

IV.D NOISE AND VIBRATION

This chapter evaluates noise and vibration impacts associated with the implementation of the proposed project. The noise and vibration analysis in this section assesses: existing noise and vibration conditions at the project site and its vicinity, as well as short-term construction and long-term operational noise and vibration impacts associated with the proposed project. Mitigation measures for potentially significant impacts are recommended when appropriate to reduce noise and vibration levels.

EXISTING CONDITIONS

NOISE AND VIBRATION CHARACTERISTICS AND EFFECTS

Noise

Characteristics of Sound

Sound is technically described in terms of the loudness (amplitude) and frequency (pitch) of the sound. The standard unit of measurement for sound is the decibel (dB). The human ear is not equally sensitive to sound at all frequencies. The “A-weighted scale,” abbreviated dBA, reflects the normal hearing sensitivity range of the human ear. On this scale, the range of human hearing extends from approximately 3 to 140 dBA. **Figure IV.D-1** provides examples of A-weighted noise levels from common sounds.

Noise Definitions

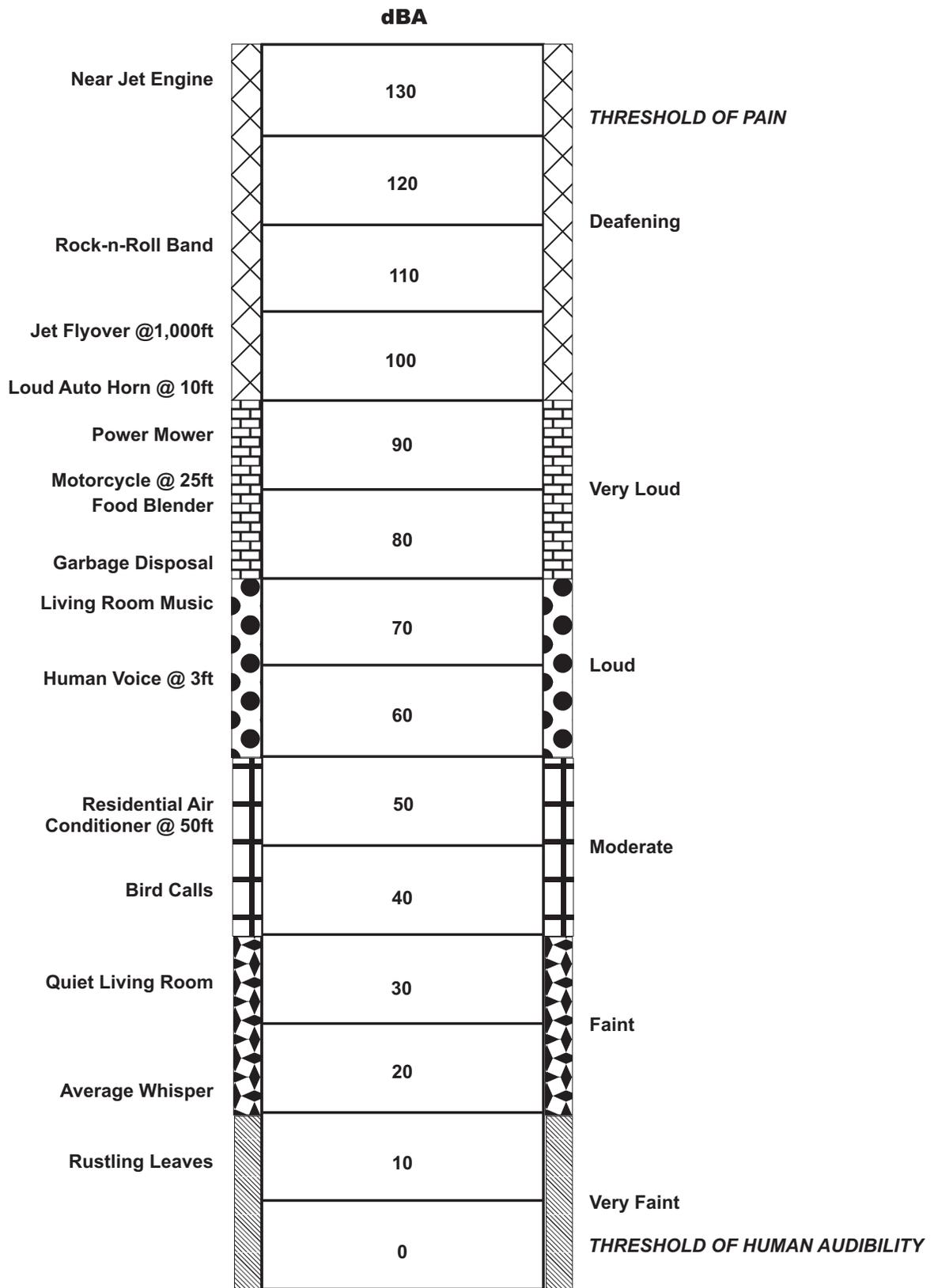
This noise analysis discusses sound levels in terms of Community Noise Equivalent Level (CNEL) and Equivalent Noise Level (L_{eq}).

Community Noise Equivalent Level

CNEL is an average sound level during a 24-hour period. CNEL is a noise measurement scale, which accounts for noise source, distance, single event duration, single event occurrence, frequency, and time of day. Human reaction to sound between 7:00 p.m. and 10:00 p.m. is as if the sound were actually 5 dBA higher than if it occurred from 7:00 a.m. to 7:00 p.m. From 10:00 p.m. to 7:00 a.m., humans perceive sound as if it were 10 dBA higher due to the lower background level. Hence, the CNEL is obtained by adding an additional 5 dBA to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and 10 dBA to sound levels in the night from 10:00 p.m. to 7:00 a.m. Because CNEL accounts for human sensitivity to sound, the CNEL 24-hour figure is always a higher number than the actual 24-hour average.

Equivalent Noise Level

L_{eq} is the average noise level on an energy basis for any specific time period. The L_{eq} for one hour is the energy average noise level during the hour. The average noise level is based on the energy content (acoustic energy) of the sound. L_{eq} can be thought of as the level of a continuous noise which has the same energy content as the fluctuating noise level. The equivalent noise level is expressed in units of dBA.



