APPENDIX F

Noise Analysis Technical Report

Noise Technical Report for the Trails at Carmel Mt. Ranch City of San Diego, California

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Acronyms and Abbreviations

Acronym/Abbreviation	Definition
ANSI	American national Standards Institute
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
CNMP	construction noise management plan
County	County of San Diego
dB	Decibel
dBA	A-weighted decibel
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HVAC	Heating, Ventilation, and Air Conditioning
Hz	Hertz
ISO	International Standards Organization
GSF	Gross square foot
In/sec	inches per second
Ldn	Day–night average sound level
Leq	Equivalent sound level
Lmax	Maximum sound level
Lmin	Minimum sound level
Ln	Sound level exceeded “n”-percent of a time period
NSLU	Noise Sensitive Land Use
PPV	peak particle velocity
RCNM	Roadway Construction Noise Model
SDMC	San Diego Municipal Code
SAN	San Diego International Airport
SLM	Sound level meter
SPL	Sound pressure level
ST	Short-term

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1 Introduction and Background

New Urban West, Inc. has proposed the redevelopment of the closed Carmel Mountain Ranch golf course in the City of San Diego, California. This report reviews applicable noise standards and criteria, evaluates the existing noise environment, describes modeling assumptions and methodologies used to predict noise impacts and effects associated with the proposed project. The report assesses the potential for project-generated noise levels to result in noise impacts on nearby noise-sensitive receptors in the area.

This analysis is based on the proposed project tentative parcel map included herein as Figure 1. Appendix A provides a discussion of acoustical fundamentals and terminology used in this report. Field noise measurement data are included in Appendix B, with sound modeling input/output data included in Appendices C and D.

1.1 Project Description

The Trails at Carmel Mountain Ranch (project) is located within the City of San Diego, Carmel Mountain Ranch Community. The project proposes to redevelop the closed Carmel Mountain Ranch Country Club and associated 18-hole golf course. The project site is located west of the City of Poway, east of the community of Rancho Penasquitos, north of the community of Sabre Springs, and south of the community of Rancho Bernardo. The project site is bound by Ted Williams Parkway to the south; Carmel Mountain Road to the north; Interstate 15 (I-15) and Rancho Carmel Drive to the west; and the boundary with the City of Poway to the east. The project site consists of approximately 164.5 acres and currently has an address of 14050 Carmel Ridge Road, San Diego, CA 92128. The project location is shown in Figure 2.

The proposed project includes a total of 1,200 multi-family homes and a mix of open space and recreational uses. Residential land uses would compose approximately 53.2 acres and would range in density from 12.94 to 37.43 dwelling units per acre, incorporating a variety of building types such as townhomes, garden walk-ups, stacked flats and apartments, among others. All proposed new residential construction would be set back 50 feet from existing residential developments in the vicinity. Open space uses would be composed of approximately 111 acres, which includes approximately 6 miles of publically accessible trails and 9.79 acres of publicly-accessible parkland.

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2 Environmental Setting & Conditions

The project site is at an elevation between approximately 550 feet and 805 feet above mean sea level. The project site is comprised of 26 parcels, which are interspersed within single family and multi-family residential developments and commercial developments.

The proposed Project area has a number of existing noise sources influencing the ambient noise environment. The most dominant noise source affecting the overall area is transportation noise; primarily generated from vehicular traffic on the regional and local roadway network. Light commercial areas to the north and west of the Project site contribute to the ambient noise levels to a lesser extent.

The existing ambient noise environment was quantified through field surveys, implementation of a noise-monitoring program and through the application of accepted reference data and noise prediction methodologies. Separate discussions of identified major noise sources and their respective effects are provided in the following sections.

Existing Noise-Sensitive Land Uses

Noise-sensitive land uses generally include those uses where exposure to noise would result in adverse effects, as well as uses where quiet is an essential element of the intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels. Existing land uses surrounding the project site consist of public education facilities, residential, neighborhood commercial and mixed-use. Existing Noise Sensitive Land Uses (NSLUs) in the project area include single family residential, multi-family residential, Carmel Mountain Ranch Library, Highland Ranch Elementary and Shoal Creek Elementary. Single family residential land uses are located throughout the project area. Multi-family residential land uses are located north of the project site, between Stoney Peak Drive and Highland Ranch Road, and at the southern-most boundary of the project area.

Existing Ambient Noise Survey

The existing ambient noise environment in the project area was surveyed on September 03, 2019. The sound level measurements were performed with a Rion NL 52 integrating sound level meters (SLM) using A-weighting and "slow" response settings. The sound level meter was equipped with a 0.5-inch pre-polarized condenser microphone and pre-amplifier. All instrumentation components, including microphones, preamplifiers and field calibrators have laboratory certified calibrations traceable to the National Institute of Standards and Technology (NIST). The equipment meets all pertinent specifications of the American National Standards Institute (ANSI) for Type 1 SLMs (ANSI S1.4-1983 [R2006])

Sound level measurements were performed in accordance with ANSI and American Standards for Testing and Measurement (ASTM) guidelines. Field calibrations were performed on the SLM with acoustic calibrators before and after the measurements. The SLM was positioned at a height of approximately 5 feet above the ground during the sound level measurements. The monitoring program incorporated five (5) ambient noise measurement locations, with specific consideration to document noise levels in the vicinity of nearby noise-sensitive receptors, and additionally to document existing transportation noise source levels associated with roadways projected to potentially carry significant project-related traffic volumes. Locations of the sound level measurements are depicted in Figure 2 as ST1 through ST5. A description of the noise measurement locations and the results of the noise measurements are presented in Table 1. Field data reports and photos are provided in Appendix B.

Table 1. Existing Ambient Noise Monitoring Results, September 03, 2019

Site	Location/Description	Time (Duration)	Leq	Lmax
ST1	APN 313-031-28-00, Rancho Carmel Dr.	10:12 AM (10 min.)	60.1	68.7
ST2	APN 313-040-62-00, NSLU north of Stoney Gate Pl.	10:30 AM (15 min)	47.0	54.8
ST3	APN 313-043-02-00, NSLU north of former Club House	10:50 AM (15 min)	45.0	52.6
ST4	APN 313-541-10-00, Highland Ranch Dr.	11:10 AM (10 min)	57.2	68.0
ST5	APN 313-704-01-00, Ted Williams Pkwy	11:35 AM (10 min)	52.5	63.3

Notes: Leq = equivalent continuous sound level (time-averaged sound level); Lmax = maximum sound level during the measurement interval; dBA = A-weighted decibels; ST = short-term noise measurement locations.

As shown in Table 1, monitoring locations providing characterization information for project area roadways (ST1, ST4 and ST5) and noise level exposure of nearby NSLUs were documented to experience average sound levels ranging from approximately 53 dBA to 60 dBA Leq, with maximum sound levels reaching 69 dBA Lmax. Monitoring locations representing NSLUs that are central to the proposed project's development area and away from the local roadway network were documented to have average noise level ranging from approximately 45 dBA to 47 dBA, with maximum noise levels reaching approximately 55 dBA Lmax.

Existing Traffic Noise

Existing traffic noise levels were modeled for roadway segments in the project vicinity based on the Federal Highway Administration (FHWA) Highway Traffic Noise Model (TNM) prediction methodologies (FHWA 1998), and traffic data developed as part of the traffic impact study prepared for the proposed Project (LLG 2019). The FHWA TNM incorporates sound emissions and sound propagation algorithms based on well-established theory and accepted international standards. The acoustical algorithms contained within the FHWA TNM have been validated with respect to carefully conducted noise measurement programs and show excellent agreement in most cases for sites with and without noise barriers. The noise modeling accounted for factors such as vehicle volume, speed, vehicle type, roadway configuration, distance to the receiver, and propagation over different types of ground (acoustically soft and hard ground).

To determine existing day-evening-night (Lden/CNEL) traffic noise levels in the project vicinity, the average daily traffic (ADT) volumes for roadways in the immediate vicinity of the project site were used as inputs to the traffic noise model. Noise prediction receiver locations were plotted for the outdoor activity areas nearest the adjacent roadway segments. Modeled existing traffic noise levels are summarized in Table 2, along with distances from roadway centerlines to the 60-, 65-, and 70-dBA CNEL traffic noise level contours. As shown in Table 2, the location of the 65- A-Weighted Decibel (dBA) Community Noise Equivalent Level (CNEL) traffic noise contour along the local roadway network ranges from within the right-of-way to approximately 1,800 feet from the centerline of the modeled roadways. Refer to Appendix B of this report for complete modeling inputs and results.

Table 2. Summary of Modeled Existing Traffic Noise Levels

Roadway	Segment	ADT[1]	CNEL at 100 ft. from CL	Distance to CNEL Contour (feet)[2]		
	From / To			*70 dBA*	*65 dBA*	*60 dBA*
Ted Williams Pkwy	I-15 to Rancho Carmel Dr.	43,971	58.7	168	363	781
	Rancho Carmel Dr to Shoal Creek Dr.	32,195	72.9	150	323	697
	Shoal Creek Dr. to Carmel Ridge Rd.	31,130	73.7	152	328	706
	Carmel Ridge Rd. to Highland Ranch Rd.	29,305	69.2	134	288	620
	Highland Ranch Rd. to Pomerado Rd.	28,510	73.9	133	287	619
Rancho Carmel Dr	Provencal Place to Shoal Creek Dr.	11,194	66.5	41	88	189
	Shoal Creek Dr. to Windcrest Lane	11,969	68.7	44	96	206
	Windcrest Lane to Carmel Mountain Rd.	13,664	59.5	43	92	198
Carmel Mountain Rd	Rancho Carmel Dr. to Stoney Peak Dr.	34,979	60.0	51	109	235
Highland Ranch Rd	World Trade Dr. to Eastbourne Rd.	14,946	66.4	39	85	182
	Eastbourne Rd. to Carmel Ridge Rd.	11,770	67.1	35	76	163
	Carmel Ridge Rd. to Ted Williams Pkwy.	11,281	65.5	33	71	152
World Trade Dr	Stoney Peak Dr. to Highland Ranch Rd.	4,714	55.8	13	29	62
Interstate 15	South of Ted Williams Pkwy	222,000	73.7	681	1466	3159
	Ted Williams Pkwy to Carmel Mountain Ranch Rd.	238,000	80.2	825	1778	3831
Interstate 15	North of Carmel Mountain Ranch Rd.	227,000	78.7	767	1653	3561

Notes:
dBA = A-weighted decibels; CNEL = Community Noise Equivalent Level. ADT – Average Daily Traffic Volumes.
ADT volumes calculated based on Traffic Impact Report prepared for the Project (LLG 2019).
Not accounting for shielding provided by natural or man-made intervening objects. Actual distance to real-world noise level contours will be dependent upon shielding effects in the environment under consideration.

Existing Aircraft Operations

There are no operational public use airports within 2-miles of the proposed project. The project under consideration is located approximately 9 nautical miles southwest of the Ramona Airport and 15.5 nautical miles north of the San Diego International Airport. The project site is not located within any currently adopted 60 or 65 dB CNEL/Ldn airport noise contours. As such, noise associated with existing and future aircraft operations in the area is not a substantial contributor to the ambient noise environment and is not discussed or analyzed further.

Existing Vibration

There are no major sources of groundborne vibration in the proposed project area. Transportation-related vibration from roadways is the primary source of groundborne vibration. Heavy truck traffic can generate groundborne vibration, which varies considerably depending on vehicle type, weight, and pavement conditions. However, groundborne vibration levels generated from vehicular traffic are not typically perceptible outside of the roadway right-of-way.

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3 Regulatory Setting

Various private and public agencies have established noise guidelines and standards to protect citizens from potential hearing damage and other adverse physiological and sociological effects associated with noise. Applicable standards and guidelines are described below.

