APPENDIX O

ENVIRONMENTAL NOISE ANALYSIS

Environmental Noise Assessment

Amoruso Ranch Specific Plan EIR

City of Roseville, California

Job # 2011-143

Prepared For:

City of Roseville

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December 4, 2015

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INTRODUCTION

This report has been prepared to address the noise impacts due to and upon the proposed Amoruso Ranch Specific Plan (ARSP) development located in the western region of the City of Roseville, California. The 694-acre Amoruso Ranch Project Area is located immediately north of the City's existing boundary, north of the proposed Creekview Specific Plan, south of Sunset Boulevard, in unincorporated Placer County. The Plan Area is bisected by the future planned alignment of Placer Parkway, a separately funded regional road improvement that is not part of the ARSP Project.

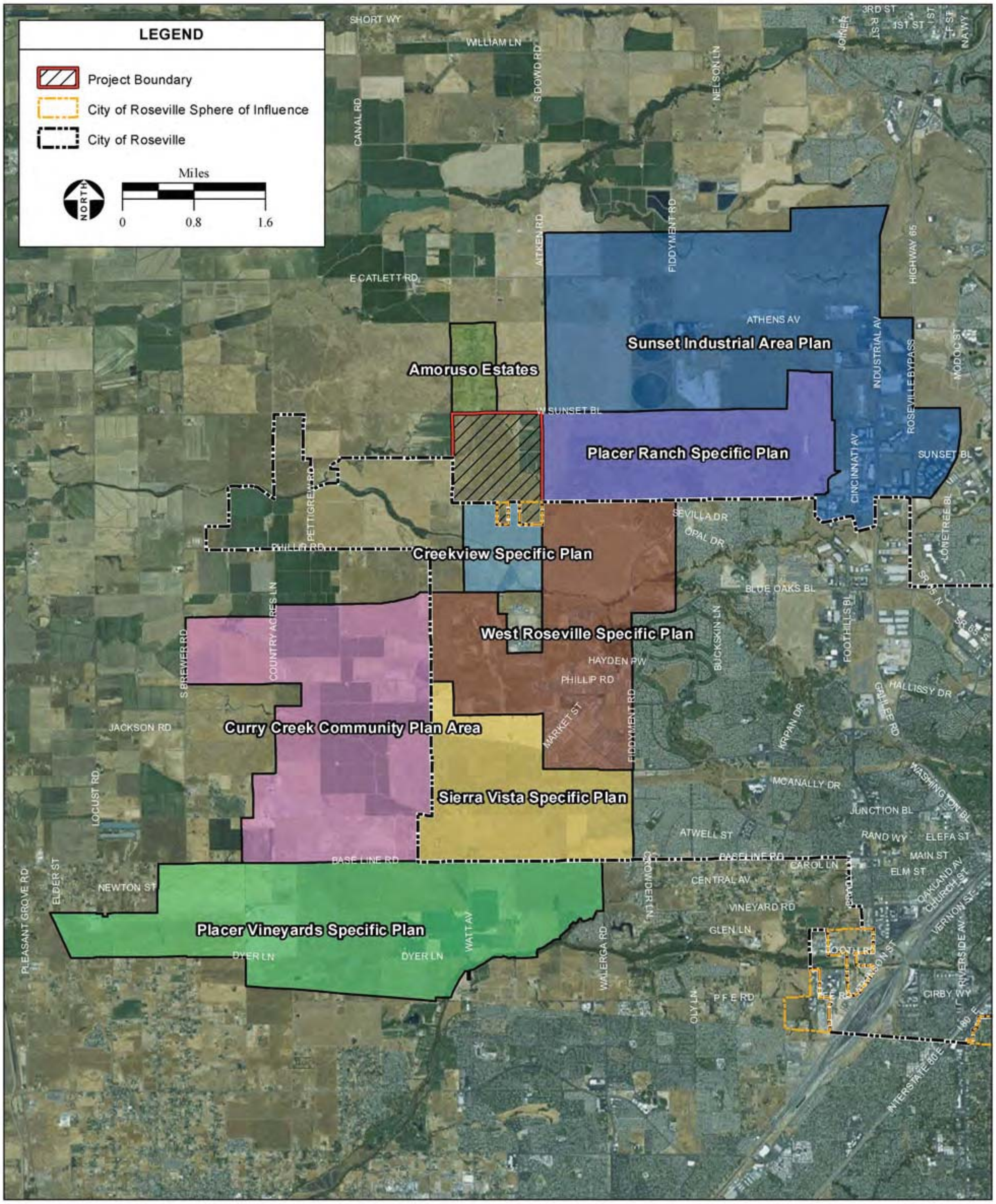
See Figure 1 for a vicinity map of the project area.

The project would include the following land use designations:

- Approximately 2,797 residential units ranging from low to high density residential (LDR, MDR, and HDR) on approximately 338.85 acres;
- Approximately 109 residential units on approximately 27.1 acres of commercial mixed-use – special area (CMU-SA);
- Approximately 23.85 acres of community commercial (CC);
- 143.86 acres of open space;
- 25.83 acres of parks;
- Approximately 13.94 acres of public/quasi-public;
- 20 acres of urban reserve; and
- 51.44 acres of miscellaneous roads and right-of-way space.

Figure 2 shows the project site plan.

This section discusses the existing noise environment in the immediate project vicinity, and identifies potential impacts and mitigation measures related to the project.



Amoruso Ranch Specific Plan

Figure 1: Vicinity Map

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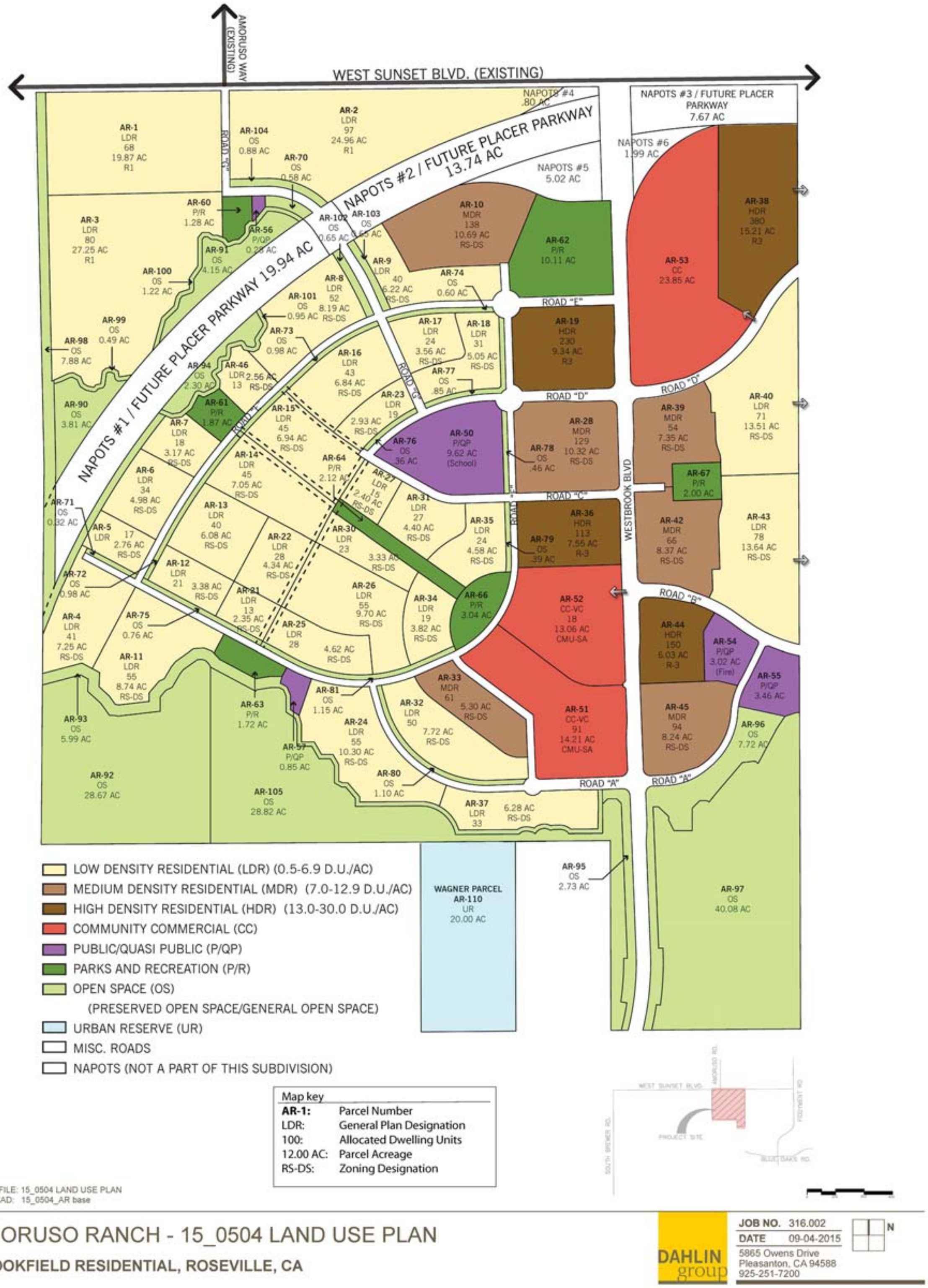

Amoruso Ranch Specific Plan

Figure 2: Project Site Plan

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ACOUSTIC TERMINOLOGY[1]

Fundamentals of Acoustics

Acoustics is the science of sound. Sound may be thought of as mechanical energy of a vibrating object transmitted by pressure waves through a medium to human (or animal) ears. If the pressure variations occur frequently enough (at least 20 times per second), then 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 or Hertz (Hz).