SOURCE: Cowan, James P., *Handbook of Environmental Acoustics*

Effects of Noise

Noise is generally defined as unwanted sound. The degree to which noise can impact the human environment range from levels that interfere with speech and sleep (annoyance and nuisance) to levels that cause adverse health effects (hearing loss and psychological effects). Human response to noise is subjective and can vary greatly from person to person. Factors that influence individual response include the intensity, frequency, and pattern of noise, the amount of background noise present before the intruding noise, and the nature of work or human activity that is exposed to the noise source.

Audible Noise Changes

Studies have shown that the smallest perceptible change in sound level for a person with normal hearing sensitivity is approximately 3 dBA. A change of at least 5 dBA would be noticeable and would likely evoke a community reaction. A 10-dBA increase is subjectively heard as a doubling in loudness and would cause a community response.

Noise levels decrease as the distance from the noise source to the receiver increases. Noise generated by a stationary noise source, or "point source," will decrease by approximately 6 dBA over hard surfaces (e.g., reflective surfaces such as parking lots or smooth bodies of water) and 7.5 dBA over soft surfaces (e.g., absorptive surfaces such as soft dirt, grass, or scattered bushes and trees) for each doubling of the distance. For example, if a noise source produces a noise level of 89 dBA at a reference distance of 50 feet, then the noise level would be 83 dBA at a distance of 100 feet from the noise source, 77 dBA at a distance of 200 feet, and so on. Noise generated by a mobile source will decrease by approximately 3 dBA over hard surfaces and 4.5 dBA over soft surfaces for each doubling of the distance.

Generally, noise is most audible when traveling by direct line-of-sight.¹ Barriers, such as walls, berms, or buildings, that break the line-of-sight between the source and the receiver greatly reduce noise levels from the source since sound can only reach the receiver by bending over the top of the barrier (diffraction). Sound barriers can reduce sound levels by up to 20 dBA. However, if a barrier is not high or long enough to break the line-of-sight from the source to the receiver, its effectiveness is greatly reduced.

Applicable Regulations

Construction Noise

The City of Pasadena has established policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise sensitive land uses. Regarding construction, the Pasadena Municipal Code (PMC) limits construction or repair work to between the hours of 7:00 a.m. to 7:00 p.m. Monday through Friday and between 8:00 a.m. to 5:00 p.m. on Saturdays, and prohibits such activity at any time on Sunday.² In addition to the time constraints on construction activity, the PMC regulates construction equipment noise. Any powered equipment or hand tool that produces a maximum noise level exceeding 85 dBA at a distance of 100 feet is prohibited.³

¹ Line-of-sight is an unobstructed visual path between the noise source and the noise receptor.

² City of Pasadena Municipal Code website, Chapter 9.36.070, accessed August 11, 2009.

³ City of Pasadena Municipal Code website, Chapter 9.36.080, accessed August 11, 2009.

Operational Noise

The PMC specifies that “[i]t is unlawful for any person to create, cause, make or continue to make or permit to be made or continued any noise or sound which exceeds the ambient noise level at the property line of any property by more than 5 decibels.” This 5-dBA increase includes operation of any machinery, equipment, pumps, fans, air conditioning apparatus or similar mechanical device.⁴ The PMC also specifies the maximum interior noise standards for multi-family residential properties when measured within the dwelling unit or within 20 feet outside of the dwelling unit. Between the hours of 7:00 a.m. to 10:00 p.m. the maximum interior noise levels cannot exceed 60 dBA, and between the hours of 10:00 p.m. to 7:00 a.m. the next day the maximum interior noise levels cannot exceed 50 dBA.⁵

Vibration

Characteristics of Vibration

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 can be a serious concern, causing buildings to shake and rumbling sounds to be heard. In contrast to noise, vibration is not a common environmental problem. It is unusual for vibration from sources such as buses and trucks to be perceptible, even in locations close to major roads. Some common sources of vibration are trains, buses on rough roads, and construction activities, such as blasting, pile driving, and heavy earth-moving equipment.

Vibration Definitions

There are several different methods that are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts to buildings and is usually measured in inches per second. The root mean square (RMS) amplitude is most frequently used to describe the effect of vibration on the human body. The RMS amplitude is defined as the average of the squared amplitude of the signal. Decibel notation (Vdb) is commonly used to measure RMS. The decibel notation acts to compress the range of numbers required to describe vibration.⁶

Effects of Vibration

High levels of vibration may cause physical personal injury or damage to buildings. However, ground-borne vibration levels rarely affect human health. Instead, most people consider ground-borne vibration to be an annoyance that may affect concentration or disturb sleep. In addition, high levels of ground-borne vibration may damage fragile buildings or interfere with equipment that is highly sensitive to ground-borne vibration (e.g., electron microscopes).

To counter the effects of ground-borne vibration, the Federal Transit Administration (FTA) has published guidance relative to vibration impacts. According to the FTA, standard reinforced-concrete buildings can be exposed to ground-borne vibration levels of 0.5 inches per second without experiencing structural damage.⁷ Buildings extremely susceptible to vibration damage

⁴ City of Pasadena Municipal Code website, Chapter 9.36.050 and 9.36.090, accessed August 11, 2009.

⁵ City of Pasadena Municipal Code website, Chapter 9.36.060, accessed August 11, 2009.

⁶ Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, May 2006.

⁷ *Ibid.*

can be exposed to ground-borne vibration levels of 0.12 inches per second without experiencing structural damage.

Perceptible Vibration Changes

In contrast to noise, ground-borne vibration is not a phenomenon that most people experience every day. The background vibration velocity level in residential areas is usually 50 RMS or lower, well below the threshold of perception for humans which is around 65 RMS.⁸ Most perceptible indoor vibration is caused by sources within buildings, such as operation of mechanical equipment, movement of people, or slamming of doors. Typical outdoor sources of perceptible ground-borne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If the roadway is smooth, the vibration from traffic is rarely perceptible.

Applicable Regulations

There are no adopted City standards for ground-borne vibration.

