APPENDIX G

ENVIRONMENTAL NOISE ASSESSMENT

NEWPARK PLACE PROJECT PHASE A RESIDENTIAL DEVELOPMENT ENVIRONMENTAL NOISE ASSESSMENT

Newark, California

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INTRODUCTION

The NewPark Place Specific Plan was approved by the City of Newark in 2018. It allows a variety of uses, including mixed-use retail and residential uses. This study evaluates a proposed individual mixed-use project known as "Phase A". The Phase includes the construction five- to six-story mixed-use building at the western end of the existing mall. It would include 319 residential units located over 3,700 square feet of ground-level retail and approximately 12,900 square feet of amenities. An internal parking structure would also be constructed.

This report evaluates the project's potential to result in significant noise and vibration impacts with respect to applicable California Environmental Quality Act (CEQA) guidelines. The report is divided into two sections: 1) the Setting Section provides a brief description of the fundamentals of environmental noise, summarizes applicable regulatory criteria, and discusses the existing noise conditions in the project vicinity; and 2) the Impacts and Mitigation Measures Section describes the significance criteria used to evaluate project impacts, and provides a discussion of each project impact.

SETTING

Fundamentals of Environmental Noise

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound could be caused by its *pitch* or its *loudness*. *Pitch* is the height or depth of a tone or sound, depending on the relative rapidity (frequency) of the vibrations by which it is produced. Higher pitched signals sound louder to humans than sounds with a lower pitch. *Loudness* is intensity of sound waves combined with the reception characteristics of the ear. Intensity may be compared with the height of an ocean wave in that it is a measure of the amplitude of the sound wave.

In addition to the concepts of pitch and loudness, there are several noise measurement scales which are used to describe noise in a particular location. A *decibel (dB)* is a unit of measurement which indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 decibels represents a ten-fold increase in acoustic energy, while 20 decibels is 100 times more intense, 30 decibels is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 1.

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level (dBA).* This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events.

This *energy-equivalent sound/noise descriptor* is called L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends upon the distance the receptor is from the noise source. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

Since the sensitivity to noise increases during the evening and at night -- because excessive noise interferes with the ability to sleep -- 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level* (*CNEL*) is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 pm - 10:00 pm) and a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels. The *Day/Night Average Sound Level* (L_{dn} or *DNL*) is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

Effects of Noise

Sleep and Speech Interference

The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noises of sufficient intensity (above 35 dBA) and fluctuating noise levels above about 45 dBA have been shown to affect sleep. Interior residential standards for multi-family dwellings are set by the State of California at 45 dBA DNL. Typically, the highest steady traffic noise level during the daytime is about equal to the DNL and nighttime levels are 10 dBA lower. The standard is designed for sleep and speech protection and most jurisdictions apply the same criterion for all residential uses. Typical structural attenuation is 12-17 dBA with open windows. With closed windows in good condition, the noise attenuation factor is around 20 dBA for an older structure and 25 dBA for a newer dwelling. Sleep and speech interference is therefore possible when exterior noise levels are about 57-62 dBA DNL with open windows and 65-70 dBA DNL if the windows are closed. Levels of 55-60 dBA are common along collector streets and secondary arterials, while 65-70 dBA is a typical value for a primary/major arterial. Levels of 75-80 dBA are normal noise levels at the first row of development outside a freeway right-of-way. In order to achieve an acceptable interior noise environment, bedrooms facing secondary roadways need to be able to have their windows closed; those facing major roadways and freeways typically need special glass windows.

Annoyance

Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that the causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The DNL as a measure of noise has been found to provide a valid

correlation of noise level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. When measuring the percentage of the population highly annoyed, the threshold for ground vehicle noise is about 50 dBA DNL. At a DNL of about 60 dBA, approximately 12 percent of the population is highly annoyed. When the DNL increases to 70 dBA, the percentage of the population highly annoyed increases to about 25-30 percent of the population. There is, therefore, an increase of about 2 percent per dBA between a DNL of 60-70 dBA. Between a DNL of 70-80 dBA, each decibel increase increases by about 3 percent the percentage of the population highly annoyed. People appear to respond more adversely to aircraft noise. When the DNL is 60 dBA, approximately 30-35 percent of the population is believed to be highly annoyed. Each decibel increase to 70 dBA adds about 3 percentage points to the number of people highly annoyed. Above 70 dBA, each decibel increase results in about a 4 percent increase in the percentage of the population highly annoyed.

Fundamentals of Groundborne Vibration

Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One method is the Peak Particle Velocity (PPV). The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. In this report, a PPV descriptor with units of mm/sec or in/sec is used to evaluate construction generated vibration for building damage and human complaints. Table 3 displays the reactions of people and the effects on buildings that continuous or frequent intermittent vibration levels produce. The guidelines in Table 3 represent syntheses of vibration criteria for human response and potential damage to buildings resulting from construction vibration.

Construction activities can cause vibration that varies in intensity depending on several factors. The use of pile driving and vibratory compaction equipment typically generates the highest construction related groundborne vibration levels. Because of the impulsive nature of such activities, the use of the PPV descriptor has been routinely used to measure and assess groundborne vibration and almost exclusively to assess the potential of vibration to cause damage and the degree of annoyance for humans.

The two primary concerns with construction-induced vibration, the potential to damage a structure and the potential to interfere with the enjoyment of life, are evaluated against different vibration limits. Human perception to vibration varies with the individual and is a function of physical setting and the type of vibration. Persons exposed to elevated ambient vibration levels, such as people in an urban environment, may tolerate a higher vibration level.

Structural damage can be classified as cosmetic only, such as paint flaking or minimal extension of cracks in building surfaces; minor, including limited surface cracking; or major, that may threaten the structural integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher. The damage criteria presented in Table 3 include several categories for ancient, fragile, and historic structures, the types of structures most at risk to damage. Most buildings are included within the categories ranging from “Historic and

some old buildings" to "Modern industrial/commercial buildings". Construction-induced vibration that can be detrimental to the building is very rare and has only been observed in instances where the structure is at a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

The annoyance levels shown in Table 3 should be interpreted with care since vibration may be found to be annoying at lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage.

Railroad and light rail operations are potential sources of substantial ground vibration depending on distance, the type and the speed of trains, and the type of railroad track. People's response to ground vibration from rail vehicles has been correlated best with the average, root mean square (RMS) velocity of the ground. The velocity of the ground is expressed on the decibel scale. The reference velocity is 1 x 10-6 in/sec RMS, which equals 0 VdB, and 1 in/sec equals 120 VdB. Although not a universally accepted notation, the abbreviation "VdB" is used in this document for vibration decibels to reduce the potential for confusion with sound decibels.

