Environmental Noise Analysis

Barrett Ranch East Development EIR

Sacramento County, California

BAC Job # 2014-336

Prepared For:

Antelope RBVP/Barrett Winn, LLC

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February 23, 2015

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Introduction

The Barrett Ranch East Development Project is an approximately 128-acre mixed-use residential and commercial project. The vacant project area is located along Don Julio Boulevard, north of the existing alignment of Antelope Road, within the Antelope community in northern Sacramento County. The project area is proposed to be developed with 495 single-family detached residential units, 196 multifamily units, and 108,900 square feet of commercial uses. The project area and site plan are presented as Figures 1 and 2, respectively.

Antelope RBVP/Barrett Winn, LLC has retained Bollard Acoustical Consultants, Inc. (BAC) to prepare this noise study report identifying existing noise sources within or affecting the project area, quantifying baseline ambient noise and vibration conditions within the project area, and identifying noise impacts and mitigation measures associated with development within the project area. It is intended that information contained in this report will be utilized in the development of the Noise Section of the Environmental Impact Report (EIR) to be prepared for the project area.

Acoustical Fundamentals and Terminology

The Decibel

Noise is simply described as unwanted sound. Sound is defined as any pressure variation in air that the human ear can detect. If the pressure variations occur frequently enough (at least 20 times per second), they can be heard and are called sound. The number of pressure variations per second is called the frequency of sound, and is expressed as cycles per second, called Hertz (Hz).

Discussing sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid this, the decibel (dB) scale was devised. The decibel scale uses the hearing threshold (20 micropascals of pressure), as a point of reference, defined as 0 dB. Other sound pressures are compared to the reference pressure and the logarithm is taken to keep the numbers in a practical range. The dB scale allows a million-fold increase in pressure to be expressed as 120 dB.

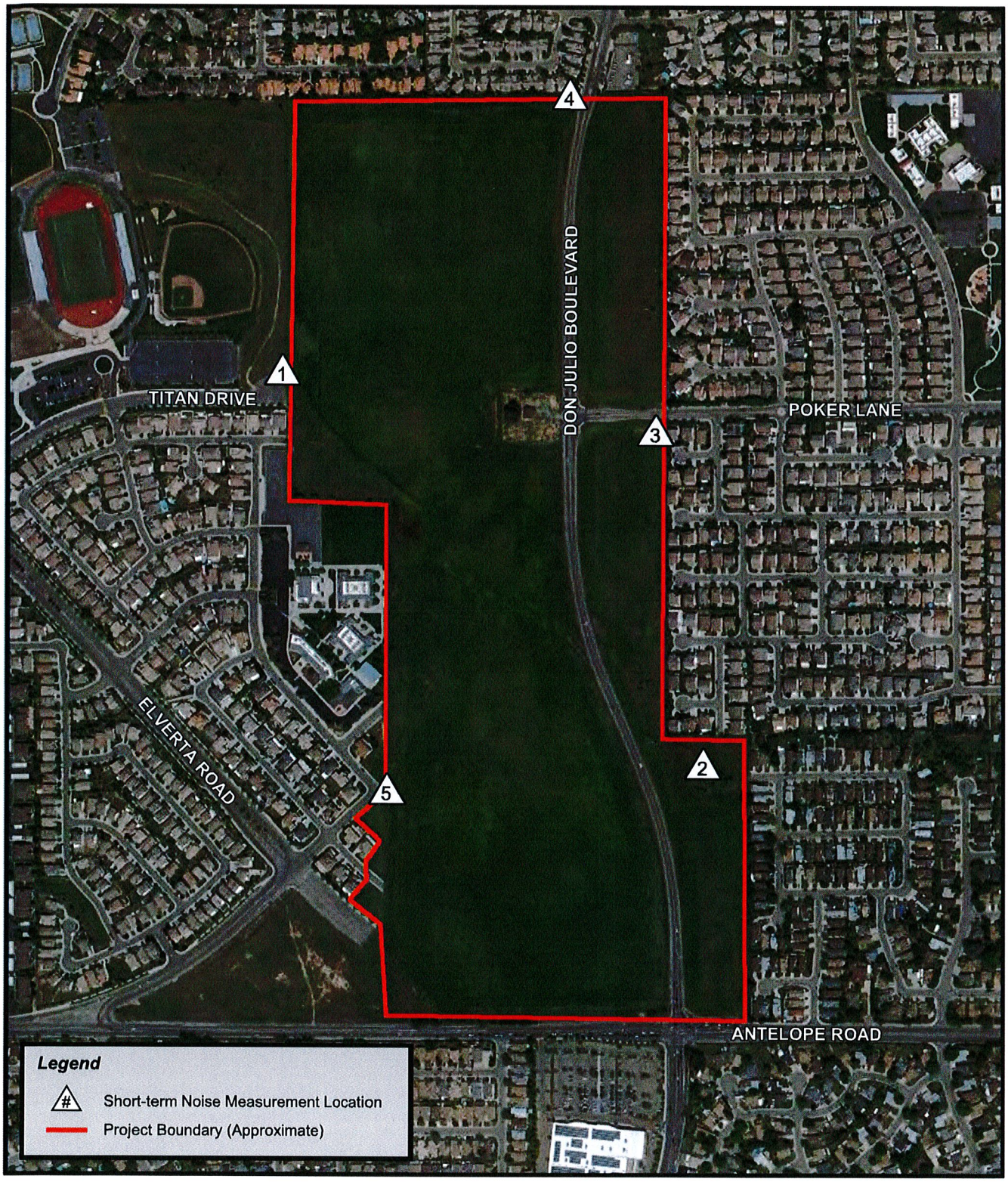
A-Weighting

To better relate overall sound levels and loudness to human perception, frequency-dependent weighting networks were developed. There is a strong correlation between the way humans perceive sound and A-weighted sound levels. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment for community exposures. All sound levels expressed in this section are A-weighted sound levels, unless noted otherwise. Definitions of acoustical terminology are provided in Appendix A.

Figure 1

Barrett Ranch Development EIR - Sacramento County, California

Project Area and Ambient Noise Monitoring Locations



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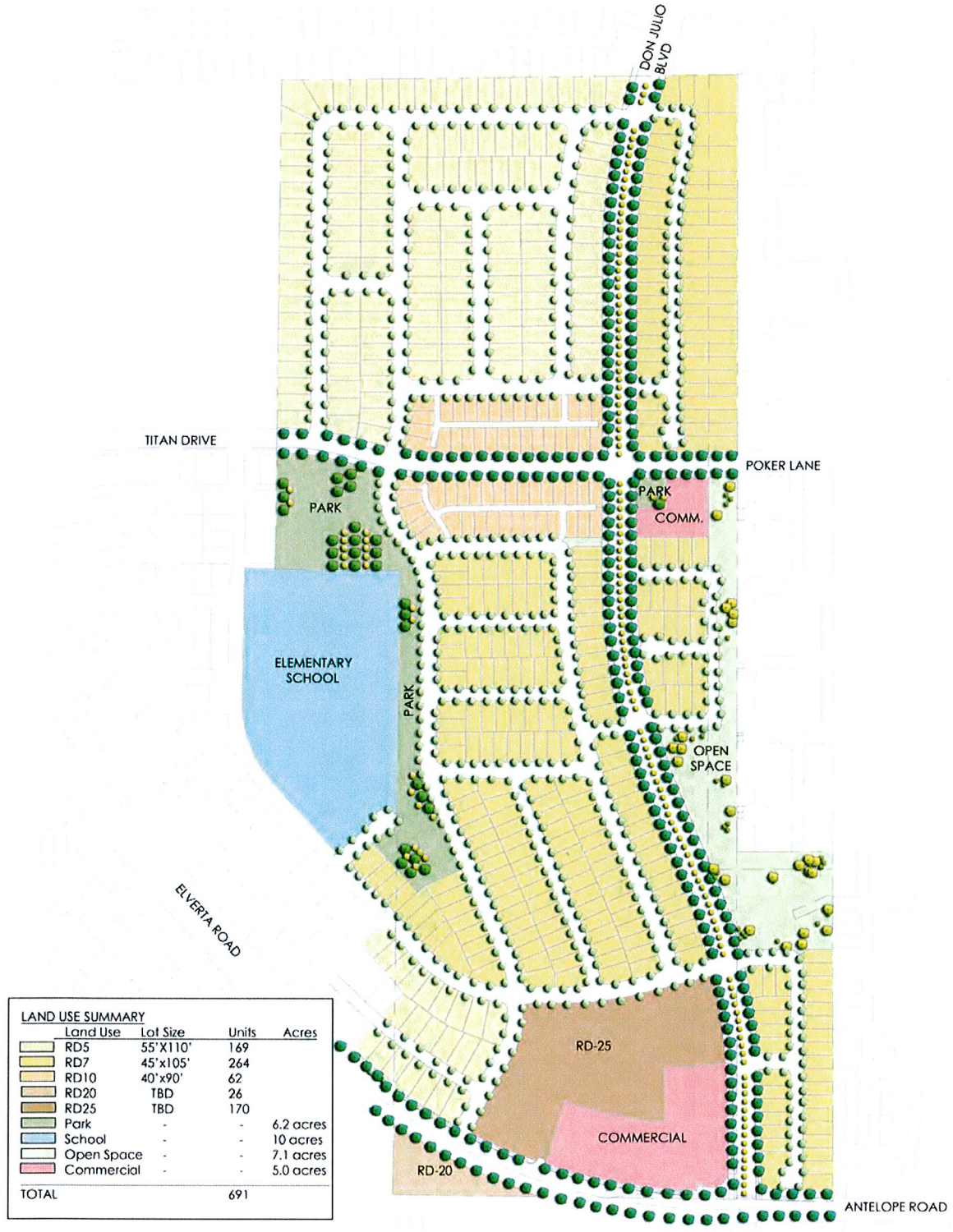
Scale (feet)
0 400 800

Figure 2

Barrett Ranch Development EIR - Sacramento County, California

Project Site Plan



LAND USE SUMMARY

Land Use	Lot Size	Units	Acres
RD5	55'X110'	169	
RD7	45'x105'	264	
RD10	40'x90'	62	
RD20	TBD	26	
RD25	TBD	170	
Park	-	-	6.2 acres
School	-	-	10 acres
Open Space	-	-	7.1 acres
Commercial	-	-	5.0 acres
TOTAL		691	

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Scale (feet)
0 400 800

Community Noise

Community noise is commonly described in terms of the "ambient" noise level, which is defined as the all-encompassing noise level associated with a given noise environment. A common statistical tool to measure the ambient noise level is the average, or equivalent, sound level (L_{eq}), over a given time period (usually one hour). The L_{eq} is the foundation of the day-night average noise descriptor, and shows very good correlation with community response to noise for the average person.

The L_{dn} is based upon the average noise level over a 24-hour day, with a +10 dB weighting applied to noise occurring during nighttime (10:00 p.m. to 7:00 a.m.) hours. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures. Because L_{dn} represents a 24-hour average, it tends to disguise short-term variations in the noise environment. Where short-term noise sources are an issue, noise impacts may be assessed in terms of maximum noise levels, hourly averages, or other statistical descriptors.

Perception of Loudness

The perceived loudness of sounds and corresponding reactions to noise are dependent upon many factors, including sound pressure level, duration of intrusive sound, frequency of occurrence, time of occurrence, and frequency content. As mentioned above; however, within the usual range of environmental noise levels, perception of loudness is relatively predictable, and can be approximated by weighing the frequency response of a sound level meter by means of the standardized A-weighing network. Table 1 shows examples of noise levels for several common noise sources and environments.

