² Vibration levels equivalent to a small bulldozer.

³ Distance measured from the source to the building edge of the sensitive land use.

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IMPACT 5.4-4: CONSTRUCTION ACTIVITIES WOULD NOT RESULT IN SUBSTANTIAL TEMPORARY NOISE INCREASES IN THE VICINITY OF THE PROPOSED PROJECT. [THRESHOLD N-4]

Impact Analysis: Noise levels associated with construction activities would be higher than the ambient noise levels in the project area today, but would subside once construction of the proposed project is completed. Short-term noise would be generated from construction activities, including demolition, grading, and building construction. Two types of short-term noise impacts could occur during construction: (1) mobile noise from transport of workers and material deliveries and (2) stationary construction noise from use of onsite construction equipment. The following analysis describes construction noise impacts of the project:

Mobile Sources of Short-Term Construction Noise

The transport of workers and equipment to the construction site would incrementally increase noise levels along site access roadways. Approximately 80,000 cubic yards of soil would be exported during the two-month excavation phase of construction. Site excavation is estimated to generate up to 227 daily haul trips. Construction activities would generate approximately 5 to 117 daily construction workers' passenger vehicle trips depending on the construction phase. The maximum number of daily trips would occur during the excavation phase, with 227 daily haul trips and 5 daily workers' trips, totaling 232 daily trips. Construction activities could generate up to 117 workers' passenger vehicle trips per day during vertical building construction.²

Even though there would be a relatively high single-event noise exposure potential with passing trucks—a maximum noise level of 86 dBA at 50 feet (Caltrans 1998)—the expected number of trucks is minimal in comparison to average daily traffic volumes on the surrounding roadways. In addition, the 227 daily haul trips would only occur during the excavation stage which would occur over a four month period.

The worker trips and truck trips would be spread throughout the workday. In addition, construction trucks would be driving to and from the site during construction hours with the majority of the trips avoiding peak periods. The existing roadway volumes within the project study area range, on average, between 1,200 to 38,000 daily vehicular trips. Typically, to increase noise levels by 3 dB, a doubling of vehicle trips would be required. The relatively low volume of project-related construction worker and haul trips would be negligible compared to existing traffic volumes (i.e., maximum of 232 total daily trips compared to 1,200 to 38,000 daily vehicular trips is between 19.3 and 0.6 percent, respectively, and would result in average daily noise increases of less than 1 dB). Therefore, these impacts are less than significant at noise receptors along the construction routes.

Onsite Sources of Short-Term Construction Noise

Noise generated during construction is based on the type of equipment used, the location of the equipment relative to sensitive receptors, and the timing and duration of the noise-generating activities. Construction noise levels reported in Bolt et al. were used to estimate future construction noise levels for the proposed project. Noise levels are the average noise levels for each construction phase. Each stage involves the use of different kinds of construction equipment and therefore has its own distinct noise characteristics. The dominant noise source from most construction activities is the engine, and noise levels from construction activities are dominated by the loudest piece of construction equipment.

² Estimates based on methodology from the project's air quality analyses using the South Coast Air Quality Management District's California Emissions Estimator Model (CalEEMod), Version 2011.1.1.

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Project-related construction activities would take approximately 15 months to complete. In general, construction activities would elevate ambient noise levels during the daytime in the vicinity of the project site. The proposed office building and subterranean parking structure would require construction activities throughout the entire site. Noise levels from project-related construction activities were calculated from use of all applicable construction equipment based on the construction schedule and are shown in Table 5.4-10. The noise levels in the table are the average noise levels, which are based on the average distance that construction activities would occur from the nearby noise-sensitive receptors. The average noise levels represent the noise levels that noise-sensitive receptors would be exposed to the majority of the time.

