DRAFT NOISE AND VIBRATION ANALYSIS REPORT

THE COVE AT EL NIGUEL
LAGUNA NIGEL, CALIFORNIA

PREPARED FOR

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February 7, 2022

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1. INTRODUCTION

The Cove at El Niguel project (Project) is a proposed townhome residential community to be developed within a currently vacant parcel of land located along Crown Valley Parkway, opposite of Paseo Del Niguel, in the City of Laguna Niguel, California. Access to the Project site is currently provided via an existing private driveway called Playa Blanca (located opposite Paseo Del Niguel). Figure 1 presents a vicinity map which illustrates the Project location and the surrounding street system.

The proposed Project includes the construction of a 22-unit townhome residential community within eight (8) buildings. Parking for the Project includes 44 garage spaces (2 spaces per unit) and nineteen (19) surface lot spaces. Access to the Project site will remain the same as the existing private driveway that currently serves the site, located along Crown Valley Parkway.

Since the proposed Project site is adjoining existing noise-sensitive land uses, this noise and vibration study has been prepared to quantify the existing noise conditions in the vicinity of the project site, and to determine whether noise and vibration levels from construction and future use of the project cause significant impacts on surrounding land uses. This study also provides recommendations for noise and/or vibration mitigation, as required.

2. FUNDAMENTALS OF NOISE AND VIBRATION

2.1 Noise

Sound pressure can be measured in units of micro Newtons per square meter ($\mu N/m^2$) called micro Pascals (µPa). One µPa is approximately one-hundred-billionth of the normal atmospheric pressure. The pressure of a very loud sound may be 200,000,000 µPa, or 10,000,000 times the pressure of the weakest audible sound (20 µPa). Expressing sound levels in terms of µPa would be cumbersome because of this wide range. As such, sound pressure levels (SPL) are described in logarithmic units of ratios of actual sound pressures to a reference pressure squared. These units are called bels, named after Alexander G. Bell. To provide a finer resolution, a bel is subdivided into decibels (deci- or tenth of a bel), abbreviated dB.

Appendix A provides a description of the acoustical terminology used in this report. Unless otherwise stated, all sound levels reported are A-weighted sound pressure levels in decibels (dBA). The A-weighting approximates how humans actually hear sounds by de-emphasizing lower-frequency sounds below 1,000 hertz (1 kilohertz [kHz]) and higher-frequency sounds above 4 kHz, and emphasizing sounds between 1 kHz and 4 kHz. A-weighting is the measure most commonly

Figure 1
Project Location
The Cove at El Niguel

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used for traffic and environmental noise throughout the world. Most community noise standards utilize A-weighting because it accurately reflects human hearing and thereby provides for a high degree of correlation with human annoyance and health effects.

Table 1 shows the noise levels of common sounds measured in the environment and in industry and their effects.

Table 1. Typical Sound Levels Measured in the Environment

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

Source: Caltrans, 2013

The actual impact of noise is not a function of loudness alone. The time of day noise occurs and duration of the noise are also important. In addition, frequency content (pitch) of the noise, and its onset rate (i.e., whether it is impulsive) affect people's reactions to the noise. Higher pitch sounds are typically more easily audible to an average human, and therefore, tend to be more annoying. A pure tone sound can be perceived more easily by humans than a variable-pitch sound of the same intensity. Furthermore, an impulsive noise with a very quick onset rate, such as a hammer drop or pile driving noise, can be more disturbing than a regular noise because of its startle effect.

Most noise that lasts for more than a few seconds is variable in its intensity. Consequently, a variety of noise descriptors, such as L_{eq}, L_{min}, L_{max}, L_n, and CNEL (or L_{dn}), are used to quantify noise levels. While the existing background noise measurements conducted in and around the project area have been conducted in term of various metrics, the primary noise descriptors used for this study are the average noise level (L_{eq}) and the Community Noise Equivalent Level (CNEL).

The L_{eq} is the equivalent steady-state sound level that, within a stated period of time, would contain the same acoustical energy as the time-varying sound level during the same period. The L_{eq} (h) is the energy-average of the A-weighted sound levels, occurring during a 1-hour period, in decibels (i.e., a 1-hour L_{eq}). CNEL is 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 addition of 10 decibels to sound levels measured in the night between 10:00 p.m. and 7:00 a.m.

From the source to the receiver, noise changes both in level and frequency spectrum. The most obvious is the decrease in noise as the distance from the source increases.

The manner in which noise decreases with distance depends on:

- Geometric spreading from point and line sources
- Ground absorption
- Atmospheric effects and refraction
- Shielding by natural and man-made features, noise barriers, diffraction, and reflection

Sounds from a small localized source (approximating a “point” source) radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level decreases or drops-off at a rate of 6 dBA for each doubling of the distance (6 dBA/DD). However, highway traffic noise is not a single, stationary point source of sound. The movement of the vehicles makes the source of the sound appear to emanate from a line (line source) rather than a point when viewed over some time interval.

Changes in noise levels are typically perceived by the human ear as follows:

- A 3-dBA change is barely perceptible.
- A 5-dBA change is readily perceptible.
- A 10-dBA change is perceived as a doubling or halving of noise.

For determination of significance of noise impacts in a given environment, noise level changes brought about by a specific project (or set of projects) are often evaluated in the context of preexisting noise conditions in that environment. For quieter existing noise environments, as opposed to already noisy environments, project-induced noise level changes are allowed to be higher before the project causes a significant impact.

2.2 Vibration

When the ground is subject to vibration from a source, such as heavy construction machinery, a disturbance propagates away from the vibration source. The ground vibration waves created are similar to those that propagate in water when a stone is dropped into the water.

When the ground is subject to vibratory impact, vibration waves propagate outward from the source of impact. These waves encounter an increasingly large volume of material in the ground as they travel outward, and the energy density in each wave decreases with distance from the source. This decrease in energy density and the associated decrease in displacement amplitude is called spreading loss (or vibration attenuation).

The quantities that are used to describe vibratory motion include displacement, velocity, and acceleration. In describing vibration in the ground and in structures, the concepts of particle displacement, velocity, and acceleration are used to describe how the ground or structure responds to excitation. Vibratory motion is commonly described by identifying the peak particle velocity (PPV) or peak particle acceleration (PPA). Velocity is measured in inches per second (in/sec) or millimeters per second (mm/sec). Acceleration is measured in in/sec per second (in/sec^2), mm/sec per second (mm/sec^2), or relative to the acceleration of gravity (g) (32.2 feet [ft.]/sec^2).

Soil and subsurface conditions are known to have a strong influence on the levels of ground-borne vibration. Among the most important factors are the stiffness and internal damping of the soil and the depth to bedrock. Experience with ground-borne vibration is that vibration propagation is more efficient in stiff clay soils, and shallow rock seems to concentrate the vibration energy close to the surface and can result in ground-borne vibration problems at large distances from the source. Factors such as layering of the soil and depth to water table can have significant effects on the propagation of ground-borne vibration.

When the ground surfaces of the excitation source and the receiver are at different elevations, much of the vibration energy carried through waves causing surface displacement of the ground dissipates. This results in weaker vibratory motion at the receiver than if the receiver were at the same elevation as the source.

3. APPLICABLE NOISE AND VIBRATION CRITERIA

3.1 City of Laguna Niguel General Plan

City of Laguna Niguel General Plan in its Chapter 6, Noise, establishes land use compatibility criteria in terms of the Day-Night Noise Level (L_{dn}) or CNEL for various land uses, including residential. The City in Table N-9 of the General Plan has established exterior and interior noise standards for various land uses. Table 2 below shows the summary of the City's General Plan noise standards.

Table 2. City of Laguna Niguel Land Use Noise Standards (CNEL, dBA)

Land Use	Interior Standard	Exterior Standard
Residential – Detached Residential – Attached	45	65
Neighborhood Commercial Community Commercial	--	70
Professional Office	50	70
Community Commercial/Professional Office	--	70
Industrial/ Business Park	55[1]	70
Professional Office/ Industrial/Business Park Industrial/Business Park/ Professional Office/ Community Commercial	--	75
Public/Institutional Public Institutional/ Professional Office	50	70
Schools	50[2]	65[2]
Parks and Recreation	--	70

Notes:
1. Where quiet is a basis for use.
2. In interior or exterior classroom areas during school operating hours.