3.1 Federal

Federal Noise Control Act of 1972

The U.S. Environmental Protection Agency's (EPA's) Office of Noise Abatement and Control was originally established to coordinate federal noise control activities. After its inception, the EPA's Office of Noise Abatement and Control issued the Federal Noise Control Act of 1972, establishing programs and guidelines to identify and address the effects of noise on public health, welfare, and the environment. In 1981, EPA administrators determined that subjective issues such as noise would be better addressed at more local levels of government. Consequently, responsibilities for regulating noise control policies were transferred to state and local governments in 1982. However, noise control guidelines and regulations contained in the EPA rulings in prior years are still adhered to by designated federal agencies where relevant. There are no Federal noise regulations which are directly applicable to the construction or operation of the project.

3.2 State

The State of California has adopted noise standards that regulate noise levels of motor vehicles, sound transmission within buildings, occupational noise control, and noise insulation.

California Code of Regulations, Title 24

Title 24, also known as the California Building Standards Code, establishes building standards applicable to all occupancies throughout the state. The code provides acoustical regulations for both exterior-to-interior sound insulation as well as sound and impact isolation between adjacent spaces of various occupied units. Title 24 regulations state that interior noise levels generated by exterior noise sources shall not exceed 45 dBA CNEL/Ldn, with windows closed, in any habitable room for general residential use. These regulations are applicable to the proposed project.

Additionally, Part 11 of Title 24, known as the California Green Building Standards Code or CalGreen, provides guidance on mandatory and voluntary measures for environmental comfort and acoustical control. CalGreen Code recommends that classrooms have a maximum background noise level of 45 dBA Leq.

Governor's Office of Planning and Research

The State of California, Governor's Office of Planning and Research (OPR), published the State of California General Plan Guidelines (OPR 2003), which provides guidance for the acceptability of projects within specific day-night average noise level (Ldn) contours. The guidelines also present adjustment factors that may be used to arrive at noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

As shown below in Table 3, residential uses (e.g., single-family homes, mobile homes) are considered to be acceptable in areas where exterior noise levels do not exceed 60 dBA Ldn. Multi-family residential uses are normally unacceptable in areas exceeding 70 dBA Ldn and conditionally acceptable within 60 to 70 dBA Ldn. Schools are normally acceptable in areas up to 70 dBA Ldn and normally unacceptable in areas exceeding 70 dBA Ldn. Professional uses are normally acceptable in areas up to 70 dBA Ldn. Between 67.5 and 77.5 dBA Ldn, commercial uses are conditionally acceptable, depending on the noise insulation features and the noise reduction requirements.

Table 3. Summary of Land-Use Noise Compatibility Guidelines

Land Use Category	Community Noise Exposure (dBA Ldn)			
	Normally Acceptable1	*Conditionally Acceptable2*	*Normally Unacceptable3*	*Clearly Unacceptable4*
Residential—Low-Density Single-Family, Duplex, Mobile Home	<60	55–70	70–75	75+
Residential—Multifamily	<65	60–70	70–75	75+
Transient Lodging—Motel, Hotel	<65	60–70	70–80	80+
Schools, Libraries, Churches, Hospitals, Nursing Homes	<70	60–70	70–80	80+
Auditoriums, Concert Halls, Amphitheaters	—	<70	65+	—
Sports Arena, Outdoor Spectator Sports	—	<75	70+	—
Playgrounds, Neighborhood Parks	<70	—	67.5–75	72.5+
Golf Courses, Riding Stables, Water Recreation, Cemeteries	<75	—	70–80	80+
Office Building, Business Commercial, and Professional	<70	67.5–77.5	75+	—
Industrial, Manufacturing, Utilities, Agriculture	<75	70–80	75+	—

Source: OPR 2003
Notes:
dBA = A-weighted decibels; Ldn = day-night average noise level

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

2 New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning, will normally suffice.

3 New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design. Outdoor areas must be shielded.

4 New construction or development should generally not be undertaken.

California Department of Transportation – Vibration

There are no state standards for vibration. However, for the protection of historic and residential structures, the California Department of Transportation (Caltrans) recommends a threshold of 0.3 in/sec peak particle velocity (PPV) for older residential structures and 0.25 in/sec PPV for historic building and some old buildings (Caltrans 2013b).

3.3 Local Plans, Policies, Regulations and Ordinances

City of San Diego General Plan

The City of San Diego General Plan Noise Element contains goals, policies and implementation programs intended to protect citizens from exposure to excessive noise. The Public Safety Element and the Noise Element establishes standards and policy to provide compatible noise environments for new development or redevelopment projects and to control excessive noise exposure of existing land uses. The following goals and policies are applicable to the proposed project:

Goal A. Consider existing and future noise levels when making land use planning decisions to minimize people's exposure to excessive noise.

Policies

NE-A.1. Separate excessive noise-generating uses from residential and other noise-sensitive land uses with a sufficient spatial buffer of less sensitive uses.

NE-A.2. Assure the appropriateness of proposed developments relative to existing and future noise levels by consulting the guidelines for noise-compatible land use (shown on Table NE-3) to minimize the effects on noise-sensitive land uses.

NE-A.3. Limit future residential and other noise-sensitive land uses in areas exposed to high levels of noise.

NE-A.5. Require an acoustical study consistent with Acoustical Study Guidelines (Table NE-4) for proposed developments in areas where the existing or future noise level exceeds or would exceed the "compatible" noise level thresholds as indicated on the Land Use - Noise Compatibility Guidelines (Table NE-3), so that noise mitigation measures can be included in the project design to meet the noise guidelines.

NE-A.5. Prepare noise studies to address existing and future noise levels from noise sources that are specific to a community when updating community plans.

Goal B. Minimal excessive motor vehicle traffic noise on residential and other noise-sensitive land uses.

Policies

NE-B.1. Encourage noise-compatible land uses and site planning adjoining existing and future highways and freeways.

NE-B.2. Consider traffic calming design, traffic control measures, and low-noise pavement surfaces that minimize motor vehicle traffic noise (see also Mobility Element, Policy ME–C.5 regarding traffic calming).

NE-B.3. Require noise reducing site design, and/or traffic control measures for new development in areas of high noise to ensure that the mitigated levels meet acceptable decibel limits.

NE-B.4. Require new development to provide facilities which support the use of alternative transportation modes such as walking, bicycling, carpooling and, where applicable, transit to reduce peak-hour traffic.

NE-B.5. Designate local truck routes to reduce truck traffic in noise-sensitive land uses areas.

NE-B.6. Work with Caltrans to landscape freeway-highway rights-of-way buffers and install low noise pavement surfaces, berms, and noise barriers to mitigate state freeway and highway traffic noise.

NE-B.7. Promote the use of berms, landscaping, setbacks, and architectural design where appropriate and effective, rather than conventional wall barriers to enhance aesthetics.

Table 4. Land Use - Noise Compatibility Guidelines (Table NE-3 of the City of San Diego Noise Element)

Land Use Category	Exterior Noise Exposure (dBA CNEL)	60	65	70	75
Open Space and Parks and Recreational					
Community & Neighborhood Parks; Passive Recreation					
Regional Parks; Outdoor Spectator Sports, Golf Courses; Athletic Fields; Outdoor Spectator Sports, Water Recreational Facilities; Horse Stables; Park Maint. Facilities					
Residential					
Single Units; Mobile Homes; Senior Housing		45			
Multiple Units; Mixed-Use Commercial/Residential; Live Work; Group Living Accommodations **For uses affected by aircraft noise, refer to Policies NE-D.2. & NE-D.3.*		45	45*		
Institutional					
Hospitals; Nursing Facilities; Intermediate Care Facilities; Kindergarten through Grade 12 Educational Facilities; Libraries; Museums; Places of Worship; Child Care Facilities		45			
Vocational or Professional Educational Facilities; Higher Education Institution Facilities (Community or Junior Colleges, Colleges, or Universities)		45	45		
Cemeteries					

	Compatible	Indoor Uses	Standard construction methods should attenuate exterior noise to an acceptable indoor noise level. Refer to Section I.
		Outdoor Uses	Activities associated with the land use may be carried out.
	Conditionally Compatible	Indoor Uses	Building structure must attenuate exterior noise to the indoor noise level indicated by the number for occupied areas. Refer to Section I.
		Outdoor Uses	Feasible noise mitigation techniques should be analyzed and incorporated to make the outdoor activities acceptable. Refer to Section I.
	Incompatible	Indoor Uses	New construction should not be undertaken.
		Outdoor Uses	Severe noise interference makes outdoor activities unacceptable.

Source: City of San Diego General Plan Noise Element, Table NE-3 2008
Notes: dBA = A-weighted decibels; CNEL = Community Noise Equivalent Level.

City of San Diego Municipal Code

The San Diego Municipal Code (SDMC) serves to further protect the welfare and the peace and quiet of the community through the establishment of both objective and subjective methods for determining non-compliance with the City of San Diego noise regulations. The City of San Diego has enumerated these standards and methods of enforcement in Chapter 5, Article 9.5 of the SDMC. Relevant standards and thresholds are presented below.

§59.5.0401 Sound Level Limits

(a) It shall be unlawful for any person to cause noise by any means to the extent that the one-hour average sound level exceeds the applicable limit given in the following table (Table 5), at any location in the City of San Diego on or beyond the boundaries of the property on which the noise is produced. The noise subject to these limits is that part of the total noise at the specified location that is due solely to the action of said person.

Table 5. Applicable Noise Limits

Land Use	Time of Day	One-Hour Average Sound Level (dB)
Single-family residential	7:00 a.m. to 7:00 p.m.	50
	7:00 p.m. to 10:00 p.m.	45
	10:00 p.m. to 7:00 a.m.	40
Multifamily residential (up to a maximum density of 1/2,000)	7:00 a.m. to 7:00 p.m.	55
	7:00 p.m. to 10:00 p.m.	50
	10:00 p.m. to 7:00 a.m.	45
All other residential	7:00 a.m. to 7:00 p.m.	60
	7:00 p.m. to 10:00 p.m.	55
	10:00 p.m. to 7:00 a.m.	50
Commercial	7:00 a.m. to 7:00 p.m.	65
	7:00 p.m. to 10:00 p.m.	60
	10:00 p.m. to 7:00 a.m.	60
Industrial or agricultural	Any time	75

Note: dB = decibels
Source: SDMC 2010

(b) The sound level limit at a location on a boundary between two zoning districts is the arithmetic mean of the respective limits for the two districts. Permissible construction noise level limits shall be governed by Sections 59.5.0404 of this article.

(c) Fixed–location public utility distribution or transmission facilities located on or adjacent to a property line shall be subject to the noise level limits of Part A. of this section, measured at or beyond six feet from the boundary of the easement upon which the equipment is located.

§59.5.0404 Construction Noise

(a) It shall be unlawful for any person, between the hours of 7:00 p.m. of any day and 7:00 a.m. of the following day, or on legal holidays as specified in Section 21.04 of the San Diego Municipal Code, with exception of Columbus Day and Washington's Birthday, or on Sundays, to erect, construct, demolish, excavate for, alter or repair any building or structure in such a manner as to create disturbing, excessive or offensive noise unless a permit has been applied for and granted beforehand by the Noise Abatement and Control Administrator. In granting such permit, the Administrator shall consider whether the construction noise in the vicinity of the proposed work site would be less objectionable at night than during the daytime because of different population densities or different neighboring activities; whether obstruction and interference with traffic particularly on streets of major importance, would be less objectionable at night than during the daytime; whether the type of work to be performed emits noises at such a low level as to not cause significant disturbances in the vicinity of the work site; the character and nature of the neighborhood of the proposed work site; whether great economic hardship would occur if the work were spread over a longer time; whether proposed night work is in the general public interest; and he shall prescribe such conditions, working times, types of construction equipment to be used, and permissible noise levels as he deems to be required in the public interest.