Existing Noise Environment

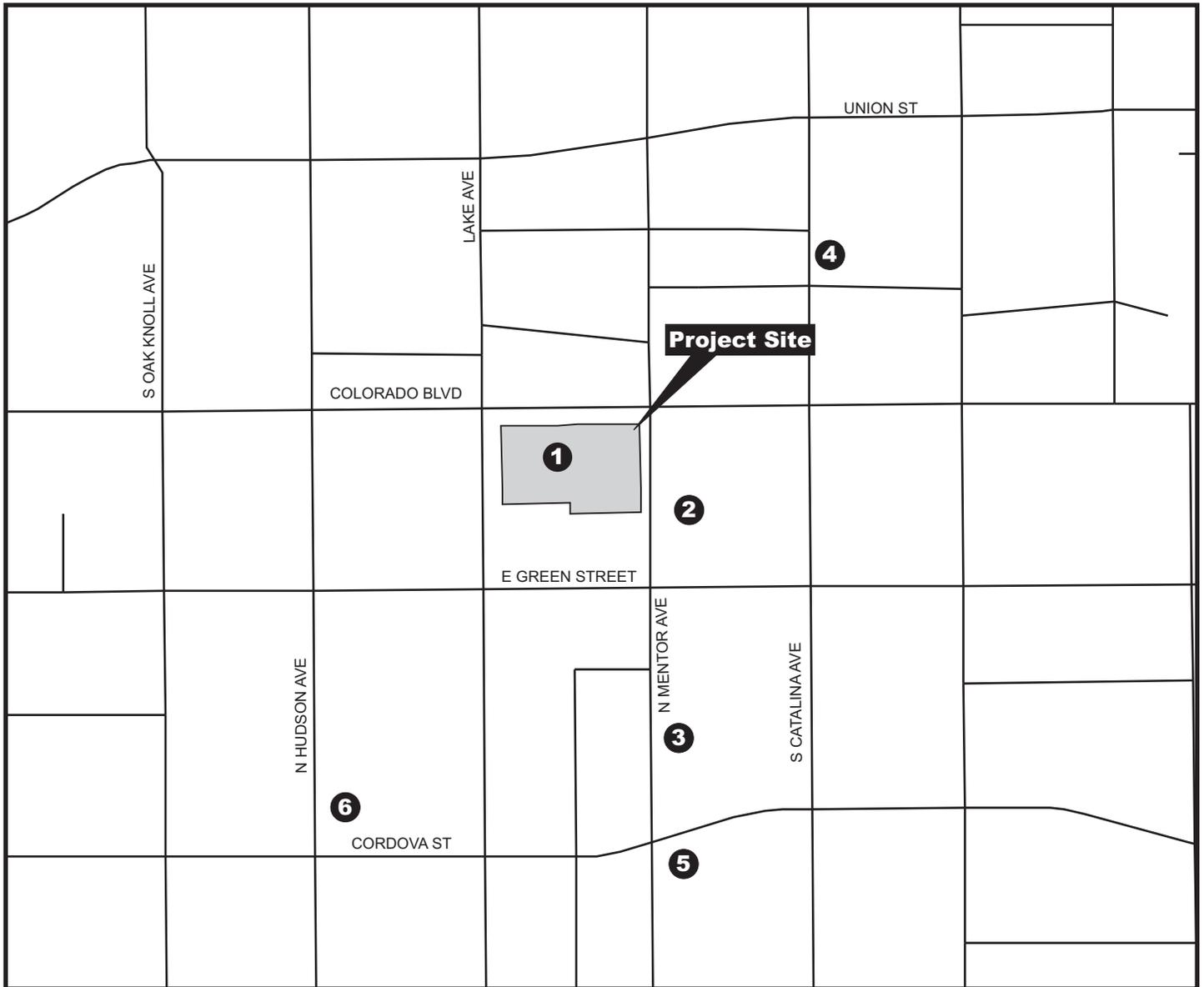
The existing noise environment of the project area is characterized by vehicular traffic and noises typical to a dense urban area (e.g., sirens, horns, helicopters, etc.). Vehicular traffic is the primary source of noise in the project vicinity.

Sound measurements were taken using a SoundPro DL Sound Level Meter between 7:00 a.m. and 12:30 p.m. on August 12, 2009 to determine existing ambient daytime noise levels in the project vicinity. These readings were used to establish existing ambient noise conditions and to provide a baseline for evaluating construction and operational noise impacts. Noise monitoring locations are shown in **Figure IV.D-2**. As shown in **Table IV.D-1**, existing ambient sound levels range from 54.3 to 64.7 dBA L_{eq} for peak hour, and from 54.0 to 62.2 dBA L_{eq} for off-peak hour measurements.

Existing Vibration Environment

There are not any stationary sources of vibration located near the project site. Heavy-duty trucks can generate ground-borne vibrations that vary depending on vehicle type, weight, and pavement conditions. However, vibration levels from adjacent roadways are not typically perceptible at the project site.

⁸ *Ibid.*



LEGEND:

-  Project Site
-  Monitoring Locations
- 1.** Project Site
- 2.** Multi-Family Residences
- 3.** Multi-Family Residences
- 4.** Multi-Family Residences
- 5.** Multi-Family Residences
- 6.** Multi-Family Residences