Source: City of Laguna Niguel General Plan, Table N-9, 1992

3.2 City of Laguna Niguel Municipal Code

Sections 6-6-5 and 6-6-6 of the City's Municipal Code outline the residential exterior and interior noise standards, respectively. The Code specifies maximum noise level limits of 55 dB for daytime hours (7 a.m. to 10 p.m.) and 45 dB for nighttime (10 p.m. to 7 a.m.) for exterior areas of noise-sensitive land uses, including residential uses.

The noise standards in Table 3, unless otherwise specifically indicated, apply to all residential property within the City.

Table 3. City of Laguna Niguel Municipal Code Noise Standards

Noise Zone	Exterior Noise Level	Interior Noise Level	Time Period
1	55 dB(A)	55 dB(A)	7:00 a.m.—10:00 p.m.
	50 dB(A)	45 dB(A)	10:00 p.m.— 7:00 a.m.
Note: If the alleged offensive noise consists entirely of impact noise, simple tone noise, speech or music, or any combination thereof, each of the noise levels specified in the table in this subsection shall be reduced by five dB(A).			

Source: City of Laguna Niguel, 2020

It is unlawful for any person at any location within the city to create any noise, or to allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person, when such noise causes the noise level, when measured on any other residential property, to exceed:

1. The exterior noise standard for a cumulative period of more than 30 minutes in any hour;
2. The exterior noise standard plus five dB(A) for a cumulative period of more than 15 minutes in any hour;
3. The exterior noise standard plus ten dB(A) for a cumulative period of more than five minutes in any hour;
4. The exterior noise standard plus 15 dB(A) for a cumulative period of more than one minute in any hour; or
5. The exterior noise standard plus 20 dB(A) for any period of time.

If the ambient noise level exceeds any of the first four noise limit categories above, the cumulative period applicable to such category shall be increased to reflect the ambient noise level. If the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under such category shall be increased to reflect the maximum ambient noise level.

For interior noise standards, it is unlawful for any person at any location within the city to create any noise, or to allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person, when such noise causes the noise level, when measured within any other dwelling unit on any residential property, to exceed:

1. The interior noise standard for a cumulative period of more than five minutes in any hour;
2. The interior noise standard plus five dB(A) for a cumulative period of more than one minute in any hour; or
3. The interior noise standard plus ten dB(A) for any period of time.

If the ambient noise level exceeds either of the first two noise limit categories above, the cumulative period applicable to the category shall be increased to reflect such ambient noise level. If the ambient noise level exceeds the third noise limit category, the maximum allowable noise level under the category shall be increased to reflect the maximum ambient noise level.

The City also exempts certain activities from its noise standards. Such exemption includes private construction projects, provided that: such activities do not take place between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or at any time on Sunday or a federal holiday.

3.3 City of Laguna Niguel CEQA Manual

The City of Laguna Niguel, in its California Environmental Quality Act (CEQA) Manual has established significance criteria to be applied to noise and vibration generated during the construction and operation of a project (City of Laguna Niguel, 2022).

According to the CEQA Manual, construction activities lasting more than ten (10) days in a three (3)-month period would cause a significant noise impact at residential land use if they result in the ambient exterior 8-hour average noise level (L_{eq}) to exceed 80 dBA during daytime hours of 7:00 a.m. to 7:00 p.m.

As related to operational noise, if baseline noise levels at nearest noise-sensitive land uses without a project are below 55 dBA CNEL, project operation would result in a significant noise impact if it causes noise level increases of 10 dBA CNEL or more in ambient noise levels.

The City has established its CEQA thresholds of significance for vibration impacts from the California Department of Transportation (Caltrans) as shown in Tables 4 and 5 below.

Table 4 lists the vibration damage criteria for four general categories of buildings. These criteria are expressed in terms of PPV, which is the maximum instantaneous positive or negative peak of the vibration signal, often used in monitoring of construction vibration (such as blasting) since it is related to the stresses that are experienced by buildings.

Table 4. Construction Vibration Potential Damage Criteria

Structure and Condition	Maximum PPV (in/sec) Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.10
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5
Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.		

Source: Caltrans Transportation and Construction Vibration Guidance Manual, 2013

Criteria listed in Table 5 are thresholds of vibration levels that would result in annoyance or interference with activities of people. These levels are also expressed in terms of the PPV. The City has adopted the "distinctly perceptible" levels as its threshold of significance for people's sensitivity to vibration.

Table 5. Groundborne Vibration Potential Annoyance Criteria

Human Response	Maximum PPV (in/sec) Transient Sources	Continuous/Frequent Intermittent Sources
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.9	0.10
Severe	2.0	0.4
Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.		

Source: Caltrans Transportation and Construction Vibration Guidance Manual, 2013

It should be noted, projects using only equipment that generates little or no ground vibration, such as air compressors, light trucks, and hydraulic loaders, would only require qualitative descriptions. A quantitative construction vibration analysis is appropriate for projects where construction vibration may result in building damage or prolonged annoyance. For example, activities involving blasting, pile driving, vibratory compaction, demolition, drilling, or heavy grading or excavation near sensitive structures require a quantitative vibration analysis.

4. METHODOLOGY

4.1 Noise

To quantify the existing noise environment in the vicinity of the project site, a noise measurement survey consisting of long-term (24-hour) and short-term (15-minute) noise measurements was conducted at seven locations representative of noise-sensitive receivers nearest to the project site (see Figure 2). The noise measurements consisted of 24-hour measurements at two of the monitoring sites (LT1 and LT2, located near the north and west parts of the project site), and short-term measurements at the remaining sites (ST1 through ST5) representing other noise-sensitive uses surrounding the project site. The purpose of the 24-hour measurements was to capture variations in background noise levels during the day and night hours and capture CNEL values typical of the adjoining existing homes in the Project area. The short-term noise levels were conducted in order to quantify existing background noise levels at representative noise-sensitive locations around the project site during the daytime hours when future construction activities would occur. Short-term Crown Valley traffic noise measurements and concurrent traffic counts were also conducted at one additional location within the Project site (ST6) in order to validate the noise model developed for Crown Valley traffic.

Characteristic noise sources are typically identified with land use intensification such as that proposed for the development of the proposed Project. Construction activities, especially construction heavy equipment and traffic, will create short-term noise increases near the Project site. Such impacts would be important for nearby noise-sensitive receptors, such as any existing residential uses. Upon completion of project construction, project-related traffic will cause an incremental increase in area-wide noise levels throughout the project area. Traffic noise impacts are analyzed to insure that the project does not adversely impact the acoustic environment of the surrounding community.

For assessment of potential future noise impacts due to the proposed Project, temporary noise exposure during the construction phase and permanent noise effects due to existing traffic on area roadways and additional traffic generated by the project are evaluated.

Noise levels due to construction of the proposed project are estimated based upon available reference noise level data from construction equipment (FHWA, 2006), distance between construction activities and nearest representative noise-sensitive receiver locations, and shielding effects of local terrain, where applicable.

Traffic noise levels were evaluated using the Federal Highway Administration (FHWA) Traffic Noise Model (TNM) version 2.5 computer program. TNM is the latest analytical method developed for roadway traffic noise prediction. The model is based upon reference energy emission levels for automobiles, medium trucks (2 axles), heavy trucks (3 or more axles), buses and motorcycles, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, atmospheric conditions, and the acoustical characteristics of the site. TNM was developed to predict hourly Leq values for free-flowing and interrupted-flow traffic conditions.

Traffic data used in the noise model were developed from the Project construction and operation traffic study data provided by the project traffic consultant (LLG, 2021). Peak-hour and daily traffic volumes with and without the Project for existing (2020) conditions were utilized in TNM to assess changes in noise exposure of noise-sensitive uses due to traffic changes induced by the proposed Project.