Typical background vibration levels in residential areas are usually 50 VdB or lower, well below the threshold of perception for most humans. Perceptible vibration levels inside residences are attributed to the operation of heating and air conditioning systems, door slams and foot traffic. Construction activities, train operations, and street traffic are some of the most common external sources of vibration that can be perceptible inside residences. Table 4 illustrates some common sources of vibration and the association to human perception or the potential for structural damage.

TABLE 1 Definition of Acoustical Terms Used in this Report

Term	Definition
Decibel, dB	A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20 micro Pascals.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e. g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, L_{dn} or DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 p.m. and 7:00 a.m.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 p.m.to 10:00 p.m. and after addition of 10 decibels to sound levels measured in the night between 10:00 p.m. and 7:00 a.m.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Handbook of Acoustical Measurements and Noise Control, Harris, 1998.

TABLE 2 Typical Noise Levels in the Environment

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110 dBA	Rock band
Jet fly-over at 1,000 feet		
	100 dBA	
Gas lawn mower at 3 feet		
	90 dBA	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80 dBA	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	70 dBA	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	60 dBA	
		Large business office
Quiet urban daytime	50 dBA	Dishwasher in next room
Quiet urban nighttime	40 dBA	Theater, large conference room
Quiet suburban nighttime		
	30 dBA	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20 dBA	
		Broadcast/recording studio
	10 dBA	
	0 dBA	

Source: Technical Noise Supplement (TeNS), California Department of Transportation, September 2013.

TABLE 3 Reaction of People and Damage to Buildings from Continuous or Frequent Intermittent Vibration Levels

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
0.1	Strongly perceptible	Virtually no risk of damage to normal buildings
0.25	Strongly perceptible to severe	Threshold at which there is a risk of damage to historic and some old buildings.
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential dwellings such as plastered walls or ceilings
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to newer residential structures

Source: Transportation and Construction Vibration Guidance Manual, California Department of Transportation, September 2013.

TABLE 4 Typical Levels of Groundborne Vibration

Human/Structural Response	Velocity Level, VdB	Typical Events (50-foot setback)
Threshold, minor cosmetic damage	100	Blasting, pile driving, vibratory compaction equipment
		Heavy tracked vehicles (Bulldozers, cranes, drill rigs)
Difficulty with tasks such as reading a video or computer screen	90	
		Commuter rail, upper range
Residential annoyance, infrequent events	80	Rapid transit, upper range
Residential annoyance, occasional events		Commuter rail, typical Bus or truck over bump or on rough roads
Residential annoyance, frequent events	70	Rapid transit, typical
Approximate human threshold of perception to vibration		Buses, trucks and heavy street traffic
	60	
		Background vibration in residential settings in the absence of activity
Lower limit for equipment ultra-sensitive to vibration	50	

Source: Transit Noise and Vibration Impact Assessment Manual, US Department of Transportation Federal Transit Administration, September 2018.

Regulatory Background - Noise

The State of California and the City of Newark have established regulatory criteria that are applicable in this assessment. The State of California Environmental Quality Act (CEQA) Guidelines, Appendix G, are used to assess the potential significance of impacts pursuant to local General Plan policies, Municipal Code standards, or the applicable standards of other agencies. A summary of the applicable regulatory criteria is provided below.

State CEQA Guidelines. The CEQA contains guidelines to evaluate the significance of effects of environmental noise attributable to a proposed project. Under CEQA, noise impacts would be considered significant if the project would result in:

(a) 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;

(b) Generation of excessive groundborne vibration or groundborne noise levels; or

(c) 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, if the project would expose people residing or working in the project area to excessive noise levels.

Newark, California General Plan. The City of Newark's General Plan, which was adopted on December 12, 2013 includes a Noise section within the Environmental Hazards Element. This section establishes standards for acceptable noise levels, as well as goals, policies, and actions related to noise. The applicable portions of the Noise section are as follows:

Goal EH-6: Maintain the peace and quiet of Newark neighborhoods and promote an environment where noise does not adversely affect sensitive land uses.

Policy EH-6.6: Construction Noise – Regulating Construction Hours. Reduce noise associated with construction activities by prohibiting construction in residential neighborhoods between the hours of 7:00 p.m. and 7:00 a.m. Monday through Friday and at all times on Saturdays, Sundays, and State/federal holidays.

Policy EH-6.7: Construction Noise – Addressing Sources of Construction Noise. Reduce noise associated with construction activities by requiring properly maintained mufflers on construction vehicles, requiring the placement of stationary construction equipment as far as possible from developed areas, and requiring temporary acoustical barriers/shielding to minimize construction noise impacts at adjacent receptors. Special attention should be paid to noise-sensitive receptors (including residential, hospital, school, and religious land uses).

Goal EH-7: Ensure that new structures/uses are designed and constructed to preclude excessive, inappropriate, and undesirable noise effects.

Policy EH-7.2: Noise Compatibility Strategies. Where land use noise compatibility conflicts currently exist, explore the need for mitigation measures on noise sources that may be adjacent to sensitive receptors. In planning for future developments, promote the use of buffer zones, barrier/shielding measures, and/or sound insulation building techniques to preclude noise impacts to noise-sensitive land uses.

Policy EH-7.3: Reducing Exposure to Operational Noise. In new residential and mixed-use developments, require that stationary equipment (such as air conditioning units and condensers) be placed in separate spaces, rooftops, or other areas such that noise impacts to interior living areas will be reduced. Similarly, potentially noisy common spaces, such as trash collection areas and loading zones, should be located away from residential units or other noise-sensitive spaces.

Policy EH-7.6: New Noise Sources. Require new developments that have the potential to create long-term noise increases to mitigate potential impact to off-site receptor properties.

Action EH-7.A: Noise Mitigation. Use the development review process to ensure that noise impacts are mitigated through setbacks/buffer zones, earthen berms, sound walls, building siting/orientation, and other appropriate means.

Action EH-7.B: Conditional Use Permits. Use the development review process, including conditional use permits, to limit activities which would generate high levels of noise during nighttime hours (i.e., from 7:00 p.m. to 7:00 a.m.).

Action EH-7.C: Allowing Noise-Sensitive Uses Near Noise Sources. Use the development review process when evaluating zoning changes to consider potential noise impacts due to noise-sensitive uses being located near commercial uses, industrial uses, or other activities that typically generate excessive noise.