(b) Except as provided in subsection C. hereof, it shall be unlawful for any person, including the City of San Diego, to conduct any construction activity so as to cause, at or beyond the property lines of any property zoned residential, an average sound level greater than 75 decibels during the 12-hour period from 7:00 a.m. to 7:00 p.m.

(c) The provisions of subsection B. of this section shall not apply to construction equipment used in connection with emergency work, provided the Administrator is notified within 48 hours after commencement of work. (City of San Diego 2010)

City of San Diego Significance Determination Thresholds

The City of San Diego Significance Determination Thresholds (Guidelines) provides guidance for City staff, project proponents and the public, to aid in determining whether a project may have a significant effect on the environment under the California Environmental Quality Act (CEQA) (City of San Diego 2016). The guidelines document reference the SDMC to establish definitions for acoustical terminology and provide additional significance thresholds for impact determination based on the source type.

Traffic Generated Noise

The Guidelines contain significance thresholds for traffic noise, which are presented in Table 6. In addition to the absolute interior and exterior noise level threshold shown in Table 6, the Guidelines establish a relative threshold for increases resulting from project-generated noise. A significant permanent increase is defined as a direct project-related permanent ambient increase of 3 dBA or greater, where exterior noise levels would already exceed the City's significance thresholds (e.g., 65 dBA daytime for single-family residential land uses) (City of San Diego 2016).

Stationary Noise Sources

A project that would generate noise levels at the property line that exceed the City's Noise Ordinance Standards is considered potentially significant (such as potentially a carwash or projects operating generators or noisy equipment).

If a nonresidential use, such as a commercial, industrial, or school use, is proposed to abut an existing residential use, the decibel level at the property line should be the arithmetic mean of the decibel levels allowed for each use as set forth in SDMC Section 59.5.0401 of the Municipal Code. Although the noise level could be consistent with the City's Noise Ordinance Standards, a noise level above 65 dB (A) CNEL at the residential property line could be considered a significant environmental impact. (City of San Diego 2016).

Table 6. City of San Diego Traffic Noise Significance Thresholds (dBA CNEL) (Table K-2 of the Guidelines)

Structure of Proposed Use That Would Be Impacted by Traffic Noise	Interior Space	Exterior Useable Space[1]	General Indication of Potential Significance
Single-family detached	45 dB	65 dB	Structure or outdoor useable area[2] is <50 feet from the center of the closest (outside) lane on a street with existing or future ADTs >7,500
Multi-family, school, library, hospital, day care center, hotel, motel, park, convalescent home	Development Services Department ensures 45 dB pursuant to Title 24	65 dB	
Office, church, business, Professional uses	n/a	70 dB	Structure or outdoor useable area is <50 feet from the center of the closest lane on a street with existing or future ADTs >20,000
Commercial, retail, industrial, outdoor sports uses	n/a	75 dB	Structure or outdoor useable area is <50 feet from the center of the closest lane on a street with existing or future ADTs >40,000

Source: City of San Diego 2016.
Notes:
1 If a project is currently at or exceeds the significance thresholds for traffic noise described above, and noise levels would result in less than a 3-dB increase, then the impact is not considered significant.
2 Traffic counts are available from:
- San Diego Regional Association of Governments (SANDAG) Regional Economic Development Information
- System (REDI): http://cart.sandag.cog.ca.us/REDI/
- SANDAG Traffic Forecast Information Center: http://pele.sandag.org/trfic.html

Temporary Construction Noise

Temporary construction noise that exceeds 75 dBA Leq at a sensitive receptor would be considered significant. Construction noise levels measured at or beyond the property lines of any property zoned residential shall not exceed an average sound level greater than 75 dB during the 12-hour period from 7:00 a.m. to 7:00 p.m. In addition, construction activity is prohibited between the hours of 7:00 p.m. of any day and 7:00 a.m. of the following day, on Sundays or on legal holidays as specified in SDMC Section 21.04, with the exception of Columbus Day and Washington's Birthday. Exceptions may be granted for disturbing, excessive, or offensive noise with a permit issued by the Noise Abatement and Control Administrator, in conformance with SDMC Section 59.5.0404.

Additionally, where temporary construction noise would substantially interfere with normal business communication, or affect sensitive receptors, such as day care facilities, a significant noise impact may be identified.

Noise/Land Use Compatibility

The Guidelines present land use compatibility noise factors in Table K-4, which identify noise levels were land is considered compatible. Land uses that are typically considered noise-sensitive, such as residences, schools, libraries, nature preserves, hospitals, park and playgrounds, are compatible with noise levels of 60 dBA CNEL or below. This is largely consistent with the thresholds identified as compatible in the City of San Diego General Plan Noise Element land use compatibility table, presented above in Table 4 of this report.

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4 Project Analysis

Short-Term Construction

Development of the proposed project would generate noise levels associated with the operation of heavy construction equipment and construction related activities in the project area. Construction noise levels in the project area would fluctuate depending on the particular type, number, and duration of usage for the various pieces of equipment. Other factors that influence noise levels include the relative exposure and distance between the source and receptors. As discussed in Section 4, the proposed project would be developed in phases. Developments implemented during earlier phases would have the potential to expose the on-site noise-sensitive receptors of the earlier phases to construction noise levels associated with the later phases of project development (e.g., Phase 1 NSLU would be affected by the construction of Phase 2 and beyond). Construction noise associated with the proposed project is assessed with respect to the nearest existing residential receptors, at which the 75 dBA 12-hour Leq threshold would apply, per SDMC 59.5.0404(c).

The effects of construction noise depend largely on the types of construction activities occurring on any given day, noise levels generated by those activities, distances to noise-sensitive receptors, and the existing ambient noise environment in the vicinity of the receiver. Construction generally occurs in several discrete stages, with each phase varying the equipment mix and the resulting overall noise emission. These stages alter the characteristics of the noise environment generated on the project site and in the surrounding community for the duration of the construction phase. Construction stages for the proposed project are anticipated to include demolition, grading, utility infrastructure, building construction, paving and architectural coating.

To assess noise levels associated with the various equipment types and operations, construction equipment can be considered to operate in two modes, mobile and stationary. Mobile equipment sources move around a construction site performing tasks in a recurring manner (e.g., loaders, graders, dozers). Stationary equipment operates in a given location for an extended period of time to perform continuous or periodic operations. Thus, it is necessary to determine the location of stationary sources during specific phases, and the effective acoustical center of operations for mobile equipment during various phases of the construction process. The effective acoustical center is the idealized point from which the energy sum of all construction activity noise near and far would appear to originate. As one increases the distance between equipment and/or between areas with simultaneous construction activity, dispersion and attenuation over distance reduce the effects of the combined noise sources.

Operational characteristics of heavy construction equipment are additionally typified by short periods of full-power operation followed by periods of operation at lower power, idling, or powered-off conditions. These characteristics are accounted for through the application of typical usage factors (operational percentage) to the reference maximum noise levels. The FTA and FHWA have measured and documented maximum noise levels and operational characteristics for a wide range of construction machinery, which are summarized in Table 7.

Table 7. Construction Equipment Noise Emission Levels

Equipment Description	Acoustical Use Factor (%)	Lmax at 50ft (dBA, slow)1
Auger Drill Rig	20	85
Backhoe	40	80
Blasting[2]	-- N/A --	94

Table 7. Construction Equipment Noise Emission Levels

Equipment Description	Acoustical Use Factor (%)	Lmax at 50ft (dBA, slow)1
Compactor (ground)	20	93
Compressor (air)	40	80
Concrete Mixer Truck	40	85
Concrete Pump Truck	20	82
Concrete Saw	20	90
Crane	16	85
Dozer	40	85
Dump Truck	40	80
Excavator	40	85
Flat Bed Truck	40	84
Front End Loader	40	80
Generator	50	82
Grader	40	85
Jackhammer[2]	20	85
Mounted Impact Hammer (hoe ram) [2]	20	90
Pavement Scarafier	20	85
Paver	50	85
Pneumatic Tools	50	85
Pumps	50	77
Rock Drill	20	85
Roller	20	85
Scraper	40	85
Tractor	40	84
Vacuum Excavator (Vac-truck)	40	85

Notes: dBA = A-weighted decibels; Lmax = day-night average noise level.
1 – All equipment fitted with a properly maintained and operational noise control device, per manufacturer specifications.
2 – Impulsive/impact device.
Source: Federal Highway Administration 2006; Federal Transit Administration 2006.

Although specific designs and construction requirements for build out of the proposed project are currently unknown, it is anticipated that development of various project developments and phases would incorporate the use of typical construction fleet mixes. Based on the reference noise levels, usage rates, and operational characteristics discussed above, overall hourly average noise levels attributable to project construction activities were calculated by phase. Construction noise levels were predicted using reference noise emission data and operational parameters contained in the FHWA RCNM, the FTA guidance manual and the default construction fleet assumptions used in the air quality analysis. These construction stages are assumed to be consistent for all development phases of the proposed project. The resultant construction noise levels and the distance from construction activity to the SDMC 75 dBA Leq 12-hour noise level threshold are presented by phase in Table 8. Detailed construction noise modeling information can be found in Appendix D.

Table 8. Construction Noise Model Results Summary

Construction Stage Noise Levels (dBA L_{eq}) at 50 feet					
Demolition	*Grading*	*Dry & Wet Utilities*	*Paving*	*Building Construction*	*Architectural Coating*
87.2 dBA	86.2 dBA	85.9 dBA	85.5 dBA	86.8 dBA	76 dBA
Distance to City of San Diego 75 dBA Leq-12Hr Noise Level Threshold					
162 feet	136 feet	132 feet	128 feet	143 feet	55 feet

Notes: dBA = A-weighted decibels; L_{eq} = equivalent sound level

As shown in Table 8, noise levels for typical construction activities are predicted to generate maximum noise levels ranging from 76 to 87.2 dBA at a distance of 50 feet from the acoustical center of construction operations, depending on construction phase. Noise from localized point sources (e.g., heavy construction equipment, mobile-source construction noise, stationary-source construction noise) typically decrease at a rate of 6 dB to 7.5 dB with each doubling of distance between the noise source and the receptor. Conservatively assuming an attenuation rate of 6 dB per doubling of distance, construction operations and related activities would have the potential to generate exterior noise levels exceeding the SDMC construction noise threshold at distances ranging from 55 feet to 162 feet from the acoustical center of construction operations. Given the nature of the project site, being interspersed within existing residential land uses, the distance from the acoustical center of localized construction operations to the nearest existing noise-sensitive land uses would range from approximately 105 feet to 185 feet. With the proximate location of noise-sensitive land uses, the majority of construction operations associated with the proposed project would exceed the City's 75 dBA 12-hour average property line noise level threshold and, therefore, mitigation would be necessary. Recommended mitigation for construction noise is provided in **MM-NOI-1.**

As mentioned, future on-site noise-sensitive land uses developed during the earlier phases of the proposed project would also have the potential to be exposed construction noise levels generated by the later phases of development. However, the distance from the acoustical center of construction operations for subsequent development phases would range from approximately 250 feet to 1,000 feet to the nearest on-site future noise-sensitive receptors. As shown in Table 8, construction operations were calculated to attenuate (lessen) to within compliance of the City's construction noise level threshold at distances greater than 162 feet. Therefore, the predicted construction noise levels at future on-site receptors would comply with the City of San Diego 75 dBA 12-hour average property line noise level threshold.

With regard to the efficacy of recommended MM-NOI-1, application of noise control techniques affecting and controlling construction noise at the source (i.e., heavy equipment, generators) set forth in MM-NOI-1 can obtain reductions of 3 to 6 dBA; noise control techniques implemented along the path of the noise (i.e., temporary noise barriers, enclosures, relocation of equipment) has been shown to reduce construction noise levels between 2 to 7 dBA (Wu & Keller 2007). The overall noise level reduction achieved through implementation of the noise control techniques set forth in MM-NOI-1 is expected to range from 5 to 13 dBA.

