Noise Analysis for the Rockport Ranch Project, Menifee, California

Prepared for
Excel Engineering
440 State Place
Escondido, California 92029
Contact: Mr. Rod Jones

Prepared by
RECON Environmental, Inc.
1927 Fifth Avenue
San Diego, CA 92101
P 619.308.9333

RECON Number 8149
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Jack T. Emerson, Noise Analyst

Reviewed and Approved by
William A. Maddux, Senior Noise Specialist

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Acronyms

AASHTO	American Association of State Highway and Transportation Officials
ADT	average daily traffic
CCR	California Code of Regulations
City	City of Menifee
CNEL	community noise equivalent level
dB	decibels
dB(A)	A-weighted decibels
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HVAC	heating, ventilation, and air conditioning
Hz	hertz
in/sec	inches per second
L_{eq}	one-hour equivalent noise level
LOS	Level of Service
PPV	Peak particle velocity
project	Rockport Ranch Project
RV	recreational vehicle
STC	Sound Transmission Class

Executive Summary

This report evaluates potential noise and vibration impacts associated with the Rockport Ranch Project (project) in city of Menifee, California (City). The 79.68-acre project site is located south of Old Newport Road, west of Briggs Road, north of the Wilderness Lakes Recreational Vehicle Resort, and east of Camellia at the Lakes Residential Complex (under construction). The project consists of subdivision of the site and construction of 305 single-family residences and associated amenities.

As part of this assessment, project construction noise levels at adjacent uses were assessed for compliance with standards of the City Noise Ordinance. Additionally, project compatibility with existing traffic noise levels was assessed based on the City's planning policies. A summary of the findings is provided below.

Construction Noise

Hourly average construction noise levels (L_{eq}) at adjacent residences would be 70 A-weighted decibels [dB(A)] or less. Although adjacent residences would be exposed to construction noise levels in excess of ambient noise levels, the exposure would be short term. Additionally, construction activities would occur between the hours of 6:00 a.m. and 6:00 p.m. from June through September and 7:00 a.m. and 6:00 p.m. from October through May, as specified in the City's Municipal Code Section 9.09.020. Because construction activities associated with the project would comply with the applicable regulation for construction, temporary increases in noise levels from construction activities would be less than significant.

On-site Generated Noise

The noise sources associated with proposed single-family residences would be those typical of any residential development (vehicles arriving and leaving, children at play, and landscape maintenance machinery, etc.). None of these noise sources has substantial potential to violate noise level standards or result in a substantial permanent increase in existing noise levels. Ground- or roof-mounted heating, ventilation, and air conditioning units would be newer models and would be reviewed as part of building inspection. The City's Noise Ordinance Section 9.09.020 exempts all "heating and air conditioning equipment in proper repair." Impacts would be less than significant.

Traffic Noise

Land Use Compatibility

Traffic noise levels at exterior use areas would be 63 community noise equivalent level (CNEL) or less. Therefore, the project would comply with the City's planning policies, which indicate that noise-sensitive land uses should be protected from noise levels that exceed 65 CNEL. The project would be compatible with the existing noise environment.

Maximum interior noise levels in habitable rooms on the first floor of proposed buildings would be 45 CNEL or less. These noise levels would be consistent with the state's interior compatibility standard of 45 CNEL and interior noise levels at habitable rooms on the first floor or proposed buildings would be less than significant.

Without mitigation, maximum interior noise levels in habitable rooms on the second floor of proposed buildings would exceed the City's interior compatibility standard of 45 CNEL at the second floor of proposed residences along Briggs Road. Mitigation measure NOI-1 would require the installation of sound resistant windows and doors at these residences. With incorporation of mitigation measure NOI-1 the interior noise levels would not exceed applicable interior compatibility standards at any habitable room. Impacts would be less than significant with mitigation incorporated.

Traffic Noise Increases

Project-generated traffic would increase volumes on local roadways and thereby increase traffic noise levels. The relative noise level increase attributable to the project would be greatest initially and would decrease, as ambient growth would increase the overall volume on local roadways. Traffic noise level increases would be less than 3 dB(A) along nearby roadways. A change of 3 dB(A) is barely perceptible to the human ear. Thus, project traffic would not result in a significant increase in traffic noise levels.

The project would extend Tres Lagos Drive along the southern boundary of the project site. The extension of Tres Lagos Drive would generate noise levels of approximately 60 CNEL at a distance of 50 feet. Due to the low traffic volumes anticipated on the extension of Tres Lagos Drive, the extension is not anticipated to result in noise levels that conflict with the City's planning policies regarding noise and land use compatibility standard (65 CNEL) at any noise sensitive land use. Thus, project traffic would not result in a significant increase in traffic noise levels along proposed roadways.

Vibration

Excessive groundborne vibration may result in damage to structures or may generate a rumbling noise as vibrations propagate through the components of a building.

The project would include development of single-family residences. No substantial sources of vibration would be associated with project operation. Additionally, the project would not be exposed to any substantial source of groundborne vibration.

Project construction equipment would include heavy earth-moving such as graders, dozers, and excavators. Additionally, the extension of Tres Lagos Drive may involve the use of additional vibration-generating equipment such as a vibratory roller. Peak particle velocity vibration levels would range from 0.014 to 0.033 inches per second at the nearest residential structures. These vibration levels would generally not be perceptible to the average person and would result in neither cosmetic nor structural damage of buildings vibration impacts from project construction would be less than significant.

1.0 Introduction

1.1 Project Description

The project site is located in the city of Menifee, California, south of Old Newport Road, west of Briggs Road, north of the Wilderness Lakes Recreational Vehicle (RV) Resort, and east of Camellia at the Lakes Residential Complex (under construction). Figure 1 shows the regional location of the project site. Figure 2 shows an aerial photograph of the project site and vicinity. The project site consists of single 79.68-acre parcel: Assessor's Parcel Number 364-190-004. The project applicant proposes to construct 305 detached single-family residences and associated amenities. Figure 3 shows the proposed site plan for the project. The project is anticipated to be completed and fully occupied by 2020.

1.2 Fundamentals of Noise

Sound levels are described in units called the decibel (dB). Decibels are measured on a logarithmic scale that quantifies sound intensity in a manner similar to the Richter scale used for earthquake magnitudes. Thus, a doubling of the energy of a noise source, such as doubling of traffic volume, would increase the noise level by 3 dB; a halving of the energy would result in a 3 dB decrease.

In technical terms, sound levels are described as either a "sound power level" or a "sound pressure level," which while commonly confused are two distinct characteristics of sound. Both share the same unit of measure, the dB. However, sound power, expressed as L_{pw}, is the energy converted into sound by the source. As sound energy travels through the air, it creates a sound wave that exerts pressure on receivers such as an ear drum or microphone, the sound pressure level. Sound measurement instruments only measure sound pressure, and limits used in standards are generally sound pressure levels.

Noise is as a sound that is loud or unpleasant sound that causes disturbance. The human ear is not equally sensitive to all frequencies within the sound spectrum. To accommodate this phenomenon, the A-scale, which approximates the frequency response of the average young ear when listening to most ordinary everyday sounds, was devised. When people make relative judgments of the loudness or annoyance of a sound, their judgments correlate well with the A-scale sound levels of those sounds. Therefore, the "A-weighted" noise scale is used for measurements and standards involving the human perception of noise. Noise levels using A-weighted measurements are designated with the notation dB(A). Human perception of noise has no simple correlation with acoustical energy. Changes in noise levels are generally perceived by the average human ear as follows: 3 dB(A) is barely perceptible, 5 dB(A) is readily perceptible, and 10 dB(A) is perceived as a doubling or halving of noise (California Department of Transportation 2013a).

FIGURE 1
Regional Location

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Image Source: NearMaps (flown September 2016)

Project Boundary

FIGURE 2

Project Location on Aerial Photograph

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Map Source: Excel Engineering, 9/16/16

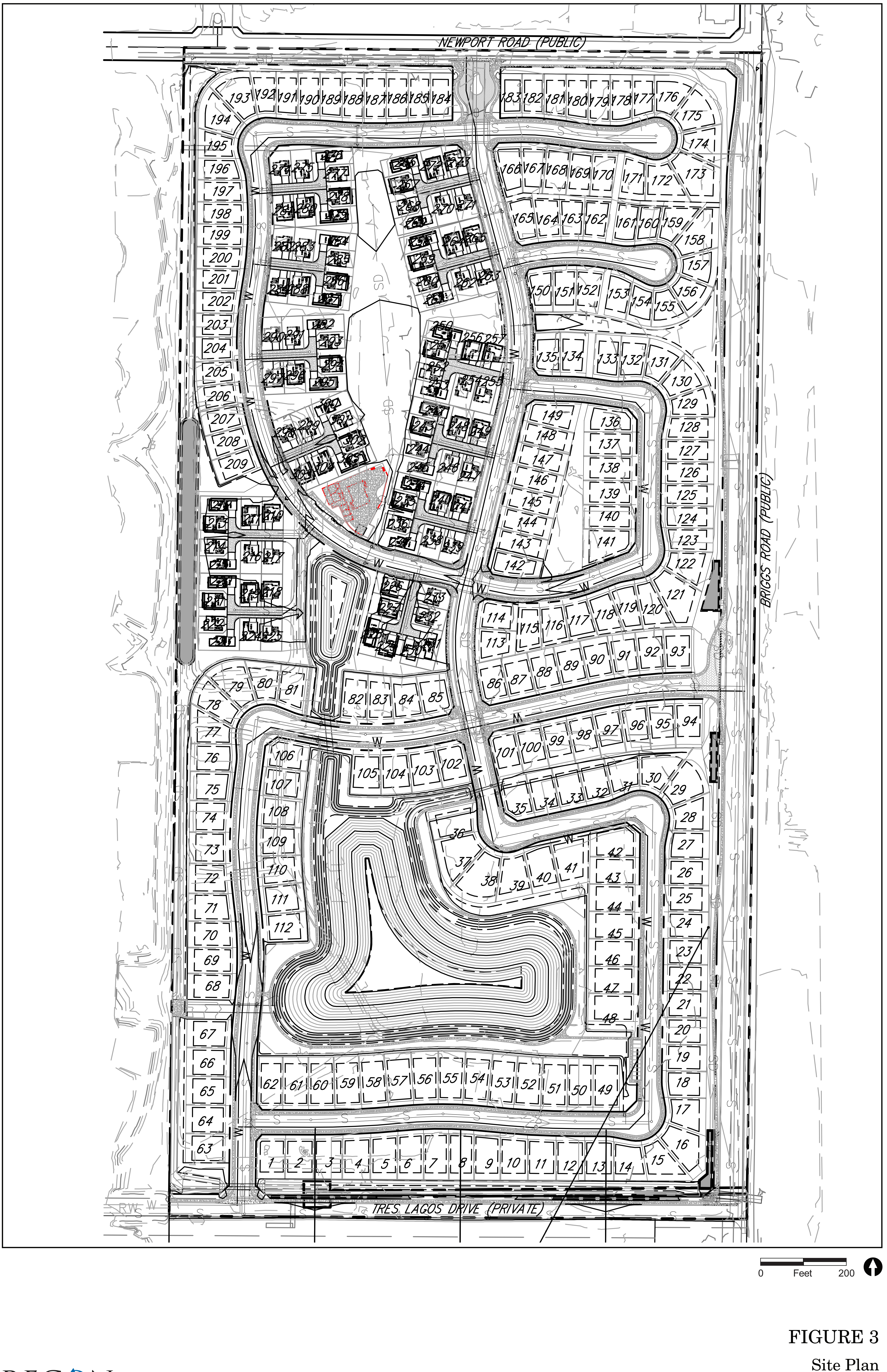

FIGURE 3

Site Plan

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1.2.1 Descriptors

The impact of noise is not a function of loudness alone. The time of day when noise occurs and the duration of the noise are also important. In addition, most noise that lasts for more than a few seconds is variable in its intensity. Consequently, a variety of noise descriptors has been developed. The noise descriptors used for this study are the equivalent noise level (L_{eq}) and the community noise equivalent level (CNEL). The L_{eq} is the equivalent steady-state noise level in a stated period of time that is calculated by averaging the acoustic energy over a time period; when no period is specified, a 1-hour period is assumed. For this analysis, the 10-minute L_{eq} is used frequently due to local noise standards. The CNEL is a 24-hour equivalent sound level. The CNEL calculation applies an additional 5 A-weighted decibels dB(A) penalty to noise occurring during evening hours, between 7:00 p.m. and 10:00 p.m., and a 10 dB(A) penalty is added to noise occurring during the night, between 10:00 p.m. and 7:00 a.m. These increases for certain times are intended to account for the added sensitivity of humans to noise during the evening and night.

