3.6 NOISE

This section examines noise and vibration impacts from the construction and operation of the proposed project.

3.6.1 ENVIRONMENTAL SETTING

HUMAN PERCEPTION OF NOISE

Sound is a vibratory disturbance created by a moving or vibrating source, which is capable of being detected by the hearing organs. Noise is defined as sound that is loud, unpleasant, unexpected, or undesired and may therefore be classified as a more specific group of sounds. The effects of noise on people can include general annoyance, interference with speech communication, sleep disturbance, physiological responses, and, in the extreme, hearing impairment (Caltrans 1998). Each of these potential noise impacts on people is briefly discussed below.

In its most basic form, a continuous sound can be described by its frequency or wavelength (pitch) and its amplitude (loudness). Frequency is expressed in cycles per second, or hertz. Frequencies are heard as the pitch or tone of sound. High-pitched sounds produce high frequencies; low-pitched sounds produce low frequencies. Sound pressure levels are described in units called the decibel (dB).

Decibels are measured on a logarithmic scale that quantifies sound intensity in a manner similar to the Richter scale used for earthquake magnitudes. Thus, a doubling of the energy of a noise source, such as doubling of traffic volumes, would increase the noise level by 3 dB; a halving of the noise sources would result in a 3 dB decrease.

The human ear is not equally sensitive to all frequencies within the sound spectrum. To accommodate this phenomenon, the A-scale, which approximates the frequency response of the average young ear when listening to most ordinary everyday sounds, was devised. When people make relative judgments of the loudness or annoyance of a sound their judgments correlate more closely with the A-scale sound levels of those sounds. Therefore, the “A-weighted” noise scale is used for measurements and standards involving the human perception of noise. Noise levels using A-weighted measurements are written dB(A) or dBA. Table 3.6-1 shows the relationship of various noise levels to commonly experienced noise events.

TABLE 3.6-1 TYPICAL NOISE LEVELS

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	--110--	Rock Band
Jet Fly-over at 300 meters (1,000 feet)	--100--	
Gas Lawn Mower at 1 meter (3 feet)	--90--	
Diesel Truck at 15 meters (50 feet), at 80 km/hr (50 mph)	--80--	Food Blender at 1 meter (3 feet) Garbage Disposal at 1 meter (3 feet)
Noisy Urban Area, Daytime Gas Lawn Mower at 30 meters (100 feet)	--70--	Vacuum Cleaner at 3 meters (10 feet)
Commercial Area Heavy Traffic at 90 meters (300 feet)	--60--	Normal Speech at 1 meter (3 feet)
Quiet Urban Daytime	--50--	Large Business Office Dishwasher in Next Room
Quiet Urban Nighttime	--40--	Theater, Large Conference Room (Background)
Quiet Suburban Nighttime	--30--	Library
Quiet Rural Nighttime	--20--	Bedroom at Night, Concert Hall (Background)
	--10--	Broadcast/Recording Studio
Lowest Threshold of Human Hearing	--0--	Lowest Threshold of Human Hearing
Source: Caltrans 1998		

Several methods have been developed for the description and analysis of environmental noise. These methods are designed to account for the known effects of noise on people. Common noise level descriptions include the equivalent noise level (L_{eq}), the community noise equivalent level (CNEL), and the day-night average sound level (L_{dn}). Average noise levels over a period of minutes or hours are usually expressed as dBA L_{eq}, meaning the equivalent noise level for that period of time. The period of time averaging may be specified; for example, $L_{eq(3)}$ would be a 3-hour average. When no period is specified, a 1-hour average is assumed. One consequence of averaging is that a loud noise lasting a very short time may not be revealed in the measured sound level averaged over a 1-hour period. To evaluate community noise impacts, descriptors were developed that account for human sensitivity to nighttime noise. L_{dn} represents the 24-hour average sound level with a penalty for noise occurring at night. The L_{dn} computation divides the 24-hour day into 2 periods: daytime (7:00 a.m. to 10:00 p.m.) and nighttime (10:00 p.m. to 7:00 a.m.). The nighttime sound levels are assigned a 10 dBA penalty prior to averaging with daytime hourly sound levels. CNEL is similar to L_{dn} except that it separates a 24-hour day into 3 periods: daytime (7:00 a.m. to 7:00 p.m.), evening (7:00 p.m. to 10:00 p.m.), and nighttime (10:00 p.m. to 7:00 a.m.). The evening and nighttime sound levels are assigned 5 and 10 dBA penalties respectively, prior to averaging with daytime hourly sound levels.

HUMAN PERCEPTION OF VIBRATION

Construction operations have the potential to result in varying degrees of temporary ground vibration, depending on the specific construction equipment used and operations involved. Ground vibration generated by construction equipment spreads through the ground and diminishes in magnitude with

increases in distance. The effects of ground vibration may be imperceptible at the lowest levels (low rumbling sounds) and detectable vibrations at moderate levels. Damage to nearby structures could occur at the highest levels. To assess the potential for structural damage associated with vibration from construction activities, the vibratory ground motion in the vicinity of an affected structure is measured in terms of peak particle velocity (ppv), typically in units of inches per second (in/sec). Table 3.6-2 presents the vibration level thresholds for architectural and structural damage and human perception thresholds.

