AVALON WEST VALLEY EXPANSION ENVIRONMENTAL NOISE AND VIBRATION ASSESSMENT

San José, California

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Prepared for:

Fiona Phung
David J. Powers & Associates, Inc.
1871 The Alameda, Suite 200
San José, CA 95126

Prepared by:

Manasi Biwalkar
Dana M. Lodico, PE, INCE Bd. Cert.

ILLINGWORTH & RODKIN, INC.
Acoustics • Air Quality
1 Willowbrook Court, Suite 120
Petaluma, CA 94954
(707) 794-0400

Project: 17-235

INTRODUCTION

The project proposes to demolish two on-site garages and an existing amenities/leasing building and pool area, and construct up to 300 residential units in two buildings, approximately 17,800 square feet of retail, and a new parking structure with approximately 1,160 parking spaces. 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 three sections: 1) the Setting Section provides a brief description of the fundamentals of environmental noise, summarizes applicable regulatory criteria, and discusses the results of the ambient noise monitoring survey completed to document existing noise conditions; 2) the General Plan Consistency Section discusses noise and land use compatibility utilizing policies in the City's General Plan; and, 3) the Impacts and Mitigation Measures Section describes the significance criteria used to evaluate project impacts, provides a discussion of each project impact, and presents mitigation measures, where necessary, to provide a compatible project in relation to adjacent noise sources and land uses.

PROJECT DESCRIPTION

The 18.9-acre project site is comprised of six parcels located east of Saratoga Avenue, between Blackford Avenue and Manzanita Drive in the City of San José. The project site is currently developed with 873 residential apartment units and two parking structures (the Saratoga Garage and the Manzanita Garage). The Saratoga Garage is located at the southeast corner of the Saratoga Avenue/Blackford Avenue intersection. The Manzanita Garage is located near the center of the site and along Manzanita Drive. The project site is located within the Paseo de Saratoga Urban Village and is proposed as a Signature Project. It is anticipated that the project would be rezoned to Planned Development.

The project, as proposed, would redevelop approximately 6.9-acres of the 18.9-acre site. The project would demolish both parking structures (a total of 618 parking stalls), and the leasing/amenity building and pool area directly south of the Saratoga Garage. The project would construct up to 300 residential units in two buildings, approximately 17,800 square feet of retail, and a new parking structure with approximately 1,160 parking spaces. Additionally, approximately 20,108 square feet of amenity space would be constructed within the two buildings. The Avalon Building, which would be located at the northwest corner of the site, would have up to 245 residential units and a maximum height of 85 feet. The Manzanita Building, which would be located along Manzanita Drive, would have up to 55 residential units and a maximum height of 45 feet.

The new stand-alone parking structure would be located immediately northeast of the proposed Manzanita building. The parking structure would be one level below-grade and three levels above-grade with 788 parking stalls and a maximum height of 35 feet. A combined total of 443 parking stalls is proposed within the Avalon building area. The Avalon Building would include one level of above-grade and two levels of below-grade parking with up to 404 parking stalls. The remaining 39 parking stalls would be located adjacent to the building in a surface lot.

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* (*DNL* or L_{dn}) 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, and 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 vibration levels produce.

The annoyance levels shown in Table 3 should be interpreted with care since vibration may be found to be annoying at much 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.

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 induce structural 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. Studies have shown that the threshold of perception for average persons is in the range of 0.008 to 0.012 in/sec PPV. 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 minor cracking of building elements, or may threaten the integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher and there is no general consensus as to what amount of vibration may pose a threat for structural damage to the building. 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.

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 pm and 7:00 am.
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 pm to 10:00 pm and after addition of 10 decibels to sound levels measured in the night between 10:00 pm and 7:00 am.
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, November 2009.

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
0.3	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.

Regulatory Background – Noise

The State of California and the City of San José have established regulatory criteria that are applicable in this assessment. The State 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) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;

(b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;

(c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;

(d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;

(e) For a project located within an airport land use plan or where such a plan has not been adopted within two miles of a public airport or public use airport, if the project would expose people residing or working in the project area to excessive noise levels; or

(f) For a project within the vicinity of a private airstrip, if the project would expose people residing or working in the project area to excessive noise levels.

Checklist items (a), (b), (c), and (d) are applicable to the proposed project. The project would not expose people residing or working in the project area to excessive aircraft noise levels; therefore, items (e) and (f) are not carried further in this analysis.

The impacts of the project on the surrounding land uses are addressed in the Noise Impacts and Mitigation Measures Section of the report. The impacts of site constraints such as exposure of the proposed project to excessive levels of noise and vibration are not considered under CEQA and are discussed in a separate section addressing Noise and Land Use Compatibility for consistency with the policies set forth in the City's General Plan.

2016 California Building Code, Title 24, Part 2. The current version of the California Building Code (CBC) requires interior noise levels attributable to exterior environmental noise sources to be limited to a level not exceeding 45 dBA DNL/CNEL in any habitable room.

2016 California Green Building Standards Code (Cal Green Code). The State of California established exterior sound transmission control standards for new non-residential buildings as set forth in the 2016 California Green Building Standards Code (Section 5.507.4.1 and 5.507.4.2). Section 5.507 states that either the prescriptive (Section 5.507.4.1) or the performance method (Section 5.507.4.2) shall be used to determine environmental control at indoor areas. The prescriptive method is very conservative and not practical in most cases; however, the performance method can be quantitatively verified using exterior-to-interior calculations. For the purposes of this report, the performance method is utilized to determine consistency with the Cal Green Code. The sections that pertain to this project are as follows:

> **5.507.4.1 Exterior noise transmission, prescriptive method.** Wall and roof-ceiling assemblies exposed to the noise source making up the building envelope shall meet a composite STC rating of at least 50 or a composite OITC rating of no less than 40, with exterior windows of a minimum STC of 40 or OITC of 30 when the building falls within the 65 dBA L_{dn} noise contour of a freeway or expressway, railroad, industrial source or fixed-guideway noise source, as determined by the local general plan noise element.
>
> **5.507.4.2 Performance method.** For buildings located, as defined by Section 5.507.4.1, wall and roof-ceiling assemblies exposed to the noise source making up the building envelope shall be constructed to provide an interior noise environment attributable to exterior sources that does not exceed an hourly equivalent noise level ($L_{eq\ (1\text{-}hr)}$) of 50 dBA in occupied areas during any hour of operation.

The performance method, which establishes the acceptable interior noise level, is the method typically used when applying these standards.

City of San José General Plan. The Environmental Leadership Chapter in the Envision San José 2040 General Plan sets forth policies with the goal of minimizing the impact of noise on people through noise reduction and suppression techniques, and through appropriate land use policies in the City of San José. The following policies are applicable to the proposed project:

EC-1.1 Locate new development in areas where noise levels are appropriate for the proposed uses. Consider federal, State, and City noise standards and guidelines as a part of new development review. Applicable standards and guidelines for land uses in San José include:

<u>Interior Noise Levels</u>

- The City's standard for interior noise levels in residences, hotels, motels, residential care facilities, and hospitals is 45 dBA DNL. Include appropriate site and building design, building construction and noise attenuation techniques in new development to meet this standard. For sites with exterior noise levels of 60 dBA DNL or more, an acoustical analysis following protocols in the City-adopted California Building Code is required to demonstrate that development projects can meet this standard. The acoustical analysis shall base required noise attenuation techniques on expected Envision General Plan traffic

volumes to ensure land use compatibility and General Plan consistency over the life of this plan.