4.2 Vibration

For estimation of ground-borne vibration levels at the nearest residential structures in the vicinity of the Project site due to Project construction, reference vibration levels were obtained from the Caltrans *Transportation and Construction Vibration Guidance Manual* (Caltrans, 2013). Local ground vibration attenuation rate was determined based on the type of soil within the Project site. Ground vibration attenuation rate was then applied to reference vibration levels from construction machinery to predict the levels of construction vibration at the nearest residential structures to the Project site. Estimated construction vibration levels are compared with applicable building damage and human perceptibility criteria to determine Project vibration impacts at neighboring receivers.

5. SETTING

The Project site is within a currently vacant parcel of land located along Crown Valley Parkway, opposite of Paseo Del Niguel, in the City of Laguna Niguel. Surrounding land uses consist of single-family land uses to the north, west, and east of the Project site and multi-family condominiums (La Vista Condominiums) to the south.

The main source of noise currently affecting the Project area is local vehicular traffic on Crown Valley Parkway located along the east side of the Project site. Other noise sources include occasional distant aircraft overflights, occasional landscape maintenance activities, and other natural sounds, such as those from chirping birds.

5.1 Existing Noise Environment

5.1.1 Ambient Noise Measurements

Existing ambient noise levels in the project environs were quantified based upon two long-term (24-hour) and five short-term (15-minute) noise level measurements conducted at locations representative of the nearest noise-sensitive uses in the vicinity of the project site. The noise monitoring locations are depicted on Figure 2. Long-term noise monitoring locations are designated as LT1 and LT2, and short-term noise monitoring locations are shown as locations ST1 through ST5. Following are brief descriptions of the noise monitoring locations:

LT1: This 24-hour noise monitoring site is located near the backyard of the residence at 30581 North Hampton Road, Laguna Niguel. The purpose of choosing this site is to capture day and night noise levels representative of the outdoor activity areas of existing single-family homes located at the end of North Hampton Road cul-de-sac north of the Project site.

LT2: This 24-hour noise monitoring site is located near the southwest corner of the Project site, and represents background noise levels in areas west and south of the Project site that are farther from Crown Valley Parkway.

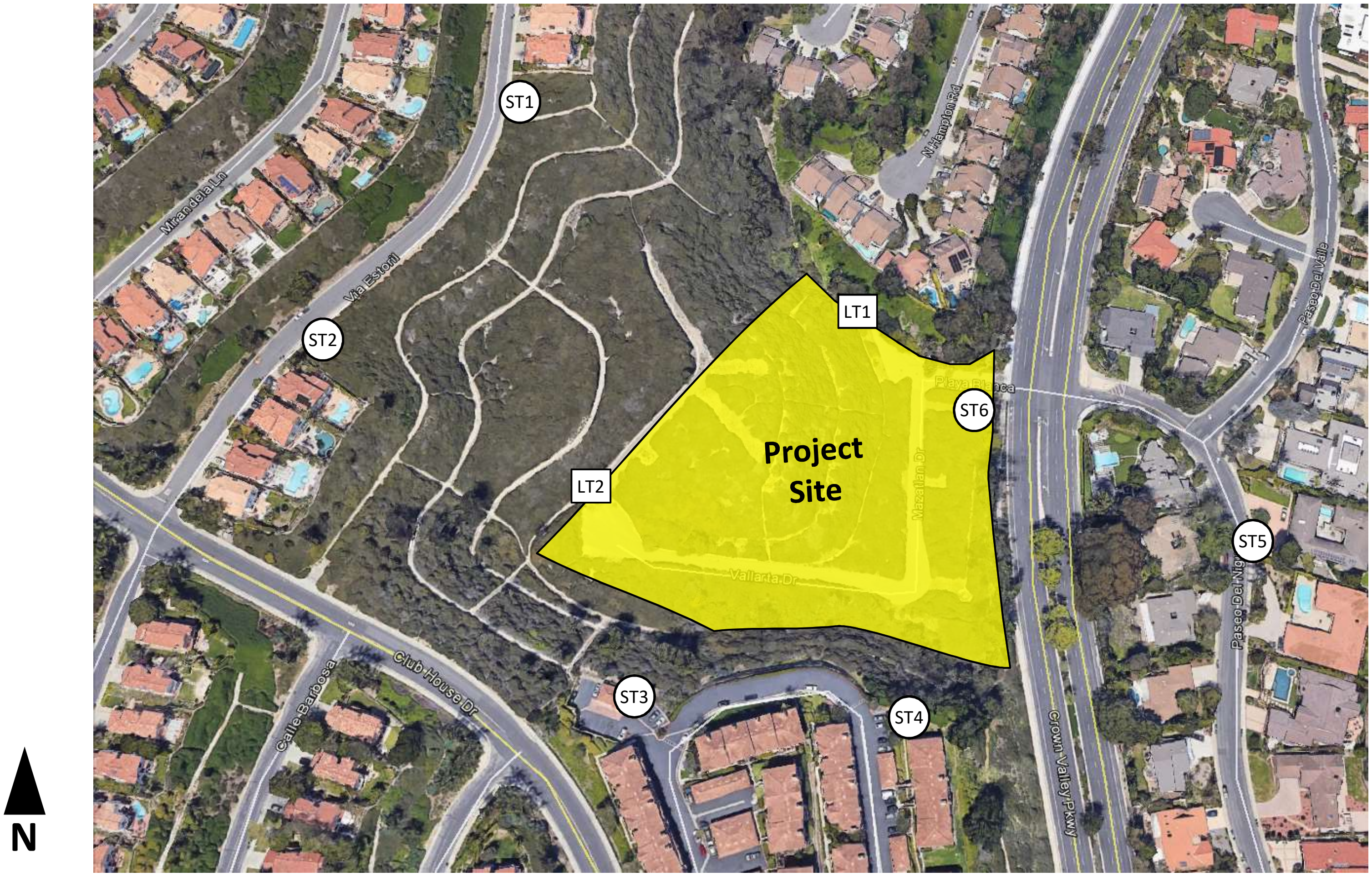
Short-term noise monitoring was also conducted for the purpose of quantifying daytime noise levels at noise-sensitive locations surrounding the project site during times of day when future Project construction activities would take place. Descriptions of the short-term noise monitoring locations are as follows:

ST1: This short-term noise measurement location is near the outdoor areas of the single-family home located at 30562 Via Estoril, and is representative of the existing residences northwest of the Project site.

ST2: This short-term location is near the outdoor areas of the single-family home located at 30652 Via Estoril, and is representative of the existing residences west and southwest of the Project site.

ST3: This short-term monitoring site is located north of Building 1 within the La Vista Condominiums, and is representative of the outdoor areas of condominiums nearest to the Project site and farthest from Crown Valley Parkway.

Figure 2
Noise Measurement Locations
The Cove at El Niguel



LT# 24-hour Noise Measurement Location

ST# Short-term Noise Measurement Location

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ST-4: This short-term measurement location is north of Building 22 within the La Vista Condominiums, and is representative of the outdoor areas of condominiums nearest to the Project site and closest to Crown Valley Parkway.

ST-5: This noise measurement location is on the public sidewalk next to the single-family home located at 30652 Paseo Del Niguel. This site represents the residential land uses east of the project site across Crown Valley Parkway.

Instrumentation utilized for the measurement of existing noise levels included a Rion NL-42 sound level meter and a Rion NL-52 sound level meter. The instrumentation was calibrated prior to and following each measurement with a Rion NC-74 acoustical calibrator to ensure the accuracy of the measurements. All measurement equipment complies with applicable specifications of the American National Standards Institute (ANSI) and the International Electrotechnical Commission (IEC) for the Type I and Type II (precision) sound level meters. The microphones were placed on tripods at 5 feet above the local ground.

The background noise level measurements were conducted during several time periods between Wednesday, April 28, 2021 and Thursday, April 29, 2021 at the locations noted on Figure 2. The noise measurements at the long-term monitoring locations included hourly average background noise level (L_{eq}) in dBA. At each of the short-term monitoring locations, the measurements included two 15-minute continuous samples of background noise, for which L_{eq}, L_{min} (minimum sound level), and L_{max} (maximum sound level), L10 (level exceeded 10 percent of the time), L50 (level exceeded 50 percent of the time), and L90 (level exceeded 90 percent of the time) were recorded. These measurements are deemed to be adequate to depict typical daytime noise levels (i.e., during times when construction would occur) at each of the representative monitoring locations. Appendix B depicts photographs of the noise monitors at each of the long-term and short-term monitoring locations.