Sound Propagation

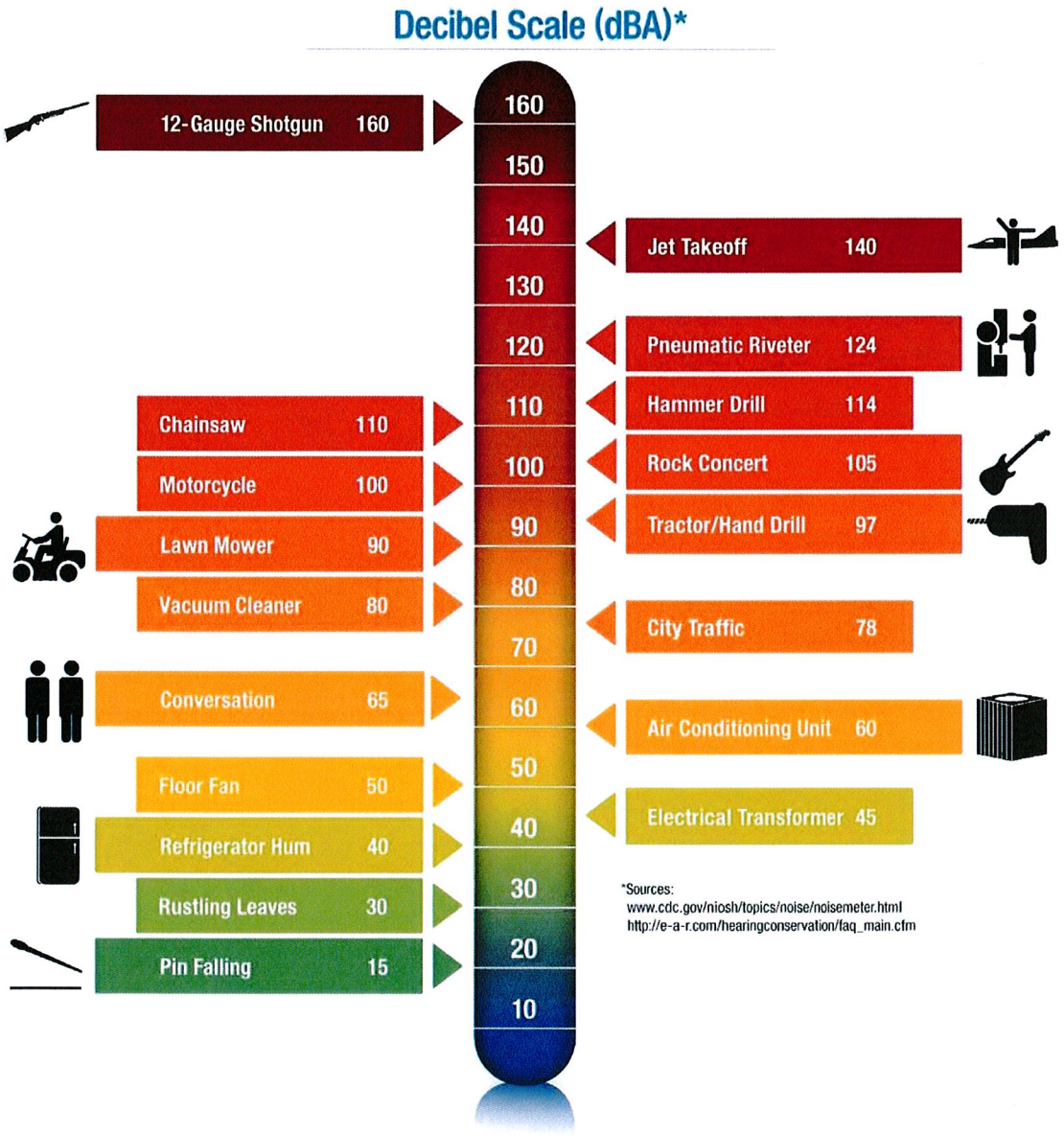
It is commonly understood that sound decreases with distance. But the propagation of sound is dependent on considerably more variables than distance alone. Those variables include the type of noise source (point, moving point, or line sources), the directionality of the noise source, the frequency content of the source (low frequency sound is absorbed in the atmosphere at a slower rate than high-frequency sound and therefore "carries" farther), atmospheric conditions (wind, temperature, humidity, gradients), ground type (dirt, grass fields, concrete, etc.), shielding (structures, noise barriers, topography), and vegetation.

For this project, proposed residential receptors are located within fairly close proximity to the major noise sources. At short distances between the source and receptor, the effects of the atmosphere on sound propagation are diminished, as those effects become more pronounced at distances in excess of 300 feet.

For the purposes of assessing noise sources within the project area, traffic on public roadways are considered "moving point" sources. The sound level decay rate for this type of source is 4.5 dB per doubling of distance from the source.

Table 1

Examples of Noise Sources



Perception of Changes in Noise Levels

Table 2 is based upon recommendations made in August 1992 by Federal Interagency Committee on Noise (FICON) to provide guidance in the assessment of changes in ambient noise levels resulting from aircraft operations. The recommendations are based upon studies that relate aircraft noise levels to the percentage of persons highly annoyed by noise. Although the FICON recommendations were specifically developed to assess aircraft noise impacts, these criteria have been applied to other sources of noise similarly described in terms of cumulative noise exposure metrics such as the L_{dn}.

Table 2
Significance of Changes in Cumulative Noise Exposure

Ambient Noise Level Without Project, L_{dn}	Increase Required for Significant Impact
<60 dB	+5.0 dB or more
60-65 dB	+3.0 dB or more
>65 dB	+1.5 dB or more

Source: Federal Interagency Committee on Noise (FICON)

According to Table 2, an increase in noise from similar sources of 5 dB or more would be noticeable where the ambient level is less than 60 dB. Where the ambient level is between 60 and 65 dB, an increase in noise of 3 dB or more would be noticeable, and an increase of 1.5 dB or more would be noticeable where the ambient noise level exceeds 65 dB L_{dn}. The rationale for the Table 2 criteria is that, as ambient noise levels increase, a smaller increase in noise resulting from a project is sufficient to cause annoyance.

Noise Mitigation Fundamentals

Any noise problem may be considered as being composed of three basic elements: the noise source, a transmission path, and a receiver. The appropriate acoustical treatment for a given project should consider the nature of the noise source and the sensitivity of the receiver. The problem should be defined in terms of appropriate criteria (Ldn, L_{50}, or Lmax), the location of the sensitive receiver (inside or outside), and when the problem occurs (daytime, nighttime, or 24-hour average). Noise control techniques should then be selected to provide an acceptable noise environment for the receiving property while remaining consistent with local aesthetic standards and practical structural and economic limits. Fundamental noise control techniques include the following:

Use of Setbacks

Noise exposure may be reduced by increasing the distance between the noise source and receiving use. The available noise attenuation from this technique is limited by the characteristics of the noise source, but is generally about 4 to 6 dB per doubling of distance from the source.

Use of Barriers

Shielding by barriers can be obtained by placing walls, berms or other structures, such as buildings, between the noise source and the receiver. The effectiveness of a barrier depends upon blocking line-of-sight between the source and receiver, and is improved with increasing the distance the sound must travel to pass over the barrier as compared to a straight line from source to receiver. The difference between the distance over a barrier and a straight line between source and receiver is called the "path length difference," and is the basis for calculating barrier noise reduction.

Barrier effectiveness depends upon the relative heights of the source, barrier and receiver. In general, barriers are most effective when placed close to either the receiver or the source. An intermediate barrier location yields a smaller path-length-difference for a given increase in barrier height than does a location closer to either source or receiver.

For maximum effectiveness, barriers must be continuous and relatively airtight along their length and height. To ensure that sound transmission through the barrier is insignificant, barrier mass should be about 3-4 lbs./square foot, although a lesser mass may be acceptable if the barrier material provides sufficient transmission loss. Satisfaction of the above criteria requires substantial and well-fitted barrier materials, placed to intercept line of sight to all significant noise sources.

There are practical limits to the noise reduction provided by barriers. For traffic noise, a 5 to 10 dB noise reduction may often be reasonably attained. A 15 dB noise reduction is usually difficult but sometimes possible to attain, but a 20 dB noise reduction is extremely difficult to achieve. Barriers usually are provided in the form of walls, berms, or berm/wall combinations. The use of an earth berm in lieu of a solid wall may provide additional attenuation over that attained by a solid wall alone due to the absorption provided by the earth. Berm/wall combinations offer slightly better acoustical performance than solid walls, and are often preferred for aesthetic reasons over solid barrier walls alone.

Site Design

Buildings can be placed on a project area to shield other structures or areas, to remove them from noise-impacted areas, and to prevent an increase in noise level caused by reflections. The use of one building to shield another can significantly reduce overall project noise control costs, particularly if the shielding structure is insensitive to noise. As an example, carports or garages can be used to form or complement a barrier shielding adjacent dwellings or an outdoor activity area. Similarly, one residential unit can be placed to shield another so that noise reduction measures are needed for only the building closest to the noise source. Placement of outdoor activity areas within the shielded portion of a building complex, such as a central courtyard, can be an effective method of providing a quiet retreat in an otherwise noisy environment. Patios or balconies should be placed on the side of a building opposite the noise source, and "wing walls" can be added to buildings or patios to help shield sensitive uses.

Another useful option in site design is the placement of relatively insensitive land uses, such as commercial uses, between the noise source and a more sensitive portion of the

project. Examples include development of a commercial strip along a busy arterial to block noise affecting a residential area. If existing topography or development adjacent to the project area provides some shielding, as in the case of an existing berm, knoll or building, sensitive structures or activity areas may be placed behind those features to reduce noise control requirements.

Building Design

When structures have been located to provide maximum noise reduction by site design or shielding, noise reduction measures may still be required to achieve an acceptable interior noise environment. The cost of such measures may be reduced by placement of interior dwelling unit features. For example, bedrooms, living rooms, family rooms and other noise-sensitive portions of a dwelling can be located on the side of the unit farthest from the noise source.

Bathrooms, closets, stairwells and food preparation areas are relatively insensitive to exterior noise sources, and can be placed on the noisy side of a unit. When such techniques are employed, noise reduction requirements for the building facade can be significantly reduced, although the architect must take care to isolate the noise impacted areas by the use of partitions or doors.

Noise Reduction by Building Facades

When interior noise levels are of concern in a noisy environment, noise reduction may be obtained through acoustical design of building facades. Standard residential construction practices provide 10 to 15 dB noise reduction for building facades with open windows, and approximately 25-30 dB noise reduction when windows are closed. Thus a 25 dB exterior-to-interior noise reduction can be obtained by the requirement that building design include adequate ventilation systems, allowing windows on a noise-impacted facade to remain closed under any weather condition.

Where greater noise reduction is required, acoustical treatment of the building facade is necessary. The greatest improvement in building façade noise reduction can typically be realized through specification of upgraded windows with higher Sound Transmission Class (STC) ratings.

Noise transmitted through walls can be reduced by increasing wall mass (using stucco or brick in lieu of wood siding), isolating wall members by the use of double- or staggered-stud walls, or mounting interior walls on resilient channels. Noise control for exterior doorways is provided by reducing door area, using solid-core doors, and by acoustically sealing door perimeters with suitable gaskets. Roof treatments may include the use of plywood sheathing under roofing materials.

Whichever noise control techniques are employed, it is essential that attention be given to installation of weather-stripping and caulking of joints. Openings for attic or subfloor ventilation may also require acoustical treatment; tight-fitting fireplace dampers and glass doors may be needed in aircraft noise-impacted areas.

Use of Vegetation

Trees and other vegetation are often thought to provide significant noise attenuation. However, approximately 100 feet of dense foliage (so that no visual path extends through the foliage) is required to achieve a 5 dB attenuation of traffic noise. Thus the use of vegetation as a noise barrier should not be considered a practical method of noise control unless large tracts of dense foliage are part of the existing landscape.

Vegetation can be used to acoustically "soften" intervening ground between a noise source and receiver, increasing ground absorption of sound and thus increasing the attenuation of sound with distance. Planting of trees and shrubs is also of aesthetic and psychological value, and may reduce adverse public reaction to a noise source by removing the source from view, even though noise levels will be largely unaffected.

In summary, the effects of vegetation upon noise transmission are minor, and are primarily limited to increased absorption of high frequency sounds and to reducing adverse public reaction to the noise by providing aesthetic benefits.

Noise-Reducing Paving Materials (Rubberized Asphalt)

Studies conducted for the Sacramento County Planning and Environmental Review Department and Transportation Department to determine the noise reduction provided by rubberized asphalt have been completed in recent years. Those studies indicate that the use of rubberized asphalt on two County roadways appears to have resulted in an average traffic noise level reduction of approximately 4 dB over that provided by conventional asphalt.

Vibration Fundamentals and Terminology

Vibration is like noise in that it involves a source, a transmission path, and a receiver. While vibration is related to noise, it differs in that noise is generally considered to be pressure waves transmitted through air, while vibration is usually associated with transmission through the ground or structures. As with noise, vibration consists of an amplitude and frequency. A person's response to vibration will depend on their individual sensitivity as well as the amplitude and frequency of the source.