Exterior Noise Levels

- The City's acceptable exterior noise level objective is 60 dBA DNL or less for residential and most institutional land uses such as schools, 65 dBA DNL for playground and outdoor spaces, and 70 dBA DNL for commercial uses (Table EC-1). The acceptable exterior noise level objective is established for the City, except in the environs of the San José International Airport and the Downtown, as described below:

    - For new multi-family residential projects and for the residential component of mixed-use development, use a standard of 60 dBA DNL in usable outdoor activity areas, excluding balconies and residential stoops and porches facing existing roadways. Some common use areas that meet the 60 dBA DNL exterior standard will be available to all residents. Use noise attenuation techniques such as shielding by buildings and structures for outdoor common use areas. On sites subject to aircraft overflights or adjacent to elevated roadways, use noise attenuation techniques to achieve the 60 dBA DNL standard for noise from sources other than aircraft and elevated roadway segments.

Table EC-1: Land Use Compatibility Guidelines for Community Noise in San José

LAND USE CATEGORY	EXTERIOR NOISE EXPOSURE (DNL IN DECIBELS (DBA)) 55 60 65 70 75 80
1. Residential, Hotels and Motels, Hospitals and Residential Care[1]	
2. Outdoor Sports and Recreation, Neighborhood Parks and Playgrounds	
3. Schools, Libraries, Museums, Meeting Halls, Churches	
4. Office Buildings, Business Commercial, and Professional Offices	
5. Sports Arena, Outdoor Spectator Sports	
6. Public and Quasi-Public Auditoriums, Concert Halls, Amphitheaters	

[1]Noise mitigation to reduce interior noise levels pursuant to Policy EC-1.1 is required.

Normally Acceptable:

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

Conditionally Acceptable:

- Specified land use may be permitted only after detailed analysis of the noise reduction requirements and needed noise insulation features included in the design.

Unacceptable:

- New construction or development should generally not be undertaken because mitigation is usually not feasible to comply with noise element policies.

EC-1.2 Minimize the noise impacts of new development on land uses sensitive to increased noise levels (Categories 1, 2, 3 and 6) by limiting noise generation and by requiring use of noise attenuation measures such as acoustical enclosures and sound barriers, where feasible. The City considers significant noise impacts to occur if a project would:

- Cause the DNL at noise sensitive receptors to increase by five dBA DNL or more where the noise levels would remain "Normally Acceptable;" or

- Cause the DNL at noise sensitive receptors to increase by three dBA DNL or more where noise levels would equal or exceed the "Normally Acceptable" level.

EC-1.3 Mitigate noise generation of new nonresidential land uses to 55 dBA DNL at the property line when located adjacent to existing or planned noise-sensitive residential and public/quasi-public land uses.

EC-1.6 Regulate the effects of operational noise from existing and new industrial and commercial development on adjacent uses through noise standards in the City's Municipal Code.

EC-1.7 Require construction operations within San José to use best available noise suppression devices and techniques and limit construction hours near residential uses per the City's Municipal Code. The City considers significant construction noise impacts to occur if a project located within 500 feet of residential uses or 200 feet of commercial or office uses would:

- Involve substantial noise generating activities (such as building demolition, grading, excavation, pile driving, use of impact equipment, or building framing) continuing for more than 12 months.

- For such large or complex projects, a construction noise logistics plan that specifies hours of construction, noise and vibration minimization measures, posting or notification of construction schedules, and designation of a noise disturbance coordinator who would respond to neighborhood complaints will be required to be in place prior to the start of construction and implemented during construction to reduce noise impacts on neighboring residents and other uses.

City of San José Municipal Code. The City's Municipal Code contains a Zoning Ordinance that limits noise levels at adjacent properties. Chapter 20.30.700 states that sound pressure levels generated by any use or combination of uses on a property shall not exceed 55 dBA at any property line shared with land zoned for residential use, except upon issuance and in compliance with a Conditional Use Permit.

Chapter 20.100.450 of the Municipal Code establishes allowable hours of construction within 500 feet of a residential unit between 7:00 am and 7:00 pm Monday through Friday unless permission is granted with a development permit or other planning approval. No construction activities are permitted on the weekends at sites within 500 feet of a residence.

Regulatory Background – Vibration

The City of San Jos**é** has established vibration guidelines applicable to this analysis.

City of San José General Plan. The Environmental Leadership Chapter in the Envision San José 2040 General Plan sets forth policies to achieve the goal of minimizing vibration impacts on people, residences, and business operations in the City of San José. The following policies are applicable to the proposed project:

EC-2.3 Require new development to minimize vibration impacts to adjacent uses during demolition and construction. A vibration limit of 0.20 in/sec PPV will be used to minimize the potential for cosmetic damage at buildings of normal conventional construction.

Existing Noise Environment

The project site is located to the east of Saratoga Avenue between Blackford Avenue and Manzanita Drive. Residential, recreational and parking structures surround the project site. A noise monitoring survey was performed in the vicinity of the project site beginning Tuesday, February 27, 2018 and concluding on Wednesday, February 28, 2018. The monitoring survey included three long-term noise measurements and four short-term measurements, as shown in Figure 1. Table 4 summarizes the results of the short-term measurements. The results of the long-term noise measurements at LT-1, LT-2, and LT-3 are shown in Figures 2, 3 and 4, respectively.

Long-term noise measurement LT-1 was made at a distance of about 75 feet east from the centerline of Saratoga Avenue, near the existing tennis courts at the north-west corner of the proposed project site. The primary noise source at this location was traffic along Saratoga Avenue. Hourly average noise levels ranged from 68 to 71 dBA L_{eq} at this location during daytime hours, and from 61 to 70 dBA L_{eq} at night. The day-night average noise level from noon on Tuesday February 27, 2018 to noon on Wednesday, February 28, 2018 was 73 dBA DNL.

LT-2 was measured in front of 710 Blackford Avenue, 35 feet from centerline of Blackford Avenue. The primary noise sources at this location were traffic on Blackford Avenue and Saratoga Avenue. Hourly average noise levels at this location ranged from 59 to 66 dBA L_{eq} during the day and from 49 to 62 dBA L_{eq} at night. The day-night average noise level from noon on Tuesday February 27, 2018 to noon on Wednesday, February 28, 2018 was 65 dBA DNL.

LT-3 was measured at the southeastern corner of Manzanita Drive and Dessert Isle Drive, 20 feet from the centerline of Manzanita Drive. The primary noise sources at this location were traffic on Manzanita Dive. Hourly average noise levels at this location ranged from 55 to 61 dBA L_{eq} during the day and from 49 to 60 dBA L_{eq} at night. The day-night average noise level from 12:30 pm on Tuesday February 27, 2018 to 12:30 pm on Wednesday, February 28, 2018 was 62 dBA DNL.