Action EH-7.D: Vibration-Intensive Construction. Implement a standard operating procedure that requires the evaluation of vibration impacts for individual projects which use vibration-intensive construction activities, such as pile drivers, jack hammers, and vibratory rollers, near sensitive receptors. If construction-related vibration is determined to be perceptible (i.e., in excess of Federal Transit Administrations vibration annoyance criterion) at vibration-sensitive uses, then additional requirements, such as the use of less-vibration-intensive equipment or construction techniques, shall be implemented during construction.

City of Newark Municipal Code. The City's Noise Ordinance establishes noise limits and construction restrictions.

Chapter 17.24.10 Noise

A. Noise Limits. It shall be unlawful for any person to disturb the peace, quiet, and comfort of the community, or any portion thereof, or neighborhood therein, by creating or causing to be created any unreasonable noises.

2. ***Noise Restriction by Decibel.***

a. *Residential Property Noise Limits.*

i. No person shall produce or allow to be produced by human voice, machine, device, or any combination of same, on residential property, a noise level at any point outside of the property plan that exceeds 70 dBA between the hours of 7:00 a.m. and 9:00 p.m. or 60 dBA between the hours of 9:00 p.m. and 7:00 a.m.

ii. No person shall produce or allow to be produced by human voice, machine, device, or any combinations of same, on multifamily residential property, a noise level more than 60 dBA three feet from any wall, floor, or ceiling inside any dwelling unit on the same property, when the windows and doors of the dwelling unit are closed, except within the dwelling unit in which the noise source or sources may be located.

b. *Commercial and Industrial Property Noise Limits.* Except for commercial and industrial property abutting residential property, no person shall produce or allow to be produced by human voice, machine, device, or

any other combination of same, on commercial or industrial property, a noise level at any point outside of the property plane that exceeds 70 dBA.

i. Abutting Residential Property. Commercial and industrial property that abuts residential property shall be subject to the residential property noise limits set forth in subsections (a)(i) and (ii) above.

3. ***Construction and Landscaping Activities*.** Unless otherwise provided pursuant to a duly-issued permit or a condition of approval of a land use entitlement, the construction, alteration, or repair of structures and any landscaping activities, occurring between the hours of 10:00 a.m. and 6:00 p.m. on Sundays and holidays, and 7:00 a.m. and 7:00 p.m. on other days, shall be subject to the following:

a. No individual device or piece of equipment shall produce a noise level exceeding 83 dBA at a distance of 25 feet from the source. If the device or equipment is housed within a structure on the property, the measurement shall be made outside the structure at a distance as close as possible to 25 feet from the equipment.

b. The noise level at any point outside of the property plane shall not exceed 86 dBA. During all other times, the decibel levels set forth in Subsection 17.24.100A.2, Noise Restriction by Decibel, control.

Existing Noise Environment

The project site is located at the western end of the existing NewPark Mall, just east of Mowry Avenue in the City of Newark, California. Currently, the project site is developed with a surface parking lot and a Sears autobody shop, which would be demolished as part of the project. The existing NewPark Mall, which is expected to remain under project conditions, is located to the east of the site, and existing surface parking lots, which would also remain under project conditions, are located to the north and to the south. The site is bounded to the north and to the east by existing access roads for the parking lot (future Castle Avenue); to the south by an existing parking lot access road (future Alpenrose Court); and to the west by NewPark Mall Road.

The NewPark Mall is expected to remain under full build out conditions would be located east of the project site, opposite Castle Avenue. Existing commercial uses, such as a bank and fast-food restaurants, are located to the west and to the south, opposite NewPark Mall Road. The nearest existing residential uses are located approximately 275 feet west of the site, opposite NewPark Mall Road and to the west of Mowry Avenue. Existing hotels in the project vicinity include the Chase Suite Hotel – Newark/Silicon Valley, which is located approximately 490 feet south of the project site; the Comfort Inn & Suites, which is located approximately 690 feet west of the project site; and the Homewood Suites by Hilton Newark-Fremont, which is approximately 1,000 feet southeast of the project site. Existing single-family residences are also located approximately 1,315 feet northeast of the project site, opposite Interstate 880 (I-880).

The noise environment at the site and in the surrounding areas results primarily from vehicular traffic along I-880 and Mowry Avenue. The commercial uses currently at the site and surrounding the site also influence the existing noise environment in localized areas. Occasional overhead

aircraft associated with the Mineta San José International Airport and the Oakland International Airport are also audible at times at the project site.

Due to the Shelter-in-Place restrictions in the Bay Area at the time of this study, traffic volumes along the surrounding roadways were reduced as compared to typical conditions. A noise monitoring survey was not completed to document ambient noise levels during this unique time period because resultant noise levels would not be representative of typical ambient noise level conditions.

According to the City's General Plan, however, existing and future noise levels at the NewPark Mall range from 65 to 70 dBA CNEL. Based on previous measurements made along I-880, the peak hour L_{eq} is typically 2 to 3 dBA lower than the CNEL. Therefore, daytime hourly average noise levels would typically range up to 68 dBA L_{eq} at the project site and the surrounding area. This is consistent with the ambient noise measurements made at the project site by *Veneklasen Associates*[1] in June 2019. From this study, short-term noise measurements in the project vicinity ranged from 58 to 66 dBA L_{eq}.

NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

The following criteria were used to evaluate the significance of environmental noise resulting from the project:

- A significant noise impact would be identified if the project would generate a substantial temporary or permanent noise level increase over ambient noise levels at existing noise-sensitive receptors surrounding the project site and that would exceed applicable noise standards presented in the General Plan or Municipal Code at existing noise-sensitive receptors surrounding the project site.

    - Hourly average noise levels during construction that would exceed 60 dBA L_{eq} at residential land uses or exceed 70 dBA L_{eq} at commercial land uses and exceed the ambient noise environment by at least 5 dBA L_{eq} for a period of more than one year would constitute a significant temporary noise increase in the project vicinity.

    - A significant permanent noise level increase would occur if project-generated traffic generated by the project or project improvements/operations would substantially increase noise levels at sensitive receivers in the vicinity. A substantial increase would occur if: a) the noise level increase is 5 dBA CNEL or greater, with a future noise level of less than the "normally acceptable" standard, or b) the noise level increase is 3 dBA CNEL or greater, with a future noise level equal to or greater than the "normally acceptable" standard.

[1] Veneklasen Associates, "NewPark Place Phase A Exterior Noise and Exterior Façade Acoustical Analysis," VA Project No. 4010-023, August 13, 2019.

