HARMONY GROVE VILLAGE SOUTH

APPENDIX G

ACOUSTICAL ANALYSIS REPORT

to the

DRAFT ENVIRONMENTAL IMPACT REPORT

PDS2015-GPA-15-002; PDS2015-SP-15-002
PDS2015-TM-5600; PDS2015-REZ-15-003
PDS2015-MUP-15-008; PDS2015-ER-15-08-006

APRIL 2017

Prepared for:
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HELIX Environmental Planning

Harmony Grove Village South Project

Acoustical Analysis Report

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March 2017

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GLOSSARY OF TERMS AND ACRONYMS

ADT	average daily trip (roadway traffic)
ANSI	American National Standards Institute
APN	Assessor's Parcel Number
CAD	Computer Aided Design
CadnaA	Computer Aided Noise Abatement
CFR	Code of Federal Regulations
CNEL	Community Noise Equivalent Level
County	County of San Diego
dB	decibel
dBA	A-weighted decibels
dBC	C-weighted noise level
ft	feet
HGV South	Harmony Grove Village South
HVAC	Heating, ventilating, and air conditioning
Hz	Hertz
in/sec	inches per second
I-15	Interstate 15
kHz	kilohertz
L_{DN}	day-night level
L_{EQ}	equivalent sound level
LLG	Linscott, Law & Greenspan Engineers
mPa	micro-Pascals
mph	miles per hour
ms	millisecond
NSLU	Noise-sensitive land use
OSM	Office of Surface Mining Reclamation and Enforcement
PPV	peak particle velocity
Project	Harmony Grove Village South
RCNM	Roadway Construction Noise Model
rms	root mean square

GLOSSARY OF TERMS AND ACRONYMS (cont.)

SF	square feet (foot)
SPL	sound pressure level
SR	State Route
STC	Sound Transmission Class
S_{WL}	sound power level
TIA	Traffic Impact Analysis
TNM	Traffic Noise Model
USDOT	U.S. Department of Transportation
WTWRF	wastewater treatment and water reclamation facility

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EXECUTIVE SUMMARY

This report presents an assessment of potential construction and operational noise impacts associated with the proposed Harmony Grove Village South (HGV South) Project.

HGV South is located on an approximately 111-acre site in an unincorporated portion of San Diego County near the City of Escondido. HGV South includes 453 multi- and single-family residential units, a limited neighborhood community/commercial site, and related uses such as access roads, parks and open space. HGV South would have 13 parks, including a basketball court and dog park. HGV South includes construction best management practices to minimize noise from blasting and pile driving to noise sensitive receptors.

Construction of HGV South may cause potentially significant noise impacts to surrounding residences. If a breaker is utilized on site and operates within 125 feet of the nearest property line of an occupied residence, the breaker noise may exceed the County of San Diego's (County) noise limits. To reduce potential breaker impacts to below significant levels, a breaker shall not generate maximum noise levels that exceed 82 A-weighted decibels (dBA) when measured at the property line for 25 percent of a one-hour period, or be used within 125 feet of the property line for any occupied residence. Material that would require a breaker shall be moved a minimum distance of 125 feet from the nearest residence. Additionally, if a rock crusher is required as part of construction, it shall not be used within 250 feet of the property line unless a temporary noise barrier or berm is constructed to reduce the noise levels from the rock crusher to below a level of significance at the adjacent occupied residences.

If blasting is necessary for HGV South construction, impacts to off-site residences and other land uses would be potentially significant. To reduce potential impacts, the following mitigation measures would be required: (1) blasts would be limited to three per week; (2) a blasting management plan would be implemented (in compliance with the County Consolidated Fire Code); and (3) if boulders must be reduced in size within 200 feet of the closest residence, they would be reduced via chemical expansion.

Residential and commercial heating, ventilation, and air conditioning (HVAC) noise from the condensers would not exceed allowable County limits for operational sources. In addition, the parks nearest to County Club Drive (conservatively assumed as passive parks) would not exceed the County's 65 Community Noise Equivalent Level (CNEL) limit for passive parks. The proposed dog park and basketball court would not generate noise that would exceed County thresholds at future on-site residences.

HGV South is currently proposed to include an on-site wastewater treatment and water reclamation facility (WTWRF). Noise generated by the WTWRF equipment, especially by the diesel generator, could have the potential to exceed allowable levels. Mitigation would include a 6-foot high noise wall and demonstration that the final design for the WTWRF with the noise wall complies with the County limits for operational noise.

Traffic noise generated by vehicles on adjacent streets could also result in noise levels greater than the noise limits. Exterior noise levels for the two single-family residences identified as R9 and R10 in Figure 4 may be in excess of the most restrictive 60 CNEL limit within the County

Noise Element. In addition, because building façade noise levels may exceed 60 CNEL, traditional architectural materials would not be expected to attenuate interior noise to a level of 45 CNEL. Mitigation is required to reduce exterior noise levels to below 60 dBA CNEL. This would be accomplished through the installation of one 5-foot high sound wall along the northern perimeter of the two affected residences, with approximately 20-foot long return walls along the western perimeter of the western residence (R9) and the eastern perimeter of the eastern residence (R10).

The upper stories of residences R9 and R10 may be exposed to noise in excess of 60 CNEL even after the installation of the 5-foot-high sound wall, and interior noise levels may exceed 45 CNEL. In accordance with standard County requirements, additional exterior to interior noise analysis would need to be conducted where exterior noise levels are expected to exceed 60 CNEL.

1.0 INTRODUCTION

1.1 Project Location

The proposed Harmony Grove Village South (HGV South) Project includes an approximately 111-acre site in an unincorporated portion of San Diego County in the community of Harmony Grove (Figure 1, *Regional Location*, and Figure 2, *Project Vicinity [Aerial Photograph]*). HGV South contains parcels with the following Assessor Parcel Numbers (APNs): 235-011-06-00, 238-021-08-00, 238-021-09-00, and 238-021-10-00. The HGV South site is currently zoned as Limited Agriculture (A-70), with a small patch of Rural Residential (R-R) in the southwest corner; HGV South proposes a rezone to Specific Plan (S88). The HGV South site is located approximately 2.5 miles west of Interstate 15 (I-15) and approximately 2.6 miles south of State Route (SR-) 78. Escondido Creek flows east-west just north of HGV South, and the City of Escondido is located to the east. The community of Elfin Forest is located to the west. San Diego County open-space parcels (part of the Del Dios Highland Preserve) abut the southern boundary of HGV South. The western HGV South boundary is adjacent to Country Club Drive. Primary access to the HGV South site is provided by Harmony Grove Road and Country Club Drive.

1.2 Project Description

HGV South would contain 453 residential units with a small commercial area with limited retail/commercial uses (the Center House). Refer to Figure 3, *Site Plan*, for the location of proposed on-site uses. In addition to the on-site uses, HGV South would require the construction of on- and off-site infrastructure improvements associated with roads, water, and sewer.

The residential units would be a mix of multi- and single-family units, depending on the design area. In general, the multi-family product types would be situated interior to the development, and would be surrounded by the less intensive single-family residential uses. This helps to create a buffer between the village core and the surrounding semi-rural and rural residential uses. Buildings would be primarily two to three stories in height, but would include one-story elements such as porches, garages, and bays. The total square footage of structures associated with the Center House is approximately 5,000 square feet (SF) (with a minimum of 500 SF of commercial use).

Country Club Drive is anticipated to be improved with the addition of a single lane from Harmony Grove Road to the southern-most HGV South entry. A new bridge that has been studied by the County of San Diego (County) may be built by the Project (the current crossing is an at-grade crossing with culverts for the creek to flow through).

The Project design includes an on-site wastewater treatment and water reclamation facility (WTWRF) located in the northwestern portion of the site[1]. This facility would provide treatment for all wastewater generated on site, and would produce reclaimed effluent per applicable regulatory standards for irrigation of on-site landscaping. Based on the loading and design

[1] As described in the Project EIR Chapter 4.0, Alternatives, alternative design scenarios were evaluated for the treatment of wastewater. Of the possible scenarios, the full on-site WTWRF proposed for the Project would result in the greatest noise generation, and was therefore included in this analysis as a worst case.

criteria used in the 180,000 gallons per day (gpd) Harmony Grove plant design, a scaled-down version could be constructed to serve HGV South.

1.3 Noise Reduction Construction Best Management Practices

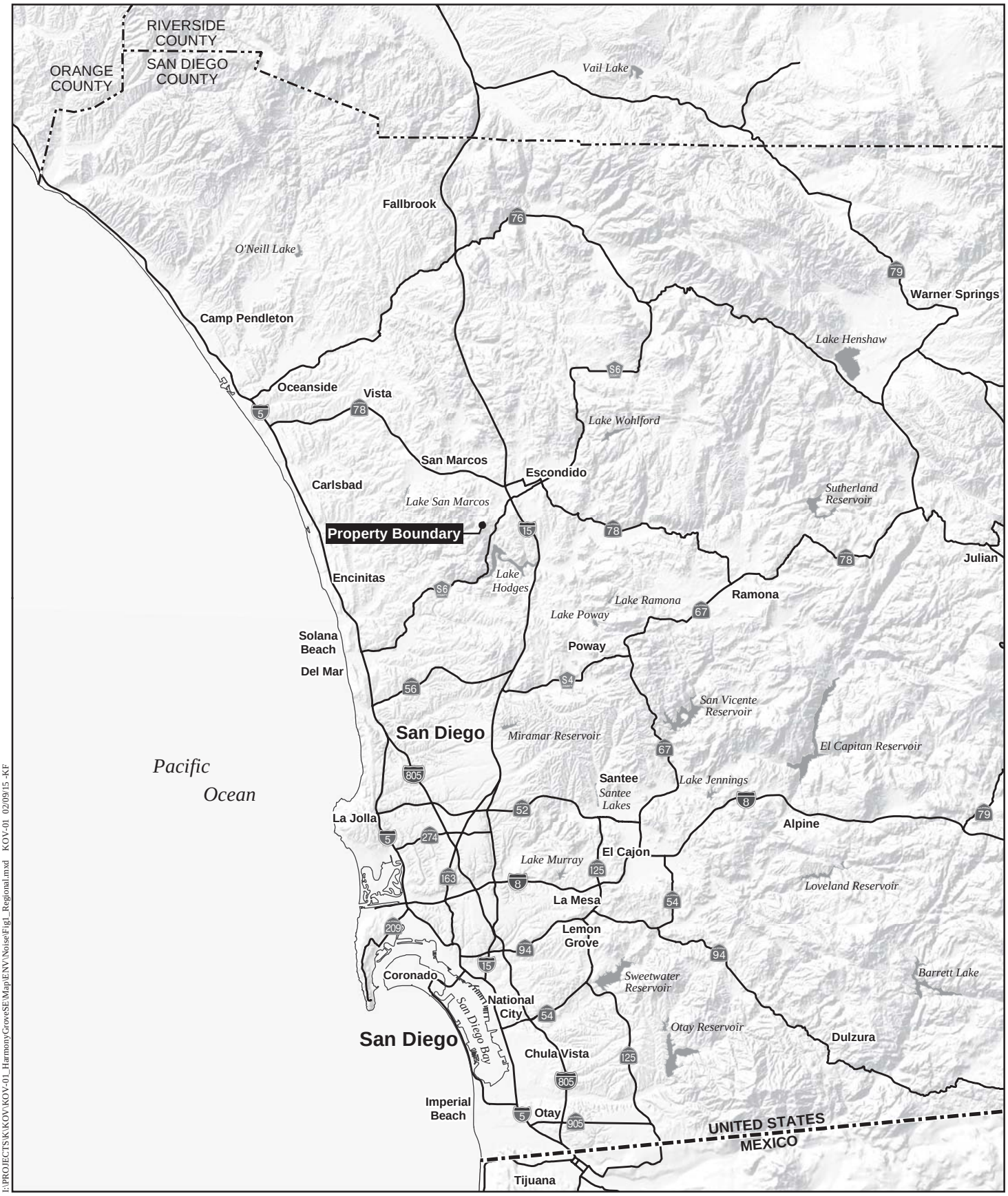
HGV South would incorporate the following construction best management practices to minimize noise levels:

- To avoid potential danger to horseback riders and horses from blasting, the following best management practices would be implemented:
    - All residents within a 0.5-mile radius of the blast location shall receive notice from the blasting contractor prior to blasting, containing the day and hour that blasting will occur. Residents shall receive this notice at least 24 hours before any blasting event;
    - Residents shall also be contacted prior to the first notice of blasting to determine their preferred method of contact for the blasting information (e.g., phone, email, regular mail);
    - In addition, signage providing noticing of the blast, including the date and time of the blast, shall be posted by the blasting contractor near the Harmony Grove Road and Country Club Drive intersection, the Country Club Drive and Cordrey Drive intersection, and the entrance to the Del Dios Highland Preserve trail (off Del Dios Highway). This signage shall be posted at least seven days before any blasting event; and
    - Both resident notices and posted signage shall contain contact information so residents and visitors can obtain more information if requested.
- If pile driving is utilized as part of the construction of the bridge over Escondido Creek and the Harmony Grove Equestrian Park is operational during pile driving operations, the following best management practices would be implemented to avoid potential adverse effects to horseback riders, horses, and other park visitors:
    - Bridge construction may use cast-in-drilled holes in place of pile driving while the park is occupied; and
    - If pile driving is to be performed, pile driving shall not occur on Saturdays or Sundays so that the equestrian park may remain open on the weekends.