Through the application of **MM-NOI-1** and through effective management of construction operations associated with the proposed project, construction noise levels are expected to comply with the City's 75 dBA property line noise level standard. Therefore, short-term construction noise levels generated by the proposed project would be less than significant with mitigation incorporated.

Groundborne Vibration

Construction activities on the project site may result in varying degrees of temporary groundborne vibration or noise, depending on the specific construction equipment used and the operations involved. Representative groundborne vibration levels for various types of construction equipment, developed by FTA, are summarized below in Table 9. As shown in Table 9, heavier pieces of construction equipment, such as a bulldozer, have been documented to generate peak particle velocities of approximately 0.089 in/sec PPV or less at a reference distance of 25 feet (DOT 2006). Pile driving and blasting are not currently expected to be utilized in the construction of the proposed project.

Groundborne vibration attenuates rapidly, even over short distances. The attenuation of groundborne vibration as it propagates from source to receptor through intervening soils and rock strata can be estimated with expressions found in FTA and Caltrans guidance. Using standard FTA vibration attenuation formulas, non-pile driving construction activities would exceed the FTA/Caltrans recommended threshold of significance of 0.2 in/sec. PPV at a distance of 15-feet or less. Heavy construction equipment would not operate within 15 feet of any sensitive receptor, as buildings associated with the existing sensitive receptors are located approximately 20-feet or more from their respective property lines, proposed project boundaries and construction areas.

It is notable that ground-borne vibrations from construction activities do not often reach the levels that can damage structures or affect activities that are not vibration sensitive, although the vibrations may be felt by nearby persons in close proximity and result in annoyance (FTA 2018). Additionally, the proposed project does not include elements that would generate ground-borne vibration during operation. As such, the proposed project's potential groundborne impact is considered less than significant.

Table 9. Representative Vibration Levels for Construction Equipment

Equipment		PPV at 25 feet (in/sec)[1,3]	Approximate Lv (VdB) at 25 feet[2]
Pile Driver (impact)	Upper range	1.518	112
	Typical	0.644	104
Pile Driver (vibratory/sonic)	Upper range	0.734	105
	Typical	0.170	93
Vibratory Roller		0.210	94
Hoe Ram		0.089	87
Large Bulldozer		0.089	87
Caisson Drilling		0.089	87
Heavy-duty Trucks (Loaded)		0.076	86
Jackhammer		0.035	79
Small Bulldozer		0.003	58

Source: DOT 2006

Notes:

1 Where PPV is the peak particle velocity.

2 Where Lv is the RMS velocity expressed in vibration decibels (VdB), assuming a crest factor of 4.

3 Vibration levels can be approximated at other locations and distances using the above reference levels and the following equation: PPVequip = PPVref (25/D)1.5 (in/sec); where "PPV ref" is the given value in the above table, "D" is the distance for the equipment to the new receiver in feet.

Long-Term Operational

Off-Site Roadway Traffic Noise

The proposed project would result in the creation of additional vehicle trips on regional and local roadways (i.e., Carmel Mountain Ranch, Rancho Carmel, Highland Ranch, Ted Williams Pkwy, and I-15), which could result in increased traffic noise levels at noise-sensitive land uses adjacent to area roadways. To assess the effect of project-generated traffic increases, traffic noise levels were modeled for roadway segments in the project vicinity based on FHWA Highway TNM prediction methodologies (FHWA 1998). Potential off-site noise impacts resulting from the increase in vehicular traffic on the local roadway network, associated with long-term operations of the proposed project, were evaluated under Existing conditions (2019), a Near-Term year (2025), and project Horizon year (2050) conditions with and without implementation of the proposed project.

Traffic volumes and the distribution of those volumes were obtained from the Traffic Impact Analysis prepared for the proposed project (LLG 2019). Average vehicle speeds on local area roadways were assumed to be consistent with posted speed limits and remain as such with or without implementation of the proposed project.

Table 10 through Table 12 summarize modeled CNEL traffic noise levels at noise prediction receiver locations, representing the outdoor activity areas of noise-sensitive land uses adjacent to roadway segments in the project vicinity. The tables also present relative traffic noise level increase (net change) resulting from implementation of the proposed project along with an evaluation of relative significance. Actual traffic noise exposure levels at noise-sensitive receptors in the project vicinity would vary depending on a combination of factors such as daily traffic volumes, relative distances between sources and receiver locations, shielding provided by existing and proposed structures, and meteorological conditions. Refer to Appendix C for complete modeling inputs and results.

As shown below in Table 10, modeled traffic noise levels along roadway segments in the vicinity of the proposed project approach or exceed the "normally acceptable" noise level threshold under the Existing No Project condition at a number of locations in the study area. To evaluate the effects of the proposed project, the potential for the project to increase the ambient noise level in the project's vicinity is also analyzed, and any such impacts are considered significant when they cause an increase of 3 dB from existing noise levels.

Table 10. Predicted Existing No Project and Existing Plus Project Traffic Noise Levels

Roadway	Segment From / To	Predicted Level, dBA CNEL			
		Existing	*Existing Plus Project*	*Net Change*	*Impact?*
Ted Williams Pkwy	I-15 to Rancho Carmel Dr.	58.7	59.0	<1	No
Ted Williams Pkwy	Rancho Carmel Dr. to Shoal Creek Dr.	72.9	73.2	<1	No
Ted Williams Pkwy	Shoal Creek Dr. to Carmel Ridge Rd.	73.7	73.9	<1	No
Ted Williams Pkwy	Carmel Ridge Rd. to Highland Ranch Rd.	69.2	69.4	<1	No
Ted Williams Pkwy	Highland Ranch Rd. to Pomerado Rd.	73.9	74.2	<1	No
Rancho Carmel Dr.	Provencal Place to Shoal Creek Dr.	66.5	66.9	<1	No
Rancho Carmel Dr.	Shoal Creek Dr. to Windcrest Lane	68.7	69.0	<1	No
Rancho Carmel Dr.	Windcrest Lane to Carmel Mountain Rd.	59.5	60.0	<1	No

Table 10. Predicted Existing No Project and Existing Plus Project Traffic Noise Levels

Roadway	Segment From / To	Predicted Level, dBA CNEL			
		Existing	*Existing Plus Project*	*Net Change*	*Impact?*
Carmel Mountain Rd.	Rancho Carmel Dr. to Stoney Peak Dr.	60.0	60.1	<1	No
Highland Ranch Rd.	World Trade Dr. to Eastbourne Rd.	66.4	66.7	<1	No
Highland Ranch Rd.	Eastbourne Rd. to Carmel Ridge Rd.	67.1	67.6	<1	No
Highland Ranch Rd.	Carmel Ridge Rd. to Ted Williams Pkwy.	65.5	65.8	<1	No
World Trade Dr.	Stoney Peak Dr. to Highland Ranch Rd.	55.8	55.9	<1	No
Interstate 15	South of Ted Williams Pkwy	73.7	73.7	<1	No
Interstate 15	Ted Williams Pkwy to Carmel Mountain Ranch Rd.	80.2	80.2	<1	No
Interstate 15	North of Carmel Mountain Ranch Rd.	78.7	78.7	<1	No

Source: Dudek 2020
Notes: dBA = A-weighted decibels; CNEL = Community Noise Equivalent Level
* Traffic noise levels are predicted at a standard distance of 100 feet from the roadway centerline and do not account for shielding from existing noise barriers or intervening structures. Traffic noise levels may vary depending on actual setback distances and localized shielding.

Existing (2019) traffic noise levels presented in Table 10 indicate that traffic noise levels in the project area currently range from approximately 56 to 80 dBA CNEL without the proposed project. Existing (2019) plus project traffic noise levels are predicted to remain the same; i.e., ranging from approximately 56 to 80 dBA CNEL. Development of the proposed project is calculated to result in a net change in traffic noise levels of less than 1 dB. Implementation and development of the project is therefore not projected to result in an increase in traffic noise levels of 3 dB CNEL or more at noise-sensitive receptors in the project area or contribute significantly to further degradation of the ambient noise environment.

Table 11. Predicted Near-Term (2025) No Project and Near-Term (2025) Plus Project Traffic Noise Levels

Roadway	Segment From / To	Predicted Level, dBA CNEL			
		Near-Term	*Near-Term Plus Project*	*Net Change*	*Impact?*
Ted Williams Pkwy	I-15 to Rancho Carmel Dr.	58.8	59.0	<1	No
Ted Williams Pkwy	Rancho Carmel Dr. to Shoal Creek Dr.	72.9	73.2	<1	No
Ted Williams Pkwy	Shoal Creek Dr. to Carmel Ridge Rd.	73.7	73.9	<1	No
Ted Williams Pkwy	Carmel Ridge Rd. to Highland Ranch Rd.	69.2	69.4	<1	No
Ted Williams Pkwy	Highland Ranch Rd. to Pomerado Rd.	74.0	74.2	<1	No
Rancho Carmel Dr.	Provencal Place to Shoal Creek Dr.	66.6	67.0	<1	No
Rancho Carmel Dr.	Shoal Creek Dr. to Windcrest Lane	68.7	69.0	<1	No
Rancho Carmel Dr.	Windcrest Lane to Carmel Mountain Rd.	59.6	60.0	<1	No

Table 11. Predicted Near-Term (2025) No Project and Near-Term (2025) Plus Project Traffic Noise Levels

Roadway	Segment From / To	Predicted Level, dBA CNEL			
		Near-Term	*Near-Term Plus Project*	*Net Change*	*Impact?*
Carmel Mountain Rd.	Rancho Carmel Dr. to Stoney Peak Dr.	60.0	60.2	<1	No
Highland Ranch Rd.	World Trade Dr. to Eastbourne Rd.	66.4	66.7	<1	No
Highland Ranch Rd.	Eastbourne Rd. to Carmel Ridge Rd.	67.1	67.6	<1	No
Highland Ranch Rd.	Carmel Ridge Rd. to Ted Williams Pkwy.	65.5	65.8	<1	No
World Trade Dr.	Stoney Peak Dr. to Highland Ranch Rd.	55.8	55.9	<1	No
Interstate 15	South of Ted Williams Pkwy	74.0	74.0	<1	No
Interstate 15	Ted Williams Pkwy to Carmel Mountain Ranch Rd.	80.4	80.4	<1	No
Interstate 15	North of Carmel Mountain Ranch Rd.	78.9	78.9	<1	No

Source: Dudek 2020
Notes: dBA = A-weighted decibels; CNEL = Community Noise Equivalent Level
* Traffic noise levels are predicted at a standard distance of 100 feet from the roadway centerline and do not account for shielding from existing noise barriers or intervening structures. Traffic noise levels may vary depending on actual setback distances and localized shielding.

Near-Term (2025) traffic noise levels presented in Table 11 indicate that traffic noise levels in the project area without the proposed project would range from approximately 56 to 80 dBA CNEL. Near-Term (2025) plus project traffic noise levels are predicted to remain the same, i.e., ranging from approximately 56 to 80 dBA CNEL. Development of the proposed project is calculated to result in a net change in traffic noise levels of less than 1 dB. Implementation and development of the proposed project is therefore not projected to result in an increase in traffic noise levels of 3 dB CNEL or more at noise-sensitive receptors in the project area or contribute significantly to further degradation of the ambient noise environment.

