

5.2 NOISE

This section of the Draft EIR 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 project. This evaluation uses procedures and methodologies as specified by California Department of Transportation (Caltrans), the Federal Transit Administration (FTA), and the Federal Highway Administration (FHWA). Noise modeling data sheets for this analysis are included as Appendix F.

5.2.1 Environmental Setting

Noise Terminology

The following are definitions of terminology used in this section:

- **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 that humans can hear.
- **Sound Level Equivalent (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 sound levels occurring during the period from 7 PM to 10 PM and 10 dB added to the sound levels occurring during the period 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.

Noise Descriptors

Noise is most often defined as unwanted sound. Although sound can be easily 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.”

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. Therefore, to approximate this human, frequency-dependent response, the A-weighted filter system is used to adjust measured sound levels. The normal range of human hearing extends from approximately 0 dBA to 140 dBA.



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Unlike linear units such as inches or pounds, decibels 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. Table 5.2-1, *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 2003

Sound is generated from a source and dissipates exponentially with distance from that source. This phenomenon is known as “spreading loss.”

When sound is measured for distinct time intervals, the statistical distribution of the overall sound level during that period can be obtained. The sound level equivalent (L_{eq}) is the most common parameter associated with such measurements. L_{eq} is the average sound level over a given period of time. For example, the L_{50} noise level is the level that is exceeded 50 percent of the time; half the time the noise exceeds this level and half the time it is less than this level. This level is also exceeded 30 minutes in an hour. Similarly, the L_{02} , L_{08} , and L_{25} values are 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 are the minimum and maximum noise levels obtained over the measurement period.

Because community receptors are more sensitive to unwanted noise intrusion at night, state law requires that, for planning purposes, an artificial dB increment be added to quiet-time noise levels in 24-hour noise descriptors called 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 the entire biological system, with prolonged noise exposure in excess of 75 dBA increasing body tensions, thereby affecting blood pressure and functions of the heart and nervous system. Extended periods of noise exposure above 90 dBA can result in permanent cell 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 the feeling of pain in the ear, called the threshold of pain. A sound level of 160 to 165 dBA will result in dizziness or loss of equilibrium. The ambient or background noise problem is widespread and generally more concentrated in urban areas than in outlying, less developed areas. Table 5.2-2 shows *Typical Noise Levels from Noise Sources*.

**Table 5.2-2
Typical Noise Levels from Noise Sources**

<i>Common Outdoor Activities</i>	<i>Noise Level (dBA)</i>	<i>Common Indoor Activities</i>
	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 three feet
	80	Garbage Disposal at three feet
Noisy Urban Area, Daytime		
	70	Vacuum Cleaner at ten feet
Commercial Area		Normal Speech at three feet
Heavy Traffic at 300 feet	60	
		Large Business Office
Quiet Urban Daytime	50	Dishwasher Next Room
Quiet Urban Nighttime	40	Theater, Large Conference Room (background)
Quiet Suburban Nighttime		
	30	Library
Quiet Rural Nighttime		Bedroom at Night, Concert Hall (background)
	20	
		Broadcast/Recording Studio
	10	
Lowest Threshold of Human Hearing	0	Lowest Threshold of Human Hearing

Source: California Department of Transportation, Technical Noise Supplement to the Traffic Noise Analysis Protocol, Table 9-2136.2, October 1998.



Noise- and Vibration-Sensitive Receptors

Certain land uses are particularly sensitive to noise and vibration, including residential, school, churches, and open space/recreation areas where quiet environments are necessary for enjoyment, public health, and safety. Sensitive receptors in the vicinity of the project site include residential uses surrounding the site as follows:

- **Single-Family Residents adjacent to San Marino High School.** Residential areas are sensitive to noise, especially during the evening and early morning hours when people are sleeping. Single-family residences abut San Marino High School to the west. These residences are approximately 305 feet away from the Michael White Adobe (Adobe) at the San Marino High School campus.
- **Classrooms at San Marino High School.** Classrooms at the San Marino High School campus are sensitive to noise. Noise generated by nonclassroom sources can interfere with the intelligibility of communication in the classroom setting and disrupt the classroom environment. The classroom buildings at the San Marino High School are approximately 170 feet southeast of the Adobe.