Vibration can be described in terms of acceleration, velocity, or displacement. A common practice is to monitor vibration measures in terms of peak particle velocities (inches/second). Standards pertaining to perception as well as damage to structures have been developed for vibration in terms of peak particle velocity.

As vibrations travel outward from the source, they excite the particles of rock and soil through which they pass and cause them to oscillate. Differences in subsurface geologic conditions and distance from the source of vibration will result in different vibration levels characterized by different frequencies and intensities. In all cases, vibration amplitudes will decrease with increasing distance. The maximum rate, or velocity of particle movement, is the commonly accepted descriptor of the vibration "strength".

Human response to vibration is difficult to quantify. Vibration can be felt or heard well below the levels that produce any damage to structures. The duration of the event has an effect on human response, as does frequency. Generally, as the duration and vibration frequency increase, the potential for adverse human response increases.

According to the Transportation and Construction-Induced Vibration Guidance Manual (Caltrans, June 2004), operation of construction equipment and construction techniques generate ground vibration. Traffic traveling on roadways can also be a source of such vibration. At high enough amplitudes, ground vibration has the potential to damage structures and/or cause cosmetic damage (e.g., crack plaster). Ground vibration can also be a source of annoyance to individuals who live or work close to vibration-generating activities. However, traffic, including heavy trucks traveling on a highway, rarely generates vibration amplitudes high enough to cause structural or cosmetic damage.

Criteria for Acceptable Noise and Vibration Levels

Sacramento County

Sacramento County General Plan

The Noise Element of the Sacramento County General Plan contains policies pertaining to acceptable noise generation and exposure levels within the County. The policies contained within the County Noise Element which are pertinent to the evaluation of noise impacts due to and upon development within the project are reproduced below.

Traffic Noise Sources

NO-1 The noise level standards for noise-sensitive areas of new uses affected by traffic or railroad noise sources in Sacramento County are shown by Table 3. Where the noise level standards of Table 3 are predicted to be exceeded at new uses proposed within Sacramento County which are affected by traffic or railroad noise, appropriate noise mitigation measures shall be included in the project design to reduce projected noise levels to a state of compliance with the Table 3 standards.

Non-Transportation Noise Sources (school playgrounds)

NO-5 The interior and exterior noise level standards for noise-sensitive areas of new uses affected by existing non-transportation noise sources in Sacramento County are shown by Table 4. Where the noise level standards of Table 4 are predicted to be exceeded at a proposed noise-sensitive area due to existing non-transportation noise sources, appropriate noise mitigation measures shall be included in the project design to reduce projected noise levels to a state of compliance with the Table 4 standards within sensitive areas.

NO-6 Where a project would consist of or include non-transportation noise sources, the noise generation of those sources shall be mitigated so as not to exceed the

interior and exterior noise level standards of Table 4 at existing noise-sensitive areas in the project vicinity.

NO-7 The "last use there" shall be responsible for noise mitigation. However, if a noise-generating use is proposed adjacent to lands zoned for uses which may have sensitivity to noise, then the noise generating use shall be responsible for mitigating its noise generation to a state of compliance with the Table 4 standards at the property line of the generating use in anticipation of the future neighboring development.

Construction Noise

NO-8 Noise associated with construction activities shall adhere to the County Code requirements. Specifically, Section 6.68.090(e) addresses construction noise within the County.

General Noise Policy

NO-12 All noise analyses prepared to determine compliance with the noise level standards contained within this Noise Element shall be prepared in accordance with Table 3.

NO-13 Where noise mitigation measures are required to satisfy the noise level standards of this Noise Element, emphasis shall be placed on the use of setbacks and site design to the extent feasible, prior to consideration of the use of noise barriers.

NO-14 Noise analyses prepared for multi-family residential projects, town homes, mixed-use, condominiums, or other residential projects where floor ceiling assemblies or party-walls shall be common to different owners/occupants shall be consistent with the State of California Noise Insulation standards.

NO-15 The County shall have the flexibility to consider the application of 5 dB less restrictive exterior noise standards than those prescribed in Tables 3 and 4 in cases where it is impractical or infeasible to reduce exterior noise levels within infill projects to a state of compliance with the Table 3 or 4 standards. In such cases, the rational for such consideration shall be clearly presented and disclosure statements and noise easements should be included as conditions of project approval. The interior noise level standards of Tables 3 and 4 would still apply. The maximum allowable long-term noise exposure permissible for non-industrial uses is 75 dB.

Table 3
Noise Standards for New Uses Affected by Traffic and Railroad Noise
Sacramento County Noise Element

Land Use	Sensitive Outdoor Areas[a] dBA, L_{dn}/CNEL	Sensitive Interior Area[b] dBA, L_{dn}/CNEL
Residential	65[e]	45
Transient lodging	65[c,e]	45
Hospitals, nursing homes	65[c,d,e]	45
Theaters, auditoriums, music halls	--	35[c]
Churches, meeting halls	65[c]	40
Office buildings	65[c]	45
School, libraries, museums	65[c]	40
Commercial Buildings	--	50[c]
Playgrounds, neighborhood parks	70	--
Industry	65[c]	50

Source: Sacramento County General Plan (2011)

Notes:

[a] Sensitive areas are defined in acoustic terminology section.

[b] Interior noise level standards are applied within noise-sensitive areas of the various land uses, with windows and doors in the closed positions.

[c] Where there are no sensitive exterior spaces proposed for these use, only the interior noise level standard shall apply.

[d] Hospitals are often noise-generating uses. The exterior noise level standards for hospitals are applicable only at clearly identified areas designated for outdoor relaxation by either hospital staff or patients.

[e] If this use is affected by railroad noise, a maximum (Lmax) noise level standard of 70 dB shall be applied to all sleeping rooms to reduce the potential for sleep disturbance during nighttime train passages.

Table 4
Non-Transportation Noise Standards
Median (L50) / Maximum (Lmax)[a]
Sacramento County Noise Element

	Outdoor Area[b]		Interior[c]
Land Use	**Daytime**	**Nighttime**	**Day & Night**
All Residential	55 / 75	50 / 70	35 / 55
Transient lodging[d]	55 / 75	--	35 / 55
Hospitals, nursing homes[e,f]	55 / 75	--	35 / 55
Theaters, auditoriums, music halls[f]	--	--	30 / 50
Churches, meeting halls[f]	55 / 75	--	35 / 60
Office buildings[f]	60 / 75	--	45 / 65
Commercial buildings[f]	--	--	45 / 65
Playgrounds, neighborhood parks[f]	65 / 75	--	--
Industry[f]	60 / 80	--	50 / 70

Source: Sacramento County General Plan (2011)

Notes:

[a] The table 4 standards shall be reduced by 5 dB for sounds consisting primarily of speech or music, and for recurring impulsive sounds. If the existing ambient noise level exceeds the standards of Table 4, then the noise level standards shall be increased at 5 dB increments to encompass the ambient.

[b] Sensitive areas are defined in the acoustic terminology section of the Noise Element.

[c] Interior noise level standards are applied within noise-sensitive areas of the various land uses, with windows and doors in the closed positions.

[d] Outdoor activity areas of transient lodging facilities are not commonly used during nighttime hours.

[e] Hospitals are often noise-generating uses. The exterior noise level standards for hospitals are applicable only at clearly identified areas designated for outdoor relaxation by either hospital staff or patients.

[f] The outdoor activity areas of these uses (if any), are not typically utilized during nighttime hours.

[g] Where median (L50) noise level data is not available for a particular noise source, average (Leq) values may be substituted for the standards of this table provided the noise source in question operates for at least 30 minutes of an hour. If the source in question operates less than 30 minutes per hour, then the maximum noise level standards shown would apply.

Sacramento County Code

Chapter 6.68 of the Sacramento County Code pertains to Noise Control and is referred to in this study as the Noise Ordinance. The purpose of the Noise Ordinance is to assess complaints of noises alleged to exceed the ambient noise levels. Further, it is declared to be the policy of the County of Sacramento to contain sound levels at their present levels with the ultimate goal of reducing such levels, when and where feasible and without causing undue burdens, to meet the noise standards set forth below. The following section provides the pertinent sections of the County Noise Ordinance.

6.68.070 Exterior Noise Standards

a. The following noise standards, unless otherwise specifically indicated in this chapter, shall apply to all properties within a designated noise area.

Noise Area	County Zoning Districts	Time Period	Exterior Noise Standard
1	RE-1, RD-1, RE-2, RD-2, RE-3, RD-3, RD-4, R-1-A, RD-5, R-2, RD-10, R-2A, RD-20, R-3, R-D-30, RD-40, RM-1, RM-2, A-1-B, AR-1, A-2, AR-2, A-5, AR-5	7 a.m.--10 p.m. 10 p.m.--7 a.m.	55 dBA 50 dBA

b. It is unlawful for any person at any location within the County of Sacramento to create any noise which causes the noise levels on an affected property, when measured in the designated noise area, to exceed for the duration of time set forth following, the specified exterior noise standards in any one hour by:

Cumulative Duration of the Intrusive Sound	Allowance Decibels
1. Cumulative period of 30 minutes per hour	0
2. Cumulative period of 15 minutes per hour	+5
3. Cumulative period of 5 minutes per hour	+10
4. Cumulative period of 1 minute per hour	+15
5. Level not to be exceeded for any time per hour	+20

c. Each of the noise limits specified in subdivision (b) of this section shall be reduced by five dBA for impulsive* or simple tone** noises, or for noises consisting of speech or music.

* "Impulsive noise" means a noise characterized by brief excursions of sound pressures whose peak levels are very much greater than the ambient noise level, such as might be produced by the impact of a pile driver, punch press or a drop hammer, typically with one second or less duration.

** "Simple tone noise" or "pure tone noise" means a noise characterized by the presence of a predominant frequency or frequencies such as might be produced by whistle or hum.

d. If the ambient noise level exceeds that permitted by any of the first four noise-limit categories specified in subdivision (b), the allowable noise limit shall be increased in 5 dBA increments in each category to encompass the ambient noise level. If the ambient noise level exceeds the fifth noise level category, the maximum ambient noise level shall be the noise limit for that category.

6.68.080 Interior Noise Standards

a. In any apartment, condominium, townhouse, duplex or multiple dwelling unit it is unlawful for any person to create any noise from inside his unit that causes the noise level when measured in a neighboring unit during the periods ten p.m. to seven a.m. to exceed:

1. 45 dBA for a cumulative period of more than 5 minutes in any hour;
2. 50 dBA for a cumulative period of more than 1 minute in any hour;
3. 55 dBA for any period of time.

b. If the ambient noise level exceeds that permitted by any of the noise level categories specified in subdivision (a) of this section, the allowable noise limit shall be increased in five-dBA increments in each category to encompass the ambient noise level.

6.68.090 Exemptions

The following activities shall be exempted from the provisions of this chapter:

a. School bands, school athletic and school entertainment events;

b. Outdoor gatherings, public dances, shows and sporting and entertainment events, provided said events are conducted pursuant to a license or permit by the County;

c. Activities conducted on parks, public playgrounds and school grounds, provided such parks, playgrounds and school grounds are owned and operated by a public entity or private school;

d. Any mechanical device, apparatus or equipment related to or connected with emergency activities or emergency work;

e. Noise sources associated with construction, repair, remodeling, demolition, paving or grading of any real property, provided said activities do not take place between the hours of eight p.m. and six a.m. on weekdays and Friday commencing at eight p.m. through and including seven a.m. on Saturday; Saturdays commencing at eight p.m. through and including seven a.m. on the next following Sunday and on each Sunday after the hour of eight p.m. Provided, however, when an unforeseen or unavoidable condition occurs during a construction project and the nature of the project necessitates that work in process be continued until a specific phase is completed, the contractor or owner shall be allowed to continue work after eight p.m. and to operate machinery and equipment necessary until completion of the specific work in progress can be brought to conclusion under conditions which will not jeopardize inspection acceptance or create undue financial hardships for the contractor or owner;

f. Noise sources associated with agricultural operations, provided such operations do not take place between the hours of eight p.m. and six a.m.;

g. All mechanical devices, apparatus or equipment which are utilized for the protection or salvage of agricultural crops during periods of adverse weather conditions or when the use of mobile noise sources is necessary for pest control;

h. Noise sources associated with maintenance of residential area property, provided said activities take place between the hours of six a.m. and eight p.m. on any day except Saturday or Sunday, or between the hours of seven a.m. and eight p.m. on Saturday or Sunday;

i. Any activity, to the extent provisions of Chapter 65 of Title 42 of the United States Code, and Articles 3 and 3.5 of Chapter 4 of Division 9 of the Public Utilities Code of the State of California preempt local control of noise regulations and land use regulations related to noise control of airports and their surrounding geographical areas, any noise source associated with the construction, development, manufacture, maintenance, testing or operation of any aircraft engine, or of any weapons system or subsystems which are owned, operated or under the jurisdiction of the United States, or any other activity to the extent regulation thereof has been preempted by state or federal law or regulation;

j. Any noise sources associated with the maintenance and operation of aircraft or airports which are owned or operated by the United States.