Noise is a subjective reaction to different types of sounds. Noise is typically defined as (airborne) sound that is loud, unpleasant, unexpected or undesired, and may therefore be classified as a more specific group of sounds. Perceptions of sound and noise are highly subjective from person to person.

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

The perceived loudness of sounds is dependent upon many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable, and can be approximated by A-weighted sound levels. There is a strong correlation between A-weighted sound levels (expressed as dBA) and the way the human ear perceives sound. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment. All noise levels reported in this section are in terms of A-weighted levels, but are expressed as dB, unless otherwise noted.

The decibel scale is logarithmic, not linear. In other words, two sound levels 10 dB apart differ in acoustic energy by a factor of 10. When the standard logarithmic decibel is A-weighted, an increase of 10 dBA is generally perceived as a doubling in loudness. For example, a 70 dBA sound is half as loud as an 80 dBA sound, and twice as loud as a 60 dBA sound.

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 environment. A common statistical tool to measure the ambient noise level is the average, or equivalent, sound level (L_{eq}), which corresponds to a steady-state A weighted sound level containing the same total energy as a time varying signal over a given time period (usually one hour). The L_{eq} is the foundation of the composite noise descriptor, L_{dn}, and shows very good correlation with community response to noise.

The day/night average level (L_{dn}) is based upon the average noise level over a 24-hour day, with a +10 decibel weighing 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

[1] For an explanation of these terms, see Appendix A: "Acoustical Terminology"

average, it tends to disguise short-term variations in the noise environment. CNEL is similar to L_{dn}, but includes a +3 dB penalty for evening noise.

Table 1 lists several examples of the noise levels associated with common situations.

TABLE 1: TYPICAL NOISE LEVELS

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	--110--	Rock Band
Jet Fly-over at 300 m (1,000 ft)	--100--	
Gas Lawn Mower at 1 m (3 ft)	--90--	
Diesel Truck at 15 m (50 ft), at 80 km/hr (50 mph)	--80--	Food Blender at 1 m (3 ft) Garbage Disposal at 1 m (3 ft)
Noisy Urban Area, Daytime Gas Lawn Mower, 30 m (100 ft)	--70--	Vacuum Cleaner at 3 m (10 ft)
Commercial Area Heavy Traffic at 90 m (300 ft)	--60--	Normal Speech at 1 m (3 ft)
Quiet Urban Daytime	--50--	Large Business Office Dishwasher in Next Room
Quiet Urban Nighttime	--40--	Theater, Large Conference Room (Background)
Quiet Suburban Nighttime	--30--	Library
Quiet Rural Nighttime	--20--	Bedroom at Night, Concert Hall (Background)
	--10--	Broadcast/Recording Studio
Lowest Threshold of Human Hearing	--0--	Lowest Threshold of Human Hearing
Source: Caltrans, Technical Noise Supplement, Traffic Noise Analysis Protocol. October 1998.		

Effects of Noise on People

The effects of noise on people can be placed in three categories:

- Subjective effects of annoyance, nuisance, and dissatisfaction
- Interference with activities such as speech, sleep, and learning
- Physiological effects such as hearing loss or sudden startling

Environmental noise typically produces effects in the first two categories. Workers in industrial plants can experience noise in the last category. There is no completely satisfactory way to measure the subjective effects of noise or the corresponding reactions of annoyance and dissatisfaction. A wide variation in individual thresholds of annoyance exists and different tolerances to noise tend to develop based on an individual's past experiences with noise.

Thus, an important way of predicting a human reaction to a new noise environment is the way it compares to the existing environment to which one has adapted: the so-called ambient noise level. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged by those hearing it.

With regard to increases in A-weighted noise level, the following relationships occur:

- Except in carefully controlled laboratory experiments, a change of 1 dBA cannot be perceived;
- Outside of the laboratory, a 3 dBA change is considered a just-perceivable difference;
- A change in level of at least 5 dBA is required before any noticeable change in human response would be expected; and
- A 10 dBA change is subjectively heard as approximately a doubling in loudness, and can cause an adverse response.

Stationary point sources of noise – including stationary mobile sources such as idling vehicles – attenuate (lessen) at a rate of approximately 6 dB per doubling of distance from the source, depending on environmental conditions (i.e. atmospheric conditions and either vegetative or manufactured noise barriers, etc.). Widely distributed noises, such as a large industrial facility spread over many acres, or a street with moving vehicles, would typically attenuate at a lower rate.

ENVIRONMENTAL SETTING

Transportation Noise

Motor vehicle traffic is a major contributor to the existing transportation noise along the northern boundary of the project site. Vehicular noise within the immediate project vicinity occurs primarily along West Sunset Boulevard.

McClellan Airfield is located approximately 8.25 miles south of the project site. The project site is also under the flight track for aircraft flying to the Sacramento International Airport (SMF) and trainer jets flying between Beale Air Force Base and Mather Airport. Occasional aircraft overflights were observed during visits to the project site. Figures 3-5 show the typical aircraft overflights for a one month period over the Amoruso Ranch project area.

Non-Transportation Noise

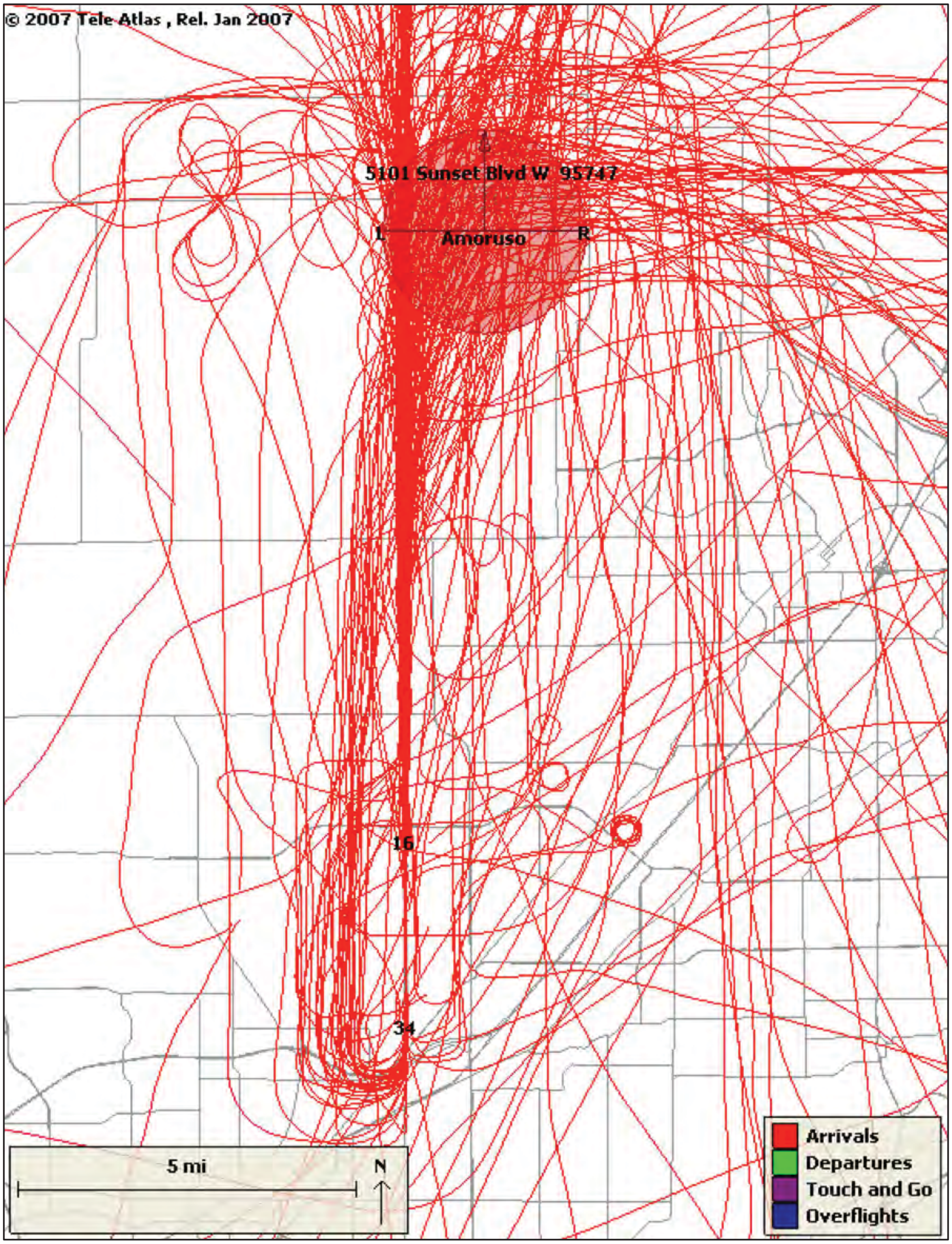
In the immediate project vicinity, there are no substantial sources of non-transportation noise. The City of Roseville Energy Park (REP) located approximately 1.1 miles south of the project site is audible at times, but is not a primary noise generator at the project site. Some agricultural noise occurs periodically in the project vicinity. However, lands adjacent to the project site are used primarily for cattle grazing and do not include intensive use of agricultural equipment.