Table 12. Predicted Cumulative (2050) No Project and Cumulative (2050) Plus Project Traffic Noise Levels

Roadway	Segment From / To	Predicted Level, dBA CNEL			
		Horizon (2050)	*Horizon Plus Project*	*Net Change*	*Impact?*
Ted Williams Pkwy	I-15 to Rancho Carmel Dr.	59.8	60.0	<1	No
Ted Williams Pkwy	Rancho Carmel Dr. to Shoal Creek Dr.	73.7	74.0	<1	No
Ted Williams Pkwy	Shoal Creek Dr. to Carmel Ridge Rd.	74.1	74.3	<1	No
Ted Williams Pkwy	Carmel Ridge Rd. to Highland Ranch Rd.	69.6	69.8	<1	No
Ted Williams Pkwy	Highland Ranch Rd. to Pomerado Rd.	74.7	74.8	<1	No
Rancho Carmel Dr.	Provencal Place to Shoal Creek Dr.	68.0	68.3	<1	No
Rancho Carmel Dr.	Shoal Creek Dr. to Windcrest Lane	70.7	70.9	<1	No

Table 12. Predicted Cumulative (2050) No Project and Cumulative (2050) Plus Project Traffic Noise Levels

Roadway	Segment From / To	Predicted Level, dBA CNEL			
		Horizon (2050)	*Horizon Plus Project*	*Net Change*	*Impact?*
Rancho Carmel Dr.	Windcrest Lane to Carmel Mountain Rd.	61.0	61.3	<1	No
Carmel Mountain Rd.	Rancho Carmel Dr. to Stoney Peak Dr.	60.9	61.0	<1	No
Highland Ranch Rd.	World Trade Dr. to Eastbourne Rd.	67.0	67.3	<1	No
Highland Ranch Rd.	Eastbourne Rd. to Carmel Ridge Rd.	67.8	68.2	<1	No
Highland Ranch Rd.	Carmel Ridge Rd. to Ted Williams Pkwy.	66.2	66.5	<1	No
World Trade Dr.	Stoney Peak Dr. to Highland Ranch Rd.	56.5	56.7	<1	No
Interstate 15	South of Ted Williams Pkwy	64.9	74.9	<1	No
Interstate 15	Ted Williams Pkwy to Carmel Mountain Ranch Rd.	81.2	81.2	<1	No
Interstate 15	North of Carmel Mountain Ranch Rd.	79.7	79.7	<1	No

Source: Dudek 2020
Notes: dBA = A-weighted decibels; CNEL = Community Noise Equivalent Level
* Traffic noise levels are predicted at a standard distance of 100 feet from the roadway centerline and do not account for shielding from existing noise barriers or intervening structures. Traffic noise levels may vary depending on actual setback distances and localized shielding.

Cumulative (2050) traffic noise levels presented in Table 12 indicate that traffic noise levels in the project area without the proposed project would range from approximately 57 to 81 dBA CNEL. Cumulative (2050) plus project traffic noise levels are predicted to remain the same; i.e., ranging from approximately 57 to 81 dBA CNEL. Development of the proposed Project is calculated to result in a net change in traffic noise levels less than 1 dB under the cumulative scenario. Implementation and development of the project is therefore not projected to result in an increase in cumulative traffic noise levels of 3 dB CNEL or more at noise-sensitive receptors in the Project area or contribute significantly to further degradation of the ambient noise environment.

As presented in Table 10 through Table 12, the addition vehicular traffic associated with the proposed project would result in a CNEL increase of less than 1 dB, which is below the 3 dB discernible level of change for the average healthy human ear, and below the City of San Diego threshold for significant change in the ambient noise environment. Therefore, the proposed project is predicted to result in off-site traffic noise levels that are a **less-than-significant impact.**

On-Site Traffic Noise Compatibility

As previously discussed, the ambient noise environment in the project area is largely influenced by vehicular traffic on the local and regional roadway network. To determine compatibility of the proposed project with the existing and future ambient noise environments. The traffic noise model was further employed to evaluate noise levels at the outdoor activity areas (labeled as “recreation”) identified in the proposed project’s tentative map. Modeled existing plus project and future plus project noise levels at the receiver locations are present below in Table 13.

The traffic noise model does not account for shielding or level reductions provided by natural or man-made intervening structures, such as topography, earthen berms, buildings, barriers, etc. As such, in-situ noise levels on the proposed project site would likely be lower in comparison to the modeled noise levels within this analysis. Additionally, multi-family developments, such as those proposed with this project, generally include a common outdoor activity area that is typically located more central to the use and shielded from traffic noise by the associated intervening multi-family buildings. Locating the common use outdoor activity area more central to the use allows for placement of multi-family uses in closer proximity to traffic noise sources, while remaining in compliance with local land use compatibility standards.

Table 13. Predicted Existing and Cumulative (2050) Plus Project Traffic Noise Levels at Future On-Site NSLUs

Development Area	Noise Source	Distance from OAA to CL (feet)	Predicted Level, dBA CNEL		Level of Compatability1
			Existing Plus Project	Future Plus Project	
Hole 1	I-15	2,328	63.0	64.0	Compatible
	Rancho Carmel Dr.	1,110			
	Ted Williams Parkway	1,265			
Hole 2	I-15	1,930	63.9	64.9	Conditionally Compatible
	Rancho Carmel Dr.	810			
	Ted Williams Parkway	1,420			
Hole 5	I-15	850	69.2	70.2	Incompatible
	Rancho Carmel Dr.	230			
	Ted Williams Parkway	1,030			
Hole 6	I-15	1,350	66.7	67.8	Conditionally Compatible
	Rancho Carmel Dr.	310			
	Ted Williams Parkway	805			
Hole 8	I-15	2,625	64.3	65.0	Conditionally Compatible
	Rancho Carmel Dr.	1,300			
	Ted Williams Parkway	525			
Hole 10-11	I-15	4,360	55.6	56.1	Compatible
	Rancho Carmel Dr.	3,060			
	Carmel Mountain Rd	2,660			
	Highland Ranch Rd	1,050			
	Ted Williams Parkway	1,375			
Hole 16	I-15	4,000	55.2	55.9	Compatible
	Carmel Mountain Rd	1,775			
	World Trade Dr	1,075			
	Highland Ranch Rd	455			
	Ted Williams Parkway	2,200			

Table 13. Predicted Existing and Cumulative (2050) Plus Project Traffic Noise Levels at Future On-Site NSLUs

Development Area	Noise Source	Distance from OAA to CL (feet)	Predicted Level, dBA CNEL		Level of Compatability1
			Existing Plus Project	Future Plus Project	
Hole 17	I-15	3,550	60.8	61.4	Conditionally Compatible
	Carmel Mountain Rd	1,445			
	World Trade Rd	720			
	Highland Ranch Rd	445			
	Ted Williams Parkway	2,400			
Hole 9-18	I-15	3,350	54.1	54.8	Compatible
	Rancho Carmel Dr.	2,050			
	Carmel Mountain Rd	1,770			
	Ted Williams Parkway	1,630			
	Highland Ranch Rd	1,705			

Notes: dBA = A-weighted decibels; CNEL = Community Noise Equivalent Level
1- Level of compatibility within the City of San Diego Noise Compatibility Guidelines (Table 4), without accounting for intervening structure, topography or mitigation.
Source: Dudek 2020

As shown in Table 13, the outdoor activity areas identified on the tentative map meet the “compatible” or “conditionally compatible” use thresholds for existing and future traffic noise levels, without accounting for noise level reductions provided by intervening elements in the vicinity, with the exception of Hole 5.

Based on the modeled traffic noise level from I-15, Hole 5 would incompatible with the multi-family land use thresholds, not accounting for shielding provided by the existing earthen berm to the north of the site or the developments buildings. The earthen berm to the north would limit the exposure of the outdoor activity area to traffic noise being generated north of the proposed project and would likely provide a reduction of 2 to 3 dB from the calculated levels. Intervening buildings associated with the development would largely break line of sited to the outdoor activity area, resulting in a noise level reduction of 3 to 5 dB. Therefore, traffic noise levels at the common use outdoor activity area associated with Hole 5 are calculated to range from approximately 62 to 65 dB. Therefore, a multi-family use designed in accordance with the tentative map would be consistent with the conditionally acceptable threshold of the City of San Diego Land Use Compatibility guidelines.

Additionally, the project would be required to comply with the California Building Code and the City of San Diego Code, which require that interior noise levels be maintained at 45 dBA Ldn/CNEL or less. As Such, On-Site land use compatibility would be considered less-than-significant.

Non-Transportation Noise Sources

The incorporation of new single family and multi-family residences and open space / recreational uses included in the proposed project will add a variety of non-transportation noise sources to the existing community. The open space and recreational uses would attract residents and their guests and thus create new potential community noise.

Residential Mechanical Equipment

Mechanical equipment associated with residential land uses generally includes heating, ventilation, and air-conditioning (HVAC) equipment that can be a significant noise source. Noise levels generated by the HVAC and mechanical equipment vary significantly depending on unit size, efficiency, location, type of fan, and orientation of openings. For purposes of this analysis, each of the new occupied residential unit is assumed to feature a split-system type air-conditioning unit, with a refrigeration condenser unit mounted within a rooftop parapet (at multifamily residential) or installed at grade and near the residential façade, shielded from adjacent receptors (at single family or multi-family residential). The specific equipment types and location for outdoor HVAC equipment associated with the various elements of the proposed project are unknown; as such, outdoor HVAC equipment representative of what is typical for similar residential housing developments was assumed. Each outdoor HVAC condenser unit is anticipated to have a sound emission source level of 74 dBA at 3 feet (Johnson Controls 2010). Design guidelines for the proposed projects specify a 50-foot setback/buffer between existing residential property boundaries and new buildings. Assuming an attenuation rate of 6 dB per doubling of distance, and shielding that would break the line of site to the outdoor HVAC equipment, the noise level at the nearest receiving property line would be approximately 44.5 dBA L_{eq} during continuous operation. This would exceed that SDMC residential noise level standard of 40 dBA between 10 PM and 7 AM. As such, residential mechanical noise levels would be a **potentially significant** impact. Recommended mitigation for residential mechanical equipment is presented in **MM-NOI-2**, which would require the use of equipment that would inherently comply with the SMDC standards or the design of localized barriers to provide the necessary shielding of the mechanical equipment to achieve compliance with the SDMC standards. Implementation of **MM-NOI-2** would reduce residential mechanical equipment noise level exposure at adjacent noise-sensitive receiving property lines to comply with SDMC standards.

Outdoor Recreation and Gathering Spaces

The proposed project includes outdoor community amenities to promote outdoor recreation, play, social gatherings and events. Proposed outdoor spaces include trails, nature viewing areas, children's play areas, picnic areas, a space for outdoor performances and entertainment, farmers markets, and an open park area to support sporting activities and "movies in the park". Design details, such as location, capacity, specific activity elements, site configuration and design are unknown. Residents and community members enjoying the outdoor activity areas, interacting and cheering produce a wide range of sound levels, depending on the activity and individual enthusiasm. Due to the variability of participants, the associated acoustic power and unpredictable nature of recreational behavior, quantitative calculation of noise levels associated with the outdoor recreational activities would be excessively speculative. However, farmers markets, food truck events, performances and entertainment events typically incorporate or necessitate the use of amplified sound systems. Amplified sound systems are capable of producing sound levels in excess of 90 dB at a distance of 100 feet. Therefore, sound levels associated with the outdoor recreation activities and events would have the potential to exceed SDMC non-transportation noise standards, and impacts would be **potentially significant** prior to mitigation. **MM-NOI-3** provides recommendations to address outdoor recreation and event noise levels, which would limit activity to daytime and evening hours and require that events using amplified sound systems demonstrate compliance with the SDMC standards. Implementation of **MM-NOI-3** would reduce outdoor recreational and gathering space noise at adjacent noise-sensitive receiving property lines to comply with SDMC standards.

Commercial Land Uses

As discussed in the project description, the proposed project would include community commercial area slated to incorporate an art gallery/studio, a café/restaurant/banquet center and a caretaker unit, within unit 17. Specific site plans and locations for the amenities within the community commercial area have not yet been identified. The community commercial use would have the potential to generate additional vehicle trip, parking lot noise, shipping and receiving noise and mechanical noise.