Table 6 summarizes the measured background noise levels at long-term (24-hour) sites LT1 and LT2. For each of these locations, the 24-hour CNEL is also calculated and shown in the table. The measured background sound levels reported in Table 6 may be compared to the noise level standards of the City to determine how existing noise levels compare with the City's applicable noise level criteria.

From the measured existing background sound level data at the two long-term locations, it is apparent that measured existing CNEL values at the 24-hour noise monitoring locations are below the City’s land use compatibility threshold of 60 dB CNEL for residential uses.

Table 6

24-hour Noise Monitoring Results
The Cove at El Niguel
April 28-29, 2021

Measurement Start Time		**Measured Hourly Leq, dBA**	
		Site LT1	**Site LT2**
April 28, 2021	10:00 AM	46.3	-
	11:00 AM	44.0	-
	12:00 PM	45.2	-
	1:00 PM	45.1	-
	2:00 PM	47.2	46.8
	3:00 PM	50.2	43.2
	4:00 PM	53.2	53.9
	5:00 PM	46.8	42.1
	6:00 PM	44.8	40.2
	7:00 PM	46.0	43.3
	8:00 PM	45.3	40.3
	9:00 PM	45.4	41.5
	10:00 PM	41.2	36.4
	11:00 PM	40.0	37.0
April 29, 2021	12:00 AM	35.7	31.4
	1:00 AM	36.6	32.7
	2:00 AM	34.1	31.5
	3:00 AM	31.7	31.2
	4:00 AM	39.1	35.9
	5:00 AM	48.0	41.9
	6:00 AM	44.7	41.2
	7:00 AM	46.2	45.3
	8:00 AM	45.9	50.3
	9:00 AM	46.0	43.4
	10:00 AM	-	47.1
	11:00 AM	-	41.6
	12:00 PM	-	43.7
	1:00 PM	-	51.5
CNEL, dBA		50.0	47.5

Source: A/E Tech LLC

Summary of the noise levels measured during the short-term sampling effort is shown in Table 7. The results of short-term background noise measurements indicate that existing daytime noise levels at exterior of single- and multi-family land uses west and southwest of the Project site, away from Crown Valley Parkway, are 46 to 48 dBA. At outdoor locations of condominiums south of the Project site and closer to Crown Valley Parkway, exterior average daytime noise levels are about 58 dBA. Within the single-family residential neighborhoods beyond the first row of homes east of the Project site, outdoor daytime noise levels are between 48 to 52 dBA. All the measured daytime background noise levels are typical of residential settings and considered relatively quiet.

Table 7

Summary of Measured Short-Term Background Noise Levels (dBA)
The Cove at El Niguel
April 28-29, 2021

Monitoring Location	Date	Start Time	Duration (minutes)	Leq	Lmin	Lmax	L_{10}	L_{50}	L_{90}
ST1	4/28/2021	11:51 AM	15	47.5	41.4	67.9	47.5	44.4	42.9
		12:06 PM	15	47.8	42.3	63.3	49.4	45.9	44.1
ST2	4/29/2021	1:06 PM	15	46.2	41.1	61.9	47.7	44.7	42.3
		1:21 PM	15	47.8	43.1	62.1	49.6	46.3	44.4
ST3	4/28/2021	11:10 AM	15	48.0	38.7	57.6	51.2	46.4	42.2
		11:25 AM	15	47.2	40.2	54.3	49.9	46.4	43.1
ST4	4/28/2021	10:34 AM	15	58.2	41.2	69.7	61.2	56.6	50.3
		10:49 AM	15	57.7	40.8	68.0	61.3	56.1	48.1
ST5	4/29/2021	10:33 AM	15	48.4	38.5	64.2	49.9	46.4	43.2
		10:48 AM	15	51.8	43.3	64.5	53.4	49.6	46.5

Source: A/E Tech LLC

5.1.2 Traffic Noise Measurements

Short-term traffic noise level measurements (15 minutes in duration) and concurrent traffic counts were conducted within the Project site (at Site ST6 shown on Figure 2) on Thursday, April 29, 2021. The purpose of these measurements is to validate the noise model to be used in estimating Crown Valley traffic noise levels.

Measurement equipment consisted of a Rion NL-52 precision sound-level meter. A Rion NC-74 acoustical calibrator was used to calibrate the sound-level meter before and after each measurement to ensure the accuracy of the measurements. All instrumentation comply with the requirements of the American National Standards Institute (ANSI) and International Electrotechnical Commission (IEC) for Type I (precision) sound-level equipment.

During the traffic noise measurements, weather conditions were generally calm to slightly breezy (2 to 7 miles per hour) with clear skies. Temperatures were near 79 degrees Fahrenheit (°F) and relative humidity was 35 percent.

The results of the traffic noise level measurements and concurrent traffic counts are summarized in Table 8.

TABLE 8

Measured Traffic Noise Levels (dBA)
The Cove at El Niguel
April 29, 2021

Start Time	Measured Sound Level			Traffic Counts (15 minutes)									
				Southbound					Northbound				
	Leq	Lmin	Lmax	A	MT	HT	Bus	MC	A	MT	HT	Bus	MC
11:45 AM	60.5	39.7	71.5	212	2	0	0	0	172	2	1	1	1
12:00 PM	61.3	42.8	73.0	258	0	1	1	4	195	3	1	1	3

A = Automobiles MT = Medium Trucks HT = Heavy Trucks Bus=Busses MC=Motorcycles

Source: A/E Tech LLC

Existing roadway geometry and number of vehicles counted during the noise measurement periods were entered into the noise model, and noise levels were calculated. Table 9 is a summary of noise levels obtained during the traffic noise measurements and their comparison to levels predicted by the TNM.

The last column of Table 9 depicts the differences between the measured and modeled noise levels. The difference between measured and modeled noise levels are within 2 dBA, which depicts acceptable agreement between the two levels. This close agreement verifies the accuracy of TNM in predicting traffic noise levels in areas within and in the vicinity of the Project site.

TABLE 9

Comparison of Measured and Modeled Traffic Noise Levels (dBA)

Measurement Location	Measured L_{eq}	Modeled L_{eq}	Modeled minus Measured L_{eq}
ST6	60.5	61.7	+1.2
	61.3	62.9	+1.6

Source: A/E Tech LLC

6. FUTURE NOISE IMPACTS

Future noise impacts from the proposed Project would include short-term, temporary effects during the construction phase of the Project and potential permanent effects resulting from increased traffic brought on the local roadway system by the proposed Project. This section describes the methods, data, and findings of the construction and traffic noise analyses performed to determine the level of impacts, and whether predicted noise exposure would be in compliance with the City's applicable noise criteria.

6.1 Construction Noise

During the construction of the proposed project, overall noise levels would vary based on the level of construction activity, the types of equipment used, when the equipment is being operated, and the distance from construction activities to neighboring noise-sensitive receivers. Construction of the proposed Project will include three distinct time periods during which several components would occur. In the first phase, noise will be due to site preparation, excavation, and grading of the site. In the second phase, noise would be from construction of building foundations, framing, and building construction. In the last construction period, noise exposure would be caused by activities involving paving, concrete installation, and landscaping.

Of the above, the grading/excavation component of construction typically generates the highest noise levels due to higher utilization of heavier machinery and the need for use of haul trucks at the Project site to export or import soil as may be needed.

6.1.1 Grading/Excavation Noise Levels

Grading/excavation of the Project site would take place over a period of two to six working weeks. The equipment to be utilized during peak grading activities period include two (2) scrapers, one dozer, one motor grader, and one water truck.

Noise levels at exterior areas of the nearest neighboring noise-sensitive receivers (see Figure 3), were estimated for grading and excavation activities by using equipment reference noise levels, equipment utilization rates, and estimated distances to each receiver.