TABLE 3.6-2 REACTION OF PEOPLE AND DAMAGE TO BUILDINGS AT VARIOUS CONTINUOUS VIBRATION LEVELS

Effects on Structures	Effects on People	Vibration Level (in/sec ppv)
Architectural damage and possibly minor structural damage	Considered unpleasant	0.4-0.6
Threshold of risk of architectural damage to normal dwelling with plastered walls and ceilings	Annoying to people in buildings	0.2
Virtually no risk of damage	Threshold of annoyance	0.1
Recommended upper level for ruins and ancient monuments	Vibrations readily perceptible	0.08
Unlikely to cause damage of any type	Threshold of perception; possibility of intrusion	0.006-0.019

[1] Caltrans considers most construction vibrations, with the exception of pile driving and blasting, to be continuous.
Source: Caltrans 2002

SENSITIVE NOISE RECEPTORS

Noise-sensitive receptors are generally considered humans engaged in activities or utilizing land uses that may be subject to the stress of significant interference from noise. Activities usually associated with sensitive receptors include, but are not limited to, talking, reading, and sleeping. Land uses often associated with sensitive receptors include residential dwellings, mobile homes, education facilities, hotels, motels, hospitals, nursing homes, concert halls, houses of worship, and libraries.

Sensitive noise receptors in the vicinity of the project site include residential uses to the north, east, south, and west. In addition, the existing and proposed independent living, assisted living, and psychiatric uses are considered sensitive noise receptors.

SENSITIVE VIBRATION RECEPTORS

People, structures, or equipment can all be adversely affected by ground vibration. Ground vibration can be annoying to people. The degree of annoyance depends on the activity they are participating in when the vibration occurs. For example, someone sleeping would be more sensitive than someone who was more active.

Vibration generated by construction has the potential to damage structures. This damage may be structural damage, such as cracking of floor slabs, or cosmetic architectural damage, such as cracked

plaster. Ground vibration also has the potential to disrupt the operation of vibration-sensitive research and advanced technology equipment. The degree to which equipment can be impacted depends on the type of equipment, how it is used, and how it is supported.

EXISTING NOISE LEVELS

Existing noise level measurements were conducted on August 2, 2007 and September 12, 2007 between 11:00 a.m. and 3:30 p.m. The predominant noise source at the project site was from vehicles on adjacent roadways. Other noise sources include patients of the hospital, and landscaping/maintenance activities on the hospital grounds and adjacent residential properties. Measured noise levels are typical of a quiet residential neighborhood. The higher noise levels recorded along San Gabriel Boulevard and Del Mar Boulevard are typical for roadways of these types. The results of the field noise measurements are summarized in Table 3.6-3. The locations of the noise measurements are shown on Figure 3.6-1.

TABLE 3.6-3 EXISTING NOISE LEVELS AT SELECTED LOCATIONS NEAR THE PROJECT SITE[1]

Site ID	Location	Time	L_{eq} (dBA)	L_{min} (dBA)	L_{max} (dBA)
1	South of Las Flores (Building 3)	1:28 p.m. – 1:33 p.m.	52	47	68
2	Southwest of Oaks Apartment (Building 9)	1:48 p.m. – 2:03 p.m.	48	43	60
3	10 feet north of the southern property line southwest of Adolescent Psychiatry Building (Building 33)	2:07 p.m. – 2:17 p.m.	46	40	60
4	Southeast of Maintenance Building (Building 27)	2:26 p.m. – 2:36 p.m.	43	40	53
5	North of San Gabriel Resident (Building 13)	2:46 p.m. – 2:56 p.m.	47	40	58
6	South of 336 San Gabriel Residence Garage (Building 11B)	3:06 p.m. – 3:17 p.m.	46	40	55
7	50 feet east of San Gabriel Boulevard, west of 336 San Gabriel Residence Storage Building (Building 11A)	11:08 a.m. – 11:24 a.m.	58	40	71
8	50 feet north of Del Mar Boulevard, 30 feet west of Eastern Avenue	12:07 p.m. – 12:38 p.m.	64	35	77

[1] Noise levels were measured using a Larson-Davis Model 824 Type, which was calibrated before and after the measurements.
Source: EDAW 2008