- A significant noise impact would be identified if the project would expose persons to or generate noise levels that would exceed applicable noise standards presented in the General Plan or Municipal Code.

- A significant impact would be identified if the construction of the project would generate excessive vibration levels surrounding receptors. Groundborne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in cosmetic damage to normal buildings. Groundborne vibration levels exceeding 78 VdB at residential uses or 84 VdB at commercial uses during daytime hours would potentially result in human annoyance.

- A significant noise impact would be identified if the project would expose people residing or working in the project area to excessive aircraft noise levels.

Impact 1a: **Temporary Construction Noise.** Existing noise-sensitive land uses would potentially be exposed to a temporary increase in ambient noise levels due to project construction activities. With the implementation of the construction best management practices, temporary noise levels at receiving sensitive uses would result in a **less-than-significant impact**.

Noise impacts resulting from construction depend upon the noise generated by various pieces of construction equipment, the timing and duration of noise-generating activities, and the distance between construction noise sources and noise-sensitive areas. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (e.g., early morning, evening, or nighttime hours), the construction occurs in areas immediately adjoining noise-sensitive land uses, or when construction lasts over extended periods of time.

Policy EH-6.6 of the City's General Plan limits construction in residential neighborhoods to the hours of 7:00 a.m. to 7:00 p.m. Monday through Friday and prohibits construction on weekends and holidays. The City's Municipal Code states that no individual device or piece of construction equipment shall generate noise levels exceeding 83 dBA at a distance of 25 feet from the source or at a distance of 25 feet from an enclosure between the hours of 7:00 a.m. to 7:00 p.m. on weekdays and Saturdays and between 10:00 a.m. and 6:00 p.m. on Sundays and holidays. Further, noise levels at any point outside of the property plane shall not exceed 86 dBA.

Additionally, Policy EH-6.7 of the General Plan provides the following measures to reduce construction noise:

- Require properly maintained mufflers on construction vehicles;

- Require stationary construction equipment to be placed as far as possible from developed areas; and

- Require temporary acoustical barriers/shielding to minimize construction noise impacts at adjacent receptors.

Thresholds for speech interference indoors is 45 dBA, as discussed in the Fundamentals section of this report. Assuming a 15 dBA exterior-to-interior reduction for standard residential construction and a 25 dBA exterior-to-interior reduction for standard commercial construction, this would correlate to an exterior threshold of 60 dBA L_{eq} at residential land uses, which would include hotels, and 70 dBA L_{eq} at commercial land uses. Additionally, temporary construction would be annoying to surrounding land uses if the ambient noise environment increased by at least 5 dBA L_{eq} for an extended period of time. Ambient noise levels at noise-sensitive receptors in the vicinity of the project site range from 58 to 68 dBA L_{eq} during daytime hours.

Construction activities generate considerable amounts of noise, especially during earth-moving activities when heavy equipment is used. The typical range of maximum instantaneous noise levels for the proposed project would be 70 to 90 dBA L_{max} at a distance of 50 feet (see Table 5). Based on the City's maximum threshold for individual pieces of construction equipment, the 83 dBA limit would be exceeded by most equipment expected to be used in for the construction of this project (i.e., concrete/industrial saw, dozer, tractor, grader, scraper, and generator).

Table 6 shows typical hourly average construction-generated noise levels measured at a distance of 50 feet from the center of the site during busy construction periods (e.g., earth moving equipment, impact tools, etc.). As shown in Table 6, typical residential developments generate construction noise levels ranging from 72 to 88 dBA L_{eq} at a distance of 50 feet from the center of the active site. Construction-generated noise levels drop off at a rate of about 6 dBA per doubling of the distance between the source and receptor. Shielding by buildings or terrain often result in lower construction noise levels at distant receptors; however, for purposes of assessing a worst-case scenario, construction noise levels in this report are estimated assuming no attenuation due to intervening buildings.

Construction for the proposed project is expected to last for about 33 months.

Construction activities for the proposed project would be completed in phases. During each phase of construction, there would be a different mix of equipment operating, and noise levels would vary by phase and vary within phases, based on the amount of equipment in operation and the location at which the equipment is operating. Equipment expected to be used in each construction phase are summarized in Table 7, along with the quantity of each piece of equipment, the duration of each phase, and the estimated noise levels projected from the center of the project site to the property lines of the surrounding land uses. For the purposes of assuming worst-case conditions, all pieces of equipment shown per phase are assumed to be operating simultaneously. The range of levels shown for various phases represents noise levels for that individual phase and noise levels during the overlapping periods with other phases. Note, the existing shopping mall is not considered a sensitive receptor since all activities would occur indoors.

FHWA's Roadway Construction Noise Model (RCNM) was used to calculate the hourly average noise levels for each phase of construction, assuming every piece of equipment would operate simultaneously, which would represent the worst-case scenario. Based on the hourly average noise levels calculated with RCNM, construction noise levels for each construction phase were propagated from the center of the project site, which represents the geometrical center of the active construction site, to the property lines of the receiving land uses surrounding the site. Construction

noise levels shown do not assume shielding from potential intervening buildings or temporary or permanent sound walls.

TABLE 5 Construction Equipment, 50-foot Noise Emission Limits

Equipment Category	L_{max} Level (dBA)[1,2]	Impact/Continuous
Arc Welder	73	Continuous
Auger Drill Rig	85	Continuous
Backhoe	80	Continuous
Bar Bender	80	Continuous
Boring Jack Power Unit	80	Continuous
Chain Saw	85	Continuous
Compressor[3]	70	Continuous
Compressor (other)	80	Continuous
Concrete Mixer	85	Continuous
Concrete Pump	82	Continuous
Concrete Saw	90	Continuous
Concrete Vibrator	80	Continuous
Crane	85	Continuous
Dozer	85	Continuous
Excavator	85	Continuous
Front End Loader	80	Continuous
Generator	82	Continuous
Generator (25 KVA or less)	70	Continuous
Gradall	85	Continuous
Grader	85	Continuous
Grinder Saw	85	Continuous
Horizontal Boring Hydro Jack	80	Continuous
Hydra Break Ram	90	Impact
Impact Pile Driver	105	Impact
Insitu Soil Sampling Rig	84	Continuous
Jackhammer	85	Impact
Mounted Impact Hammer (hoe ram)	90	Impact
Paver	85	Continuous
Pneumatic Tools	85	Continuous
Pumps	77	Continuous
Rock Drill	85	Continuous
Scraper	85	Continuous
Slurry Trenching Machine	82	Continuous
Soil Mix Drill Rig	80	Continuous
Street Sweeper	80	Continuous
Tractor	84	Continuous
Truck (dump, delivery)	84	Continuous
Vacuum Excavator Truck (vac-truck)	85	Continuous
Vibratory Compactor	80	Continuous
Vibratory Pile Driver	95	Continuous
All other equipment with engines larger than 5 HP	85	Continuous

Notes: [1] Measured at 50 feet from the construction equipment, with a “slow” (1 sec.) time constant.