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Existing Noise Environment

The project site is on the San Marino High School campus, which had a student enrollment of 1,096 students during the 2008–2009 academic year. The existing ambient noise environment in the vicinity of the project site includes stationary noise from use of the onsite athletic hardcourts and playfields and noise from the parking lot, as well as mobile-source noise from traffic on Huntington Drive south of the school.

Regulatory Framework

State of California

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 for 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.

Land Use Compatibility Criteria

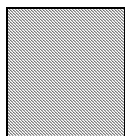
Table 5.2-3 presents a land use compatibility chart for community noise adopted by the State of California as part of General Plan Guidelines. This table provides urban planners with a tool to gauge the compatibility of new land uses relative to existing and future noise levels. This table identifies normally acceptable, conditionally acceptable, and clearly unacceptable noise levels for various land uses. A conditionally acceptable designation implies new construction or development should be undertaken only after a detailed analysis of the noise reduction requirements for each land use is made and needed noise insulation features are incorporated in the design. By comparison, a normally acceptable designation indicates that standard construction can occur with no special noise reduction requirements.

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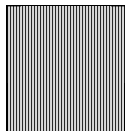
**Table 5.2-3
Land Use Compatibility for Community Noise Environments**

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



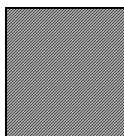
Normally Acceptable:

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



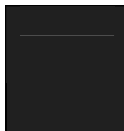
Conditionally Acceptable:

New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and the 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 be discouraged. If new construction 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 generally should not be undertaken.



Source: California Office of Noise Control. Guidelines for the Preparation and Content of Noise Elements of the General Plan. February 1976. Adapted from the US EPA Office of Noise Abatement Control, Washington D.C. Community Noise. Prepared by Wyle Laboratories. December 1971.

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City of San Marino

City of San Marino Ambient Base Noise Level

The City of San Marino regulates noise through the Chapter XIV, Article 4, Section 14.04.05 of the City's Municipal Code. Pursuant to the Noise Ordinance, noise levels generated at a property are restricted from exceeding certain noise levels for extended periods of time. The City applies the noise standards (summarized in Table 5.2-4) to nontransportation noise sources. These standards do not gauge the compatibility of developments in the noise environment, but provide restrictions on the amount and duration of noise generated at a property, as measured at the property line of the noise receptor. The City's Noise Ordinance is designed to protect people from objectionable nontransportation noise sources such as music, machinery, pumps, and air conditioners. Pursuant to the City's Municipal Code, the City restricts any person from generating noise at any adjacent residential property line at a level that exceeds a noise level of 65 dB from any parcel in an R-1 zone and 75 dB from any parcel in a C-1 Zone, Park and Recreational Zone, or Historical and Cultural Zone.

**Table 5.2-4
City of San Marino Ambient Base Noise Level**

<i>Land Use/Zone</i>	<i>Time Interval</i>	<i>Ambient Base Noise Levels (dBA)¹</i>	<i>Maximum Permissible Noise Limits</i>
R-1 Residential	7:00 a.m. to 10:00 p.m.	55	65
	10:00 p.m. to 7:00 a.m.	45	55
R-1 Residential Corridor ²	7:00 a.m. to 10:00 p.m.	60	70
	10:00 p.m. to 7:00 a.m.	45	55
C-1 Commercial, Park and Recreational Zone, Historical or Cultural Zone	7:00 a.m. to 10:00 p.m.	65	75
	10:00 p.m. to 7:00 a.m.	50	60

Source: City of San Marino, City of San Marino Municipal Code. Chapter XIV, Article 4, Noise Control, Section 14.04.04.

Notes: Any noise at a level which exceeds the ambient base level as set forth in this Section by more than 10 dB, when measured at any adjacent privately owned residential property line, shall constitute proof of a violation of this section.

¹ Where the ambient noise levels is less than the base noise levels, the ambient noise levels shall be used as the baseline noise environment.

² Residential corridor shall mean any residential property located within 150 feet of a commercial zone or from any portion of Huntington Drive not abutting a commercial Area.

City of San Marino Construction Hours

According to Section 14.04.07 of the City's Municipal Code, it is unlawful to operate construction equipment that would require a building, plumbing, electrical or grading permit in a residential zone or 500 feet within a residential zone in a manner that the noise produced would exceed 65 dBA in a residential zone or 75 dBA in a commercial, park and recreation, or historical and cultural zone, unless a permit has been obtained from the Planning and Building Director. In addition, the City regulates hours of construction. Construction activities are restricted to the hours of 7:00 AM to 6:00 PM Monday through Friday and 9:00 AM to 4:00 PM on Saturday.