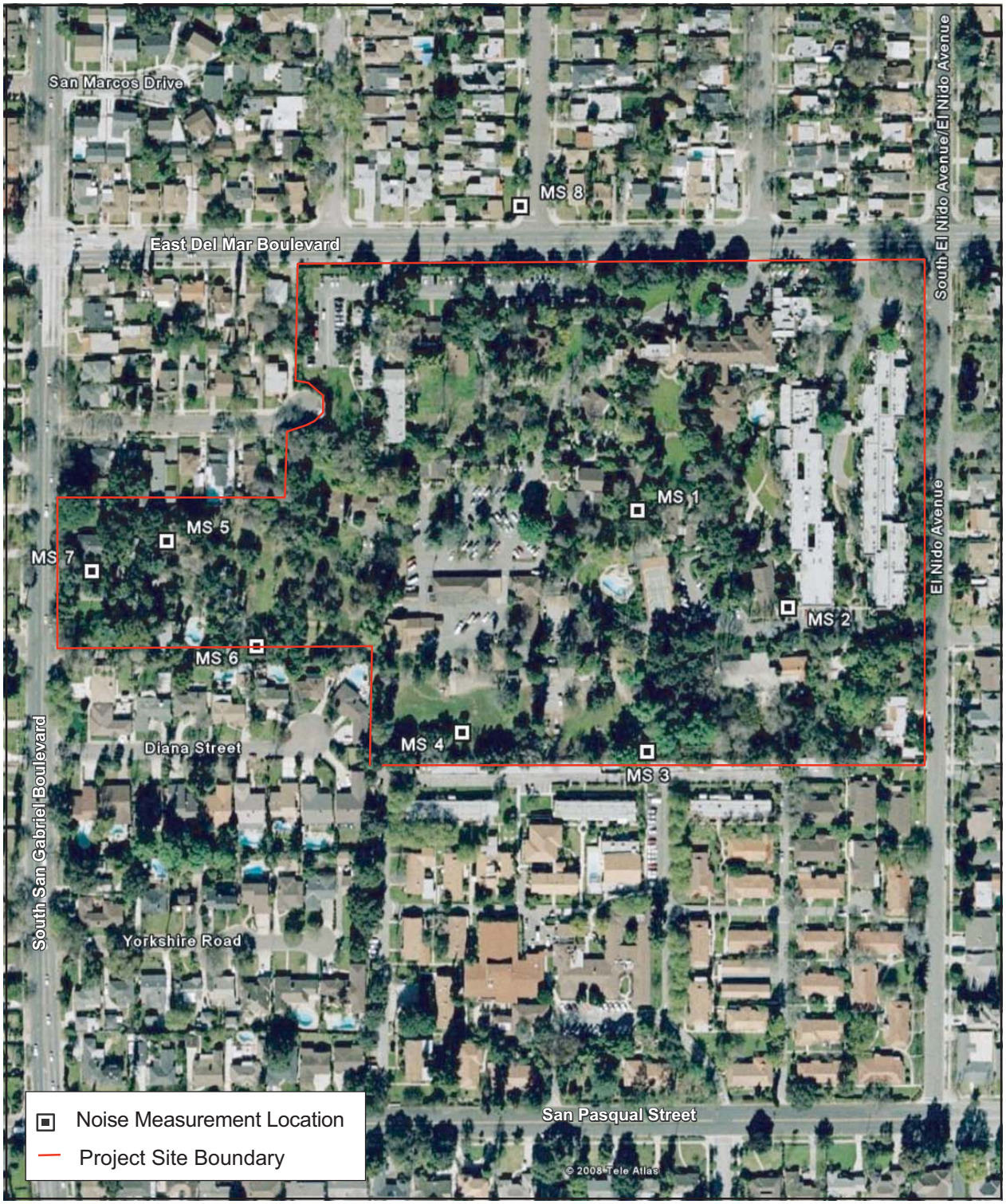


Figure 3.6-1
Noise Measurement Locations

N

3.6.2 REGULATORY SETTING

CITY OF PASADENA GENERAL PLAN

The Noise Element of the City's General Plan establishes a number of goals and policies to provide an acceptable noise environment for noise sensitive developments with the City (City of Pasadena 2002a). The implementation measures for the Noise Element policies include, but are not limited to, exterior and interior noise level standards, noise study triggers, site design considerations, traffic calming measures, and coordination with other local agencies, regional agencies, state agencies, and federal agencies. The City's noise compatibility guidelines are provided in Table 3.6-4.