1.4 Noise and Sound Level Descriptors and Terminology

1.4.1 Descriptors

All noise level or sound level values presented herein are expressed in terms of decibels (dB), with A-weighting (dBA) to approximate the hearing sensitivity of humans. Time-averaged noise levels are expressed by the symbol L_{EQ}, with a specified duration. The Community Noise



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Regional Location

HARMONY GROVE VILLAGE SOUTH

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N 0 8 Miles

Figure 1

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Project Vicinity (Aerial Photograph)

HARMONY GROVE VILLAGE SOUTH

HELIX Environmental Planning

N 0 2,000 Feet

Figure 2

PARK AREA DATA TABLE

AREA DESIGNATION	USES	AREA	
		PUBLIC	PRIVATE
1	DOG PARK	0.38	
2	PICNIC	0.09	
3	PICNIC	0.21	
4	REC CENTER W/POOL		1.15
5	COMMUNITY GARDENS		0.25
6	COMMUNITY GARDENS		0.14
7	COMMUNITY GARDENS		0.10
8	EQUESTRIAN STAGING	0.21	
9	BASKETBALL COURT	0.54	
10	PICNIC	0.28	
11	PICNIC		0.20
12	DUAL USE SW-REC		0.64
13	DUAL USE SW-REC		0.28
	TOTAL	1.71	2.76
	GRAND TOTAL	4.47	

Source: Project Design Consultants 2016

Site Plan

HARMONY GROVE VILLAGE SOUTH

Figure 3

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Equivalent Level (CNEL) is a 24-hour average, where noise levels during the evening hours of 7:00 p.m. to 10:00 p.m. have an added 5 dBA weighting, and sound levels during the nighttime hours of 10:00 p.m. to 7:00 a.m. have an added 10 dBA weighting. This is similar to the Day-Night sound level (L_{DN}), which is a 24-hour average with an added 10 dBA weighting on the same nighttime hours but no added weighting on the evening hours. Sound levels expressed in CNEL are always based on dBA. These metrics are used to express noise levels for both measurement and municipal regulations, as well as for land use guidelines and enforcement of noise ordinances.

1.4.2 Terminology

Sound, Noise, and Acoustics

Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium (e.g., air) to a hearing organ, such as a human ear. Noise is defined as loud, unexpected, or annoying sound.

In the science of acoustics, the fundamental model consists of a sound (or noise) source, a receiver, and the propagation path between the two. The loudness of the noise source and obstructions or atmospheric factors affecting the propagation path to the receiver determines the sound level and characteristics of the noise perceived by the receiver. The field of acoustics deals primarily with the propagation and control of sound.

Frequency

Continuous sound can be described by frequency (pitch) and amplitude (loudness). A low-frequency sound is perceived as low in pitch. Frequency is expressed in terms of cycles per second, or Hertz (Hz) (e.g., a frequency of 250 cycles per second is referred to as 250 Hz). High frequencies are sometimes more conveniently expressed in kilohertz (kHz), or thousands of Hertz. The audible frequency range for humans is generally between 20 Hz and 20,000 Hz.

Sound Pressure Levels and Decibels

The amplitude of pressure waves generated by a sound source determines the loudness of that source. Sound pressure amplitude is measured in micro-Pascals (mPa). One mPa is approximately one hundred billionth (0.00000000001) of normal atmospheric pressure. Sound pressure amplitudes for different kinds of noise environments can range from less than 100 to 100,000,000 mPa. Because of this wide range of values, sound is rarely expressed in terms of mPa. Instead, a logarithmic scale is used to describe sound pressure level (SPL) in terms of dBA. The threshold of hearing for the human ear is about 0 dBA, which corresponds to 20 mPa.

Addition of Decibels

Because decibels are logarithmic units, SPL cannot be added or subtracted through ordinary arithmetic. Under the decibel scale, a doubling of sound energy corresponds to a 3 dBA increase. In other words, when two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dBA higher than from one source under the same conditions. For example, if one automobile produces an SPL of 70 dBA when it passes an

observer, two cars passing simultaneously would not produce 140 dBA—rather, they would combine to produce 73 dBA. Under the decibel scale, three sources of equal loudness together produce a sound level 5 dBA louder than one source.

Under controlled conditions in an acoustical laboratory, the trained, healthy human ear is able to discern 1 dBA changes in sound levels, when exposed to steady, single-frequency ("pure-tone") signals in the mid-frequency (1,000 Hz–8,000 Hz) range. In typical noisy environments, changes in noise of 1 to 2 dBA are generally not perceptible. It is widely accepted, however, that people begin to detect sound level increases of 3 dBA in typical noisy environments. Further, a 5 dBA increase is generally perceived as a distinctly noticeable increase, and a 10 dBA increase is generally perceived as a doubling of loudness.

No known studies have directly correlated the ability of a healthy human ear to discern specific levels of change in traffic noise over a 24-hour period. Many ordinances, however, specify a change of 3 CNEL as the significant impact threshold. This is based on the concept of a doubling in noise energy resulting in a 3-dBA change in noise (which is the amount of change in noise necessary for the increase to be perceptible to the average healthy human ear).

1.4.3 Noise-Sensitive Land Uses

Noise-sensitive land uses (NSLUs) are land uses that may be subject to stress and/or interference from excessive noise, including residences, hospitals, schools, hotels, resorts, libraries, sensitive wildlife habitat, or similar facilities where quiet is an important attribute of the environment. Noise receptors are individual locations that may be affected by noise.

NSLUs in the HGV South vicinity include sensitive wildlife habitat adjacent to portions of the northern, eastern, and southern HGV South boundaries, as well as existing residential development adjacent to the east and west (on Cordrey Drive) of the HGV South site. All existing residential sites, and all proposed on-site housing units associated with HGV South, would be considered sensitive noise receptors.

The approved Harmony Grove Village project is currently under construction. The HGV South Traffic Impact Analysis (TIA) assumes that project in place for traffic generation. Current projections also assume that the Harmony Grove Village WTWRF will come on line in summer 2015—this requires a minimum of 90 residential units to be occupied. Consistent with these assumptions, it is assumed that Harmony Grove Village residents will be present at HGV South initiation.

1.5 Regulatory Framework

Code of Federal Regulations (30 CFR 816.61-816.68)

Various aspects of blasting, including flyrock and airblast, are regulated by the Code of Federal Regulations (30 CFR 816.61-816.68). Section 816.67(b) specifies maximum levels for airblast; Section 816.67(c) specifies allowable distances for flyrock.

California Noise Control Act

This section of the California Health and Safety Code finds that excessive noise is a serious hazard to the public health and welfare and that exposure to certain levels of noise can result in physiological, psychological, and economic damage. It also finds that there is a continuous and increasing bombardment of noise in the urban, suburban, and rural areas. The California Noise Control Act declares that the State of California has a responsibility to protect the health and welfare of its citizens by the control, prevention, and abatement of noise. It is the policy of the State to provide an environment for all Californians free from noise that jeopardizes their health or welfare.

California Noise Insulation Standards [California's Title 24 Noise Standards. Cal. Adm. Code Title 24, Chap. 2-35]

In 1974, the California Commission on Housing and Community Development adopted noise insulation standards for multi-family residential buildings (Title 24, Part 2, California Code of Regulations). Title 24 establishes standards for interior room noise (attributable to outside noise sources). The regulations also specify that acoustical studies must be prepared whenever a residential building or structure is proposed to be located near an existing or adopted freeway route, expressway, parkway, major street, thoroughfare, rail line, rapid transit line, or industrial noise source, and where such noise source or sources create an exterior CNEL (or L_{DN}) of 60 dBA or greater. Such acoustical analysis must demonstrate that the residence has been designed to limit intruding noise to an interior CNEL (or L_{DN}) of at least 45 dBA.

San Diego County General Plan, Noise Element

The Noise Element of the County General Plan includes guidelines for noise compatibility (Tables N-1 and N-2 from the County General Plan), as detailed below in Table 1-1, *San Diego County Noise Compatibility Guidelines*, and noise standards, as detailed below in Table 1-2, *San Diego County General Plan Noise Standards.*

Table 1-1
SAN DIEGO COUNTY NOISE COMPATIBILITY GUIDELINES

Land Use Category		Exterior Noise Level (CNEL)					
		55	60	65	70	75	80
A	Residential—single family residences, mobile homes, senior housing, convalescent homes						
B	Residential—multi-family residences, mixed-use (commercial/residential)						
C	Transient lodging—motels, hotels, resorts						
D[(1)]	Schools, churches, hospitals, nursing homes, child care facilities						
E[(1)]	Passive recreational parks, nature preserves, contemplative spaces, cemeteries						
F[(1)]	Active parks, golf courses, athletic fields, outdoor spectator sports, water recreation						
G[(1)]	Office\professional, government, medical\dental, commercial, retail, laboratories						
H[(1)]	Industrial, manufacturing, utilities, agriculture, mining, stables, ranching, warehouse, maintenance/repair						
	ACCEPTABLE—Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal construction, without any special noise insulation requirements.						
	CONDITIONALLY ACCEPTABLE—New construction or development should be undertaken only after a detailed noise analysis is conducted to determine if noise reduction measures are necessary to achieve acceptable levels for land use. Criteria for determining exterior and interior noise levels are listed in Table 3, Noise Standards. If a project cannot mitigate noise to a level deemed Acceptable, the appropriate County decision-maker must determine that mitigation has been provided to the greatest extent practicable or that extraordinary circumstances exist.						
	UNACCEPTABLE—New construction or development shall not be undertaken.						

Source: County 2011

1 Denotes facilities used for part of the day; therefore, an hourly standard would be used rather than CNEL

2 For projects located within an Airport Influence Area of an adopted Airport Land Use Compatibility Plan (ALUCP), additional Noise Compatibility Criteria restrictions may apply as specified in the ALUCP.

Table 1-2 COUNTY OF SAN DIEGO GENERAL PLAN NOISE STANDARDS	
1.	The exterior noise level (as defined in Item 3) standard for Category A shall be 60 CNEL, and the interior noise level standard for indoor habitable rooms shall be 45 CNEL.
2.	The exterior noise level standard for Categories B and C shall be 65 CNEL, and the interior noise level standard for indoor habitable rooms shall be 45 CNEL.
3.	The exterior noise level standard for Categories D and G shall be 65 CNEL and the interior noise level standard shall be 50 dBA L_{EQ} (one hour average).
4.	For single-family detached dwelling units, "exterior noise level" is defined as the noise level measured at an outdoor living area which adjoins and is on the same lot as the dwelling, and which contains at least the following minimum net lot area: (i) for lots less than 4,000 square feet in area, the exterior area shall include 400 square feet, (ii) for lots between 4,000 square feet to 10 acres in area, the exterior area shall include 10 percent of the lot area; (iii) for lots over 10 acres in area, the exterior area shall include 1 acre.
5.	For all other residential land uses, "exterior noise level" is defined as noise measured at exterior areas that are provided for private or group usable open space purposes. "Private Usable Open Space" is defined as usable open space intended for use of occupants of one dwelling unit, normally including yards, decks, and balconies. When the noise limit for Private Usable Open Space cannot be met, then a Group Usable Open Space that meets the exterior noise level standard shall be provided. "Group Usable Open Space" is defined as usable open space intended for common use by occupants of a development, either privately owned and maintained or dedicated to a public agency, normally including swimming pools, recreation courts, patios, open landscaped areas, and greenbelts with pedestrian walkways and equestrian and bicycle trails, but not including off-street parking and loading areas or driveways.
6.	For non-residential noise sensitive land uses, exterior noise level is defined as noise measured at the exterior area provided for public use.
7.	For noise sensitive land uses where people normally do not sleep at night, the exterior and interior noise standard may be measured using either CNEL or the one-hour average noise level determined at the loudest hour during the period when the facility is normally occupied.
8.	The exterior noise standard does not apply for land uses where no exterior use area is proposed or necessary, such as a library.
9.	For Categories E and F the exterior noise level standard shall not exceed the limit defined as "Acceptable" in Table N-1 or an equivalent one-hour noise standard.

Note: Exterior Noise Level compatibility guidelines

* Although the proposed HGV South Project could be subject to the County Noise Element Land Use Category B for multiple single-family residences within a single lot within Table 1-1 above, the analysis assumes Category A noise requirements for these proposed single-family residential units as a more restrictive noise assessment. This is a higher standard than Category B and is applied to this Project and referenced throughout this Acoustical Analysis report.

County of San Diego Municipal Code - Noise Ordinance

Sections 36.401 through 36.423 of the San Diego County Municipal Code discuss further County noise requirements. The purpose of the Noise Ordinance is to regulate noise in the unincorporated area of the County to promote the public health, comfort and convenience of the County's inhabitants and its visitors.

The Noise Ordinance sets limits pertaining to the generation of exterior noise. It is unlawful for any person to cause or allow the creation of any noise to the extent that the one-hour average sound level at any point on or beyond the boundaries of the property will exceed the applicable limits in Table 1-3, *County of San Diego Municipal Code Exterior Sound Level Limits*.

Table 1-3
COUNTY OF SAN DIEGO MUNICIPAL CODE
EXTERIOR SOUND LEVEL LIMITS

Zone	Time	One-Hour Average Sound Level Limits (dBA)
(1) R-S, R-D, R-R, R-MH, A-70, A-72, S-80, S-81, S-87, S-90, S-92 and R-V and R-U with a density of less than 11 dwelling units per acre.	7:00 a.m. to 10:00 p.m. 10:00 p.m. to 7:00 a.m.	50 45
(2) R-RO, R-C, R-M, S-86, V5 and R-V and R-U with a density of 11 or more dwelling units per acre.	7:00 a.m. to 10:00 p.m. 10:00 p.m. to 7:00 a.m.	55 50
(3) S-94, V4 and all other commercial zones.	7:00 a.m. to 10:00 p.m. 10:00 p.m. to 7:00 a.m.	60 55
(4) V1, V2	7:00 a.m. to 7:00 p.m.	60
V1, V2	7:00 p.m. to 10:00 p.m.	55
V1	10:00 p.m. to 7:00 a.m.	55
V2	10:00 p.m. to 7:00 a.m.	50
V3	7:00 a.m. to 10:00 p.m. 10:00 p.m. to 7:00 a.m.	70 65
(5) M-50, M-52 and M-54	Anytime	70
(6) S-82, M-56 and M-58	Anytime	75
(7) S-88 (see subsection (c) below)	-	-

Source: County of San Diego Municipal Code Section 36.404.
Zoning Code Definitions: R-S = Single-Family Residential; R-D = Duplex Residential; R-R = Rural Residential; R-MH = Mobile home Residential; A-70 = Limited Agriculture; A-72 = General Agriculture; S-80 = Open Space; S-90 = Holding Area; S-92 = General Rural; S-94 = Transportation and Utility Corridor; R-V = Variable-Family Residential; R-RO = ; R-C = Residential-Commercial; R-M = Multi-Family Residential ; S-86 = Parking; R-U = Urban Residential; V1, V2, V3, V4, and V5 = Village Designations; M-50 = Basic Industrial; M-52 = Limited Industrial; M-54 = General Impact Industrial; S-82 = Extractive Use; M-56 = Mixed Industrial; M-58 = High-Impact Industrial; S-88 = Specific Plan

- If the measured ambient level exceeds the applicable limit noted above, the allowable one-hour average sound level shall be the ambient noise level, plus 3 dBA. The ambient noise level shall be measured when the alleged noise violation source is not operating.