The gallery/studio is anticipated to incorporate an outdoor studio area with a wood-burning ceramic kiln. Wood-burning kilns are most often custom built on-site, with site and purpose specific designs to accommodate the space available and the requirements of the product being produced. Some wood-burning kiln designs incorporate an intake or exhaust air fan to aid in controlling internal temperature and available oxygen that would contribute to the noise generated by the kiln. Depending on the kiln design, thermal air flows through the vents which can generate flow noise. Therefore sound levels associated with the proposed commercial land use would have the potential to exceed SDMC non-transportation noise standards, and impacts would be **potentially significant** prior to mitigation.

5 Mitigation Measures

MM-NOI-1 Construction Noise Reduction Techniques. Prior to issuance of demolition, grading, or building permits, Mitigation Monitoring Coordination shall verify that construction activity occurring as a result of proposed project implementation within 175 feet of noise-sensitive receivers includes noise-reduction measures to ensure construction activities do not exceed the 75 dBA CNEL and comply with City of San Diego Noise Standards (San Diego Municipal Code Section 59.5.0401, Sound Level Limits, and Section 59.5.0404, Construction Noise), as follows:

- Construction operations and related activities associated with the proposed project shall be performed during daytime hours, as outlined within the San Diego Municipal Code, between 7:00 AM and 7:00 PM, with the exception of the days and holidays identified in the Municipal Code.
- Construction equipment and vehicles shall be fitted with efficient, well-maintained mufflers that reduce equipment noise emission levels at the project site. Internal combustion powered equipment shall be equipped with properly operating noise suppression devices (e.g., mufflers, silencers, wraps) that meet or exceed manufacturer specifications. Mufflers and noise suppressors shall be properly maintained and tuned to ensure proper fit, function and minimization of noise.
- Portable and stationary site support equipment (such as generators, compressors, rock crushers, and cement mixers) shall be located at a point within the construction zone which is the greatest feasible distance from the closest off-site noise-sensitive receptors.
- Impact tools shall have the working area/impact area shrouded or shielded, with intake and exhaust ports on power equipment muffled or suppressed. The use of temporary or portable, application specific noise shields or barriers shall be required for use of impact tools within 150 feet of noise-sensitive receivers.
- Construction equipment shall not be idled for extended periods (e.g., 15 minutes or longer) of time within 50 feet of noise-sensitive receptors.
- A disturbance coordinator shall be designated by the general contractor, which will post contact information in a conspicuous location near the entrance of the project construction site, prior to start of any construction activities so that it is clearly visible to nearby receivers most likely to be disturbed. The coordinator shall catalog complaints resulting from the construction noise, attempt to remedy each complaint upon receipt, and submit a weekly record of noise complaints to the City building and safety division. Recurring disturbances shall be evaluated by a qualified acoustical consultant retained by the project proponent to ensure compliance with applicable standards.

MM-NOI-2 Minimize mechanical noise levels through equipment selection, project-site design, and construction of localized barriers (i.e., solid fences or landscape walls at the ground level or parapets for roof-mounted equipment). Selection of mechanical equipment shall consider radiated outdoor sound pressure levels and efficiency as the primary criteria. Outdoor residential mechanical equipment shall be located so that there is not a direct line of site from the equipment to the adjacent noise-sensitive receiving property line. As an alternative, localized noise barriers for equipment located at grade or rooftop parapets shall be constructed around the HVAC equipment so that line-of-site from the noise source to the property line of the adjacent noise-sensitive receptors is blocked. To ensure compliance with the San Diego Municipal Code, further noise analysis for any proposed exterior mechanical equipment shall be performed by a qualified acoustical consultant, with appropriate specifications provided for sound controls to meet applicable code requirements; the detailed mechanical equipment analysis and controls shall be submitted to the satisfaction of the City Development Services Department prior to the issuance of building permits for the project.

MM-NOI-3 Minimize excessive sound levels associated with outdoor recreation activities and community events through application of project-site design and limitations on event capacity, allowable sound amplification equipment and operational hours. Proposed recreational activity areas should be located in a manner to minimize noise exposure at surrounding noise-sensitive receptors, such as placing such recreational activity areas where structures, topography, or introduced barriers would be located between the recreational area and off-site receptors. Use of recreational areas immediately adjacent to noise-sensitive receptors should generally be limited to daytime hours (7 AM to 7 PM). Likewise, community events using areas of the property immediately adjacent to noise-sensitive receptors should generally be limited to daytime and evening hours (7 AM to 10 PM). The use of outdoor amplified sound systems should be prohibited unless a detailed noise evaluation demonstrates such systems would be in compliance with San Diego Municipal Code. To ensure compliance with the San Diego Municipal Code, further noise analysis shall be performed for proposed recreational outdoor activity areas and community event venues by a qualified acoustical consultant with appropriate specifications provided for sound controls to meet applicable code requirements; the detailed noise analysis and controls shall be submitted to the satisfaction of the City Development Services Department prior to the issuance of building permits for the project.

MM-NOI-4 Minimize commercial noise levels through project-site design, equipment selection and construction of noise barriers. The commercial land use shall designed in such a way to minimize exposure of adjacent noise-sensitive receptors to new noise generating sources of the commercial land use. As site plans and further details become available, a site-specific noise analysis shall be performed by a qualified acoustical consultant shall be submitted to City Development Services Department prior to the issuance of building permits for the project.

6 Summary of Findings

This noise report was conducted to predictively quantify construction and operation noise and vibration attributed to the proposed project. The results indicate that potential impacts during construction would be less than significant with mitigation (MM-NOI-1). Long-term noise impacts due to traffic noise would be less than significant. Long-term non-transportation noise sources associated with the proposed project would be less than significant with mitigation (MM-NOI-2, MM-NOI-3 and MM-NOI-4).

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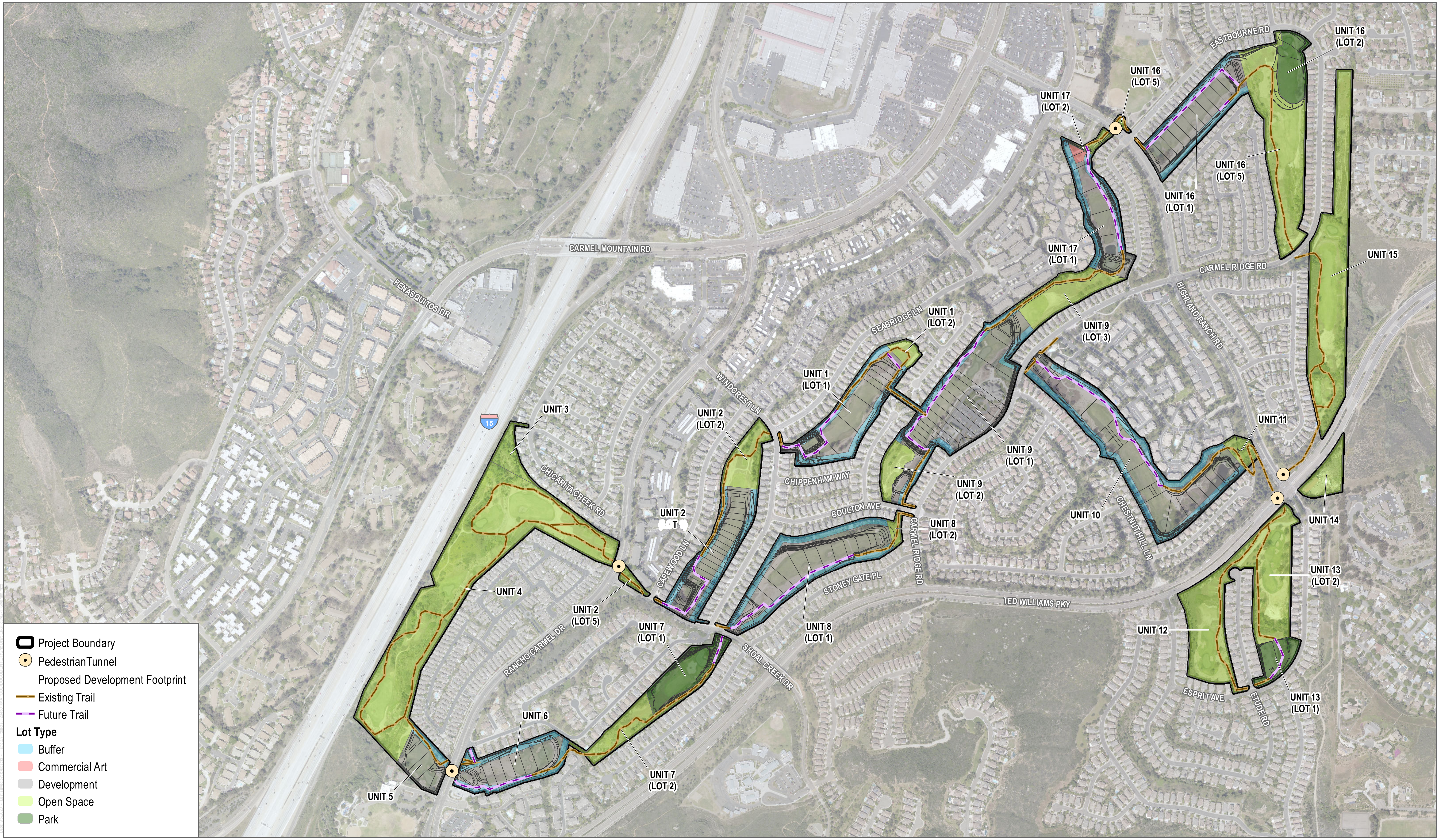

SOURCE: SANGIS 2017; SANGIS 2019; Project Design 2020

DUDEK

0 355 710 Feet

FIGURE 1

Site Plan

Trails at Carmel Mountain Ranch

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SOURCE: SANGIS 2017, 2019

DUDEK

0 360 720 Feet

FIGURE 2

Noise Monitoring Locations

Trails at Carmel Mountain Ranch

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SOURCE: SANGIS 2017, 2019

DUDEK

0 360 720 Feet

FIGURE 3

Traffic Noise Modeling Receiver Locations

Trails at Carmel Mountain Ranch

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7 References Cited

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Appendix A

Acoustics Fundamentals and Terminology

Acoustic Fundamentals

Acoustics is the scientific study that evaluates perception, propagation, absorption, and reflection of sound waves. Sound is a mechanical form of radiant energy, transmitted by a pressure wave through a solid, liquid, or gaseous medium. Sound that is loud, disagreeable, unexpected, or unwanted is generally defined as noise; consequently, the perception of sound is subjective in nature, and can vary substantially from person to person. Common sources of environmental noise and relative noise levels are shown in Figure A-1.

A sound wave is initiated in a medium by a vibrating object (e.g., vocal chords, the string of a guitar, the diaphragm of a radio speaker). The wave consists of minute variations in pressure, oscillating above and below the ambient atmospheric pressure. The number of pressure variation cycles occurring per second is referred to as the frequency of the sound wave and is expressed in hertz (Hz), which is equivalent to one complete cycle per second.

Directly measuring sound pressure fluctuations would require the use of a very large and cumbersome range of numbers. To avoid this and have a more useable numbering system, the decibel (dB) scale was introduced. Sound level expressed in decibels (dB) is the logarithmic ratio of two like pressure quantities, with one pressure quantity being a reference sound pressure and the second pressure being that of the sound source of concern. For sound pressure in air, the standard reference quantity is generally considered to be 20 micropascals, which directly corresponds to the threshold of human hearing. The use of the decibel is a convenient way to handle the million-fold range of sound pressures to which the human ear is sensitive. A decibel is logarithmic; it does not follow normal algebraic methods and cannot be directly added. For example, a 65 dB source of sound, such as a truck, when joined by another 65 dB source results in a sound amplitude of 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by 3 dB). A sound level increase of 10 dB corresponds to 10 times the acoustical energy, and an increase of 20 dB equates to a 100-fold increase in acoustical energy.