1.2.2 Propagation

Sound from a small, localized source (approximating a "point" source) radiates uniformly outward as it travels away from the source in a spherical pattern, known as geometric spreading. The sound level decreases or drops off at a rate of 6 dB(A) for each doubling of the distance.

Traffic noise is not a single, stationary point source of sound. The movement of vehicles makes the source of the sound appear to emanate from a line (line source) rather than a point when viewed over some time interval. The drop off rate for a line source is 3 dB(A) for each doubling of distance.

The propagation of noise is also affected by the intervening ground, known as ground absorption. A hard site (such as parking lots or smooth bodies of water) receives no additional ground attenuation, and the changes in noise levels with distance (drop-off rate) are simply the geometric spreading from the source. A soft site (such as soft dirt, grass, or scattered bushes and trees) provides an additional ground attenuation value of 1.5 dB(A) per doubling of distance. Thus, a point source over a soft site would drop off at 7.5 dB(A) per doubling of distance.

1.3 Fundamentals of Vibration

Vibration consists of energy waves transmitted through solid material (Federal Transit Administration [FTA] 2006). Groundborne vibration propagates from the source through the ground to adjacent buildings by surface waves. Vibration may be composed of a single pulse, a series of pulses, or a continuous oscillatory motion. The frequency of a vibrating object describes how rapidly it is oscillating, measured in hertz (Hz). The normal frequency range of most groundborne vibration that can be felt generally starts from a low frequency of less than 1 Hz to a high of about 200 Hz (FTA 2006). Typical vibration from transportation and construction sources typically falls in the range of 10 to 30 Hz and usually centers around 15 Hz (California Department of Transportation [Caltrans] 2013b).

Vibration energy spreads out as it travels through the ground, causing the vibration amplitude to decrease with distance away from the source. Instantaneous groundborne vibration is measured by its peak particle velocity (PPV). The PPV is normally described in inches per second (in/sec). Excessive groundborne vibration has potential to result in structural damage.

Although groundborne vibration is sometimes noticeable in outdoor environments, groundborne vibration is almost never annoying to people who are outdoors (FTA 2006). Ground vibration can be annoying to people within structures. Ground vibration generated by construction activity has the potential to damage structures. Ground vibration also has the potential to disrupt the operation of vibration-sensitive research and advanced technology equipment. Thus, the primary concern from construction- and transportation-related vibration is the ability to be intrusive and annoying to local residents and other indoor, vibration-sensitive land uses (Caltrans 2013b).

While people have varying sensitivities to vibrations at different frequencies, in general they are most sensitive to low-frequency vibration (i.e., 8 to 80 Hz) (Caltrans 2013b). Vibration in buildings caused by construction activities may be perceived as motion of building surfaces or rattling of windows, items on shelves, and pictures hanging on walls. Vibration of building components can also take the form of an audible, low-frequency rumbling noise, which is referred to as groundborne noise (FTA 2006). Groundborne noise is usually only a problem when the originating vibration spectrum is dominated by frequencies in the upper end of the range (60 to 200 Hz), or when the structure and the construction activity are connected by foundations or utilities, such as sewer and water pipes.

2.0 Applicable Standards

2.1 Menifee Municipal Code

The Menifee Municipal Code, Section 9.09 (Noise Ordinance), establishes performance standards for the regulation of noise within the City. Enforcement of general noise level limits, which are specific to various land use types, is intended to prevent exposure to excessive noise levels. Specific noise regulations are applicable to certain sources. The City Noise Ordinance does not specify enforcement criteria for the regulation of groundborne vibration.

2.1.1 General Noise Level Limits

Applicable noise limits from the Noise Ordinance for stationary sources are summarized in Table 1. As shown, the project may not generate 10-minute L_{eq} noise levels in excess of

65 dB(A) during the day and 45 dB(A) at night at or beyond the property line of an occupied residential property.

Table 1 Stationary Source Noise Standards		
Land Use	Interior Standards	Exterior Standards
Residential		
10:00 p.m. to 7:00 a.m.	40 L_{eq} (10-minute)	45 L_{eq} (10-minute)
7:00 a.m. to 10:00 p.m.	55 L_{eq} (10-minute)	65 L_{eq} (10-minute)

2.1.2 Exempted Noise Sources

The Noise Ordinance provides exemptions for noise from certain sources. According to Section 9.09.020 – General Exemptions, relevant to the project include:

- Property maintenance including lawnmowers, leaf blowers, etc., provided such maintenance occurs between the hours of 7 a.m. and 8:00 p.m.;
- Motor vehicles, other than off-highway vehicles; and
- Heating and air conditioning equipment in proper repair.

Additionally, according to Section 9.09.030 – Construction-Related Exemptions, construction noise is exempt from applicable noise standards provided that:

- The construction project is located at least one-quarter mile from an inhabited dwelling; or
- Construction does not occur between the hours of 6:00 p.m. and 6:00 a.m. from June through September and 6:00 p.m. and 7:00 a.m. from October through May.

2.2 City of Menifee General Plan

The Noise Element of the General Plan outlines the City's planning policies and objectives to prevent future residents from being exposed to excessive noise and vibration levels. The Noise Element is organized around two general topics, (1) protecting noise-sensitive land uses and (2) limiting noise spillover from noise-generating uses.

2.2.1 Noise Compatibility Policies

Noise-sensitive land uses identified in the Noise Element include residencies, schools, and open space recreational areas where quiet environments are necessary for enjoyment, public health, and safety. General Plan policies related to protecting noise-sensitive land uses include discouraging the siting of noise-sensitive uses in areas in excess of 65 CNEL and requiring mitigation to reduce noise levels to below noise level limits. Policies that limit noise spillover from noise-generating uses include limiting the development of new noise-generating uses adjacent to noise-sensitive land uses and guiding noise-tolerant land uses into areas exposed to irrevocable noise sources such as transportation corridors and areas adjacent to airports.

2.2.1 Vibration-related Policies

General Plan policies intended to prevent future vibration impacts include:

Policy N-1.13: Require new development to minimize vibration impacts to adjacent uses during demolition and construction.

Policy N-1.14: Minimize vibration impacts on people and businesses near light and heavy rail lines or other sources of ground-borne vibration through the use of setbacks and/or structural design features that reduce vibration to levels at or below the guidelines of the Federal Transit Administration. Require new development within 100 feet of rail lines to demonstrate, prior to project approval, that vibration experienced by residents and vibration-sensitive uses would not exceed these guidelines.

2.3 California Code of Regulations Title 24 Interior Noise Building Standards

Interior noise levels for dwellings are regulated by Title 24 of the California Code of Regulations (CCR), California Noise Insulation Standards. Title 24, Chapter 12, Section 1207.04, of the California Building Code requires that interior noise levels, attributable to exterior sources, not exceed 45 CNEL in any habitable room within a residential structure. A habitable room in a building is used for living, sleeping, eating, or cooking. Bathrooms, closets, hallways, utility spaces, and similar areas are not considered habitable spaces (24 CCR 1207 2015).

2.4 California Department of Transportation Vibration Guidance

Vibration limits used in this analysis to determine a potential impact to local land uses are based on information contained in Caltrans' *Transportation and Construction Vibration Guidance Manual* (Caltrans 2013b). Maximum recommended vibration limits by the American Association of State Highway and Transportation Officials (AASHTO) are identified in Table 2.

Table 2 AASHTO Maximum Vibration Levels for Preventing Damage	
Type of Situation	Limiting Velocity (in/sec)
Historic sites or other critical locations	0.1
Residential buildings, plastered walls	0.2–0.3
Residential buildings in good repair with gypsum board walls	0.4–0.5
Engineered structures, without plaster	1.0–1.5
SOURCE: Caltrans 2013b	

Based on AASHTO recommendations, limiting vibration levels to below 0.2 PPV in/sec at residential structures would prevent structural damage regardless of building construction type. These limits are applicable regardless of the frequency of the source. However, as shown in Table 3 and 4, potential human annoyance associated with vibration is usually different if it is generated by a steady state or a transient vibration source. These levels are summarized in Tables 3 and 4.

Table 3 Human Response to Steady State Vibration	
PPV (in/sec)	Human Response
3.6 (at 2 Hz)–0.4 (at 20 Hz)	Very disturbing
0.7 (at 2 Hz)–0.17 (at 20 Hz)	Disturbing
0.10	Strongly perceptible
0.035	Distinctly perceptible
0.012	Slightly perceptible
SOURCE: Caltrans 2013b	

Table 4 Human Response to Transient Vibration	
PPV (in/sec)	Human Response
2.0	Severe
0.9	Strongly perceptible
0.24	Distinctly perceptible
0.035	Barely perceptible
SOURCE: Caltrans 2013b	

As shown in Table 4, the vibration level threshold at which transient vibration sources (such as construction equipment) are considered to be distinctly perceptible is 0.24 PPV. Although groundborne vibration is sometimes noticeable in outdoor environments, groundborne vibration is almost never annoying to people who are outdoors; therefore, the vibration level threshold for human perception is assessed at occupied structures (FTA 2006).

3.0 Existing Conditions

3.1 Land Use and Adjacent Land Uses

The project site is zoned Heavy Agriculture (A-2), and the current occupant is Abacherli Dairy. Land north of the site, across Old Newport Road, is zoned Planned Residential (R-4) and is occupied by a single-family residential development, Tierra Shores. Land east of the project site, across Briggs Road, is outside the city boundary. The parcel east, across Briggs Road from the northern half of the site, is zoned Light Agriculture with Poultry (A-P) and is occupied by industrial chicken coops. The parcels southeast, across Briggs Road are zoned A-2 and are farmland. Land south of the project site is zoned Rural Residential (R-R) and is occupied by the Wilderness Lakes RV Resort and a residence at 30524 Briggs Road. Land west of the project site is part of the Menifee East Specific Plan and is being developed as a single-family residential development, Camellia at the Lakes.

3.2 Site Measurements

Existing noise levels at the project site were measured on February 4, 2016, using a Larson-Davis LxT Sound Expert Sound Level Meter, serial number 3827. The following parameters were used:

Filter:	A-weighted
Response:	Slow
Time History Period:	5 seconds
Height of Instrument:	5 feet above ground level

The meter was calibrated before and after each measurement. Four 15-minute measurements were made on the project site, as described below. The locations of the measurements are shown on Figure 4, and the noise measurement data are contained in Attachment 1.

Measurement 1 was located near the northern boundary of the project site, 50 feet south of Old Newport Road, and approximately 900 feet west of Briggs Road. The main noise source at this location was traffic on Old Newport Road. No other noise source substantially contributed to the noise environment at this location. During Measurement 1 traffic volumes on Old Newport Road were counted; the results are shown in Table 5. The average measured noise level during Measurement 1 was 53.7 dB(A) L_{eq}.

Measurement 2 was located near the eastern site boundary, 50 feet west of Briggs Road, across from the chicken coops along Briggs Road. The main noise source at this location was chicken coops. Other noise sources included traffic on Briggs Road. During Measurement 2 traffic volumes on Briggs Road were counted; the results are shown in Table 5. The average measured noise level during Measurement 2 was 60.1 dB(A) L_{eq}.

Image Source: NearMaps (flown September 2016)

FIGURE 4

Noise Measurement Locations

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Measurement 3 was located at the eastern project site boundary, 50 feet west of Briggs Road, and approximately 800 feet north of the Wilderness Lakes RV Resort. The main source of noise at this location was vehicle traffic on Briggs Road. No other noise source substantially contributed to the noise environment at this location. During Measurement 3 traffic volumes on Briggs Road were counted; the results are shown in Table 5. The average measured noise level during Measurement 3 was 60.0 dB(A) L_{eq}.

Measurement 4 was located 50 feet north of the southern project site boundary, near the east–west midpoint of the Wilderness Lakes RV Resort. Noise at this location was minimal and consisted of a single car pass on the internal roads of the Wilderness Lakes RV Resort (Tres Lagos Drive), a plane flyover, and birds. During Measurement 4 traffic volumes on Tres Lagos Drive were counted; the results are shown in Table 5. The average measured noise level during Measurement 3 was 40.1 dB(A) L_{eq}.