- The sound level limit at a location on a boundary between two zones is the arithmetic mean of the respective limits for the two zones; provided however, that the one-hour average sound level limit applicable to extractive industries, including but not limited to borrow pits and mines, shall be 75 dBA at the property line regardless of the zone which the extractive industry is actually located.

- S-88 zones are Specific Planning Areas that allow for different uses. The sound level limits in Table 1-1 above that apply in an S-88 zone depend on the use being made of the property. The limits in Table 1-1, subsection (1) apply to property with a residential, agricultural, or civic use. The limits in subsection (5) apply to property with an industrial use that would only be allowed in an M-50, M-52, or M-54 zone. The limits in subsection (6) apply to all property with an extractive use or a use that would only be allowed in an M-56 or M-58 zone.

- A fixed-location public utility distribution or transmission facility located on or adjacent to a property line shall be subject to the sound level limits of this section, measured at or beyond six feet from the boundary of the easement upon which the facility is located.

Section 36.409, Construction Noise

Except for emergency work, it shall be unlawful for any person to operate construction equipment or cause construction equipment to be operated, that exceeds an average sound level of 75 dB for an 8-hour period, between 7:00 a.m. and 7:00 p.m., when measured at the boundary line of the property where the noise source is located or on any occupied property where the noise is being received.

Section 36.410, Impulsive Noise

Section 36.410 provides additional limitation on construction equipment beyond Section 36.404 pertaining to impulsive noise. Except for emergency work or work on a public road project, no person shall produce or cause to be produced an impulsive noise that exceeds the maximum sound level shown in Table 1-4, *County of San Diego Maximum Sound Levels (Impulsive)*, when measured at the boundary line of the property where the noise source is located or on any occupied property where the noise is received, for 25 percent of the minutes in the measurement period.

Table 1-4
COUNTY OF SAN DIEGO MAXIMUM SOUND LEVELS (IMPULSIVE)

Occupied Property Use	Decibels (dBA) L_{MAX}
Residential, village zoning or civic use	82
Agricultural, commercial or industrial use	85

Source: County of San Diego Municipal Code Section 36.410

The minimum measurement period for any measurements is one hour. During the measurement period, a measurement must be conducted every minute from a fixed location on an occupied property. The measurements must measure the maximum sound level during each minute of the measurement period. If the sound level caused by construction equipment or the producer of the impulsive noise exceeds the maximum sound level for any portion of any minute, it will be deemed that the maximum sound level was exceeded during that minute.

County Consolidated Fire Code (Section 96.1.5601.2)

Blasting activities are regulated by the County Consolidated Fire Code (County 2014a) within Sections 96.1.5601.2.1 through 5601.2.10. A blasting permit must be issued by the Sheriff prior to commencement of any blasting operations. The County code specifies hours when blasting may be performed, requirements of noticing for surrounding property owners, and the completion of pre- and post-blasting inspection reports.

San Dieguito Elfin Forest and Harmony Grove Community Plan

The San Dieguito Elfin Forest and Harmony Grove Community Plan includes provisions that address construction noise that may affect equestrian uses in this community (County 2014b). The rugged terrain in the San Dieguito Community can absorb or redirect the sound of the warning sirens used during construction blasting. The sudden blast noise and concussion can frighten horses causing riders to fall and make riding horseback especially hazardous for area residents. In response, the Plan has established construction-related mitigation measures for blasting to avoid impacts to the horseback riding in the area:

- All residents will receive notice prior to blasting and equestrians will receive sufficient notice immediately prior to blasting to allow riders to dismount and secure their horses.

- The warning sirens should be tested to ensure that area residents can properly hear these sirens or other means of notification (e.g., cell phone calls) should be set up to ensure that everyone receives adequate notice before each blasting event occurs.

2.0 ENVIRONMENTAL SETTING

2.1 Surrounding Land Uses

The area surrounding the HGV South site consists predominantly of single-family homes. Located adjacent to the site to the west, off Country Club Drive, Cordrey Drive, and Cordrey Lane, is a collection of single-family homes. Within these properties are equestrian facilities. Adjacent to the east are three single-family homes (that access County Club Drive through HGV South site). To the north of the site is Escondido Creek and then Harmony Grove Road; to the south is the open space Del Dios Highlands Preserve. Additional surrounding land uses (not immediately adjacent) include: the Harmony Grove Village (of which HGV South is an extension of) that is currently under construction, the residences of which are located approximately 800 feet to the north of the HGV South boundary and 500 feet to the north of where the Escondido Creek crossing will be replaced; the Harmony Grove Community Park and

Harmony Grove Equestrian Park, located approximately 800 feet and 100 feet, respectively, to the west of where the Escondido Creek bridge will be implemented; and the Elfin Forest Recreational Reserve, which is located approximately 4,000 feet south of the HGV South site.

2.2 Existing Noise Environment

The dominant noise source near the HGV South site is the moderate traffic noise on Country Club Drive. The HGV South site is not located near any active airports. The closest airport is McClellan-Palomar Airport, located approximately nine miles west of the HGV South site.

2.2.1 Ambient Noise Survey

Two locations were measured for the ambient noise survey: one for traffic near the HGV South entrance, and one for baseline ambient noise on the HGV South site (see Appendix A, *On-site Noise Measurement Sheet*, for survey notes). Traffic volumes for County Club Drive near the entrance of the HGV South site were recorded for automobiles, medium-size trucks (double-tires/two axles), and heavy trucks (three or more axles). The measured noise levels and related weather conditions are shown in Table 2-1, *Noise Measurement Results*. Traffic counts for the timed measurement and the one-hour equivalent volume are shown in Table 2-2, *Recorded Traffic Volume and Vehicle Mix.*

Table 2-1
NOISE MEASUREMENT RESULTS

Date	August 12, 2014
Measurement 1: Traffic Noise (County Club Drive)	
Conditions:	Sunny, clear skies, ~7 mph breeze from the north, temperature of approximately 72°F with medium to high humidity.
Time:	10:52 a.m. – 11:07 a.m.
Location:	County Club Drive near HGV South entrance
Distance to Roadway Centerline:	~40 feet
Measured Noise Level:	54.4 dBA L_{EQ}
Notes:	Minor noise sources include airplane overflight, construction noise from the Harmony Grove Village site occurring approximately 600 feet away, and birdsong.
Measurement 2: Baseline Site Conditions	
Conditions:	Sunny, clear skies, ~3 mph breeze from the north, temperature of approximately 72°F with medium to high humidity.
Time:	11:28 a.m. – 11:44 a.m.
Location:	Approximately 170 feet southeast of Country Club Drive and south of an unnamed private access road.
Measured Noise Level:	42.8 dBA L_{EQ}
Notes:	Minor noise sources include vehicles along Country Club Drive and noises from equestrian ranches.

Table 2-2 RECORDED TRAFFIC VOLUME AND VEHICLE MIX				
Roadway	**Traffic**	**Autos**	**MT[1]**	**HT[2]**
Country Club Drive near HGV South entrance	15-minute Count	5	0	1
	One-hour Equivalent	20	0	4
Percent		83%	0%	17%

[1] Medium Trucks (double tires/two axles)
[2] Heavy Trucks (three or more axles)

3.0 ANALYSIS METHODOLOGY AND ASSUMPTIONS

3.1 Methodology

3.1.1 Ambient Noise Survey

The following equipment was used to measure existing noise levels at the HGV South site:

- Larson Davis System LxT Integrating Sound Level Meter
- Larson Davis Model CA250 Calibrator
- Windscreen and tripod for the sound level meter
- Digital camera

The sound level meter was field-calibrated immediately prior to the noise measurements to ensure accuracy. All sound level measurements conducted and presented in this report were made with a sound level meter that conforms to the American National Standards Institute (ANSI) specifications for sound level meters (ANSI SI.4-1983 R2001). All instruments were maintained with National Bureau of Standards traceable calibration per the manufacturers' standards.

3.1.2 Noise Modeling Software

Modeling of the exterior noise environment for this report was accomplished using two computer noise models: Computer Aided Noise Abatement (CadnaA) version 4.2 and Traffic Noise Model (TNM) version 2.5. CadnaA is a model-based computer program developed by DataKustik for predicting noise impacts in a wide variety of conditions. CadnaA assists in the calculation, presentation, assessment, and mitigation of noise exposure. It allows for the input of project-related information, such as noise source data, barriers, structures, and topography to create a detailed CadnaA model, and uses the most up-to-date calculation standards to predict outdoor noise impacts. CadnaA traffic noise prediction is based on the data and methodology used in the TNM. The TNM was released in February 2004 by the U.S. Department of Transportation (USDOT), and calculates the daytime average hourly L_{EQ} from three-dimensional model inputs and traffic data (Caltrans 2004a). The TNM used in this analysis was developed from Computer Aided Design (CAD) plans provided by the HGV South Applicant. Input variables included road alignment, elevation, lane configuration, area topography, existing and planned noise control features, projected traffic volumes, estimated truck composition percentages, and vehicle speeds.

The one-hour L_{EQ} noise level is calculated utilizing peak-hour traffic; peak-hour traffic volumes can be estimated based on the assumption that 8 to 10 percent of the average daily traffic would occur during a peak hour. The model-calculated one-hour L_{EQ} noise output is the equivalent to the CNEL (Caltrans Technical Noise Supplement, November 2009).

Project construction noise was analyzed using the Roadway Construction Noise Model (RCNM; USDOT 2008), which utilizes estimates of sound levels from standard construction equipment.

3.2 Assumptions

3.2.1 Construction

General Equipment and Schedule

Construction would require heavy equipment during mass grading, utility installations, building construction, and paving. Construction equipment utilized on site would include but not be limited to crawler tractors, dumpers, graders, off-highway tractors (including water trucks), rollers, rubber-tired dozers, excavators, breakers, rock crushers (jaw and impact), rubber-tired loaders, scrapers, skid steer loaders, cranes, pavers, air compressors, and backhoe loaders/tractors. Most construction phases would occur simultaneously with other phases, with the exception being site preparation and blasting. Due to the anticipated phasing, it is possible that occupation of up to half of the dwelling units may occur concurrently with the later construction phases (building construction, paving, and architectural coating) of the remaining units. The closest NSLUs to the equipment listed above are the residences located adjacent to the western border of the HGV South site; equipment may be operated approximately 50 feet from the NSLUs. Construction is expected to begin in July 2018. Refer to Table 3-1, *Anticipated Construction Schedule*, for more specific information regarding the schedule of construction activities.

Table 3-1
ANTICIPATED CONSTRUCTION SCHEDULE

Construction Activity	Construction Period		
	Start	End	Number of Working Days
Site Preparation and Blasting	07/01/2018	09/30/2018	65
Backbone Infrastructure	10/01/2018	03/31/2019	130
Road Construction	10/01/2018	03/31/2019	130
Grading	04/01/2019	06/30/2019	65
Bridge Construction	04/01/2019	03/31/2020	260
Building Construction	07/01/2019	09/30/2021	588
Parking Lot Paving	05/01/2021	09/30/2021	109
Architectural Coating	05/01/2021	09/30/2021	109

Blasting Assumptions

Blasting typically includes three components that can result in impacts: flyrock, vibration, and airblast. The closest NSLU to potential blasting would be the residences located adjacent to the western border of the HGV South site, which would be approximately 200 feet to the west of possible blasting.

Flyrock: Flyrock is debris (smaller and potentially larger chunks of rock) ejected from the blast. Outside the immediate area of the blast itself, flyrock is potentially the most dangerous portion of blasting; it has the ability to damage structures and maim or kill humans or other animals at great distances from the blast.

Vibration: Both air and ground vibrations create waves that disturb the material in which they travel. When these waves encounter a structure, they cause it to shake and may cause structural damage. Ground vibrations enter the house through the foundation.

Airblast: Airblast is a pressure wave that creates a push (positive pressure) and pull (negative pressure) effect; it may be audible (noise) or inaudible (concussion). A blast occurring outside of a residence may be heard inside because of the audible noise; however, noise has little impact on the structure. The concussion wave causes the structure to shake and rattle and can break windows at higher pressure levels.

Vibration Assumptions

Construction vibration for HGV South may be caused by pile driving, a vibratory roller, or blasting. Pile driving could be required for the bridge footings as part of the Escondido Creek bridge construction. The closest NSLU to the bridge construction would be the least Bell's vireo habitat in Escondido Creek, located approximately 50 feet to the east and west. A vibratory roller may be used to achieve soil compaction as part of the foundation construction (and possibly for on-site driveways at a later time). The closest NSLU to operation of a vibratory roller would be the residences adjacent to the western border of the HGV South site, which would be located approximately 50 feet from equipment operation.

3.2.2 Operation

The known or anticipated HGV South site operational noise sources include residential or commercial heating, ventilation, and air conditioning (HVAC) systems, the WTWRF, parks, and vehicular traffic.

Residential Air Conditioners

Specific planning data for the future HVAC systems is not available at this stage of HGV South design; however, analysis using a typical to larger-sized residential condenser mounted on ground level pads provides a reasonable basis for analysis. The unit used in this analysis is a Carrier 38HDR060 split system condenser (see Appendix B). The manufacturer's noise data is provided below in Table 3-2, *Carrier HDR060 Condenser Noise.*

Table 3-2 CARRIER HDR060 CONDENSER NOISE							
Noise Levels in Decibels[1] (dB) Measured at Octave Frequencies							Overall Noise Level in A-weighted Scale (dBA)[1]
125 Hz	250 Hz	500 Hz	1 KHz	2 KHz	4 KHz	8 KHz	
63.0	61.5	64.0	66.5	66.0	64.5	55.5	72.0

[1] Sound Power Levels (S_{WL})
Hz = Hertz; KHz = kilohertz

Wastewater Treatment and Water Reclamation Facility

The HGV South design includes a WTWRF and pump station (located in the northwestern portion of the site) to provide treatment for all wastewater generated on site. Based on the loading and design criteria used in the 180,000-gpd Harmony Grove plant design, a scaled-down version could be constructed to serve HGV South. The closest NSLUs to the proposed WTWRF would be the northernmost on-site residences, located approximately 300 feet south of the facility.