[2] Noise limits apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation.

[3]Portable Air Compressor rated at 75 cfm or greater and that operates at greater than 50 psi.

TABLE 6 Typical Ranges of Construction Noise Levels at 50 Feet, L_{eq} (dBA)

	Domestic Housing		Office Building, Hotel, Hospital, School, Public Works		Industrial Parking Garage, Religious Amusement & Recreations, Store, Service Station		Public Works Roads & Highways, Sewers, and Trenches	
	I	**II**	**I**	**II**	**I**	**II**	**I**	**II**
Ground Clearing	83	83	84	84	84	83	84	84
Excavation	88	75	89	79	89	71	88	78
Foundations	81	81	78	78	77	77	88	88
Erection	81	65	87	75	84	72	79	78
Finishing	88	72	89	75	89	74	84	84

I - All pertinent equipment present at site.
II - Minimum required equipment present at site.

Source: U.S.E.P.A., Legal Compilation on Noise, Vol. 1, p. 2-104, 1973.

TABLE 7 Estimated Construction Noise Levels at Nearby Land Uses During the Project Construction

Phase	Phase Duration	Construction Equipment (Quantity)	Calculated Hourly Average L_{eq} at Noise-Sensitive Receptors, dBA						
			Citibank (260ft W)	Multi-Family (510ft W)	Fast-Food (525ft S)	Chase Suite Hotel (810ft S)	Comfort Inn & Suites (970ft SW)	Homewood Suites (1250ft SE)	Single-Family (1600ft NE)
Demolition	9/15/2021-11/1/2021	Concrete/Industrial Saw (1) Excavator (3) Rubber-Tire Dozer (2) Tractor/Loader/Backhoe (2)	74	68	68	64	62	60	58
Site Preparation	11/1/2021-11/15/2021	Grader (1) Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (2)	72	66	65	62	60	58	56
Grading/ Excavation	11/15/2021-2/1/2022	Excavator (2) Grader (2) Rubber-Tired Dozer (1) Scraper (2) Tractor/Loader/Backhoe (2)	75	69	69	65	63	61	59
Trenching/ Foundation	6/15/2021-8/31/2022	Tractor/Loader/Backhoe (2) Excavator (2)	70-76[a]	65-70[a]	64-70[a]	61-66[a]	59-65[a]	57-62[a]	55-60[a]
Building Exterior	5/1/2022-4/1/2023	Crane (1) Forklift (3) Generator Set (1) Tractor/Loader/Backhoe (3) Welder (1)	72-74[b]	66-68[b]	66-68[b]	62-64[b]	60-63[b]	58-61[b]	56-58[b]
Building Interior/ Architectural Coating	5/1/2023-2/28/2024	Air Compressor (4) Aerial Lift (1)	66-73[c]	60-67[c]	60-67[c]	56-63[c]	54-61[c]	52-59[c]	50-57[c]
Paving	8/1/2023-10/30/2023	Cement and Mortar Mixer (1) Paver (2) Paving Equipment (2) Roller (2)	73[d]	67[d]	66-67[d]	63[d]	61-62[d]	59-60[d]	57-58[d]

[a] The range of construction noise levels represents the levels during the Trenching/Foundation phase only and when combined with the Demolition, Site Preparation, and Grading/Excavation phases.
[b] The range of construction noise levels represents the levels during the Building Exterior phase only and when combined with the Trenching/Foundation phase.
[c] The range of construction noise levels represents the levels during the Building Interior/Architectural Coating phase only and when combined with the Building Exterior phase.
[d] The range of construction noise levels represents the levels during the Paving phase only and when combined with the Building Interior/Architectural Coating phase.

The predicted construction noise levels in Table 7 indicate that project construction could potentially generate noise levels exceeding 60 dBA L_{eq} at the nearby residences and hotels and exceeding 70 dBA L_{eq} at the nearby commercial uses. At times, the existing ambient noise levels would potentially be exceeded by 5 dBA L_{eq} or more. Additionally, several individual pieces of equipment would exceed the City's 83 dBA noise limit at a distance of 25 feet, and noise levels would exceed 86 dBA outside of the property plane.:

Reasonable regulation of the hours of construction, as well as regulation of the arrival and operation of heavy equipment and the delivery of construction material, are necessary to protect the health and safety of persons, promote the general welfare of the community, and maintain the quality of life. Measures included in Policies EH-6.6 and EH-6.7 of the General Plan would limit construction hours and reduce construction noise levels emanating from the site. Additionally, in conformance to Action EH-7.B, which states that noise impacts would be reduced to a less-than-significant level with the implementation of measures developed during the review process, a construction noise control plan shall be implemented as a project conditions of approval to reduce construction noise levels emanating from the site and minimize disruption and annoyance at existing noise-sensitive receptors in the project vicinity. The construction noise control plan shall include, but not limited to, the following:

- Ensure that excavating, grading, and filling activities, and other construction activities (including the loading and unloading of materials and truck movements) are limited to the hours of 7:00 a.m. to 7:00 p.m. on weekdays. No construction is permitted on weekends or holidays, per Policy EH-6.6 of the City's General Plan.

- Limit noise produced by construction equipment such that no individual device or piece of construction equipment generates noise levels exceeding 83 dBA at a distance of 25 feet from the source or at a distance of 25 feet from an enclosure between the hours of 7:00 a.m. to 7:00 p.m. on weekdays and Saturdays and between 10:00 a.m. and 6:00 p.m. on Sundays and holidays. Further, noise levels at any point outside of the property plane shall not exceed 86 dBA. The contractor shall submit documentation that proposed equipment will meet the Municipal Code limit or propose alternative methods/additional noise controls to meet the Municipal Code limits.

- Require properly maintained mufflers on construction vehicles.

- Require stationary construction equipment to be placed as far as possible from developed areas. If they must be located near receptors, adequate muffling (with enclosures where feasible and appropriate) shall be used to reduce noise levels at the adjacent sensitive receptors. Any enclosure openings or venting shall face away from sensitive receptors.