SOURCE: TAHA, 2010

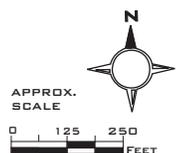


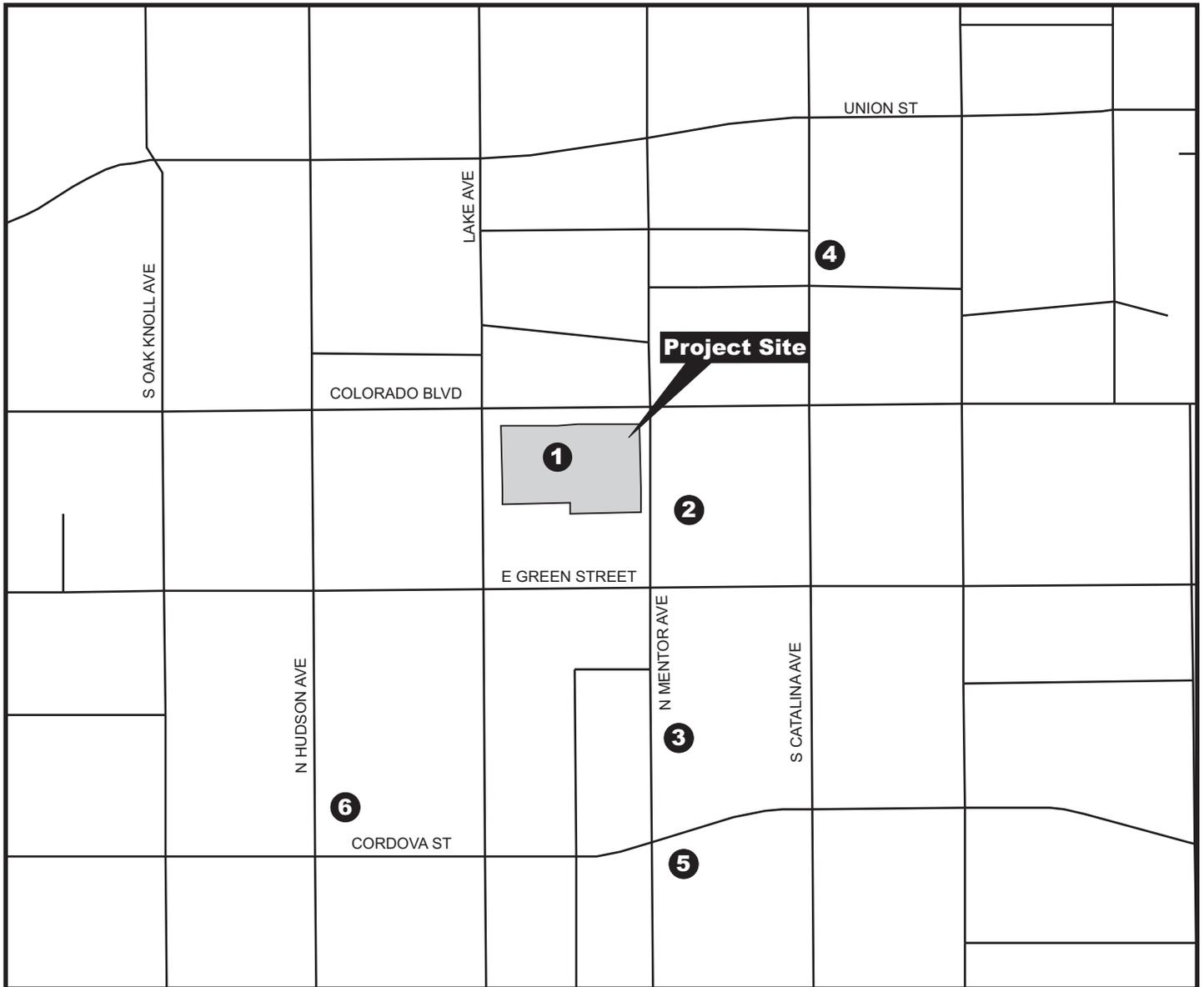
TABLE IV.D-1 Existing Noise Levels – AM Peak Hour and AM Mid-Morning			
Key	Noise Monitoring Location	Distant from Project Site (feet)	Sound Level (dBA, L _{eq})
PEAK HOUR MEASUREMENTS			
1	Boston Court Performing Arts Center north of project site	425	58.7
2	Multi-family residences northeast of the project site	1,320	54.3
3	Multi-family residence east of the project site	65	61.1
4	North side of project site along Colorado Boulevard	10	64.7
5	West side of project site along Lake Avenue	10	63.5
6	Multi-family residences south of project site along Mentor Avenue	580	57.4
7	Multi-family residences southeast of the project site	1,320	55.1
8	Multi-family residences southwest of the project site	1,320	54.3
OFF-PEAK HOUR MEASUREMENTS			
1	Boston Court Performing Arts Center north of project site	425	56.3
2	Multi-family residences northeast of the project site	1,320	54.0
3	Multi-family residence east of the project site	65	59.4
4	North side of project site along Colorado Boulevard	10	62.2
5	West side of project site along Lake Avenue	10	61.4
6	Multi-family residences south of project site along Mentor Avenue	580	56.5
7	Multi-family residences southeast of the project site	1,320	54.6
8	Multi-family residences southwest of the project site	1,320	54.2
SOURCE: Terry A. Hayes Associates LLC, <i>Air Quality and Noise Impact Report</i> , June 29, 2010.			

Sensitive Receptors

Noise- and vibration-sensitive land uses are locations where people reside or where the presence of unwanted sound could adversely affect the use of the land. Residences, schools, hospitals, guest lodging, libraries, and some passive recreation areas would each be considered noise- and vibration-sensitive and may warrant unique measures for protection from intruding noise. As shown in **Figure IV.D-3**, the nearest sensitive receptors to the project site include the following:

- A multi-family residential building approximately 65 feet east of the project site
- A Boston Court Performing Arts Center located approximately 425 feet north of the project site
- Multi-family residences approximately 580 feet south of the project site
- Multi-family residences approximately 675 feet northeast of the project site
- Multi-family residences approximately 750 feet southeast of the project site
- Multi-family residences approximately 1,150 feet southwest of the project site

The former Hotel Constance on the east side of the project site at the corner of Colorado Boulevard and Mentor Avenue is an historical structure constructed in 1926. The hotel will be renovated as part of the proposed project and is sensitive to damaging vibration levels.



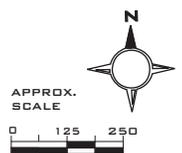
LEGEND:

 Project Site

 Sensitive Receptor Locations

- 1. Project Site
- 2. Multi-Family Residences
- 3. Multi-Family Residences
- 4. Multi-Family Residences
- 5. Multi-Family Residences
- 6. Multi-Family Residences

SOURCE: TAHA, 2010



Vehicular Traffic

Vehicular traffic is the predominant noise source in the project vicinity. Using existing traffic volumes provided by the project traffic consultant and the Federal Highway Administration (FHWA) RD-77-108 noise calculation formulas, the CNEL was calculated for various roadway segments near the project site. Existing weekday and weekend mobile noise levels are shown in **Table IV.D-2**. As shown in **Table IV.D-2**, mobile noise levels in the project area range from 61.2 to 70.2 dBA CNEL. Modeled vehicle noise levels are typically lower than the noise measurements along similar roadway segments as modeled noise levels do not take into account additional noise sources (e.g., sirens, horns, helicopters, etc.).