6.68.110 Schools, Hospitals and Churches

It is unlawful for any person to create any noise which causes the noise level at any school, hospital or church, while the same is in use, to exceed the noise standards specified in Section 6.68.070 or to create any noise which unreasonably interferes with the use of such institution or unreasonably disturbs or annoys patients in the hospital. In any disputed case, interfering noise which is ten dBA or more, greater than the ambient noise level at the building, shall be deemed excessive and unlawful.

6.68.120 Machinery, Equipment, Fans and Air Conditioning

a. It is unlawful for any person to operate any mechanical equipment, pump, fan, air conditioning apparatus, stationary pumps, stationary cooling towers, stationary compressors, similar mechanical devices, or any combination thereof installed after July 1, 1976 in any manner so as to create any noise which would cause the maximum noise level to exceed:

1. 60 dBA at any point at least one foot inside the property line of the affected residential property and three to five feet above ground level;

2. 55 dBA in the center of a neighboring patio three to five feet above ground level;

3. 55 dBA outside of the neighboring living area window nearest the equipment location. Measurements shall be taken with the microphone not more than three feet from the window opening but at least three feet from any other surface.

b. Equipment installed five years after July 1, 1976 must comply with a maximum limit of fifty-five dBA at any point at least one foot inside the property line of the affected residential property and three to five feet above ground level.

c. Equipment installed before December 17, 1970 must comply with a limit of 65 dBA maximum in sound level at any point at least one foot inside the affected property line and three to five feet above ground level by January 1, 1977. Equipment installed between December 16, 1970 and July 1, 1976 must comply with a limit of 65 dBA maximum sound level at any point at least one foot inside the property line of the affected residential property and three to five feet above ground level.

A6.68.150 General Noise Regulations

Notwithstanding any other provisions of this chapter and in addition thereto, it is unlawful for any person to willfully make or continue or cause to be made or continued any loud, unnecessary or unusual noise which disturbs the peace and quiet of any neighborhood or which causes discomfort or annoyance to any reasonable person of normal sensitiveness residing in the area. The standards which shall be considered in determining whether a violation of the provisions of this section exists shall include, but not be limited to, the following:

a. The sound level of the objectionable noise;
b. The sound level of the ambient noise;
c. The proximity of the noise to residential sleeping facilities;
d. The nature and zoning of the area within which the noise emanates;
e. The density of the inhabitation of the area within which the noise emanates;
f. The time of day or night the noise occurs;
g. The duration of the noise and its tonal informational or musical content;
h. Whether the noise is continuous, recurrent or intermittent;
i. Whether the noise is produced by a commercial or noncommercial activity.

Vibration Criteria

Sacramento County has no adopted vibration standards. As a result, Caltrans-recommended criteria are applied for this project, as described below. Human and structural response to different vibration levels is influenced by a number of factors, including ground type, distance between source and receptor, duration, and the number of perceived vibration events. The Caltrans publication, *Transportation-and Construction-Induced Vibration Guidance Manual*, written for Caltrans by Jones & Stokes in June 2004, provides guidelines for acceptable vibration limits for transportation and construction projects in terms of the induced peak particle velocity (PPV). Those standards are reproduced below in Table 5.

Table 5
Vibration Criteria

Structure and Condition	Maximum PPV (in/sec)	
	Transient Sources[1]	Continuous or Frequent Intermittent Sources[2]
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.20	0.10
Historic and some old building	0.50	0.25
Older residential structures	0.50	0.30
New residential structures	1.00	0.50
Modern industrial/commercial building	2.00	0.50

Notes:
1. Transient sources create a single isolated vibration event.
2. Continuous/frequent intermittent sources include repetitive single events.

Current Caltrans research illustrates that there are different thresholds of perception for different types of vibration sources. Section XI(b) of Appendix G of the CEQA guidelines requires that a project result in exposure of persons to, or generation of, *excessive* groundborne vibration levels or groundborne noise levels, for the finding of a significant impact. The CEQA guidelines specifically mention "excessive" vibration, rather than just perceptible vibration. The general range at which vibration becomes distinctly to strongly perceptible is noted in Table 5 as being 0.1 – 0.50 in/sec ppv.

Existing (Baseline) Noise & Vibration Environments

Overview of Existing Noise and Vibration Environment within the Project Area

The existing noise environment within the overall project area varies by location and is defined by a combination of noise sources. The most pervasive noise source affecting the project area is surface traffic on Don Julio Boulevard, Antelope Road, and other local and distant roadways. In addition, the project area is potentially affected by noise levels generated from playground activity noise at Barrett Ranch Elementary School, and athletic events at Antelope High School.

No appreciable sources of vibration were identified during BAC field surveys of the project area and existing ambient vibration levels were subjectively evaluated as being below the threshold of perception.

Methodology for Assessing Baseline Noise Environment

The existing noise environment within the project area was quantified through a combination of short-term ambient noise level measurements and modelling of traffic noise levels using the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA-RD-77-108).

Existing General Traffic Noise Environment

To describe noise levels because of traffic, the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA RD-77-108) was used. The FHWA model is based upon the Calveno reference noise factors for automobiles, medium trucks and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site.

Baseline FHWA Model traffic volume inputs were obtained from the traffic impact analysis completed by the project traffic consultants, Kimley-Horn and Associates (October 14, 2014). Table 6 shows the predicted existing traffic noise levels at a reference distance of 100 feet from the roadway centerlines, as well as the distances to the unshielded L_{dn} contours. The FHWA Model Inputs for baseline conditions are provided in Appendix B.

Table 6
Existing (Baseline) Traffic Noise Levels @ 100 feet and Distances to Traffic Noise Contours
Barrett Ranch East Development – Sacramento County

Segment	Roadway	Segment Description	L_{dn} @ 100 feet, (dB)	Distance to L_{dn} Contour (feet)		
				70 dB	65 dB	60 dB
1	Titan Dr	Elverta Rd - Antelope HS Dwy	52	7	14	31
2	Palmerson Dr	N Loop Blvd - Elverta Rd	55	9	20	44
3	Elverta Rd	Walerga Rd - Palmerson Dr	63	35	76	164
4		Palmerson Dr - Titan Dr	61	27	57	123
5		Titan Dr - Pismo Beach Dr	60	21	45	96
6		Pismo Beach Dr - Sand City Dr	60	20	43	93
7	Antelope Rd	Watt Ave - Walerga Rd	66	53	114	246
8		Walerga Rd - Esteem Dr	68	69	149	320
9		Esteem Dr - Elverta Rd	59	19	40	87
10		Don Julio Blvd - Roseville Rd	69	85	184	396
11	Elkhorn Blvd	Walerga Rd - Don Julio Blvd	68	75	162	349
12		Don Julio Blvd - Roseville Rd	70	102	220	474
13		Roseville Rd - I80 WB Ramps	70	99	214	462
14	Don Julio Blvd	N Loop Blvd - Poker Ln	65	44	95	204
15		Poker Ln - Antelope Rd	66	53	115	247
16		Antelope Rd - Elkhorn Blvd	66	56	121	262
17	Watt Ave	Antelope Rd - Elkhorn Blvd	68	71	152	327
18	Walerga Rd	Elverta Rd - Antelope Rd	69	80	173	372
19		Antelope Rd - Elkhorn Blvd	68	71	153	330

Source: FHWA-RD-77-108 with traffic inputs provided by Kimley-Horn and Associates.

Existing General Ambient Noise Environment within the Project Area

To quantify the existing ambient noise environment, short-term (continuous) ambient noise level measurements were conducted at five locations within or adjacent to the proposed project area on December 1, 2014. The locations of the continuous noise monitoring sites are shown in Figure 2.

Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meters were used for the short-term ambient noise level measurement surveys. The meters were calibrated before use with LDL Model CAL200 acoustical calibrators prior to use to ensure the accuracy of the measurements. The equipment used meets all pertinent specifications of the American National Standards Institute.

The results of the short-term ambient noise measurement survey are summarized in Table 7. The Table 7 data indicate that existing noise levels within the project area vary, depending on location of the noise monitoring site relative to nearby noise sources. Inspection of the data showed that monitoring locations nearest Don Julio Boulevard and Poker Lane recorded the highest noise levels during the noise monitoring periods.

Table 7
Short-term Ambient Noise Level Monitoring Summary
Barrett Ranch East Development – Sacramento County

		Measured Noise Levels, dBA[2,3]				
Site[1]	Time	L_{eq}	L_{max}	L_{50}	L_{90}	Notes/Source
1	1:46 PM	49	62	46	43	High School dominant source
2	2:15 PM	60	67	59	56	Don Julio Blvd dominant source
3	2:38 PM	58	65	57	52	Don Julio Blvd/Poker Ln dominant source
4	3:02 PM	71	84	69	56	Don Julio Blvd dominant source
5	3:28 PM	51	57	48	45	Elementary School/Distant Traffic

Notes:
1 Noise monitoring locations illustrated on Figure 1.
2 Noise level descriptors (Leq, Lmax, L50, and L90) defined in Appendix A.
3 Noise level measurements were 15 minutes in duration.

Source: Bollard Acoustical Consultants, Inc. (BAC)

Existing (Baseline) Vibration Environment

No appreciable sources of vibration were identified during BAC field surveys of the project area and existing ambient vibration levels were subjectively evaluated as being below the threshold of perception. Further, BAC does not anticipate any substantive sources of vibration associated with the project.

Standards of Significance Applied to this Project

The following standards of significance, which are based on the California Environmental Quality Act Guidelines (State CEQA Guidelines) in conjunction with adopted local noise policy and appropriate noise standards as described above, are applied to this project:

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

For transportation noise affecting existing or proposed noise-sensitive land uses within the project site, the noise standards of Table 3 are applied.

For Non-transportation noise sources affecting existing or proposed noise-sensitive land uses within the project site, the noise standards of Table 4 are applied.

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

For this assessment, a vibration level of 1 in/sec ppv is considered a criterion that would protect against significant architectural or structural damage. The general range at which vibration becomes distinctly to strongly perceptible is approximately 0.1 in/sec ppv.

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

The following criteria are used to assess the significance of project-related traffic noise level increases:

1. Where existing traffic noise levels are less than 60 dB Ldn at the outdoor activity areas of noise-sensitive uses, a +5 dB Ldn increase in noise levels due to roadway improvement projects will be considered significant; and

2. Where existing traffic noise levels range between 60 and 65 dB Ldn at the outdoor activity areas of noise-sensitive uses, a +3 dB Ldn increase in noise levels due to roadway improvement projects will be considered significant; and

3. Where existing traffic noise levels are greater than 65 dB Ldn at the outdoor activity areas of noise-sensitive uses, a +1.5 dB Ldn increase in noise levels due to roadway improvement projects will be considered significant.

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

A substantial temporary increase in noise levels is defined using the criteria shown above in threshold C.

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

The project site is located over 3 miles away from the nearest airport, McClellan Airfield. Evaluation of aircraft noise impacts with McClellan Airfield is not warranted for this project.

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

No private airstrips were identified in the project vicinity so an evaluation of aircraft noise impacts associated with such facilities is not warranted for this project.

Impacts and Mitigation Measures

For this project, noise impacts both due to and upon the proposed Barrett Ranch development are assessed. Noise impacts due to (resulting from), the proposed project would occur if project-generated traffic causes a substantial increase in traffic noise levels at existing, off-site, noise-sensitive land uses in the immediate project vicinity.

Noise impacts upon the proposed project would result if projected future traffic, commercial or school-related noise exposure at the proposed residences within the Barrett Ranch development site would exceed Sacramento County noise standards at either the outdoor activity areas (backyards) or interior spaces of individual the residences.

The following sections separately evaluate noise impacts due to, and upon, the project development.

Noise Impacts due to the Barrett Ranch Development

To assess noise impacts due to the project, existing and future traffic noise levels are predicted for the local area roadways, both with and without traffic generated by the proposed project. The project and no-project noise levels are compared and the noise level increases resulting from the project are assessed relative to the Significance Criteria cited above.