A summary of major plant components includes:

- Equalization basin to balance out variations in flow by storing a portion of the peak flows received for treatment in the plant during low-flow periods, and incorporating the Headworks to provide fine screening of the influent wastewater.

- Secondary treatment areas to include aeration basins and anoxic basins to perform the activated sludge process along with biological nitrogen removal, as well as a clarifier basins to settle most of the solids out of the wastewater in order to yield a clarified flow that goes to filters for further turbidity removal.

- Filters to further remove turbidity to produce reclaimed water meeting Title 22 standards for effluent clarity.

- Chlorine contact basins to disinfect the reclaimed water by chlorine solution.

- Residual solids processing to further reduce the settled solids produced by the treatment process; the Aero-Mod process typically includes digester basins.

- Equipment building, also providing space for employees to store their personal items, restrooms and showers for employees, some desk space and a small laboratory for use in operational control of the plant.

- Non-compliant effluent storage tanks to provide 24 hours of storage for non-compliant effluent.

The treatment basins would be located approximately 8 feet downslope from the plant. The WTWRF would be screened with landscape plantings. Any structures would be one story and no

higher than 25 feet. All mechanical equipment would be housed within buildings or noise-attenuating covers.

Noise-generating equipment in the process area would include a pre-screening unit, submersible pumps, and an aerobic mixing system. The loudest noise source is typically the screen, which has been measured at other locations, including the Santa Fe Valley WTWRF, at 50 dBA at 50 feet (Pacific Noise Control 2006).

Wastewater treatment facilities also typically include air compressors, standby diesel generators, odor control facilities, centrifuges, pumps, and blowers. The odor control facility may also be located within the dewatering and equipment building. The piece of equipment that would be anticipated to generate the most noise would be the standby diesel generator. Excluding the generator, this group of equipment would generate a noise level of approximately 62 dBA at a distance of 25 feet (Pacific Noise Control 2006).

Community Center/Commercial Uses

HGV South would develop a limited, 5,000-SF Center House area that would include a privately maintained recreational gathering space; this area may include limited overnight accommodations and small public commercial uses (such as a coffee shop). Equipment associated with this small commercial area are HVAC systems, such as those described at the beginning of this section. The closest NSLUs to the proposed commercial uses would be the multi-family on-site residences near the first driveway into HGV South, located approximately 200 feet east of the commercial area.

Parks

HGV South would develop 13 parks throughout the community (see Figure 3). These would potentially include active park areas such as a basketball court, dog park, equestrian staging area, a swimming pool, and a picnic area.

Vehicular Traffic

Transportation noise near HGV South is primarily from vehicular traffic. Anticipated future traffic noise levels are based on forecasted traffic volumes provided in the Traffic Impact Assessment (TIA) prepared by Linscott, Law, & Greenspan (LLG 2017). It should be noted that these traffic volumes are based upon a previously proposed 450 residential units, instead of the currently proposed 453 units; therefore, the noise analysis in this report is assessed with slightly lower traffic volumes than is expected. With an increase of three units, peak-hour traffic would only be expected to increase by a few ADT; this would have a nominal effect on the analysis and would not change the conclusions of significance presented in this report. Table 3-3, *Existing and Future Traffic Volumes*, summarizes the forecasted Average Daily Trips (ADT) data included in the TIA for the existing and future traffic conditions, which includes near-term scenarios of existing plus Project, existing plus cumulative, existing plus Project plus cumulative, and long term scenarios of buildout with Project and buildout without Project.

Table 3-3
EXISTING AND FUTURE TRAFFIC VOLUMES (ADT)

Roadway Segment	Existing		Near Term		Long Term	
	Existing	Existing + Project	Existing + Cumulative	Existing + Cumulative + Project	Buildout without Project	Buildout with Project
Country Club Drive						
Auto Park Way to Hill Valley Drive	6,490	7,615	9,530	10,655	7,500	8,070
Hill Valley Drive to Kauana Loa Drive	5,980	7,105	8,260	9,385	6,300	6,870
Kauana Loa Drive to Harmony Grove Village Parkway	3,260	4,250	5,980	6,970	3,600	4,102
Harmony Grove Village Parkway to Harmony Grove Road	2,430	3,420	3,810	4,800	3,900	4,402
Harmony Grove Road to Cordrey Drive	605	5,105	605	5,105	2,825	5,105
Harmony Grove Road						
Wilgen Drive to Country Club Drive	8,370	8,730	11,690	12,050	8,000	8,182
Country Club Drive to Harmony Grove Village Parkway	7,510	10,660	10,680	13,830	9,900	11,496
Harmony Grove Village Parkway to Kauana Loa Drive	5,890	7,240	9,770	11,120	9,100	9,784
Kauana Loa Drive to Enterprise Street	7,310	8,525	11,520	12,735	5,500	5,500
Harmony Grove Village Parkway						
Harmony Grove Road to Citracado Parkway	8,220	10,020	10,360	12,160	9,200	10,112

For modeling purposes, TNM software was utilized to calculate the distances to noise contour lines for the existing and the near-term scenarios (existing plus Project, existing plus cumulative, and existing plus Project plus cumulative; refer to Section 4.2.4.1). Note that Buildout with Project traffic volumes are lower than near-term traffic volumes due to traffic network changes from construction of new roads and modification of existing roads. These expected network changes would result in a shift of traffic within the area from Country Club Drive to other surrounding streets. For this reason, the near-term conditions were modeled to provide a worst-case analysis.

Given the low traffic volume recorded during the HGV South ambient noise survey of Country Club Drive, the traffic composition percentages presented in Table 2-2 were not used for modeling. Instead, vehicle distribution percentages typical for roadways in the area were used for all street segments in HGV South. Therefore, the traffic composition used for modeling in this analysis was 94 percent autos, 4 percent medium trucks and 2 percent heavy trucks.

In addition, modeling was based on the posted speed limits of 45 mph for Country Club Drive and 40 mph for Harmony Grove Road. Harmony Grove Village Parkway is currently under construction; however, a conservative speed limit of 45 mph was used for this road.

4.0 IMPACTS

4.1 Guidelines for the Determination of Significance

The following thresholds are based on the County of San Diego Guidelines for Determining Significance for Noise (County 2009), as applicable to HGV South.

A significant noise impact would occur if HGV South would:

1. Generate construction noise that exceeds the standards listed in the San Diego County Code, Section 36.409, Sound Level Limitations on Construction Equipment (8-hour average of 75 dBA).

2. Generate construction noise that exceeds 60 dBA L_{EQ} or the average ambient noise level, whichever is greater, at the edge of sensitive biological habitat during the breeding season. Please refer to the Biological Technical Report for more details (HELIX 2017).

3. Generate impulsive noise that exceeds the standards listed in the San Diego County Code, Section 36.410, Sound Level Limitations on Impulsive Noise.

4. Subject residences to ground-borne vibration that exceeds the following limits:

    - Isolated events (e.g., blasting) shall not exceed 1 inch per second (in/sec) peak particle velocity (PPV);

    - Non-transportation vibration sources such as impact pile drivers or hydraulic breakers shall not exceed 0.1 in/sec PPV;

- Other construction sources shall not exceed the "severe" criteria, as specified by Caltrans (2004b), for residences of 0.4 in/sec PPV.

5. Expose exterior on- or off-site, existing or reasonably foreseeable future, NSLUs to noise (including road noise) in excess of 60 CNEL for single-family residential uses, 65 CNEL for multi-family residential uses, or an increase of 10 CNEL or more over existing noise levels. If existing conditions approach or exceed County standards, a direct impact to off-site uses would occur if the project more than doubles (increases by more than 3 dBA CNEL) the existing noise level.

6. Generate noise that exceeds the noise limits in the San Diego County Code, Section 36.404, General Sound Level Limits, at the property line of the property on which the noise is produced or at any location on the property that is receiving the noise.

    - For single-family residential uses the exterior noise limit is 50 dBA from 7:00 a.m. to 10:00 p.m. and 45 dBA from 10:00 p.m. to 7:00 a.m.

    - For multi-family units (more than 11 dwelling units per acre) the exterior noise limit is 55 dBA from 7:00 a.m. to 10:00 p.m. and 50 dBA from 10:00 p.m. to 7:00 a.m.

7. Expose interior on- or off-site, existing or reasonably foreseeable future, NSLUs to noise in excess of 45 CNEL.

8. Considerably contribute to a cumulative scenario that would result in the exposure of any on- or off-site, existing or reasonably foreseeable future NSLU, to:

    - An increase of 10 dBA (CNEL) over pre-existing noise levels,

    - An increase of 3 dBA CNEL in existing plus project plus cumulative conditions if that total is above 60 dBA CNEL, or

    - Interior noise in excess of 45 dBA CNEL.

    A "cumulatively considerable" project contribution to an identified significant cumulative noise impact would occur if the project contributes more than a 1 dBA increase.

4.2 Construction Noise and Vibration Impacts

Construction of HGV South would generate elevated noise levels that may disrupt nearby noise sensitive receptors, including nearby residents and sensitive biological habitat. The magnitude of the impact would depend on the type of construction activity, equipment, duration of each construction phase, distance between the noise source and receiver, and any intervening structures.

Construction noise impact analysis includes mass grading, which is typically significantly louder than other activities and has the greatest potential to create impacts to off-site NSLUs; impact

analysis also includes off-site construction, such as roadway widening, utility installations, and bridge construction. For mass grading and roadway construction, HGV South would require material excavation and/or fill, and portions of the site may experience difficult ripping. Blasting would likely be performed to assist with grading given the underlying geology of portions of the site. The necessity and extent of blasting would not be known until surface clearing is completed. Utility installations would require the digging of trenches using an excavator. For bridge construction, HGV South may require pile driving or cast-in-drilled holes.

As stated under Section 3.2.1, the later phases of construction (building construction, parking lot paving, and architectural coatings) may occur simultaneously with a portion of the HGV South residences occupied in another area of the site. The final construction phase operations would occur at a minimum distance of 50 feet from future occupied HGV South residences. The loudest type of construction equipment used for building construction, paving, and architectural coatings would be a crane, paver, and air compressor, respectively. A crane, paver, and air compressor would generate noise levels of 72.6 dBA L_{EQ}, 73.7 dBA L_{EQ}, and 74.2 dBA L_{EQ} at 50 feet, respectively; these noise levels would be below the County's 75 dBA 8-hour average limit. Therefore, the types of construction activities associated with these later phases would not generate significant noise impacts.

4.2.1 Hard Rock Handling

Hard rock handling involves the ripping of materials, the drilling of non-rippable materials, and the breaking of oversize materials typically using a dozer, excavator, breaker, and rock crushing equipment. Table 4-1, *Construction Equipment Noise Levels*, provides the 50-foot distance noise level for a dozer, excavator, and breaker, as modeled in RCNM.

Table 4-1
CONSTRUCTION EQUIPMENT NOISE LEVELS

Unit	% Operating Time	dBA L_{EQ} @ 50 feet	L_{MAX} @ 50 feet
Dozer	40	77.7	81.7
Excavator	40	76.7	80.7
Breaker	10	80.0	90.0

Source: RCNM

A dozer and an excavator may be working on the site at the same time, but would not be working in close proximity to one another at a given time due to the nature of their respective operations. Therefore, a dozer and an excavator were analyzed for construction noise impacts in isolation, using RCNM to determine the worst-case construction noise levels at nearby residential receptors.

It was assumed that a dozer and an excavator working on proposed grading areas would be in operation for 40 percent of a typical construction day at a distance of 100 feet from the nearest residences. The nearest residences to the proposed grading areas are adjacent to the western portion of the HGV South site. Over the course of a day, a dozer or excavator may be closer or farther than 100 feet from the nearest residence; however, a conservative average is 100 feet.

Based on these assumptions, the highest impact level for a dozer at the adjacent property boundary is 71.7 dBA L_{EQ} and an excavator is 70.7 dBA L_{EQ}.

A hydraulically operated impact hammer attached to a tracked excavator is commonly called a breaker. These units are used in site preparation to reduce large granitic materials to a size where they can either be transported off site, buried on site for fill, or used as rip rap or landscaping materials. If blasting is to occur (see below), leftover boulders may be large enough for a breaker to be used at the HGV South site.

Breakers create an impulsive noise that is regulated by the County's 75 dBA 8-hour average limit and the maximum impulsive noise level limit of 82 dBA L_{MAX}. A breaker generates a one-hour L_{EQ} of 80 dBA at a distance of 50 feet, and a maximum noise level of 90.0 dBA L_{MAX} at a distance of 50 feet. Assuming a noise attenuation rate of 6 dBA per doubling of distance, noise levels from the breaker would reduce to 75 dBA L_{EQ} at a distance of 90 feet. The maximum noise level would be below 82 dBA L_{MAX} at 125 feet.

To minimize materials exportation and importation, a rock crusher, consisting of an impact crusher and a jaw crusher, would be utilized. This crushing will reduce the material to a size and type that will be appropriate for use in foundation and other land use development at the HGV South site.

To reduce large aggregate sizes, a crusher with screens and both a rocking jaw and impact or cone crusher would be used. A loader is used to feed the crusher hopper that feeds (through a belt) the aggregate into the rocking jaw crusher. This reduces the larger aggregate-size material to a maximum size that can be fed via a secondary belt through the screen for sorting, and then into the impact or cone crusher to produce the final materials sized to meet HGV South requirements. The material is stacked with a final belt into a temporary stockpile for later use. This system of crushers is hereafter referred to as the "plant."

Table 4-2, *Rock Crusher Equipment Noise Levels*, shows the measured noise levels. Measurements of the impact and jaw crushers were during operation, which were stationary. Note, however, that additional factors such as the types of material being crushed, topography, and weather conditions can have an effect on noise levels. Site-specific conditions and/or other equipment operations near the plant operations may result in higher or lower noise levels at any given receiver and time.

Table 4-2
ROCK CRUSHER EQUIPMENT NOISE LEVELS

Equipment	Average Distance (in feet)	Measured Noise Level
Impact crusher used for Concrete/Recycling[1]	50 feet	83.9 dBA L_{EQ} (1-min)
Jaw crusher used for rock crushing[2]	50 feet	86.5 dBA L_{EQ} (1-min)

[1] UN15 Portable Impact Crusher, Eagle Crusader, Measured at Airport Vista Road in Santee on Tuesday June 3, 2003 at 7:20 a.m.

