5.5 NOISE

This section of the Draft Environmental Impact Report (EIR) evaluates the potential for the Eastside Neighborhood School (proposed project) to impact the noise environment in the local vicinity. Specifically, this section summarizes relevant federal, state, and local noise guidelines, policies, and standards; reviews noise levels at existing receptor locations; and evaluates potential noise impacts. This evaluation uses procedures and methodologies specified by the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA). The analysis in this section is based in part on the noise modeling data in Appendix F of this Draft EIR.

Terminology

- **Sound.** A disturbance created by a vibrating object, which, when transmitted by pressure waves through a medium such as air, is capable of being detected by a receiving mechanism, such as the human ear or a microphone.
- **Noise.** Sound that is loud, unpleasant, unexpected, or otherwise undesirable.
- **Decibel (dB).** A unitless measure of sound on a logarithmic scale.
- **A-Weighted Decibel (dBA).** An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.
- **Equivalent Continuous Noise Level (L_{eq}); also called the Energy-Equivalent Noise Level.** The value of an equivalent, steady sound level that, in a stated time period (often over an hour) and at a stated location, has the same A-weighted sound energy as the time-varying sound. Thus, the L_{eq} metric is a single numerical value that represents the equivalent amount of variable sound energy received by a receptor over the specified duration.
- **Statistical Sound Level (L_n).** The sound level that is exceeded "n" percent of time during a given sample period. For example, the L_{50} level is the statistical indicator of the time-varying noise signal that is exceeded 50 percent of the time (during each sampling period); that is, half of the sampling time, the changing noise levels are above this value and half of the time they are below it. This is called the "median sound level." The L_{10} level, likewise, is the value that is exceeded 10 percent of the time (i.e., near the maximum) and this is often known as the "intrusive sound level." The L_{90} is the sound level exceeded 90 percent of the time and is often considered the "effective background level" or "residual noise level."
- **Day-Night Sound Level (L_{dn} or DNL).** 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 10:00 pm to 7:00 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 from 7:00 pm to 10:00 pm and 10 dB from 10:00 pm to 7:00 am. For general community/environmental noise, CNEL and L_{dn} values rarely differ by more than

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NOISE

1 dB (with the CNEL being only slightly more restrictive, that is, higher than the L_{dn} value). As a matter of practice, L_{dn} and CNEL values are interchangeable and are treated as equivalent in this assessment.

- **Peak Particle Velocity (PPV).** The peak signal value of an oscillating vibration velocity waveform usually expressed in inches per second (in/sec).
- **Sensitive Receptor.** Noise- and vibration-sensitive receptors include land uses where quiet environments are necessary for enjoyment and public health and safety. Residences, schools, motels and hotels, libraries, religious institutions, hospitals, and nursing homes are examples.

Noise and Vibration Fundamentals

Noise is defined as unwanted sound and is known to have several adverse effects on people, including hearing loss, speech and sleep interference, physiological responses, and annoyance. 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." Based on these known adverse effects of noise, the federal government, the State of California, and many local governments have established criteria to protect public health and safety and to prevent disruption of certain human activities.

Sound Fundamentals

Sound is a pressure wave transmitted through the air. It is described in terms of loudness or amplitude (measured in decibels), frequency or pitch (measured in Hertz [Hz] or cycles per second), and duration (measured in seconds or minutes). The standard unit of measurement of the loudness of sound is the decibel (dB). Changes of 1 to 3 dBA are detectable under quiet, controlled conditions, and changes of less than 1 dBA are usually indiscernible. A 3 dBA change in noise levels is considered the minimum change that is detectable with human hearing in outside environments. A change of 5 dBA is readily discernable to most people in an exterior environment, and a 10 dBA change is perceived as a doubling (or halving) of the sound.

The human ear is not equally sensitive to all frequencies. Sound waves below 16 Hz are not heard at all and are "felt" more as a vibration. Similarly, while people with extremely sensitive hearing can hear sounds as high as 20,000 Hz, most people cannot hear above 15,000 Hz. In all cases, hearing acuity falls off rapidly above about 10,000 Hz and below about 200 Hz. Since the human ear is not equally sensitive to sound at all frequencies, a special frequency-dependent rating scale is usually used to relate noise to human sensitivity. The A-weighted decibel scale (dBA) performs this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear.

Noise is defined as unwanted sound and is known to have several adverse effects on people, including hearing loss, speech and sleep interference, physiological responses, and annoyance. Based on these known adverse effects of noise, the federal government, the State of California, and many local governments have established criteria to protect public health and safety and to prevent disruption of certain human activities.

Sound Measurement

Sound intensity is measured through the A-weighted scale to correct for the relative frequency response of the human ear. That is, an A-weighted noise level de-emphasizes low and very high frequencies of sound similar to the human ear's de-emphasis of these frequencies.

Unlike linear units such as inches or pounds, decibels are measured on a logarithmic scale, representing points on a sharply rising curve. On a logarithmic scale, an increase of 10 dBA is 10 times more intense than 1 dBA, while 20 dBA is 100 times more intense, and 30 dBA is 1,000 times more intense. A sound as soft as human breathing is about 10 times greater than 0 dBA. The decibel system of measuring sound gives a rough connection between the physical intensity of sound and its perceived loudness to the human ear. Ambient sounds generally range from 30 dBA (very quiet) to 100 dBA (very loud).

Sound levels are generated from a source and their decibel level decreases as the distance from that source increases. Sound dissipates exponentially with distance from the noise source. This phenomenon is known as "spreading loss." For a single point source, sound levels decrease by approximately 6 dBA for each doubling of distance from the source. This drop-off rate is appropriate for noise generated by on-site operations from stationary equipment or activity at a project site. If noise is produced by a line source, such as highway traffic, the sound decreases by 3 dBA for each doubling of distance in a hard site environment. Line source noise in a relatively flat environment with absorptive vegetation decreases by 4.5 dBA for each doubling of distance.

Time variation in noise exposure is typically expressed in terms of a steady-state energy level equal to the energy content of the time varying period (called L_{eq}), or alternately, as a statistical description of the sound level that is exceeded over some fraction of a given observation period. For example, the L_{50} noise level represents the noise level that is exceeded 50 percent of the time. Half the time the noise level exceeds this level and half the time the noise level is less than this level. This level is also representative of the level that is exceeded 30 minutes in an hour. Similarly, the L_2, L_8, and L_{25} values represent the noise levels that are exceeded 2, 8, and 25 percent of the time or 1, 5, and 15 minutes per hour. These "L" values are typically used to demonstrate compliance for stationary noise sources with a city's noise ordinance, as discussed below. Other values typically noted during a noise survey are the L_{min} and L_{max}. These values represent the minimum and maximum root-mean-square noise levels obtained over the measurement period.

Because community receptors are more sensitive to unwanted noise intrusion during the evening and at night, an artificial dB increment is added to quiet time noise levels in a 24-hour noise descriptor called the Community Noise Equivalent Level (CNEL) or Day-Night Noise Level (L_{dn}). The CNEL descriptor requires that an artificial increment of 5 dBA be added to the actual noise level for the hours from 7:00 am to 10:00 pm and 10 dBA for the hours from 10:00 pm to 7:00 am. The L_{dn} descriptor uses the same methodology except that there is no artificial increment added to the hours between 7:00 pm and 10:00 pm. Both descriptors give roughly the same 24-hour level with the CNEL being only slightly more restrictive (i.e., higher).

Psychological and Physiological Effects of Noise

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

Vibration Fundamentals

Vibration is an oscillatory motion through a solid medium, such as the ground or a building. Vibration is normally associated with activities stemming from operations of railroads or vibration-intensive stationary sources but can also be associated with construction equipment such as jackhammers, pile drivers, and hydraulic hammers.

Amplitude

Vibration amplitudes are usually described in terms of either the peak particle velocity (PPV) or the root mean square (RMS) velocity. PPV is the maximum instantaneous peak of the vibration signal, and RMS is the square root of the average of the squared amplitude of the signal. PPV is more appropriate for evaluating potential building damage. The units for PPV are normally inches per second (in/sec). Typically, groundborne vibration generated by human activities attenuates rapidly with distance from the source of the vibration.