Table 5
15-minute Traffic Counts

Meas.	Interval	Roadway	Vehicle Mix: Autos	Medium Trucks	Heavy Trucks	Buses	Motor-cycles
1	11:22 a.m. to 11:37 a.m.	Old Newport Road	35	2	0	0	0
2	12:09 p.m. to 12:24 p.m.	Briggs Road	24	2	0	0	0
3	12:40 p.m. to 12:55 p.m.	Briggs Road	36	0	0	0	2
4	1:17 p.m. to 1:32 p.m.	Tres Lagos Drive	1	0	0	0	0

4.0 Analysis Methodology

4.1 Construction Noise Analysis

Noise generated by future traffic was modeled using SoundPLAN. The SoundPLAN program (Navcon Engineering 2015) uses noise propagation following the International Organization for Standardization method *ISO 9613-2 – Acoustics, Attenuation of Sound during Propagation Outdoors*. The model calculates noise levels at selected receiver locations using input parameter estimates such as total noise generated by each noise source; distances between sources, barriers, and receivers; and shielding provided by intervening terrain, barriers, and structures. Topography, roadways, and receivers were input into the model using three-dimensional coordinates.

Project construction noise would be generated by diesel engine-driven construction equipment used for site preparation and grading, removal of existing structures (Abacherli Dairy) and pavement, loading, unloading, and placing materials and paving. Diesel engine-driven trucks also would bring materials to the site and remove the soils from excavation.

Construction equipment with a diesel engine typically generates maximum noise levels from 80 to 90 dB(A) L_{eq} at a distance of 50 feet (Federal Highway Administration [FHWA] 2006). Table 6 summarizes typical construction equipment noise levels.

Table 6 Typical Construction Equipment Noise Levels	
Equipment	Noise Level at 50 Feet [dB(A) L_{eq}]
Air Compressor	81
Backhoe	80
Compactor	82
Concrete Mixer	85
Crane	81
Dozer	85
Excavator	81
Grader	85
Jack Hammer	88
Loader	85
Paver	89
Pump	76
Roller	74
Scraper	89
Truck	88
SOURCE: FHWA 2006.	

During excavation, grading, and paving operations, equipment moves to different locations and goes through varying load cycles, and there are breaks for the operators and for non-equipment tasks, such as measurement. Although maximum noise levels may be 85 to 90 dB(A) at a distance of 50 feet during most construction activities, hourly average noise levels would be lower when taking into account the equipment usage factors. For the project, the loudest phase of construction would be the excavation/grading phase. Construction noise levels were calculated assuming all pieces of construction equipment would be active simultaneously.

4.2 On-site Generated Noise

The noise sources associated with proposed single-family residences would be those typical of any residential development (vehicles arriving and leaving, children at play and landscape maintenance machinery, etc.). Most of these noise sources do not have substantial potential to violate noise level standards or result in a substantial permanent increase in existing noise levels. Ground- or roof-mounted heating, ventilation, and air conditioning (HVAC) units may generate noise; however, the all HVAC units would be newer models and would be reviewed as part of building inspection. The City's Noise Ordinance Section 9.09.020 exempts all "heating and air conditioning equipment in proper repair."

4.3 Traffic Noise Analysis

4.3.1 Land Use Compatibility

Noise generated by future traffic was modeled in SoundPlan using the FHWA's Traffic Noise Model algorithms and reference levels to calculate noise levels at selected receiver locations. In addition to standard input such as topography and barriers, traffic parameters include roadway lengths and gradients; projected hourly traffic volumes; and vehicle mix, distribution, and speed. Noise level contours were calculated based on the peak hour traffic volumes, which were estimated to be 10 percent of the total Average Daily Traffic (ADT) volume. Typically, the predicted CNEL and the maximum daytime hourly L_{eq} calculated are equal.

Roadways in the vicinity of the project site include Newport Road, Old Newport Road (also known as "Rockport Road"), Menifee Road, Tres Lagos Road, and Briggs Road. The project would include an extension of Tres Lagos Drive to Briggs Road and improvements to Old Newport Road and Briggs Road. Consistent with policies from the Riverside County General Plan, traffic noise was assessed based on the maximum level of service (LOS) C ADT volume of the roadway. This condition represents a condition where the maximum number of vehicles are using the roadway at the maximum speed. LOS A and B categories allow full travel speed but do not have as many vehicles, while LOS E and F have a greater number of vehicles, but due to the traffic volume travel at reduced speeds, thus generating less noise.

A vehicle classification mix of 92 percent passenger vehicles, 1.84 percent medium trucks, and 0.74 percent heavy trucks was assumed for secondary highways and collector streets. Traffic speeds were modeled as 40 miles per hour. The project would not substantially alter the vehicle classifications mix on local or regional roadways. Traffic volumes on adjacent roadways and the distribution of project-generated traffic are summarized in Table 7.

Table 7
Land Use Compatibility - Modeled Traffic Volumes

Roadway	Classification	Maximum LOS C Traffic Volume (ADT)
Newport Road	Urban Arterial	45,000
Old Newport Road	Collector Street	10,400
Tres Lagos Drive	Secondary Highway	20,700
Holland Road	Major Highway	27,300
Menifee Road	Arterial Highway	29,600
Briggs Road	Major Highway	27,300

4.3.2 Traffic Noise Increases

Roadways in the vicinity of the project site include Newport Road, Old Newport Road (also known as "Rockport Road"), Menifee Road, Tres Lagos Road, and Briggs Road. The project would include an extension of Tres Lagos Drive to Briggs Road and improvements to Old Newport Road and Briggs Road. According to the traffic impact analysis, the project would generate 3,037 trips per day and thereby would contribute to traffic volumes on local roadways (Linscott, Law & Greenspan Engineers 2016). Whereas land use compatibility was assessed based on maximum LOS C traffic volumes, traffic noise level increases were estimated based on traffic volumes obtained from the project traffic impact analysis. Noise levels increase due to project-generated traffic is conservatively assessed based on existing (year 2016) traffic volumes. Traffic volumes on adjacent roadways are summarized in Table 8.

Table 8
Traffic Noise Increases – Modeled Traffic Volumes

Roadway	Speed Limit (mph)	Traffic Volume (ADT)[1] Existing	Existing Plus Project	Cumulative Future (2040)
Newport Road				
West of Menifee Road	45	34,685	36,963	47,613
East of Menifee Road	55	27,621	29,291	32,148
Old Newport Road				
West of Laguna Vista Drive	40	951	1,407	1,688
East of Laguna Vista Drive	40	2,867	5,266	5,496
Tres Lagos Drive	Not posted[2]	1,395	1,851	5,249
Holland Road				
Antelope to Menifee Road	45	5,819	5,819	20,119
Southshore to Briggs Road	45	956	956	11,039
Menifee Road				
North of Old Newport Road	45	9,657	10,416	22,435
South of Old Newport Road	45	9,817	10,121	22,140
Briggs Road				
North of Gold Crest Drive	Not posted[2]	1,435	2,042	4,273
South of Gold Crest Drive		1,201	1,262	2,746

SOURCE: Linscott, Law & Greenspan Engineers, Inc. 2016

[1] Existing and Existing Plus Project scenarios do not assume completion of the Holland Road Overpass. The Cumulative Future Scenario assumes completion of the Holland Road Overpass.

[2] Tres Lagos Drive and Briggs Road do not have a posted speed limit. Tres Lagos Drive was modeled with speeds of 40 mph, and Briggs Road was modeled with speeds of 45 mph.

4.4 Vibration Analysis

4.4.1 Construction Vibration

A quantitative assessment of potential vibration impacts from construction activities, such as blasting, pile-driving, vibratory compaction, demolition, drilling, or excavation, may be conducted using the following equations (Caltrans 2013b). Vibration impacts from normal equipment to structures may be estimated at any distance from the following equation:

$$PPV_{equipment} = PPV_{reference} \times (\frac{25}{Distance})^{1.5}$$

where: $PPV_{equipment}$ is the peak particle velocity in inches per second of the equipment adjusted for distance; and $PPV_{reference}$ is the reference vibration level in inches per second at 25 feet as shown in Table 9.

Table 9
Typical Construction Equipment Vibration Levels

Equipment	PPV at 25 feet (in/sec)[1]
Vibratory Roller	0.210
Impact Pile Driver (typical)	0.644
Sonic Pile Driver (typical)	0.170
Large Bulldozer	0.089
Hoe Ram	0.089
Loaded Trucks	0.076
Jackhammer	0.035
Small Bulldozer	0.003

[1]Where PPV is the peak particle velocity.
[2] Where noise level is the level in decibels referenced to 1 micro-inch/second and based on the root mean square velocity amplitude.
SOURCE: FTA 2006; Caltrans 2013b.

4.4.2 Operation Vibration

The project would include development of residential uses. No substantial sources of vibration would be associated with project operation.

4.4.3 Vibration Exposure

The project would include development of residential uses. As discussed in Section 3.1, adjacent uses would include single-family residences to the north and west (Tierra Shores and Camellia at the Lakes), a Wilderness Lakes RV Resort residence at 30524 Briggs Road to the south, and agricultural uses to the east. Vibration sources are not typically associated with these land uses.

Following the screening procedure from the FTA guidance manual (FTA 2006), groundborne vibration from the most heavily traveled railroads may result in impacts to residences within 200 feet of the railroad. There are no railroads within 200 feet of the project site.

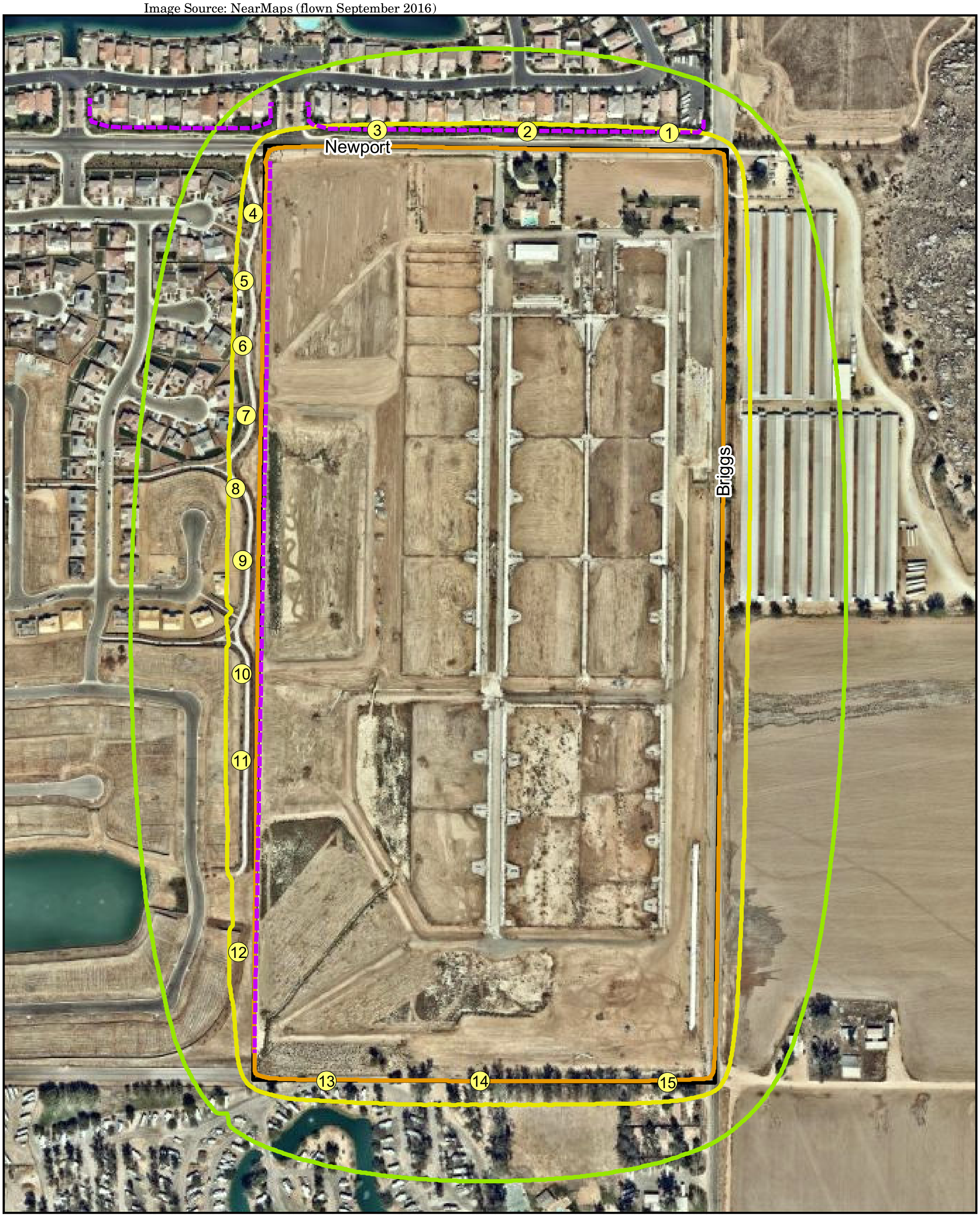
5.0 Future Acoustical Environment and Impacts