[2] Rocking Jaw Crusher, Thunderbird Type II, Measured at Massachusetts Avenue site in Lemon Grove on Tuesday June 3, 2003 at 8:30 a.m.

The equipment noise levels were used to augment the assumptions in the RCNM. It was assumed that the impact crusher and jaw crusher, as well as a top load feeder to deposit the material into the crusher, would be in operation for 100 percent of the day on the days that the crusher was needed. The combined noise levels from this equipment would be 89 dBA L_{EQ} at a distance of 50 feet, and the noise level would attenuate to 75 dBA at a distance of 250 feet. Based on these assumptions, if a rock crusher is used within 250 feet to the nearest residence, the noise level would exceed the County's 8-hour noise level limits of 75 dBA L_{EQ} (see Appendix C, *RCNM Rock Crusher Outputs*).

In summary, noise levels from a breaker would be significant if operated within 125 feet of a NSLU (**Impact Noi-1**) and noise levels from a rock crusher would be significant if operated within 250 feet of a NSLU **(Impact Noi-2)**.

Mitigation

M-Noi-1 **Breaker Equipment Operation Limit:** If a breaker is required as part of HGV South construction, then it shall not generate maximum noise levels that exceed 82 dBA L_{MAX} when measured at the property line for 25 percent of a one-hour period, or be used within 125 feet of the property line for any occupied residence. Material that would require a breaker shall be moved a minimum distance of 125 feet from the nearest residence.

M-Noi-2 **Rock Crusher Operation Limit:** If a rock crusher is required as part of HGV South construction, then it shall not be used within 250 feet of the property line for any occupied residence until a temporary noise barrier or berm is constructed at the edge of the development footprint or around the piece of equipment to reduce noise levels below 75 dBA L_{EQ} at the property line for the occupied residences. If a barrier or berm is used, decibel output will be confirmed by a County-approved noise specialist. Otherwise, a rock crusher shall be moved a minimum distance of 250 feet from the nearest residence before use.

4.2.2 Blasting

A full blasting analysis cannot be done until after the site is cleared of all surface material (including any rippable material) to expose the specific type of material to be blasted, and until the extent of the area of blasting and the required blasting charge type are known. However, blasting is probable on the northeastern and western portions of the site due to the underlying granitic rocks (GEOCON 2005). There are residences adjacent to the HGV South site in both of these areas; a conservative estimate of their distances from potential blasting areas is 200 feet. See Section 3.2.1, *Construction Assumptions*, for general background information regarding blasting.

Flyrock cannot be allowed at this site, beyond the direct area of the blast, under any circumstances. This analysis assumes that proper blast planning would be used, that all flyrock would be controlled with blast mats or other flyrock control techniques, and proper stemming materials for the charge hole would be utilized.

As with flyrock, control of airblast is dependent on the skill of the Blasting Supervisor, along with many factors including but not limited to: the depth of the charge, the type of rock, the amount of fractures in the rock, and the length of correct stemming materials. Airblast is regulated by the limits from the Code of Federal Regulations (30 CFR 816.61-68), which are provided below (refer to Table 4-3, *Maximum Allowable Airblast Limit*s).

Table 4-3
MAXIMUM ALLOWABLE AIRBLAST LIMITS

Lower Frequency Limit of Measuring System (in Hz)	Maximum Level (in ±3 dBA)
0.1 Hz or lower	134 peak
2 Hz or lower	133 peak
6 Hz or lower	128 peak
C-weighted decibel noise level (dBC)	105 dBC

The following analysis is based on a general description of potential impacts that would be result from blasting activities. The information is based on guidance for calculating the scaled distance in blasting provided by the Office of Surface Mining Reclamation and Enforcement (OSM; 2009).

Blasting operations would be conducted through the use of drilling and blasting to fracture rocks. At this time the exact amount of blasting has not been determined, however, it is assumed that approximately two to three blasting events may occur each week. Blasting operations would be conducted by a licensed blasting contractor, in strict compliance with pertinent federal, state, and county requirements. All blasting materials would be transported to the site for each blasting sequence and no explosives would be stored at the site.

A single drill rig would be used to drill a pattern of boreholes each with a 3- to 6-inch diameter. Several holes are drilled in an area that is typically at least 40,000 SF. Typically, the pattern is laid out in a 10 x 10 to 20 x 20 grid spacing pattern between the holes depending on shot requirements, with up to approximately 25-foot deep holes. A contractor then loads the holes with carefully metered explosives. Each shot hole would be completely stemmed using fine gravel or dry sand. The shot is timed to detonate each hole(s) in sequence. This minimizes the ground vibration and noise of the blast, while maximizing fracture and controlling shot placement of the rock. The rock would be broken up to boulders less than 18 inches in diameter.

Based on an assumption of 0.5 pound of explosive material required per ton of material removed and a typical granite weight of 166.5 pounds per cubic foot, or 2.25 tons per cubic yard, a typical shot designed to break up 10 cubic yards of material (typical truckload) would require about 11.25 pounds of explosive charge. The charge would typically consist of a 0.5-pound or less of detonation charge per hole, and the remainder of the charge would be provided by TOVEX or other similar water gel explosive slurry.

The following scaled distance factors in Table 4-4, *Scaled Distance Factors*, are based on the relationship between peak particle velocity and frequency. Analysis of scaled distance for the charge weight is based on the following:

Table 4-4
SCALED DISTANCE FACTORS

Distance from the Blasting Site (feet)	Scaled Distance Factor
0 to 300	50
300 to 5,000	55
5,001 and Beyond	65

The allowable charge weight is calculated by: $W = (D/D_S)^2$

W = Allowable charge weight in pounds
D = Distance to the nearest structure in Feet
D_S = Value from table based on D

If D = 100 feet, the maximum charge weight would be 4 pounds
If D = 150 feet, the maximum charge weight would be 9 pounds
If D = 200 feet, the maximum charge weight would be 16 pounds

Therefore, the minimum distance by this analysis from any blast for this site should be 200 feet for the control of ground borne vibration impacts to the closest residence.

The previous analysis is based on typical and normal requirements. The basic planning for blasting charge weight limits at distances greater than 200 feet from an off-site structure does not provide final project-specific analysis for allowable blasting charges, nor is it intended to limit the blasting company to this as a minimum distance or maximum or minimum charge weights. This planning analysis is provided as general guidance and is not intended to provide final blasting planning for any specific blast nor does it imply acceptance of any liability for the proper or improper planning of any blasting and/or responsibility for any damages caused by the blaster. All blasting planning and impacts and/or damages that may occur are the sole responsibility of the owner and blasting planning company.

Because project-specific details regarding blasting operations are not available at this time, impacts to off-site residences and other land uses are conservatively assessed as significant (**Impact Noi-3)**.

The Elfin Forest and Harmony Grove Community Plan requires community-specific procedures for blasting due to the frequent horseback riding in the area. The loud blast noise and pressure wave from blasting can frighten horses, causing riders to fall. Many residences in the vicinity have stables or similar facilities for horses. In addition, many visitors use the area for horseback riding, including the Del Dios Highway Preserve trail that passes within 0.5 mile of the HGV South site. The construction best management practices for blasting described under Section 1.3 would be implemented to minimize impacts to horses and horseback riders.

Mitigation

M-Noi-3 Blasting Measures: The following measures would be implemented to reduce impacts from blasting:

- The number of blasts would be limited to three blasting events per week.
- HGV South would also include a blasting management plan due to the blasting that is likely to occur on site. All blast planning must be done by a San Diego County Sheriff approved blaster, with the appropriate San Diego County Sheriff blasting permits, in compliance with the County Consolidated Fire Code SEC. 96.1.5601.2 (County 2014a), and all other applicable local, state, and federal permits, licenses, and bonding. The blasting contractor or owner must conduct all notifications, inspections, monitoring, and major or minor blasting requirements planning with seismograph reports, as necessary.
- If boulders must be reduced in size with blasting within 200 feet of the closest residence, the use of chemical expansion via a chemical cracking agent shall be performed instead.

4.2.3 Off-site Construction

As mentioned previously, the HGV South off-site improvements are conservatively assumed to include construction of a new bridge over Escondido Creek, implementation of a third lane within Country Club Drive from Harmony Grove Road to the southern HGV South entrance, and installation of utilities within Country Club Drive and Harmony Grove Road.

Pile driving may be used to construct the bridge, and the nearest currently occupied residence is approximately 1,200 feet to the southwest of where the bridge construction will take place. The nearest potentially occupied residence as part of the Harmony Grove Village project would be approximately 500 feet from the bridge construction. The Harmony Grove Village project residences are currently under construction and may be in use by the start of bridge construction. Noise from pile driving also may be audible at the Harmony Grove Equestrian Park and Harmony Grove Community Park, although the County construction noise limits apply to occupied residential property only, and the Project includes construction best management practices to avoid potential adverse effects to park users.

Assuming a standard assumption of operation for 20 percent of a typical construction day, a pile driver has a 74.3 dBA L_{EQ} at 500 feet and a 66.7 dBA L_{EQ} at 1,200 feet. The 75 dBA L_{EQ} noise contour would be at approximately 460 feet. Therefore, impacts from pile driving to currently occupied and potentially occupied residences at Harmony Grove Village would not exceed the County limit of 75 dBA and impacts would be less than significant.

An alternative to a pile driver to construct the bridge would be to use cast-in-drilled-holes. This would involve using a track-mounted drill to bore the hole and then a cement truck and pumper to plug the hole with concrete. Construction of the bridge using cast-in-drilled holes has a 56.7 dBA L_{EQ} at 500 feet and 49.1 dBA L_{EQ} at 1,200 feet, the nearest potentially occupied

residences to the bridge as identified in the previous paragraph. Therefore, impacts to nearby residences from cast-in-drilled holes would be less than significant.

For the roadway widening, it is likely that a dozer would first be used to break up the current roadway, and then subsequent work would be performed with material export and import through dump trucks, road graders, water trucks, and if drainage systems are to be installed, excavators. It is possible that a dump truck and loader or a dump truck and excavator would be in operation at the same time; otherwise, each piece of equipment is expected to be operated in isolation. As a conservative measure, a dozer, the loudest piece of equipment to be used, and a dump truck were modeled to be working simultaneously. At 80 feet, a dozer and a loader would create a noise level of 75 dBA L_{EQ}. However, the nearest residence is a minimum of 200 feet from where the widening would occur, so noise levels from the dozer at the residence would be lower than the County limit. Therefore, impacts would be less than significant.

Utility installations could include normal trenching activities to install an 8-inch sewer line, 12- and 8-inch water lines, 8-inch recycled water lines, and/or a 5-foot sewer corridor at an assumed depth not to exceed 6 feet. This would involve the use of a small- to medium-sized excavator, medium-sized loader, and dump truck for the excavation and closure of the trenches, with only small equipment being utilized during the installation. A small- to medium-sized excavator would create noise levels of 73.6 dBA L_{EQ} at a distance of 50 feet.

The closest utility line to a NSLU would be the 8-inch recycled water line that would involve trenching within 50 feet of single-family homes alongside Country Club Drive to the west of HGV South. Assuming normal excavation duration, the excavator or backhoe and loader would not be expected to be in front of any single home for more than two hours. At a worst-case potential distance of 25 feet from the nearest property line distance (which is a typical street-work distance) for 2 hours (of an 8-hour day), the average noise level would be expected to be 73.6 dBA L_{EQ} (8-hour). Thus, noise levels from for the off-site utility installations would not be in excess of the allowed levels.

4.2.4 Construction Vibration

An on-site source of vibration during HGV South construction would be a vibratory roller (primarily used to achieve soil compaction as part of the foundation construction), which is expected to be used within 50 feet of the nearest occupied residence. A vibratory roller creates approximately 0.210 inches per second (in/sec) PPV at a distance of 25 feet. The County provides for the use of the Caltrans standards (2004) for construction vibration impacts in the footnotes of Table 4 of the County of San Diego Guidelines for Determining Significance, Noise (Table 1-5, *Guidelines for Determining the Significance of Ground-borne Vibration and Noise Impact.* in this report). Using the Caltrans criterion of 0.4 in/sec PPV, the approximately 0.210 in/sec PPV vibration impact would be less than what is considered a "severe" impact. Therefore, although vibration may be perceptible by nearby residences, temporary impacts associated with the vibratory roller (and other potential equipment) would be less than significant.

An off-site source of vibration may be the pile driving from the off-site bridge construction. As noted above, the nearest occupied residence is approximately 1,200 feet to the southwest of

where the bridge construction would take place and the nearest Harmony Grove Village residence is 500 feet from the bridge. At these distances, a pile driver would create approximately 0.0146 in/sec PPV and 0.0382 in/sec PPV, respectively (see Appendix D, *Pile Driver Vibration Calculations*), which is below the Caltrans criterion of 0.4 in/sec PPV. Therefore, vibration impacts to residences from pile driving would be less than significant.

4.2.5 Cumulative Construction Noise Impacts

While there may be construction projects in the general vicinity of HGV South (e.g., Harmony Grove Village project), it is likely that construction on that project would be completed before HGV South is under construction, and no other potential projects in the immediate vicinity are known. Therefore, it is unlikely that other projects would contribute additional construction noise and vibration to potentially affected residential properties located adjacent to HGV South.

4.3 Operational Noise Impacts

The known or anticipated HGV South site stationary noise sources include the residential and/or commercial HVAC systems, and the on-site WTWRF. Potential impacts from these noise sources are discussed below.

4.3.1 Residential Air Conditioners

As mentioned in Section 3.2.2, modeling assumed that the air conditioning condenser would be a Carrier 38HDR060 split system. This unit typically generates a noise level of 56 dBA at a distance of 7 feet. Based on the site plan, the closest HGV South building to the property line would be set back an approximate distance of 58 feet from the property line. Assuming that an HVAC system is 3 feet from the building, the minimum distance that the HVAC unit would be to the property line would be 55 feet. At this distance, the condenser would generate a noise level of 38 dBA, which does not exceed the County's nighttime allowable hourly limit of 45 dBA and therefore impacts would be less than significant.