Major Vibration Sources in the Project Vicinity

No major sources of groundborne vibration were observed at the project site.

Noise-Sensitive Land Uses in the Project Vicinity

Existing noise sensitive land uses in the immediate project vicinity consist of single-family residential uses located north of West Sunset Boulevard.



Amoruso Ranch Specific Plan

Figure : Mc lellan Airfiel Arri al rac s April 1

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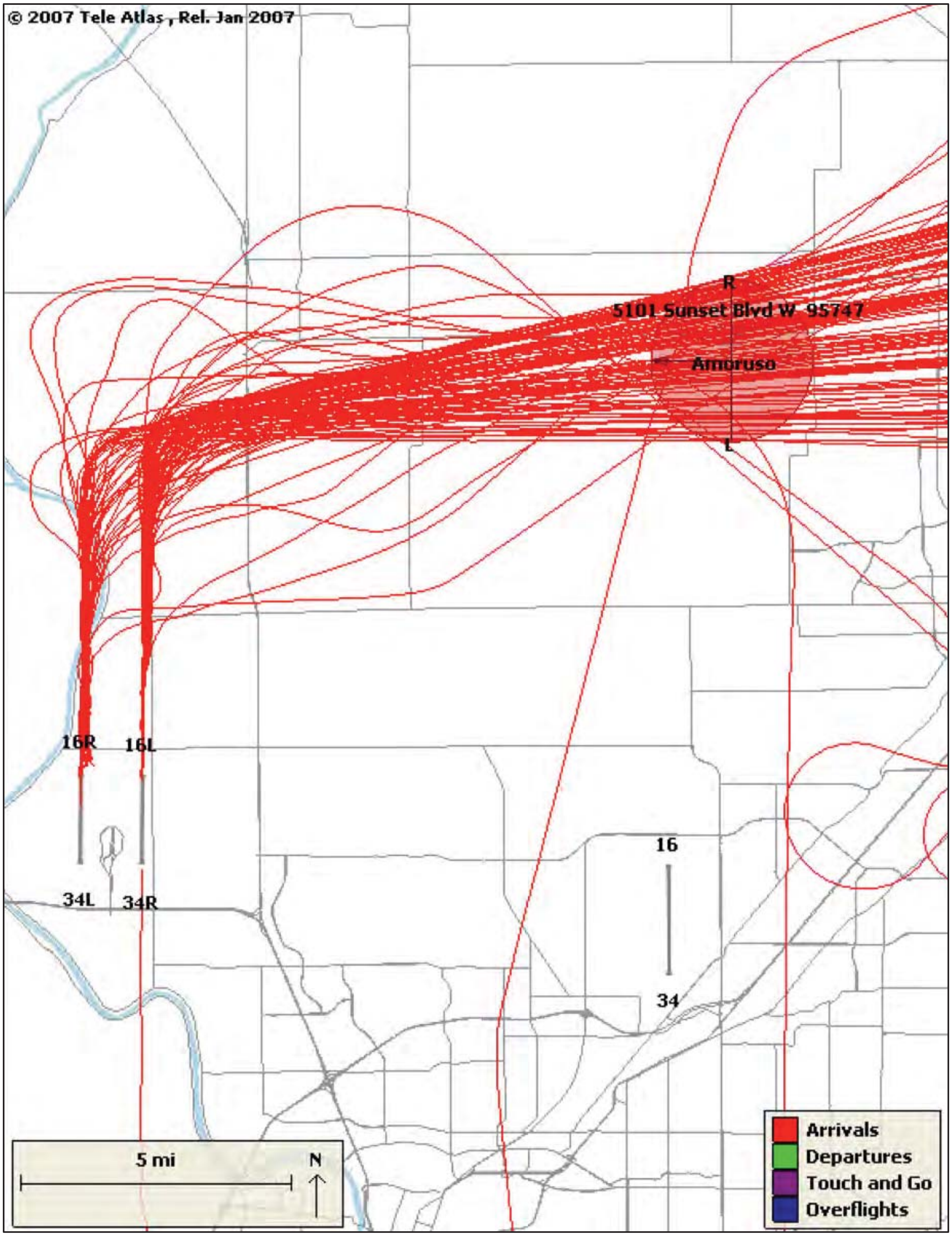

Amoruso Ranch Specific Plan

Figure : Sacramento nternational Airport Arri al rac s uly 1

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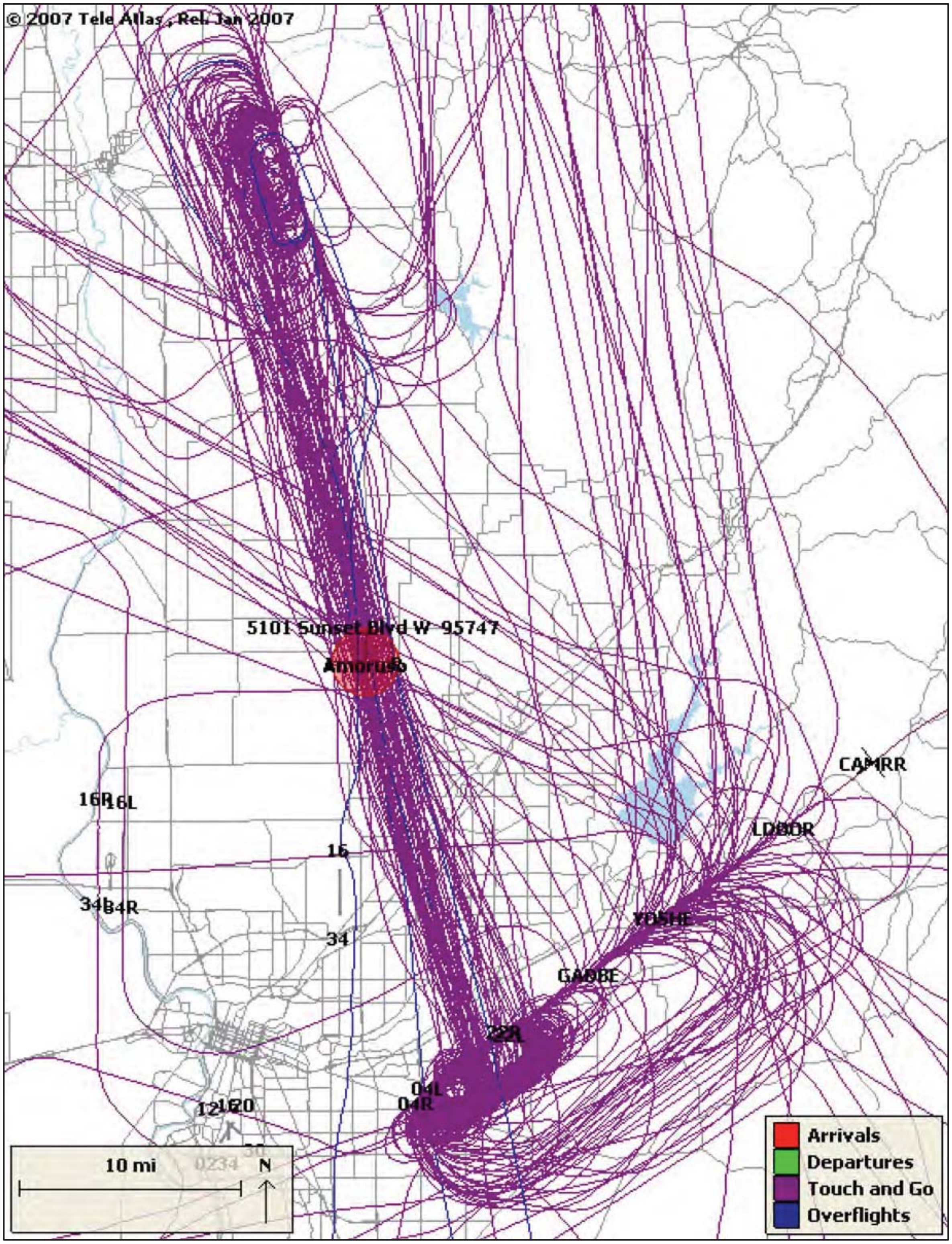

Amoruso Ranch Specific Plan

Figure : eale Air Force ase to Mather Airport
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Existing Traffic Noise Levels

To describe existing noise levels due to traffic, the Federal Highway Administration highway Traffic Noise Prediction Model (FHWA RD-77-108) was used. Direct inputs to the model included traffic volumes provided by Fehr and Peers Transportation Consultants. 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. The FHWA model was developed to predict hourly L_{eq} values for free-flowing traffic conditions. To predict L_{dn}/CNEL values, it is necessary to determine the day/night distribution of traffic and adjust the traffic volume input data to yield an equivalent hourly traffic volume. Table 2 shows the results of this analysis. Appendix B provides the complete inputs and results for the FHWA traffic noise prediction modeling.

Traffic noise levels are predicted at the sensitive receptors located at the closest typical setback distance along each project-area roadway segment. . A conservative adjustment of -5 dB is assumed where noise barriers are located adjacent to the majority of sensitive receptors, or where outdoor activity areas are located behind residences. In some locations sensitive receptors may not receive full shielding from noise barriers, or may be located at distances which vary from the assumed calculation distance. However, the traffic noise analysis is believed to be representative of the majority of sensitive receptors located closest to the Project area roadway segments analyzed in this report.