CITY OF PASADENA NOISE ORDINANCE

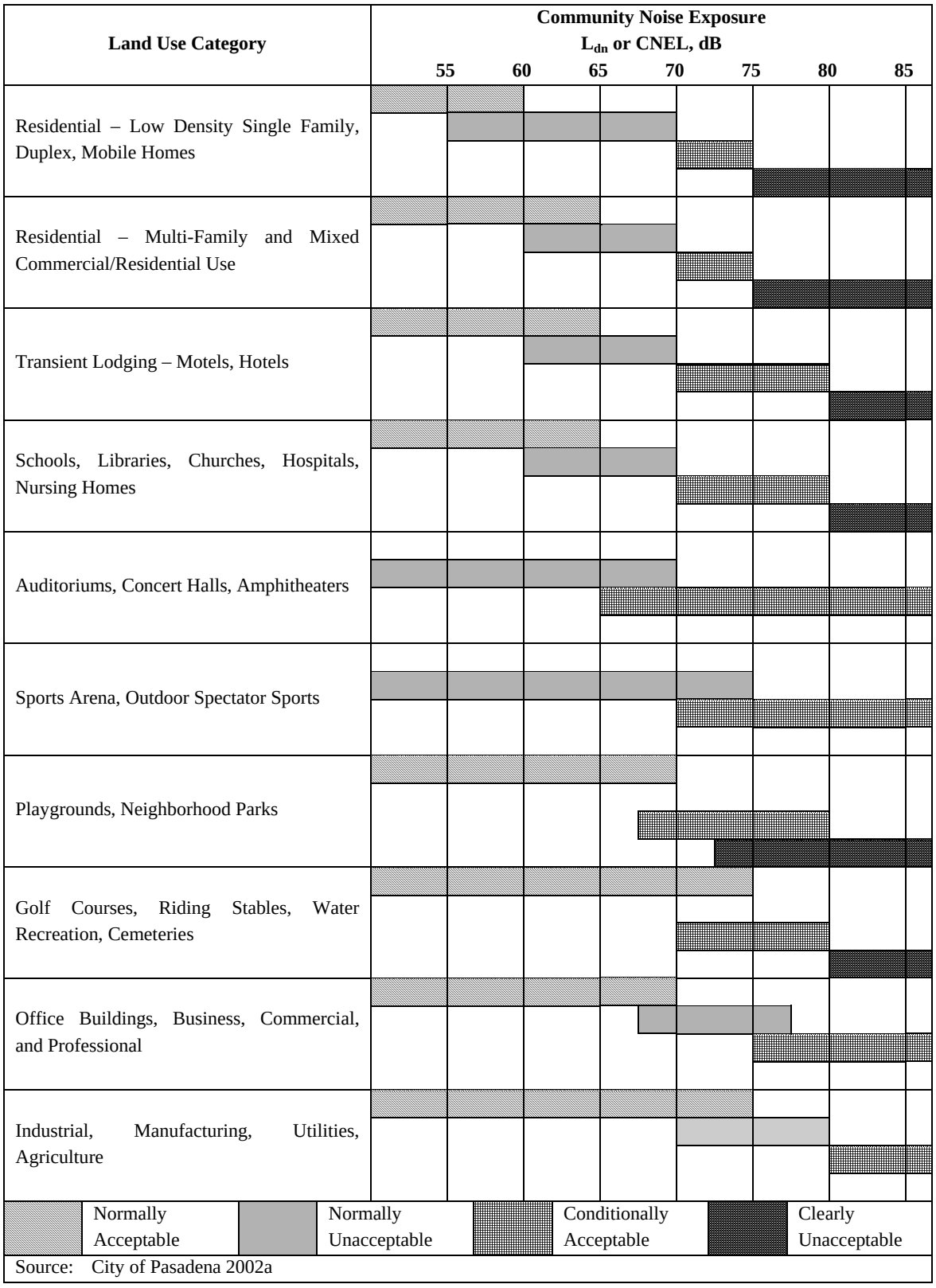
The City has jurisdiction over noise regulation, as stated in the City's Municipal Code, Title 9, Chapter 36 Noise Restrictions (Noise Ordinance) (City of Pasadena 2008). The noise ordinance generally limits intrusive noises from exceeding the ambient level at the property line by more than 5 dB. The ambient is the actual measured ambient noise level. Section 9.36.060 sets the interior noise limit for multi-family residential uses to 60 dBA between 7:00 a.m. and 10:00 p.m., and 50 dBA between 10:00 p.m. and 7:00 a.m.

Construction noise is regulated by Section 9.36.070, which restricts construction activities "within a residential district or within a radius of 500 feet at any time other than" between 7:00 a.m. and 7:00 p.m. Monday through Friday, and between 8:00 a.m. and 5:00 p.m. on Saturdays. Construction activities are prohibited on Sundays and holidays. Additionally, Section 9.36.080 further restricts noise levels from construction equipment to 85 dBA L_{eq} measured at 100 feet from the equipment.

STATE OF CALIFORNIA NOISE INSULATION STANDARDS

Title 24 of the California Code of Regulations requires that residential structures, other than detached single-family dwellings, be designed to prevent the intrusion of exterior noise so that the interior CNEL with windows closed, attributable to exterior sources, would not exceed 45 dBA in any habitable room. The regulations also specify that acoustical studies must be prepared whenever a residential building or structure is proposed to be located near an existing or adopted transportation corridor and where the noise source creates an exterior CNEL (or L_{dn}) of 60 dBA or greater. Such acoustical analysis must demonstrate that the residence has been designed to limit intruding noise to an interior CNEL (or L_{dn}) of at least 45 dBA.

TABLE 3.6-4 NOISE/LAND USE COMPATIBILITY GUIDELINES



Source: City of Pasadena 2002a

3.6.3 ENVIRONMENTAL IMPACTS

THRESHOLDS OF SIGNIFICANCE

As part of the Initial Study (see Appendix A), it was determined that the proposed project would not expose persons to excessive noise from public or private airports. Accordingly, these issues are not further analyzed in the EIR.

Pursuant to the CEQA Guidelines, the proposed project would have a significant noise effect if it would:

- Expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Expose persons to or generate excessive groundborne vibration or groundborne noise levels;
- Create a substantial permanent increase in ambient noise levels in the vicinity of the project above levels without the project; or
- Create a substantial temporary or periodic increase in ambient noise levels in the vicinity of the project, in excess of noise levels existing without the project.

The City of Pasadena restricts construction noise to 85 dBA L_{eq}. Operational noise shall not increase by 5 dBA over the measured ambient noise level. There are no applicable federal, state, or local standards for a significant vibration impact. Both the California Department of Transportation (Caltrans) and the Federal Transit Administration (FTA) recommend a 0.2-in/sec level for impact assessment (Caltrans 2002; FTA 2006).