TABLE 4 Summary of Short-Term Noise Measurement Data, February 28, 2018

ID	Location (Start Time)	Measured Noise Levels, dBA				Primary noise source
		L_{10}	L_{50}	L_{90}	L_{eq}	
ST-1	In front of 771 Aurora Avenue (12:00 pm to 12:10 pm)	54	51	49	52	Traffic on Aurora Avenue and Saratoga Avenue
ST-2	At the north corner of Olga Drive and Dessert Isle Drive (11:30 p.m. to 11:40 p.m.)	53	43	41	50	Traffic on Olga Drive and Dessert Isle Drive
ST-3	Pool area, south of tennis courts (12:00 p.m. to 12:10 p.m.)	53	50	47	51	Traffic on Saratoga Drive
ST-4	In the courtyard behind Building 'L', 135 feet north of Manzanita parking garage. (12:20 p.m. to 12:30 p.m.)	53	47	46	50	Traffic on Saratoga Avenue

FIGURE 1 Noise Measurement Locations

FIGURE 2 Daily Trend in Noise Levels at LT-1

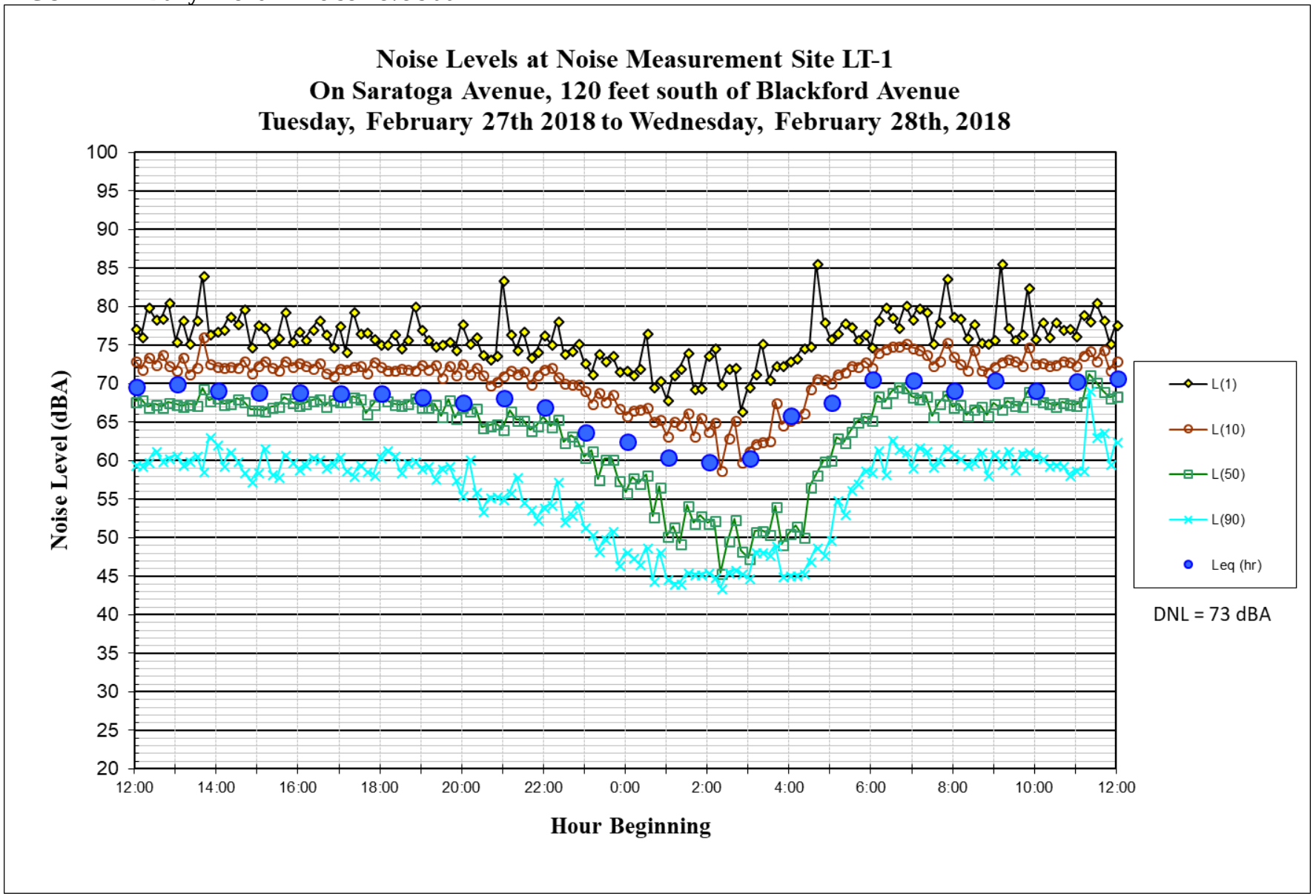


FIGURE 3 Daily Trend in Noise Levels at LT-2

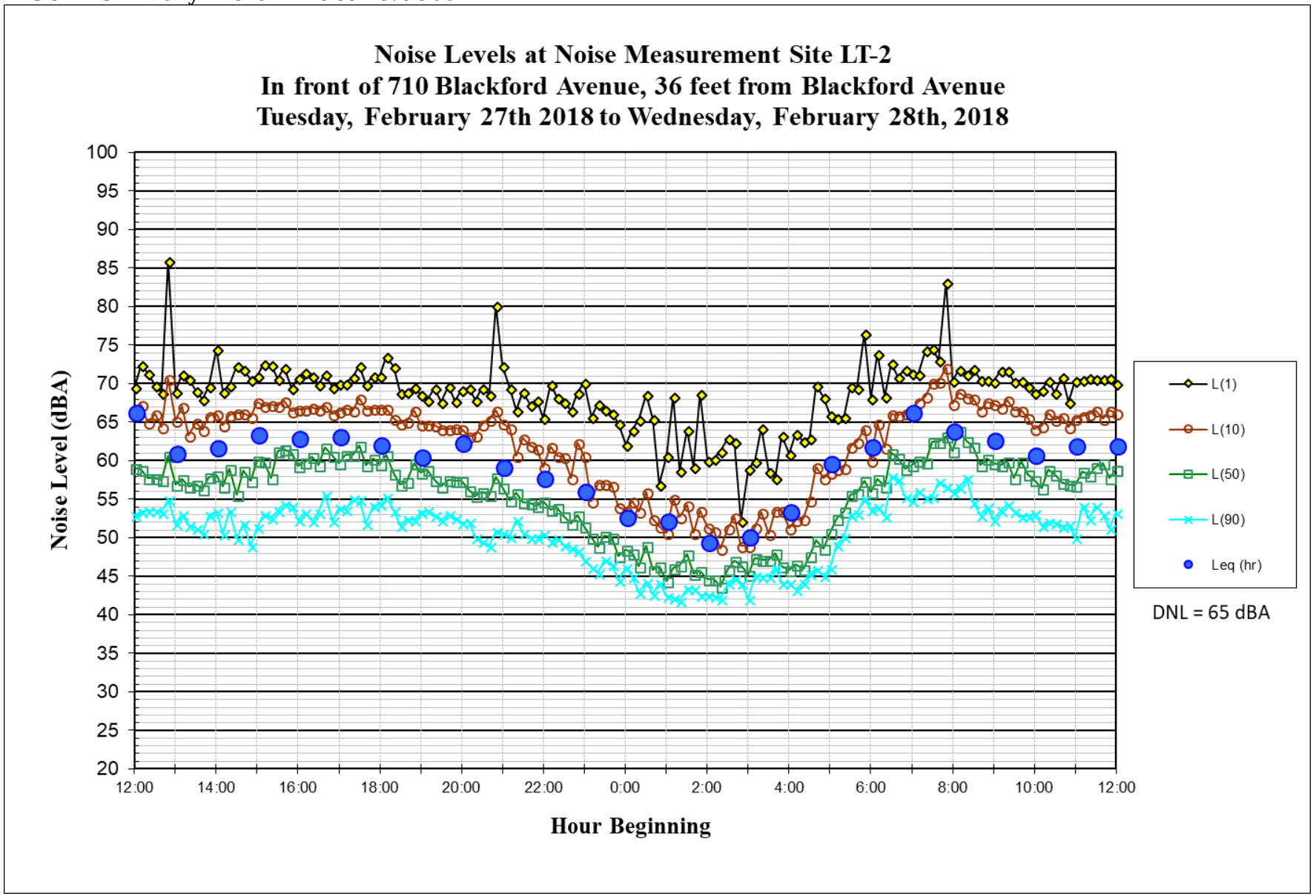
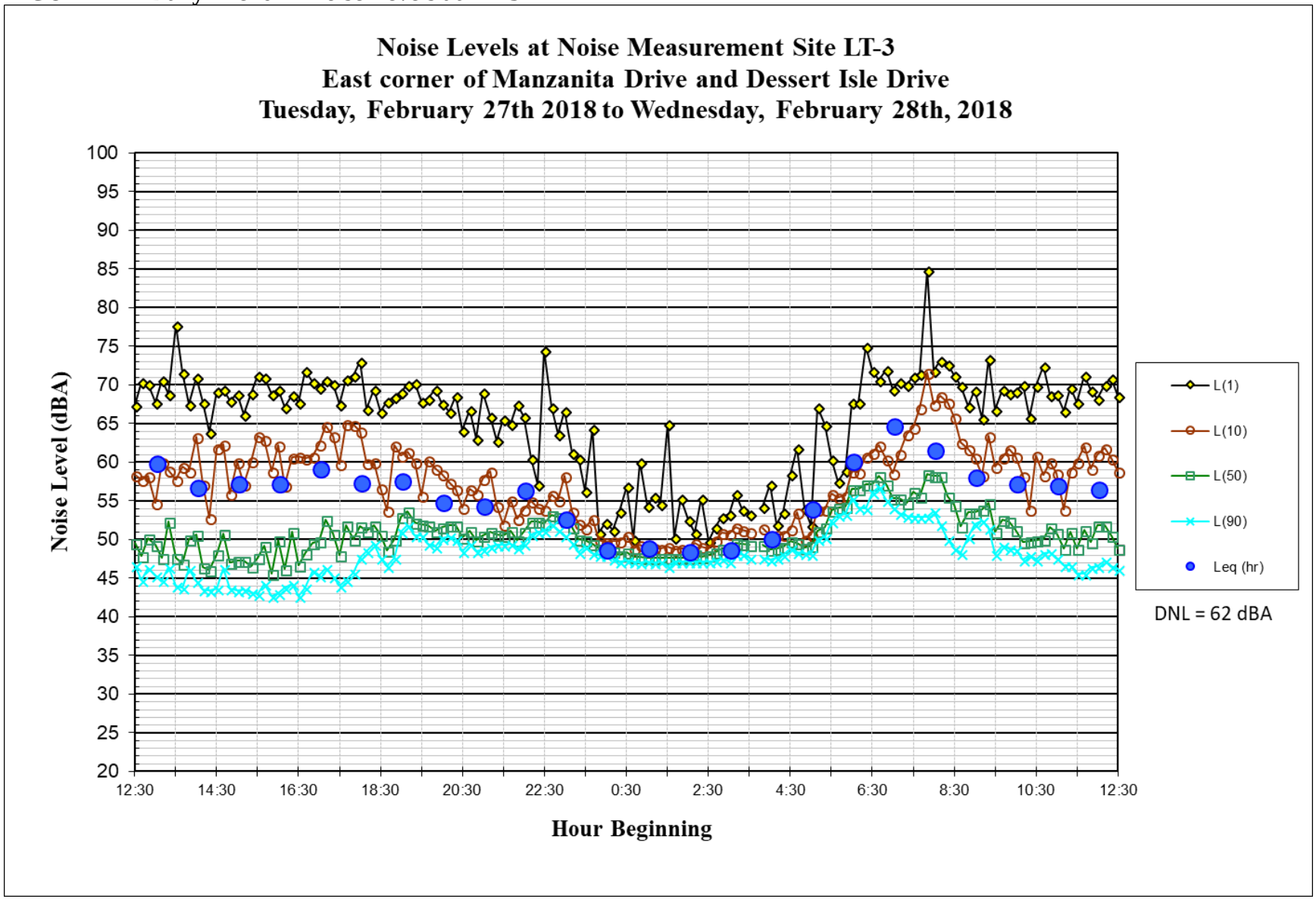


FIGURE 4 Daily Trend in Noise Levels at LT-3



GENERAL PLAN CONSISTENCY ANALYSIS

Noise and Land Use Compatibility

The Environmental Leadership Chapter in the Envision San José 2040 General Plan sets forth policies with the goal of minimizing the impact of noise on people through noise reduction and suppression techniques, and through appropriate land use policies in the City of San José. The applicable General Plan policies were presented in detail in the Regulatory Background section and are summarized below for the proposed project:

- The City's acceptable exterior noise level objective is 60 dBA DNL or less for the proposed residential uses (Table EC-1).

- The City's acceptable exterior noise level objective is 70 dBA DNL for the proposed office and commercial uses (Table EC-1).

- The City's standard for interior noise levels in residences is 45 dBA DNL.

- The Cal Green Code standards specify an interior noise environment attributable to exterior sources not to exceed an hourly equivalent noise level ($L_{eq\ (1\text{-}hr)}$) of 50 dBA in occupied areas of non-residential uses during any hour of operation.

Noise and Land Use Compatibility

The project proposes to redevelop approximately 6.9 of the 18.9-acre site. The project would demolish both parking structures and leasing/amenity building and pool area directly south of Saratoga Garage and construct up to 300 residential units in two buildings, approximately 17,800 square feet of retail, and a new parking structure with approximately 1,160 parking spaces.