- Require temporary acoustical barriers/shielding to minimize construction noise impacts at adjacent receptors.

- Unnecessary idling of internal combustion engines should be strictly prohibited.

- Utilize "quiet" air compressors and other stationary noise sources where technology exists.

- Construction staging areas shall be established at locations that will create the greatest distance between the construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction.

- Locate material stockpiles, as well as maintenance/equipment staging and parking areas, as far as feasible from residential receptors.

- Route construction-related traffic along major roadways and as far as feasible from sensitive receptors.

- Locate material stockpiles, as well as maintenance/equipment staging and parking areas, as far as feasible from residential receptors.

- Control noise from construction workers' radios to a point where they are not audible at existing residences bordering the project site.

- Erect a temporary fence around the perimeter of the project site to break the line-of-sight between the noise source and surrounding receptors.

- The contractor shall prepare a detailed construction schedule for major noise-generating construction activities. The construction plan shall identify a procedure for coordination with adjacent residential land uses so that construction activities can be scheduled to minimize noise disturbance.

- Designate a "disturbance coordinator" who would be responsible for responding to any complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g., bad muffler, etc.) and will require that reasonable measures be implemented to correct the problem. Conspicuously post a telephone number for the disturbance coordinator at the construction site and include in it the notice sent to neighbors regarding the construction schedule.

Implementation of these measures would achieve the Municipal Code noise limits and result in an overall reduction of construction noise levels by about 5 dBA. Implementation of the above measures would reduce construction noise levels at receiving sensitive properties to within 5 dBA of ambient levels, limit construction hours, and minimize disruption and annoyance. In compliance with the *NewPark Place Specific Plan Initial Study*[2] and the *General Plan EIR*,[3] the implementation of these measures and recognition that noise generated by construction activities would occur over a temporary period would result in a less-than-significant temporary increase in ambient noise levels.

Mitigation Measure 1a: No further mitigation required.

[2] EMC Planning Group Inc., "NewPark Place Specific Plan Initial Study," February 16, 2018.
[3] The Planning Center DC&E, "Newark General Plan Tune Up Draft Program EIR," State Clearinghouse No. 2013012052, August 13, 2013.

Impact 1b: **Permanent Noise Level Increase.** The proposed project would not result in a substantial permanent noise level increase due to project-generated traffic at the existing noise-sensitive land uses in the project vicinity. **This is a less-than-significant impact.**

A significant impact would occur if the permanent noise level increase due to project-generated traffic was 3 dBA CNEL or greater for future ambient noise levels exceeding 60 dBA CNEL or was 5 dBA CNEL or greater for future ambient noise levels at or below 60 dBA CNEL. The General Plan shows that existing and future noise contours show noise levels at the project site and surrounding area would exceed 60 dBA CNEL. Therefore, a significant impact would occur if project-generated traffic increased levels by 3 dBA CNEL or more. For reference, a 3 dBA CNEL noise increase would be expected if the project would double existing traffic volumes along a roadway.

The traffic study prepared for the proposed project[4] includes 404 residential project trips during the peak AM hour, 254 trips during the peak PM hour, and 270 trips during the peak Saturday hour. These trips reflect the 319 units on the Phase A project site, as well as 1,200 additional residential units expected for the remainder of the specific plan area. The noise-sensitive receptors, including existing residential uses and hotels in the project vicinity, are exposed to noise levels dominated by I-880, Mowry Avenue, and Cedar Boulevard. Compared to the existing traffic volumes along these roadways, the noise level increase with the inclusion of all 1,519 residential units would be 1 dBA CNEL or less. Therefore, the proposed Phase A project would not double traffic volumes along these roadways, nor cause a substantial permanent noise increase at the surrounding noise-sensitive receptors. This impact is a less-than-significant impact.

Mitigation Measure 1b: **None required.**

Impact 1c: **Noise Levels in Excess of Standards.** The proposed project is not expected to generate noise levels exceeding the City's residential noise thresholds. **This is a less-than-significant impact.**

Under the City of Newark Municipal Code, noise generated on residential property shall not generate noise levels exceeding 70 dBA during the hours of 7:00 a.m. to 9:00 p.m. or 60 dBA during the hours of 9:00 p.m. to 7:00 a.m. at any point outside the property plane. The commercial uses located on the project site would be limited to the same threshold since this is a mixed-use building.

Policy EH-7.3 of the City of Newark General Plan requires that stationary equipment be placed in separate spaces, rooftops, or other areas of mixed-use buildings such that noise impacts be reduced. It further states that potential noisy areas, such as loading zones and trash collection areas be located away from residential units or other noise-sensitive uses.

The proposed residential mixed-use building would potentially generate noise due to mechanical equipment, parking, and truck deliveries associated with the ground-floor commercial uses. While mechanical equipment and parking lot activity would be expected to occur at any time during

[4] Sandis, "NewPark Place Circulation Analysis," February 23, 2021.

daytime and nighttime hours, truck deliveries would only be expected between the hours of 7:00 a.m. and 9:00 p.m.

Mechanical Equipment

Various mechanical equipment for heating, ventilation, and air conditioning (HVAC) purposes are expected as part of the proposed mixed-use building. Electrical rooms and maintenance rooms are shown on the interior of the building, surrounding the parking structure. Any equipment located within these rooms would not be audible on the exterior of the building. Additionally, HVAC units are typically located on the rooftops of mixed-use buildings. While details pertaining to the specific type of units, the number of units, and location of units was unavailable at the time of this study, rooftop equipment may be indicated in the site plan. Assuming all equipment would be set back from the edge of the building by at least 10 feet, the shortest distance between the rooftop equipment and the property line would be 25 feet.

Typical HVAC units at residential buildings of this size would be about 53 to 63 dBA at 3 feet. These units are typically clustered together, and under worst-case conditions, up to 10 units operating simultaneously for a continuous 24-hour period was assumed at any given time. At a distance of 3 feet, the hourly average noise level at the property line of the project site would range from 45 to 55 dBA L_{eq}. This would meet the City's daytime and nighttime thresholds.

Parking Lot Noise

The proposed project includes a parking structure, with access along NewPark Mall Road. The building façades would provide a minimum noise level reduction of 20 dBA at the property lines. Since the existing land use is a surface parking lot with no shielding, noise generated at the project site due to parking lot noise would reduce under project conditions. The City's daytime and nighttime thresholds would not be exceeded.