5.1 Construction Noise

Construction noise is considered a point source and would attenuate at approximately 6 dB(A) for every doubling of distance. For the project, the loudest phase of construction would be the excavation/grading phase. Project construction equipment required during excavation/grading is anticipated to include two excavators, two loaders, two scrapers, a grader, a dozer, and a water truck. These types of equipment typically generate maximum noise levels between 80 and 85 dB(A) at 50 feet and generally operate with a usage factor, a ratio of an hour spent at full power, of 40 percent (FHWA 2006). Average hourly noise levels due to simultaneous activity of all construction equipment in a small area would be 91 dB(A) L_{eq} at 50 feet, or a sound power level of approximately 123 dB(A). To reflect the nature of grading and construction activities, equipment was modeled as an area source distributed over the project footprint. The total sound energy of the area source was modeled with all pieces of equipment operating simultaneously.

Following the methodology discussed in Section 4.1, Construction Noise Analysis, future ground-floor contours during the loudest construction phase, grading, were calculated in the vicinity of the project site. Construction noise contours are shown on Figure 5. Construction noise levels were modeled at a series of specific receiver locations at the property line of the nearest properties occupied by residential uses, which include single family residences to the north (Tierra Shores Residential Complex) and west (Camellia at the Lakes Residential Complex) and mobile homes to the south (Wilderness Lakes RV Resort). Each receiver location was modeled at elevations corresponding to each floor of the nearest residence. Modeling accounts for the existing walls along the western boundary of the project site. There is also a wall located along the southern boundary of the Tierra Shores Residential Complex to the north. Modeled receiver locations for the Tierra Shores Residential Complex are on the project side of the wall, thus, noise levels experienced at the actual residences would be less. Table 10 summarizes the projected noise levels at the modeled receivers. Receiver locations and ground-floor noise contours are shown on Figure 5. SoundPLAN data for construction noise modeling are contained in Attachment 2.

Image Source: NearMaps (flown September 2016)



0 Feet 400

Project Boundary

Existing Wall

Construction Noise Contours

60 dB(A) Leq

65 dB(A) Leq

70 dB(A) Leq

FIGURE 5

Construction Noise Contours

RECON

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Table 10 Construction Noise Levels [dB(A) L_{eq}]			
Receiver	Description	First Floor	Second Floor
RES-1	Southern Property Lines of Residences in Tierra Shores Residential Complex	66	66
RES-2		66	67
RES-3		66	67
RES-4	Eastern Property Line of Residences in Camellia at the Lakes Residential Complex	67	67
RES-5		66	67
RES-6		66	67
RES-7		67	67
RES-8		66	66
RES-9		67	67
RES-10		67	67
RES-11		67	67
RES-12		66	67
RES-13	Northern Property Line of Wilderness Lakes RV Resort	70	–
RES-14		70	–
RES-15	Northern Property Line of 30524 Briggs Road	69	–

As shown in Table 10, noise levels at the property line of the nearest residential uses would be 70 dB(A) L_{eq} or less. Thus, adjacent residences would be exposed to construction noise levels in excess of ambient noise levels. Consistent with the City's Noise Ordinance Section 9.09.020, construction would be limited to between 6:00 a.m. and 6:00 p.m. from June through September and 7:00 a.m. and 6:00 p.m. from October through May. Although construction would be audible over ambient noise levels, temporary increases in noise levels from construction activities would be less than significant, because construction activities associated with the project would comply with the applicable regulation for construction.

5.2 On-site Generated Noise

The noise sources associated with the project are anticipated to be those that would be typical of any residential complex, such as vehicles arriving at and leaving from the parking garage, children at play, and landscape maintenance machinery. None of these noise sources is anticipated to violate the noise level limits of the Municipal Code or result in a substantial permanent increase in existing noise levels.

5.3 Traffic Noise

5.3.1 Land Use Compatibility

Ground-floor and second-floor traffic noise contours were developed using the SoundPLAN program. The project includes 6-foot block walls along the rear property lines of parcels. Noise levels were also modeled at specific receiver locations corresponding to the exterior use areas (at property line and 5 feet above grade or 10 feet within rear wall and 5 feet above grade), first floor building façade (20 foot minimum setback from property line, 5 feet above grade), and the second floor building façade (20 foot minimum setback from property line, 14 feet above grade). Modeled ground floor noise contours and receiver locations are shown in Figure 6. Modeled second floor (i.e. 14 feet above grade) noise contours are shown in Figure 7. Noise levels at specific receiver points are summarized in Table 11. See Attachment 2 for SoundPLAN data.

Table 11
Traffic Noise Levels

Receiver	Description	Noise Level (CNEL)		
		Exterior Use Area	First Floor Façade	Second Floor Façade
1	Near the property line of the northeastern lot	56	56	63
2	Near the property line of a northern lot	57	57	63
3	Near the property line of a northern lot	58	59	63
4	Near the property line of a northern lot	58	58	64
5	Near the property line of the northwestern lot	60	60	***66***
6	Near the property line of a western lot	63	63	***68***
7	Near the property line of a western lot	62	62	***68***
8	Near the property line of a western lot	61	61	***67***
9	Near the property line of a western lot	61	62	***68***
10	Near the property line of a western lot	59	60	***66***
11	Near the property line of a western lot	61	61	***67***
12	Near the property line of the southwestern lot	62	62	***67***
13	Near the property line of a southern lot	59	58	65
14	Near the property line of a southern lot	59	58	64
15	At the property line of the southeastern lot	59	56	62
16	At the property line of an eastern lot	51	51	52
17	At the property line of an eastern lot	49	49	49
18	At the property line of an eastern lot	48	48	50
19	At the property line of an eastern lot	54	54	55

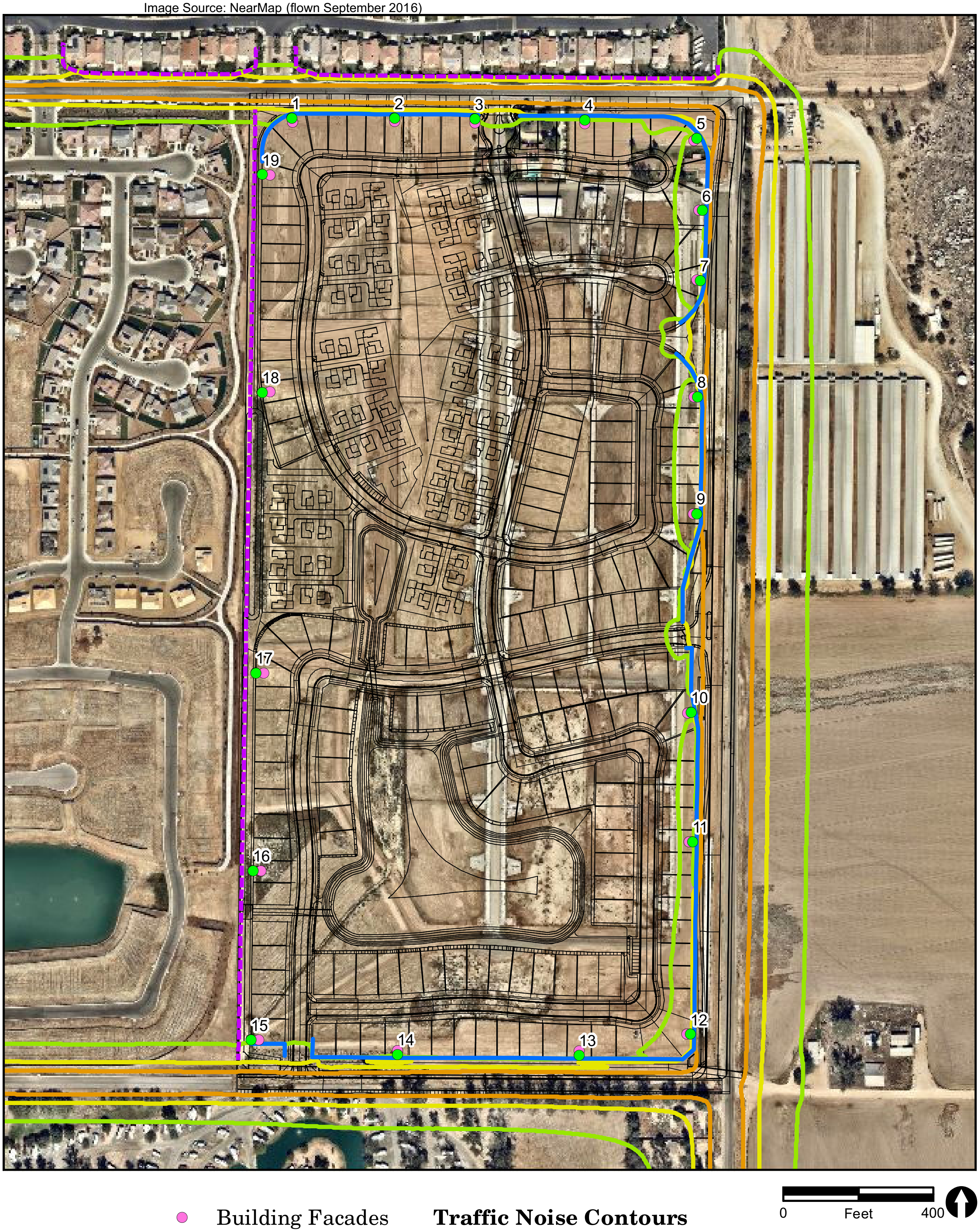
5.3.1.1 Exterior Traffic Noise Levels

As shown in Table 11, traffic noise levels at the exterior use areas would be 63 CNEL or less. Therefore, the project would comply with the City's planning policies regarding noise and land use compatibility standard for exterior use areas (65 CNEL). Exterior traffic noise levels would be less than significant.

5.3.1.2 Interior Traffic Noise Levels

As shown in Table 11, traffic noise levels at the first floor building façades would be 63 CNEL or less. It is assumed that standard construction techniques would result in exterior-to-interior noise level attenuation of at least 20 dB(A) (with windows in a closed position) (County of Riverside 2015). Thus, interior noise levels would be 43 CNEL or less at rooms on the first floor. Therefore, the project would comply with the City's planning policies regarding noise and land use compatibility standard for habitable rooms (45 CNEL). Interior traffic noise levels at rooms on the first floor or proposed residences would be less than significant.