TABLE 2: EXISTING (2014) NO PROJECT TRAFFIC NOISE LEVELS

Roadway	Segment	Traffic Noise Level, L_{dn} (dBA)	Distance to Contours (feet) [1]		
			70 dB L_{dn}	65 dB L_{dn}	60 dB L_{dn}
Blue Oaks	W. of Fiddyment	52.7	6	14	29
Blue Oaks	Fiddyment to Woodcreek	61.9	27	59	127
Blue Oaks	Woodcreek to Foothills	63.0	38	81	174
Blue Oaks	Foothills to Washington	69.4	91	196	423
Pleasant Grove Bl.	W. of Fiddyment	60.0	16	35	76
Pleasant Grove Bl.	Fiddyment to Woodcreek	63.7	29	62	133
Pleasant Grove Bl.	Woodcreek to Foothills	63.3	36	77	167
Pleasant Grove Bl.	Foothills to Washington	66.2	42	90	195
Pleasant Grove Bl.	Washington to Roseville Pkwy	64.7	45	96	207
Pleasant Grove Bl.	Roseville Pkwy to SR 65	63.6	47	101	217
Pleasant Grove Rd.	North of Baseline	55.4	12	25	54
Baseline	W. of Fiddyment	60.3	25	54	116
Baseline	Fiddyment to Junction	58.4	19	40	86
Baseline	Junction to Woodcreek	60.9	19	40	86
Baseline	Woodcreek to Foothills	62.2	23	49	105
Baseline	Foothills to Washington	66.9	31	67	144
Junction	Baseline to Woodcreek	59.1	14	30	65
Junction	Woodcreek to Foothills	60.5	15	32	70
Junction	Foothills to Washington	61.1	17	36	77
Roseville Pkwy	Washington to Pleasant Grove	59.4	20	42	91
Roseville Pkwy	E. of Pleasant Grove	63.8	43	92	197
Sunset Bl. West	Pleasant Grove to Amoruso	50.6	8	16	35
Sunset Bl. West	Amoruso to Westbrook	51.0	8	18	38
Fiddyment	N. of Blue Oaks	57.0	14	31	66
Fiddyment	Blue Oaks to Pleasant Grove	60.8	22	47	102
Fiddyment	Pleasant Grove to Baseline	62.9	30	65	140
Woodcreek Oaks	N. of Blue Oaks	57.9	13	29	62
Woodcreek Oaks	Blue Oaks to Pleasant Grove	59.2	17	37	79
Woodcreek Oaks	Pleasant Grove to Junction	58.4	17	37	79
Woodcreek Oaks	Junction to Baseline	57.8	11	23	50
Foothills	N. of Blue Oaks	61.8	28	61	132
Foothills	Blue Oaks to Pleasant Grove	61.8	21	46	98
Foothills	Pleasant Grove to Junction	62.8	33	72	154
Foothills	Junction to Baseline	64.5	32	69	150
Foothills	S. of Baseline	66.3	37	79	170
Washington	Blue Oaks to Roseville Pkwy	60.6	24	51	110
Washington	Roseville Pkwy to Pleasant Grove	58.9	20	43	94
Washington	Pleasant Grove to Junction	61.9	25	53	114
Washington	Junction Baseline	70.0	55	119	257

[1] Distances are measured from the centerline of the roadway.
-- Roadway does not exist under this scenario.

Existing Aviation Noise Levels

Based upon comments received during the project NOP from the Sacramento County Department of Airports (SCDOA), the Amoruso Ranch project is located under the flight path of current and planned future operations at McClellan Airfield (MCC) and Sacramento International Airport (SMF) as well as military training jets transitioning between Beale Air Force Base (Beale) and Mather Airport (MHR). Based on their comments, the area is subject to aircraft overflights by large aircraft at altitudes less than 3,000 feet (ft) above Mean Sea Level (MSL) which may cause annoyance to residential or other sensitive uses. Based upon analysis conducted by SCDOA, the proposed project site is likely to experience overflights by propeller and turbo-prop aircraft arriving to MCC approximately six times per day, commercial jet aircraft arriving to SMF approximately three times per day and military supersonic jet training aircraft transitioning between Beale and MHR approximately two times per day for a total of 11 overflights per day.

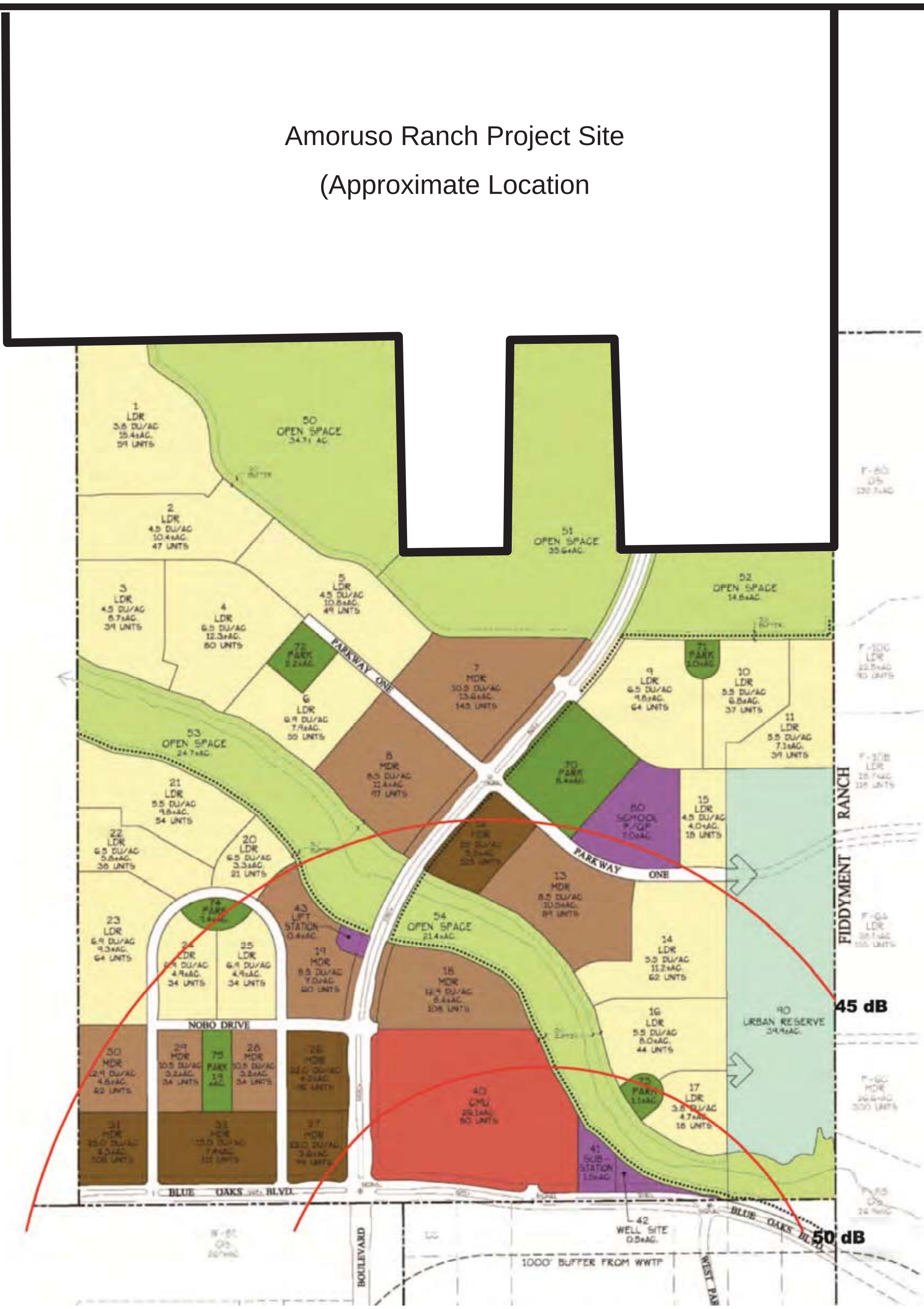
The Sacramento County Airport System previously conducted aircraft noise monitoring on the Creekview SP project site during the week of December 14-20, 2006 using their portable noise monitoring and flight tracking system. The Airport Noise and Operations Monitoring System (ANMS) is a state-of-the-art noise monitoring and flight tracking system. The system enables the Sacramento County Airport System (SCAS) to monitor the amount of noise being generated over the communities surrounding the Sacramento County airports by the aircraft operating at each airport. The ANMS collects, analyzes and processes data from a number of sources of information including four portable noise monitors, FAA radar data, and noise complaints. The noise monitoring report developed by the County Airport System indicates that daily CNEL noise levels due to aircraft operations ranged between 38-50 dB CNEL with an average of 42 daily overflights. Sound Exposure Levels (SEL) for individual aircraft were also collected and reported. These values were used by j.c. brennan & associates, Inc. to conservatively estimate the potential for sleep disturbance due to individual aircraft overflights at the Amoruso Ranch SP project site. Based upon the SCDOA NOP comment letter, the daily overflights for Amoruso Ranch is approximately 11.

Existing Roseville Energy Park Noise Levels

The Roseville Energy Park (REP) is located approximately 1.1 miles south of the Amoruso Ranch SP project site, adjacent to the Pleasant Grove Wastewater Treatment Plant. The REP is a 160-megawatt power generation facility which includes two gas-fired turbine generators and one steam turbine generator.