The way in which vibration is transmitted through the earth is called propagation. As vibration waves propagate from a source, the energy is spread over an ever-increasing area such that the energy level striking a given point is reduced with the distance from the energy source. This geometric spreading loss is inversely proportional to the square of the distance. The amount of attenuation provided by material damping varies with soil type and condition as well as the frequency of the wave.

As with airborne sound, annoyance with vibrational energy is a subjective measure, depending on the level of activity and the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Persons accustomed to elevated ambient vibration levels, such as in an urban environment, may tolerate higher vibration levels. Table 5.5-1 shows the human response and the effects on buildings resulting from continuous vibration (in terms of various levels of PPV).

Table 5.5-1 Human Reaction to Typical Vibration Levels

Vibration Level Peak Particle Velocity	Human Reaction	Effect on Buildings
0.006–0.019 in/sec	Threshold of perception, possibility of intrusion	Vibrations unlikely to cause damage of any type
0.08 in/sec	Vibrations readily perceptible	Recommended upper level of vibration to which ruins and ancient monuments should be subjected
0.10 in/sec	Level at which continuous vibration begins to annoy people	Virtually no risk of "architectural" (i.e., not structural) damage to normal buildings
0.20 in/sec	Vibrations annoying to people in buildings	Threshold at which there is a risk to "architectural" damage to normal dwellings – houses with plastered walls and ceilings
0.4–0.6 in/sec	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Vibrations at a greater level than normally expected from traffic, but would cause "architectural" damage and possibly minor structural damage

Source: California Department of Transportation (Caltrans). 2013, September. Transportation and Construction Vibration Manual.

5.5.1 Environmental Setting

5.5.1.1 REGULATORY FRAMEWORK

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

State

California Code of Regulations

Title 24, Part 11. The State of California's noise insulation standards for nonresidential uses are codified in the California Code of Regulations (CCR), Title 24, Building Standards Administrative Code, Part 11, California Green Building Standards Code (CALGreen). CALGreen noise standards are applied to new or renovation construction projects in California to control interior noise levels resulting from exterior noise sources. Proposed projects may use either the prescriptive method (Section 5.507.4.1) or the performance method (5.507.4.2) to show compliance. Under the prescriptive method, a project must demonstrate transmission loss ratings for the wall and roof-ceiling assemblies and exterior windows when located within a noise environment of 65 dBA CNEL or higher. Under the performance method, a project must demonstrate that interior noise levels do not exceed 50 dBA $L_{eq(1hr)}$.

Title 5, Section 14040(q). Under Title 5, the California Department of Education (CDE) regulations require the school district to consider noise in the site selection process. As recommended by CDE guidance, if a school district is considering a potential school site near a freeway or other source of noise, it should hire an acoustical engineer to determine the level of sound that the site is exposed to and to assist in designing the school should that site be chosen.

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Local

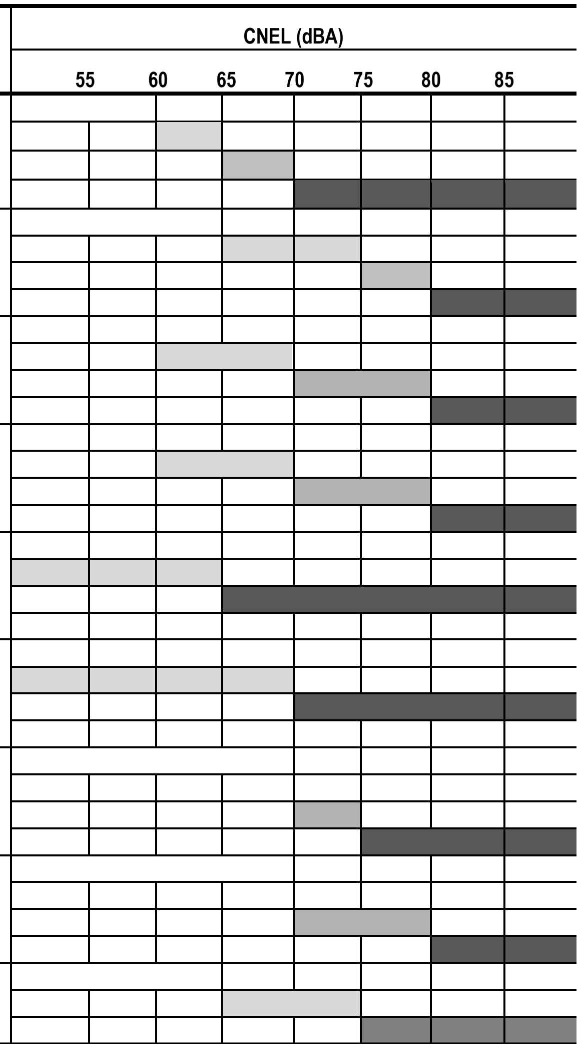
City of Riverside General Plan

Principal noise sources in the City of Riverside are from transportation, specifically from major arterial roadways; State Route (SR-) 91, SR-60, and Interstate (I-) 215; train movement along railroad lines; and aircraft overflight noise from Riverside Municipal Airport, Flabob Airport, and March Air Reserve Base.

The City of Riverside's General Plan Noise Element has set forth land use guidelines to protect residential neighborhoods and noise-sensitive receptors such as schools and hospitals from potentially harmful noise sources.[1] The noise and land use compatibility criteria are shown in Table 5.5-2.

Table 5.5-2 Noise and Land Use Compatibility Criteria: Riverside General Plan

Land Uses
Single-Family Residential
Infill Single-Family Residential
Commercial – Motels, Hotels, Transient Lodging
Schools, Libraries, Churches, Hospitals, Nursing Homes
Amphitheaters, Concert Hall, Auditorium, Meeting Hall
Sports Arena, Outdoor Spectator Sports
Playground, Neighborhood Parks
Golf Courses, Riding Stables, Water Recreation, Cemeteries
Office Buildings, Businesses, Commercial, Professional



1 Riverside, City of. February 2018. Riverside General Plan 2025. https://www.riversideca.gov/planning/gp2025program/general-plan.asp

Table 5.5-2 Noise and Land Use Compatibility Criteria: Riverside General Plan

Land Uses	CNEL (dBA) 55	60	65	70	75	80	85
Industrial, Manufacturing, Utilities, Agricultural							
Freeway Adjacent Commercial, Office, and Industrial Uses							

Explanatory Notes

Normally Acceptable: Specific land use is satisfactory, based on the assumption that any building is of normal conventional construction without any special noise insulation requirements.	**Normally Unacceptable:** New construction or development should generally be discouraged. If new construction or development does not proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.
Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of noise reduction requirement is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.	**Conditionally Unacceptable:** New construction or development should generally not be undertaken, unless it can be demonstrated that noise reduction requirements can be employed to reduce noise impacts to an acceptable level if new construction or development does proceed, a detailed analysis of noise reduction requirements must be made and needed noise insulation features included in the design.

Source: State Department of Health, as modified by the City of Riverside. Riverside, City of. February 2018. *Riverside General Plan 2025*. https://www.riversideca.gov/planning/gp2025program/general-plan.asp
* For properties located within airport influence areas, acceptable noise limits for single-family residential uses are established by the Riverside County Airport Land Use Compatibility Plan.

City of Riverside Municipal Code

The City of Riverside regulates and enforces exterior noise standards through Section 7.25.010, *Exterior Sound Level Limits,* of the Municipal Code. Exterior noise standards are summarized in Table 5.5-3. The City of Riverside noise regulations are enforced through its code of ordinances. The code provides decibel corrections that shall not exceed the following:

- The exterior noise standard of the applicable land use category, up to 5 dB, for a cumulative period of more than 30 minutes in any hour (L_{50}).

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- The exterior noise standard of the applicable land use category, plus 5 dB, for a cumulative period of more than 15 minutes in any hour (L_{25}).
- The exterior noise standard of the applicable land use category, plus 10 dB, for a cumulative period of more than five minutes in any hour (L_8).
- The exterior noise standard of the applicable land use category, plus 15 dB, for the cumulative period of more than one minute in any hour (L_2).
- The exterior noise standard for the applicable land use category, plus 20 dB or the maximum measured ambient noise level (L_{max}), for any period of time.