Typical construction equipment noise level data were obtained from the Roadway Construction Noise Model developed by the Federal Highway Administration (FHWA, 2006). The noise database utilized for estimating construction noise levels includes maximum noise level from each piece of machinery at a reference distance of 50 feet. Noise attenuation due to distance is assumed to be 6 dBA per doubling of distance from the equipment. Approximate local shielding effects due to topography and property walls were also taken into account in the calculations.

Table 10 summarizes estimated ranges of grading/excavation noise levels in terms of hourly L_{eq} and compares the overall resultant noise levels to the existing background noise levels at each representative receiver location. These noise levels are based on a conservative assumption of non-stop grading activities by multiple construction equipment in each area during a full construction day. Therefore, because of variations in intensity of grading activities, it is unlikely that such noise levels would be generated for the full scheduled duration of grading/excavation.

As defined previously, a noise impact would occur if construction of a project causes ambient noise levels to exceed 80 dBA Leq during daytime. Comparison of the combined construction and background noise levels to those existing at each location shows that grading/excavation operations would not result in significant noise levels at any of the exterior areas of homes nearest to the Project site.

With windows and doors closed, standard residential building construction achieves outdoor-to-indoor noise reductions of 25 dBA or more. Therefore, interior noise levels at the homes immediately adjacent to the Project site would have interior noise levels of 48 dBA (73 dBA - 25 dBA = 48 dBA) or less. Such levels would be below the City’s daytime interior noise level limit of 55 dBA (see Table 3). This means that construction noise would not result in an interior impact.

Figure 3
Construction Noise Receivers
The Cove at El Niguel

C# Construction Noise Receivers

TECH
Noise & Vibration

TABLE 10

Combined Construction and Existing Noise Levels (Leq, dBA)
Grading/Excavation
The Cove at El Niguel

Receiver Location	Existing Sound Level	Range of Distances to Construction (feet)	Estimated Construction Noise Level	Combined Construction + Existing Noise Level	Significant Noise Impact?
C1: 30562 Via Estoril	48	455–1,000	55–62	56–62	No
C2: 30652 Via Estoril	47	325–900	56–65	57–65	No
C3: Building 22, The Vista Condominiums	58	135–625	59–72	62–72	No
C4: First-Row Homes, Paseo Del Niguel	50	140–735	53–67	55–67	No
C5: Single-Family Homes, N Hampton Rd	46	70–610	54–73	55–73	No

Source: A/E Tech LLC

6.1.2 Construction Traffic Noise

During the construction of the proposed project, vehicular traffic on local roadways will increase due to use of personal vehicles by construction employees and hauling trucks transporting materials and equipment to and from the Project site. Such increases in traffic volumes would result in increased traffic noise levels along the local roadways utilized by traffic associated with the Project.

In order to forecast the potential construction related trips associated with the construction activities at the project site, the following assumptions have been utilized for the three construction components:

<u>Site Grading/Excavation</u>

- A five-day workweek (Monday through Friday) and nine-hour workday was assumed.
- The Project site is generally considered near-balanced and will require approximately 130 cubic yards (CY) of soil to be exported for grading. Based on a capacity of 10 CY per truck, the site would require approximately 13 truckloads for soil export (i.e. 26 total daily truck trips).
- A total of 5 workers per day was assumed.

Building Foundation/Framing/Construction

- A five-day workweek (Monday through Friday) and nine-hour workday was assumed.
- A total of 7 trucks per day was assumed (i.e. 14 total daily truck trips).
- A total of 6 workers per day was assumed.

Paving/Concrete/Landscape

- A five-day workweek (Monday through Friday) and nine-hour workday was assumed.
- A total of 3 trucks per day was assumed (i.e. 6 total daily truck trips).
- A total of 6 workers per day was assumed.

Construction traffic route during all construction periods would be along Crown Valley Parkway, with entering traffic approaching from the north and exiting traffic traveling to the north.

Potential increases in traffic noise exposure due to vehicle trips generated during construction components with the highest traffic volumes were evaluated using existing traffic volumes on local roadways leading to the Project site and adding the highest anticipated construction traffic volumes to the existing volumes. The traffic data were utilized in the validated TNM to evaluate the differences in hourly average traffic noise level (L_{eq}) between the existing and existing with construction AM peak-hour conditions. AM peak-hour was used for the analysis because it presents slightly lower existing total traffic volumes than PM peak-hour on Crown Valley Parkway, and would therefore result in higher increases in noise levels due to addition of construction traffic.

Based on the construction traffic assumptions, during the most intensive construction activities, i.e., site grading/excavation, a total of five employee automobiles would travel to the Project site in the AM peak-hour and two trucks would arrive at and one truck depart from the project site during this hour.

Table 11 summarizes the comparison of calculated existing AM peak-hour L_{eq} values between the existing and existing with construction conditions. As shown in Table 11, the proposed Project construction truck traffic would cause increases in hourly traffic noise level of only up to 0.2 dB at the exterior of residential uses along Crown Valley Parkway north of the Project site. Such increases in traffic noise would not be noticeable to neighboring residents.

TABLE 11

Comparison of AM Peak-Hour Traffic Leq (dBA)
Between Existing and Existing with Construction Conditions
The Cove at El Niguel

Roadway Segment	AM Peak-hour Traffic Volume		Predicted Peak-hour Traffic Noise Level at 100 ft from Roadway Centerline		
	Existing	Existing With Construction	Existing	Existing With Construction	Noise Level Change
SB Crown Valley Pkwy – North of Project site	1,029	1,036	62.6	62.8	+0.2
NB Crown Valley Pkwy – North of Project site	749	750			
Based on the construction traffic assumptions, a total of 5 employee automobiles would travel to the project site in the AM peak-hour, two trucks would arrive at and one truck would depart from the Project site during this hour. Construction traffic is assumed to travel on Crown Valley Parkway north of the Project site.					

Sources: LLG, 2021
A/E Tech LLC

On an average daily basis, the project construction during its most intense periods would increase the average daily traffic (ADT) volume by only 36 vehicle trips, including 10 employee vehicle trips and 26 heavy truck trips in and out of the Project site. Noise effect of this increase in ADT on the CNEL at noise-sensitive locations along Crown Valley Parkway would be an increase of only 0.1 dB or less. Therefore, increase in traffic CNEL along area roadways would not be noticeable at nearby noise-sensitive locations during the construction of the proposed Project.

6.2 Project-Related Operational Noise

Long-term noise effects of the proposed Project on neighboring noise-sensitive uses would be due to increased vehicular traffic on the local roadways generated by the proposed Project. This analysis quantifies noise effects of increased traffic on local roadways due to the proposed project by comparing the existing traffic noise levels along Crown Valley Parkway without the Project to those with the Project.

6.2.1 Project-related Traffic Noise

The proposed Project will add traffic to the local roadway system on a daily basis. Vehicular traffic generated by the Project would utilize the local area roadway network for accessing the Project site. Potential increases in traffic noise exposure due to traffic generated by the proposed Project were evaluated using existing peak-hour and ADT volumes with and without the proposed Project.

With- and without-Project existing AM and PM peak-hour traffic volumes and ADT volumes on Crown Valley Parkway were obtained from the Traffic Assessment prepared for the project (LLG, 2021). Vehicle composition data, including breakdown of automobiles, medium trucks (2-axle), heavy trucks (3 or more axles), buses, and motorcycles were developed from the traffic counts conducted during the onsite traffic noise measurements.

Based on the traffic data obtained from the Traffic Assessment report, Project traffic volumes during the AM and PM peak hours would be 10 and 12 vehicle trips, respectively. Over a 24-hour period, the Project would generate a total of 161 vehicle trips. These traffic data were utilized in the FHWA TNM version 2.5 to evaluate differences in hourly average (L_{eq}) and daily (CNEL) traffic noise levels between the with- and without-Project scenarios.

Comparison of existing peak-hour L_{eq} values between the with-Project and without-Project scenarios at the traffic noise measurement location (approximately 60 feet from the edge of the nearest travel lane) shows that there would be virtually no change in traffic noise levels due to the Project during AM and PM peak traffic hours. Therefore, Project traffic would not result in any noticeable changes in traffic noise at residential uses along Crown Valley Parkway during peak traffic hours, and such impacts would not be significant.