Based upon observations and noise measurements conducted at the project site, the REP currently generates noise levels that are audible at the project site. The degree of audibility varies significantly depending on atmospheric conditions, including wind, humidity, and temperature. Additionally, the REP operates as-needed based upon demand and electrical rates. Depending on conditions the REP could operate nearly year-round or as little as 6 months out of the year.

Measured noise levels during REP operation were less than 41 dB L_{eq} at the Amoruso Ranch SP project site. Figure 6 shows the most recently developed average REP noise contours.



Amoruso Ranch Specific Plan

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Figure Prepared October 2014

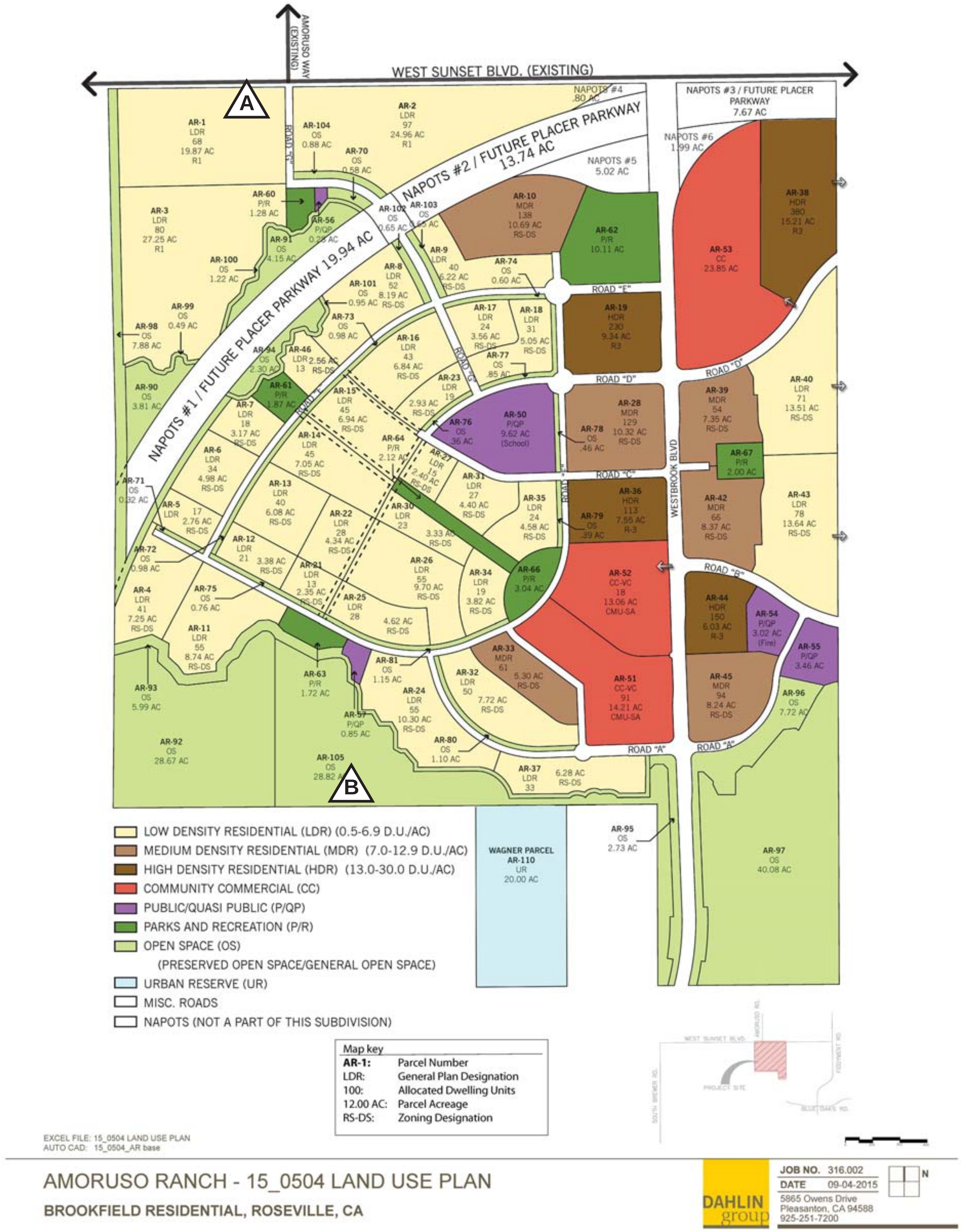
Existing Ambient Noise Levels

To quantify existing ambient noise levels in the vicinity of the project site, j.c. brennan & associates, Inc. staff conducted continuous (24-hour) noise level measurements at two locations on the project site. See Figure 7 for noise measurement locations. The noise level measurements were conducted between January 4th and 6th, 2014. The noise level measurements were conducted to determine typical background noise levels and for comparison to the project related noise levels. Table 3 shows a summary of the noise measurement results. Appendix C provides the complete results of the continuous ambient noise measurements. It should be noted that the Roseville Energy Park (REP) was in operation during the noise monitoring period.

Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meters were used for the continuous noise level measurement surveys. The meters were calibrated before and after use with an LDL Model CAL200 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all pertinent specifications of the American National Standards Institute for Type 1 sound level meters (ANSI S1.4).

TABLE 3: NOISE MONITORING RESULTS

Site	Location	Date	Duration	Average Measured Hourly Noise Levels, (dBA)						
				24-hr	Daytime (7:00 am - 10:00 pm)			Nighttime (10:00 pm - 7 am)		
				L_{dn}	L_{eq}	L_{50}	L_{max}	L_{eq}	L_{50}	L_{max}
Continuous (24-hour) Noise Measurements										
A	Amoruso Ranch Site (North)	Saturday 1/4/14	24-hr	60	56	46	76	53	32	72
		Sunday 1/5/14		58	54	42	75	51	31	71
		Monday 1/6/14		60	56	47	74	53	34	70
B	Amoruso Ranch Site (South)	Saturday 1/4/14	24-hr	43	43	38	54	33	30	50
		Sunday 1/5/14		44	39	32	55	37	31	50
		Monday 1/6/14		43	42	35	58	35	31	46
Source - j.c. brennan & associates, Inc. 2014.										



△ : **Continuous Noise Measurement Site**

Amoruso Ranch Specific Plan

Figure 7: Noise Monitoring Locations

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REGULATORY SETTING

Federal

There are no federal regulations related to noise that apply to the Proposed Project.

State

The State Building Code, Title 24, Part 2 of the State of California Code of Regulations establishes uniform minimum noise insulation performance standards to protect persons within new buildings which house people, including hotels, motels, dormitories, apartment houses and dwellings other than single-family dwellings. Title 24 mandates that interior noise levels attributable to exterior sources shall not exceed 45 dB L_{dn} or CNEL in any habitable room. Title 24 also mandates that for structures containing noise-sensitive uses to be located where the L_{dn} or CNEL exceeds 60 dB, an acoustical analysis must be prepared to identify mechanisms for limiting exterior noise to the prescribed allowable interior levels. If the interior allowable noise levels are met by requiring that windows be kept close, the design for the structure must also specify a ventilation or air conditioning system to provide a habitable interior environment.

City of Roseville

General Plan Noise Element

The City of Roseville General Plan Noise Element provides the following goals and policies relative to noise.

Goals:

1. Protect City residents from the harmful and annoying effects of exposure to excessive noise.

2. Protect the economic base of the City by preventing incompatible land uses from encroaching upon existing or planned noise-producing uses.

Policies – Transportation Noise

1. Allow the development of new noise-sensitive land uses (which include but are not limited to residential, schools, and hospitals) only in areas exposed to existing or projected levels of noise from transportation noise sources which satisfy the levels specified in Table 4. Noise mitigation measures may be required to reduce noise in outdoor activity areas and interior spaces to the levels specified in Table 4.

   Recognizing that in increasingly urban areas it is difficult to maintain suburban noise standards, and in order to facilitate the City's goals to encourage reinvestment and economic development in the Riverside and Downtown Specific Plan areas, the City may elect to allow new noise-sensitive land uses on a case by case basis in proximity to transportation sources. Noise mitigation, including an acoustical analysis, would be required to reduce interior space noise levels to the standards specified in Table 4. Exterior noise levels would require mitigation to the extent feasible using building orientation, construction and design features; however ultimately, noise levels may exceed the noise standards identified in Table 4.

2. Require new roadway improvement projects to be mitigated so as not to exceed the noise levels specified in Table 4 at outdoor activity areas or interior spaces of existing noise sensitive land uses.

3. Evaluate new transportation projects, such as light and heavy rail, using the standards contained in Table 4. However, noise from these projects may be allowed to exceed the standards contained in Table 4 if the City Council finds that there are special overriding circumstances.

4. Require an acoustical analysis where:

    a. Noise sensitive land uses are proposed in areas exposed to existing or projected noise levels exceeding the levels specified in Table 4;

    a. Proposed transportation noise source projects are likely to produce noise levels exceeding the levels specified in Table 4 at existing or planned noise-sensitive uses.

   An acoustical analysis shall be required as part of the environmental review process so that noise mitigation may be considered in the project design.

5. Work in cooperation with Caltrans and the Union Pacific Transportation Company to maintain noise level standards for both new and existing projects in compliance with Table 4.