Section 7.25.010(D) specifically addresses air conditioning noise stating that where the intruding noise source is an air-conditioning unit or refrigeration system, the exterior noise level when measured at the property line must not exceed 60 dBA for units installed before January 1, 1980, and 55 dBA for units installed after January 1, 1980.

Table 5.5-3 Exterior Noise Standards

Land Use Category	Time Period	Noise Level in dBA
Residential	Night: 10:00 pm to 7:00 am	45
	Day: 7:00 am to 10:00 pm	55
Office/commercial	Any time	65
Industrial	Any time	70
Community support	Any time	60
Public recreation facility	Any time	65
Nonurban	Any time	70

Source: City of Riverside Code of Ordinances, Title 7, Noise Control. https://library.municode.com/ca/riverside/codes/code_of_ordinances
Note: If the measured ambient noise level exceeds that permissible within any of the first four noise limit categories, the allowable noise exposure standard shall be increased in five decibel increments in each category as appropriate to encompass the ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level.

Construction Noise

Per Section 7.35.010(B)(5), *Construction*, of the Municipal Code, it is unlawful for any person to make, continue, or cause to be made or continued any disturbing, excessive, or offensive noise that causes discomfort or annoyance to reasonable persons of normal sensitivity, including conducting construction activities between the hours of 7:00 pm and 7:00 am on weekdays and between 5:00 pm and 8:00 am on Saturdays, or at any time on Sunday or federal holidays.

Exemptions

Section 7.35.020, *Exemptions*, of the Municipal Code, exempts sounds from authorized school bands, school athletic, and school entertainment events conducted between the hours of 7:00 am and 10:00 pm.

Vibration Standards

The City of Riverside does not have specific limits or thresholds for vibration. The FTA provides criteria for acceptable levels of groundborne vibration for various types of buildings. The FTA criteria are used for this analysis. Structures amplify groundborne vibration, and wood-frame buildings, such as typical residential structures, are more affected by ground vibration than heavier buildings. The level at which groundborne vibration is strong enough to cause architectural damage has not been determined conclusively. The most conservative estimates are reflected in the FTA standards shown in Table 5.5-4.

Table 5.5-4 Groundborne Vibration Criteria: Architectural Damage

Building Structural Category	PPV, in/sec
I. Reinforced-concrete steel or timber (no plaster)	0.5
II. Engineered concrete and masonry (no plaster)	0.3
III. Engineered concrete and masonry (no plaster)	0.2
IV. Engineered concrete and masonry (no plaster)	0.12

Source: Federal Transit Administration, 2018. Transit Noise and Vibration Impact Assessment Manual. September.
PPV = peak particle velocity

5.5.1.2 EXISTING CONDITIONS

The project site is an L-shape, consisting of an existing school campus (Lincoln High School) on the eastern portion of the project site, existing residences and light industrial uses on the southwestern corner of the project, and Lincoln Park on the northern portion of the site. Surrounding the project site are commercial/retail uses and railroad tracks to the west that run parallel to Commerce Street and residences to the northeast and south. The noise environment surrounding the project site is primarily characterized by roadway traffic from 14th Street, rail noise, and existing park operations. Intermittent noise from the high school (students talking and bells/buzzers) also contribute to the existing ambient noise environment.

Certain land uses are particularly sensitive to noise and vibration. These uses include residences, schools, hospital facilities, houses of worship, open space, and recreation areas where quiet environments are beneficial to the enjoyment, public health, and safety of the community. The nearest sensitive receptors are the surrounding single-family homes to the north, east, and south of the project site.

Ambient Noise Measurements

To determine a baseline noise level at different environments in the project area, ambient noise monitoring was conducted by PlaceWorks in February 2022. Six short-term (10-minute) measurements were made during weekday periods during the evening of 7:00 pm and 10:00 pm in the vicinity of the project. Long-term (24-hour) measurements were conducted at three locations. All measurements were conducted Wednesday, February 9, 2022, through Friday, February 11, 2022. One long-term measurement was repeated due to equipment malfunction on Wednesday, February 16, 2022, through Thursday, February 17, 2022.

The primary noise sources around the measurements were traffic and rail noise. Urban and activity noise (such as dogs barking, persons using the park, and birds chirping) also contributed to the overall noise environment. Meteorological conditions during the measurement periods were favorable for outdoor sound measurements and were noted to be typical for the season.

The sound level meters used (Larson Davis LxT and Larson Davis 820) for noise monitoring satisfy the American National Standards Institute (ANSI) standard for Type 1 instrumentation. The sound-level meters were set to "slow" response and "A" weighting (dBA). The meters were calibrated prior to and after the monitoring periods. All measurements were at least five feet above the ground and away from reflective surfaces. The results of the long-term and short-term noise monitoring are summarized in Table 5.5-5, *Long-Term Noise Measurement Summary,* and Table 5.5-6, *Short-Term Noise Measurement Summary*. Noise measurement locations are shown in Figure 5.5-1, *Approximate Noise Monitoring Locations*, and are described herein:

- **Long-Term Location 1 (LT-1)** was at Lincoln Park, approximately 30 feet east of Howard Avenue's nearest northbound travel lane centerline. A 24-hour noise measurement was conducted, beginning at 5:00 pm on Wednesday, February 9, 2022. The noise environment is characterized primarily by traffic noise on Howard Avenue and park visitors.

- **Long-Term Location 2 (LT-2)** was next to the 13th Street Lincoln High School entrance, approximately 25 feet south of the nearest eastbound travel lane centerline. A 24-hour noise measurement was conducted, beginning at 3:00 pm on Wednesday, February 9, 2022. The noise environment is characterized primarily by traffic and on-site school activities.

- **Long-Term Location 3 (LT-3)** was on-site at Lincoln High School in the open green space/playfield approximately 25 feet north of the nearest westbound travel lane centerline. A 24-hour noise measurement was conducted, beginning at 1:00 pm on Wednesday, February 16, 2022. The noise environment is characterized primarily by traffic from 14th Street.

- **Short-Term Location 1 (ST-1)** was in the northwest corner of Lincoln Park A 10-minute noise measurement began at 8:14 pm on Wednesday, February 9, 2022. The noise environment is characterized primarily by traffic noise from Howard Avenue and 12th Street. A train was heard during the time of measurement and measured at 70 dBA. Traffic noise levels generally ranged from 60 dBA to 73 dBA.

- **Short-Term Location 2 (ST-2)** was south of 2931 12th Street approximately 20 feet north of the nearest westbound travel lane centerline. A 10-minute noise measurement began at 7:50 pm on Wednesday, February 9, 2022. There was light traffic along 12th Street and traffic noise levels ranged between 48 dBA and 51 dBA.

- **Short-Term Location 3 (ST-3)** was west of 4260 Park Avenue approximately 20 feet west of the nearest northbound travel lane centerline. A 10-minute noise measurement began at 7:25 pm on Wednesday, February 9, 2022. The noise environment is characterized primarily by traffic noise from 14th Street. Traffic generally ranged from 55 dBA to 59 dBA.

- **Short-Term Location 4 (ST-4)** was west of 4342 Howard Avenue and approximately 20 feet east of the nearest northbound travel lane centerline. A 10-minute noise measurement began at 8:35 pm on Wednesday, February 9, 2022. The noise environment is characterized primarily by traffic noise from 14th Street and Howard Avenue. Traffic generally ranged from 50 dBA to 65 dBA. Trains were observed during ST-4 measurement and measured up to 72 dBA.

- **Short-Term Location 5 (ST-5)** was at the eastern property line of Lincoln High School approximately 15 feet west from the nearest Victoria Avenue eastbound travel lane centerline. A 10-minute noise measurement began at 9:25 pm on Wednesday, February 9, 2022. The noise environment is characterized primarily by traffic noise from 14th Street. Traffic generally ranged from 50 dBA to 60 dBA.