The Avalon building would be located at the northwest corner of the project site would include residential, retail/commercial, and parking uses. Residential units would be located on levels three through six in the main building and levels three through 7 in the south wing. Exterior use areas would include an outdoor pool area on level 2, a rooftop deck, and ground level use areas along the western side of the building. Indoor amenities would include a leasing office on level one and a fitness area on level two in the south wing. Retail/commercial uses would be located on the ground floor of the north and west wing of the building facing Blackford Avenue and Saratoga Avenue. Two levels of below-grade parking and one level of above-grade parking would be located in the south wing. The primary noise source for Avalon building would be the traffic on Saratoga Avenue.

The Manzanita building would be constructed at the south side of the project site on Manzanita Drive. The building would include three levels of residential use and a new parking garage. Exterior noise sensitive areas would include an outdoor pool and courtyard. The building would be partially shielded by existing structures.

Future Exterior Noise Environment

Based on traffic volumes provided in the Traffic Impact Assessment Report[1], future traffic noise levels along Saratoga Avenue, Blackford Avenue and Manzanita Drive are not anticipated to change substantially from existing levels (see Impact 3). As a result, future traffic noise levels at the site were calculated based on the results of the noise monitoring survey.

Exterior use areas of the Avalon building would include an outdoor pool area on level 2, a rooftop deck. The primary noise source for these outdoor areas is the traffic on Saratoga Avenue. The outdoor pool area would be shielded from Saratoga Avenue by the west wing of Avalon building. Based on measurements made during the noise monitoring survey, the pool area would be exposed to a noise level of 52 dBA DNL, the roof deck would be exposed to 67 dBA DNL. There are no outdoor use areas available for the commercial spaces.

Exterior noise sensitive areas for the Manzanita building would include an outdoor pool and a courtyard area, both adjacent to Manzanita Drive. The exterior use areas would be shielded from Saratoga Avenue by the Manzanita building itself but would not be shielded from traffic on Manzanita Drive. The courtyard area and pool area of Manzanita building would be exposed to a noise level of 59 dBA DNL, primarily due to traffic on Manzanita Drive.