4.3.2 Wastewater Treatment and Water Reclamation Facility

WTWRF equipment would have the potential to create noise in excess of allowable limits; the piece of WTWRF equipment that would generate the most noise would be the standby diesel generator. The generator would produce noise levels ranging from 90 to 105 dBA at 23 feet, and thus noise levels of 45 dBA (the night-time allowable limit) could be experienced at distances of up to 23,000 feet (without consideration for other factors that could reduce this noise level). Therefore, impacts are conservatively assessed as potentially significant. (**Impact Noi-4)**

Regarding off-site noise sources, operational noise impacts from the Harmony Grove Village project to the north are not envisioned to affect the proposed NSLU at HGV South. The distances from Harmony Grove Village's operational noise sources such as its WTWRF and HVAC units (at least 900 feet for the WTWRF and 1,200 feet for the HVAC units from the property line) would be sufficient to attenuate significant noise to below County standards.

Mitigation

M-Noi-4 WTWRF Final Design Noise Shielding: The WTWRF shall be enclosed by a solid 6-foot high wall. Final design for the WTWRF with the noise wall shall demonstrate that exterior noise levels generated from all stationary WTWRF equipment combined shall not exceed the one-hour exterior noise level of 45 dBA L_{EQ} at the property line.

The applicant shall be required to provide a final noise impact analysis as part of the facilities design submittal package for the WTWRF with the noise wall prepared by a County-approved noise consultant. The final noise impact analysis shall demonstrate compliance with the County 45 dBA L_{EQ} property line nighttime limit completed to the satisfaction of the County Planning & Development Services.

4.3.3 On-site Commercial Uses

The potential HGV South commercial uses (limited lodging facilities, coffee shop) greatest source of noise would be the HVAC equipment, which would be similar to the residential HVAC equipment. Modeling assumed that the condenser would be a Carrier 38HDR060 split system. This unit typically generates a noise level of 56 dBA at a distance of 7 feet. Based on the site plan, the closest building footprint within the Community Center to the property line approximately 90 feet. Assuming that an HVAC system is 3 feet from the building, the minimum distance that the HVAC unit would be to the property line would be 87 feet. At this distance, the condenser would generate a noise level of 34 dBA, which does not exceed the County's nighttime allowable hourly limit of 45 dBA and therefore impacts would be less than significant.

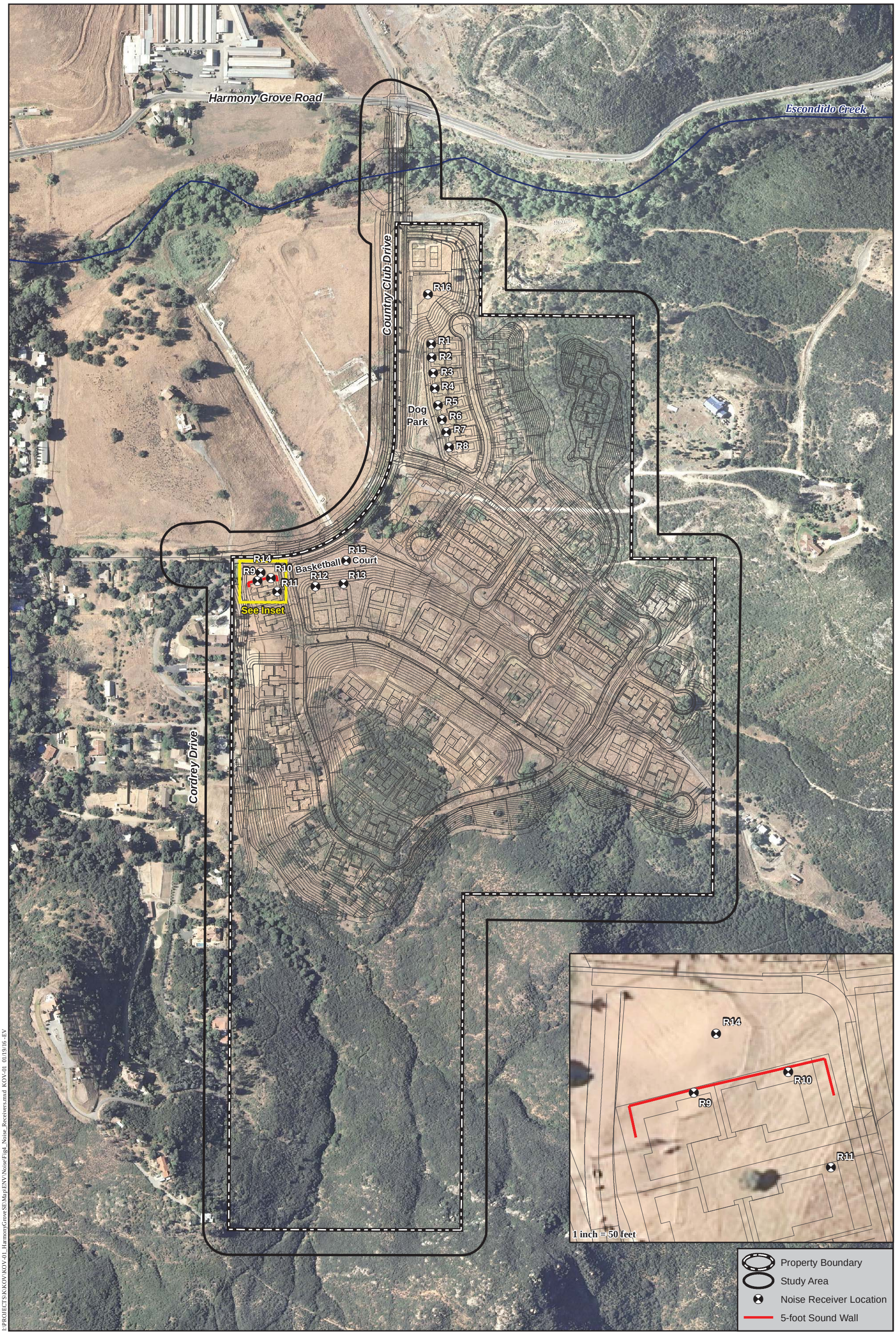
4.3.4 Parks

Impacts to Parks

The potential HGV South parks would be spread throughout the site, although a few of them would be located near County Club Drive near the HGV South boundaries such as the basketball court and equestrian staging area (see Figure 3). It was assumed that these would be active parks and therefore would have a County noise limit of 70 CNEL. However, for the purposes of a conservative analysis, receiver locations for three parks (R14, R15 and R16) located nearest to County Club Drive were modeled to assess whether they would meet the County noise compatibility standard of 65 CNEL for passive recreational parks (such as a nature preserve or contemplative space). The receivers were placed in the middle of the park area to best approximate the exterior use area of the park, and the locations of these receivers can be seen on Figure 4, *Receivers and Required Sound Wall Locations*. R14 was modeled at 63.9 CNEL, R15 was modeled at 61.2 CNEL, and R16 was modeled at 59.5 CNEL. Therefore, even with consideration of the planned parks being used as passive parks, noise compatibility impacts would be less than significant.

Impacts from Parks

The parks expected to be the greatest noise generators would be the basketball court and the dog park. The loudest noise from the basketball court would be the sound of the basketball striking the backboard. The basketball court would be placed in a lot that is approximately 50 feet wide



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Receiver and Required Sound Wall Locations

HARMONY GROVE VILLAGE SOUTH

HELIX Environmental Planning

N 0 350 Feet

Figure 4

by 275 feet long. A small two-hoop court would be approximately 42 feet wide by 74 feet long (Basketball-goals.com 2016). This court was assumed to be placed in the approximate center of the park lot; therefore, the closest future residence (the multi-family residences to the south of the court) to one of the two backboards would be 100 feet. The nearest off-site residence is approximately 400 feet to the west of the basketball court.

The sound of a ball hitting the backboard would typically have a maximum noise level of less than 85 dBA L_{EQ} at about 5 feet and a duration of less than 0.2 second. A single event of a ball hitting the backboard, averaged over the duration of one hour, would be approximately 42.4 dBA L_{EQ} at 5 feet, 22.4 dBA L_{EQ} at 50 feet, and 16.4 dBA L_{EQ} at 100 feet. Given the distances to the nearest residences, this would allow up to a total of approximately 23 minutes per hour of backstop noise, or 7,000 backboard hits, prior to exceedance of the County's 55 dBA L_{EQ} limit for multi-family residences.

Although the amount of backboard hits in a recreational basketball game would vary, a reasonable conservative assumption is based on a professional basketball game, which typically has 150 to 200 field goal shots per one hour of play (Teamrankings.com 2016). With a similar amount of shots, recreational use of HGV South's basketball court would result in substantially fewer than 7,000 backboard hits, and noise impacts from the basketball court would be less than significant.

The loudest noise from the dog park would be from dogs barking. The center of the dog park would be approximately 50 feet from the nearest future residences (the single-family residences to the east). The nearest off-site residence is approximately 1,000 feet to the southwest of the dog park. Similar to the backboard, a dog bark would typically have a maximum noise level of less than 85 dBA L_{EQ} at about 5 feet and have a duration of less than 0.2 second. A single event of a dog barking, averaged over the duration of one hour, would be approximately 42.4 dBA L_{EQ} at 5 feet, 22.4 dBA L_{EQ} at 50 feet, and 16.4 dBA L_{EQ} at 100 feet. Given the distances to the nearest residences, this would allow up to a total of 110 seconds per hour of barking, or 550 barks, at the dog park to not exceed the County's 50 dBA L_{EQ} limit for single-family residences.

The exact number of dogs and their barking patterns would vary during the day of week and hour of the day. A reasonable assumption for the dog park during a busy day would be 20 dogs in the park, each with 10 barking events per hour, for a total of 200 barking events per hour. Therefore, under these assumptions, the amount of barks per hour would not cause an exceedance of County thresholds and impacts would be less than significant.

Although not a significant impact under CEQA, if noise from the parks is found by a nearby resident to be a nuisance, the County has an "Email a Noise Compliant" section on their website to report such occurrences (http://www.sandiegocounty.gov/pds/ce5/EastNorthCo.html).

4.3.5 Transportation Sources

As noted in the assumptions, future traffic noise levels presented in this analysis are based on forecasted traffic volumes provided in the HGV South's TIA. Refer to Table 3-3, *Existing and Future Traffic Volumes*, for the forecasted ADT data for all analyzed traffic conditions.

4.3.5.1 *On-site Transportation Noise*

Exterior

Exterior traffic-related noise levels were calculated for the proposed on-site residences under the existing plus Project plus cumulative (near term) condition. Thirteen receiver locations of exterior use areas (e.g., an outdoor living area such as a patio) for proposed on-site residences were modeled. The results of this modeling are shown in Table 4-5, *Future Exterior On-Site Noise Levels* and the location of these receivers can be seen in Figure 4.

As seen in Table 4-5 and applying the most restrictive County Noise Element noise threshold for single family residences, noise levels exceed the 60 CNEL at two of the 13 receivers modeled. These two receivers are located on two single-family residences that are located in the westernmost portion of the HGV South site that face Country Club Drive, referred to as R9 and R10 on Figure 4. These residences are located on the same lot. Noise levels at other multi-family and single-family residences on the HGV South site would not exceed 60 CNEL. Therefore, exterior use area noise impacts to on-site residences are potentially significant (**Impact Noi-5).**

Table 4-5
FUTURE EXTERIOR ON-SITE
NOISE LEVELS

Receiver Name	Noise Levels with No Wall (CNEL)
R1	60
R2	60
R3	60
R4	59
R5	57
R6	56
R7	55
R8	55
R9	**62**
R10	**62**
R11	60
R12	59
R13	58

Note: Noise levels in table are for the existing plus Project plus cumulative (near term) condition; receivers that exceed 60 CNEL are shaded in grey; all numbers have been rounded to the nearest whole number.

Mitigation

M-Noi-5 **On-Site Noise Barriers.** Exterior noise levels at exterior use areas for the proposed residences identified as R9 and R10 on Figure 4 shall be reduced to the most restrictive County Noise Element threshold of 60 CNEL. Noise reduction for on-site exterior traffic noise impacts, which could lead to interior noise impacts, could be accomplished through on-site noise barriers. One 5-foot-high sound wall along the northern perimeter of the affected lot would be installed, with approximately

20-foot-long return walls along the western perimeter of the western residence and the eastern perimeter of the eastern residence.

The sound attenuation fence or wall must be solid. It can be constructed of masonry, wood, plastic, fiberglass, steel, or a combination of those materials, as long as there are no cracks or gaps, through or below the wall. Any seams or cracks must be filled or caulked. If wood is used, it can be tongue and groove and must be at least one-inch total thickness or have a density of at least 3.5 pounds per SF. Where architectural or aesthetic factors allow, glass or clear plastic ⅜ of an inch thick or thicker may be used on the upper portion, if it is desirable to preserve a view. Sheet metal of 18 gauge (minimum) may be used, if it meets the other criteria and is properly supported and stiffened so that it does not rattle or create noise itself from vibration or wind. Any door(s) or gate(s) must be designed with overlapping closures on the bottom and sides and meet the minimum specifications of the wall materials described above. The gate(s) may be of one-inch thick or better wood, solid-sheet metal of at least 18-gauge metal, or an exterior-grade solid-core steel door with prefabricated doorjambs.

Interior

Traditional architectural materials are normally able to reduce exterior to interior noise by up to 15 dBA. Because building façade noise levels may exceed 60 CNEL at the two residences mentioned above, traditional architectural materials would not be expected to attenuate interior noise to a level of 45 CNEL. Second- and third-story balconies would occur within the multi-family units located near the southern portion of HGV South. This area is sufficiently set back from the roadway that noise levels would not exceed the 60 CNEL noise level, as these buildings are located approximately 300 foot further south from the roadway than receiver R12, which has a CNEL of 59.

The proposed site plan assumes that the residential units identified as R9 and R10 would have a second story. Even with the noise barrier identified as part of M-Noi-5, the upper story may be exposed to noise in excess of 60 CNEL. Therefore, in accordance with standard County requirements, additional noise analysis would be conducted where exterior noise levels are expected to exceed 60 CNEL **(Impact Noi-6)**.