Policies – Fixed Noise Source

6. Allow the development of new noise-sensitive uses (which include, but are not limited to, residential, school, and hospitals) only where the noise level due to fixed (non-transportation) noise sources satisfies the noise level standards of Table 5. Noise mitigation may be required to meet Table 5 performance standards.

   Recognizing that in increasingly urban areas it is difficult to maintain suburban noise standards, and in order to facilitate the City's goals to encourage reinvestment and economic development in the Riverside and Downtown Specific Plan areas, the City may elect to allow new noise-sensitive land uses on a case by case basis in a mixed-use environment. Noise levels would require mitigation to the extent feasible using building orientation, construction and design features; however ultimately, noise levels may exceed noise standards identified in Table 5.

7. Require proposed fixed noise sources adjacent to noise-sensitive uses to be mitigated so as not to exceed the noise level performance standards of Table 5.

8. Require an acoustical analysis where:

   Noise-sensitive land uses are proposed in areas where existing or anticipated future fixed noise sources may

a. Proposed non-residential or other fixed noise sources are likely to produce noise levels exceeding the performance standards of Table 5 at existing or planned noise-sensitive uses.

An acoustical analysis shall be required as part of the environmental review process so that noise mitigation may be considered during project design.

Policies – General

9. Where noise mitigation measures are required to achieve the standards of Tables 4 and 5, the emphasis of such measures should be placed on site planning and project design. These measures may include, but are not limited to, building orientation, setbacks, landscaping, and building construction practices. The use of noise barriers, such as soundwalls, should be considered as a means of achieving the noise standards only after all other practical design-related noise mitigation measures have been integrated into the project.

10. Regulate construction-related noise to reduce impacts on adjacent uses consistent with the City's Noise Ordinance.

Table 4: (Table IX-1 of the Roseville General Plan Noise Element) Maximum Allowable Noise Exposure Transportation Noise Sources

Land Use	Outdoor Activity Areas[1] L_{dn}/CNEL, dB	Interior Spaces	
		L_{dn}/CNEL, dB	L_{eq}, dB[2]
Residential	60[3]	45	--
Transient Lodging	60[3]	45	--
Hospitals & Nursing Homes	60[3]	45	--
Theaters, Auditoriums, Music Halls	--	--	35
Churches, Meeting Halls	60[3]	--	40
Office Buildings	65	--	45
Schools, Libraries, Museums	--	--	45
Playgrounds, Neighborhood Parks	70	--	--

1. Outdoor activity areas for residential developments are considered to be the back yard patios or decks of single family dwelling, and the patios or common areas where people generally congregate for multi-family development.

   Outdoor activity areas for non-residential developments are considered to be those common areas where people generally congregate, including pedestrian plazas, seating areas and outside lunch facilities.

   Where the location of outdoor activity areas is unknown, the exterior noise level standard shall be applied to the property line of the receiving land use.

2. As determined for a typical worst-case hour during periods of use.

3. Where it is not possible to reduce noise in outdoor activity areas to 60 dB L_{dn}/CNEL or less using a practical application of the best-available noise reduction measures, an exterior noise level of up to 75 dB L_{dn}/CNEL may be allowed provided that available exterior noise level reduction measures have been implemented and interior noise levels area in compliance with this table.

Note: Where a proposed use is not specifically listed on this table, the use shall comply with the noise exposure standards for the nearest similar use as determined by the Planning Department. Commercial and industrial uses have not been listed because such uses are not considered to be particularly sensitive to noise exposure.

Source: City of Roseville, 2025 General Plan.

TABLE 5: (TABLE IX-3 OF THE CITY OF ROSEVILLE GENERAL PLAN NOISE ELEMENT) PERFORMANCE STANDARDS FOR NON-TRANSPORTATION NOISE SOURCES OR PROJECTS AFFECTED BY NON-TRANSPORTATION NOISE SOURCES
(AS MEASURED AT THE PROPERTY LINE OF NOISE-SENSITIVE USES)

Noise Level Descriptor	Daytime (7 a.m. - 10 p.m.)	Nighttime (10 p.m. - 7 a.m.)
Hourly Average (L_{eq})	50 dB	45 dB
Maximum Level (L_{max})	70 dB	65 dB

[1] For municipal power plants consisting primarily of broadband, steady state noise sources, the hourly (L_{eq}) noise standard may be increased up to 10 dB(A), but not exceed 55 dB(A) Hourly L_{eq} dB.

Each of the noise levels specified above should be lowered by five dB for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises. Such noises are generally considered by residents to be particularly annoying and are a primary source of noise complaints. These noise level standards do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings).

No standards have been included for interior noise levels. Standard construction practices should, with exterior noise levels identified, result in acceptable interior noise levels.

Source: City of Roseville, 2025 General Plan.

Roseville Municipal Code

The City of Roseville Noise Ordinance, Chapter 9.24 of the Municipal Code establishes procedures and policies for handling noise complaints within the City. The ordinance also establishes limits on noise sources, such as amplified music or sound.

Section 9.24.100 of the ordinance establishes sound limits for sensitive receptors, as shown below:

> ***9.24.100 Sound limits for sensitive receptors.***
>
> *It is unlawful for any person at any location to create any sound, or to allow the creation of any sound, on property owned, leased, occupied or otherwise controlled by such person, which causes the exterior sound level when measured at the property line of any affected sensitive receptor to exceed the ambient sound level by three dBA or exceed the sound level standards as set forth in Table 6, by three dBA, whichever is greater.*

TABLE 6: SOUND LEVEL STANDARDS (FOR NON-TRANSPORTATION OR FIXED SOUND SOURCES)

Sound Level Descriptor	*Daytime (7:00 a.m. to 10:00 p.m.)*	*Nighttime (10:00 p.m. to 7:00 a.m.)*
Hourly L_{eq}, dB	*50*	*45*
Maximum level, dB	*70*	*65*

A. Each of the sound level standards specified in Table 6 shall be reduced by five dB for simple tone noises, consisting of speech and music. However, in no case shall the sound level standard be lower than the ambient sound level plus three dB.

B. If the intruding sound source is continuous and cannot reasonably be discontinued or stopped for a time period whereby the ambient sound level can be measured, the sound level measured while the source is in operation shall be compared directly to the sound level standards of Table 6. (Ord. 3638 § 1, 2001.)

Section 9.24.030.G of the ordinance also exempts noise from private construction (e.g., construction, alteration or repair activities) between the hours of 7:00 a.m. and 7:00 p.m. Monday through Friday, and between the hours of 8:00 a.m. and 8:00 p.m. Saturday and Sunday; provided, however, that all construction equipment is fitted with factory installed muffling devices and that all construction equipment shall be maintained in good working order. These exemptions are typical of City and County Noise Ordinances and reflect the recognition that construction-related noise is temporary in character, is generally acceptable when limited to daylight hours, and is part of what residents of urban areas expect as part of a typical urban noise environment (along with sirens, etc.)

Section 9.24.140 of the ordinance also exempts noise from city operations and activities. This would include garbage collection which is conducted by the Solid Waste Division of the City's Environmental Utilities Department.

It should be noted that under the City's Noise Ordinance Standards, as outlined above in Table 6, the project would be allowed to generate noise levels up to 3 dB over existing ambient noise conditions. However, to be conservative, this analysis applies the more restrictive General Plan standards (Table 5) even where ambient noise levels currently exceed the City's General Plan noise standards. Therefore, with noise control measures, project-related noise levels may be less than existing ambient noise levels.

Determination of a Significant Increase in Noise Levels

Another means of determining a potential noise impact is to assess a person's reaction to changes in noise levels due to a project. Table 6 is commonly used to show expected public reaction to changes in environmental noise levels. This table was developed on the basis of test subjects' reactions to changes in the levels of steady-state pure tones or broad-band noise and to changes in levels of a given noise source. It is probably most applicable to noise levels in the range of 50 to 70 dBA, as this is the usual range of voice and interior noise levels.

TABLE 7: SUBJECTIVE REACTION TO CHANGES IN NOISE LEVELS OF SIMILAR SOURCES

Change in Level, dBA	Subjective Reaction	Factor Change in Acoustical Energy
1	Imperceptible (Except for Tones)	1.3
3	Just Barely Perceptible	2.0
6	Clearly Noticeable	4.0
10	About Twice (or half) as Loud	10.0
Source: Architectural Acoustics, M. David Egan, 1988.		

IMPACTS AND MITIGATION MEASURES

Standard of Significance

Consistent with Appendix G of the CEQA Guideline, the City's General Plan and Noise Ordinance, and professional judgment, the project will have a significant impact related to noise if it will result in:

- Exposure of persons to, or generation of noise levels in excess of standards established in the City of Roseville General Plan, specifically, the exterior and interior noise levels listed in Tables 4.6-4 and 4.6-5 (General Plan Tables IX-1 and IX-3).
- A substantial (greater than 3 dBA) permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
- Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels.
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity at least 4 dB above levels existing without the project and occurring on weekdays between 7:00 p.m. and 7:00 a.m. or on weekends between 8:00 p.m. and 8:00 a.m.
- For a project located within an airport land use plan or, where such a plan has not be adopted, within two miles of a public airport or public use airport, exposure of people residing or working in the area to excessive noise levels.
- For a project within the vicinity of a private airstrip exposure of people residing or working in the project area to excessive noise levels.

The proposed project will not be a significant source of groundborne vibration or groundborne noise. Therefore, this item is not discussed further in this analysis.