Existing Versus Existing Plus Project Traffic Noise Levels

With development within the project area as a whole, traffic volumes on the local roadway network will increase. Those increases in daily traffic volumes will result in a corresponding increase in traffic noise levels. The FHWA Model was used to predict existing and existing plus project traffic noise levels, and the project-related noise level increases. Traffic volume inputs were obtained from the traffic impact analysis completed by the project traffic consultants, Kimley-Horn and Associates. Table 8 shows existing versus existing plus project traffic noise levels on the regional roadway network.

Table 8
Existing Versus Existing Plus Project Traffic Noise Levels
Barrett Ranch East Development – Sacramento County

			L_{dn}, dB @ 100 feet			
Segment	Roadway	Segment Description	Existing	Existing Plus Project	Change	Substantial Increase?
1	Titan Dr	Elverta Rd - Antelope HS Dwy	52	54	+2	No
2	Palmerson Dr	N Loop Blvd - Elverta Rd	55	55	0	No
3	Elverta Rd	Walerga Rd - Palmerson Dr	63	65	+2	No
4		Palmerson Dr - Titan Dr	61	63	+2	No
5		Titan Dr - Pismo Beach Dr	60	62	+2	No
6		Pismo Beach Dr - Sand City Dr	60	61	+1	No
7	Antelope Rd	Watt Ave - Walerga Rd	66	66	0	No
8		Walerga Rd - Esteem Dr	68	68	0	No
9		Esteem Dr - Elverta Rd	59	66	+7	Yes
10		Don Julio Blvd - Roseville Rd	69	69	0	No
11	Elkhorn Blvd	Walerga Rd - Don Julio Blvd	68	68	0	No
12		Don Julio Blvd - Roseville Rd	70	70	0	No
13		Roseville Rd - I80 WB Ramps	70	70	0	No
14	Don Julio Blvd	N Loop Blvd - Poker Ln	65	65	0	No
15		Poker Ln - Antelope Rd	66	66	0	No
16		Antelope Rd - Elkhorn Blvd	66	66	0	No
17	Watt Ave	Antelope Rd - Elkhorn Blvd	68	68	0	No
18	Walerga Rd	Elverta Rd - Antelope Rd	69	69	0	No
19		Antelope Rd - Elkhorn Blvd	68	68	0	No

Source: FHWA-RD-77-108 with traffic inputs provided by Kimley-Horn and Associates.

Impact 1: Project-Generated Traffic Noise Increase – Baseline Conditions

Development within the project area would cause increases in existing traffic noise levels on the local roadway network. A total of 19 existing roadway segments were evaluated (see Table 8), and it was determined that the project-related traffic noise level increase relative to existing traffic noise levels without the project would range from having no change to +7 dB. A substantial increase was identified on the 1 of the 19 segments evaluated. The criteria for determination of a substantial project-related increase in traffic noise levels is as follows:

- 5 dB increase where baseline levels are below 60 dB L_{dn}.
- 3 dB increase where baseline levels are between 60 – 65 dB L_{dn}.
- 1.5 dB increase where baseline levels exceed 65 dB L_{dn}.

A finding of a substantial traffic noise increase may or may not trigger a finding of significant noise impact. For example, if a roadway segment where a substantial increase has been identified has no existing noise-

sensitive land uses developed adjacent to that roadway, then no impact would be identified. Similarly, if sensitive development is substantially shielded by either topography, structures, or soundwalls, it may reduce the baseline noise conditions at that receptor such that the threshold for a finding of significance increases from 1.5 dB to 3 dB or 5 dB. For example, where an increase of 1.5 dB would be considered significant for an unshielded residence with a baseline exposure exceeding 65 dB L_{dn}, the same 1.5 dB increase would not be considered significant if the baseline exposure at that same residence was reduced to less than 65 dB L_{dn} through shielding.

After identification of the roadway segments for which a substantial increase in traffic noise levels was determined to result from the project (only one segment), additional analysis was conducted to identify whether or not the segment contained a residential or other noise-sensitive development, as well as for existing sound walls. Table 9 contains the results of that additional analysis.

The Table 9 data indicates that, although the increase in traffic noise levels due to the project would be 7 dB, it should be noted that this increase results more from the reorientation of Antelope Road than by additional traffic generated by the project. Specifically, existing traffic on Antelope Road, between Don Julio and Walerga, does not currently pass the residences located on the different segment of Antelope Road between Esteem Drive and Elverta Road. After the roadway reconfiguration, however, a considerable shift of Antelope Road traffic will now pass these residences, thereby resulting in a 7 dB increase in traffic noise levels.

Although the increase due to the realigned traffic would be considered substantial, the increase due to the project-generated traffic alone would not. Furthermore, an existing noise barrier approximately 8 feet in height has been constructed adjacent to these residences. That barrier is predicted to reduce traffic noise levels to 60 dB L_{dn} or less in the primary outdoor activity areas (backyards) of the residences located along this roadway segment, which would comply with Sacramento County noise standards. As a result, the realignment of Antelope Road was evidentially anticipated at the time these residences were constructed because ample mitigation measures were included in the project design to achieve satisfaction with County noise standards. As a result, off-site traffic noise impacts resulting from project-generated traffic are considered to be ***less than significant***.

Table 9
Traffic Noise Impact Assessment – Existing vs. Existing Plus Project Conditions
Barrett Ranch East Development – Sacramento County

Roadway Segment		Existing	Existing + Project	Change	Substantial Increase?	Sensitive Uses?	Noise Barriers	Significant Impact?
Antelope Road	Esteem Dr - Elverta Rd	59	66	7	Yes	Yes	Yes	No[1]

1. See discussion regarding significance of this noise impact.
2. Source: FHWA-RD-77-108 with inputs from Kimley-Horn and BAC analysis.

Cumulative Vs. Cumulative-Plus-Project Traffic Noise Levels

With cumulative development of the region, traffic volumes on the local roadway network will increase. Those increases in daily traffic volumes will result in a corresponding increase in cumulative traffic noise levels. As with the evaluation of existing and existing-plus-project traffic noise levels, the increase on the local roadway network will result largely from the realignment of Antelope Road to the connection with Elverta Road.

The FHWA Model was used to predict cumulative and cumulative-plus-project traffic noise levels, and the project-related noise level increases. Traffic volume inputs were obtained from the traffic impact analysis completed by the project traffic consultants, Kimley-Horn and Associates. Table 10 shows the results of that analysis.

Table 10
Cumulative Versus Cumulative Plus Project Traffic Noise Levels
Barrett Ranch East Development – Sacramento County

			L_{dn}, dB @ 100 feet			
Segment	Roadway	Segment Description	Cumulative	Cumulative Plus Project	Change	Substantial Increase?
1	Titan Dr	Elverta Rd - Antelope HS Dwy	54	56	+2	No
2	Palmerson Dr	N Loop Blvd - Elverta Rd	56	56	0	No
3	Elverta Rd	Walerga Rd - Palmerson Dr	67	69	+2	Yes
4		Palmerson Dr - Titan Dr	65	68	+3	Yes
5		Titan Dr - Pismo Beach Dr	64	68	+4	Yes
6		Pismo Beach Dr - Sand City Dr	64	68	+4	Yes
7	Antelope Rd	Watt Ave - Walerga Rd	69	69	0	No
8		Walerga Rd - Esteem Dr	70	71	+1	No
9		Esteem Dr - Elverta Rd	64	68	+4	Yes
10		Don Julio Blvd - Roseville Rd	71	72	+1	No
11	Elkhorn Blvd	Walerga Rd - Don Julio Blvd	70	70	0	No
12		Don Julio Blvd - Roseville Rd	72	72	0	No
13		Roseville Rd - I80 WB Ramps	72	72	0	No
14	Don Julio Blvd	N Loop Blvd - Poker Ln	67	66	-1	No
15		Poker Ln - Antelope Rd	67	67	0	No
16		Antelope Rd - Elkhorn Blvd	68	69	+1	No
17	Watt Ave	Antelope Rd - Elkhorn Blvd	71	71	0	No
18	Walerga Rd	Elverta Rd - Antelope Rd	70	70	0	No
19		Antelope Rd - Elkhorn Blvd	70	70	0	No

Source: FHWA-RD-77-108 with traffic inputs provided by Kimley-Horn and Associates.

Impact 2: Project-Generated Traffic Noise Increase – Future (Cumulative) Conditions

Development within the project area would cause increases in future (cumulative) traffic noise levels on the local roadway network. A total of 19 future roadway segments were evaluated (see Table 10), and it was

determined that the project-related traffic noise level increases relative to future traffic noise levels without the project would range from -1 dB to +4 dB. Of the 19 segments evaluated, the increase was considered to be substantial on five roadway segments.

After identification of the roadway segments for which a substantial increase in traffic noise levels was determined to result from the project (five segments), additional analysis was conducted to identify whether or not the segment contained a residential or other noise-sensitive development, as well as for existing sound walls. Table 11 contains the results of that additional analysis.

The Table 11 data indicate that there are existing traffic noise barriers along four of the five identified roadway segments where substantial increases in cumulative traffic noise levels would result from the project. As a result, the cumulative baseline traffic noise environment at the sensitive land uses located adjacent to those roadway segments is predicted to be 60 dB Ldn or less. Given this baseline level, a 5 dB increase in traffic noise levels would be required for a finding of significant noise increases. Because the identified increase in traffic noise levels ranges from 3-4 dB along those segments, cumulative traffic noise impacts at those residences would be less than significant.

The existing land use at the one segment in Table 11 which is not shielded by an existing traffic noise barrier is a multi-family apartment complex. The outdoor activity area of this residential receptor is the common pool area which is substantially setback and shielded from Elverta Road traffic noise. As a result, the cumulative baseline traffic noise environment at the sensitive exterior area of the apartment complex is predicted to be below 60 dB L_{dn}. Given this baseline level, a 5 dB increase in traffic noise levels would be required for a finding of significant noise increases. Because the identified increase in traffic noise level along this segment is 2 dB, cumulative traffic noise impacts at this apartment complex are identified as being less than significant.

The Table 10 data indicate that, although the increase in traffic noise levels due to the project would be considered substantial along several segments, it should be noted that this increase results more from the reorientation of Antelope Road than by additional traffic generated by the project. Nonetheless, because the project's contribution to the cumulative noise environment is not considerable, off-site cumulative traffic noise impacts resulting from project-generated traffic are considered to be ***less than significant***.

Table 11
Traffic Noise Impact Assessment – Cumulative vs. Cumulative Plus Project Conditions
Barrett Ranch East Development – Sacramento County

Roadway Segment		Cumulative	Cumlative + Project	Change	Substantial Increase?	Sensitive Uses?	Noise Barriers	Significant Impact?
Elverta Rd	Walerga Rd - Palmerson Dr	67	69	+2	Yes	Yes	No	No[1]
	Palmerson Dr - Titan Dr	65	68	+3	Yes	Yes	Yes	No[2]
	Titan Dr - Pismo Beach Dr	64	68	+4	Yes	Yes	Yes	No[2]
	Pismo Beach Dr - Sand City Dr	64	68	+4	Yes	Yes	Yes	No[2]
Antelope Rd	Esteem Dr - Elverta Rd	64	68	+4	Yes	Yes	Yes	No[2]

Source: FHWA-RD-77-108 with inputs from Kimley-Horn and BAC analysis.

Noise Impacts upon the Barrett Ranch Development

The project proposes 495 single-family detached residential units, 196 multi-family homes, a shopping center and parks. The locations of the proposed land uses within the project site are identified on Figure 2.

Traffic Noise Impacts

As noted in the Criteria Section of this report, Sacramento County requires that future traffic noise levels in new residential developments not exceed 65 dB Ldn at outdoor activity areas and 45 dB Ldn inside residences.

To predict future traffic noise exposure at the proposed sensitive land uses within the Barrett Ranch project area, the information contained in Table 12 was utilized. Specifically, the roadways within the project area were extracted from the Table 10 data in order to predict exposure at the land uses proposed adjacent to those roadways. Table 12 shows the future traffic noise levels and distances to the critical 65 dB L_{dn} traffic noise contours for the roadways adjacent to which noise-sensitive development is proposed.