Truck Loading and Unloading

Loading zones are shown along the curbs of the proposed building on the east and west sides of the building. The west loading zone is shown near the lobby of the residential building; while residential moving trucks may be parked here, moving trucks are not typically regulated for noise since they do not occur regularly and would not permanently increase the noise environment. However, the loading zones along the west side of the building would be closer to the ground-level retail use where weekly deliveries would be expected. This location is compatible with Policy EH-7.3, which requires loading zones to be located away from noise-sensitive uses. The nearest residences are located to the west and would be shielded from this commercial loading zone. Further, the adjacent shopping mall would also provide shielding the nearby hotels from noise generated at the loading zone.

Vendor delivery trucks typically generate maximum noise levels of 60 to 65 dBA L_{max} at a distance of 50 feet. Low speed truck noise results from a combination of engine, exhaust, and tire noise, as well as the intermittent sounds of back-up alarms and releases of compressed air associated with

truck/trailer air brakes. Based on the size of this commercial use, 1 to 2 deliveries a week would be assumed.

The loading zones for the proposed project would be located along the property line, which would increase maximum noise levels up to about 80 dBA L_{max}. However, it should be noted that the shopping mall currently includes truck deliveries by larger trucks generating significantly higher noise levels. Further, this is a very noisy area with a lot of existing heavy truck traffic, and truck deliveries due to the proposed project would not result in a noticeable noise level increase. Due to the low anticipated volume of truck deliveries and the smaller sized trucks expected at the project site, prohibiting truck idling during a delivery would significantly reduce noise levels and overall time of exposure to truck delivery noise. With the implementation of this measure, this is not expected to result in a significant impact.

Mitigation Measure 1c: None required.

Impact 2: Exposure to Excessive Groundborne Vibration due to Construction. Project construction could potentially generate vibration levels exceeding the annoyance thresholds established by the FTA. The incorporation of construction vibration measures, in accordance with Action EH-7.D of the City's General Plan, as project conditions of approval would result in a **less-than-significant** construction vibration impact.

The construction of the project may generate vibration when heavy equipment or impact tools (e.g., jackhammers, hoe rams) are used. Construction activities would include grading, foundation work, paving, and new building framing and finishing. According to the equipment list provided at the time of this study, pile driving activities, which can cause excessive vibration, are not anticipated for this project.

For structural damage, the California Department of Transportation (Caltrans) recommends a vibration limit of 0.5 in/sec PPV for buildings structurally sound and designed to modern engineering standards, 0.3 in/sec PPV for buildings that are found to be structurally sound but where structural damage is a major concern, and a conservative limit of 0.08 in/sec PPV for ancient buildings or buildings that are documented to be structurally weakened. No known ancient buildings or buildings that are documented to be structurally weakened adjoin the project area.

Action EH-7.D of the City's General Plan states that if construction-related vibration is in excess of the Federal Transit Administration's (FTA) vibration annoyance criterion at vibration-sensitive uses, the project would be considered significant and would require measures to be implemented to reduce vibration levels. The FTA's Noise and Vibration Impact Assessment Manual[5] includes Construction Vibration Damage Criteria to be used in assessing construction vibration impacts (Table 8). The FTA manual discusses vibration annoyance criteria in terms of frequency of events (see Table 9), such as train pass-by exposure, and is difficult to use in assessing construction vibration considering usage throughout the day of any individual piece of equipment would vary, as would the distance from the equipment to the receptor. According to the General Plan Update

[5] Federal Transit Administration, "Transit Noise and Vibration Impact Assessment Manual," FTA Report No. 0123, September 2018.

EIR, the FTA criteria for human annoyance during daytime activities would range from 78 to 90 VdB. Conservatively, a threshold of 78 VdB would be enforced for residential uses and 84 VdB for offices and other commercial uses.

TABLE 8 Construction Vibration Damage Criteria

Building/Structural Category	PPV, in/sec	Approximately L_v[a]
I. Reinforced-concrete, steel or timber (no plaster)	0.5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
III. Non-engineered timber and masonry buildings	0.2	94
IV. Buildings extremely susceptible to vibration damage	0.12	90

[a] RMS velocity in decibels, VdB re 1 μin/sec

Source: Transit Noise and Vibration Impact Assessment Manual, Federal Transit Administration, Office of Planning and Environment, U.S. Department of Transportation, FTA Report No. 0123, September 2018.

TABLE 9 Indoor Groundborne Vibration Impact Criteria

Land Use Category	Groundborne Impact Levels, VdB		
	Frequent Events (more than 70 events per day)	Occasional Events (30-70 events per day)	Infrequent Events (fewer than 30 events per day)
Category 1: Buildings where vibration would interfere with interior operations	65	65	65
Category 2: Residences and buildings where people normally sleep	72	75	80
Category 3: Institutional land uses with primarily daytime use	75	78	83

Source: Transit Noise and Vibration Impact Assessment Manual, Federal Transit Administration, Office of Planning and Environment, U.S. Department of Transportation, FTA Report No. 0123, September 2018.

Table 10 presents typical vibration levels that could be expected from construction equipment, as measured at a distance of 25 feet. Project construction activities, such as drilling, the use of jackhammers, rock drills and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles, compactors, etc.), may generate substantial vibration in the immediate vicinity. Jackhammers typically generate vibration levels of 0.035 in/sec PPV or 79 VdB, and drilling typically generates vibration levels of 0.09 in/sec PPV or 87 VdB at a distance of 25 feet. Vibration levels would vary depending on soil conditions, construction methods, and equipment used.

TABLE 10 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft. (in/sec)	Approx. L_v[a] at 25 ft.	Minimum Distance to Meet 0.3 in/sec PPV (feet)	Minimum Distance to Meet 78 VdB (feet)	Minimum Distance to Meet 84 VdB (feet)
Clam shovel drop		0.202	94	18	86	55
Hydromill (slurry wall)	in soil	0.008	66	1	10	7
	in rock	0.017	75	2	20	13
Vibratory Roller		0.210	94	19	86	55
Hoe Ram		0.089	87	9	51	32
Large bulldozer		0.089	87	9	51	32
Caisson drilling		0.089	87	9	51	32
Loaded trucks		0.076	86	8	47	30
Jackhammer		0.035	79	4	28	18
Small bulldozer		0.003	58	<1	6	4

[a] RMS velocity in decibels, VdB re 1 μin/sec

Source: Transit Noise and Vibration Impact Assessment Manual, Federal Transit Administration, Office of Planning and Environment, U.S. Department of Transportation, FTA Report No. 0123, September 2018, as modified by Illingworth & Rodkin, Inc., February 2021.