- **Short-Term Location 6 (ST-6)** was west of 4430 Grove Avenue approximately 15 feet east from the nearest northbound travel lane centerline. A 10-minute noise measurement began at 8:49 pm on Wednesday, February 9, 2022. The noise environment is characterized primarily by traffic noise from 14th Street. Traffic generally ranged from 55 dBA to 70 dBA.

Table 5.5-5 Long-Term Noise Measurement Summary

Monitoring Location	Description	Long-Term Noise Level, dBA		
		CNEL	Lowest $L_{eq(1hr)}$	Highest $L_{eq(1hr)}$
LT-1	Lincoln Park (Howard Avenue) 02/9/2022, 5:00 pm	70.0	55.0	66.3
LT-2	Lincoln Park (13th Street) 02/9/2022, 11:00 am	63.0	52.8	63.3
LT- 3	Lincoln High School (14th Street) 02/16/2022, 10:00 am	73.0	58.5	74.6

Table 5.5-6 Short-Term Noise Measurement Summary

Monitoring Location	Description	15-minute Noise Level, dBA						
		L_{eq}	L_{max}	L_{min}	L_{50}	L_{25}	L_8	L_2
ST-1	Northwest corner of Lincoln Park 02/9/2022, 8:14 pm	57.4	72.8	46.9	53.3	55.6	61.3	66.4
ST-2	South of 2931 12th Street 02/9/2022, 7:50 pm	54.0	62.6	48.8	52.9	54.6	56.7	59.5
ST-3	West of 4260 Park Avenue 02/9/2022, 7:25 pm	57.7	77.5	46.6	51.0	54.4	59.3	65.3
ST-4	West of 4342 Howard Avenue 02/9/2022, 8:35 pm	58.5	72.6	44.7	55.5	58.2	62.1	66.1
ST-5	Lincoln High School (Victoria Avenue) 02/9/2022, 9:25 pm	66.9	90.7	49.2	52.4	55.0	63.6	69.1
ST-6	West of 4430 Grove Avenue 02/9/2022, 8:49 pm	64.2	79.9	47.5	60.5	64.9	68.3	71.0

5.5.2 Thresholds of Significance

According to Appendix G of the California Environmental Quality Act (CEQA) Guidelines, a project would normally have a significant effect on the environment if the project would result in:

N-1 Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

N-2 Generation of excessive groundborne vibration or groundborne noise levels.

N-3 For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels.

5.5.2.1 CONSTRUCTION NOISE

The City does not have established noise limits for temporary construction activities. The FTA recommends a noise level limit of 80 dBA L_{eq} for residential receptors. The FTA noise threshold is used in this analysis to assess construction noise impacts that occur in the daytime hours when people are less sensitive to noise.

5.5.2.2 TRANSPORTATION NOISE

A project will normally have a significant effect on the environment related to noise if it will substantially increase the ambient noise levels for adjoining areas. Most people can detect changes in sound levels of approximately 3 dBA under normal, quiet conditions, and changes of 1 to 3 dBA are detectable under quiet, controlled conditions. Changes of less than 1 dBA are usually indiscernible. A change of 5 dBA is readily discernible to most people in an exterior environment. Based on this, the following thresholds of significance similar to those recommended by the Federal Aviation Administration (FAA) are used to assess traffic noise impacts at sensitive receptor locations. A significant impact would occur if traffic noise increases would exceed:

- 1.5 dBA in ambient noise environments of 65 dBA CNEL and higher
- 3 dBA in ambient noise environments of 60 to 64 dBA CNEL
- 5 dBA in ambient noise environments of less than 60 dBA CNEL

A significant cumulative traffic noise impact occurs when the thresholds above are exceeded under cumulative conditions (with project) and the contribution of the project to future traffic is calculated to be greater than 1 dBA CNEL. This is because from psychoacoustics (the branch of science studying the human psychological responses associated with sound) standpoint, as mentioned above, any increase less than 1 dBA is not perceptible by humans, not even under controlled, interior, conditions. Therefore, it is conservatively assumed cumulative traffic noise would occur if the project would result in an increase greater than 1 dBA CNEL. Stationary Noise

Figure 5.5-1 - Approximate Noise Monitoring Locations

Source: Nearmap, 2021

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The City's exterior noise standards are established in Section 7.25.010, *Exterior Sound Level Limits,* summarized in Table 5.5-3, *Exterior Noise Standards*. Air-conditioning units shall be 55 dBA or less at receiving residential property lines for units installed after January 1, 1980.

5.5.2.3 VIBRATION

The City of Riverside does not have an established vibration limit. Therefore, the FTA criteria for architectural damage to buildings is used. For engineered concrete and masonry (i.e., commercial/retail buildings), the FTA criterion is a max exposure of 0.3 in/sec PPV, for buildings with nonengineered timber and masonry (i.e., residential buildings), the FTA criterion is a max exposure of 0.2 in/sec PPV and for historical structures the FTA criterion is a max exposure of 0.12 in/sec PPV.

5.5.3 Plans, Programs, and Policies

PPP N-1 Stationary noise from the proposed project will comply with the Riverside Municipal Code, Section 7.25.010, *Exterior Sound Level Limits,* for residential land uses:

- 45 dBA 10:00 pm to 7:00 am
- 55 dBA 7:00 am to 10:00 pm

PPP N-2 The proposed project's construction-related activities will comply with Riverside Municipal Code, Section 7.35.010, Part B, 5-Construction.

PPP N-3 Construction of new or renovation of existing buildings will be built to the State of California's noise insulation standards for nonresidential uses codified in the California Code of Regulations, Title 24, Building Standards Administrative Code, Part 11, California Green Building Standards Code.

5.5.4 Environmental Impacts

5.5.4.1 METHODOLOGY

This section analyzes impacts related to short-term construction noise and vibration, as well as operational noise and vibration associated with operational buildout of the proposed project.

Construction Noise and Vibration

Construction noise includes two main sources: construction-related traffic (worker, vendor, and haul truck trips) and construction equipment (associated with actual construction activities on-site). Construction noise modeling is conducted using the FHWA Roadway Construction Noise Model (RCNM) with construction equipment mix based on CalEEMod defaults (FHWA 2006). Project vibration impacts are addressed using reference vibration levels for construction equipment published by FTA (FTA 2018).

Operational Noise and Vibration

Assessment of operational noise resulting from full buildout of the project site considers three main noise components: noise associated with increased traffic generated by the project, noise associated with stationary equipment and Option 2 joint-park use that would be developed, and noise associated with the overall increased student capacity. Traffic noise increases along study roadway segments were estimated using the average daily segment volumes provided by Garland Associates (2022). Existing With Project traffic volumes are compared to Existing No Project to estimate the project's traffic noise increase and similarly, Future With Project is compared to Existing No Project to estimate cumulative traffic noise increases is compared to future buildout and cumulative data to generate the traffic noise increase.

5.5.4.2 IMPACT ANALYSIS

The following impact analysis addresses the thresholds of significance; the applicable thresholds are identified in brackets after the impact statement.

Impact 5.5-1: The proposed project would not result in a temporary increase in ambient noise levels in the vicinity of the project in excess of applicable standards. [Threshold N-1 (part)]

The proposed project has three different options. The worst-case scenario for construction noise is Option 3 where Lincoln High School students could remain on-site during construction activity and proposes the most building area constructed. Options 1 and 3 have the same acreage disturbed.

Two types of short-term noise could occur: (1) mobile-source noise from transport of workers, material deliveries, and debris and soil haul, and (2) stationary-source noise from construction equipment. For the environmental analysis purposes, construction is assumed to start in January 2026 and last approximately 31 months. Equipment may include, but is not limited to, items such as graders, excavators, tractors, loaders, backhoes, forklifts, air compressors, dozers, and trucks.

Construction Vehicles

The transport of workers and materials to and from the construction site would incrementally increase noise levels along school access roadways. Individual construction vehicle pass-bys may create momentary noise levels of up to approximately 85 dBA L_{max} at 50 feet from worker and vendor vehicles and haul trucks. Most of the haul trips would occur during demolition debris hauling. However, these occurrences would generally be infrequent (approximately five per day) and short lived. Therefore, noise impacts from construction vehicles and haul trips would be less than significant.