Table 12
Future Traffic Noise Levels of Roadways within Project Area
Barrett Ranch East Development – Sacramento County

Segment	Roadway	Segment Description	L_{dn} @ 100 feet[2]	Distance to 65 dB L_{dn} Contour (feet)
14	Don Julio Blvd	N Loop Blvd - Poker Ln	66	119
15		Poker Ln - Antelope Rd	67	145
n/a[1]	Elverta Road	Sand City Dr - Don Julio Blvd	71	236

Notes:
1 Connector does not currently exist.
2 L_{dn} values presented in red indicate roadway segments where the County's 65 dB L_{dn} exterior noise standard would be exceeded at a distance of 100 feet from the roadway centerline.

Source: FHWA-RD-77-108 with traffic inputs provided by Kimley-Horn and Associates.

Impact 3: Future Traffic Noise Levels at Sensitive Receptors Proposed Within the Project Area

Development within the project area will have varying degrees of noise sensitivity. The most sensitive of the proposed land uses include residential. Where future traffic noise levels at proposed sensitive land uses would exceed Sacramento County noise standards applicable to sensitive land uses (Table 3), a finding of significant noise impact is made and mitigation measures must be considered.

The Table 12 data, which represent predicted future (cumulative plus project) traffic noise levels within the project area, indicate that traffic noise levels are predicted to exceed the County's 65 dB L_{dn} exterior noise

standard at a distance of 100 feet from the 3 roadway segments analyzed. As a result, ***this impact is considered significant***.

Mitigation for Impact 3

The following specific noise mitigation measures are recommended to reduce this impact to a less than significant level:

A. 6-foot tall solid noise barriers should be constructed adjacent to the lots backing up to Don Julio Boulevard. These barriers, which would be constructed relative to backyard elevations, would be sufficient to reduce future traffic noise levels to a state of compliance with the County's 65 dB Ldn exterior noise standard for new residential uses affected by transportation noise sources. See Figure 3 for required barrier locations.

B. 8-foot tall solid noise barriers should be constructed adjacent to the single-family residential lots backing up to Antelope Road and Elverta Road. These barriers, which would be constructed relative to backyard elevations, would be sufficient to reduce future traffic noise levels to a state of compliance with the County's 65 dB Ldn exterior noise standard for new residential uses affected by transportation noise sources. See Figure 3 for required barrier locations.

C. Mechanical ventilation (air conditioning) should be provided for all residential uses to allow occupants to close doors and windows as desired for additional acoustical isolation.

D. All second-floor windows of detached single family residences, and all windows of multi-family residences, constructed adjacent to Elverta and Antelope Roads from which those roadways will be visible should have a minimum Sound Transmission Class Rating of 32. This measure would ensure compliance with Sacramento County interior noise level standard of 45 dB Ldn within residences.

Significance after Mitigation: *Less than Significant.*

Impact 4: Impacts due to Project-Generated Traffic on Barrett Elementary School

As noted previously, Barrett Ranch Elementary School is located on the western boundary of the project area, near the corner of Ocean Park Drive and Sand City Drive. Based on traffic modeling results previously presented in this report, it is expected that noise levels in the project area will increase. Although a traffic impact analysis was not conducted for a

roadway segment adjacent to the school, results from the nearby Titan Drive segment (Elverta Road – Antelope HS Dwy) indicate that the cumulative plus project traffic impact was 65 Ldn at 100 feet. The estimated distance from the middle of Ocean Park Drive to the closest building that students use exceeds 300 feet. Based on this information, and with the consideration of noise attenuation over distance, BAC does not anticipate that impacts due to future traffic noise levels from the project area will exceed the County's exterior or interior noise standards for schools structures (65 dB Ldn and 40 dB Ldn, respectively). As a result, **this impact is considered less than significant.**

Impacts Associated with Non-Transportation Noise Sources

Park and Playground/Sports Fields

Two existing schools; Barrett Ranch Elementary School and Antelope High School (see Figure 1), are located on the western boundary of the project area. Both facilities have existing playgrounds and/or sports fields with activities that could potentially impact noise levels at nearby sensitive receptors proposed within the project area.

Impact 5: Impacts due to Nearby Playground/Sports Fields Activities on Project Area

Barrett Ranch Elementary School is located on the western boundary of the project area, near the corner of Ocean Park Drive and Sand City Drive. The existing playgrounds and sports field are located on the north/northeast side of the facility, bordering Ocean Park Drive and Olberoing Way. There is an existing residential development adjacent to the playgrounds, with residential structures located approximately 100 feet away.

In previous playground noise monitoring efforts conducted by BAC, it was found that a group of approximately 100 children spread out over various playground locations generated noise levels of approximately 60 dB Leq and 75 dB Lmax at a distance of 100 feet. Based on information in the project site plan, the nearest proposed residential structures (to the north and east of the playgrounds) would be located at least 350 feet from the existing playgrounds. In addition, the project plan also includes the installation of a park as a buffer. Based on this information, and with the consideration of noise attenuation over distance, BAC does not anticipate that noise generated from the playgrounds at Barrett Ranch Elementary School will exceed the County's exterior noise standard for residential structures (55 L_{50} or Leq and 75 Lmax, or 55 dB Ldn).

Antelope High School is located on the northwestern boundary of the project area, at the end of Titan Way. The existing sports field (baseball field) is located on the eastern boundary of the facility, and borders outdoor areas of proposed residences on the northwest side of the project area

baseball fence. Based on previous BAC findings, reference noise level data collected at similar sized baseball facilities indicated that average noise levels during games would be approximately 55 dB Leq and 70 dB Lmax at a distance of 100 feet from the center of the pitcher's mound. The estimated distance from home plate to the nearest proposed residence exceeds 600 feet. Based on this information, and with the consideration of noise attenuation over distance, BAC does not anticipate that noise generated from the baseball field at Antelope High School will exceed the County's exterior noise standard for residential structures (55 L_{50} or Leq and 75 Lmax, or 55 dB Ldn). As a result, impacts related to either school facilities **are considered less than significant.**

Future Commercial Uses Proposed within the Barrett Ranch Development

Impact 6: Impacts upon Future Residences of the Barrett Ranch Development from Commercial Noise.

Noise from non-transportation sources would include onsite noise generated by commercial and other non-residential uses. Such uses could include commercial delivery vehicles, mechanical equipment, etc. Depending on the size of the equipment, HVAC equipment can produce sound levels in the range of 70 to 75 dBA at 50 feet (Hoover & Keith 2000). Because the project calls for commercial uses to be located adjacent to residential uses, stationary sources associated with commercial uses could result in noise that exceeds the County's compatibility standards for stationary noise sources. As a result, this impact is considered **potentially significant**.

Mitigation for Impact 6

The following specific noise mitigation measures are recommended to reduce this impact to a less than significant level:

A. At such time as specific proposals for commercial uses are proposed, the applicant shall prepare a design-level operational noise control plan that identifies all project features and treatments that will be implemented to achieve compliance with County noise standards. The plan shall be developed by a qualified acoustical consultant. Depending upon the noise exposure for a particular site, such treatments may include, but are not limited to those listed below, as recommended by the acoustical consultant.

    1. Construction of solid noise barriers between noise sources and receivers. The specific locations and heights of barriers, if necessary, shall be determined

during final design when the locations of residences and noise sources are finalized.

2. Construction of enclosures around noise-generating mechanical equipment at commercial uses.

3. Use of setback from noise sources to maximum attenuation of noise over distance.

4. Orient outdoor use areas such that they do not directly face adjacent residences.

5. Restrict truck delivery hours to between 7 a.m. and 7 p.m. at locations where such deliveries would occur in close proximity to residences.

Significance after Mitigation: *Less than Significant.*

Construction Noise Impacts

Impact 7: Impacts associated with Project Construction

During the construction phases of the project, noise from on-site construction activities, including infrastructure construction, grading, and development of a variety of land use types, would add to the noise environment in the project vicinity.

Activities involved in construction would typically generate maximum noise levels ranging from 85 to 90 dB at a distance of 50 feet. Noise would also be generated during the construction phase by increased truck traffic on area roadways. A significant project-generated noise source would be truck traffic associated with transport of heavy materials and equipment to and from construction sites.

Provided construction activities occur between the hours of 6 am – 8 pm during weekdays, and 7 am – 8 pm on weekends, construction activities would be exempt from the provisions of the Sacramento County Noise Ordinance (6.68.090). Because on-site construction activities are proposed to adhere to the County's requirements, no adverse on-site or off-site construction noise effects are identified for this project and **this impact is considered less than significant.**

Vibration Impacts

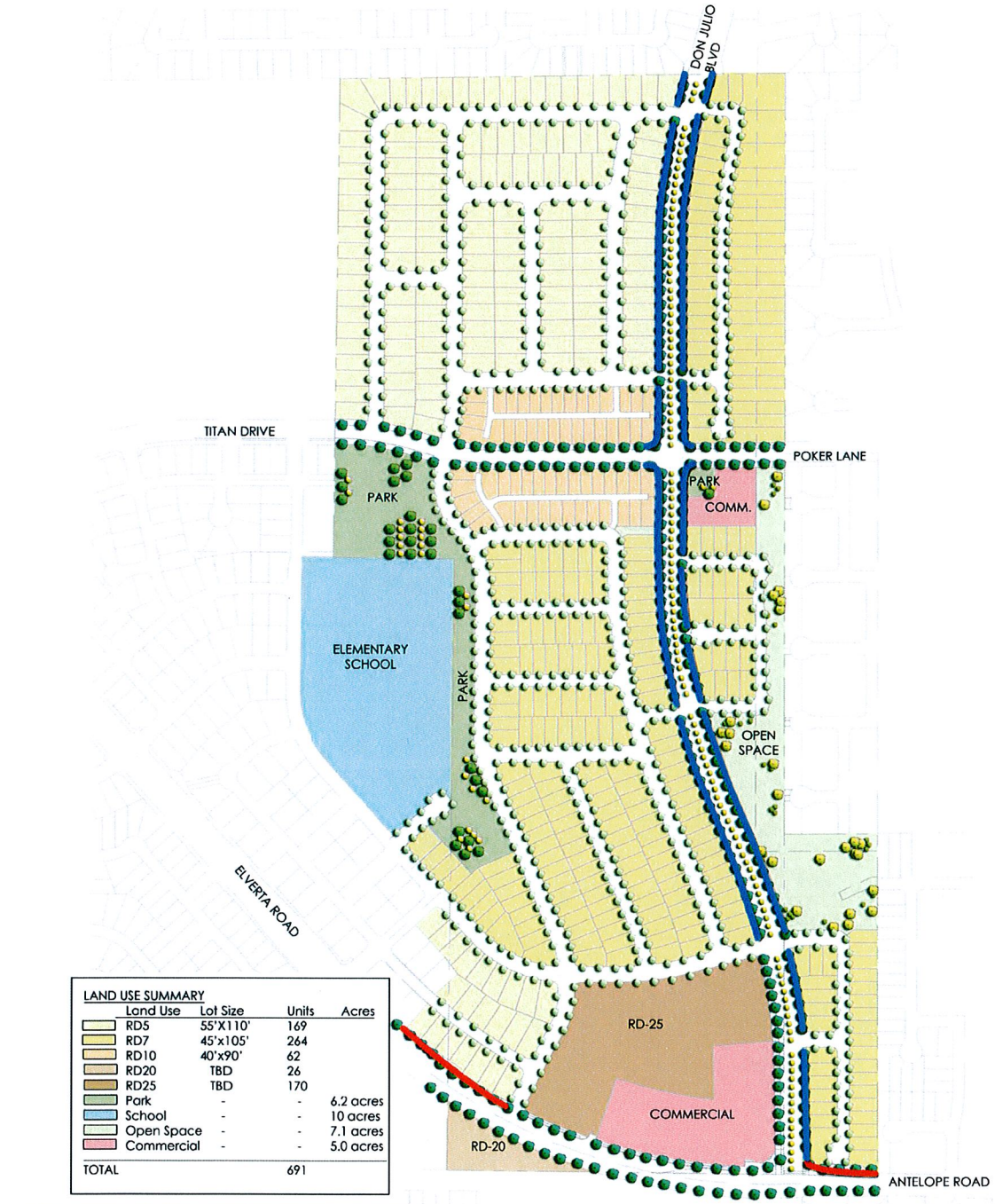
Impact 8: Impacts associated with Project-Generated Vibration

BAC field inspections of baseline vibration within the project area revealed no discernable sources of vibration which would adversely affect future sensitive land uses located within the project area. In addition, the project does not propose any appreciable sources of ongoing vibration. As a result, vibration impacts either due to the project, or upon the project, are not anticipated, and this **impact is considered less than significant.**