IMPACT ANALYSIS

NOISE-1 *The proposed project would expose persons to or generate noise levels in excess of City standards during project construction and operation.*

Construction

Noise impacts from construction are a function of the noise generated by equipment, the location and sensitivity of nearby land uses, and the timing and duration of the noise-generating activities. Noise levels within and adjacent to the project site would increase during the construction period. Construction noise levels at and near the project site would fluctuate depending on the particular type, number, and duration of use of various pieces of construction equipment. Table 3.6-5 shows noise levels associated with various types of construction related equipment when measured at a distance of 50 feet from the noise source. The list was used in this analysis to estimate construction noise.

TABLE 3.6-5 TYPICAL CONSTRUCTION EQUIPMENT NOISE LEVELS

Equipment	Typical Noise Level 50 feet from source (dBA)
Air Compressor	81
Backhoe	80
Compactor	82
Crane, Mobile	83
Dozer	85
Generator	81
Grader	85
Loader	85
Paver	89
Truck	88
Source: FTA 2006	

Typical construction projects, with equipment moving from one area to another, work breaks, and idle time, have long-term noise averages that are lower than louder short-term noise events. Instead of averaging noise levels to take into account idling, work breaks, and other interruptions in construction, a maximum short-term noise level of 90 dBA at a distance of 50 feet is assumed to occur. This is intended to provide a more conservative estimate of maximum construction noise. Peak noise events would occur during the 8-month demolition and excavation phases, when there may be a combination of noise from several pieces of equipment in proximity, including the noise of backup alarms. Noise levels of other activities, such as erecting structures or paving, would be less. With construction equipment moving around the project site and pauses for measurements and worker breaks, average hourly noise levels would be 5 to 10 dBA less than the maximum noise levels. Therefore, a construction noise level of 85 L_{eq} at 50 feet, as measured from the center of the construction site is assumed. Noise levels from construction activities are typically considered as point sources and would drop off at a rate of 6 dBA per doubling of distance over hard sites, such as streets and parking lots. Thus, a noise level of 85 dBA at 50 feet would be 79 dBA at 100 feet and 73 dBA at 200 feet. The drop-off rate would increase slightly over soft sites, such as grass fields and open terrain with vegetation.

Construction of the proposed project is anticipated to begin in July 2009 with construction of the adolescent psychiatric facility (Building 33). Construction of Phase 1 would be complete in March 2010. Construction of Phase 2 would start in May 2010 and include the independent living facility (Building 34) and the assisted living facility (Building 32). It would be completed in February 2012. Construction of Phase 2 would overlap Phase 3 construction by approximately one year. Phase 3 involves the senior living residences (Building 36). Phase 3 construction would start in May 2011 and be completed in approximately June 2012. Phase 4 construction would start in May 2012 and include the medical offices (Building 31, 36, and 37). Construction of Phase 4 would be completed in August 2013. Construction of Phase 5, the acute psychiatric hospital (Building 35), would overlap Phase 4 by approximately 4 months. Phase 5 construction would begin in May 2013 and be completed in August 2014. Although the construction schedules overlap for some phases, the types of construction activity occurring during each phase would be different. For example, while interior construction and site landscaping is being completed on Phase 3 (senior residences), demolition of the existing medical office buildings (Buildings

23 and 18) would be underway as part of Phase 4. Demolition and grading in one phase, the highest noise generating activities, would not occur at the same time as demolition and grading of another phase. Thus, peak noise created during construction would be distributed in different parts of the site.

Demolition of the existing structures would require front-end loaders, bulldozers, and backhoes. Subsequent construction phases, such as utilities installment, building construction, and roadway and parking lot construction, would require a mix of equipment with similar peak and average noise levels to the equipment used in the demolition phase. No pile driving or blasting is anticipated. For the purposes of presenting the worst-case analysis, the peak noise generating activities for the different phases of the project were modeled. It should be noted that all construction activities would occur within the allowable construction noise hours per the City of Pasadena Noise Ordinance.

The nearest on-site noise sensitive receptors are patients living and/or convalescing within the existing medical facilities. During Phase 1, the adolescent psychiatry facility (Building 32) and all internal roadways would be constructed. No off-site noise sensitive receptors are in proximity to the building construction site for Phase 1. Construction activities associated with the adolescent psychiatry facility (Building 33) would occur approximately 65 feet from Las Flores (Building 3) and a bungalow immediately south of Building 3, which would result in the generation of noise levels on the order of 83 dBA L_{eq} at the nearest noise sensitive receptors, which would be below the City standard of 85 dBA L_{eq}. The impact would be less than significant. In order to minimize noise impacts on sensitive receptors in Building 3 (Las Flores), construction of the adolescent psychiatry facility (Building 33) would only take place while Building 3 is vacant (see mitigation measure NOISE-A). Interior construction work, such as installation of drywall, electrical work, plumbing, and other low volume activities could occur while Building 3 is occupied.