TABLE IV.D-2 Existing Estimated Community Noise Equivalent Level	
Roadway Segment	Estimated CNEL (dBA)
Colorado Boulevard between Lake Avenue and North Mentor Avenue	67.8
Mentor Avenue Between Colorado Boulevard and Walnut Street	62.0
Colorado Boulevard between North Mentor Avenue and North Catalina Avenue	67.9
Mentor Avenue Between Colorado Boulevard and East Green Street	61.2
Lake Avenue Between Colorado Boulevard and East Green Street	70.2

SOURCE: Terry A. Hayes Associates LLC, *Air Quality and Noise Impact Report*, June 29, 2010.

ENVIRONMENTAL IMPACT

METHODOLOGY

The noise analysis considers construction, operational, and vibration sources. Construction noise levels are based on information obtained from the USEPA's *Noise from Construction Equipment and Operations, Building Equipment and Home Appliances*.⁹ The noise level during the construction period at each receptor location was calculated by (1) making a distance adjustment to the construction source sound level and (2) logarithmically adding the adjusted construction noise source level to the ambient noise level. Operational noise levels were calculated based on information provided in the traffic study and stationary noise sources located on the project site (e.g., mechanical equipment). Vibration levels were estimated based on information provided by the FTA.¹⁰

THRESHOLDS OF SIGNIFICANCE

Construction Criteria

Based on the PMC, the proposed project would result in significant noise impacts if:

- Construction equipment noise levels exceed 85 dBA at 100 feet; and/or

⁹ USEPA, *Noise from Construction Equipment and Operations, Building Equipment and Home Appliances*, PB 206717, 1971.

¹⁰ Federal Transit Authority, *Transit Noise and Vibration Impact Assessment*, May 2006.

- Construction activities would commence outside the hours of listed in the PMC (7:00 a.m. to 7:00 p.m. Monday through Friday, 8:00 a.m. to 5:00 p.m. on Saturday, or anytime on Sunday).

Operational Criteria

A significant operational noise impact would result if:

- The proposed project causes the ambient noise level measured at the property line of the affected uses to increase by 3 dBA CNEL to or within the “normally unacceptable” or “clearly unacceptable” categories, as shown in **Table IV.D-3**, or any 5-dBA or more increase in noise level.

Ground-borne Vibration Criteria

There are no adopted State or City of Pasadena ground-borne vibration standards. Based on federal guidelines, the proposed project would result in a significant construction or operational vibration impact if:

- The proposed project would expose buildings to vibration levels of 0.5 inches per second, or would expose historic buildings to vibration levels of 0.12 inches per second.

TABLE IV.D-3 Land Use Compatibility For Community Noise Environments							
Land Use Category	Community Noise Exposure (dBA, CNEL)						
	55	60	65	70	75	80	
Residential - Low Density Single-Family, Duplex, Mobile Homes							
Residential - Multi-Family							
Transient Lodging - Motels Hotels							
Schools, Libraries, Churches, Hospitals, Nursing Homes							
Auditoriums, Concert Halls, Amphitheaters							
Sports Arena, Outdoor Spectator Sports							
Playgrounds, Neighborhood Parks							
Golf Courses, Riding Stables, Water Recreation, Cemeteries							
Office Buildings, Business Commercial and Professional							
Industrial, Manufacturing, Utilities, Agriculture							
 Normally Acceptable - Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction without any special noise insulation requirements.							
 Conditionally Acceptable - New construction or development should be undertaken only after a detailed 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 system or air conditionally will normally suffice.							
 Normally Unacceptable - New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.							
 Clearly Unacceptable - New construction or development should generally not be undertaken.							
SOURCE: City of Pasadena, <i>General Plan Noise Element</i> , 2002.							

CONSTRUCTION IMPACTS

Construction Noise

Construction of the proposed project would result in temporary increases in ambient noise levels in the project area on an intermittent basis. The increase in noise would occur during the approximate 38-month construction schedule. Noise levels would fluctuate depending on the construction phase, equipment type and duration of use, distance between the noise source and receptor, and presence or absence of noise attenuation barriers. Construction activities typically require the use of numerous pieces of noise-generating equipment. Typical noise levels from various types of equipment that may be used during construction are listed in **Table IV.D-4**. The table shows noise levels at distances of 50 and 100 feet from the construction noise source.

TABLE IV.D-4 Maximum Noise Levels of Common Construction Machines		
Noise Source	Noise Level (dBA)	
	50 Feet ¹	100 Feet ¹
Front Loader	80	74
Trucks	89	83
Cranes (derrick)	88	82
Jackhammers	90	84
Generators	77	71
Back Hoe	84	78
Tractor	88	82
Scraper/Grader	87	81
Paver	87	81
Impact Pile Driving	101	95
Auger Drilling	77	71

¹ Assumes a 6-dBA drop-off rate for noise generated by a "point source" and traveling over hard surfaces. Actual measured noise levels of the equipment listed in this table were taken at distances of ten and 30 feet from the noise source.

SOURCE: USEPA, *Noise from Construction Equipment and Operations, Building Equipment and Home Appliances*, PB 206717, 1971.

The noise levels shown in **Table IV.D-5** take into account the likelihood that more than one piece of construction equipment would be in operation at the same time and lists the typical overall noise levels that would be expected for each phase of construction. The highest noise levels are expected to occur during the grading/excavation and finishing phases of construction. A typical piece of noisy equipment is assumed to be active for 40 percent of the eight-hour workday (consistent with the USEPA studies of construction noise), generating a noise level of 89 dBA L_{eq} at a reference distance of 50 feet.

TABLE IV.D-5 Outdoor Construction Noise Levels	
Construction Phase	Noise Level At 50 Feet (dBA)
Ground Clearing	84
Grading/Excavation	89
Foundations	78
Structural	85
Finishing	89

SOURCE: USEPA, *Noise from Construction Equipment and Operations, Building Equipment and Home Appliances*, PB 206717, 1971.