The loudness of sound perceived by the human ear depends primarily on the overall sound pressure level and frequency content of the sound source. The human ear is not equally sensitive to loudness at all frequencies in the audible spectrum. To better relate overall sound levels and loudness to human perception, frequency-dependent weighting networks were developed. The standard weighting networks are identified as A through E. There is a strong correlation between the way humans perceive sound and A-weighted sound levels (dBA). For this reason, the dBA can be used to predict community response to noise from the environment, including noise from transportation and stationary sources. Sound levels expressed as dB in this section are A-weighted sound levels, unless noted otherwise.

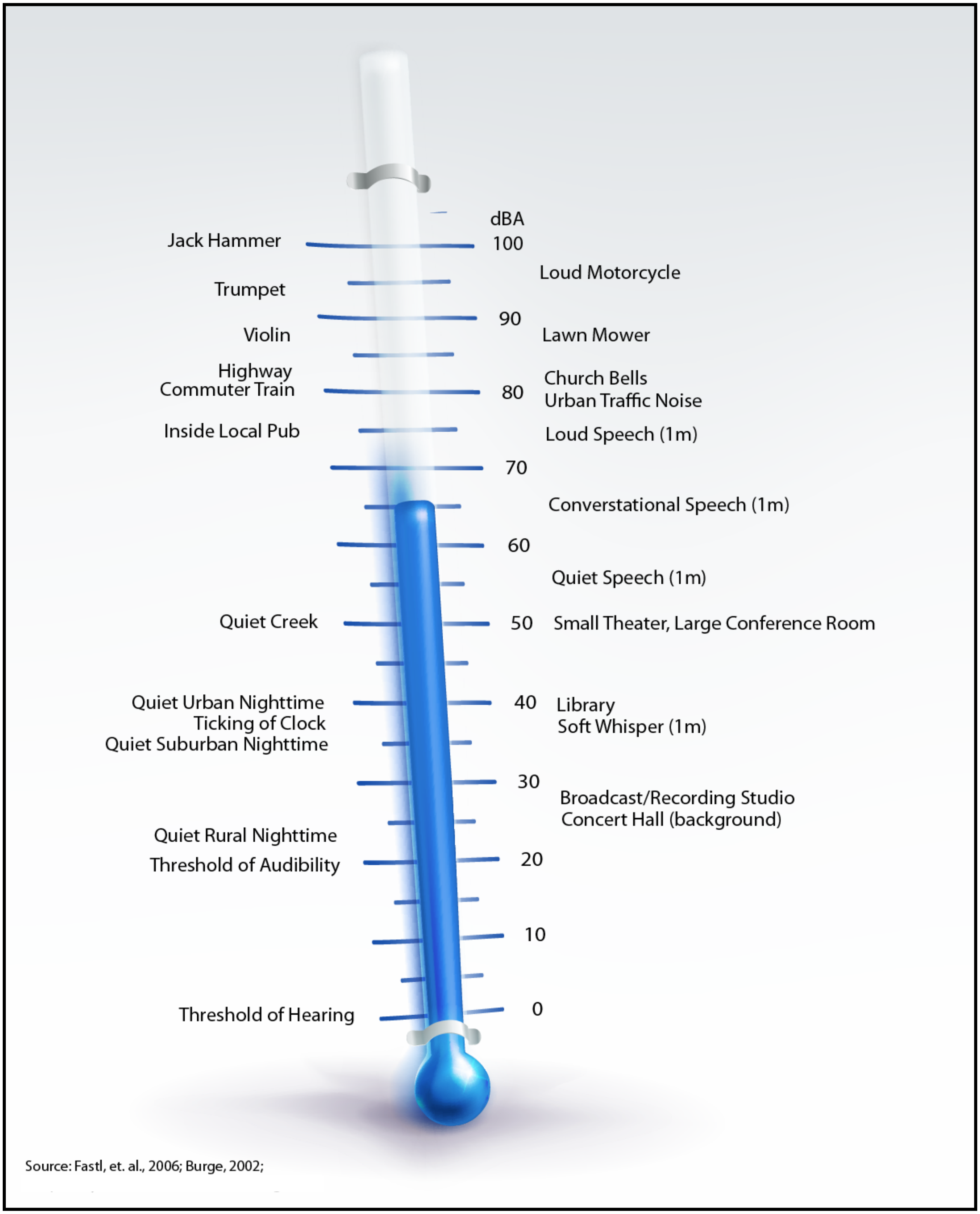

Figure A-1 -Common Noise Sources and Levels.

Noise can be generated by a number of sources, including mobile sources (transportation noise) such as automobiles, trucks, and airplanes and stationary sources (non-transportation noise) such as construction sites, machinery, and commercial and industrial operations. As acoustic energy spreads through the atmosphere from the source to the receiver, noise levels attenuate (decrease) depending on ground absorption characteristics, atmospheric conditions, and the presence of physical barriers (e.g., walls, building façades, berms). Noise generated from mobile sources generally attenuate at a rate of 3dBA (typical for hard surfaces, such as asphalt) to 4.5 dBA (typical for soft surfaces, such as grasslands) per doubling of distance, depending on the intervening ground type. Stationary noise sources spread with more spherical dispersion patterns that attenuate at a rate of 6 to 7.5 dBA per doubling of distance for hard and soft sites, respectively.

Atmospheric conditions such as wind speed, turbulence, temperature gradients, and humidity may additionally alter the propagation of noise and affect levels at a receiver. Furthermore, the presence of a large object (e.g., barrier, topographic features, and intervening building façades) between the source and the receptor can provide significant attenuation of noise levels at the receiver. The amount of noise level reduction or “shielding” provided by a barrier primarily depends on the size of the barrier, the location of the barrier in relation to the source and receivers, and the frequency spectra of the noise. Natural barriers such as berms, hills, or dense woods as well as man-made features such as buildings, berms and walls may be effective barriers for the reduction of source noise levels.

Noise Level Descriptors

The intensity of environmental noise levels can fluctuate greatly over time and as such, several different descriptors of time-averaged noise levels may be used to provide the most effective means of expressing the noise levels. The selection of a proper noise descriptor for a specific source depends on the spatial and temporal distribution, duration, and fluctuation of both the noise source and the environment near the receptor(s). Noise descriptors most often used to describe environmental noise are defined below.

Lmin (Minimum Noise Level): The minimum noise level during a specific period of time, while accounting for the appropriate weighting curve and response setting (i.e., A-weighted, slow).

Lmax (Maximum Noise Level): The maximum instantaneous noise level during a specific period of time, while accounting for the appropriate weighting curve and response setting (i.e., A-weighted, slow).

SEL (Sound Exposure Level): The cumulative exposure to sound energy over a stated period of time.

Ln (Statistical Descriptor): The noise level exceeded “n”% of a specific period of time. For example, L50 is the median noise level, or level exceeded 50% of the time (typically equated to the noise level exceeded 30-minutes out of the hour).

Leq (Equivalent Noise Level): The energy-average noise level or exposure, from all noise events that occur in a specified period; such as one-minute, one-hour, 24-hours, etc. Leq can be used to report results of short-term noise measurements, usually ranging between 15 minutes and 1 hour, to supplement longer term measurements.

Ldn (Day-Night Average Noise Level): The 24-hour Leq with a 10-dBA "penalty" for noise events that occur during the noise-sensitive hours between 10 p.m. and 7 a.m. In other words, 10 dBA is "added" to noise events that occur in the nighttime hours, and this generates a higher reported noise level when determining compliance with noise standards. The Ldn attempts to account for the fact that noise during this specific period of time is a potential source of disturbance with respect to normal sleeping hours.

CNEL (Community Noise Equivalent Level): The CNEL is similar to the Ldn described above, but with an additional 5-dBA "penalty" added to noise events that occur during the noise-sensitive hours between 7 p.m. and 10 p.m., which are typically reserved for relaxation, conversation, reading, and television. When the same 24-hour noise data are used, it is typical for the reported CNEL to be approximately 0.5 dBA higher than the Ldn.

Community noise is commonly described in terms of the ambient noise level which is defined as the all-encompassing noise level associated with a given noise environment. A common statistical tool to measure the ambient noise level is the average, or equivalent sound level (Leq)which corresponds to the steady-state A-weighted sound level containing the same total energy as the time-varying signal over a given time period (usually one hour). The Leq is the foundation of the composite noise descriptors such as Ldn and CNEL, as defined above, and shows very good correlation with community response to noise. Use of these descriptors along with the maximum noise level occurring during a given time period provides a great deal of information about the ambient noise environment in an area.

Effect of Noise on Humans

Excessive and chronic exposure to elevated noise levels can result in auditory and non-auditory effects on humans. Auditory effects of noise on people are those related to temporary or permanent hearing loss caused by loud noises. Non-auditory effects of exposure to elevated noise levels are those related to behavioral and physiological effects. The non-auditory behavioral effects of noise on humans are associated primarily with the subjective effects of annoyance, nuisance and dissatisfaction, which lead to interference with activities such as communications, sleep and learning. The non-auditory physiological health effects of noise on humans have been the subject of considerable research attempting to discover correlations between exposure to elevated noise levels and health problems, such as hypertension and cardiovascular disease. The mass of research infers that noise-related health issues are predominantly the result of behavioral stressors and not a direct noise-induced response. The extent to which noise contributes to non-auditory health effects remains a subject of considerable research, with no definitive conclusions.

The degree to which noise results in annoyance and interference is highly subjective and may be influenced by several non-acoustic factors. The number and effect of these non-acoustic environmental and physical factors vary depending on individual characteristics of the noise environment such as sensitivity, level of activity, location, time of day, and length of exposure. One key aspect in the prediction of human response to new noise environments is the individual level of adaptation to an existing noise environment. The greater the change in the noise levels that are attributed to a new noise source, relative to the environment an individual has become accustomed to, the less tolerable the new noise source will be to an individual.

With respect to how humans perceive and react to changes in noise levels, a 1 dBA increase is generally imperceptible outside of a laboratory environment, a 3 dBA increase is barely perceptible, a 6 dBA increase is clearly noticeable, and a 10-dBA increase is subjectively perceived as approximately twice as loud (Egan 1988). These subjective reactions to changes in noise levels was developed on the basis of test subjects' reactions to changes in the levels of steady-state, pure tones or broad-band noise and to changes in levels of a given noise source. Perception and reaction to changes in noise levels in this manner is thought to be most applicable in the range of 50 to 70 dBA, as this is the usual range of voice and interior noise levels.

Vibration Fundamentals

Vibration is similar to noise in that it is a pressure wave traveling through an elastic medium involving a periodic oscillation relative to a reference point. Vibration is most commonly described in respect to the excitation of a structure or surface, such as in buildings or the ground. Human and structural response to different vibration levels is influenced by a number of factors, including ground type, distance between source and receptor, duration, and the number of perceived vibration events. Sources of vibration include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) and those introduced by human activity (e.g., explosions, machinery, traffic, trains, construction equipment). Vibration sources may be continuous, (e.g., operating factory machinery) or transient in nature (e.g., explosions, impacts). Vibration levels can be depicted in terms of amplitude and frequency; relative to displacement, velocity, or acceleration.

Vibration amplitudes are commonly expressed in peak particle velocity (PPV) or root-mean-square (RMS) vibration velocity. PPV is defined as the maximum instantaneous positive or negative peak of a vibration signal, or the quantity of displacement measured from peak to trough of the vibration wave. Root-mean-square is defined as the positive and negative statistical measure of the magnitude of a varying quantity. The RMS of a signal is the average of the squared amplitude of the signal, typically calculated over a period of one second. PPV is typically used in the monitoring of transient and impact vibration and has been found to correlate well to the stresses experienced by buildings (Federal Transit Administration [FTA] 2006, California Department of Transportation [Caltrans] 2004). PPV and RMS vibration velocity are nominally described in terms of inches per second (in/sec). However, as with airborne sound, vibration velocity can also be expressed using decibel notation as vibration decibels (VdB). The logarithmic nature of the decibel serves to compress the broad range of numbers required to describe vibration and allow for the presentation of vibration levels in familiar terms.