Noise levels at the Avalon building roof deck would exceed the City's acceptable exterior noise level criteria of 60 dBA DNL for residential use. A 3.5 feet-high parapet wall could provide the necessary attenuation to reduce the sound exposure on the rooftop patio to 60 dBA DNL. This is discussed in the *Recommended Conditions of Approval* section, below. The remaining outdoor use areas would meet the City's acceptable exterior noise level objectives with no additional noise reduction measures.

Future Interior Noise Environment

The City of San José requires that interior noise levels be maintained at 45 dBA DNL or less for residences. The Cal Green code requires interior noise attributable to exterior sources to not exceed 50 dBA $L_{eq\text{-}1hr}$ in non-residential spaces.

The calculated exterior noise level exposures of building façades are summarized in Table 5, based on the results of the noise monitoring survey.

[1] 700 Saratoga Avenue Mixed-Use Residential Development, Draft Transportation Impact Analysis; Hexagon Transportation Consultants, Inc., May 21, 2018.

TABLE 5 Predicted Exterior Noise Levels at Building Façades

Building façade		Predicted Noise Levels at Façades (dBA DNL)			
		Commercial	Lowermost residential (level 2)	Uppermost residential (level 6 – Avalon level 3 – Manzanita)	Rooftop
Avalon	North façade facing Blackford Avenue	62	61	58	-
	West façade facing south	62	62	62	-
	West façade facing Saratoga Avenue	71	71	69	-
	South façade facing Saratoga Avenue	garage	69 (level 3)	69	67
	South façade	65	65	64	-
Manzanita	South façade	-	59		-
	West façade	-	49		-

Interior noise levels would vary depending upon the design of the buildings (relative window area to wall area) and the selected construction materials and methods. Standard residential construction provides approximately 15 dBA of exterior-to-interior noise reduction, assuming the windows are partially open for ventilation. Standard construction with the windows closed provides approximately 20 to 25 dBA of noise reduction in interior spaces. Where exterior noise levels range from 60 to 65 dBA DNL, the inclusion of adequate forced-air mechanical ventilation can reduce interior noise levels to acceptable levels by allowing occupants the option of closing the windows to control noise. Where noise levels exceed 65 dBA DNL, forced-air mechanical ventilation systems and sound-rated construction methods are normally required. Such methods or materials may include a combination of smaller window and door sizes as a percentage of the total building façade facing the noise source, sound-rated windows and doors, sound-rated exterior wall assemblies, and mechanical ventilation so windows may be kept closed at the occupant's discretion.

Interior noise levels at residences in the Manzanita building are calculated to be below 45 dBA DNL with standard construction only and windows in the open or closed position. Interior noise levels in Avalon building residences with standard construction and windows open would be up to 56 dBA DNL inside residences facing Saratoga Avenue and 46 dBA DNL inside residences facing Blackford Avenue. These levels exceed the City's threshold for interior noise. The inclusion of forced air mechanical ventilation would be sufficient to limit interior noise at residences on the north façade of the Avalon Building to acceptable levels. However, additional attenuation may be required for residential facades facing the Saratoga Avenue. Preliminary analysis[2] shows that windows with STC 28 rating or higher would be sufficient to reduce the interior noise exposure in these units to 45 dBA DNL or less.

[2] Analysis assumes window area to be 40% of the façade area or less.

Commercial use spaces on level 1 of Avalon building would have standard commercial construction, with closed windows and forced air conditioning provided. Commercial-use construction with closed windows would be anticipated to provide approximately 25 dB of noise reduction from exterior noise sources, resulting in interior noise levels ranging from 37 to 46 dBA $L_{eq\ (1\text{-}hr)}$. These levels would be in compliance with the acceptable interior limit of 50 dBA $L_{eq\ (1\text{-}hr)}$ specified by the Cal Green Code.

Recommended Conditions of Approval

For consistency with the General Plan, the following Conditions of Approval are recommended for consideration by the City:

- Methods available to reduce exterior traffic noise levels in rooftop level outdoor use areas include site planning alternatives (e.g., altering the orientation of the proposed buildings to use the proposed buildings as noise barriers) and/or the construction of parapet walls.

    - Preliminary calculations indicate that the construction of 3.5-foot-high parapet walls, as measured above the base elevation of the Avalon Building rooftop use area, would reduce exterior noise levels to about 60 dBA DNL. Parapet walls would need to be located along the perimeter of the use area. To be effective, the parapet wall must be constructed with a solid material with no gaps in the face of the wall or at the base. Openings or gaps between sound wall materials or the ground substantially decrease the effectiveness of the sound wall. Suitable materials for sound wall construction should have a minimum surface weight of 3 pounds per square foot (such as 1-inch-thick wood, ½-inch laminated glass, masonry block, concrete, or metal one-inch). The final recommendations for mitigation shall be confirmed when detailed plans are available.

- Provide a suitable form of forced-air mechanical ventilation, as determined by the local building official, for all Avalon building residences, so that windows can be kept closed to control noise.

- Provide sound rated windows to Avalon building residential façades facing Saratoga Avenue to maintain interior noise levels at acceptable levels. Preliminary calculations show that sound-rated windows with minimum STC[3] Ratings of 28 would be satisfactory for units to achieve acceptable interior noise levels. The specific determination of what noise insulation treatments are necessary shall be conducted on a room-by-room basis during final design of the project.

[3] **Sound Transmission Class (STC)** A single figure rating designed to give an estimate of the sound insulation properties of a partition. Numerically, STC represents the number of decibels of speech sound reduction from one side of the partition to the other. The STC is intended for use when speech and office noise constitute the principal noise problem.

NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

Paraphrasing from Appendix G of the CEQA Guidelines, a project would normally result in significant noise impacts if noise levels generated by the project conflict with adopted environmental standards or plans, if the project would generate excessive groundborne vibration levels, or if ambient noise levels at sensitive receivers would be substantially increased over a permanent, temporary, or periodic basis. The following criteria were used to evaluate the significance of environmental noise resulting from the project:

- **Conflict with Established Standards:** A significant impact would be identified if project construction were to conflict with local noise standards contained in the San José General Plan or Municipal Code.

- **Groundborne Vibration from Construction:** A significant impact would be identified if the construction of the project would expose persons to excessive vibration levels. Groundborne vibration levels exceeding 0.2 in/sec PPV would have the potential to result in cosmetic damage to normal buildings.

- **Permanent Noise Increases:** A significant permanent noise impact would occur if the project resulted in an increase of 3 dBA DNL or greater at noise-sensitive land uses where existing or projected noise levels would equal or exceed the noise level considered satisfactory for the affected land use (60 dBA DNL for single-family residential areas) and/or an increase of 5 dBA DNL or greater at noise-sensitive land uses where noise levels would continue to be below those considered satisfactory for the affected land use. (General Plan Policy EC-1.2)

- **Construction Noise:** A significant noise impact would be identified if construction-related noise would temporarily increase ambient noise levels at sensitive receptors. Hourly average noise levels exceeding 60 dBA L_{eq} at the property lines shared with residential land uses, and the ambient by at least 5 dBA L_{eq}, for a period of more than one year would constitute a significant temporary noise increase at adjacent residential land uses. Hourly average noise levels exceeding 70 dBA L_{eq} at the property lines shared with residential land uses, and the ambient by at least 5 dBA L_{eq}, for a period of more than one year would constitute a significant temporary noise increase at adjacent commercial land uses.