General Construction Noise

Table IV.D-6 presents the estimated noise levels at sensitive receptors during construction activity. As shown in **Table IV.D-6**, ambient noise levels during construction would range from 56.2 to 86.7 dBA L_{eq} . The highest construction-related noise increase would occur at the multi-family residences directly east of the project site, across Mentor Avenue. However, as shown in **Table IV.D-4**, general construction equipment noise levels would not exceed the 85-dBA at 100 feet significance threshold. Construction activity would result in a less-than-significant noise impact.

TABLE IV.D-6 Construction Noise Levels				
Sensitive Receptor	Distance (feet) ¹	Maximum Construction Noise Level (dBA) ²	Existing Ambient (dBA, L_{eq}) ³	New Ambient (dBA, L_{eq}) ⁴
Multi-family residences east of project site	65	86.7	59.4	86.7
Boston Court Performing Arts Center	425	70.4	56.3	70.6
Multi-family residences south of project site	850	64.4	56.5	65.0
Multi-family residences northeast of project site	675	56.4	54.0	58.4
Multi-family residences southeast of project site	750	55.5	54.6	58.1
Multi-family residences southwest of project site	1,150	51.8	54.2	56.2

¹ Distance of noise source from receptor.
² Construction noise source's sound level at receptor location with distance and building adjustment.
³ Pre-construction activity ambient sound level at receptor location.
⁴ New sound level at receptor location during the construction period, including noise from construction activity.

SOURCE: Terry A. Hayes Associates LLC, *Air Quality and Noise Impact Report*, June 29, 2010.

Pile Driving Noise

Pile driving activity would potentially occur during the construction process. Impact pile driving typically generates noise levels of 101 dBA L_{eq} at 50 feet. As shown in **Table IV.D-7**, the ambient noise levels during pile driving activity would range from 64.2 and 98.7 dBA L_{eq} at sensitive receptors in the project vicinity. Although temporary and intermittent, pile driving noise levels would exceed the 85-dBA at 100 feet significance threshold. Pile driving noise would result in a significant noise impact without mitigation.

TABLE IV.D-7 Pile Driving Noise Impact - Unmitigated				
Sensitive Receptor	Distance (feet) ¹	Maximum Construction Noise Level (dBA) ²	Existing Ambient (dBA, L _{eq}) ³	New Ambient (dBA, L _{eq}) ⁴
Multi-family residences east of project site	65	98.7	59.4	98.7
Boston Court Performing Arts Center	425	82.4	56.3	82.4
Multi-family residences south of project site	850	76.4	56.5	76.4
Multi-family residences northeast of project site	675	68.4	54.0	68.5
Multi-family residences southeast of project site	750	67.5	54.6	67.7
Multi-family residences southwest of project site	1,150	63.8	54.2	64.2
¹ Distance of noise source from receptor. ² Construction noise source's sound level at receptor location with distance and building adjustment. ³ Pre-construction activity ambient sound level at receptor location. ⁴ New sound level at receptor location during the construction period, including noise from construction activity. SOURCE: Terry A. Hayes Associates LLC, <i>Air Quality and Noise Impact Report</i> , June 29, 2010.				

OPERATIONAL IMPACTS

Vehicular Noise

Off-site mobile noise impacts were modeled utilizing FHWA RD-77-108 noise calculation formulas. **Table IV.D-8** shows mobile noise levels after each phase of development. The greatest project-related noise increase after the completion of Phase 1 would be 0.6 dBA CNEL, after the completion of Phase 2 would be 0.5 dBA CNEL, and after the completion of Phase 3 would be 1.1 dBA CNEL. All three noise levels for each of the three project phases would occur along Mentor Avenue between Colorado Boulevard and East Green Street.

Mobile noise generated by the proposed project would not cause the ambient noise level measured at the property line of the affected uses to increase by 3 dBA CNEL to or within the "normally unacceptable" or "clearly unacceptable" category (**Table IV.D-3**) or any 5-dBA or more increase in noise level. The proposed project would result in a less-than-significant mobile noise impact.

Stationary Noise

The proposed project would include various pieces of equipment (e.g., air handlers, exhaust fans, kitchen grease exhaust systems, and pool equipment) located in the mechanical areas of the project site. The majority of these noise sources would be located within equipment enclosures and screened from view to comply with Section 9.36.090 of the PMC. Cooling towers would be located on the southern portion of the project site. The cooling towers would be enclosed on all sides and covered with a screen. Based on this design, it was estimated that the cooling towers would create a noise level of approximately 70 dBA at 15 feet. The nearest land use would be a multi-family residences located approximately 217 feet east of the cooling tower. This residential use would experience a 0.6-dBA increase in ambient noise from noise generated by the cooling tower. This incremental increase would not be audible, and the cooling tower would result in a less-than-significant impact.

TABLE IV.D-8
Estimated Mobile Source Noise Levels

Roadway Segment	Estimated dBA, CNEL		
	No Project	Project	Project Impact
Phase 1			
Colorado Boulevard between Lake Avenue and North Mentor Avenue	72.0	72.1	0.1
Mentor Avenue Between Colorado Boulevard and Walnut Street	62.3	62.7	0.4
Colorado Boulevard between North Mentor Avenue and North Catalina Avenue	69.9	69.9	0.0
Mentor Avenue Between Colorado Boulevard and East Green Street	64.4	64.3	0.6
Lake Avenue Between Colorado Boulevard and East Green Street	70.7	70.8	0.1
Phase 2			
Colorado Boulevard between Lake Avenue and North Mentor Avenue	72.1	72.2	0.1
Mentor Avenue Between Colorado Boulevard and Walnut Street	62.4	62.6	0.2
Colorado Boulevard between North Mentor Avenue and North Catalina Avenue	70.0	70.1	0.1
Mentor Avenue Between Colorado Boulevard and East Green Street	63.8	64.3	0.5
Lake Avenue Between Colorado Boulevard and East Green Street	70.8	70.8	0.0
Phase 3			
Colorado Boulevard between Lake Avenue and North Mentor Avenue	72.2	72.4	0.2
Mentor Avenue Between Colorado Boulevard and Walnut Street	62.7	63.1	0.6
Colorado Boulevard between North Mentor Avenue and North Catalina Avenue	69.9	70.2	0.1
Mentor Avenue Between Colorado Boulevard and East Green Street	64.3	65.0	1.1
Lake Avenue Between Colorado Boulevard and East Green Street	70.8	71.1	0.3
SOURCE: Terry A. Hayes Associates LLC, <i>Air Quality and Noise Impact Report</i> , June 29, 2010.			