During roadway construction and widening activities for Phase 1, construction would occur throughout the project site; however, unlike building construction or grading, the noise sources associated with these activities would work along a linear path. Roadway construction activities typically average 300 linear feet per day with equipment moving back and forth in this length. Under these conditions noise levels would reach 74 dBA L_{eq} at 50 feet from the centerline of the roadway, or 80 dBA at 25 feet. Based on a review of the site plan, all existing on-site structures are at least 30 feet from the centerline of proposed internal roadways and all off-site receptors are at greater distances. Thus, construction of roadways would not exceed the City's noise standard. The impact would be less than significant.

During Phase 2, construction activities would occur approximately 100 feet from occupied on-site buildings, which would result in the generation of noise levels of 79 dBA L_{eq} at the nearest noise sensitive receptor. The nearest off-site receptor is approximately 165 feet south of the construction site, and at this distance, noise levels would be 75 dBA L_{eq}. Thus, Phase 2 would not exceed the City's construction noise standard. The impact would be less than significant.

Construction activities during Phase 3 would occur approximately 390 feet from the independent living facility (Building 34), which would result in the generation of noise levels of 67 dBA L_{eq} at the nearest potential noise sensitive receptor. The nearest off-site receptor is approximately 150 feet from the

construction site, and at this distance, noise levels would be 76 dBA L_{eq}. Thus, Phase 3 construction would not exceed the City's construction noise standard. The impact would be less than significant.

During Phase 4, construction activities would occur approximately 150 feet from the easternmost senior bungalows built during Phase 3, which would result in the generation of noise levels of 76 dBA L_{eq} at the nearest potential noise sensitive receptor. The nearest off-site receptor is approximately 315 feet southwest of the construction site, and at this distance, noise levels would reach 69 dBA L_{eq}. Thus, Phase 4 construction would not exceed the City's construction noise standard. The impact would be less than significant.

During Phase 5, construction activities would occur approximately 65 feet from the adolescent psychiatry facility (Building 33) constructed in Phase 1, which would result in the generation of noise levels of 83 dBA L_{eq} at the nearest noise sensitive receptor. No off-site noise sensitive receptors are in proximity to the building construction site for Phase 5. Thus, Phase 5 construction would not exceed the City's construction noise standard. However, in order to minimize noise impacts associated with construction of the acute psychiatric hospital (Building 35) on sensitive receptors located in the adolescent psychiatry facility (Building 33), the applicant would be required to install a temporary 8-foot tall wood wall around the perimeter of the construction site where there is a direct line-of-sight between the construction site and the adolescent psychiatry facility (Building 35) (see mitigation measure NOISE-B). Implementation of a wood wall would reduce the noise level experienced by sensitive receptors at the adolescent psychiatry facility (Building 33) by approximately 6 dBA during construction to approximately 77 dBA L_{eq}. In addition to compliance with the City's noise ordinance, the applicant would be required to implement mitigation measures NOISE-C through NOISE-E to further reduce noise generated on-site and to minimize the nuisance to off-site sensitive receptors. The impact would be less than significant.

To determine the impact construction vehicles would have on noise levels along local roadways, the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (RD-77-108) was used to predict noise levels with and without the project (FHWA 1978). The FHWA noise model determines a predicted noise level through a series of adjustments to a reference sound level. These adjustments account for traffic flows, speed, truck mix, varying distances from the roadway, length of exposed roadway, and noise shielding. Demolition is anticipated to generate a maximum of 20 truck trips daily. Construction workers would generate approximately 30 trips daily. It is assumed all construction traffic would travel to the project site via I-210. The primary routes for construction traffic coming from I-210 would be either Madre Street to Del Mar Boulevard or San Gabriel Boulevard to Del Mar Boulevard. Del Mar Boulevard may also serve as the sole route for Phase 3. Based on the existing volumes on these roadways, construction related traffic would constitute a less than 5 percent increase in volume and the truck percentage compared to the total volume would be less than 1 percent. Thus, construction traffic is anticipated to result in a noise level increase of less than 2 dBA L_{eq} along all affected roadways. Additionally, all construction deliveries would occur between the hours of 7:00 a.m. and 7:00 p.m., the least noise sensitive time of the day. Thus, noise generated by construction traffic would result in a less than significant impact.

Operation

Noise/Land Use Compatibility

The primary source of noise in the project area is traffic on local streets. Based on a review of the City's Noise Element, the project site is currently exposed to, and would continue to be throughout project completion, noise levels in the range of 60 to 65 dBA CNEL from I-210 and adjacent roadways. The higher noise levels occur along Del Mar Boulevard and San Gabriel Boulevard. This information appears consistent with measured noise levels, which indicate higher noise levels of approximately 64 dBA L_{eq} on these 2 roadways.

As indicated, the nearest roadways to the project site would be San Gabriel Boulevard, located along the western boundary of the project site, and Del Mar Boulevard, located along the northern boundary of the project site. Based on data from the traffic study (see Appendix F), the "Future With Project" peak hour traffic volumes on San Gabriel Boulevard and Del Mar Boulevard would be 2,354 and 2,075 vehicles, respectively. For noise modeling purposes, the vehicle mix/classification was based on traffic observations made during the noise measurements. Table 3.6-6 presents the anticipated location of the 60, 65, and 70 dBA CNEL contours represented as a distance from the centerline of San Gabriel Boulevard and Del Mar Boulevard.