Analysis Methodology

<u>Traffic Noise Impact Assessment Methodology</u>

To describe future noise levels due to traffic, the Federal Highway Administration highway Traffic Noise Prediction Model (FHWA RD-77-108) was used. Direct inputs to the model included traffic volumes provided by Fehr and Peers Transportation Consultants. 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. The FHWA model was developed to predict hourly L_{eq} values for free-flowing traffic conditions. To predict L_{dn}/CNEL values, it is necessary to determine the day/night distribution of traffic and adjust the traffic volume input data to yield an equivalent hourly traffic volume. Appendix B provides the complete inputs and results for the FHWA traffic noise prediction modeling.

Traffic noise levels are predicted at the sensitive receptors located at the closest typical setback distance along each project-area roadway segment. A conservative adjustment of -5 dB is assumed where noise barriers are located adjacent to the majority of sensitive receptors, or where outdoor activity areas are located behind residences. In some locations sensitive receptors may not receive full shielding from noise barriers, or may be located at distances which vary from the assumed calculation distance. However, the traffic noise analysis is believed to be representative of the majority of sensitive receptors located closest to the Project area roadway segments analyzed in this report.

Construction Noise Impact Methodology

Construction noise was analyzed using data compiled for various pieces of construction equipment at a representative distance of 50 feet. Construction activities are discussed relative to the applicable City of Roseville Noise Ordinance policies.

Aviation Noise Impact Methodology

Aviation noise was addressed through use of data provided by the Sacramento County Airport System noise monitoring report for the Amoruso Ranch SP project site. The potential for sleep disturbance is discussed based upon the results of single event noise measurements conducted on the project site.

Stationary Noise Impact Methodology

Noise impacts associates with future commercial and park land uses were analyzed using previously collected file data for the various types of uses proposed. Noise impacts from the REP were analyzed using continuous noise level measurements and observations conducted on the project site.

Overview of Noise Mitigation Options

The following overview is provided since the site plan is in the preliminary land use stages, and may be of use during finalization of the project site plans.

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 (CNEL, L_{eq}, or L_{max}), the location of the sensitive receiver (inside or outside), and when the problem occurs (daytime or nighttime). 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 options include the following:

Use of Setbacks:

Noise exposure may be reduced by increasing the distance between the noise source and receiving use. Setback areas can take the form of open space, frontage roads, recreational areas, storage yards, etc. 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 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. Earth, in the form of berms or the face of a depressed area, is also an effective barrier material.

There are practical limits to the noise reduction provided by barriers. For vehicle traffic or railroad noise, a 5 to 10 dB noise reduction may often be reasonably attained. A 15 dB noise reduction is sometimes possible, 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 up to 3 dB 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.

Site Design:

Buildings can be placed on a project site 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.

Site design should guard against the creation of reflecting surfaces which may increase onsite noise levels. For example, two buildings placed at an angle facing a noise source may cause noise levels within that angle to increase by up to 3 dB. The open end of "U"-shaped buildings should point away from noise sources for the same reason. Landscaping walls or noise barriers located within a development may inadvertently reflect noise back to a noise-sensitive area unless carefully located. Avoidance of these problems while attaining an aesthetic site design requires close coordination between local agencies, the project engineer and architect, and the noise consultant.

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 construction practices provide 10-15 dB noise reduction for building facades with open windows, and approximately 25 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. Reduction of relative window area is the most effective control technique, followed by providing acoustical glazing (thicker glass or increased air space between panes) in low air infiltration rate frames, use of fixed (non-movable) acoustical glazing or the elimination of windows. 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.

<u>Use of Vegetation:</u>

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. It should be noted, however, that trees planted on the top of a noise control berm can actually slightly degrade the acoustical performance of the barrier. This effect can occur when high frequency sounds are diffracted (bent) by foliage and directed downward over a barrier.

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.

SPECIFIC IMPACTS AND MITIGATION MEASURES

Impact 1 **Short-Term Construction-Generated Noise Levels.** Implementation of the proposed project would result in short-term construction activities associated with individual development projects in the Plan area. These construction activities could potentially expose sensitive receptors to noise levels in excess of the applicable noise standards and/or result in a noticeable increase in ambient noise levels. This is considered to be a **less than significant** impact.

Construction Noise Impact Assessment Methodology

Noise impacts resulting from construction depend on the noise generated by various pieces of construction equipment, the timing and duration of noise generating activities, and the distance between construction noise sources and noise-sensitive areas. Noise levels from typical construction equipment are shown in Table 8.

Noise generated by construction would be the greatest during site grading activities and excavation for underground utilities.

Activities involved in construction would generate maximum noise levels, as indicated in Table 8, ranging from 76 to 90 dB at a distance of 50 feet. Construction activities would be temporary in nature and are anticipated to occur during normal daytime working hours.

Noise would also be generated during the construction phase by increased truck traffic on area roadways. A primary project-generated noise source would be truck traffic associated with transport of heavy materials and equipment to and from construction sites. This noise increase would be of short duration, and would occur during daytime hours, pursuant to the requirements of the City of Roseville Noise Ordinance, as outlined below.

TABLE 8: CONSTRUCTION EQUIPMENT NOISE

Type of Equipment	Predicted Noise Levels, L_{max} dB				Distances to Noise Contours (feet)	
	Noise Level at 50’	Noise Level at 100’	Noise Level at 200’	Noise Level at 400’	70 dB L_{max} contour	65 dB L_{max} contour
Auger Drill Rig	84	78	72	66	250	446
Backhoe	78	72	66	60	126	223
Compactor	83	77	71	65	223	397
Compressor (air)	78	72	66	60	126	223
Concrete Saw	90	84	78	72	500	889
Dozer	82	76	70	64	199	354
Dump Truck	76	70	64	58	100	177
Excavator	81	75	69	63	177	315
Generator	81	75	69	63	177	315
Jackhammer	89	83	77	71	446	792
Pneumatic Tools	85	79	73	67	281	500

Source: *Roadway Construction Noise Model User’s Guide*. Federal Highway Administration. FHWA-HEP-05-054. January 2006.

Construction activities associated with the proposed project will typically occur at distances of approximately 200 feet, or greater, from the nearest noise-sensitive receptors located north of Sunset Boulevard. At 200 feet, construction related noise levels are expected to range between approximately 64-78 dB L_{max}. Much of the project construction would occur at distances well over 200 feet and construction noise levels would be substantially less than 64-78 dB L_{max}.

The City of Roseville Municipal Code exempts construction-generated noise that occurs between the hours of 7 a.m. to 7 p.m. Monday through Friday, and 8 a.m. and 8 p.m. Saturday and Sunday from the City's exterior noise standards, provided that all construction equipment is fitted with factory installed muffling devices and maintained in good working order.

The following is the list of measures the project would include to reduce project construction noise.

- Construction activities shall comply with the requirements of the City of Roseville Noise Ordinance with respect to hours of operation.

- Locate fixed construction equipment such as compressors and generators as far as possible from sensitive receptors. Shroud or shield all impact tools, and muffle or shield all intake and exhaust ports on power construction equipment.

- Designate a disturbance coordinator and conspicuously post this person's number around the project site and in adjacent public spaces. The disturbance coordinator will receive all public complaints about construction noise disturbances and will be responsible for determining the cause of the complaint, and implement any feasible measures to be taken to alleviate the problem.

Construction activities would be temporary in nature, will occur during normal daytime working hours, and will comply with the requirements of the City of Roseville Noise Ordinance. Therefore, construction noise will be a less than significant impact.

Impact 2 **Long-Term Traffic Noise Levels at Existing Noise-Sensitive Receivers.** Implementation of the proposed project would result in an increase of average daily vehicle trips in the Plan area. The increased traffic volumes would result in a noticeable increase in traffic noise along roadways at sensitive receptors within the vicinity of the Plan area. This is considered to be a **significant** impact.

Long-term operation of the proposed project would result in an increase in ADT volumes on the local roadway network and, consequently, an increase in noise levels from traffic sources along affected segments.

To examine the affect of project-generated traffic increases, traffic noise levels associated with the proposed project were calculated for roadway segments in the project study area using the FHWA Highway Noise Prediction Model (FHWA-RD-77-108). Traffic noise levels were modeled under Existing, Cumulative (2035) conditions, and Capital Improvement Plan (CIP) 2035, with and without the implementation of the Specific Plan.

Traffic noise levels are predicted at the outdoor activity areas of sensitive receptors located at the closest typical setback distance along each project-area roadway segment. A conservative adjustment of -5 dB is assumed where noise barriers are located adjacent to the majority of sensitive receptors, or where outdoor activity areas are located behind residences. In some locations sensitive receptors may not receive full shielding from noise barriers, or may be located at distances which vary from the assumed calculation distance. However, the traffic noise analysis is believed to be representative of the majority of sensitive receptors located closest to the Project area roadway segments analyzed in this report.

Traffic volumes were obtained from the project traffic consultant (Fehr & Peers). Vehicle speeds and truck volumes on local area roadways were determined based on field observations and posted speeds. Tables 9 through 11 summarize the modeled traffic noise levels at the sensitive receptors along each roadway. Appendix B provides the complete inputs and results of the FHWA traffic modeling.