Construction vehicles would primarily access the project site via 14th Street, Victoria Avenue, and 13th Street. Existing average daily traffic (ADT) along the access roads ranges between 610 to 18,500 ADT (see Existing No Project column in Table 5.5-8). Based on CalEEMod construction modeling, the estimated worker and vendor trips would be 284 daily trips during overlapping architectural coating, building construction, and paving phases.[2] The estimated maximum daily haul truck trips is 14, which would only occur during demolition debris

[2] CalEEmod air quality modeling outputs are in Appendix B.

hauling. The additional temporary construction trips would result in a temporary noise of 0.1 dBA CNEL along 14th Street: 0.2 dBA CNEL along Victoria Avenue and 1.7 dBA CNEL along 13th Street. The existing ambient noise along 13th Street is less than 65 dBA CNEL, therefore allowing an increase of up to 3 dBA. Therefore, noise impacts from worker and vendor trips would be less than significant.

Construction Equipment

Noise generated by on-site construction equipment is based on the type of equipment used, its location relative to sensitive receptors, and the timing and duration of noise-generating activities. Each stage of construction involves different kinds of equipment and has distinct noise characteristics. Noise levels from construction activities are typically dominated by the loudest equipment. The dominant equipment noise source is typically the engine, although work-piece noise (such as dropping of materials) can also be noticeable.

The noise produced at each construction stage is determined by combining the L_{eq} contributions from each piece of equipment used at a given time, while accounting for the ongoing time-variations of noise emissions. Heavy equipment, such as a dozer or a loader, can have maximum, short-duration noise levels of up to 85 dBA at 50 feet. However, overall noise emissions vary considerably, depending on the specific activity performed at any given moment. Noise attenuation due to distance, the number and type of equipment, and the load and power requirements to accomplish tasks at each construction phase would result in different noise levels from construction activities at a given receptor. Since noise from construction equipment is intermittent and diminishes at a rate of at least 6 dBA per doubling of distance (conservatively ignoring other attenuation effects from air absorption, ground effects, and shielding effects), the average noise levels at noise-sensitive receptors could vary considerably, because mobile construction equipment would move around the site with different loads and power requirements.

Average noise levels from project-related construction activities are calculated by modeling the three loudest pieces of equipment per activity phase. Equipment for grading, site preparation, and demolition is modeled at spatially averaged distances (i.e., from the acoustical center of the general construction site to the property line of the nearest receptors) because the area around the center of construction activities best represents the potential average construction-related noise levels at the various sensitive receptors for mobile equipment. Similarly, construction noise from paving activities is modeled from the center of proposed paving areas. Equipment for building construction and architectural coating is modeled from the edge of the proposed building to the nearest sensitive receptors. Lastly, during finish and landscaping, minimal equipment is used and could occur near the edge of the project site and equipment could operate within 50 to 260 feet of the surrounding receptors.

Using information provided by the District and methodologies and computer modeling inputs used for the air quality assessment, the project's expected construction equipment mix was categorized by construction activity using the FHWA RCNM. The associated aggregate sound levels, grouped by construction activity, are summarized in Table 5.5-7, *Project-Related Construction Noise Levels*. Since the RCNM calculations do not account for shielding due to intervening buildings and structures, ground effects, or air absorption, the results of these calculations are conservative (that is, they represent a "worst-case" scenario). As shown in Table 5.5-7, construction-related noise levels are estimated to reach up to 71 dBA, and therefore would not exceed the 80

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dBA L_{eq} threshold at the nearest sensitive receptors, and therefore, off-campus construction noise impacts would be less than significant.

Table 5.5-7 Project-Related Construction Noise Levels

Construction Activity Phase	Noise Levels in dBA Leq			
	RCNM Reference Noise Level	Residence to North	Residences to East	Residences to South
Distance in feet	50	210	430	250
Demolition	85	72	66	71
Site preparation	83	70	64	69
Grading	85	72	66	82
Distance in feet	50	90	140	350
Architectural coating	74	69	65	57
Building construction	82	77	73	65
Distance in feet	50	120	180	260
Paving	83	75	72	69
Distance in feet	50	100	190	260
Utility trenching	81	75	70	67
Finish/landscaping	81	75	70	67
	Maximum dBA L_{eq}	**77**	**73**	**71**
	Exceeds FTA's 80 dBA L_{eq} Threshold?	**No**	**No**	**No**

Source: FHWA's RCNM software. Distance measurements were taken using Google Earth (2020) from the acoustical center of the project site.
dBA L_{eq} = Energy-Average (Leq) Sound Levels.

On-Campus Receptors

Students would remain on site during demolition and building construction. Construction activities could occur within 50 feet of existing or new classroom buildings. As shown in Table 5.5-7, construction noise levels would range between 74 and 85 dBA L_{eq} at 50 feet. Typical exterior-to-interior noise attenuation is 25 dBA with windows and doors closed. This would result in interior noise levels of approximately 49 to 60 dBA L_{eq}. Speech interference is considered intolerable when background noise levels exceed 60 dBA. However, average construction noise levels are not expected to exceed 60 dBA L_{eq}. In addition, to avoid classroom disruption, some work would be done during instructional breaks when students are off campus. Additionally, construction would occur further than 50 feet at times that would reduce interior noise levels. On-campus construction noise impacts would be less than significant.

Level of Significance Before Mitigation: Less than significant impact.

Impact 5.2-2 The proposed project could generate permanent increase in ambient levels in the vicinity of the project in excess of applicable standards. [Threshold N-1 (part)]

The proposed project has three different options. For the stationary operational analysis, the worst-case scenario, Option 2 included, is evaluated. Under Option 2, the District would acquire one acre of Lincoln Park converting it into a joint-use park and install nighttime lighting for evening use. For operational traffic, noise analysis of all three options were analyzed as significant traffic noise increases were found for all three options.

Playfields

The proposed project, under Option 2 would have new lighted joint-use turf playfields and hardcourts to be shared by the local community during non-school operating hours and the school during school operating hours. The nearest sensitive receptors to the proposed lighted playfields would be the residences to the east along Park Avenue and residences to the north along 12th Street at approximately 200 and 260 feet, respectively. PlaceWorks staff has previously collected noise measurement data at various sports fields, including soccer fields. Soccer games/practices typically generate noise level of 60 dBA L_{eq} at 15 feet from the soccer field. This noise level is associated with two full soccer teams scrimmaging, coaches and referees, and approximately 40 total spectators. This would represent typical conditions for the proposed as no bleachers are proposed, limiting spectators. At 200 feet, noise levels would attenuate to approximately 50 dBA L_{eq} at the nearest eastern residences. At 260 feet, noise levels would attenuate to 47 dBA L_{eq} at the nearest northern residences. This would not exceed the daytime noise standard of 55 dBA during the hours of 7:00 am to 10:00 pm, which are the parks operational hours. Therefore, noise impacts would be less than significant.

Mechanical Equipment

Regardless of which option the District moves forward with, heating, ventilation, and air conditioning (HVAC) equipment associated with new buildings would be installed on rooftops of new buildings and equipment would not be placed any closer than existing buildings. Therefore, no new buildings would be any closer to sensitive receptors than existing. New buildings would not substantially increase noise from HVAC equipment. Therefore, impacts would be less than significant.

Traffic Noise

A project would normally have a significant effect on the environment related to noise if it will substantially increase the ambient noise levels for adjoining areas. Most people can detect changes in sound levels of approximately 3 dBA under normal, quiet conditions, and changes of 1 to 3 dBA are detectable under quiet, controlled conditions. Changes of less than 1 dBA are usually indiscernible. A change of 5 dBA is readily discernible to most people in an exterior environment. Based on this, the following thresholds of significance, similar to those recommended by the FAA are used to assess traffic noise impacts at sensitive receptor locations. As discussed in Section 5.5.2, *Thresholds of Significance*, a significant impact would occur if the traffic noise increase would exceed:

- 1.5 dBA for ambient noise environments of 65 dBA CNEL and higher
- 3 dBA for ambient noise environments of 60 to 64 CNEL
- 5 dBA for ambient noise environments of less than 60 dBA CNEL

Tables 5.5-8 through 5.5-10, summarize project-related traffic-noise increases for each option by study roadway segment. Traffic noise increases are calculated using traffic volumes provided by Garland Associates. Cumulative traffic noise impacts are discussed in Section 5.5.5, *Cumulative Impacts*.