On a daily basis, the proposed Project would increase the ADT volume on Crown Valley Boulevard in the vicinity of the Project site by 161 vehicles. Noise effect of such an increase in daily volumes on the CNEL at residential locations along the roadway would only be a 0.1 dB increase. Therefore, increase in daily average traffic noise levels would also be insignificant.

7. VIBRATION

Construction of the Project is expected to generate temporary groundborne vibration in the immediate vicinity of certain construction activities. Groundborne vibration could cause human annoyance and potential building damage. Typical construction equipment with the potential to create groundborne vibration include pile drivers, vibratory rollers, large bulldozers, loaded trucks, jackhammers, and small bulldozers. Of these pieces of equipment, only small and large bulldozers are proposed for construction of the Project. For the purpose of this study, it is assumed that soil compaction would be done using pneumatic rollers.

Primary factors affecting the level of attenuation of vibration in the ground include the type and intensity of vibration at the source and the type of soil through which vibratory force propagates. Groundborne vibration levels from large and small bulldozers are 0.089 in/sec and 0.003 in/sec, respectively, at 25 feet from the source (Caltrans 2013). The soil type at the Project site may be categorized as competent soil type, which generally includes sandy clays, silty clays, gravel, silts, or weathered rock (American Geotechnical, 2021).

Use of bulldozers during construction of the proposed Project would result in generation of intermittent groundborne vibration events at the buildings located closest to construction activities. The nearest sensitive buildings to construction equipment would be residential buildings north of the Project site, at the south end of North Hampton Road, at distances as close as approximately 60 to 90 feet from construction activities.

Assuming the use of bulldozers similar to the reference equipment, the groundborne vibration levels at the nearest residential buildings to the Project site were calculated. In addition, since annoyance from ground-borne vibration is an indoor phenomenon, coupling effects of building structures on vibration levels were considered for estimating vibration velocities inside the buildings. Table 12 shows the results of calculated groundborne vibration levels in terms of PPV (in/sec).

Comparison of the results in Table 12 to the established City vibration criteria (see Section 3.3) shows that the highest groundborne vibration level of 0.023 in/sec due to a large bulldozer is far below the damage criteria for all building categories. In terms of perceptibility to the people living near the Project site, the estimated vibration levels generated by a large dozer would be below the limit of 0.04 in/sec significance threshold for frequent intermittent events at all the residential buildings nearest to the Project site. Vibration levels due to a small dozer would be well below all the sensitivity criteria at any of the neighboring structures.

Table 12
Calculated Groundborne Vibration Levels (PPV, in/sec)
The Cove at El Niguel

Receiver	Distance (feet)	Large Dozer	Small Dozer
1: 30562 Via Estoril	479	0.001	0.00005
2: 30652 Via Estoril	340	0.002	0.0001
3: Building 22 at The Vista Condos	164	0.006	0.0002
4: 30631 Paseo Del Niguel	199	0.005	0.0002
5: 30582 N Hampton Rd	97	0.013	0.0004
6: 30585 N Hampton Rd	65	0.023	0.0008
7: 30581 N Hampton Rd	76	0.019	0.0006

Source: A/E Tech LLC

In summary, construction vibration levels would not result in any potential building damage at neighboring residential structures. Highest vibration levels from a large dozer would also meet the vibration sensitivity criterion of 0.04 in/sec at all the neighboring properties. Therefore, groundborne vibration would not be perceptible at the nearest neighboring homes for the predominant majority of construction within the Project site, and should therefore be considered insignificant. Ground-borne noise levels from construction activities would be minimal and imperceptible as compared to airborne noise from such activities. Therefore, groundborne noise would be less than significant.

8. MITIGATION

8.1 Construction Noise

Estimated noise exposure due to construction of the proposed Project would exceed the existing background sound levels during daytime hours, however, construction noise levels would not exceed the City's daytime significance threshold of 80 dBA L_{eq}. The City exempts construction activities from its Municipal Code noise requirements between the hours of 7 a.m. and 8 p.m. on weekdays and Saturdays. Therefore, Project construction would not result in significant noise level increases at nearby noise-sensitive locations during each phase of construction (see Section 6.1.1 for details of impacts). Therefore, specific noise mitigation measures are not required.

To minimize the potential for complaints from neighboring noise-sensitive uses, it is recommended that property owners be informed of planned construction activities prior to the actual work and that the contractors develop construction noise control plans that include:

- Using equipment engines fitted with mufflers,
- Placing construction staging and equipment storage areas at locations as far away from noise-sensitive locations as possible.

8.2 Operational Noise

Based on estimated future peak-hour and 24-hour traffic noise level changes predicted for the Project (as presented in Section 6.2.1), Project-induced increases in traffic would not cause significant noise impacts during future traffic peak hours nor over a 24-hour period at existing noise-sensitive residential uses in the vicinity of the Project site. Therefore, no mitigation of traffic noise would be required.

8.3 Construction Vibration

Based on the vibration analysis results, Project construction would not result in significant vibration impacts at residential structures in the vicinity of the Project site. Therefore, no specific vibration mitigation measures are needed. Nonetheless, proper timely notices of scheduled construction activities to local residents would be important in managing expectations and minimizing the potential for complaints.

9. REFERENCES

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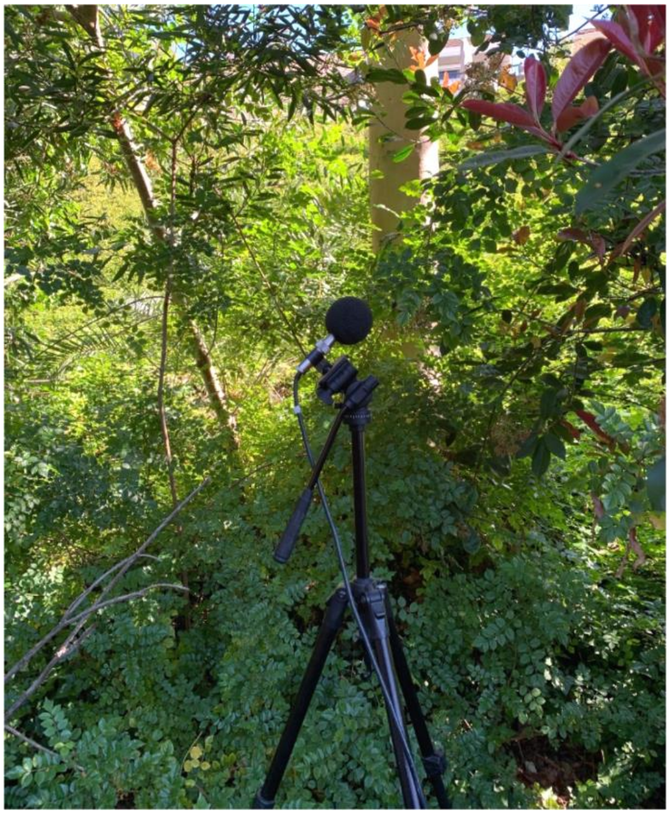
Appendix A
Acoustical Terminology