Image Source: NearMap (flown September 2016)



Building Facades
Exterior Use
Site Plan
Existing Wall
Proposed 6-foot Wall

Traffic Noise Contours
60 CNEL
65 CNEL
70 CNEL

FIGURE 6

Ground Floor Traffic Noise Contours

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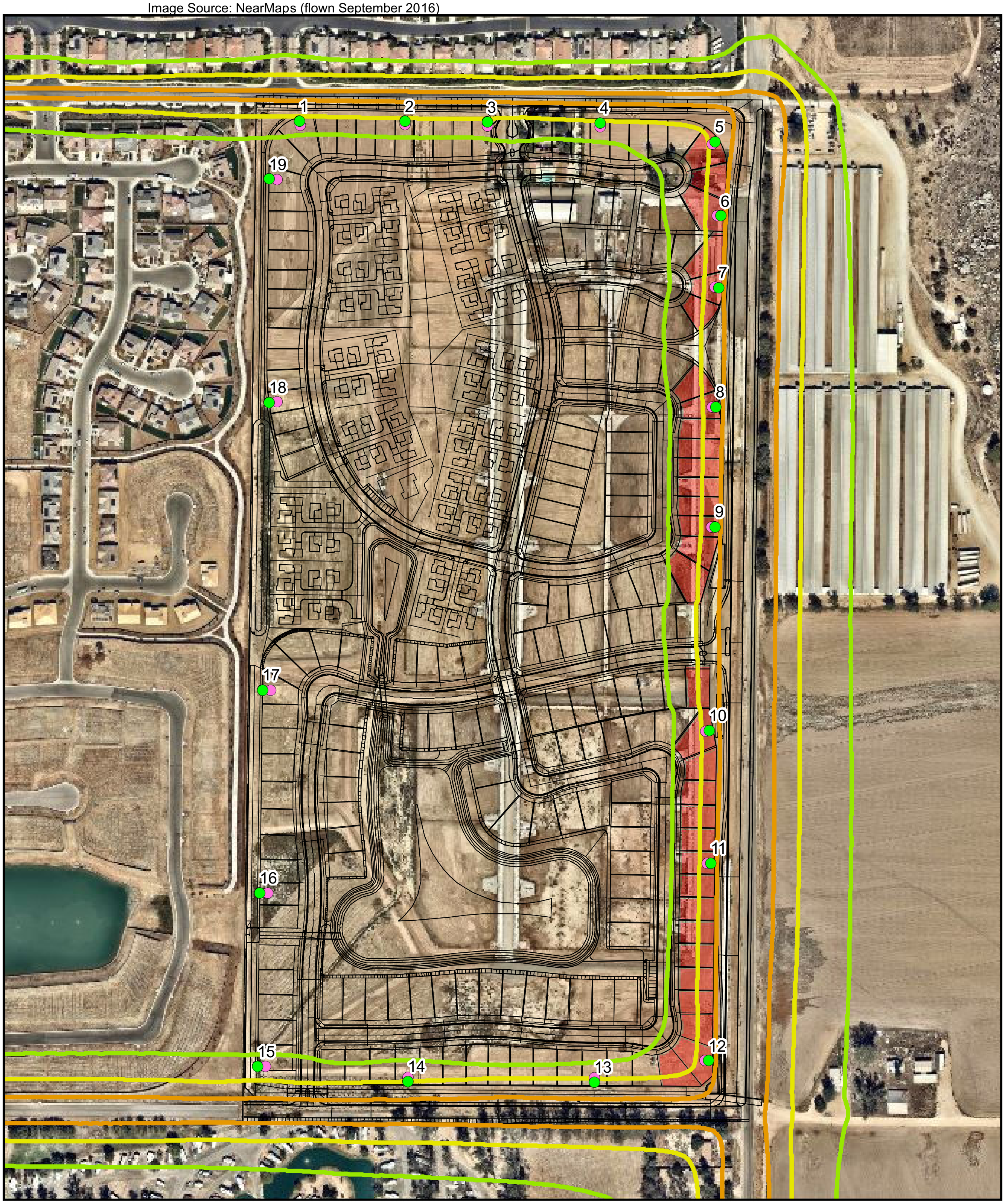
Image Source: NearMaps (flown September 2016)



Building Facades

Exterior Use

Site Plan

Mitigation NOI-1 Residences

Traffic Noise Contours

60 CNEL

65 CNEL

70 CNEL

0 Feet 400

RECON

FIGURE 7

Second Floor Traffic Noise Contours

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With the exception of proposed residences along Briggs Road, traffic noise levels at the second floor building façades would be 65 CNEL or less. Thus, interior noise levels at these proposed residences would be 45 CNEL or less at rooms on the second floor. Interior traffic noise levels at rooms on the second floor of proposed residences other than those along Briggs Road would not exceed the City's interior compatibility standard for habitable rooms (45 CNEL).

As shown in Table 11, traffic noise levels at the second floor building façades of proposed residences along Briggs Road (Receivers 5 through 12) would range from 66 to 68 CNEL. Thus, assuming an exterior-to-interior noise level attenuation of 20 dB(A), interior noise levels at proposed residences along Briggs Road would range from 46 to 48 CNEL at rooms on the second floor with windows in a closed position. These noise levels would exceed the City's interior compatibility standard for habitable rooms (45 CNEL). The following mitigation measure is designed to reduce significant impacts:

NOI-1: Sound Resistant Windows and Doors

All second story walls along Briggs Road shall have a combined sound transmission sound transmission class (STC) rating of 23 including all windows, doors, and other components. Proposed residences along Briggs Road are identified in Figure 7 of this report. Prior to issuance of a building permit, the project applicant or agent thereof, shall demonstrate to the satisfaction of the City Building & Safety Department that required sound resistant windows and doors have been identified on building plans.

The overall exterior-to-interior sound attenuation of a building façade is an affected by the STC rating of all components of the building façade such as windows, doors, finish (such as stucco or wood siding), wall assembly (i.e., framing), etc. The overall sound attenuation is most heavily influenced by the least sound resistant components, which are typically windows and doors. With incorporation of mitigation measure NOI-1 the exterior-to-interior sound attenuation of the second floor building façades of proposed residences along Briggs Road would be anticipated to be 23 CNEL or greater. Thus, interior noise levels at habitable rooms would range from 43 to 45 CNEL and would comply with the City's interior compatibility standard for habitable rooms (45 CNEL). Interior traffic noise levels at rooms on the second floor would be less than significant with incorporation of mitigation measure NOI-1.

5.3.2 Off-site Traffic Noise Increases

The increase in noise due to the addition of project traffic was calculated by comparing traffic noise levels with and without the project. The traffic volumes and potential noise level increases are summarized Table 12.

Table 12 Off-site Traffic Noise Level Increases (CNEL)						
	Speed	Existing		Existing Plus Project		Noise
Roadway	Limit (mph)	Volume (ADT)	Noise Level	Volume (ADT)	Noise Level	Level Increase
Newport Road						
West of Menifee Road	45	34,685	74.0	36,963	74.2	0.2
East of Menifee Road	55	27,621	75.5	29,291	75.7	0.2
Old Newport Road						
West of Laguna Vista Drive	40	951	56.9	1,407	58.4	1.5
East of Laguna Vista Drive	40	2,867	61.7	5,266	64.3	2.6
Tres Lagos Drive	Not posted[2]	1395	58.4	1,851	59.9	1.5
Holland Road						
Antelope to Menifee Road	45	5,819	66.2	5,819	66.2	0.0
Southshore to Briggs Road	45	956	58.3	956	58.3	0.0
Menifee Road						
North of Old Newport Road	45	9,657	68.4	10,416	68.7	0.3
South of Old Newport Road	45	9,817	68.5	10,121	68.6	0.1
Briggs Road						
North of Gold Crest Drive	Not posted[2]	1,435	60.0	2,042	61.6	1.6
South of Gold Crest Drive		1,201	59.4	1,262	59.5	0.1

mph = miles per hour
SOURCE: Linscott, Law & Greenspan Engineers, Inc. 2016
[1] Existing and Existing Plus Project scenarios do not assume completion of the Holland Road Overpass. The Cumulative Future Scenario assumes completion of the Holland Road Overpass.
2 Tres Lagos Drive and Briggs Road do not have a posted speed limit. Tres Lagos Drive was modeled with speeds of 40 mph, and Briggs Road was modeled with speeds of 45 mph.

As shown in Table 12, the resulting noise increases would be less than 3 dB(A) along nearby roadways. As discussed in Section 1.2, Fundamentals of Noise, a change of 3 dB(A) is barely perceptible to the human ear. Thus, project traffic would not result in a significant increase in traffic noise levels along existing roadways.

The project would extend Tres Lagos Drive along the southern boundary of the project site. The nearest noise-sensitive land uses would be mobile homes in the Wilderness Lakes RV Resort. As shown in Table 12, Tres Lagos Drive would generate noise levels of approximately 60 CNEL at a distance of 50 feet. Due to the low traffic volumes anticipated on the extension of Tres Lagos Drive (1,851 ADT), the extension is not anticipated to result in noise levels that conflict with the City's planning policies regarding noise and land use compatibility standard (65 CNEL) at any noise-sensitive land use. Thus, project traffic would not result in a significant increase in traffic noise levels along proposed roadways.

5.4 Vibration

5.4.1 Construction Vibration

Construction activities have the potential to result in varying degrees of temporary ground vibration, depending on the specific construction equipment used and activities involved.

Ground vibration generated by construction equipment spreads through the ground and diminishes in magnitude with increases in distance. The effects of ground vibration may be imperceptible at the lowest levels, low rumbling sounds and detectable vibrations at moderate levels, and damage to nearby structures at the highest levels. Vibration perception occurs primarily at structures, as people do not perceive vibrations without vibrating structures.

Project construction would not be anticipated to include substantial sources of vibration such as blasting or pile driving. Project construction equipment that would be anticipated to generate the highest vibration levels would include heavy earth-moving equipment such as graders, dozers, excavators, etc. Additionally, the project would include the extension of Tres Lagos Drive along the southern boundary of the project site; extension of Tres Lagos Drive may involve the use of additional vibration-generating equipment such as a vibratory roller. Reference vibration levels are limited. Heavy earth-moving equipment such as graders, dozers, and excavators was conservatively assumed to be most similar to a large bulldozer. Based on the reference vibration levels for a large bulldozer these pieces of equipment would generate vibration levels with a PPV of 0.089 in/sec PPV or less at 25 feet from the equipment. Based on reference vibration levels, use of a vibratory roller for the extension of Tres Lagos Drive would generate vibration levels with a PPV of 0.210 in/sec PPV at 25 feet from the equipment.

As discussed in Section 3.1 adjacent land uses include the Camellia at the Lakes residential development to the west, the Tierra Shores residential development to the north, light agricultural uses (industrial chicken coops) to the east, and the Wilderness Lakes RV Resort and residence at 30524 Briggs Road to the south of the site. The nearest residential structures to the east in Camelia at the Lakes are approximately 68 feet from the project site boundary; vibration levels at this distance from heavy earth-moving equipment would be approximately 0.030 PPV in/sec. The nearest residential structures to the north in Tierra Shores are approximately 73 feet from the project site boundary; vibration levels at this distance from heavy earth-moving equipment would be approximately 0.027 PPV in/sec. The development to the east of the project site is non-residential. The nearest residential structures to the south is 30524 Briggs Road[1], which is approximately 133 feet south of the project site; vibration levels at this distance from heavy earth-moving equipment would be approximately 0.014 PPV in/sec. Additionally, vibration levels at this distance from a vibratory roller would be approximately 0.033 PPV in/sec. Calculations are included in Attachment 3.

As discussed in Section 2.4, the threshold of perception for transient vibration sources is 0.035 in/sec PPV, with 0.24 in/sec PPV being a distinctly perceptible (Caltrans 2013b). Neither cosmetic nor structural damage of buildings occurs at levels below 0.2 in/sec PPV. Vibration levels would range from 0.014 to 0.033 PPV in/sec at the nearest residential structures. These vibration levels would be less than barely perceptible. As vibration levels

[1] Recreational vehicles in the Wilderness Lakes RV Resort may be located within a few feet of the project site. Groundborne vibration does not result in structural damage and is less readily perceptible at recreational vehicles.

would generally not be perceptible to the average person and would not result in cosmetic nor structural damage to buildings, vibration impacts from project construction would be less than significant.

5.4.2 Operation Vibration

The project would include development of a community park. No substantial sources of vibration would be associated with project operation. Impacts would be less than significant.

5.4.2 Vibration Exposure

Common sources of groundborne vibration are trains, and construction activities such as blasting, pile-driving, and operating heavy earth-moving equipment. It is unusual for vibration from sources such as buses and trucks to be perceptible even in locations close to major roads (FTA 2006).

Land uses in the project vicinity include residential and agricultural uses. There are no land uses or transportation sources in the vicinity of the project site that would be anticipated to generate substantial groundborne vibration. Impacts would be less than significant.