Table 5.4-10
Average Project-Related Construction Noise Levels

Construction Phase	Noise Levels dBA L_{eq} ¹					
	Oak Wood Apartments (410 feet)	Trio Apartments (525 feet)	Pasadena Presbyterian Church (195 feet)	First United Methodist Church (320 feet)	First Church of Christ (375 feet)	At 100 Feet
Clearing/Grading/Demolition	66	64	72	68	66	78
Excavation ⁷	71	69	77	73	71	83
Foundation Construction	59	57	65	61	59	71
Building Construction	66	64	72	68	68	78
Finishing and Site Cleanup	71	69	77	73	71	83

Source: Based on Bolt, et al. 1971.

Notes: Based on analysis for Office Building, Hotel, Hospital, School, and Public Works with all applicable equipment in use.

Distances based on the average distance from the center of construction activities.

¹ Noise levels shown do not account for any noise attenuation from surrounding buildings and barriers.



As shown in the table, construction activities would result in elevated ambient noise levels. In general, while the magnitude of noise may be loud compared to the ambient noise environment, construction activities would fluctuate throughout the work day since equipment would not be in use at one location for an extended period of time. Construction-generated noise at the Oak Wood Apartments, which is the nearest residential land use, would range from 59 to 71 dBA L_{eq} . Construction-generated noise at the Trio Apartments would range from 57 to 69 dBA L_{eq} . These noise levels would be below the City's construction equipment noise limit of 85 dBA L_{eq} . The residents at these two apartment buildings would be exposed to noise generated during the ground clearing/grading and excavation phases for approximately 4 months and for 11 months during the remaining phases (general building construction). Construction noise at both apartment buildings would be partially attenuated from the intervening buildings (depending on the location of the construction activities), which can provide up to 15 dB noise attenuation (FHWA 2006). The outdoor pool area of the Oak Wood Apartments would be shielded by the apartment building itself in addition to the building directly to the south. Therefore, construction-generated noise would be reduced even further. Additionally, depending on the construction schedule, completion of the exterior shell of the medical office building would attenuate interior construction noise and noise from the subterranean parking garage. As a result, the duration of exposure to the noise levels associated with general building construction activities, as shown in Table 5.4-10, would also be reduced. The project would comply with the City of Pasadena's Municipal Code, limiting the hours for construction to the least noise-sensitive portions of the day (7:00 AM to 7:00 PM, Monday through Friday, from 8:00 AM to 5:00 PM on Saturday, and at no time on Sundays or federal holidays). Therefore, construction activities would not occur in the evening or late-night hours when residential land uses are more sensitive to noise. Based

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on these factors, construction noise impacts on the nearby residences are considered less than significant.

The surrounding churches—such as the Pasadena Presbyterian Church directly to the north across Colorado Boulevard, the First United Methodist Church to the west across Oakland Avenue, and the First Church of Christ to the south—would be exposed to construction-generated noise ranging from 59 to 77 dBA L_{eq} . However, construction activities would be restricted to (7:00 AM to 7:00 PM, Monday through Fridays and from 8:00 AM to 5:00 PM on Saturday. Since church services and programs would primarily be on Sundays they would not coincide with construction activities. Also, while the surrounding churches also have programs midweek, these programs generally start after 7:00 PM and would therefore not coincide with construction hours. Some church services may be offered on Saturdays which may result in noise exposure due to excavation activities up to 77 dBA L_{eq} at Pasadena Presbyterian Church, 73 dBA L_{eq} at First United Methodist Church, and 71 dBA L_{eq} at First Church of Christ. However, Pasadena Presbyterian Church is separated from the project site by Colorado Boulevard which is a four lane undivided principal arterial. Construction noise at the First United Methodist Church to the west and the First Church of Christ to the south would be further reduced due to the buildings intervening between these two locations and the project site. In addition, maximum noise exposure would be temporary in nature with the loudest excavation phase occurring over a four month period. Therefore, construction noise impacts on the surrounding churches are considered to be less than significant.