TABLE 3.6-6 NOISE LEVEL CONTOUR DISTANCES[1]

Roadway	Peak Hour Volume[2]	Noise Level at 50 Feet*	Distance to		
			60 dBA CNEL (Feet)	65 dBA CNEL (Feet)	70 dBA CNEL (Feet)
San Gabriel Boulevard	2,354	71	258	120	56
Del Mar Boulevard	2,075	69	211	98	45

[1] Assumes the posted speed is the actual travel speed and the traffic.
[2] Traffic mix: 95 percent automobiles, 3 percent medium trucks, and 2 percent heavy trucks.
Source: EDAW 2008

The proposed project would locate noise sensitive land uses approximately 60 feet east of the centerline of San Gabriel Boulevard and approximately 245 feet south of the centerline of Del Mar Boulevard. Seven senior living bungalows built as part of Phase 3 would be located within the 60 CNEL noise level contour of San Gabriel Boulevard. Three of these bungalows would also be located within the 65 dBA CNEL noise level contour. No noise sensitive land uses would be located within the 70 dBA CNEL noise level contour. The City's exterior noise level standard for hospitals and multi-family residential uses, such as the proposed bungalows, is 65 dBA CNEL under the "clearly acceptable" category. The proposed project land uses would not exceed the City's noise/land use compatibility guidelines. Therefore, the proposed project would not expose persons to noise levels above City standards during project operation. The impact would be less than significant.

Typical wood frame construction, with windows in the closed position, would provide 20 dBA noise level reductions for exterior noise levels (FHWA 1995). Based on the location of the proposed uses and the calculated exterior noise levels, interior noise levels under future conditions would be on the order of 40 to 45 dBA CNEL. As such, the proposed project would not exceed federal noise policies for interior noise levels. The impact would be less than significant.

On-Site Noise

Project operation would create additional on-site noise sources within the project site. These sources would include the typical noise sources associated with hospital and residential land uses, such as vehicles arriving and leaving, and landscape maintenance machinery. None of these noise sources is anticipated to violate the noise ordinance. However, the mechanical equipment would be required to comply with Section 9.36.030, of the noise ordinance, which limits nose levels from on-site noise sources at the property boundary. This may be achieved by several methods, including the selection of quiet models, constructing barriers, enclosing the equipment, and careful consideration of equipment orientation and location. Therefore, compliance with existing regulations would ensure that on-site noise sources would comply with the City's property line noise levels limits. The impact would be less than significant.

Off-Site Noise

The principal source of off-site noise in the project area would be traffic on local roadways. The long-term project-related noise analysis is based on traffic projections contained in the project traffic report (see Appendix F). Traffic generated by the proposed project would disperse onto Del Mar Boulevard, San Gabriel Boulevard, San Pasqual Street, Madre Street, and El Nido Avenue depending on the final destination; however, the majority of the traffic would use San Gabriel Boulevard and Madre Street, via Del Mar Boulevard, to access the main transportation network and local freeways. Based on the project traffic report, the project would generate an additional 1,467 daily one-way trips (Linscott, Law and Greenspan 2008). Approximately 95 percent (1,320 vehicle trips) of all project traffic would enter or exit on Del Mar Boulevard, with 3 percent (118 vehicle trips) using San Gabriel Boulevard and approximately 2 percent (29 vehicle trips) using El Nido Avenue. The Del Mar Boulevard traffic volumes generally split evenly east and westbound to San Gabriel Boulevard and Madre Street; these volumes further split north and south at these roadways. The project-related traffic volumes continue to disperse into the community this way and become diluted by non-project related traffic. Thus, the greatest off-site noise impacts from traffic would occur in close proximity to the project site.

Under the existing plus project condition, the proposed project would generate a 7 percent increase over existing volumes along Del Mar Boulevard, a 7 percent increase along Madre Street, a 3 percent increase along San Gabriel Boulevard, and a 1 percent increase along San Pasqual Street and El Nido Avenue. Under the future conditions, the proposed project would result in similar increases along the same roadways. These increases would increase the without-project noise levels by less than 1 dBA over conditions without the project. These increases would represent a barely perceivable change in the future noise conditions with the proposed project and would not represent a significant impact. As such, traffic

generated by the proposed project would not create off-site noise impacts that would exceed the City's standards. The impact would be less than significant.

NOISE-2 *The proposed project would not expose persons to or generate excessive groundborne vibration during construction or operation.*

Construction

Although it is possible for vibrations from construction projects to cause building damage, the vibrations from construction activities are almost never of sufficient amplitude to cause more than minor cosmetic damage to buildings (FTA 2006). Groundborne vibration generated by construction projects is usually highest during pile driving, soil compacting, jackhammering, and demolition-related activities.

An assessment of potential vibration impacts from construction activities, such as demolition, drilling, and excavation, was conducted using equations and methodology developed by the FTA for construction impact evaluation. Table 3.6-7 shows typical vibration levels for various pieces of construction equipment.