Figure 3

Barrett Ranch Development EIR - Sacramento County, California

Recommended Noise Barriers



LAND USE SUMMARY

Land Use	Lot Size	Units	Acres
RD5	55'X110'	169	
RD7	45'x105'	264	
RD10	40'x90'	62	
RD20	TBD	26	
RD25	TBD	170	
Park	-	-	6.2 acres
School	-	-	10 acres
Open Space	-	-	7.1 acres
Commercial	-	-	5.0 acres
TOTAL		691	

Legend

Recommended 8-foot Noise Barrier

Recommended 6-foot Noise Barrier

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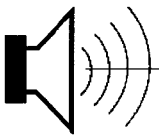
Appendix A

Acoustical Terminology

Acoustics	The science of sound.
Ambient Noise	The distinctive acoustical characteristics of a given space consisting of all noise sources audible at that location. In many cases, the term ambient is used to describe an existing or pre-project condition such as the setting in an environmental noise study.
Attenuation	The reduction of an acoustic signal.
A-Weighting	A frequency-response adjustment of a sound level meter that conditions the output signal to approximate human response.
Decibel or dB	Fundamental unit of sound, A Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell.
CNEL	Community Noise Equivalent Level. Defined as the 24-hour average noise level with noise occurring during evening hours (7 - 10 p.m.) weighted by a factor of three and nighttime hours weighted by a factor of 10 prior to averaging.
Frequency	The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz.
Ldn	Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.
Leq	Equivalent or energy-averaged sound level.
Lmax	The highest root-mean-square (RMS) sound level measured over a given period of time.
Loudness	A subjective term for the sensation of the magnitude of sound.
Masking	The amount (or the process) by which the threshold of audibility is for one sound is raised by the presence of another (masking) sound.
Noise	Unwanted sound.
Peak Noise	The level corresponding to the highest (not RMS) sound pressure measured over a given period of time. This term is often confused with the Maximum level, which is the highest RMS level.
RT_{60}	The time it takes reverberant sound to decay by 60 dB once the source has been removed.
Sabin	The unit of sound absorption. One square foot of material absorbing 100% of incident sound has an absorption of 1 sabin.
SEL	A rating, in decibels, of a discrete event, such as an aircraft flyover or train passby, that compresses the total sound energy of the event into a 1-s time period.
Threshold of Hearing	The lowest sound that can be perceived by the human auditory system, generally considered to be 0 dB for persons with perfect hearing.
Threshold of Pain	Approximately 120 dB above the threshold of hearing.



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Appendix B-1

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Data Input Sheet

Project #: 2014-336 Barret Ranch East Development EIR
Description: Existing (2014)
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	Titan Dr	Elverta Rd - Antelope HS Dwy	2,809	83		17	2	1	25	100	
2	Palmerson Dr	N Loop Blvd - Elverta Rd	4,789	83		17	2	1	25	100	
3	Elverta Rd	Walerga Rd - Palmerson Dr	10,397	83		17	2	1	45	100	
4		Palmerson Dr - Titan Dr	6,805	83		17	2	1	45	100	
5		Titan Dr - Pismo Beach Dr	4,698	83		17	2	1	45	100	
6		Pismo Beach Dr - Sand City Dr	4,463	83		17	2	1	45	100	
7	Antelope Rd	Watt Ave - Walerga Rd	19,135	83		17	2	1	45	100	
8		Walerga Rd - Esteem Dr	28,407	83		17	2	1	45	100	
9		Esteem Dr - Elverta Rd	4,033	83		17	2	1	45	100	
10		Don Julio Blvd - Roseville Rd	39,061	83		17	2	1	45	100	
11	Elkhorn Blvd	Walerga Rd - Don Julio Blvd	32,287	83		17	2	1	45	100	
12		Don Julio Blvd - Roseville Rd	51,136	83		17	2	1	45	100	
13		Roseville Rd - I80 WB Ramps	49,202	83		17	2	1	45	100	
14	Don Julio Blvd	N Loop Blvd - Poker Ln	14,470	83		17	2	1	45	100	
15		Poker Ln - Antelope Rd	19,219	83		17	2	1	45	100	
16		Antelope Rd - Elkhorn Blvd	20,981	83		17	2	1	45	100	
17	Watt Ave	Antelope Rd - Elkhorn Blvd	29,382	83		17	2	1	45	100	
18	Walerga Rd	Elverta Rd - Antelope Rd	35,537	83		17	2	1	45	100	
19		Antelope Rd - Elkhorn Blvd	29,702	83		17	2	1	45	100	

Appendix B-2

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Data Input Sheet

Project #: 2014-336 Barret Ranch East Development EIR
Description: Existing Plus Project (2014)
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	Titan Dr	Elverta Rd - Antelope HS Dwy	4,232	83		17	2	1	25	100	
2	Palmerson Dr	N Loop Blvd - Elverta Rd	4,789	83		17	2	1	25	100	
3	Elverta Rd	Walerga Rd - Palmerson Dr	15,314	83		17	2	1	45	100	
4		Palmerson Dr - Titan Dr	10,003	83		17	2	1	45	100	
5		Titan Dr - Pismo Beach Dr	7,094	83		17	2	1	45	100	
6		Pismo Beach Dr - Sand City Dr	6,739	83		17	2	1	45	100	
7	Antelope Rd	Watt Ave - Walerga Rd	19,446	83		17	2	1	45	100	
8		Walerga Rd - Esteem Dr	31,809	83		17	2	1	45	100	
9		Esteem Dr - Elverta Rd	20,021	83		17	2	1	45	100	
10		Don Julio Blvd - Roseville Rd	41,638	83		17	2	1	45	100	
11	Elkhorn Blvd	Walerga Rd - Don Julio Blvd	33,369	83		17	2	1	45	100	
12		Don Julio Blvd - Roseville Rd	52,682	83		17	2	1	45	100	
13		Roseville Rd - I80 WB Ramps	50,748	83		17	2	1	45	100	
14	Don Julio Blvd	N Loop Blvd - Poker Ln	15,707	83		17	2	1	45	100	
15		Poker Ln - Antelope Rd	20,662	83		17	2	1	45	100	
16		Antelope Rd - Elkhorn Blvd	21,909	83		17	2	1	45	100	
17	Watt Ave	Antelope Rd - Elkhorn Blvd	29,485	83		17	2	1	45	100	
18	Walerga Rd	Elverta Rd - Antelope Rd	35,949	83		17	2	1	45	100	
19		Antelope Rd - Elkhorn Blvd	31,970	83		17	2	1	45	100	

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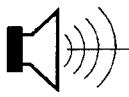
Appendix B-3

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Data Input Sheet

Project #: 2014-336 Barret Ranch East Development EIR
Description: Cumulative (2035)
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	Titan Dr	Elverta Rd - Antelope HS Dwy	3,923	83		17	2	1	25	100	
2	Palmerson Dr	N Loop Blvd - Elverta Rd	6,405	83		17	2	1	25	100	
3	Elverta Rd	Walerga Rd - Palmerson Dr	25,491	83		17	2	1	45	100	
4		Palmerson Dr - Titan Dr	15,816	83		17	2	1	45	100	
5		Titan Dr - Pismo Beach Dr	12,935	83		17	2	1	45	100	
6		Pismo Beach Dr - Sand City Dr	12,288	83		17	2	1	45	100	
7	Antelope Rd	Watt Ave - Walerga Rd	39,960	83		17	2	1	45	100	
8		Walerga Rd - Esteem Dr	53,334	83		17	2	1	45	100	
9		Esteem Dr - Elverta Rd	11,673	83		17	2	1	45	100	
10		Don Julio Blvd - Roseville Rd	68,580	83		17	2	1	45	100	
11	Elkhorn Blvd	Walerga Rd - Don Julio Blvd	53,688	83		17	2	1	45	100	
12		Don Julio Blvd - Roseville Rd	76,930	83		17	2	1	45	100	
13		Roseville Rd - I80 WB Ramps	79,900	83		17	2	1	45	100	
14	Don Julio Blvd	N Loop Blvd - Poker Ln	22,795	83		17	2	1	45	100	
15		Poker Ln - Antelope Rd	27,652	83		17	2	1	45	100	
16		Antelope Rd - Elkhorn Blvd	29,945	83		17	2	1	45	100	
17	Watt Ave	Antelope Rd - Elkhorn Blvd	59,621	83		17	2	1	45	100	
18	Walerga Rd	Elverta Rd - Antelope Rd	52,860	83		17	2	1	45	100	
19		Antelope Rd - Elkhorn Blvd	46,588	83		17	2	1	45	100	



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Appendix B-4

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Data Input Sheet

Project #: 2014-336 Barret Ranch East Development EIR
Description: Cumulative Plus Project (2035)
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	Titan Dr	Elverta Rd - Antelope HS Dwy	5,907	83		17	2	1	25	100	
2	Palmerson Dr	N Loop Blvd - Elverta Rd	6,662	83		17	2	1	25	100	
3	Elverta Rd	Walerga Rd - Palmerson Dr	39,316	83		17	2	1	45	100	
4		Palmerson Dr - Titan Dr	34,755	83		17	2	1	45	100	
5		Titan Dr - Pismo Beach Dr	31,898	83		17	2	1	45	100	
6		Pismo Beach Dr - Sand City Dr	30,303	83		17	2	1	45	100	
7	Antelope Rd	Watt Ave - Walerga Rd	36,705	83		17	2	1	45	100	
8		Walerga Rd - Esteem Dr	65,701	83		17	2	1	45	100	
9		Esteem Dr - Elverta Rd	28,255	83		17	2	1	45	100	
10		Don Julio Blvd - Roseville Rd	71,640	83		17	2	1	45	100	
11	Elkhorn Blvd	Walerga Rd - Don Julio Blvd	48,524	83		17	2	1	45	100	
12		Don Julio Blvd - Roseville Rd	80,559	83		17	2	1	45	100	
13		Roseville Rd - I80 WB Ramps	82,521	83		17	2	1	45	100	
14	Don Julio Blvd	N Loop Blvd - Poker Ln	20,371	83		17	2	1	45	100	
15		Poker Ln - Antelope Rd	27,528	83		17	2	1	45	100	
16		Antelope Rd - Elkhorn Blvd	36,700	83		17	2	1	45	100	
17	Watt Ave	Antelope Rd - Elkhorn Blvd	60,479	83		17	2	1	45	100	
18	Walerga Rd	Elverta Rd - Antelope Rd	49,276	83		17	2	1	45	100	
19		Antelope Rd - Elkhorn Blvd	44,631	83		17	2	1	45	100	
20	Elverta Rd	Sandy City Dr - Don Julio Blvd	56,914	83		17	2	1	45	100	

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Appendix C-1

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Predicted Levels

Project #: 2014-336 Barret Ranch East Development EIR
Description: Existing (2014)
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	Titan Dr	Elverta Rd - Antelope HS Dwy	49	44	48	52
2	Palmerson Dr	N Loop Blvd - Elverta Rd	51	46	51	55
3	Elverta Rd	Walerga Rd - Palmerson Dr	62	53	55	63
4		Palmerson Dr - Titan Dr	60	52	53	61
5		Titan Dr - Pismo Beach Dr	59	50	51	60
6		Pismo Beach Dr - Sand City Dr	58	50	51	60
7	Antelope Rd	Watt Ave - Walerga Rd	65	56	57	66
8		Walerga Rd - Esteem Dr	66	58	59	68
9		Esteem Dr - Elverta Rd	58	49	51	59
10		Don Julio Blvd - Roseville Rd	68	59	61	69
11	Elkhorn Blvd	Walerga Rd - Don Julio Blvd	67	58	60	68
12		Don Julio Blvd - Roseville Rd	69	60	62	70
13		Roseville Rd - I80 WB Ramps	69	60	62	70
14	Don Julio Blvd	N Loop Blvd - Poker Ln	63	55	56	65
15		Poker Ln - Antelope Rd	65	56	58	66
16		Antelope Rd - Elkhorn Blvd	65	56	58	66
17	Watt Ave	Antelope Rd - Elkhorn Blvd	66	58	59	68
18	Walerga Rd	Elverta Rd - Antelope Rd	67	59	60	69
19		Antelope Rd - Elkhorn Blvd	67	58	59	68