The specific location of other stationary noise sources was not known at the time of this analysis. The sources would generally be located central to the project site and away from sensitive receptors. Proposed development would typically shield mechanical equipment from off-site land uses and all mechanical equipment would comply with the regulations set forth in the Municipal Code. Based on the above analysis, stationary noise would result in a less-than-significant impact.

Outdoor Activity Noise

The proposed project would include a rooftop pool on the southeastern portion of the project site. The pool area would be located approximately 75 feet from the multi-family residences on Mentor Avenue. The crowd noise levels were modeled at 75 dBA at a reference distance of ten feet, which is typical for outdoor entertainment areas of this type. The pool area would include a glass safety wall that would attenuate noise levels by at least five dBA. The pool area would generate an exterior noise level of 54.5 dBA at the multi-family residences. This would increase the lower of the two monitored ambient noise levels by approximately 1.2 dBA. This incremental increase would not be audible, and the pool area noise would result in a less-than-significant impact.

Outdoor restaurant space would largely be located on the second (terrace) level. The seating area would be central to the project site and generally shielded from existing noise-sensitive land uses by proposed buildings. The restaurant seating would generate a similar noise level as the pool area. Based on location, the restaurant seating noise levels would be less than the pool area noise levels presented above at sensitive receptors, and would result in a less-than-significant impact.

Parking Noise

Phase 1 would need to find temporary alternative sites to accommodate its parking needs during construction of the Phase 2 parking structure. Parking for Phase 1 would be provided by a valet service utilizing a structure at 2 North Lake Avenue. The traffic study has estimated that there would be 1,294 trips to off-site valet parking. Valet services would access the structure by traveling north on Lake Avenue, East on Union Street, and South on Mentor Avenue. As shown in **Table IV.D-8**, mobile noise would result in a maximum mobile noise increase of 1.1 dBA along these roadway segments. This increase would result in a less-than-significant impact.

Phase 2 would include 225 parking spaces in a subterranean parking garage and 12 at-grade spaces along the southwestern portion of the project site. Both parking lots would be accessed via driveways along Lake Avenue and Mentor Avenue. Parking access would be located approximately 65 feet from the multi-family residences to the east of the project site. Automobile parking activity typically generates a noise level of approximately 58.1 dBA L_{eq} at 50 feet (e.g., tire noise, engine runups and door slams).¹¹

The highest ambient noise increase due to parking activity noise would occur at the multi-family residences along Mentor Avenue, located approximately 65 feet east of the project boundary. The nearest parking activity noise would occur at the surface level of the parking structure, approximately 65 feet from this residential use. This residential use would experience a 1.6-dBA increase in ambient noise from noise generated at the parking structure. This would not exceed the 5-dBA threshold for operational noise. All other nearby sensitive uses would experience ambient noise level increases below the 5-dBA threshold from parking activity noise. Parking activity noise would result in a significant and unavoidable impact without mitigation.

Phase 3 construction would complete the subterranean parking garage. Subterranean parking noise would be inaudible at sensitive receptors.

Loading Activity and Delivery Truck Noise

The proposed project would include one loading dock for delivery trucks located in the rear of the buildings near the south side of the project site. Noise levels from medium-duty trucks accessing the project site would range from 71 to 79 dBA L_{eq} at 50 feet.¹² Back-up safety alarms would generate a single event noise level of approximately 79 dBA at 50 feet.¹³

Delivery trucks would enter the project site along Lake Avenue, and would park in a loading dock at the back of the new building directly west of the hotel. The loading dock would be enclosed on three sides by the walls of surrounding buildings (to the west, north, and east), and

¹¹ The reference parking noise level is based on a series of noise measurements completed 50 feet from vehicles accessing a multi-level parking structure.

¹² California Department of Transportation, *Technical Noise Supplement*, October 1998.

¹³ The back-up safety alarm noise level was based on regulations set forth by the Occupational Safety and Health Administration.

would be completely screened from the nearest sensitive receptor – the multi-family residences to the east along Mentor Avenue. Trucks would back into the loading area such that unloading/loading would occur to the behind the hotel, or would be otherwise obscured or screened from sensitive receptors by intervening buildings and perimeter walls. Loading activity would not increase ambient noise level by more than 5 dBA at sensitive receptors, and would result in a less-than-significant impact.

GROUND-BORNE VIBRATION

Construction Impacts

General Construction Activity

As shown in **Table IV.D-9**, use of heavy equipment (e.g., a large bulldozer) generates vibration levels of 0.089 inches per second at a distance of 25 feet. Construction activity would occur adjacent to two commercial buildings located south of the project site. Construction equipment would typically generate a vibration level of 1.0 inches per second at these land uses. The 1.0 inches per second vibration level would exceed the 0.5 inches per second significance threshold, and off-site vibration would result in a significant impact without mitigation.

TABLE IV.D-9 Vibration Velocities For Construction Equipment	
Equipment	PPV at 25 feet (Inches /Second) ¹
Pile Driving (Impact)	0.644
Pile Driving (Sonic)	0.170
Caisson Drilling	0.089
Large Bulldozer	0.089
Loaded Trucks	0.076

SOURCE: Federal Transit Authority, *Transit Noise and Vibration Impact Assessment*, May 2006.

The former Hotel Constance on the east side of the project site at the corner of Colorado Boulevard and Mentor Avenue is an historical structure constructed in 1926. General construction equipment would generate a vibration level of 1.0 inches per second at a distance of five feet. This would exceed the 0.12 inches per second significance threshold, and vibration levels at the former Hotel Constance would result in a significant impact without mitigation.

Pile Driving Activity

The proposed project may require drilled or driven piles. Impact pile driving would generate a vibration level of 7.2 inches per second at both off-site sensitive receptors and the former Hotel Constance, which would exceed the potential fragile building damage thresholds of 0.5 and 0.12 inches per second, respectively. Vibration levels associated with pile driving equipment would result in a significant and unavoidable impact without mitigation.