Mitigation

M-Noi-6 **Exterior-to-Interior Noise Analysis:** In accordance with standard County requirements, additional exterior to interior noise analysis shall be conducted for the residential units identified as R9 and R10 on Figure 4 where exterior noise levels are expected to exceed 60 CNEL (within the second stories) to demonstrate that interior levels do not exceed 45 CNEL. The information in the analysis shall include wall heights and lengths, room volumes, window and door tables typical for a building plan, as well as information on any other openings in the building shell. With this specific building plan information, the analysis shall determine the predicted interior noise levels at the planned on-site buildings. If predicted noise levels are found to be in excess of 45 CNEL, the report shall identify architectural materials or techniques that could be included to reduce noise levels to 45 CNEL in habitable rooms.

Standard measures such as glazing with Sound Transmission Class (STC) ratings from 22 to 60, as well as walls with appropriate STC ratings (34 to 60), should be considered.

Appropriate means of air circulation and provision of fresh air would be provided to allow windows to remain closed for extended intervals of time so that acceptable interior noise levels can be maintained. The mechanical ventilation system would meet the criteria of the International Building Code (Chapter 12, Section 1203.3 of the 2001 California Building Code).

4.3.5.2 *Off-Site Transportation Noise*

Exterior

TNM software was utilized to calculate the noise contour distances for the following scenarios: existing, existing plus Project, existing plus cumulative projects (near term), and existing plus Project plus cumulative projects (near term). This modeling was conducted for the relevant street segments in the HGV South vicinity, and represents a conservative analysis that does not take into account topography or attenuation provided by existing structures. The results of this analysis for the CNEL at 100 feet are shown below in Table 4-6, *Existing and Project Traffic Noise Levels*, and Table 4-7, *Cumulative Traffic Noise Levels*. Additional analysis for the 70, 65 and 60 CNEL distances are provided in Appendix E, *Existing, Project, and Cumulative Project Traffic Noise Levels.*

As noted in Section 4.1, a significant direct impact would occur if existing conditions approach or exceed County standards and HGV South more than doubles (increases by more than 3 CNEL) the existing noise level. Although some roadway segments approach or exceed county standards, HGV South does not increase any of the noise levels by more than 3 CNEL. Therefore, exterior direct impacts from off-site transportation noise would be less than significant.

Table 4-6
EXISTING AND PROJECT TRAFFIC NOISE LEVELS

Roadway Segment	CNEL @ 100 feet			
	Existing	Existing + Project	Change from Existing	Direct Impact[1]
Country Club Drive				
Auto Park Way to Hill Valley Drive	59	60	1	No
Hill Valley Drive to Kauana Loa Drive	59	60	1	No
Kauana Loa Drive to Harmony Grove Village Parkway	56	58	2	No
Harmony Grove Village Parkway to Harmony Grove Road	55	57	2	No
Harmony Grove Road to Cordrey Drive	49	58	9	No
Harmony Grove Road				
Wilgen Drive to Country Club Drive	59	59	0	No
Country Club Drive to Harmony Grove Village Parkway	59	60	1	No
Harmony Grove Village Parkway to Kauana Loa Drive	58	59	1	No
Kauana Loa Drive to Enterprise Street	59	59	0	No
Harmony Grove Village Parkway				
Harmony Grove Road to Citracado Parkway	60	61	1	No

[1] If existing conditions approach or exceed County standards, a direct impact to off-site uses would occur if the project more than doubles (increases by more than 3 CNEL) the existing noise level.

Interior

Traditional architectural materials are normally able to reduce exterior to interior noise by up to 15 dBA. If the noise level at the exterior of a residence is above 60 CNEL, it may cause the interior noise level to be above the County standards of 45 CNEL. One roadway segment, Harmony Grove Road to Citracado Parkway on Harmony Grove Village Parkway, is modeled to be above 60 CNEL with HGV South. However, HGV South's contribution to the noise increase would be less than 3 CNEL, and interior direct impacts from off-site transportation would be less than significant.

4.3.6 Cumulative Operational Noise Impacts

4.3.6.1 *Stationary Noise Sources*

Beyond the Harmony Grove Village project, addressed above, no planned future projects are within a sufficient distance to affect the future residences at the HGV South site. Further, operational noise impacts typically are assessed on a case-by-case basis and all future development would be subject to the limits within the County noise ordinance. As a result, a cumulative impact would not occur.

4.3.6.2 *Cumulative Off-Site Traffic Noise Impacts*

Cumulative traffic noise levels were already taken into account to assess on-site noise impacts as part of Section 4.3.5.1. Therefore, the following analysis focuses on potential cumulative off-site impacts.

Exterior

The potential for a cumulative noise impact can occur when traffic from multiple projects combines to increase noise levels above thresholds. A significant cumulative exterior impact would occur if HGV South results in the exposure of any NSLU to an increase of 10 CNEL over pre-existing noise levels resulting in a combined exterior noise level of 60 CNEL or greater or if HGV South would cause an increase of 3 CNEL in existing plus Project plus cumulative conditions if that total is above 60 CNEL.

As shown on Table 4-7, *Cumulative Traffic Noise Level Impacts*, one segment is identified as having a significant cumulative exterior impact according to this standard. Country Club Drive, from Auto Park Way to Hill Valley Drive, would result in an increase of 3 CNEL compared to existing conditions.

According to County guidelines, a cumulatively considerable contribution to this impact would occur if a project contributes more than 1 dBA to the cumulative noise increase. HGV South would not contribute more than 1 dBA to the cumulative increase in traffic noise along this segment of Country Club Drive. Therefore, cumulative traffic-related exterior noise impacts from the proposed Project are not cumulatively considerable.

Interior

A significant cumulative interior impact would occur if HGV South's noise increase yields interior noise levels in excess of 45 CNEL while also causing an increase at least 3 CNEL over existing conditions. One segment is identified as having a significant cumulative interior impact according to this standard. Country Club Drive, from Auto Park Way to Hill Valley Drive, would result in an increase of 3 CNEL compared to existing conditions. However, HGV South would not contribute more than 1 dBA to the cumulative noise increase; therefore, cumulative traffic-related interior noise impacts are not cumulatively considerable.

Table 4-7
CUMULATIVE TRAFFIC NOISE LEVEL IMPACTS

Roadway Segment	E	E + C	E + P + C				
	CNEL @ 100 ft	CNEL @ 100 ft	CNEL @ 100 ft	Change from Existing[1]	Cumulative Impact[2]	Change from E + C[1]	Cumulatively Considerable Contribution[3]
County Club Drive							
Auto Park Way to Hill Valley Dr	59	61	62	3	**Yes**	1	No
Hill Valley Dr to Kauana Loa Dr	59	60	61	2	No	1	No
Kauana Load Dr to Harmony Grove Village Pkwy	56	59	60	4	No	1	No
Harmony Grove Village Pkwy to Harmony Grove Road	55	57	58	3	No	1	No
Harmony Grove Road to Cordrey Dr	49	49	58	9	No	9	No
Harmony Grove Road							
Wilgen Dr to Country Club Dr	59	61	61	2	No	0	No
Country Club Dr to Harmony Grove Village Pkwy	59	60	61	2	No	1	No
Harmony Grove Village Pkwy to Kauana Loa Dr	58	60	60	2	No	0	No
Kauana Loa Dr to Enterprise St	59	61	61	2	No	0	No
Harmony Grove Village Parkway							
Harmony Grove Road to Citracado Pkwy	60	62	62	2	No	0	No

Note: Surrounding street segments that do not have residences/NSLUs adjacent to them were not included in this analysis, as impacts to NSLUs would not occur; E = Existing; E + C = Existing + Cumulative (near term); E + P + C = Existing + Project + Cumulative (near term)

[1] Results have been rounded down to nearest whole number per County standard practice.

[2] A cumulative impact would occur if HGV South would cause: an increase of 10 CNEL over existing noise levels, resulting in a combined exterior noise level of 60 CNEL or greater; an increase of 3 CNEL over existing conditions if that total is above 60 CNEL; or if HGV South would cause interior noise levels in excess of 45 CNEL while also causing an increase at least 3 CNEL over existing conditions.

[3] A cumulatively considerable contribution to the cumulative impact would occur if HGV South adds *more than* 1 dBA to the cumulative noise increase.

5.0 SUMMARY OF PROJECT IMPACTS AND MITIGATION

5.1 Impacts

Noi-1 **Breaker Noise Impacts:** If a breaker operates within 125 feet of the nearest NSLU, the noise level would exceed the County's impulsive noise limit of 82 dBA L_{MAX}. Therefore, impacts from the operation of a breaker are considered potentially significant.

Noi-2 **Rock Crusher Noise Impacts:** If a rock crusher is used within 250 feet of the nearest NSLU, the noise level would exceed the County's 8-hour noise level limits of 75 dBA L_{EQ}. Therefore, impacts from the operation of a rock crusher are considered potentially significant.

Noi-3 **Blasting Impacts:** Because project-specific details regarding blasting operations are not available at this time, impacts to off-site residences are conservatively assessed as significant.

Noi-4 **WTWRF Impacts:** WTWRF equipment would have the potential to create noise in excess of allowable limits; the piece of WTWRF equipment that would generate the most noise would be the standby diesel generator. The generator would produce noise levels ranging from 90 to 105 dBA at 23 feet, and thus noise levels of 45 dBA (the night-time allowable limit) could be experienced at distances of up to 23,000 feet (without consideration for other factors that could reduce this noise level). Therefore, impacts are conservatively assessed as potentially significant.

Noi-5 **Exterior Use Area Noise Impacts:** As seen in Table 4-5 and applying the most restrictive County Noise Element noise threshold for single family residences, noise levels exceed the 60 CNEL at two of the 13 receivers modeled. These two receivers, R9 and R10, are located on two single-family residences that are located in the westernmost portion of the HGV South site that face Country Club Drive (see Figure 4). Noise levels at other multi-family and single-family residences on the HGV South site would not exceed 60 CNEL. Therefore, exterior use area noise impacts to on-site residences are potentially significant.

Noi-6 **Interior Noise Impacts:** Even with the noise barrier identified as part of M-Noi-5, the second stories of the residential units identified as R9 and R10 on Figure 4 may be exposed to noise in excess of 60 CNEL. Therefore, in accordance with standard County requirements, additional noise analysis would be conducted where exterior noise levels are expected to exceed 60 CNEL.

5.2 Mitigation

M-Noi-1 **Breaker Equipment Operation Limit:** If a breaker is required as part of HGV South construction, then it shall not generate maximum noise levels that exceed 82 dBA L_{MAX} when measured at the property line for 25 percent of a one-hour period, or be used within 125 feet of the property line for any occupied residence. Material that would require a breaker shall be moved a minimum distance of 125 feet from the nearest residence.

M-Noi-2 **Rock Crusher Operation Limit:** If a rock crusher is required as part of HGV South construction, then it shall not be used within 250 feet of the property line for any occupied residence until a temporary noise barrier or berm is constructed at the edge of the development footprint or around the piece of equipment to reduce noise levels below 75 dBA L_{EQ} at the property line for the occupied residences. If a barrier or berm is used, decibel output will be confirmed by a County-approved noise specialist. Otherwise, a rock crusher shall be moved a minimum distance of 250 feet from the nearest residence before use.

M-Noi-3 **Blasting Measures:** The following measures would be implemented to reduce impacts from blasting:

- The number of blasts would be limited to three blasting events per week.

- HGV South would also include a blasting management plan due to the blasting that is likely to occur on site). All blast planning must be done by a San Diego County Sheriff approved blaster, with the appropriate San Diego County Sheriff blasting permits, in compliance with the County Consolidated Fire Code SEC. 96.1.5601.2 (County 2014a), and all other applicable local, state, and federal permits, licenses, and bonding. The blasting contractor or owner must conduct all notifications, inspections, monitoring, and major or minor blasting requirements planning with seismograph reports, as necessary.

- If boulders must be reduced in size with blasting within 200 feet of the closest residence, the use of chemical expansion via a chemical cracking agent shall be performed instead.

M-Noi-4 **WTWRF Final Design Noise Shielding:** The WTWRF shall be enclosed by a solid 6-foot high wall. Final design for the WTWRF and the noise wall shall demonstrate that exterior noise levels generated from all stationary WTWRF equipment combined shall not exceed the one-hour exterior noise level of 45 dBA L_{EQ} at the property line.

The applicant shall be required to provide a final noise impact analysis as part of the facilities design submittal package for the WTWRF and noise wall prepared by a County-approved noise consultant. The final noise impact analysis shall demonstrate compliance with the County 45 dBA L_{EQ} property line nighttime limit completed to the satisfaction of the County Planning and Development Services.

M-Noi-5 **On-Site Noise Barriers:** Exterior noise levels at exterior use areas for the proposed residences identified as R9 and R10 on Figure 4 shall be reduced to the most restrictive County Noise Element threshold of 60 CNEL. Noise reduction for on-site exterior traffic noise impacts, which could lead to interior noise impacts, could be accomplished through on-site noise barriers. One 5-foot-high sound wall along the northern perimeter of the affected lot would be installed, with approximately 20-foot long return walls along the western perimeter of the western residence (R9) and the eastern perimeter of the eastern residence (R10).

The sound attenuation fence or wall must be solid. It can be constructed of masonry, wood, plastic, fiberglass, steel, or a combination of those materials, as long as there are no cracks or gaps, through or below the wall. Any seams or cracks must be filled or caulked. If wood is used, it can be tongue and groove and must be at least one-inch total thickness or have a density of at least 3.5 pounds per SF. Where architectural or aesthetic factors allow, glass or clear plastic ⅜-inch thick or thicker may be used on the upper portion, if it is desirable to preserve a view. Sheet metal of 18-gauge (minimum) may be used, if it meets the other criteria and is properly supported and stiffened so that it does not rattle or create noise itself from vibration or wind. Any

door(s) or gate(s) must be designed with overlapping closures on the bottom and sides and meet the minimum specifications of the wall materials described above. The gate(s) may be of one-inch thick or better wood, solid-sheet metal of at least 18-gauge metal, or an exterior-grade solid-core steel door with prefabricated doorjambs.