City of San Marino School Noise Exemption

Activities conducted at schools, including sports, carnivals, assemblies, and other related activities (see City of San Marino Municipal Code Chapter XIV, Article 4, Section 14.04.13), are exempt from the noise standards of the City's Noise Ordinance.

Vibration Standards

The FTA provides criteria for acceptable levels of groundborne vibration for various types of special buildings that are sensitive to vibration for both vibration annoyance and structural damage. The human reaction to various levels of vibration is highly subjective and variable. As noted in the FTA manual, “although PPV is appropriate for evaluating the potential of building damage, it is not suitable for evaluating human response” (FTA 2006). This is because it takes time for the human body to respond to vibration signals. Table 5.2-5 lists the FTA criteria for acceptable levels of groundborne vibration based on the relative perception of a vibration event for various types of vibration-sensitive land uses.

**Table 5.2-5
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.

The level at which groundborne vibration is strong enough to cause structural damage has not been determined conclusively. The most conservative estimates are reflected in the FTA standards, shown in Table 5.2-6. Wood-frame buildings, such as typical residential structures, are more easily excited by ground vibration than heavier buildings. According to the Caltrans’ *Transportation Related Earthborne Vibration* (2002), extreme care must be taken when sustained pile driving occurs within 25 feet of any building; however, the threshold at which there is a risk of architectural damage to normal houses with plastered walls and ceilings is 0.2 inch per second.



**Table 5.2-6
Groundborne Vibration and Noise Impact Criteria – Structural 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.

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

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5.2.2 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 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-2
- Threshold N-5
- Threshold N-6

These impacts will not be addressed in the following analysis.

5.2.3 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.

IMPACT 5.2-1: CONSTRUCTION ACTIVITIES ASSOCIATED WITH THE PROJECT WOULD TEMPORARILY ELEVATE THE DAYTIME NOISE ENVIRONMENT IN THE VICINITY OF NOISE-SENSITIVE USES. [THRESHOLD N-4]

Impact Analysis: Short-term noise would be generated from construction activities. 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 on-site construction equipment. The following analysis describes construction noise impacts associated with demolition of the Adobe structure.

Short-Term Construction Noise from On-Road Mobile Sources

First, the transport of workers and movement of materials to and from the site could incrementally increase noise levels along local access roads; and/or, short-term noise impacts could occur during demolition, site

preparation, grading, and/or physical construction. The transport of workers and equipment to the construction site would incrementally increase noise levels along site access roadways. Even though there would be a relatively high single-event noise exposure potential with passing trucks, the expected number of workers and trucks is small relative to the background traffic. The truck trips would be spread throughout the workday and would primarily occur during nonpeak traffic periods. Therefore, these impacts are less than significant at noise receptors along the construction routes during demolition of the Adobe, and no mitigation measures are necessary.

Short-Term Construction Noise from Off-Road Construction Equipment

Under the proposed project, demolition activities would commence following approval of the project and salvage of historic architectural features. Demolition activities could be conducted during winter break. However, for the purpose of this analysis, demolition activities are assumed to overlap with operational activities at the school site. Demolition of the structure would take approximately two weeks. Once demolition has been completed, the site would be capped with a concrete foundation. Off-road construction equipment used for site preparation would include a bobcat and backhoe.

For onsite construction equipment noise, construction is performed in distinct steps, each with its own mix of equipment and, consequently, its own noise characteristics. 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 were calculated using the FHWA’s Roadway Construction Noise Model (RCNM) based on the equipment list provided by the District. Noise levels in Table 5.2-7 represent the average noise levels from demolition activities associated with the Adobe.



**Table 5.2-7
Construction Noise Levels Associated with Demolition of the Michael White Adobe**

Location	Construction Noise Levels at Noise-Sensitive Uses	
	dBA L_{eq}	dBA L_{max}
Residents West of the San Marino High School Campus	57 dBA L_{eq}	58 dBA L_{max}
On-Site Classroom Buildings	67 dBA L_{eq}	67 dBA L_{max}

Source: FHWA RCNM, Version 1.1. Based on the construction equipment mix provided by the District.