5.4.4 Cumulative Impacts

Mobile-Source Noise

Traffic noise increases on local roadways in the vicinity of the project site were shown in Table 5.4-7. The difference in traffic noise between the existing environment and 2015 conditions represents cumulative noise impacts, whereas the difference between the 2015 without project and with project conditions represents the project's contribution to cumulative noise increases. A significant cumulative noise impact would occur where cumulative noise increases by 5 dB or more, the project's cumulative contribution is 1 dB or more, and the ambient noise levels exceed the 60 dBA CNEL noise compatibility standard for single-family residential land uses and 65 dBA CNEL for multifamily and mixed-use commercial/residential land uses (see Table 5.4-3). As shown in Table 5.4-7, the cumulative noise levels would increase by a noticeable amount (4 dB) along the roadway segment of El Molino Avenue between Walnut Street and Union Street, but the project would only contribute 0.1 dB to the cumulative noise environment. Therefore, project-related traffic's incremental effect to future cumulative traffic noise environments for year 2015 conditions is not cumulatively considerable.

Stationary-Source Noise

Unlike transportation noise sources, whose effects can extend well beyond the limits of the project site, stationary-source noise generated by the project is limited to impacts to noise-sensitive receptors near the project site. Cumulative noise levels from stationary sources would be negligible at the nearest residences due to the distance between these noise sources and the nearest residential uses and limitations on the generation of noise, as required by the City of Pasadena in its Municipal Code. Therefore, stationary noise associated with the project would not be cumulatively considerable and would not result in a significant cumulative noise impact.

Construction Noise and Vibration

Like stationary-source noise, construction noise and vibration impacts are confined to a localized area of impact. Cumulative impacts would only occur if other projects were being constructed in the vicinity of the project at the same time as the project. There are a few related projects that could possibly be built at the

same time as the proposed project. The nearest related project is at 680 East Colorado Boulevard. However, due to the characteristics of the built environment and surrounding land uses (i.e., multistory buildings, mixed-use land uses, etc.), construction-generated noise and vibration would be contained in the near vicinity of each related project site. Furthermore, no significant noise impacts were identified for receptors surrounding the project site. Construction-related vibration impacts would be mitigated to a less than significant level. Therefore, cumulative noise vibration impacts are considered less than significant.

5.4.5 Existing Regulations and Standard Conditions

- City of Pasadena Municipal Code, Chapter 9.36, Noise Restrictions
- City of Pasadena Municipal Code, Section 8.60.205, Times of Collection
- City of Pasadena Municipal Code, Section 17.40.150, Screening
- California Green Building Standards, Title 24, Part 11, California Code of Regulations

5.4.6 Level of Significance Before Mitigation

Upon implementation of regulatory requirements and standard conditions of approval, the following impacts would be less than significant: 5.4-1, 5.4-2, and 5.4-4.

Without mitigation, the following impacts would be **potentially significant**:

- Impact 5.4-3 The project-related construction activities could potentially generate groundborne vibration that would exceed the FTA's threshold for vibration-induced architectural damage, but this potential impact is only for heavy equipment operations within approximately eight feet of the existing County of Los Angeles building.



5.4.7 Mitigation Measures

Impact 5.4-3

- 4-1 Prior to the issuance of the grading permit, the applicant shall prepare the final shoring plans. The final shoring plan shall require the shoring method to consist of steel soldier piles, placed in drilled holes and backfilled with concrete. This method would ensure that shoring does not use construction equipment that would generate vibration levels in excess of 0.5 inch per second at the County of Los Angeles building at 532 East Colorado Boulevard. The final shoring plan shall be approved by the Building Official or their designee. The construction contractor shall implement and note on all construction management plans the shoring method identified in the preconstruction meeting for work done within 10 feet of the County of Los Angeles building.

5.4.8 Level of Significance After Mitigation

Impact 5.4-3

Implementation of Mitigation Measure 4-1 would help preclude construction equipment vibration levels from exceeding 0.5 in/sec at the nearest offsite structure. Should architectural damage be documented (using the preconstruction baseline evaluation), the developer shall be responsible for repairing any project-related damage. Therefore, vibration-induced architectural damage impacts would be reduced to less than significant.

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