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Option 1

As shown in Table 5.5-8, *Option 1 Project-Related Increases in Traffic Noise*, project-related noise increases for Option 1 would exceed the established noise thresholds at two roadway segments: 13th Street between Howard Avenue and Park Avenue and 13th Street between Park Avenue and Victoria Avenue. Therefore, impacts would be potentially significant under Option 1.

Table 5.5-8 Option 1 Project-Related Increases in Traffic Noise

	Average Daily Traffic Volumes				Traffic Noise Increase			
Roadway Segments	**Existing No Project**	**Existing With Project**	**Future No Project**	**Future With Project**	**Existing CNEL**	**Project Noise Increase**	**Cumulative Noise Increase**	**Project's Cumulative Contribution**
Howard Avenue[1]								
North of 12th Street	1,220	1,280	2,230	2,290	70	0.2	2.7	0.1
12th Street to 13th Street	1,300	1,620	2,320	2,640	70	1.0	3.1	0.6
13th Street to 14th Street	1,740	2,860	2,840	3,960	70	2.2	3.6	***1.4***
South of 14th Street	1,220	1,380	1,430	1,590	70	0.5	1.2	0.5
Park Avenue[2]								
North of 12th Street	1,040	1,100	1,220	1,280	63	0.2	0.9	0.2
12th Street to 13th Street	1,390	1,500	1,630	1,740	63	0.3	1.0	0.3
South of 14th Street	1,800	1,910	2,110	2,220	63	0.3	0.9	0.2
Victoria Avenue[1]								
North of 13th Street	6,000	6,280	7,020	7,300	70	0.2	0.9	0.2
13th Street to 14th Street	6,000	7,180	7,020	8,200	70	0.8	1.4	0.7
South of 14th Street	7,820	7,980	9,150	9,310	70	0.1	0.8	0.1
12th Street[2]								
Howard Avenue to Park Avenue	520	790	610	880	63	1.8	2.3	1.6
East of Park Avenue	700	1,190	820	1,310	63	2.3	2.7	2.0
13th Street[2]								
Howard Avenue to Park Avenue	**870**	**1,790**	**1,020**	**1,940**	**63**	**3.1**	**3.5**	**2.8**
Park Avenue to Victoria Avenue	**610**	**1,720**	**710**	**1,820**	**63**	**4.5**	**4.7**	**4.1**

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Table 5.5-8 Option 1 Project-Related Increases in Traffic Noise

Roadway Segments	Average Daily Traffic Volumes				Traffic Noise Increase			
	Existing No Project	Existing With Project	Future No Project	Future With Project	Existing CNEL	Project Noise Increase	Cumulative Noise Increase	Project's Cumulative Contribution
14th Street[3]								
West of Mulberry Street	18,500	18,610	22,400	22,510	73	0.0	0.9	0.0
Riverside Freeway to Howard Avenue	16,800	16,960	20,400	20,560	73	0.0	0.9	0.0
Howard Avenue to Park Avenue	15,600	15,960	18,500	18,860	73	0.1	0.8	0.1
Park Avenue to Victoria Avenue	16,200	16,560	19,200	19,560	73	0.1	0.8	0.1
East of Victoria Avenue	16,300	16,520	19,300	19,520	73	0.1	0.8	0.0

Source: Traffic data provided by Garland Associates. 2022. See Appendix F.
Notes:
Bold = Significant traffic noise increase
Bold Italics = Potentially significant increase but no sensitive receptors located along the roadway segment.
1 Existing CNEL corresponds with/or assigned to LT-1
2 Existing CNEL corresponds with/or assigned to LT-2
3 Existing CNEL corresponds with/or assigned to LT-3

Option 2

As shown in Table 5.5-9, *Option 2 Project-Related Increases in Traffic Noise*, project-related noise increases for Option 2 would exceed the established noise thresholds at four roadway segments: Howard Avenue between 12th Street and 13th Street, Victoria Avenue between 13th Street and 14th Street, 12th Street between Howard Avenue and Park Avenue, and 13th Street between Park Avenue and Victoria Avenue. Therefore, impacts would be potentially significant under Option 2.

Table 5.5-9 Option 2 Project-Related Increases in Traffic Noise

	Average Daily Traffic Volumes				Traffic Noise Increase			
Roadway Segments	Existing No Project	Existing With Project	Future No Project	Future With Project	Existing CNEL	Project Noise Increase	Cumulative Noise Increase	Project's Cumulative Contribution
Howard Avenue[1]								
North of 12th Street	1,220	1,650	2,230	2,660	70.0	1.3	3.4	0.8
12th Street to 13th Street	**1,300**	**2,550**	**2,320**	**3,570**	**70.0**	**2.9**	**4.4**	**1.9**
13th Street to 14th Street	1,740	2,990	2,840	4,090	70.0	2.4	3.7	***1.6***
South of 14th Street	1,220	1,470	1,430	1,680	70.0	0.8	1.4	0.7
Park Avenue[2]								
North of 12th Street	1,040	1,470	1,220	1,650	63.0	1.5	2.0	1.3
12th Street to 13th Street	1,390	2,530	1,630	2,770	63.0	2.6	3.0	2.3
South of 14th Street	1,800	1,960	2,110	2,270	63.0	0.4	1.0	0.3
Victoria Avenue[1]								
North of 13th Street	6,000	6,590	7,020	7,610	70.0	0.4	1.0	0.4
Thirteenth Street to Fourteenth Street	**6,000**	**7,890**	**7,020**	**8,910**	**70.0**	**1.2**	**1.7**	**1.0**
South of 14th Street	7,820	8,070	9,150	9,400	70.0	0.1	0.8	0.1
12th Street[2]								
Howard Avenue to Park Avenue	**520**	**2,020**	**610**	**2,110**	**63.0**	**5.9**	**6.1**	**5.4**
East of Park Avenue	700	950	820	1,070	63.0	1.3	1.8	1.2
13th Street[2]								
Park Avenue to Victoria Avenue	**610**	**2,240**	**710**	**2,340**	**63.0**	**5.6**	**5.8**	**5.2**

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Table 5.5-9 Option 2 Project-Related Increases in Traffic Noise

Roadway Segments	Average Daily Traffic Volumes				Traffic Noise Increase			
	Existing No Project	Existing With Project	Future No Project	Future With Project	Existing CNEL	Project Noise Increase	Cumulative Noise Increase	Project's Cumulative Contribution
14th Street[3]								
West of Mulberry Street	18,500	18,660	22,400	22,560	73.0	0.0	0.9	0.0
Riverside Freeway to Howard Avenue	16,800	17,050	20,400	20,650	73.0	0.1	0.9	0.1
Howard Avenue to Park Avenue	15,600	16,510	18,500	19,410	73.0	0.2	0.9	0.2
Park Avenue to Victoria Avenue	16,200	17,090	19,200	20,090	73.0	0.2	0.9	0.2
East of Victoria Avenue	16,300	16,630	19,300	19,630	73.0	0.1	0.8	0.1

Source: Traffic data provided by Garland Associates. 2022. See Appendix F.
Notes:
Bold = Significant traffic noise increase.
Bold Italics = Potentially significant increase but no sensitive receptors located along the roadway segment
[1] Existing CNEL corresponds with or assigned to LT-1
[2] Existing CNEL corresponds with or assigned to LT-2
[3] Existing CNEL corresponds with or assigned to LT-3

Option 3

As shown in Table 5.5-10, *Option 3 Project-Related Increases in Traffic Noise*, project-related noise increases for Option 3 would exceed the established noise thresholds at two roadway segments: 13th Street between Howard Avenue and Park Avenue and 13th Street between Park Avenue and Victoria Avenue. Therefore, impacts would be potentially significant under Option 3.