Impact 1: **Conflict with Established Standards.** Mechanical equipment proposed by the project could exceed the City's established operational noise thresholds at off-site receptors. Other operational and construction activities would not exceed the applicable noise thresholds. **This impact would be reduced to a less-than-significant level with the incorporation of Mitigation Measure 1.**

Project Construction

Chapter 20.100.450 of the City's Municipal Code establishes allowable hours of construction within 500 feet of a residential unit between 7:00 am and 7:00 pm Monday through Friday unless permission is granted with a development permit or other planning approval. No construction activities are permitted on the weekends at sites within 500 feet of a residence. Policy EC-1.7 of the City's General Plan states that for large or complex projects within 500 feet of residential land uses or within 200 feet of commercial land uses or offices involving substantial noise-generating activities lasting more than 12 months, a construction noise logistics plan that specifies hours of construction, noise and vibration minimization measures, posting or notification of construction schedules, and designation of a noise disturbance coordinator who would respond to neighborhood complaints will be required to be in place prior to the start of construction and implemented during construction to reduce noise impacts on neighboring residents and other uses.

Construction activities will occur only during the allowable hours and project construction would be carried out in staggered phases. Construction of Manzanita building and stand-alone garage would commence in summer of 2020 and finish in 2021, while the construction of Avalon Building would start in the fall of 2021 and end in 2023. Therefore, the project would be in compliance with the established construction noise standards, assuming *Best Construction Management Practices* discussed in Impact 4 are followed. Short-term noise increases due to construction are discussed further in Impact 4.

Mechanical Equipment Noise

Chapter 20.30.700 of the City's Municipal Code states that sound pressure levels generated by any use or combination of uses on a property shall not exceed 55 dBA at any property line shared with land zoned for residential use, except upon issuance and in compliance with a Conditional Use Permit. The code is not explicit in terms of the acoustical descriptor associated with the noise level limit. However, a reasonable interpretation of this standard, which is based on policy EC-1.3 of the City's General Plan, would identify the ambient base noise level criteria as a day-night average noise level (DNL). For mechanical equipment, which would be assumed to be operating continuously during all daytime and nighttime hours, this would be equivalent to a continuous L_{eq} level of 49 dBA.

The plan proposes fans for air circulation on parking levels B1 and B2 of Avalon Building and level B1 of Manzanita garage building. The system would be enclosed in a fan room and is not anticipated to be audible at adjacent uses. The air compressors for heating, ventilation and air conditioning (HVAC) would be located on rooftop levels over access-ways/hallways, and not directly above residential units. A total of 11 units are indicated in the project plans. Mechanical system specifications are not available at this time. Typically residential HVAC units are anticipated to generate noise levels of 50 to 60 dBA at 50 feet from the equipment, depending on the equipment selected. With 11 units operating simultaneously, the total noise level would be 60 to 70 dBA.

The rooftop equipment would be located as close as about 120 feet from the nearest residence to the south of proposed Avalon Building. Noise levels from mechanical equipment typically attenuate at a rate of 6 dB per doubling of distance. Significant acoustical shielding is provided by the rooftop itself and the surrounding structures. Not taking into account the shielding provided by

the building rooftops or the surrounding structures, the rooftop equipment would be anticipated to generate 52 to 62 dBA at a distance of 120 feet. Shielding from building rooftop and surrounding structures such as a parapet wall at the rooftop edge are anticipated to provide an additional 10 to 20 dBA of noise reduction, resulting in noise levels that are below the 49 dBA L_{eq} threshold. Although noise levels estimated based on generic noise data are anticipated to meet the City's Municipal Code Limits, mitigation is recommended to ensure that the final selection of equipment would fall within these assumptions and result in a compatible noise environment. This is a **potentially significant** impact.

Mitigation Measure 1: Prior to the issuance of building permits, mechanical equipment shall be selected and designed to reduce impacts on surrounding uses to meet the City's requirements. A qualified acoustical consultant shall be retained by the project applicant to review mechanical noise as the equipment systems are selected in order to determine specific noise reduction measures necessary to reduce noise to comply with the noise limit of 55 dBA or less at residential property lines. Noise reduction measures could include, but are not limited to, selection of equipment that emits low noise levels and/installation of noise barriers such as enclosures and parapet walls to block the line of sight between the noise source and the nearest receptors.

Impact 2: **Groundborne Vibration from Construction.** Construction-related vibration levels resulting from construction activities are not calculated to exceed 0.2 in/sec PPV at the nearest structures. **This is a less-than-significant impact.**

Policy EC-2.3 of the City of San José General Plan specifies a vibration limit of 0.2 in/sec PPV to minimize damage at buildings of normal conventional construction. A significant impact would occur if buildings adjacent to the proposed construction site were exposed to vibration levels in excess of 0.2 in/sec PPV.

The construction of the project may generate perceptible vibration when heavy equipment or impact tools (e.g. jackhammers, hoe rams) are used. Construction activities would include site demolition work, preparation work, excavation of below-grade levels, foundation work, and new building framing and finishing.

Table 6 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet. Construction activities, such as use of saws, excavators, scrapers and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles, compactors, etc.) may generate substantial vibration in the immediate vicinity. Vibration levels would vary depending on soil conditions, construction methods, and equipment used.

TABLE 6 Vibration Source Levels for Construction Equipment

Equipment		**PPV at 25 ft. (in/sec)**
Pile Driver (Impact)	upper range	1.158
	typical	0.644
Pile Driver (Sonic)	upper range	0.734
	typical	0.17
Clam shovel drop		0.202
Hydromill (slurry wall)	in soil	0.008

	in rock	0.017
Vibratory Roller		0.210
Hoe Ram		0.089
Large bulldozer		0.089
Caisson drilling		0.089
Loaded trucks		0.076
Jackhammer		0.035
Small bulldozer		0.003

The nearest existing structure close to Avalon building is at 45 feet east of proposed Avalon building and 30 feet north of the proposed Manzanita building. Impact pile driving is not anticipated for this project. At a distance of 30 feet vibration levels from construction are anticipated to be 0.17 in/sec PPV or less and at a distance of 45 feet vibration levels from construction are anticipated to be 0.11 in/sec PPV or less. Vibration levels may be perceptible to occupants, but would be below the 0.2 in/sec PPV vibration limit and would not be anticipated to cause architectural or structural damage. As construction moves away from the shared property lines, vibration levels would be even lower. This is a **less-than-significant** impact.

Mitigation Measure 2: None required.

Impact 3: **Permanent Noise Increases.** The project would not result in a substantial permanent traffic noise level increase at existing noise-sensitive land uses in the project vicinity. **This is a less-than-significant impact**.

A significant permanent noise increase would be identified if traffic noise generated by the project 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 DNL or greater, with a future noise level of less than 60 dBA DNL, or b) the noise level increase is 3 dBA DNL or greater, with a future noise level of 60 dBA DNL or greater.

Project Generated Traffic Noise

Traffic volumes were provided in Transportation Impact Assessment conducted for the project by Hexagon Transportation Consultants, Inc. To determine the effect of the project-generated traffic on the nearby residences, AM and PM peak hour traffic volumes for the Existing + Project condition were compared to Existing traffic volumes. Based on these calculations, project traffic would result in traffic noise increases of less than 1 dBA L_{eq} along the roadway network. Day-night average (DNL) noise level increases would be anticipated to be similar. This increase would not typically be noticeable and would be below the 3 dBA and 5 dBA DNL thresholds of significance. This is a **less-than-significant** impact.