Table 10 also the distances to each Caltrans (for building damage) and FTA (for annoyance) thresholds. Vibration levels (in in/sec PPV) are highest close to the source and then attenuate with increasing distance at the rate $\left({D_{ref}}/{D}\right)^{1.1}$, where *D* is the distance from the source in feet and D_{ref} is the reference distance of 25 feet. For annoyance assessment, the equation for groundborne vibration propagation is $L_{vref} - 30log\left(\frac{D}{D_{ref}}\right)$, where L_{vref} is the reference L_v shown in Table 9 for each individual equipment.

Using the source levels in Table 10, each piece of equipment was propagated to the surrounding sensitive land uses. These levels are summarized in Tables 11 and 12. While construction noise levels increase based on the cumulative equipment in use simultaneously, construction vibration levels would be dependent on the location of individual pieces of equipment. That is, equipment scattered throughout the site would not generate a collective vibration level, but a vibratory roller, for instance, operating near the project site boundary would generate the worst-case vibration levels for surrounding receptors when operating at the nearest property line of the site. Further, both construction damage and annoyance are assessed at the nearest building façades located on the receiving properties. Therefore, the distances used to propagate construction vibration levels (as shown in Tables 11 and 12), which are different than the distances used to propagate construction noise levels (as shown in Table 7), were estimated under the assumption that each piece of equipment from Table 10 was operating along the nearest boundary of the project site, which would represent the worst-case scenario.

Vibration levels shown in Table 11 at the nearest building façades surrounding the project site would not exceed the 0.3 in/sec PPV threshold for potential damage. Additionally, the annoyance threshold at the nearest residential land uses would not be exceeded. However, the annoyance criteria would potentially approach the 84 VdB threshold at the nearest façade of the adjacent shopping mall when vibratory rollers and clam shovel drops are used along the eastern boundary

of the project site. In accordance with Action EH-7.D of the City's General Plan, using less-vibration-intensive equipment or construction techniques along the eastern boundary of the project site would result in a less-than-significant impact. The following measures shall be implemented as a project condition of approval to reduce vibration perception at the nearest sensitive uses:

- Place operating equipment on the construction site as far as possible from vibration-sensitive receptors.
- Use smaller equipment to minimize vibration levels below the limits.
- Avoid using vibratory rollers or tampers within 60 feet of sensitive uses.
- Select demolition methods not involving impact tools.
- Modify/design or identify alternative construction methods to reduce vibration levels below the limits.
- Avoid dropping heavy objects or materials.

Implementation of these measures would reduce the impact to a less-than-significant level.

Mitigation Measure 2: **No further mitigation required.**

Impact 3: **Excessive Aircraft Noise.** The project site is located more than two miles from a public airport or public use airport and would not expose people residing or working in the project area to excessive aircraft noise levels. **This is a less-than-significant impact.**

The City does not have a commercial, military, or general aviation airport. The nearest airports include Mineta San José International and Hayward Executive Airports, both of which are about 11.1 miles from the project site, Palo Alto Airport, which is about 7.7 miles southwest of the site, and Moffett Federal Airfield, which is about 7.5 miles southwest of the project site. Oakland International Airport is located approximately 17.0 miles northwest. The project site lies outside the area of influence for each of these airports. Noise from aircraft would not substantially increase ambient noise levels at the project site, and interior noise levels resulting from aircraft would be compatible with the proposed project.

Mitigation Measure 3: **None required.**

TABLE 11 Construction Vibration Levels at the Surrounding Sensitive Building Façades, in/sec PPV

Equipment		Estimated Vibration Levels at Structures Surrounding the Project Site, in/sec PPV							
		Shopping Mall (55ft E)	Citibank (60ft W)	Multi-Family (310ft W)	Fast-Food (250ft S)	Chase Suite Hotel (515ft S)	Comfort Inn & Suites (725ft SW)	Homewood Suites (1065ft SE)	Single-Family (1345ft NE)
Clam shovel drop		0.085	0.77	0.013	0.016	0.007	0.005	0.003	0.003
Hydromill (slurry wall)	in soil	0.003	0.003	0.001	0.001	0.0003	0.0002	0.0001	0.0001
	in rock	0.007	0.006	0.001	0.001	0.001	0.0004	0.0003	0.0002
Vibratory Roller		0.088	0.080	0.013	0.017	0.008	0.005	0.003	0.003
Hoe Ram		0.037	0.034	0.006	0.007	0.003	0.002	0.001	0.001
Large bulldozer		0.037	0.034	0.006	0.007	0.003	0.002	0.001	0.001
Caisson drilling		0.037	0.034	0.006	0.007	0.003	0.002	0.001	0.001
Loaded trucks		0.032	0.029	0.005	0.006	0.003	0.002	0.001	0.001
Jackhammer		0.015	0.013	0.002	0.003	0.001	0.001	0.001	0.0004
Small bulldozer		0.001	0.001	0.0002	0.0002	0.0001	0.0001	0.00005	0.00004

Source: Transit Noise and Vibration Impact Assessment Manual, Federal Transit Administration, Office of Planning and Environment, U.S. Department of Transportation, September 2018, as modified by Illingworth & Rodkin, Inc., February 2021.

TABLE 12 Construction Vibration Levels at the Surrounding Sensitive Building Façades, L_v VdB

Equipment		Estimated Vibration Levels at Structures Surrounding the Project Site, in/sec PPV							
		Shopping Mall (55ft E)	Citibank (60ft W)	Multi-Family (310ft W)	Fast-Food (250ft S)	Chase Suite Hotel (515ft S)	Comfort Inn & Suites (725ft SW)	Homewood Suites (1065ft SE)	Single-Family (1345ft NE)
Clam shovel drop		**84**	83	61	64	55	50	45	42
Hydromill (slurry wall)	in soil	56	55	33	36	27	22	17	14
	in rock	65	64	42	45	36	31	26	23
Vibratory Roller		**84**	83	61	64	55	50	45	42
Hoe Ram		77	76	54	57	48	43	38	35
Large bulldozer		77	76	55	57	48	43	38	35
Caisson drilling		77	76	54	57	48	43	38	35
Loaded trucks		76	75	53	56	47	42	37	34
Jackhammer		69	68	46	49	40	35	30	27
Small bulldozer		48	47	25	28	19	14	9	6

Source: Transit Noise and Vibration Impact Assessment Manual, Federal Transit Administration, Office of Planning and Environment, U.S. Department of Transportation, September 2018, as modified by Illingworth & Rodkin, Inc., February 2021.