6.0 Conclusions

6.1 Construction Noise

As shown in Table 10, construction noise levels at adjacent residences would be 70 dB(A) L_{eq} or less. Although adjacent residences would be exposed to construction noise levels in excess of ambient noise levels, the exposure would be short-term. Additionally, construction activities would occur between the hours of 6:00 a.m. and 6:00 p.m. from June through September and 7:00 a.m. and 6:00 p.m. from October through May, as specified in the City's Municipal Code Section 9.09.020. Because construction activities associated with the project would comply with the applicable regulation for construction, temporary increases in noise levels from construction activities would be less than significant.

6.2 On-site Generated Noise

The noise sources associated with proposed single-family residences would be those typical of any residential development (vehicles arriving and leaving, children at play, and landscape maintenance machinery, etc.). None of these noise sources has substantial potential to violate noise level standards or result in a substantial permanent increase in existing noise levels. Ground- or roof-mounted HVAC units in proper working order are exempt from noise level limits. Impacts would be less than significant.

6.3 Traffic Noise

6.3.1 Land Use Compatibility

As shown in Table 11, traffic noise levels at exterior use areas would be 63 CNEL or less. Therefore, the project would comply with the City's planning policies, which indicate that noise-sensitive land uses should be protected from noise levels that exceed 65 CNEL. The project would be compatible with the existing noise environment.

Without mitigation, maximum interior noise levels would exceed the City's interior compatibility standard of 45 CNEL in habitable rooms at second floor of proposed residences along Briggs Road. Mitigation measure NOI-1 would require the installation of sound resistant windows and doors at these residences. With incorporation of mitigation measure NOI-1 the interior noise levels would not exceed applicable interior compatibility standard at any habitable room. Impacts would be less than significant with mitigation incorporated.

6.3.2 Off-site Traffic Noise Increases

Project-generated traffic would increase volumes on local roadways and thereby increase traffic noise levels. The relative noise level increase attributable to the project would be greatest initially and would decrease, as ambient growth would increase the overall volume on local roadways. As shown in Table 12, traffic noise level increases would be less than 3 dB(A) along nearby roadways. Thus, project traffic would not result in a significant increase in traffic noise levels along existing roadways.

The project would extend Tres Lagos Drive along the southern boundary of the project site. As shown in Table 12, Tres Lagos Drive would generate noise levels of approximately 60 CNEL at a distance of 50 feet. Due to the low traffic volumes anticipated on the extension of Tres Lagos Drive, the extension is not anticipated to result in noise levels that conflict with the City's planning policies regarding noise and land use compatibility standard (65 CNEL) at any noise-sensitive land use. Thus, project traffic would not result in a significant increase in traffic noise levels along proposed roadways.

6.4 Vibration

The project would include development of single-family residences. No substantial sources of vibration would be associated with project operation. Additionally, as the project would not be exposed to any substantial source of groundborne vibration.

Project construction equipment would include heavy earth-moving such as graders, dozers, excavators, etc. Additionally, the extension of Tres Lagos Drive may involve the use of additional vibration-generating equipment such as a vibratory roller. Vibration levels would range from 0.014 to 0.033 PPV in/sec at the nearest residential structures. These vibration levels would generally not be perceptible to the average person and would result in neither cosmetic nor structural damage of buildings vibration impacts from project construction would be less than significant.

7.0 References Cited

California Department of Transportation

2013a Technical Noise Supplement to the Traffic Noise Analysis Protocol. September.

2013b Transportation and Construction Vibration Guidance Manual. September.

Federal Highway Administration (FHWA)

2006 FHWA Roadway Construction Noise Model User's Guide, Final Report. January 2006.

2011 Highway Traffic Noise: Analysis and Abatement Guidance. December 2011.

Federal Transit Administration (FTA)

2006 Transit Noise and Vibration Impact Assessment. Office of Planning and Environment. FTA-VA-90-1003-06. May 2006.

Linscott Law & Greenspan Engineers

2016 Traffic Impact Analysis Report, Rockport Ranch. April 26, 2016.

Navcon Engineering, Inc.

2015 SoundPLAN Essential version 3.0.

Riverside, County of

2015 Requirements for Determining and Mitigation Traffic Noise Impacts to Residential Structures. Department of Environmental Health. Letter to Residential Development Applicants. April 15.

ATTACHMENTS

ATTACHMENT 1

Noise Measurement Data

Summary			
Filename	LxT_Data.095		
Serial Number	3827		
Model	SoundExpert™ LxT		
Firmware Version	2.206		
User			
Location			
Job Description			
Note			
Measurement Description			
Start	2016/02/04 11:22:19		
Stop	2016/02/04 11:37:20		
Duration	0:15:00.4		
Run Time	0:15:00.4		
Pause	0:00:00.0		
Pre Calibration	2016/02/04 11:21:56		
Post Calibration	None		
Calibration Deviation	---		
Overall Settings			
RMS Weight	A Weighting		
Peak Weight	A Weighting		
Detector	Slow		
Preamp	PRMLxT1L		
Microphone Correction	Off		
Integration Method	Linear		
OBA Range	Normal		
OBA Bandwidth	1/1 and 1/3		
OBA Freq. Weighting	A Weighting		
OBA Max Spectrum	At Lmax		
Overload	121.6 dB		
	A	**C**	**Z**
Under Range Peak	**77.8**	74.8	79.8 dB
Under Range Limit	**25.9**	25.2	31.9 dB
Noise Floor	16.2	16.0	21.9 dB
Results			
LAeq	53.7 dB		
LAE	83.2 dB		
EA	23.451 µPa²h		
LApeak (max)	2016/02/04 11:24:45	91.6 dB	
LASmax	2016/02/04 11:25:30	69.4 dB	
LASmin	2016/02/04 11:33:39	32.1 dB	
SEA	-99.9 dB		
LAS > 85.0 dB (Exceedence Counts / Duration)	0	0.0 s	
LAS > 115.0 dB (Exceedence Counts / Duration)	0	0.0 s	
LApeak > 135.0 dB (Exceedence Counts / Duration)	0	0.0 s	
LApeak > 137.0 dB (Exceedence Counts / Duration)	0	0.0 s	
LApeak > 140.0 dB (Exceedence Counts / Duration)	0	0.0 s	
Community Noise	**Ldn**	**LDay 07:00-22:00**	
	53.7	53.7	
LCeq	62.8 dB		
LAeq	53.7 dB		
LCeq - LAeq	9.1 dB		
LAIeq	56.0 dB		
LAeq	53.7 dB		
LAIeq - LAeq	2.3 dB		
# Overloads	0		
Overload Duration	0.0 s		
# OBA Overloads	0		
OBA Overload Duration	0.0 s		
Statistics			
LAS5.00	61.0 dB		
LAS10.00	57.3 dB		
LAS33.30	47.4 dB		
LAS50.00	42.1 dB		
LAS66.60	38.5 dB		
LAS90.00	34.9 dB		

Calibration History		
Preamp	**Date**	**dB re. 1V/Pa**
PRMLxT1	2015/06/01 14:58:37	-50.8
PRMLxT1	2015/06/01 14:58:10	-50.8
PRMLxT1	2015/03/23 12:06:20	-50.8
PRMLxT1	2015/03/03 13:49:49	-50.9
PRMLxT1	2015/03/03 13:28:13	-50.6
PRMLxT1	2015/03/03 13:27:59	-50.6
PRMLxT1	2015/03/03 13:27:25	-50.7
PRMLxT1	2015/03/03 13:27:10	-50.7
PRMLxT1	2015/03/03 13:26:55	-50.7
PRMLxT1	2015/03/03 13:26:42	-50.6
PRMLxT1	2015/03/03 13:26:28	-50.6
PRMLxT1L	2016/02/04 11:21:51	-27.9
PRMLxT1L	2016/02/04 10:13:33	-28.0
PRMLxT1L	2016/02/04 9:55:47	-27.9
PRMLxT1L	2016/02/04 9:32:27	-28.0
PRMLxT1L	2016/02/04 9:13:41	-27.9
PRMLxT1L	2016/01/28 13:49:04	-28.0
PRMLxT1L	2016/01/28 13:26:21	-28.0
PRMLxT1L	2016/01/28 13:14:47	-28.0
PRMLxT1L	2016/01/28 12:57:18	-27.9
PRMLxT1L	2016/01/28 12:47:55	-28.0
PRMLxT1L	2016/01/28 12:29:53	-27.8

Summary			
Filename	LxT_Data.096		
Serial Number	3827		
Model	SoundExpert™ LxT		
Firmware Version	2.206		
User			
Location			
Job Description			
Note			
Measurement Description			
Start	2016/02/04 12:09:30		
Stop	2016/02/04 12:24:56		
Duration	0:15:25.8		
Run Time	0:15:25.8		
Pause	0:00:00.0		
Pre Calibration	2016/02/04 12:08:40		
Post Calibration	None		
Calibration Deviation	---		
Overall Settings			
RMS Weight	A Weighting		
Peak Weight	A Weighting		
Detector	Slow		
Preamp	PRMLxT1L		
Microphone Correction	Off		
Integration Method	Linear		
OBA Range	Normal		
OBA Bandwidth	1/1 and 1/3		
OBA Freq. Weighting	A Weighting		
OBA Max Spectrum	At Lmax		
Overload	121.5 dB		
	A	**C**	**Z**
Under Range Peak	**77.8**	74.8	79.8 dB
Under Range Limit	**25.9**	25.1	31.9 dB
Noise Floor	16.2	16.0	21.9 dB
Results			
LAeq	60.1 dB		
LAE	89.7 dB		
EA	104.833 µPa²h		
LApeak (max)	2016/02/04 12:24:34	94.1 dB	
LASmax	2016/02/04 12:24:35	79.9 dB	
LASmin	2016/02/04 12:09:45	43.4 dB	
SEA	-99.9 dB		
LAS > 85.0 dB (Exceedence Counts / Duration)	0	0.0 s	
LAS > 115.0 dB (Exceedence Counts / Duration)	0	0.0 s	
LApeak > 135.0 dB (Exceedence Counts / Duration)	0	0.0 s	
LApeak > 137.0 dB (Exceedence Counts / Duration)	0	0.0 s	
LApeak > 140.0 dB (Exceedence Counts / Duration)	0	0.0 s	
Community Noise	**Ldn**	**LDay 07:00-22:00**	
	60.1	60.1	
LCeq	65.9 dB		
LAeq	60.1 dB		
LCeq - LAeq	5.9 dB		
LAIeq	61.5 dB		
LAeq	60.1 dB		
LAIeq - LAeq	1.4 dB		
# Overloads	0		
Overload Duration	0.0 s		
# OBA Overloads	0		
OBA Overload Duration	0.0 s		
Statistics			
LAS5.00	66.0 dB		
LAS10.00	63.0 dB		
LAS33.30	55.2 dB		
LAS50.00	54.1 dB		
LAS66.60	52.5 dB		
LAS90.00	49.6 dB		

Calibration History

Preamp	**Date**	**dB re. 1V/Pa**
PRMLxT1	2015/06/01 14:58:37	-50.8
PRMLxT1	2015/06/01 14:58:10	-50.8
PRMLxT1	2015/03/23 12:06:20	-50.8
PRMLxT1	2015/03/03 13:49:49	-50.9
PRMLxT1	2015/03/03 13:28:13	-50.6
PRMLxT1	2015/03/03 13:27:59	-50.6
PRMLxT1	2015/03/03 13:27:25	-50.7
PRMLxT1	2015/03/03 13:27:10	-50.7
PRMLxT1	2015/03/03 13:26:55	-50.7
PRMLxT1	2015/03/03 13:26:42	-50.6
PRMLxT1	2015/03/03 13:26:28	-50.6
PRMLxT1L	2016/02/04 12:08:40	-27.8
PRMLxT1L	2016/02/04 11:40:13	-27.9
PRMLxT1L	2016/02/04 11:21:51	-27.9
PRMLxT1L	2016/02/04 10:13:33	-28.0
PRMLxT1L	2016/02/04 9:55:47	-27.9
PRMLxT1L	2016/02/04 9:32:27	-28.0
PRMLxT1L	2016/02/04 9:13:41	-27.9
PRMLxT1L	2016/01/28 13:49:04	-28.0
PRMLxT1L	2016/01/28 13:26:21	-28.0
PRMLxT1L	2016/01/28 13:14:47	-28.0
PRMLxT1L	2016/01/28 12:57:18	-27.9