Parking Garage Noise

The project proposes two parking garages, to replace existing on-site surface parking and provide parking for the proposed uses. The Avalon Garage includes two levels of below-grade parking and one level of above-grade parking and the Manzanita Garage includes one level of below-grade parking and three levels of above-grade parking. Noise associated with parking would include vehicular circulation, engines, door slams, car alarms, and human voices. Noise sources within the

subterranean parking garage levels would not be anticipated to be audible outside of the parking garage.

Illingworth & Rodkin, Inc. conducted noise measurements near a four-story parking structure in downtown Petaluma.[4] Noise measurements were made of typical noise-generating activities occurring on the various parking levels. At each parking level, a car door was opened and closed several times, the engine was started, and the auto's horn was sounded. The noise sources were generated at the edge of each story and at a parking stall located about 50 feet from the edge. Noise measurements were also made as a vehicle traveled up and down the parking structure. The loudest noise was generated by a vehicle's horn. Maximum instantaneous noise levels, measured about 75 feet from the façade of the structure at ground level, typically ranged from 53 to 58 dBA L_{max}. Typical noise levels of a car horn ranged from 62 to 70 dBA L_{max}.

The closest residences to the Avalon Garage are located approximately 80 feet east of the garage location (Avalon building façade). At a distance of 80 feet, typical parking lot noise would range from 53 to 58 dBA L_{max}, and noise levels from car horn would range from 62 to 70 dBA L_{max}. The closest residences to the Manzanita Garage is approximately 30 feet from the proposed garage location, where maximum instantaneous noise level due to parking lot noise would be anticipated to range from 59 to 62 dBA L_{max}. The maximum levels from occasional horn soundings would range from 68 to 74 dBA L_{max} which would be similar to the horn sounding levels from local roads. Existing maximum noise levels at these locations range from 59 to 64 dBA L_{max}. The calculated noise levels due to parking lot noise are similar or lower than the measured levels at these locations and would not be anticipated to be distinguishable from ambient traffic noise generated on the surrounding roadways. This is a **less-than-significant** impact.

Mitigation Measure 3: None required.

Impact 4: **Construction Noise.** Existing noise-sensitive land uses would not be exposed to construction noise levels in excess of the significance thresholds for a period of more than one year. **This is a less-than-significant impact**.

As described in Impact 1, construction would be conducted in accordance with the City of San Jose's Municipal Code, which limits construction to within specified daytime hours. The City also considers significant construction noise impacts to have occurred if a project located within 500 feet of residential uses or 200 feet of commercial or office uses would involve substantial noise-generating activities (such as building demolition, grading, excavation, pile driving, use of impact equipment, or building framing) continuing for more than 12 months, according to Policy EC-1.7 of the General Plan.

Neither the City of San Jose nor the State of California specify quantitative thresholds for the impact of temporary increases in noise due to construction. The threshold for speech interference indoors is 45 dBA (see Setting Section, Effects of Noise). Assuming a 15 dB exterior-to-interior reduction for standard residential construction with windows open and a 25 dB exterior-to-interior reduction for standard commercial construction, assuming windows closed, this would correlate

[4] Environmental Noise Assessment Vallco Fashion Park – North Parking Garage prepared for City of Cupertino by Illingworth & Rodkin, Inc., October 11, 2006.

to an exterior threshold of 60 dBA L_{eq} at residential land uses and 70 dBA L_{eq} at commercial land uses. Therefore, the project would be considered to generate a significant temporary construction noise impact if project construction activities exceeded 60 dBA L_{eq} at nearby residences or exceeded 70 dBA L_{eq} at nearby commercial land uses and exceeded the ambient noise environment by 5 dBA L_{eq} or more for a period longer than one year.

Project construction is anticipated to occur over a period more than a year in staggered phases. 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.

Construction activities would be carried out in stages. During each stage of construction, there would be a different mix of equipment operating, and noise levels would vary by stage and vary within stages, based on the amount of equipment in operation and the location at which the equipment is operating. Typical construction noise levels at a distance of 50 feet are shown in Tables 7 and 8. Table 7 shows the average noise level ranges, by construction phase, and Table 8 shows the maximum noise level ranges for different construction equipment. Most demolition and construction noise falls with the range of 80 to 90 dBA at a distance of 50 feet from the source.

TABLE 7 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 8 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.

Source: Mitigation of Nighttime Construction Noise, Vibrations and Other Nuisances, National Cooperative Highway Research Program, 1999.

Construction activities generate considerable amounts of noise, especially during pile driving and earth-moving activities when heavy equipment is used. The construction of the proposed project would involve demolition of existing structures and pavement, site preparation, grading and excavation, trenching, building erection, and paving. The hauling of excavated materials and construction materials would generate truck trips on local roadways as well.

Table 9 shows the anticipated construction noise levels calculated using the Federal Highway Administration (FHWA) software - Roadway Construction Noise Model (RCNM).

TABLE 9 Calculated Construction Noise Levels for Each Phase of Construction

Construction Phase	At Distance of 50 ft.	
	L_{eq}, dBA	L_{max}, dBA
Demolition	91	98
Site Preparation	85	85
Grading/Excavation	86	85
Trenching	82	84
Building-Exterior	81	84
Building-Interior	74	77
Paving	82	84

At 50 feet from the noise source, maximum instantaneous noise levels generated by project construction equipment are calculated to range from 77 to 98 dBA L_{max} and hourly average noise levels are calculated to range from 74 to 91 dBA L_{eq}.

Noise sensitive uses surrounding the site include residential buildings, located 45 feet east of the proposed Avalon building and 30 feet north of the proposed Manzanita building. The residences would be exposed to a maximum noise level of 99 dBA L_{max} during demolition phase and maximum noise levels of 77 to 85 dBA L_{max} during other phases of construction. Typical hourly average noise levels of 91 dBA L_{eq} during demolition and 78 to 86 dBA L_{eq} during other phases of construction are anticipated. Noise levels would exceed 60 dBA L_{eq} at residences and 70 dBA L_{eq} at commercial uses and ambient levels by more than 5 dBA for over one year. This is a **potentially significant** impact.

Mitigation Measure 4: Implementation of the measures discussed under the following *Best Construction Management Practices* would reduce construction noise levels emanating from the site, limit construction hours, and minimize disruption and annoyance.

Best Construction Management Practices

- Construction activities shall be limited to the hours between 7:00 am and 7:00 pm, Monday through Friday, unless permission is granted with a development permit or other planning approval. No construction activities are permitted on the weekends at sites within 500 feet of a residence.

- Equip all internal combustion engine-driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.

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

- Locate stationary noise-generating equipment such as air compressors or portable power generators as far as possible from sensitive receptors. Construct temporary noise barriers to screen stationary noise-generating equipment when located near adjoining sensitive land uses. Temporary noise barriers could reduce construction noise levels by 5 dBA.

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

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

- Notify all adjacent business, residences, and other noise-sensitive land uses of the construction schedule, in writing, and provide a written schedule of "noisy" construction activities to the adjacent land uses and nearby residences.

- 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.

With the implementation of these best management practices and recognizing that noise generated by construction activities would occur over a temporary period, this would be a **less-than-significant** impact.