Appendix C-2

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Predicted Levels

Project #: 2014-336 Barret Ranch East Development EIR
Description: Existing Plus Project (2014)
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	Titan Dr	Elverta Rd - Antelope HS Dwy	51	45	50	54
2	Palmerson Dr	N Loop Blvd - Elverta Rd	51	46	51	55
3	Elverta Rd	Walerga Rd - Palmerson Dr	64	55	57	65
4		Palmerson Dr - Titan Dr	62	53	55	63
5		Titan Dr - Pismo Beach Dr	60	52	53	62
6		Pismo Beach Dr - Sand City Dr	60	51	53	61
7	Antelope Rd	Watt Ave - Walerga Rd	65	56	58	66
8		Walerga Rd - Esteem Dr	67	58	60	68
9		Esteem Dr - Elverta Rd	65	56	58	66
10		Don Julio Blvd - Roseville Rd	68	59	61	69
11	Elkhorn Blvd	Walerga Rd - Don Julio Blvd	67	58	60	68
12		Don Julio Blvd - Roseville Rd	69	60	62	70
13		Roseville Rd - I80 WB Ramps	69	60	62	70
14	Don Julio Blvd	N Loop Blvd - Poker Ln	64	55	57	65
15		Poker Ln - Antelope Rd	65	56	58	66
16		Antelope Rd - Elkhorn Blvd	65	57	58	66
17	Watt Ave	Antelope Rd - Elkhorn Blvd	66	58	59	68
18	Walerga Rd	Elverta Rd - Antelope Rd	67	59	60	69
19		Antelope Rd - Elkhorn Blvd	67	58	60	68

Appendix C-3

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Predicted Levels

Project #: 2014-336 Barret Ranch East Development EIR
Description: Cumulative (2035)
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	Titan Dr	Elverta Rd - Antelope HS Dwy	50	45	50	54
2	Palmerson Dr	N Loop Blvd - Elverta Rd	53	47	52	56
3	Elverta Rd	Walerga Rd - Palmerson Dr	66	57	59	67
4		Palmerson Dr - Titan Dr	64	55	57	65
5		Titan Dr - Pismo Beach Dr	63	54	56	64
6		Pismo Beach Dr - Sand City Dr	63	54	56	64
7	Antelope Rd	Watt Ave - Walerga Rd	68	59	61	69
8		Walerga Rd - Esteem Dr	69	60	62	70
9		Esteem Dr - Elverta Rd	62	54	55	64
10		Don Julio Blvd - Roseville Rd	70	62	63	71
11	Elkhorn Blvd	Walerga Rd - Don Julio Blvd	69	60	62	70
12		Don Julio Blvd - Roseville Rd	71	62	64	72
13		Roseville Rd - I80 WB Ramps	71	62	64	72
14	Don Julio Blvd	N Loop Blvd - Poker Ln	65	57	58	67
15		Poker Ln - Antelope Rd	66	58	59	67
16		Antelope Rd - Elkhorn Blvd	67	58	59	68
17	Watt Ave	Antelope Rd - Elkhorn Blvd	70	61	62	71
18	Walerga Rd	Elverta Rd - Antelope Rd	69	60	62	70
19		Antelope Rd - Elkhorn Blvd	68	60	61	70

Appendix C-4

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Predicted Levels

Project #: 2014-336 Barret Ranch East Development EIR
Description: Cumulative Plus Project (2035)
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	Titan Dr	Elverta Rd - Antelope HS Dwy	52	47	52	56
2	Palmerson Dr	N Loop Blvd - Elverta Rd	53	47	52	56
3	Elverta Rd	Walerga Rd - Palmerson Dr	68	59	61	69
4		Palmerson Dr - Titan Dr	67	59	60	68
5		Titan Dr - Pismo Beach Dr	67	58	60	68
6		Pismo Beach Dr - Sand City Dr	67	58	59	68
7	Antelope Rd	Watt Ave - Walerga Rd	67	59	60	69
8		Walerga Rd - Esteem Dr	70	61	63	71
9		Esteem Dr - Elverta Rd	66	58	59	68
10		Don Julio Blvd - Roseville Rd	70	62	63	72
11	Elkhorn Blvd	Walerga Rd - Don Julio Blvd	69	60	62	70
12		Don Julio Blvd - Roseville Rd	71	62	64	72
13		Roseville Rd - I80 WB Ramps	71	62	64	72
14	Don Julio Blvd	N Loop Blvd - Poker Ln	65	56	58	66
15		Poker Ln - Antelope Rd	66	58	59	67
16		Antelope Rd - Elkhorn Blvd	67	59	60	69
17	Watt Ave	Antelope Rd - Elkhorn Blvd	70	61	62	71
18	Walerga Rd	Elverta Rd - Antelope Rd	69	60	62	70
19		Antelope Rd - Elkhorn Blvd	68	60	61	70
20	Elverta Rd	Sandy City Dr - Don Julio Blvd	69	61	62	71

Appendix D-1

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Noise Contour Output

Project #: 2014-336 Barret Ranch East Development EIR
Description: Existing (2014)
Ldn/CNEL: Ldn
Hard/Soft: Soft

			------- Distances to Traffic Noise Contours ------				
Segment	Roadway Name	Segment Description	75	70	65	60	55
1	Titan Dr	Elverta Rd - Antelope HS Dwy	3	7	14	31	66
2	Palmerson Dr	N Loop Blvd - Elverta Rd	4	9	20	44	94
3	Elverta Rd	Walerga Rd - Palmerson Dr	16	35	76	164	353
4		Palmerson Dr - Titan Dr	12	27	57	123	266
5		Titan Dr - Pismo Beach Dr	10	21	45	96	208
6		Pismo Beach Dr - Sand City Dr	9	20	43	93	201
7	Antelope Rd	Watt Ave - Walerga Rd	25	53	114	246	530
8		Walerga Rd - Esteem Dr	32	69	149	320	690
9		Esteem Dr - Elverta Rd	9	19	40	87	188
10		Don Julio Blvd - Roseville Rd	40	85	184	396	853
11	Elkhorn Blvd	Walerga Rd - Don Julio Blvd	35	75	162	349	751
12		Don Julio Blvd - Roseville Rd	47	102	220	474	1021
13		Roseville Rd - I80 WB Ramps	46	99	214	462	995
14	Don Julio Blvd	N Loop Blvd - Poker Ln	20	44	95	204	440
15		Poker Ln - Antelope Rd	25	53	115	247	531
16		Antelope Rd - Elkhorn Blvd	26	56	121	262	564
17	Watt Ave	Antelope Rd - Elkhorn Blvd	33	71	152	327	705
18	Walerga Rd	Elverta Rd - Antelope Rd	37	80	173	372	801
19		Antelope Rd - Elkhorn Blvd	33	71	153	330	710

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Appendix D-2

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Noise Contour Output

Project #: 2014-336 Barret Ranch East Development EIR
Description: Existing Plus Project (2014)
Ldn/CNEL: Ldn
Hard/Soft: Soft

			------- Distances to Traffic Noise Contours ------				
Segment	Roadway Name	Segment Description	75	70	65	60	55
1	Titan Dr	Elverta Rd - Antelope HS Dwy	4	9	19	40	87
2	Palmerson Dr	N Loop Blvd - Elverta Rd	4	9	20	44	94
3	Elverta Rd	Walerga Rd - Palmerson Dr	21	46	98	212	457
4		Palmerson Dr - Titan Dr	16	34	74	160	344
5		Titan Dr - Pismo Beach Dr	13	27	59	127	273
6		Pismo Beach Dr - Sand City Dr	12	26	57	123	264
7	Antelope Rd	Watt Ave - Walerga Rd	25	54	115	249	536
8		Walerga Rd - Esteem Dr	35	74	160	345	744
9		Esteem Dr - Elverta Rd	25	55	118	254	546
10		Don Julio Blvd - Roseville Rd	41	89	192	413	890
11	Elkhorn Blvd	Walerga Rd - Don Julio Blvd	36	77	165	356	768
12		Don Julio Blvd - Roseville Rd	48	104	224	483	1041
13		Roseville Rd - I80 WB Ramps	47	102	219	471	1015
14	Don Julio Blvd	N Loop Blvd - Poker Ln	22	46	100	216	465
15		Poker Ln - Antelope Rd	26	56	120	259	558
16		Antelope Rd - Elkhorn Blvd	27	58	125	269	580
17	Watt Ave	Antelope Rd - Elkhorn Blvd	33	71	152	328	707
18	Walerga Rd	Elverta Rd - Antelope Rd	37	81	174	375	807
19		Antelope Rd - Elkhorn Blvd	35	75	161	346	746

Appendix D-3

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Noise Contour Output

Project #: 2014-336 Barret Ranch East Development EIR
Description: Cumulative (2035)
Ldn/CNEL: Ldn
Hard/Soft: Soft

			------- Distances to Traffic Noise Contours ------				
Segment	Roadway Name	Segment Description	75	70	65	60	55
1	Titan Dr	Elverta Rd - Antelope HS Dwy	4	8	18	38	82
2	Palmerson Dr	N Loop Blvd - Elverta Rd	5	11	25	53	114
3	Elverta Rd	Walerga Rd - Palmerson Dr	30	64	138	298	642
4		Palmerson Dr - Titan Dr	22	47	101	217	467
5		Titan Dr - Pismo Beach Dr	19	41	88	189	408
6		Pismo Beach Dr - Sand City Dr	18	39	85	183	394
7	Antelope Rd	Watt Ave - Walerga Rd	40	87	187	402	866
8		Walerga Rd - Esteem Dr	49	105	226	487	1050
9		Esteem Dr - Elverta Rd	18	38	82	177	381
10		Don Julio Blvd - Roseville Rd	58	124	267	576	1241
11	Elkhorn Blvd	Walerga Rd - Don Julio Blvd	49	105	227	489	1054
12		Don Julio Blvd - Roseville Rd	62	134	289	622	1340
13		Roseville Rd - I80 WB Ramps	64	137	296	638	1374
14	Don Julio Blvd	N Loop Blvd - Poker Ln	28	60	128	276	596
15		Poker Ln - Antelope Rd	31	68	146	314	677
16		Antelope Rd - Elkhorn Blvd	33	71	154	332	714
17	Watt Ave	Antelope Rd - Elkhorn Blvd	52	113	244	525	1131
18	Walerga Rd	Elverta Rd - Antelope Rd	48	104	225	484	1043
19		Antelope Rd - Elkhorn Blvd	45	96	207	445	959

BOLLARD
Acoustical Consultants

Appendix D-4

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Noise Contour Output

Project #: 2014-336 Barret Ranch East Development EIR
Description: Cumulative Plus Project (2035)
Ldn/CNEL: Ldn
Hard/Soft: Soft

			------- Distances to Traffic Noise Contours ------				
Segment	Roadway Name	Segment Description	75	70	65	60	55
1	Titan Dr	Elverta Rd - Antelope HS Dwy	5	11	23	50	108
2	Palmerson Dr	N Loop Blvd - Elverta Rd	5	12	25	54	117
3	Elverta Rd	Walerga Rd - Palmerson Dr	40	86	185	398	856
4		Palmerson Dr - Titan Dr	37	79	170	366	789
5		Titan Dr - Pismo Beach Dr	35	75	161	346	745
6		Pismo Beach Dr - Sand City Dr	33	72	155	334	720
7	Antelope Rd	Watt Ave - Walerga Rd	38	82	176	380	818
8		Walerga Rd - Esteem Dr	56	121	260	560	1206
9		Esteem Dr - Elverta Rd	32	69	148	319	687
10		Don Julio Blvd - Roseville Rd	59	128	275	593	1278
11	Elkhorn Blvd	Walerga Rd - Don Julio Blvd	46	99	212	457	985
12		Don Julio Blvd - Roseville Rd	64	138	298	641	1382
13		Roseville Rd - I80 WB Ramps	65	140	302	652	1404
14	Don Julio Blvd	N Loop Blvd - Poker Ln	26	55	119	256	553
15		Poker Ln - Antelope Rd	31	68	145	313	675
16		Antelope Rd - Elkhorn Blvd	38	82	176	380	818
17	Watt Ave	Antelope Rd - Elkhorn Blvd	53	114	246	530	1141
18	Walerga Rd	Elverta Rd - Antelope Rd	46	100	215	462	996
19		Antelope Rd - Elkhorn Blvd	43	93	201	433	932
20	Elverta Rd	Sandy City Dr - Don Julio Blvd	51	110	236	509	1096