List of Technical Terms

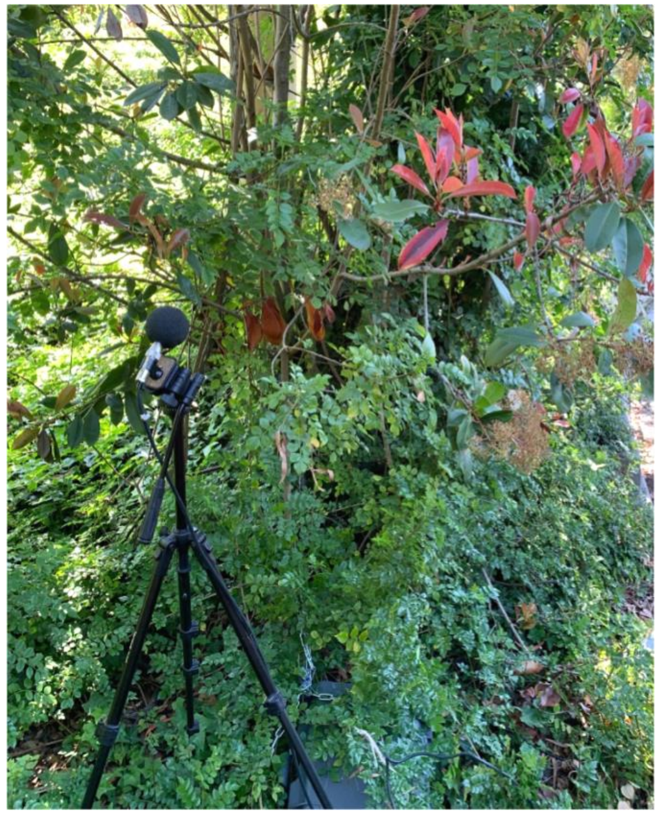
Term	Definitions
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. 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. All sound levels in this report are A-weighted, unless reported otherwise.
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 the addition of 10 decibels to sound levels measured in the night between 10:00 p.m. and 7:00 a.m.
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base of 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
Frequency, Hz	The number of complete pressure fluctuations per second above and below the atmospheric pressure.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1, 10, 50 and 90 percent of the time during the measurement period.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
Peak Particle Velocity (PPV)	The peak signal value of an oscillating vibration velocity waveform. Usually expressed in inches/second in the United States.
Vibration Decibels (VdB)	The vibration velocity level in decibel scale.

Appendix B
Noise Measurement Photographs

Noise Measurement Photographs at Site LT1



Looking North



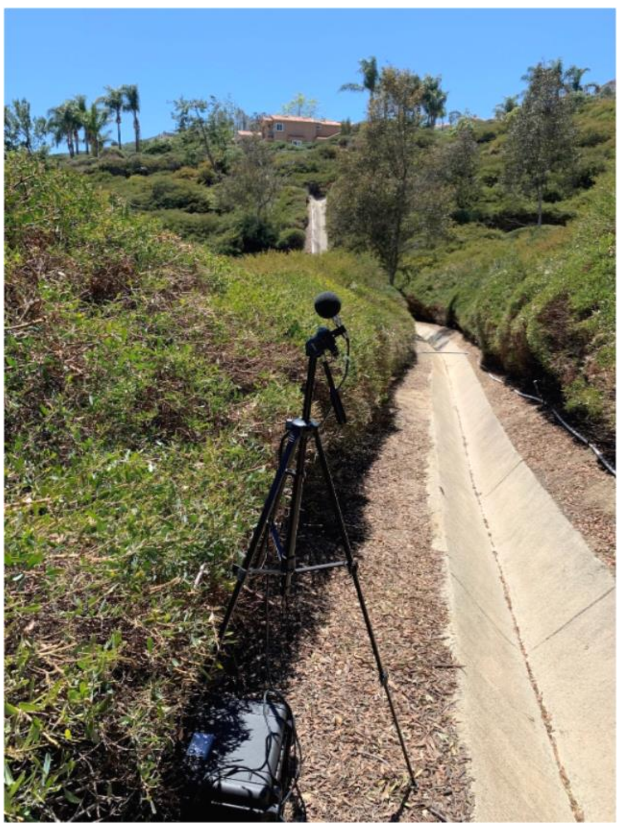
Looking East

Looking West

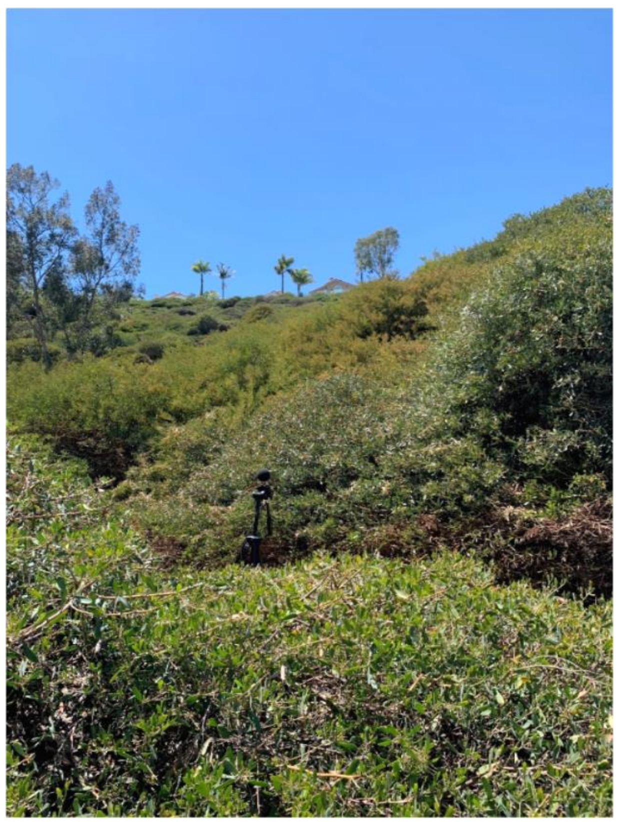
Noise Measurement Photographs at Site LT2