Although PPV is appropriate for evaluating the potential for building damage, it is not always suitable for evaluating human response. Human response to vibration has been found to correlate well to average vibration amplitude; therefore, vibration impacts on humans are evaluated in terms of RMS vibration velocity.

Typical outdoor sources of perceptible groundborne vibration include construction equipment, steel-wheeled trains, and traffic on rough roads. Although the effects of vibration may be imperceptible at low levels, effects may result in detectable vibrations and slight damage to nearby structures at moderate and high levels, respectively. At the elevated levels of vibration, damage to structures is primarily architectural (e.g., loosening and cracking of plaster or stucco coatings) and rarely results in damage to structural components. The range of vibration relevant to this analysis occurs from approximately 60 VdB, which is the typical background vibration-velocity level; to 100 VdB, which is the general threshold where minor damage can occur in fragile buildings (FTA 2006).

Appendix B

Baseline Noise Measurement Field Data

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FIELD DATA REPORT

Field Noise Measurement Data

Record: 1187	
Project Name	*Carmel mountain*
Observer(s)	*Connor Burke*
Date	*2019-09-03*

Meteorological Conditions	
Temp (F)	*91*
Humidity % (R.H.)	*44*
Wind	*Calm*
Wind Speed (MPH)	*6*
Wind Direction	*East*
Sky	*Sunny*

Instrument and Calibrator Information	
Instrument Name List	*(ENC) Rion NL-52*
Instrument Name	*(ENC) Rion NL-52*
Instrument Name Lookup Key	*(ENC) Rion NL-52*
Manufacturer	*Rion*
Model	*NL-52*
Serial Number	*553896*
Calibrator Name	*(ENC) LD CAL150*
Calibrator Name	*(ENC) LD CAL150*
Calibrator Name Lookup Key	*(ENC) LD CAL150*
Calibrator Manufacturer	*Larson Davis*
Calibrator Model	*LD CAL150*
Calibrator Serial #	*5152*
Pre-Test (dBA SPL)	*94*
Post-Test (dBA SPL)	*94*
Windscreen	*Yes*
Weighting?	*A-WTD*
Slow/Fast?	*Slow*
ANSI?	*Yes*

Monitoring	
Record #	*1*
Site ID	*ST1*
Site Location Lat/Long	*32.972335, -117.085535*
Begin (Time)	*10:12:00*
End (Time)	*10:22:00*
Leq	*60.1*
Lmax	*68.7*
Lmin	*52.2*
Other Lx?	*L90, L50, L10*
L90	*54.9*
L50	*57.5*
L10	*63.80*
Other Lx (Specify Metric)	*L*
Primary Noise Source	*Traffic*
Other Noise Sources (Background)	*Birds, Distant Aircraft, Distant Traffic, Rustling Leaves*
Is the same instrument and calibrator being used as previously noted?	*Yes*
Are the meteorological conditions the same as previously noted?	*Yes*

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CREATOR OF KERATA TECHNOLOGY

FIELD DATA REPORT

Source Info and Traffic Counts	
Number of Lanes	*4*
Lane Width (feet)	*10*
Roadway Width (feet)	*40*
Roadway Width (m)	*12.2*
Distance to Roadway (feet)	*20*
Distance to Roadway (m)	*6.1*
Distance Measured to Centerline or Edge of Pavement?	*Edge of Pavement*
Estimated Vehicle Speed (MPH)	*45*

Traffic Counts	
Vehicle Count Summary	*A 100, MT 1, HT 0, B 0, MC 0*
Select Method for Recording Count Duration	*Enter Manually*
Counting Both Directions?	*Yes*
Count Duration (minutes)	*10*
Vehicle Count Tally	
Select Method for Vehicle Counts	*Enter Manually*
Number of Vehicles - Autos	*100*
Number of Vehicles - Medium Trucks	*1*
Number of Vehicles - Heavy Trucks	*0*
Number of Vehicles - Buses	*0*
Number of Vehicles - Motorcyles	*0*

Description / Photos

Site Photos	
Photo	
Comments / Description	*Facing east.*

DUDEK
CREATOR OF KERATA TECHNOLOGY

FIELD DATA REPORT

Monitoring	
Record #	*2*
Site ID	*ST2*
Site Location Lat/Long	*32.971633, -117.080768*
Begin (Time)	*10:30:00*
End (Time)	*10:45:00*
Leq	*47*
Lmax	*54.8*
Lmin	*44.7*
Other Lx?	*L90, L50, L10*
L90	*45.8*
L50	*46.8*
L10	*48*
Other Lx (Specify Metric)	*L*
Primary Noise Source	*Distant traffic*
Other Noise Sources (Background)	*Birds, Distant Aircraft, Distant Traffic*
Is the same instrument and calibrator being used as previously noted?	*Yes*
Are the meteorological conditions the same as previously noted?	*Yes*

Description / Photos

Site Photos

Photo	
Comments / Description	*Facing south.*

FIELD DATA REPORT

Monitoring

Record #	*3*
Site ID	*ST3*
Site Location Lat/Long	*32.976529, -117.076340*
Begin (Time)	*10:50:00*
End (Time)	*11:05:00*
Leq	*45*
Lmax	*52.6*
Lmin	*43.3*
Other Lx?	*L90, L50, L10*
L90	*44*
L50	*44.8*
L10	*46.2*
Other Lx (Specify Metric)	*L*
Primary Noise Source	*Mechanical equipment at clubhouse*
Other Noise Sources (Background)	*Birds, Distant Aircraft, Distant Gardener / Landscape Noise, Distant Traffic, Rustling Leaves*
Is the same instrument and calibrator being used as previously noted?	*Yes*
Are the meteorological conditions the same as previously noted?	*Yes*

Description / Photos

Site Photos

Photo

DUDEK
CREATOR OF KERATA TECHNOLOGY

FIELD DATA REPORT

Monitoring

Record #	4
Site ID	ST4
Site Location Lat/Long	32.981046, -117.071756
Begin (Time)	11:10:00
Leq	57.2
Lmax	68
Lmin	44.9
Other Lx?	L90, L50, L10
L90	47.2
L50	53.9
L10	61.2
Other Lx (Specify Metric)	L
Primary Noise Source	Traffic
Other Noise Sources (Background)	Birds, Distant Aircraft, Rustling Leaves
Is the same instrument and calibrator being used as previously noted?	Yes
Are the meteorological conditions the same as previously noted?	Yes

Source Info and Traffic Counts

Number of Lanes	4
Lane Width (feet)	10
Roadway Width (feet)	40
Roadway Width (m)	12.2
Distance to Roadway (feet)	25
Distance to Roadway (m)	7.6
Distance Measured to Centerline or Edge of Pavement?	Edge of Pavement
Estimated Vehicle Speed (MPH)	40

Traffic Counts

Vehicle Count Summary	A 100, MT 0, HT 0, B 1, MC 0
Select Method for Recording Count Duration	Enter Manually
Counting Both Directions?	Yes
Count Duration (minutes)	10
Vehicle Count Tally	
Select Method for Vehicle Counts	Enter Manually
Number of Vehicles - Autos	100
Number of Vehicles - Medium Trucks	0
Number of Vehicles - Heavy Trucks	0
Number of Vehicles - Buses	1
Number of Vehicles - Motorcyles	0

Description / Photos

DUDEK
CREATOR OF KERATA TECHNOLOGY

FIELD DATA REPORT

Site Photos

Photo	

Monitoring

Record #	*5*
Site ID	*ST5*
Site Location Lat/Long	*32.971621, -117.070055*
Begin (Time)	*11:35:00*
End (Time)	*11:45:00*
Leq	*52.5*
Lmax	*633*
Lmin	*43*
Other Lx?	*L90, L50, L10*
L90	*46.8*
L50	*51.2*
L10	*54.6*
Other Lx (Specify Metric)	*L*
Primary Noise Source	*Traffic*
Is the same instrument and calibrator being used as previously noted?	*Yes*
Are the meteorological conditions the same as previously noted?	*Yes*

Source Info and Traffic Counts

Number of Lanes	*4*
Lane Width (feet)	*10*
Roadway Width (feet)	*40*
Roadway Width (m)	*12.2*
Distance to Roadway (feet)	*60*
Distance to Roadway (m)	*18.3*
Distance Measured to Centerline or Edge of Pavement?	*Edge of Pavement*
Estimated Vehicle Speed (MPH)	*40*

Traffic Counts	
Vehicle Count Summary	*A 220, MT 4, HT 0, B 0, MC 1*
Select Method for Recording Count Duration	*Enter Manually*
Counting Both Directions?	*Yes*
Count Duration (minutes)	*10*
Vehicle Count Tally	
Select Method for Vehicle Counts	*Enter Manually*
Number of Vehicles - Autos	*220*
Number of Vehicles - Medium Trucks	*4*
Number of Vehicles - Heavy Trucks	*0*
Number of Vehicles - Buses	*0*
Number of Vehicles - Motorcyles	*1*

Appendix C

Traffic Noise Modeling Input and Output

Appendix C

Traffic Noise Modeling Calculations - References

Citation	Reference
1	Caltrans Technical Noise Supplement. 2009 (November). Table (5-11), Pg 5-60.
2	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-26), Pg 5-60.
3	Caltrans Technical Noise Supplement. 2009 (November). Equation (2-16), Pg 2-32.
4	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-11), Pg 5-47, 48.
5	Caltrans Technical Noise Supplement. 2009 (November). Equation (2-26), Pg 2-55, 56.
6	Caltrans Technical Noise Supplement. 2009 (November). Equation (2-27), Pg 2-57.
7	Caltrans Technical Noise Supplement. 2009 (November). Pg 2-53.
8	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-7), Pg 5-45.
9	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-8), Pg 5-45.
10	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-9), Pg 5-45.
11	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-13), Pg 5-49.
12	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-14), Pg 5-49.
13	Federal Highway Administration Traffic Noise Model Technical Manual. Report No. FHWA-PD-96-010. 1998 (January). Equation (16), Pg 67
14	Federal Highway Administration Traffic Noise Model Technical Manual. Report No. FHWA-PD-96-010. 1998 (January). Equation (20), Pg 69
15	Federal Highway Administration Traffic Noise Model Technical Manual. Report No. FHWA-PD-96-010. 1998 (January). Equation (18), Pg 69

Appendix D

Construction Noise Modeling Input and Output

Appendix D-1

Project-Generated Construction Source Noise Prediction Model
The Trails at Carmel Mountain Ranch - Demolition

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold*	162	74.0
	50	87.2
	100	79.5
	150	74.9
	200	71.7
	250	69.2
	300	67.1
	350	65.4
	400	63.9
	450	62.6
	500	61.4
	550	60.3

Equipment Assumptions	Qty.	Reference Emission Noise Levels (Lmax) at 50 feet[1]	Usage Factor[1]
Concrete Saw	**1**	90	0.2
Dozer	**1**	85	0.4
Dump Truck	**1**	84	0.4
Tractor	**1**	84	0.4

Ground Type	Soft
Source Height	5
Receiver Height	5
Ground Factor	0.58

Predicted Noise Level[2]	L_{eq} dBA at 50 feet[2]
Concrete Saw	83.0
Dozer	81.0
Dump Truck	80.0
Tractor	80.0

Predicted Combined Noise Level (L_{eq} dBA at 50 feet)
87.2

Sources:
1 - Obtained from the FHWA Roadway Construction Noise Model, January 2006.
2 - Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.
L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50)
Where: E.L. = Emission Level;
U.F.= Usage Factor;
G = Constant that accounts for topography and ground effects; and
D = Distance from source to receiver.
*Project specific threshold