Summary			
Filename	LxT_Data.097		
Serial Number	3827		
Model	SoundExpert™ LxT		
Firmware Version	2.206		
User			
Location			
Job Description			
Note			
Measurement Description			
Start	2016/02/04 12:40:21		
Stop	2016/02/04 12:55:21		
Duration	0:15:00.4		
Run Time	0:15:00.4		
Pause	0:00:00.0		
Pre Calibration	2016/02/04 12:39:25		
Post Calibration	None		
Calibration Deviation	---		
Overall Settings			
RMS Weight	A Weighting		
Peak Weight	A Weighting		
Detector	Slow		
Preamp	PRMLxT1L		
Microphone Correction	Off		
Integration Method	Linear		
OBA Range	Normal		
OBA Bandwidth	1/1 and 1/3		
OBA Freq. Weighting	A Weighting		
OBA Max Spectrum	At Lmax		
Overload	121.4 dB		
	A	**C**	**Z**
Under Range Peak	**77.7**	74.7	79.7 dB
Under Range Limit	**25.8**	25.1	31.8 dB
Noise Floor	16.2	16.0	21.8 dB
Results			
LAeq	60.0 dB		
LAE	89.6 dB		
EA	101.090 µPa²h		
LApeak (max)	2016/02/04 12:44:11	89.8 dB	
LASmax	2016/02/04 12:44:11	79.0 dB	
LASmin	2016/02/04 12:42:55	30.4 dB	
SEA	-99.9 dB		
LAS > 85.0 dB (Exceedence Counts / Duration)	0	0.0 s	
LAS > 115.0 dB (Exceedence Counts / Duration)	0	0.0 s	
LApeak > 135.0 dB (Exceedence Counts / Duration)	0	0.0 s	
LApeak > 137.0 dB (Exceedence Counts / Duration)	0	0.0 s	
LApeak > 140.0 dB (Exceedence Counts / Duration)	0	0.0 s	
Community Noise	**Ldn**	**LDay 07:00-22:00**	
	60.0	60.0	
LCeq	68.8 dB		
LAeq	60.0 dB		
LCeq - LAeq	8.8 dB		
LAIeq	61.8 dB		
LAeq	60.0 dB		
LAIeq - LAeq	1.8 dB		
# Overloads	0		
Overload Duration	0.0 s		
# OBA Overloads	0		
OBA Overload Duration	0.0 s		
Statistics			
LAS5.00	67.3 dB		
LAS10.00	64.6 dB		
LAS33.30	51.6 dB		
LAS50.00	46.8 dB		
LAS66.60	43.0 dB		
LAS90.00	36.6 dB		

Calibration History		
Preamp	**Date**	**dB re. 1V/Pa**
PRMLxT1	2015/06/01 14:58:37	-50.8
PRMLxT1	2015/06/01 14:58:10	-50.8
PRMLxT1	2015/03/23 12:06:20	-50.8
PRMLxT1	2015/03/03 13:49:49	-50.9
PRMLxT1	2015/03/03 13:28:13	-50.6
PRMLxT1	2015/03/03 13:27:59	-50.6
PRMLxT1	2015/03/03 13:27:25	-50.7
PRMLxT1	2015/03/03 13:27:10	-50.7
PRMLxT1	2015/03/03 13:26:55	-50.7
PRMLxT1	2015/03/03 13:26:42	-50.6
PRMLxT1	2015/03/03 13:26:28	-50.6
PRMLxT1L	2016/02/04 12:39:25	-27.7
PRMLxT1L	2016/02/04 12:26:36	-27.9
PRMLxT1L	2016/02/04 12:08:40	-27.8
PRMLxT1L	2016/02/04 11:40:13	-27.9
PRMLxT1L	2016/02/04 11:21:51	-27.9
PRMLxT1L	2016/02/04 10:13:33	-28.0
PRMLxT1L	2016/02/04 9:55:47	-27.9
PRMLxT1L	2016/02/04 9:32:27	-28.0
PRMLxT1L	2016/02/04 9:13:41	-27.9
PRMLxT1L	2016/01/28 13:49:04	-28.0
PRMLxT1L	2016/01/28 13:26:21	-28.0

Summary			
Filename	LxT_Data.098		
Serial Number	3827		
Model	SoundExpert™ LxT		
Firmware Version	2.206		
User			
Location			
Job Description			
Note			
Measurement Description			
Start	2016/02/04 13:17:39		
Stop	2016/02/04 13:32:40		
Duration	0:15:00.3		
Run Time	0:15:00.3		
Pause	0:00:00.0		
Pre Calibration	2016/02/04 13:17:17		
Post Calibration	None		
Calibration Deviation	---		
Overall Settings			
RMS Weight	A Weighting		
Peak Weight	A Weighting		
Detector	Slow		
Preamp	PRMLxT1L		
Microphone Correction	Off		
Integration Method	Linear		
OBA Range	Normal		
OBA Bandwidth	1/1 and 1/3		
OBA Freq. Weighting	A Weighting		
OBA Max Spectrum	At Lmax		
Overload	121.6 dB		
	A	**C**	**Z**
Under Range Peak	**77.9**	74.9	79.9 dB
Under Range Limit	**25.9**	25.2	31.9 dB
Noise Floor	16.2	16.0	21.9 dB
Results			
LAeq	40.1 dB		
LAE	69.6 dB		
EA	1.016 µPa²h		
LApeak (max)	2016/02/04 13:32:14	85.1 dB	
LASmax	2016/02/04 13:19:48	53.5 dB	
LASmin	2016/02/04 13:28:18	31.8 dB	
SEA	-99.9 dB		
LAS > 85.0 dB (Exceedence Counts / Duration)	0	0.0 s	
LAS > 115.0 dB (Exceedence Counts / Duration)	0	0.0 s	
LApeak > 135.0 dB (Exceedence Counts / Duration)	0	0.0 s	
LApeak > 137.0 dB (Exceedence Counts / Duration)	0	0.0 s	
LApeak > 140.0 dB (Exceedence Counts / Duration)	0	0.0 s	
Community Noise	**Ldn**	**LDay 07:00-22:00**	
	40.1	40.1	
LCeq	57.2 dB		
LAeq	40.1 dB		
LCeq - LAeq	17.2 dB		
LAIeq	44.4 dB		
LAeq	40.1 dB		
LAIeq - LAeq	4.3 dB		
# Overloads	0		
Overload Duration	0.0 s		
# OBA Overloads	0		
OBA Overload Duration	0.0 s		
Statistics			
LAS5.00	44.8 dB		
LAS10.00	42.6 dB		
LAS33.30	38.3 dB		
LAS50.00	36.7 dB		
LAS66.60	35.1 dB		
LAS90.00	33.3 dB		

Calibration History

Preamp	**Date**	**dB re. 1V/Pa**
PRMLxT1	2015/06/01 14:58:37	-50.8
PRMLxT1	2015/06/01 14:58:10	-50.8
PRMLxT1	2015/03/23 12:06:20	-50.8
PRMLxT1	2015/03/03 13:49:49	-50.9
PRMLxT1	2015/03/03 13:28:13	-50.6
PRMLxT1	2015/03/03 13:27:59	-50.6
PRMLxT1	2015/03/03 13:27:25	-50.7
PRMLxT1	2015/03/03 13:27:10	-50.7
PRMLxT1	2015/03/03 13:26:55	-50.7
PRMLxT1	2015/03/03 13:26:42	-50.6
PRMLxT1	2015/03/03 13:26:28	-50.6
PRMLxT1L	2016/02/04 13:17:17	-27.9
PRMLxT1L	2016/02/04 12:55:54	-27.9
PRMLxT1L	2016/02/04 12:39:25	-27.7
PRMLxT1L	2016/02/04 12:26:36	-27.9
PRMLxT1L	2016/02/04 12:08:40	-27.8
PRMLxT1L	2016/02/04 11:40:13	-27.9
PRMLxT1L	2016/02/04 11:21:51	-27.9
PRMLxT1L	2016/02/04 10:13:33	-28.0
PRMLxT1L	2016/02/04 9:55:47	-27.9
PRMLxT1L	2016/02/04 9:32:27	-28.0
PRMLxT1L	2016/02/04 9:13:41	-27.9

ATTACHMENT 2

SoundPLAN Data

Construction Equipment Noise Levels

Total Equipment

Phase	Piece	Number
Grading	Excavators	2
	Graders	1
	Rubber Tired Dozer	1
	Scrapers	2
	Loaders	2
	Water Trucks	1

Maximum Simultaneously Active Equipment

Phase	Piece	Number	Individual Noise Level (dB[A] at 50 feet)	Acoustical Usage Factor	Sound Power Level	Cumulative Noise Level (dB[A] at 50 feet)
Grading	Excavators	2	85	0.4	252982213	91.4
	Graders	1	85	0.4	126491106	
	Rubber Tired Dozer	1	85	0.4	126491106	
	Scrapers	2	89	0.4	635462588	
	Loaders	1	85	0.4	126491106	
	Water Trucks	1	84	0.4	100475457	

Type	Ground Type	Reference Leq (dBA)	Reference Distance (Feet)	Directionality Factor (1 = in air) (2 = over flat plane) (4 = against wall) (8 = corner of a room)	Sound Power Level SPL (dBA)
Point	Hard	91.4	50	2	123.0

Modeling Results Table - Construction Noise

Receiver	Description	Noise Level dB(A)	
		1st Floor	2nd Floor
RES-1	Southern Property Lines of Residences in Tierra Shores Residential Complex	66	66
RES-2		66	67
RES-3		66	67
RES-4	Eastern Property Line of Residences in Camellia at the Lakes Residential Complex	67	67
RES-5		66	67
RES-6		66	67
RES-7		67	67
RES-8		66	66
RES-9		67	67
RES-10		67	67
RES-11		67	67
RES-12		66	67
RES-13	Northern Property Line of Wilderness Lakes RV Park	70	-
RES-14		70	-
RES-15	Northern Property Line of 30524 Briggs Road	69	-

HVAC Noise Mitigation Calculations

Reference Sound Pressure Level (dBA)	72
Directionality Factor:	
(1 = in air)	
(2 = over flat plane)	2
(4 = against wall)	
(8 = corner of a room, enclosed)	
Ground Condition	Hard

Orientation	Physical Geometry, Height of: Source/ HVAC (inches)	Source/ HVAC (feet)	Barrier/ Mitigation Wall (feet)	Receiver/ Ear (feet)	Physical Geometry, Horizontal distance from: Source to Barrier/ HVAC to Wall (feet)	Barrier to Receiver/ Mitigation Wall to Ear (feet)	Source to Receiver/ HVAC to Ear (feet)
1	24	2	4	5	2	3	5
2						4	6
3						5	7
4						6	8
5						7	9
6						8	10
7						9	11
8						10	12
9						11	13
10						12	14
11						13	15
12						14	16
13						15	17
14						16	18

Orientation	Physical Geometry, Path Length: Without Barrier (feet)	With Barrier (feet)	Difference (feet)	Fresnel Number	Noise Level Reduction (dBA)	Without Wall (dBA)	With Wall (dBA)	Exceeds Standards? (45 dB)
1	5.8	6.0	0.160	0.147	7.2	59.0	52	**Yes**
2	6.7	7.0	0.243	0.224	8.1	57.8	50	**Yes**
3	7.6	7.9	0.312	0.287	8.7	56.7	48	**Yes**
4	8.5	8.9	0.367	0.338	9.2	55.7	46	**Yes**
5	9.5	9.9	0.413	0.380	9.6	54.8	45	**Yes**
6	10.4	10.9	0.450	0.414	9.8	54.0	44	**No**
7	11.4	11.9	0.482	0.444	10.1	53.2	43	**No**
8	12.4	12.9	0.509	0.468	10.3	52.5	42	**No**
9	13.3	13.9	0.532	0.490	10.4	51.8	41	**No**
10	14.3	14.9	0.552	0.508	10.5	51.2	41	**No**
11	15.3	15.9	0.570	0.524	10.6	50.6	40	**No**
12	16.3	16.9	0.585	0.539	10.7	50.1	39	**No**
13	17.3	17.9	0.599	0.551	10.8	49.6	39	**No**
14	18.2	18.9	0.611	0.563	10.9	49.1	38	**No**

HVAC Noise Mitigation Calculations

Reference Sound Pressure Level (dBA)	72
Directionality Factor:	
(1 = in air)	
(2 = over flat plane)	2
(4 = against wall)	
(8 = corner of a room, enclosed)	
Ground Condition	Hard