Table 5.5-10 Option 3 Project-Related Increases in Traffic Noise

	Average Daily Traffic Volumes				Traffic Noise Increase			
Roadway Segments	Existing No Project	Existing With Project	Future No Project	Future With Project	Existing CNEL	Project Noise Increase	Cumulative Noise Increase	Project's Cumulative Contribution
Howard Avenue[1]								
North of 12th Street	1,220	1,280	2,230	2,290	70	0.2	2.7	0.1
12th Street to 13th Street	1,300	1,620	2,320	2,640	70	1.0	3.1	0.6
13th Street to 14th Street	1,740	2,860	2,840	3,960	70	2.2	3.6	***1.4***
South of 14th Street	1,220	1,380	1,430	1,590	70	0.5	1.2	0.5
Park Avenue[2]								
North of 12th Street	1,040	1,100	1,220	1,280	63	0.2	0.9	0.2
12th Street to 13th Street	1,390	1,500	1,630	1,740	63	0.3	1.0	0.3
South of 14th Street	1,800	1,910	2,110	2,220	63	0.3	0.9	0.2
Victoria Avenue[1]								
North of 13th Street	6,000	6,280	7,020	7,300	70	0.2	0.9	0.2
13th Street to 14th Street	6,000	7,180	7,020	8,200	70	0.8	1.4	0.7
South of 14th Street	7,820	7,980	9,150	9,310	70	0.1	0.8	0.1
12th Street[2]								
Howard Avenue to Park Avenue	520	790	610	880	63	1.8	2.3	1.6
East of Park Avenue	700	1,190	820	1,310	63	2.3	2.7	2.0
13th Street[2]								
Howard Avenue to Park Avenue	**870**	**1,790**	**1,020**	**1,940**	**63**	**3.1**	**3.5**	**2.8**
Park Avenue to Victoria Avenue	**610**	**1,720**	**710**	**1,820**	**63**	**4.5**	**4.7**	**4.1**

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Table 5.5-10 Option 3 Project-Related Increases in Traffic Noise

Roadway Segments	Average Daily Traffic Volumes				Traffic Noise Increase			
	Existing No Project	Existing With Project	Future No Project	Future With Project	Existing CNEL	Project Noise Increase	Cumulative Noise Increase	Project's Cumulative Contribution
14th Street[3]								
West of Mulberry Street	18,500	18,610	22,400	22,510	73	0.0	0.9	0.0
Riverside Fwy to Howard Avenue	16,800	16,960	20,400	20,560	73	0.0	0.9	0.0
Howard Avenue to Park Avenue	15,600	15,960	18,500	18,860	73	0.1	0.8	0.1
Park Avenue to Victoria Avenue	16,200	16,560	19,200	19,560	73	0.1	0.8	0.1
East of Victoria Avenue	16,300	16,520	19,300	19,520	73	0.1	0.8	0.0

Source: Traffic data provided by Garland Associates. 2022. See Appendix F.
Notes:
Bold = Significant traffic noise increase.
Bold Italics = Potentially significant increase but no sensitive receptors located along the roadway segment
1 Existing CNEL corresponds with or assigned to LT-1
2 Existing CNEL corresponds with or assigned to LT-2
3 Existing CNEL corresponds with or assigned to LT-3

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Level of Significance Before Mitigation: Potentially significant impact.

Impact 5.5-3: The proposed project could generate excessive short-term groundborne vibration or groundborne noise levels. [Threshold N-2]

Operational Vibration

Typically, land uses that result in vibration impacts are industrial businesses that use heavy machinery or operation of large trucks over uneven surfaces. The operation of the project would not include any substantial long-term vibration sources. No vibration impacts from operation sources would occur.

Temporary Construction Vibration

Construction can generate varying degrees of ground vibration, depending on the construction procedures and equipment. Operation of construction equipment generates vibrations that spread through the ground and diminish with distance from the source. The effect on buildings in the vicinity of the construction site varies depending on soil type, ground strata, and receptor-building construction. The effects from vibration can range from no perceptible effects at the lowest vibration levels, to low rumbling sounds and perceptible vibrations at moderate levels, to slight structural damage at the highest levels. Vibration from construction activities rarely reaches the levels that can damage structures. Table 5.5-11, *Vibration Levels for Typical Construction Equipment and Screening Distances*, summarizes vibration levels for typical construction equipment at a reference distance of 25 feet and the vibration impact screening distances (minimum distance needed for no potential vibration impact to occur) for different FTA building categories.

Table 5.5-11 Vibration Levels for Typical Construction Equipment and Screening Distances

Equipment	FTA Reference Vibration Levels in PPV (in/sec) at 25 feet	Commercial Structures Screening Distance to 0.3 PPV in/sec	Residential Structures Screening Distance to 0.2 PPV in/sec	Historical Structures Screening Distance to 0.12 PPV in/sec
Vibratory Roller	0.21 in/sec	20 feet	26 feet	37 feet
Large Bulldozer	0.089 in/sec	12 feet	15 feet	21 feet
Caisson Drilling	0.089 in/sec	12 feet	15 feet	21 feet
Loaded Trucks	0.076 in/sec	11 feet	14 feet	19 feet
Jackhammer	0.035 in/sec	6 feet	8 feet	>11 feet
Small Bulldozer	0.003 in/sec	2 feet	2 feet	>3 feet

Source: FTA 2018.

Vibration Damage

Off-Site Structures

Damage from vibrational energy is typically a one-time event and is most likely to occur when the source and receptor are very close. The threshold for architectural damage is 0.2 in/sec PPV for nonengineered timber and masonry buildings (applicable to the surrounding residential structures) and 0.3 in/sec PPV for engineered concrete and masonry (applicable to SolarMax Technology/commercial buildings). Table 5.5-12, *Typical*

Construction Equipment Vibration Levels, summarizes vibration levels for typical construction equipment at the nearest sensitive receptors.

Table 5.5-12 Typical Construction Equipment Vibration Levels

Equipment	FTA Reference PPV (in/sec) at 25 Feet	Residences to North PPV (in/sec) at 60 Feet	Residences to East PPV (in/sec) at 75 Feet	On-Site Historical Building PPV (in/sec) at 20 Feet
Vibratory Roller	0.21	0.056	0.040	0.293
Large Bulldozer	0.089	0.024	0.017	0.282
Caisson Drilling	0.089	0.024	0.017	0.124
Loaded Trucks	0.076	0.020	0.015	0.124
Jackhammer	0.035	0.009	0.007	0.124
Small Bulldozer	0.003	0.001	0.001	0.106

Source: FTA 2018

At 25 feet, typical construction equipment produces vibration levels of up to 0.21 in/sec PPV; at a distance greater than 25 feet, even vibratory roller vibration levels would attenuate to less than the 0.2 in/sec PPV. The nearest off-campus structures to construction activities are residences approximately 60 feet to the north (residences) and approximately 75 feet west (SolarMax) of the project site boundary. At that distance, vibration levels would attenuate to approximately 0.056 in/sec PPV or less. This is below the 0.2 in/sec PPV and 0.3 in/sec PPV threshold. Therefore, vibration impacts to off-site receptors would be less than significant.

On-Site Historical Structures

Historical buildings typically have a lower vibration tolerance, and therefore, have a threshold of 0.12 in/sec PPV (FTA 2018). Under all three options, the proposed project would keep the two historical buildings (Irvine Elementary School Kindergarten Building and the Assembly Building) in the southeastern corner of Lincoln High School (see Figure 5.2-1, *Historic Resources*). Under all three options, the historic building at 4343 Park Avenue would be relocated or demolished. The nearest construction activity to these historical buildings would be from building demolition followed by paving for the proposed hardcourts under Options 1 and 3. Building demolition and hardcourt paving could occur within 15 feet of the historical structures and would exceed the historical vibration threshold of 0.12 in/sec PPV. Under Option 2, no construction would occur within over 200 feet of the historic buildings would occur. As shown in Table 5.5-12, *Typical Construction Equipment Vibration Levels*, vibration levels for typical construction equipment at the historical structures would exceed the 0.12 in/sec PPV threshold. Therefore, impacts would be potentially significant.