Operational Impacts

The proposed project would not include significant stationary sources of ground-borne vibration, such as heavy equipment operations. Operational ground-borne vibration in the project vicinity would be generated by vehicular travel on the local roadways. However, similar to existing conditions, project-related traffic vibration levels would not be perceptible by sensitive receptors. Thus, operational vibration would result in a less-than-significant impact.

MITIGATION MEASURES

CONSTRUCTION NOISE

IV.D-1 All residential units located within one-quarter mile of the construction site shall be sent a notice regarding the construction schedule of the proposed project. A sign, legible at a distance of 50 feet shall also be posted at the construction site. All notices and the signs shall indicate the dates and duration of construction activities, as well as provide a telephone number where residents can inquire about the construction process and register complaints.

IV.D-2 A “noise disturbance coordinator” shall be established. The disturbance coordinator shall be responsible for responding to any local complaints about construction noise. The disturbance coordinator shall determine the cause of the noise complaint (e.g., starting too early, bad muffler, etc.) and shall be required to implement reasonable measures such that the complaint is resolved. All notices that are sent to residential units within one-quarter mile of the construction site and all signs posted at the construction site shall list the telephone number for the disturbance coordinator.

IV.D-3 The construction contractor shall utilize caisson drilling instead of pile driving on the project site.

CONSTRUCTION GROUND-BORNE VIBRATION

IV.D-4 Prior to commencement of construction activity, a qualified structural engineer shall survey the existing foundation and other structural aspects of the former Hotel Constance and 45 N. Mentor Avenue (subject to property owner granting access to conduct the survey). The survey shall provide a shoring design to protect the identified land uses from potential damage. Pot holing or other destructive testing of the below grade conditions may be necessary to establish baseline conditions and prepare the shoring design. The qualified structural engineer shall hold a valid license to practice structural engineering in the State of California and have a minimum of ten years specific experience rehabilitating historic buildings and applying the Secretary’s Standards to such projects.

IV.D-5 The qualified structural engineer shall submit a pre-construction survey letter establishing baseline conditions at the former Hotel Constance and the buildings located adjacent and to the south of the project site. These baseline conditions shall be forwarded to the lead agency and to the mitigation monitor prior to issuance of any foundation only or building permit for the proposed project.

IV.D-6 At the conclusion of vibration causing activities, the qualified structural engineer shall issue a follow-on letter describing damage, if any, to the former Hotel Constance and the

buildings located adjacent and to the south of the project site. The letter shall include recommendations for any repair, as may be necessary, in conformance with the Secretary of the Interior Standards. Repairs to the former Hotel Constance shall be undertaken and completed in conformance with all applicable codes including the California Historical Building Code (Part 8 of Title 24) prior to issuance of any temporary or permanent certificate of occupancy for the new building.

OPERATION NOISE

Operational noise impacts would be less than significant, and no mitigation measures are required.

OPERATION GROUND-BORNE VIBRATION

Operational ground-borne vibration impacts would be less than significant, and no mitigation measures are required.

LEVEL OF SIGNIFICANCE AFTER MITIGATION

CONSTRUCTION NOISE

Pile driving noises levels would exceed the 85-dBA at 100 feet significance threshold by approximately 10 dBA. Mitigation Measures **IV.D-1** and **IV.D-2** would assist in controlling construction noise. Mitigation Measure **IV.D-3** would eliminate pile driving activity in favor of caisson drilling. Caisson drilling generates a noise level of 71 dBA at 100 feet, which would be less than the 85 dBA significance threshold. Therefore, construction noise would result in a less-than-significant impact with mitigation.

CONSTRUCTION GROUND-BORNE VIBRATION

Mitigation Measure **IV.D-3** would require caisson drilling instead of impact pile driving. Caisson drilling would generate a vibration level of 1.0 inches per second at the former Hotel Constance and the buildings located adjacent and to the south of the project site instead of the 7.2 inches per second pile driving vibration level. Mitigation Measures **IV.D-4** through **IV.D-6** would ensure that vibration-induced building damage is recorded and repaired. As such, construction vibration would result in a less-than-significant impact with mitigation.

OPERATION NOISE

The project-related operational noise would result in a less-than-significant impact without mitigation.

OPERATION GROUND-BORNE VIBRATION

Operational ground-borne vibration impacts would be less than significant, and no mitigation measures are required.

CUMULATIVE IMPACTS

When calculating future traffic impacts, the traffic consultant took all related projects into consideration. Thus, the future traffic results without and with the proposed project already

account for the cumulative impacts from these other projects. Since the noise impacts are generated directly from the traffic analysis results, the future without project and future with project noise impacts described in this report already reflect cumulative impacts.

Table IV.D-10 presents the cumulative increase in future traffic noise levels at intersections. The maximum cumulative roadway noise increase would be 1.7 dBA CNEL and would occur along Mentor Avenue between Colorado Boulevard and East Green Street. Mobile noise generated by the proposed project would not cause the ambient noise level measured at the property line of the affected uses to increase by 3 dBA CNEL to or within the “normally unacceptable” or “clearly unacceptable” category (**Table IV.D-3**) or any 5-dBA or more increase in noise level. The proposed project would not contribute to a cumulative considerable impact.

The predominant vibration source near the project site is heavy trucks traveling on the local roadways. Neither the proposed project nor related projects would substantially increase heavy-duty vehicle traffic near the project site and would not cause a substantial increase in heavy-duty trucks on local roadways. The proposed project would not add to a cumulative vibration impact.

TABLE IV.D-10 Estimated Cumulative Mobile Source Noise Levels			
Roadway Segment	Estimated dBA, CNEL ²		
	Existing	Project	Cumulative Impact
Colorado Boulevard between Lake Avenue and North Mentor Avenue	67.8	69.0	1.2
Mentor Avenue Between Colorado Boulevard and Walnut Street	61.1	62.3	1.2
Colorado Boulevard between North Mentor Avenue and North Catalina Avenue	67.9	68.9	1.0
Mentor Avenue Between Colorado Boulevard and East Green Street	63.3	65.0	1.7
Lake Avenue Between Colorado Boulevard and East Green Street	70.2	71.1	0.9
SOURCE: Terry A. Hayes Associates LLC, <i>Air Quality and Noise Impact Report</i> , June 29, 2010.			