Orientation	Physical Geometry, Height of: Source/ HVAC (inches)	Source/ HVAC (feet)	Barrier/ Mitigation Wall (feet)	Receiver/ Ear (feet)	Physical Geometry, Horizontal distance from: Source to Barrier/ HVAC to Wall (feet)	Barrier to Receiver/ Mitigation Wall to Ear (feet)	Source to Receiver/ HVAC to Ear (feet)
15	24	2	**5**	5	2	3	5
16						4	6
17						5	7
18						6	8
19						7	9
20						8	10
21						9	11
22						10	12
23						11	13
24						12	14
25						13	15
26						14	16
27						15	17
28						16	18

Orientation	Physical Geometry, Path Length: Without Barrier (feet)	With Barrier (feet)	Difference (feet)	Fresnel Number	Noise Level: Reduction (dBA)	Without Wall (dBA)	With Wall (dBA)	Exceeds Standards? (45 dB)
15	5.8	6.6	0.775	0.713	11.8	59.0	47	**Yes**
16	6.7	7.6	0.897	0.826	12.3	57.8	45	**Yes**
17	7.6	8.6	0.990	0.911	12.7	56.7	44	**No**
18	8.5	9.6	1.062	0.977	13.0	55.7	43	**No**
19	9.5	10.6	1.119	1.030	13.2	54.8	42	**No**
20	10.4	11.6	1.165	1.072	13.4	54.0	41	**No**
21	11.4	12.6	1.204	1.108	13.5	53.2	40	**No**
22	12.4	13.6	1.236	1.138	13.6	52.5	39	**No**
23	13.3	14.6	1.264	1.163	13.7	51.8	38	**No**
24	14.3	15.6	1.288	1.185	13.8	51.2	37	**No**
25	15.3	16.6	1.308	1.204	13.9	50.6	37	**No**
26	16.3	17.6	1.327	1.221	13.9	50.1	36	**No**
27	17.3	18.6	1.343	1.236	14.0	49.6	36	**No**
28	18.2	19.6	1.357	1.249	14.0	49.1	35	**No**

HVAC Noise Mitigation Calculations

Reference Sound Pressure Level (dBA)	72
Directionality Factor: (1 = in air) (2 = over flat plane) (4 = against wall) (8 = corner of a room, enclosed)	2
Ground Condition	Hard

Orientation	Physical Geometry, Height of:				Physical Geometry, Horizontal distance from:		
	Source/ HVAC (inches)	Source/ HVAC (feet)	Barrier/ Mitigation Wall (feet)	Receiver/ Ear (feet)	Source to Barrier/ HVAC to Wall (feet)	Barrier to Receiver/ Mitigation Wall to Ear (feet)	Source to Receiver/ HVAC to Ear (feet)
29	24	2	6	5	2	3	5
30						4	6
31						5	7
32						6	8
33						7	9
34						8	10
35						9	11
36						10	12
37						11	13
38						12	14
39						13	15
40						14	16
41						15	17
42						16	18

Orientation	Physical Geometry, Path Length:			Fresnel Number	Noise Level			Exceeds Standards? (45 dB)
	Without Barrier (feet)	With Barrier (feet)	Difference (feet)		Reduction (dBA)	Without Wall (dBA)	With Wall (dBA)	
29	5.8	7.6	1.803	1.660	15.2	59.0	44	**No**
30	6.7	8.6	1.887	1.737	15.4	57.8	42	**No**
31	7.6	9.6	1.955	1.800	15.6	56.7	41	**No**
32	8.5	10.6	2.011	1.851	15.7	55.7	40	**No**
33	9.5	11.5	2.056	1.892	15.8	54.8	39	**No**
34	10.4	12.5	2.094	1.927	15.8	54.0	38	**No**
35	11.4	13.5	2.126	1.956	15.9	53.2	37	**No**
36	12.4	14.5	2.153	1.981	16.0	52.5	37	**No**
37	13.3	15.5	2.176	2.002	16.0	51.8	36	**No**
38	14.3	16.5	2.196	2.021	16.1	51.2	35	**No**
39	15.3	17.5	2.213	2.037	16.1	50.6	35	**No**
40	16.3	18.5	2.229	2.051	16.1	50.1	34	**No**
41	17.3	19.5	2.243	2.064	16.1	49.6	33	**No**
42	18.2	20.5	2.255	2.075	16.2	49.1	33	**No**

Traffic Noise Parameters

Stationing (km)	ADT (Veh/24h)	Traffic values Vehicles type	Vehicle name	day (Veh/h)	Speed (km/h)	Control device	Constr. Speed (km/h)	Affect. veh. (%)	Road surface	Gradient Min / Max (%)
Rockport Road		Traffic direction:	In entry direction							
0+000	24960	Total	-	1040	-	none	-	-	Average (of DGAC and PCC)	-2.429
0+000	24960	Automobiles	-	1013	64	none	-	-	Average (of DGAC and PCC)	-2.429
0+000	24960	Medium trucks	-	19	64	none	-	-	Average (of DGAC and PCC)	-2.429
0+000	24960	Heavy trucks	-	8	64	none	-	-	Average (of DGAC and PCC)	-2.429
0+000	24960	Buses	-	-	64	none	-	-	Average (of DGAC and PCC)	-2.429
0+000	24960	Motorcycles	-	-	64	none	-	-	Average (of DGAC and PCC)	-2.429
0+000	24960	Auxiliary Vehicle	-	-	-	none	-	-	Average (of DGAC and PCC)	-2.429
0+374	-					-	-	-	-	-
Rockport Road		Traffic direction:	In entry direction							
0+000	24960	Total	-	1040	-	none	-	-	Average (of DGAC and PCC)	3.500
0+000	24960	Automobiles	-	1013	64	none	-	-	Average (of DGAC and PCC)	3.500
0+000	24960	Medium trucks	-	19	64	none	-	-	Average (of DGAC and PCC)	3.500
0+000	24960	Heavy trucks	-	8	64	none	-	-	Average (of DGAC and PCC)	3.500
0+000	24960	Buses	-	-	64	none	-	-	Average (of DGAC and PCC)	3.500
0+000	24960	Motorcycles	-	-	64	none	-	-	Average (of DGAC and PCC)	3.500
0+000	24960	Auxiliary Vehicle	-	-	-	none	-	-	Average (of DGAC and PCC)	3.500
0+289	-					-	-	-	-	-
Briggs - Southbound		Traffic direction:	In entry direction							
0+000	32760	Total	-	1365	-	none	-	-	Average (of DGAC and PCC)	-4.000
0+000	32760	Automobiles	-	1256	64	none	-	-	Average (of DGAC and PCC)	-4.000
0+000	32760	Medium trucks	-	41	64	none	-	-	Average (of DGAC and PCC)	-4.000
0+000	32760	Heavy trucks	-	68	64	none	-	-	Average (of DGAC and PCC)	-4.000
0+000	32760	Buses	-	-	64	none	-	-	Average (of DGAC and PCC)	-4.000
0+000	32760	Motorcycles	-	-	64	none	-	-	Average (of DGAC and PCC)	-4.000
0+000	32760	Auxiliary Vehicle	-	-	-	none	-	-	Average (of DGAC and PCC)	-4.000
0+789	-					-	-	-	-	-
Briggs - South of Tres Lagos		Traffic direction:	In entry direction							
0+000	65520	Total	-	2730	-	none	-	-	Average (of DGAC and PCC)	1.667
0+000	65520	Automobiles	-	2512	64	none	-	-	Average (of DGAC and PCC)	1.667
0+000	65520	Medium trucks	-	82	64	none	-	-	Average (of DGAC and PCC)	1.667
0+000	65520	Heavy trucks	-	137	64	none	-	-	Average (of DGAC and PCC)	1.667
0+000	65520	Buses	-	-	64	none	-	-	Average (of DGAC and PCC)	1.667
0+000	65520	Motorcycles	-	-	64	none	-	-	Average (of DGAC and PCC)	1.667
0+000	65520	Auxiliary Vehicle	-	-	-	none	-	-	Average (of DGAC and PCC)	1.667
0+214	-					-	-	-	-	-
Briggs - Northbound		Traffic direction:	In entry direction							
0+000	32760	Total	-	1365	-	none	-	-	Average (of DGAC and PCC)	#DIV/0!
0+000	32760	Automobiles	-	1256	64	none	-	-	Average (of DGAC and PCC)	#DIV/0!
0+000	32760	Medium trucks	-	41	64	none	-	-	Average (of DGAC and PCC)	#DIV/0!
0+000	32760	Heavy trucks	-	68	64	none	-	-	Average (of DGAC and PCC)	#DIV/0!
0+000	32760	Buses	-	-	64	none	-	-	Average (of DGAC and PCC)	#DIV/0!
0+000	32760	Motorcycles	-	-	64	none	-	-	Average (of DGAC and PCC)	#DIV/0!
0+000	32760	Auxiliary Vehicle	-	-	-	none	-	-	Average (of DGAC and PCC)	#DIV/0!
0+796	-					-	-	-	-	-
Tres Lagos		Traffic direction:	In entry direction							
0+000	49680	Total	-	2070	-	none	-	-	Average (of DGAC and PCC)	-1.600
0+000	49680	Automobiles	-	2017	64	none	-	-	Average (of DGAC and PCC)	-1.600
0+000	49680	Medium trucks	-	38	64	none	-	-	Average (of DGAC and PCC)	-1.600
0+000	49680	Heavy trucks	-	15	64	none	-	-	Average (of DGAC and PCC)	-1.600
0+000	49680	Buses	-	-	64	none	-	-	Average (of DGAC and PCC)	-1.600
0+000	49680	Motorcycles	-	-	64	none	-	-	Average (of DGAC and PCC)	-1.600
0+000	49680	Auxiliary Vehicle	-	-	-	none	-	-	Average (of DGAC and PCC)	-1.600
1+254	-					-	-	-	-	-
0+000	12600	Heavy trucks	-	5	64	none	-	-	Average (of DGAC and PCC)	-1.600
0+000	12600	Buses	-	5	64	none	-	-	Average (of DGAC and PCC)	-1.600
0+000	12600	Motorcycles	-	3	64	none	-	-	Average (of DGAC and PCC)	-1.600
0+000	12600	Auxiliary Vehicle	-	-	-	none	-	-	Average (of DGAC and PCC)	-1.600
1+254	-					-	-	-	-	-

Modeling Results Table - Traffic Noise

Receiver	Description	Noise Level (CNEL)		
		Exterior	1st Floor	2nd Floor
1	Near the property line of the northeastern lot	56	56	63
2	Near the property line of a northern lot	57	57	63
3	Near the property line of a northern lot	58	59	63
4	Near the property line of a northern lot	58	58	64
5	Near the property line of the northwestern lot	60	60	***66***
6	Near the property line of a western lot	63	63	***68***
7	Near the property line of a western lot	62	62	***68***
8	Near the property line of a western lot	61	61	***67***
9	Near the property line of a western lot	61	62	***68***
10	Near the property line of a western lot	59	60	***66***
11	Near the property line of a western lot	61	61	***67***
12	Near the property line of the southwestern lot	62	62	***67***
13	Near the property line of a southern lot	59	58	65
14	Near the property line of a southern lot	59	58	64
15	At the property line of the southeastern lot	59	56	62
16	At the property line of an eastern lot	51	51	52
17	At the property line of an eastern lot	49	49	49
18	At the property line of an eastern lot	48	48	50
19	At the property line of an eastern lot	54	54	55

ATTACHMENT 3

Vibration Calculations

Construction Noise and Vibration Modeling

Source: Caltrans Transporation and Construction Vibration Guidance Manual 2013

V_{ref}	1E-06	
Crest Factor (PPV/RMS)	4	
Soil Type	default	Default, Hard, or competent (competent soils are sands, clays, silty clays, gravel, silts, or weathered rock)
n value	1.1	

Equipment	PPV_{ref}	Ref Distance	Distance	Distance to	Distance to	PPV_x
	(in/sec)	(feet)	(feet)	0.200 PPV	0.240 PPV	(in/sec)
Large Bulldozer	0.089	25	68	12	10	0.030
Large Bulldozer	0.089	25	73	12	10	0.027
Large Bulldozer	0.089	25	133	12	10	0.014
Vibratory Roller	0.210	25	133	26	22	0.033