Level of Significance Before Mitigation: Potentially significant impact.

Impact 5.2-4: The project site is not within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport. [Threshold N-3]

The closest airport to the school is Flabob Airport, approximately 2.5 miles to the northwest (Airnav 2022). At that distance, the project would not expose people residing or working in the project area to excessive noise levels, and no impact would occur.

Level of Significance Before Mitigation: Less than significant impact.

5.5.5 Cumulative Impacts

Operational Traffic Noise

A significant cumulative traffic noise increase would occur if the project's contribution to a significant cumulative (Cumulative Plus Project conditions) increase were calculated to be 1 dBA or greater. The cumulative traffic impact threshold is discussed in Section 5.5.2.2. The potentially significant increases along identified roadway segments in Tables 5.5-8 through 5.5-10 were found to contribute 1 dBA or more under Project's Cumulative Contribution. Table 5.5-13 summarizes the identified segments for all three options and shows the project's cumulative contribution in **bold**. The project's contribution to cumulative impacts are greater than 1 dBA, and therefore, cumulative traffic noise impacts would be significant.

Table 5.5-13 Options 1, 2, and 3 Significant Cumulative Traffic Noise Increases

	Traffic Noise Increase (dBA CNEL)			
Roadway Segments	Existing No Project	Project Noise Increase	Cumulative Noise Increase	Project's Cumulative Contribution
Option 1				
13th Street between Howard Avenue and Park Avenue	63	3.1	3.5	**2.8**
13th Street between Park Avenue to Victoria Avenue	63	4.5	4.7	**4.1**
Option 2				
Howard Avenue between 12th Street and 13th Street	70.0	2.9	4.4	**1.9**
Victoria Avenue between 13th Street and 14th Street	70.0	1.2	1.7	**1.0**
12th Street between Park Avenue and Victoria Avenue	63.0	5.9	6.1	**5.4**
13th Street between Park Avenue to Victoria Avenue	63.0	5.6	5.8	**5.2**
Option 3				
13th Street between Howard Avenue and Park Avenue	63	3.1	3.5	**2.8**
13th Street between Park Avenue to Victoria Avenue	63	4.5	4.7	**4.1**

Level of Significance Before Mitigation: Potentially significant impact.

Construction

The nearest planned and approved projects (provided by Garland Associates) to the proposed project are:

- Riverside Downtown Station Improvements Project, approximately 250 feet northwest of the project site.
- Mission Lofts Apartment Complex at 3050 Mission Inn Avenue, which have been fully constructed and are operational.
- Affordable Housing Development for eight dwelling units at 2719 11th Street, approximately 600 feet to the north.

- Medical office building at 4508 Olivewood Avenue across SR-91 over 2,000 feet to the southwest.

Although some construction activity from the planned and approved projects could overlap periodically with construction activities with proposed project, construction noise attenuates at a high rate of at least 6 dBA per doubling of distance from the noise source. At 250 feet, typical construction levels would attenuate to 71 dBA. As shown in Table 5.5-7, the proposed project would generate noise levels of up to 77 dBA at the nearest receptors. When combining the estimated construction noise from planned and approved projects with the proposed project the estimated construction cumulative noise would be 78 dBA. This would not exceed the FTA threshold of 80 dBA L_{eq}. Therefore, cumulative construction noise levels would be less than significant.

Level of Significance Before Mitigation: Less than significant impact.

5.5.6 Level of Significance Before Mitigation

Upon implementation of regulatory requirements, the following impacts would be less than significant: Impacts 5.5-1 and 5.5-4.

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

- **Impact 5.5-2** Project-related long-term operational traffic noise could exceed established thresholds.
- **Impact 5.5-3** The proposed project could result in groundborne vibration impact to on-site historic structures during construction.

5.5.7 Mitigation Measures

Impact 5.5-2

Mitigation Measures Considered but Rejected as Infeasible

In compliance with CEQA, "each public agency shall mitigate or avoid the significant effects on the environment of project it carries out or approves whenever it is feasible to do so" (Public Resources Code Section 21002.1(b)). The term "feasible" is defined in CEQA to mean "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and technological factors" (Public Resources Code Section 21061.1). A number of measures were considered for mitigating or avoiding traffic noise impacts (Impact 5.5-2).

Special Roadway Paving

Notable reductions in tire noise have been achieved via the implementation of special paving materials, such as rubberized asphalt or open-grade asphalt concrete overlays. For example, the California Department of Transportation (Caltrans) conducted a study of pavement noise along I-80 in Davis (Caltrans 2011) and found an average improvement of 6 to 7 dBA compared to conventional asphalt overlay.

The study found that although this amount of noise reduction from rubberized/special asphalt materials would be sufficient to avoid the predicted noise increase due to traffic in some cases, the potential up-front and ongoing maintenance costs are such that the cost versus benefits ratio[3] may not be feasible and reasonable and would not mitigate noise to a level of less than significant in all cases. In addition, the study found that noise levels increased over time due to pavement raveling, with the chance of noise-level increases higher after a 10-year period. The impacted street rights-of-way are not within the jurisdiction of the District, and the District has no jurisdiction over implementation of these special roadway paving. Considering the size and nature of the proposed project, the cost of providing special roadway paving and maintenance could not be afforded by the District. Taking into account economic, environmental, social, and technological factors, the special roadway paving would be infeasible, therefore, was considered but rejected.

Sound Barrier Walls

With a cursory review of aerial depictions of the impacted segments, the majority (if not all) residences around the project site have direct access (via driveways) to the associated roadway. Therefore, barrier walls would prevent access to individual properties and would be infeasible. Further, these impacted homes are on private property outside of the control of the District, therefore, barrier walls cannot be constructed without the consent of all individual property owners for the impacted roadway segment. Sound barrier walls would not effectively reduce noise, if there is a gap between the walls. Therefore, sound barrier walls as mitigation was considered but rejected as infeasible.

There are no other mitigation to feasibly reduce traffic noise to less than significant.

Impact 5.5-3

NOI-1 In the event that demolition, grading, building construction, and paving occurs within the screening distances for historical structures shown in the Draft Environmental Impact Report (EIR) Table 5.5-11, *Vibration Levels for Typical Construction Equipment and Screening Distances*, construction vibration monitoring shall be conducted to document conditions at the existing historical buildings prior to, during, and after vibration-generating demolition, grading, building construction, and paving. The construction vibration monitoring shall be implemented by an acoustical consultant, licensed historical architect, or licensed Professional Structural Engineer meeting the Secretary of the Interior's Professional Qualification Standards, to include the following tasks:

- Performance of a photo survey, elevation survey, and crack monitoring. Surveys shall be performed prior to and in regular intervals during all vibration-generating activities within the screening distances shown in the Draft EIR Table 5.5-11 to historical buildings (the FTA Historical Structures Screening Distance to 0.12 in/sec PPV).
- Conduct a post-construction survey on the structure following the completion of vibration-generating activities and applicant to make appropriate repairs in accordance

[3] Cost versus benefit considerations are in terms of the number of households benefited, per the general methodology employed by Caltrans in the evaluation of highway sound walls.

with the Secretary of the Interior's Standards where damage has occurred as a result of construction activities.

5.5.8 Level of Significance After Mitigation

Impact 5.5-2

As demonstrated under the heading "Mitigation Measures Considered" for Impact 5.5-2, there are no feasible or practical mitigation measures available to reduce project-generated traffic noise to less-than-significant levels for existing residences along the affected roadway. No individual measure and no set of feasible or practical mitigation measures are available to reduce project-generated traffic noise to less-than-significant levels in all cases. Thus, traffic noise would remain a significant and unavoidable impact.

Impact 5.5-3

Implementation of Mitigation Measure NOI-1 would ensure that any inadvertent damage to the historical buildings associated with vibration would be avoided and/or repaired to the satisfaction of a qualified professional such that the historical integrity of the building remains.

5.5.9 References

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