M-Noi-6 **Exterior-to-Interior Noise Analysis:** In accordance with standard County requirements, additional exterior to interior noise analysis shall be conducted for the residential units identified as R9 and R10 on Figure 4 where exterior noise levels are expected to exceed 60 CNEL (within the second stories) to demonstrate that interior levels do not exceed 45 CNEL. The information in the analysis shall include wall heights and lengths, room volumes, window and door tables typical for a building plan, as well as information on any other openings in the building shell. With this specific building plan information, the analysis shall determine the predicted interior noise levels at the planned on-site buildings. If predicted noise levels are found to be in excess of 45 CNEL, the report shall identify architectural materials or techniques that could be included to reduce noise levels to 45 CNEL in habitable rooms. Standard measures such as glazing with STC ratings from 22 to 60, as well as walls with appropriate STC ratings (34 to 60), should be considered.

Appropriate means of air circulation and provision of fresh air would be provided to allow windows to remain closed for extended intervals of time so that acceptable interior noise levels can be maintained. The mechanical ventilation system would meet the criteria of the International Building Code (Chapter 12, Section 1203.3 of the 2001 California Building Code).

5.3 Significance after Mitigation

With the implementation of Measures M-Noi-1, M-Noi-2, and M-Noi-3, construction impacts would be reduced to less than significant levels.

With the implementation of Measure M-Noi-4, stationary noise impacts would be reduced to less than significant levels.

With the implementation of Measure M-Noi-5, traffic noise impacts to exterior use areas associated with on-site NSLUs would be reduced to less than significant levels. The receivers on the affected lot are modeled to have unmitigated noise levels of 62 CNEL; with an approximate sound wall height of five feet, the noise levels are modeled to be 59 and 58 CNEL.

With the implementation of Measure M-Noi-6, potential interior traffic noise impacts to on-site NSLUs would be reduced to less than significant levels.

6.0 LIST OF PREPARERS

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Appendix A

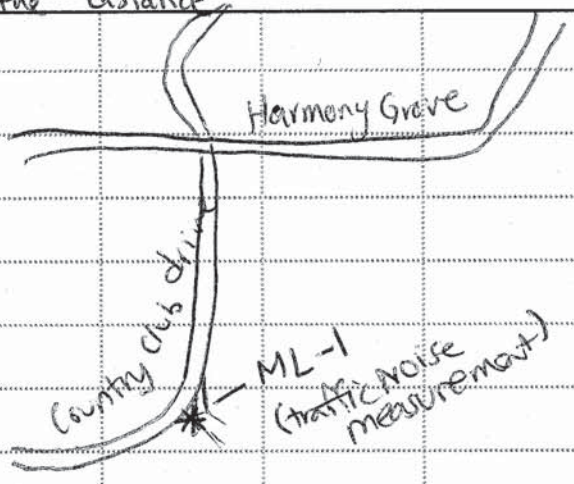
ON-SITE NOISE MEASUREMENT SHEET

Site Survey

Job # KOV-01	Project Name: Harmony Grove South		
Date: 8/12/14	Site #: ML-1	Engineer: Liz Scott	
Address: 2702-2780 Country club drive	GPS: 33°5'45.05" N & 117°7'49.79" W		
Meter: LD-LXT	Serial #: 0001741	Calibrator: CA 200	Serial #: 4371

Notes: -40ft 1inch to centerline -airplane@14 minutes
-Heavy construction occuring 200 M away (& further)
-Birds/Roosters squawking in the distance

Sketch:



Temperature: 72	Wind Speed: Wind = N 7 mph	Humidity: 76%
Start of Measurement: 10:52	End of Measurement: 11:07 (15 minutes)	54.4 dBA L_{EQ}

Cars ~~(tally per 5 cars)~~ per car	Medium Trucks (MT)	Heavy Trucks (HT)
IIII		1

Noise Measurement for Information Only

No Through Roadways

No Calibration Analysis Will Be Provided

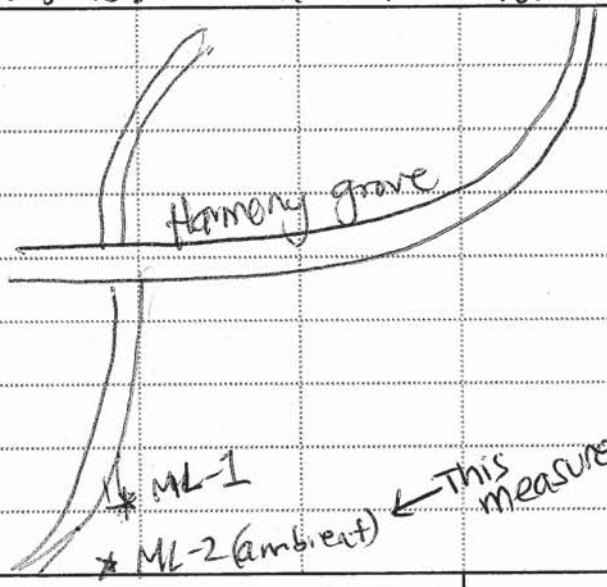
Site Survey

Job # KOV-01	Project Name: Harmony Grove South		
Date: 8/12/14	Site #: ML-2 (ambient)	Engineer: Liz Scott	
Address: On-site ambient @ GPS coord's			
Meter: LD -LXT	Serial #: 0001741	Calibrator: CA200	Serial #: 4371

Notes: a few cars, Horse noises

Approx GPS: 33°5'43.14"N & 117°7'48.73"W

Sketch:



Temperature: 72	Wind Speed: N 3mph	Humidity: 76%
Start of Measurement: 11:28	End of Measurement: 11:44 (15 minute)	42.8 dBA L_{EQ}

~~Cars (tally per 5 cars)~~	~~Medium Trucks (MT)~~	~~Heavy Trucks (HT)~~
Ambient		

Noise Measurement for Information Only

No Through Roadways

No Calibration Analysis Will Be Provided

Appendix B

CARRIER 38HDR060 SPLIT SYSTEM CONDENSER

ELECTRICAL DATA

38HDR UNIT SIZE	V–PH–Hz	VOLTAGE RANGE*		COMPRESSOR		OUTDOOR FAN MOTOR			MIN CKT AMPS	FUSE/ HACR BKR AMPS
		Min	Max	RLA	LRA	FLA	NEC Hp	kW Out		
018	208/230–1–60	187	253	9.0	48.0	0.80	0.125	0.09	12.1	20
024	208/230–1–60	187	253	12.8	58.3	0.80	0.125	0.09	16.8	25
030	208/230–1–60	187	253	14.1	73.0	1.45	0.25	0.19	19.1	30
036	208/230–1–60	187	253	14.1	77.0	1.45	0.25	0.19	19.1	30
	208/230–3–60	187	253	9.0	71.0	1.45	0.25	0.19	12.7	20
	460–3–60	414	506	5.6	38.0	0.80	0.25	0.19	7.8	15
048	208/230–1–60	187	253	21.8	117.0	1.45	0.25	0.19	28.7	50
	208/230–3–60	187	253	13.7	83.1	1.45	0.25	0.19	18.6	30
	460–3–60	414	506	6.2	41.0	0.80	0.25	0.19	8.6	15
060	208/230–1–60	187	253	26.4	134.0	1.45	0.25	0.19	34.5	60
	208/230–3–60	187	253	16.0	110.0	1.45	0.25	0.19	21.5	35
	460–3–60	414	506	7.8	52.0	0.80	0.25	0.19	10.6	15

* Permissible limits of the voltage range at which the unit will operate satisfactorily

FLA – Full Load Amps

HACR – Heating, Air Conditininng, Refrigeration

LRA – Locked Rotor Amps

NEC – National Electrical Code

RLA – Rated Load Amps (compressor)

NOTE: Control circuit is 24–V on all units and requires external power source. Copper wire must be used from service disconnect to unit. All motors/compressors contain internal overload protection.

SOUND LEVEL

Unit Size	Standard Rating (dB)	Typical Octave Band Spectrum (dBA) (without tone adjustment)						
		125	250	500	1000	2000	4000	8000
018	68	52.0	57.5	60.5	63.5	60.5	57.5	46.5
024	69	57.5	61.5	63.0	61.0	60.0	56.0	45.0
030	72	56.5	63.0	65.0	66.0	64.0	62.5	57.0
036	72	65.0	61.5	63.5	65.0	64.5	61.0	54.5
048	72	58.5	61.0	64.0	67.5	66.0	64.0	57.0
060	72	63.0	61.5	64.0	66.5	66.0	64.5	55.5

CHARGING SUBCOOLING (TXV-TYPE EXPANSION DEVICE)

UNIT SIZE–VOLTAGE, SERIES	REQUIRED SUBCOOLING °F (°C)
018	12 (6.7)
024	12 (6.7)
030	12 (6.7)
036	12 (6.7)
048	12 (6.7)
060	12 (6.7)

Appendix C

RCNM ROCK CRUSHER OUTPUTS

Appendix C - Rock Crusher Outputs

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/6/2015
Case Description: HGVS

		Baselines (dBA)			---- Receptor #1 ----			
Description	Land Use	Daytime	Evening	Night				
Residential Receivers	Residential	75	75	75				

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Impact Crusher	No	100		83.9	250	0
Jaw Crusher	No	100		86.5	250	0
Front End Loader	No	40		79.1	250	0

Results

		Calculated (dBA)	
Equipment		*Lmax	Leq
Impact Crusher		69.9	69.9
Jaw Crusher		72.5	72.5
Front End Loader		65.1	61.2
	Total	72.5	74.6

*Calculated Lmax is the Loudest value.

Appendix D

PILE DRIVER VIBRATION CALCULATIONS

Appendix D
Pile Driver Vibration Calculations

Pile driving planning is based on information provided in Caltrans's Transportation and Construction-Induced Vibration Guidance Manual (June 2004).

A pile driving analysis is based on the equation:

PPVImpact Pile Driver = PPVRef (25/D)^{n} x (Eequip/ERef)$^{0.5}$ (in/sec) (Eq. 9)

Where: *PPVRef = 0.65 in/sec for a reference pile driver at 25 ft. (see Table D-1)*

D = distance from pile driver to the receiver in ft.

n = 1.1 is a value related to the vibration attenuation rate through ground (see Table D-2)

ERef = 36,000 ft-lb (rated energy of reference pile driver)

Eequip = rated energy of impact pile driver in ft-lbs (see Table D-3).

Table D-1
VIBRATION SOURCE AMPLITUDES FOR CONSTRUCTION EQUIPMENT

Pile Driver reference	**0.65**
Vibratory roller	0.21
Large bulldozer	0.089
Caisson drilling	0.089
Loaded trucks	0.076
Jackhammer	0.035
Small bulldozer	0.003
Crack-and-seat operations	2.4

Table D-2
MEASURED AND SUGGESTED "N" VALUES BASED ON SOIL CLASS
SOIL CLASS DESCRIPTION OF SOIL MATERIAL VALUE OF "N"

Soil Class	Description of Materials	Measured by Woods and Jedele	Suggested Value of "n"
I	Weak or soft soils: loose soils, dry or partially saturated peat and muck, mud, loose beach sand, and dune sand, recently plowed ground, soft spongy forest or jungle floor, organic soils, top soil. (shovel penetrates easily)	Data not available	1.4
II	Competent soils: most sands, sandy clays, silty clays, gravel, silts, weathered rock. (can dig with shovel)	1.5	1.3
III	Hard soils: dense compacted sand, dry consolidated clay, consolidated glacial till, some exposed rock. (cannot dig with shovel, need pick to break up)	1.1	1.1
IV	Hard, competent rock: bedrock, freshly exposed hard rock. (difficult to break with hammer)	Data not available	1

Table D-3
PILE DRIVING EQUIPMENT

Equipment	kNm	Ft-lbs
DELMAG D35-32	123-56	90720

Table D-4
PILE DRIVING VIBRATION CALCULATIONS

Source	PPV/ref (25-ft)	Distance	*n*	E_{equip}	E_{ref}	PPV
DELMAG D36-32	0.65	25	1.1	90720	36000	1.03184
DELMAG D36-32	0.65	1,200	1.1	90720	36000	0.0146
DELMAG D36-32	0.65	500	1.1	90720	36000	0.0382

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Appendix E

EXISTING, PROJECT, AND CUMULATIVE PROJECT TRAFFIC NOISE LEVELS

Appendix E
Existing, Project, and Cumulative Project Traffic Noise Levels

Table E-1
EXISTING, PROJECT, AND CUMULATIVE PROJECT TRAFFIC NOISE LEVELS

Roadway Segment	Existing Conditions				Existing + Project				Existing + Cumulative				Existing + Cumulative + Project			
	CNEL @ 100 ft.	70 CNEL (ft.)	65 CNEL (ft.)	60 CNEL (ft.)	CNEL @ 100 ft.	70 CNEL (ft.)	65 CNEL (ft.)	60 CNEL (ft.)	CNEL @ 100 ft.	70 CNEL (ft.)	65 CNEL (ft.)	60 CNEL (ft.)	CNEL @ 100 ft.	70 CNEL (ft.)	65 CNEL (ft.)	60 CNEL (ft.)
Country Club Drive																
Auto Park Way to Hill Valley Drive	59	20	55	93	60	25	60	100	61	30	65	110	62	35	70	117
Hill Valley Drive to Kauana Loa Drive	59	19	53	90	60	23	58	97	60	27	62	105	61	30	65	110
Kauana Loa Drive to Harmony Grove Village Parkway	56	IRW	34	68	58	13	44	78	59	19	53	90	60	23	57	96
Harmony Grove Village Parkway to Harmony Grove Road	55	IRW	25	60	57	IRW	35	70	57	IRW	40	74	58	14	47	81
Harmony Grove Road to Cordrey Dr.	49	IRW	IRW	18	58	15	50	83	49	IRW	IRW	18	58	15	50	84
Harmony Grove Road																
Wilgen Drive to Country Club Drive	59	20	54	91	59	20	55	93	61	28	62	107	61	29	64	110
Country Club Drive to Harmony Grove Village Parkway	59	18	52	90	60	25	60	102	60	25	60	101	61	33	68	115
Harmony Grove Village Parkway to Kauana Loa Drive	58	14	44	78	59	15	50	85	60	24	57	100	60	27	61	105
Kauana Loa Drive to Enterprise Street	59	16	50	85	59	20	63	92	61	26	63	105	61	30	65	110
Harmony Grove Village Parkway																
Harmony Grove Road to Citracado Parkway	60	26	61	105	61	33	67	115	62	35	69	116	62	40	74	125

IRW = The CNEL contour indicated exists within the width of the roadway.

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