Looking North

Looking East



Looking South



Looking West

Noise Measurement Photographs at Site ST1

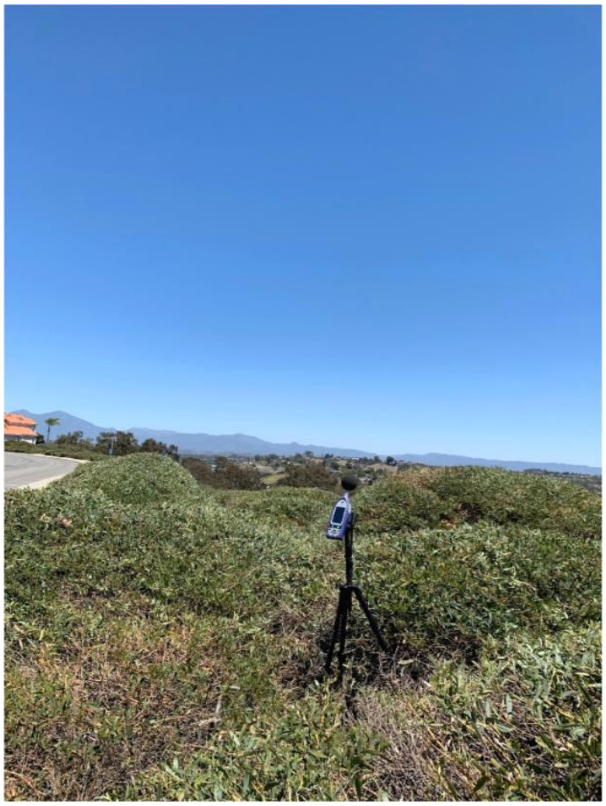
Looking North

Looking East

Looking South

Looking West

Noise Measurement Photographs at Site ST2

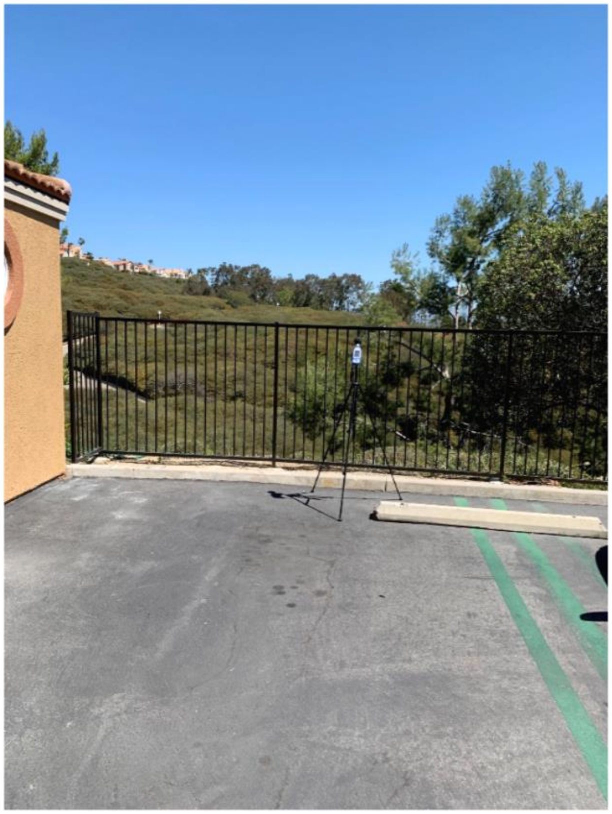


Looking Northeast

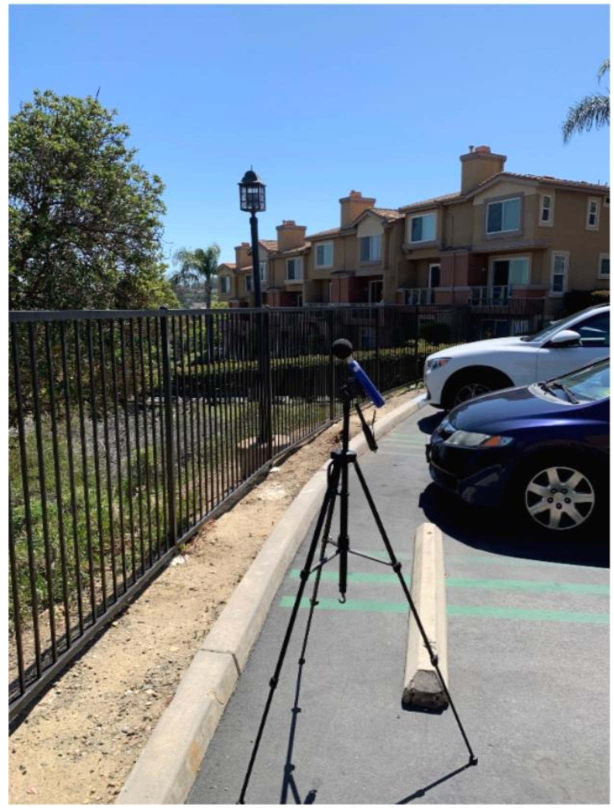
Looking East

Looking South

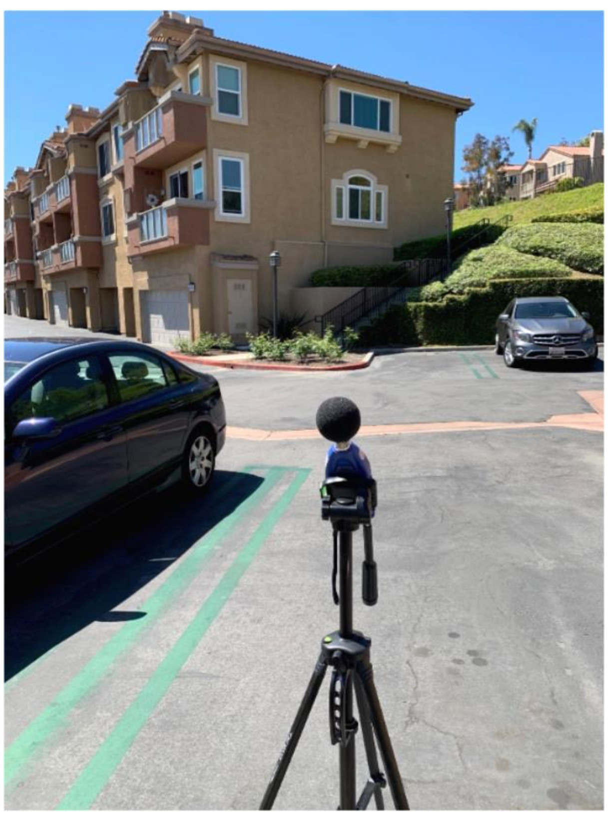
Noise Measurement Photographs at Site ST3



Looking Northeast



Looking Southeast



Looking Southwest

Looking Northwest

Noise Measurement Photographs at Site ST4

Looking North

Looking East

Looking South

Looking West

Noise Measurement Photographs at Site ST5

Looking North

Looking East

Looking South

Noise Measurement Photographs at Site ST6

Looking North

Looking East

Looking South

Looking West

Appendix C

Construction Noise Calculation Data Sheets

C-1
Site Grading/Excavation (Highest Noise Levels)

Receiver 1	Quantity	Usage Factor	Source Lmax @ 50 ft	Distance, ft	Shielding	Leq @ Receiver	Overall Leq
Scrapers	2	40%	84	455	5	59	62
Grader	1	40%	85	455	5	57	
Rubber Tired Dozer	1	40%	81	455	5	53	
Water Truck	1	40%	75	455	5	47	

Receiver 2	Quantity	Usage Factor	Source Lmax @ 50 ft	Distance, ft	Shielding	Leq @ Receiver	Overall Leq
Scrapers	2	40%	84	325	5	62	65
Grader	1	40%	85	325	5	60	
Rubber Tired Dozer	1	40%	81	325	5	56	
Water Truck	1	40%	75	325	5	50	

Receiver 3	Quantity	Usage Factor	Source Lmax @ 50 ft	Distance, ft	Shielding	Leq @ Receiver	Overall Leq
Scrapers	2	40%	84	135	5	69	72
Graders	1	40%	85	135	5	67	
Rubber Tired Dozers	1	40%	81	135	5	63	
Water Truck	1	40%	75	135	5	57	

Receiver 4	Quantity	Usage Factor	Source Lmax @ 50 ft	Distance, ft	Shielding	Leq @ Receiver	Overall Leq
Scrapers	2	40%	84	140	10	64.1	67
Graders	1	40%	85	140	10	62.1	
Rubber Tired Dozers	1	40%	81	140	10	58.1	
Water Truck	1	40%	75	140	10	52.1	

Receiver 5	Quantity	Usage Factor	Source Lmax @ 50 ft	Distance, ft	Shielding	Leq @ Receiver	Overall Leq
Scrapers	2	40%	84	70	10	70.1	73
Graders	1	40%	85	70	10	68.1	
Rubber Tired Dozers	1	40%	81	70	10	64.1	
Water Truck	1	40%	75	70	10	58.1	

C-2

Site Grading/Excavation (Lowest Noise Levels)

Receiver 1	Quantity	Usage Factor	Source Lmax @ 50 ft	Distance, ft	Shielding	Leq @ Receiver	Overall Leq
Scrapers	2	40%	84	1000	5	52	55
Grader	1	40%	85	1000	5	50	
Rubber Tired Dozer	1	40%	81	1000	5	46	
Water Truck	1	40%	75	1000	5	40	

Receiver 2	Quantity	Usage Factor	Source Lmax @ 50 ft	Distance, ft	Shielding	Leq @ Receiver	Overall Leq
Scrapers	2	40%	84	900	5	53	56
Grader	1	40%	85	900	5	51	
Rubber Tired Dozer	1	40%	81	900	5	47	
Water Truck	1	40%	75	900	5	41	

Receiver 3	Quantity	Usage Factor	Source Lmax @ 50 ft	Distance, ft	Shielding	Leq @ Receiver	Overall Leq
Scrapers	2	40%	84	625	5	56	59
Graders	1	40%	85	625	5	54	
Rubber Tired Dozers	1	40%	81	625	5	50	
Water Truck	1	40%	75	625	5	44	

Receiver 4	Quantity	Usage Factor	Source Lmax @ 50 ft	Distance, ft	Shielding	Leq @ Receiver	Overall Leq
Scrapers	2	40%	84	735	10	49.7	53
Graders	1	40%	85	735	10	47.7	
Rubber Tired Dozers	1	40%	81	735	10	43.7	
Water Truck	1	40%	75	735	10	37.7	

Receiver 5	Quantity	Usage Factor	Source Lmax @ 50 ft	Distance, ft	Shielding	Leq @ Receiver	Overall Leq
Scrapers	2	40%	84	610	10	51.3	54
Graders	1	40%	85	610	10	49.3	
Rubber Tired Dozers	1	40%	81	610	10	45.3	
Water Truck	1	40%	75	610	10	39.3	