Construction activities would elevate ambient noise levels during the daytime at the noise-sensitive uses adjacent to the project site and at onsite classrooms. Construction activities would be limited to the hours permitted by the City of San Marino (7:00 AM to 6:00 PM Monday through Friday and 9:00 AM to 4:00 PM on Saturday) under Section 14.04.07 of the City’s Municipal Code and would not occur in the evening or late night hours. Demolition activities would occur for a very short time (2 weeks). However, equipment-intensive construction activities would be limited because the majority of construction would not involve use of large construction equipment. Consequently, because construction activities would occur for a relatively short duration, during the least noise-sensitive portions of the day, and use of loud equipment would be minimal, impacts at offsite sensitive-receptors would be less than significant for either scenario.

However, construction activities would coincide with the noise-sensitive portion of the school day. Demolition could generate noise levels up to 67 dBA L_{eq} at the onsite classroom building. Excessive noise can disrupt the learning environment. A teacher can be understood without any interruption at approximately 20 feet if the inside sound level is 55 dBA L_{max} (FICON 1992). Because even short-term construction activities have the potential to disrupt the classroom learning environment, impacts are potentially significant.

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IMPACT 5.2-2 OPERATION OF THE PROJECT WOULD NOT GENERATE A SUBSTANTIAL INCREASE IN NOISE LEVELS. [THRESHOLDS N-1 AND N-3]

Impact Analysis: Once the Adobe is demolished, the project site would be capped. No additional structures or improvements would be made. The project site would be an open quad and part of the existing recreational uses of the campus. The project site would not generate additional noise. Consequently, no impact would occur from the operational phase of the project.

5.2.4 Cumulative Impacts

Construction Noise

Construction noise impacts are confined to a local area of impact. Consequently, cumulative impacts would only occur if other projects are being constructed in the vicinity of the project at the same time. The whole area surrounding the project site is developed with suburban uses. Consequently, project-related construction noise would not substantially increase the ambient noise environment. Cumulative impacts are therefore also considered less than significant.

Operation

The project would not substantially increase the ambient noise environment. Consequently, stationary noise associated the project would not be cumulatively considerable and would result in less than significant cumulative noise impacts.

5.2.5 Existing Regulations and Standard Conditions

- Title 24, California Code of Regulations, Building Standards Administrative Code, Part 2, California Building Code: Requires habitable rooms and classrooms to achieve noise levels of 45 dBA CNEL.
- City of San Marino Municipal Code, Chapter XIV, Article 4, Noise Control.

5.2.6 Level of Significance Before Mitigation

Upon implementation of regulatory requirements and standard conditions of approval, the following impacts would be less than significant: 5.2-2 and cumulative impacts.

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

- Impact 5.2-1 Construction activities associated with the project would temporarily elevate the daytime noise environment in the vicinity of noise-sensitive uses.

5.2.7 Mitigation Measures

Impact 5.2-1

- 2-1 Prior to construction, the construction contractor shall coordinate with the San Marino Unified School District administrators for San Marino High School to discuss construction activities that generate high noise levels. Coordination between the administrators and the construction contractor shall continue on an as-needed basis throughout the construction phase of the project to avoid potential disruption of classroom activities as feasible.

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- 2-2 The San Marino Unified School District shall specify that the contractor shall properly maintain and tune all construction equipment in accordance with the manufacture's recommendations to minimize noise emissions.
- 2-3 The San Marino Unified School District shall specify that the contractor shall fit all equipment with properly operating mufflers, air intake silencers, and engine shrouds no less effective than as originally equipped by the manufacturer.
- 2-4 The San Marino Unified School District shall specify that the construction contractor shall place stationary construction equipment and material delivery (loading/unloading) areas as far from adjacent residential and classroom uses as is feasible, but no closer than 50 feet.

5.2.8 Level of Significance After Mitigation

Mitigation Measures 2-1 through 2-4 would reduce noise generated by construction activities to the extent feasible. Mitigation Measure 2-1 would require the construction contractor to coordinate with the District to avoid classroom disruption. Because construction activities would occur for a relatively short duration, use of loud construction equipment would be minimal, and mitigation measures would ensure that the construction contractor would coordinate activities with the District to minimize classroom disruption, potential impacts associated would be less than significant. Therefore, no significant unavoidable adverse impacts relating to noise remain.



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