TABLE 3.6-7 REPRESENTATIVE VIBRATION SOURCE LEVELS FOR CONSTRUCTION EQUIPMENT

Equipment	ppv at 25 feet (in/sec)
Large bulldozer	0.089
Loaded trucks	0.076
Jackhammer	0.035
Small bulldozer	0.003
Source: FTA 2006	

The nearest buildings containing sensitive receptors would be on-site uses, the nearest of which are approximately 65 feet from identified construction areas, including Building 3 during Phase 1 and Building 33 during Phase 3. At this distance, these receptors would be exposed to approximately 0.02 ppv in/sec. Accordingly, vibration generated by the proposed project would not exceed Caltrans vibration standard of 0.2 ppv in/sec. Additionally, the calculated vibration level would be below the identified human response threshold of 0.1 ppv in/sec, and thus, the identified receptors would not be exposed to substantial vibration during project construction. Subsequent phases would generally use equipment that would produce less vibration or would be farther away, thus vibration during other phases would be less than at the identified receptor points. Therefore, the proposed project would not expose local sensitive receptors to excessive groundborne vibrations. The impact would be less than significant.

Operation

Operation of the proposed project would not be expected to generate substantial amounts of groundborne vibration. Groundborne vibration is currently experienced in the project area as a result of heavy trucks driving on nearby roadways such as Del Mar Boulevard and San Gabriel Boulevard. Operation of the proposed project would not require an increase in heavy trucks traveling to and from the project site. As

such, the proposed project would not expose persons to excessive amounts of groundborne vibration. The impact would be less than significant.

NOISE-3 *The proposed project would result in a substantial permanent increase in ambient noise levels in the vicinity of the project area during construction or operation.*

Construction

As described in NOISE-1 above, construction activities would be expected to increase noise levels in the project vicinity. Construction of the project would be anticipated to start in July 2009 and occur regularly over a 50-month period, ending in approximately September 2014, in order to complete all phases of the proposed project. As discussed above, noise levels experienced on- and off-site during construction would be expected to increase. Noise levels would not exceed the City of Pasadena construction noise standard during some phases of construction. Therefore, implementation of mitigation measures NOISE-A through NOISE-E would be required during construction. The impact would be reduced to a less than significant.

Operation

As described in NOISE-1 above, the proposed project would add new vehicle trips to the adjacent roadways during operation. However, these increases would represent a barely perceivable change in the future noise conditions with the proposed project and would not represent a significant impact. As such, traffic generated by the proposed project would not create a permanent increase in ambient noise levels. The impact would be less than significant.

Mechanical equipment and other on-site noise sources would create additional on-site noise sources within the project site. These sources would include the typical noise sources associated with hospital and residential land uses, such as vehicles arriving and leaving and landscape maintenance machinery. None of these noise sources would violate the noise ordinance. The impact would be less than significant.

NOISE-4 *The proposed project would result in a substantial temporary increase in ambient noise levels in the vicinity of the project area.*

As described in NOISE-1 above, noise levels experienced on- and off-site during construction would be expected to increase during construction of the proposed project. Construction of the proposed project would be anticipated to start in July 2009 and occur regularly over a 50-month period, ending in approximately September 2014, in order to complete all phases of the proposed project. Noise levels would exceed the City of Pasadena construction noise standard during some phases of construction. Therefore, implementation of mitigation measures NOISE-A through NOISE-E would be required during construction. The temporary impact to ambient noise levels would be reduced to a less than significant.

3.6.4 MITIGATION MEASURES

NOISE-A Prior to the start of construction of the adolescent psychiatry facility (Building 33), the applicant shall vacate Building 3 (Las Flores). If use of Building 3 is deemed necessary to the functioning of the hospital, the applicant shall seek approval of an alternative means of mitigating construction noise levels. An alternative mitigation measure must be reviewed and approved by the Planning Division.

NOISE-B Prior to the start of construction of the acute psychiatric hospital (Building 35), the construction contractor shall install a temporary eight-foot wood wall along the perimeter of the construction site where a direct ground level line of sight exists between the construction area and the sensitive receptors located in the adolescent psychiatry facility (Building 33).

NOISE-C During construction, the construction contractor shall equip all mobile construction equipment with properly operating mufflers or other noise reduction devices.

NOISE-D During construction, the contractor shall schedule activities to avoid operating several pieces of equipment simultaneously, which causes high noise levels.

NOISE-E Prior to the start of construction, the construction contractor shall notify residences immediately adjacent to the project site (e.g., via flyers). The notices shall include a telephone number to the Pasadena Health Department for referral to determine if a violation of the City's Noise Ordinance is occurring.

3.6.5 SIGNIFICANCE AFTER MITIGATION

Compliance with the City's Noise Ordinance and implementation of mitigation measures NOISE-A through NOISE-E would ensure that construction noise levels would not exceed the City's construction noise standards. Construction activities would also generate groundborne vibration when heavy equipment is used. However, during Phase 1 when construction activities would be closest to sensitive receptors, groundborne vibration levels would not exceed Caltrans standards. Operation of the proposed project would increase the amount of vehicle traffic on nearby roadways. However, noise associated with additional vehicle travel would not expose sensitive receptors to noise levels in excess of City standards for residential and hospital uses. Impact would be less than significant.