ILLINGWORTH & RODKIN, INC.
Acoustics • Air Quality

429 E. Cotati Avenue
Cotati, California 94931

Tel: 707-794-0400 *Fax: 707-794-0405*
www.illingworthrodkin.com *illro@illingworthrodkin.com*

December 17, 2018

Fiona Phung
David J. Powers & Associates, Inc.
1871 The Alameda, Suite 200
San Jose, CA 95126

VIA E-MAIL: **FPhung@davidjpowers.com**

SUBJECT: **Avalon West Valley Expansion, San Jose, California**
Noise Analysis of Project Updates

Dear Fiona:

An environmental noise and vibration assessment for Avalon West Valley Expansion Project was submitted on May 22, 2018[1]. This letter presents a supplementary analysis of the noise impacts at residential receptors in the vicinity of the project due to minor project updates and extended hours of construction. Options for noise mitigation measures are also discussed.

Project Update

The updated project proposes 307 units, a total of 7 additional units above the 300 units that were proposed at the time the environmental study was conducted. The massing of the building would not change as a result of these additional units. The small change in traffic volumes associated with this increase would not result in any substantial change in the noise analysis provided in the environmental assessment. For reference, a doubling of traffic would be required to result in a 3 dBA noise increase. Other operational analyses provided in the May 22, 2018 study would be likewise unaffected by this small update. The noise impact discussions and mitigation measures provided in the May 22, 2018 would continue to apply.

Nighttime Construction Noise

Chapter 20.100.450 of the Municipal Code establishes allowable hours of construction within 500 feet of a residential unit between 7:00 am and 7:00 pm Monday through Friday unless

[1] Avalon West Valley Expansion Environmental Noise and Vibration Assessment, Illingworth & Rodkin, Inc., May 22, 2018.

permission is granted with a development permit or other planning approval. No construction activities are permitted on the weekends at sites within 500 feet of a residence.

The project proposes construction hours outside of the allowable hours specified in the San José Municipal Code. Extended hours would include construction activity on Saturdays, twice a month, between the hours 9:00 am to 5:00 pm, and 24-hour construction operations on up to 10 days to accommodate large concrete pours. A total of 29 concrete pours is anticipated. Each concrete pour is estimated to take 8 hours and would require two to four trucks per hour to deliver concrete. The small increase in truck traffic along local roads would not result in any substantial change in the noise analysis provided in the May 22, 2018 assessment. Noise levels and impacts generated during Saturday construction would be anticipated to be similar to those described in Impacts 1 and 4 of the May 22, 2018 report. For nighttime construction, however, there is the additional potential for sleep disturbance. Figure 1 shows the potential locations of the night-time concrete pours, as indicated with green stars.

FIGURE 1 Locations for Concrete Pour Activity

Each concrete pour would involve 3 trucks at a time; a pump truck, a delivery truck connected to the pump truck, and another delivery truck waiting to be connected. Federal Highway Administration (FHWA) software – Roadway Construction Noise Model (RCNM) was used to calculate noise generated by a concrete mixing truck, a pump truck and a delivery truck. The nearest residences are located as close as 50 feet from the concrete pour locations. At a distance of 50 feet, concrete pour activities would generate noise levels of 79 dBA L_{eq} and 81 dBA L_{max}. Construction noise would drop off at a rate of 6 dBA per doubling of distance. Shielding by intervening structures would be anticipated to provide 10 to 20 dBA of additional noise reduction.

San José General Plan Policy EC-1.9 requires mitigation so that recurring maximum instantaneous noise levels do not exceed 50 dBA L_{max} in bedrooms and 55 dBA L_{max} in other rooms to avoid sleep disturbance. Additionally, as described in the Setting Section of the May 22, 2018 report, steady noises above 35 dBA and fluctuating noise levels above about 45 dBA have been shown to affect sleep.

Standard residential construction provides approximately 15 dBA of exterior-to-interior noise reduction, assuming the windows are partially open for ventilation. Standard construction with the windows closed provides approximately 20 to 25 dBA of noise reduction in interior spaces. Therefore, at an unshielded distance of 50 feet, interior noise levels within residences would be anticipated to be 64 dBA L_{eq} and 66 dBA L_{max} with windows partially open and 54 to 59 dBA L_{eq} and 56 to 61 dBA L_{max} with windows closed. These noise levels would be anticipated to result in sleep disturbance to occupants.

Given that only up to 10 nighttime events are requested, it may be reasonable to assume occupants could keep windows closed for periods where nighttime construction would occur. With construction of a 15-foot high temporary barrier, interior noise levels at adjacent residences would be below the 50 dBA L_{max} sleep disturbance threshold, assuming windows in the closed position. However, they would continue to be above the 45 dBA L_{eq} threshold. With construction of a 15-foot high barrier, residences within about 75 feet of construction could also be provided with offers to relocate (e.g., hotel vouchers) during periods of nighttime construction. Alternately, without the inclusion of the temporary barrier, occupants of residences with unshielded façades within about 200 feet of nighttime construction could be provided with offers to relocate during periods of nighttime construction. Construction noise monitoring should be conducted to determine affected residences who qualify for vouchers.

Mitigation Measures: Implementation of the following measures, in addition to those specified in Mitigation Measure 4 of the May 22, 2018 report, would reduce nighttime construction noise levels emanating from the site to minimize disruption, annoyance, and sleep disturbance.

- Minimize construction outside of allowable hours (7:00 a.m. to 7:00 p.m., Monday through Friday) to the degree feasible.

- The project applicant shall notify by mail all sensitive receptors and residences within 200 feet of the construction sites at least two weeks prior to the night-time concrete pours. In addition to mailing, notification methodology shall also include online and on-site posting. All notifications shall provide specific details on the schedule of the dates, times, duration, and proposed activities of all construction work occurring outside of the City's allowable hours of construction (7:00 a.m. to 7:00 p.m., Monday through Friday). Notices shall provide tips on reducing noise intrusion, for example, by closing windows facing the planned construction. Any modifications made to the dates, times, and duration of the concrete pours will require new noticing.

- The project applicant shall designate a construction noise coordinator to respond to concerns of neighboring receptors about noise construction disturbance. The construction

noise coordinator shall be available for responding to any construction noise complaints during the hours that construction is to take place. A toll-free telephone number and email address shall be provided in all notices (mailed, online website, and construction site postings) for receiving questions or complaints during construction and shall also include procedures that the construction noise coordinator will do for responding to callers and email messages. Procedures for reaching the public liaison officer via telephone or in person shall be included in the above notices and also posted at the construction site(s).

- The project applicant shall implement one of the following two options to control night-time construction noise occurring between the hours of 10:00 p.m. and 7:00 a.m. shall be implemented to reduce the occurrence of sleep disturbance to nearby residents:

  Option 1:
  - Install temporary sound walls or acoustic blankets to shield adjacent residences from all night-time concrete pours. The sound walls or acoustic blankets shall have a height of no less than three feet higher than noise-generating piece(s) or parts of equipment, a Sound Transmission Class (STC) of 27 or greater, and a surface with a solid face from top to bottom without any openings or cutouts along the face or at the base of the barrier; and

  - Offer to temporarily relocate occupants of residences that are located within 75 feet of evening construction activities by offering hotel vouchers to all affected residents. A minimum of one week notice of the offer shall be provided.

  Option 2:
  - Offer to temporarily relocate occupants of residences within 200 feet of evening construction activities by offering hotel vouchers to all affected residents. A minimum of one week notice of the offer shall be provided.

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This concludes our supplemental noise analysis completed for the Avalon West Valley Expansion Project in San Jose, California. If you have any questions or comments regarding this analysis, please do not hesitate to call.

Sincerely yours,

Manasi Biwalkar
Staff Consultant
ILLINGWORTH & RODKIN, INC.
(17-235)