Table 9: Predicted Existing and Existing Plus Project Traffic Noise Levels – Proposed Project

Roadway	Segment	Distance (Feet) [1]	Traffic Noise Levels (L_{dn} dBA) Existing	Existing + Project	Change	Significance Criteria[1]	Significant?	Distance to contours (feet) Existing[2] 70 dB L_{dn}	65 dB L_{dn}	60 dB L_{dn}	Distance to Contours (feet) Existing Plus Project[2] 70 dB L_{dn}	65 dB L_{dn}	60 dB L_{dn}
Blue Oaks	W. of Fiddyment	90	52.7	61.4	**8.7**	+3 dB	**Yes**	6	14	29	32	69	149
Blue Oaks	Fiddyment to Woodcreek	95	61.9	63.3	1.4	+3 dB	No	27	59	127	34	73	158
Blue Oaks	Woodcreek to Foothills	110	63.0	63.8	0.8	+3 dB	No	38	81	174	43	92	199
Blue Oaks	Foothills to Washington	100	69.4	69.8	0.4	+3 dB	No	91	196	423	97	208	448
Pleasant Grove Bl.	W. of Fiddyment	75	60.0	60.0	-0.1	+3 dB	No	16	35	76	16	35	75
Pleasant Grove Bl.	Fiddyment to Woodcreek	75	63.7	63.6	-0.2	+3 dB	No	29	62	133	28	60	129
Pleasant Grove Bl.	Woodcreek to Foothills	100	63.3	63.4	0.1	+3 dB	No	36	77	167	37	79	169
Pleasant Grove Bl.	Foothills to Washington	75	66.2	66.4	0.2	+3 dB	No	42	90	195	43	93	200
Pleasant Grove Bl.	Washington to Roseville Pkwy	100	64.7	64.8	0.1	+3 dB	No	45	96	207	45	97	209
Pleasant Grove Bl.	Roseville Pkwy to SR 65	125	63.6	63.7	0.1	+3 dB	No	47	101	217	47	102	220
Pleasant Grove Rd.	North of Baseline	110	55.4	59.7	**4.3**	+3 dB	**Yes**	12	25	54	23	48	104
Baseline	W. of Fiddyment	110	60.3	61.1	0.8	+3 dB	No	25	54	116	28	61	131
Baseline	Fiddyment to Junction	110	58.4	59.3	0.9	+3 dB	No	19	40	86	21	46	99
Baseline	Junction to Woodcreek	75	60.9	61.9	1.0	+3 dB	No	19	40	86	22	47	101
Baseline	Woodcreek to Foothills	75	62.2	62.6	0.4	+3 dB	No	23	49	105	24	52	112
Baseline	Foothills to	50	66.9	66.9	0.0	+3 dB	No	31	67	144	31	67	144

	Washington												
Junction	Baseline to Woodcreek	75	59.1	59.2	0.2	+3 dB	No	14	30	65	14	31	67
Junction	Woodcreek to Foothills	65	60.5	60.6	0.1	+3 dB	No	15	32	70	15	33	71
Junction	Foothills to Washington	65	61.1	61.4	0.3	+3 dB	No	17	36	77	17	37	80
Roseville Pkwy	Washington to Pleasant Grove	100	59.4	59.8	0.4	+3 dB	No	20	42	91	21	45	97
Roseville Pkwy	E. of Pleasant Grove	110	63.8	63.9	0.1	+3 dB	No	43	92	197	43	93	200
Sunset Bl. West	Pleasant Grove to Amoruso	150	50.6	54.1	**3.5**	+3 dB	**Yes**	8	16	35	13	28	61
Sunset Bl. West	Amoruso to Westbrook	150	51.0	53.8	2.8	+3 dB	No	8	18	38	13	27	58
Fiddyment	N. of Blue Oaks	105	57.0	56.6	-0.4	+3 dB	No	14	31	66	14	29	63
Fiddyment	Blue Oaks to Pleasant Grove	90	60.8	62.8	2.0	+3 dB	No	22	47	102	30	64	138
Fiddyment	Pleasant Grove to Baseline	90	62.9	63.8	1.0	+3 dB	No	30	65	140	35	75	162
Woodcreek Oaks	N. of Blue Oaks	85	57.9	57.8	-0.1	+3 dB	No	13	29	62	13	28	60
Woodcreek Oaks	Blue Oaks to Pleasant Grove	90	59.2	59.3	0.1	+3 dB	No	17	37	79	17	37	81
Woodcreek Oaks	Pleasant Grove to Junction	100	58.4	59.0	0.5	+3 dB	No	17	37	79	18	40	86
Woodcreek Oaks	Junction to Baseline	70	57.8	58.9	1.1	+3 dB	No	11	23	50	13	27	59
Foothills	N. of Blue Oaks	100	61.8	61.9	0.1	+3 dB	No	28	61	132	29	62	133
Foothills	Blue Oaks to Pleasant Grove	75	61.8	62.0	0.2	+3 dB	No	21	46	98	22	47	102
Foothills	Pleasant Grove to	100	62.8	62.9	0.1	+3 dB	No	33	72	154	34	72	156

	Junction												
Foothills	Junction to Baseline	75	64.5	64.5	0.0	+3 dB		32	69	150	32	70	150
Foothills	S. of Baseline	65	66.3	66.5	0.2	+3 dB	No	37	79	170	38	82	176
Washingt on	Blue Oaks to Roseville Pkwy	100	60.6	60.8	0.2	+3 dB	No	24	51	110	24	53	114
Washingt on	Roseville Pkwy to Pleasant Grove	110	58.9	59.2	0.2	+3 dB	No	20	43	94	21	45	97
Washingt on	Pleasant Grove to Junction	85	61.9	61.9	0.0	+3 dB	No	25	53	114	24	53	114
Washingt on	Junction Baseline	55	70.0	70.2	0.2	+3 dB	No	55	119	257	57	122	263

[1] Where existing noise levels are less than 60 dB an increase of 5 dB would be a significant increase. Additionally, any increase causing noise levels to exceed the City's Normally Acceptable 60 dB L_{dn} noise level standard at an existing outdoor activity area of a residential use would also be significant. Where existing noise levels exceed 60 dB but are less than 65 dB, an increase of 3 dB or more would be significant. Where existing noise levels exceed 65 dB, an increase of 1.5 dB or more would be significant.

[2] Distances to traffic noise contours are measured in feet from the centerlines of the roadways.

TABLE 10: PREDICTED CUMULATIVE (2035) AND CUMULATIVE (2035) PLUS PROJECT TRAFFIC NOISE LEVELS – PROPOSED PROJECT

			Traffic Noise Levels (L_{dn} dBA)					Distance to contours (feet) - Cumulative[2]			Distance to Contours (feet) - Cumulative Plus Project[2]		
Roadway	Segment	Distance (Feet)[1]	Cum. (2035)	Cum. (2035) + Project	Change	Significance Criteria[1]	Significant?	70 dB L_{dn}	65 dB L_{dn}	60 dB L_{dn}	70 dB L_{dn}	65 dB L_{dn}	60 dB L_{dn}
Blue Oaks	W. of Fiddyment	90	63.8	63.9	0.1	+3 dB	No	35	75	161	36	77	165
Blue Oaks	Fiddyment to Woodcreek	95	65.7	65.8	0.1	+3 dB	No	49	106	229	50	108	232
Blue Oaks	Woodcreek to Foothills	110	66.0	66.0	0.0	+3 dB	No	59	127	274	59	128	276
Blue Oaks	Foothills to Washington	100	71.7	71.7	0.1	+3 dB	No	129	278	598	130	280	604
Pleasant Grove Bl.	W. of Fiddyment	75	65.0	65.1	0.1	+3 dB	No	35	75	162	35	76	165
Pleasant Grove Bl.	Fiddyment to Woodcreek	75	66.0	66.0	0.0	+3 dB	No	41	88	189	41	88	190
Pleasant Grove Bl.	Woodcreek to Foothills	100	65.4	65.4	0.0	+3 dB	No	49	106	229	49	107	230
Pleasant Grove Bl.	Foothills to Washington	75	67.4	67.4	0.0	+3 dB	No	50	108	232	50	108	233
Pleasant Grove Bl.	Washington to Roseville Pkwy	100	65.9	65.9	0.0	+3 dB	No	53	114	246	53	114	246
Pleasant Grove Bl.	Roseville Pkwy to SR 65	125	65.1	65.1	0.0	+3 dB	No	59	126	272	59	126	272
Pleasant Grove Rd.	North of Baseline	110	64.0	64.4	0.4	+3 dB	No	44	94	202	46	100	216
Baseline	W. of Fiddyment	110	65.5	64.2	-1.3	+3 dB	No	55	118	255	45	97	209
Baseline	Fiddyment to Junction	110	63.9	64.0	0.0	+3 dB	No	43	94	202	44	94	202
Baseline	Junction to Woodcreek	75	65.3	65.3	0.0	+3 dB	No	36	79	169	37	79	170
Baseline	Woodcreek to Foothills	75	65.7	65.7	0.0	+3 dB	No	39	83	179	39	83	179
Baseline	Foothills to	50	69.1	69.1	0.0	+3 dB	No	43	93	201	43	93	201

TABLE 10: PREDICTED CUMULATIVE (2035) AND CUMULATIVE (2035) PLUS PROJECT TRAFFIC NOISE LEVELS – PROPOSED PROJECT

			Traffic Noise Levels (L_{dn} dBA)					Distance to contours (feet) - Cumulative[2]			Distance to Contours (feet) - Cumulative Plus Project[2]		
	Washington												
Junction	Baseline to Woodcreek	75	62.3	62.4	0.1	+3 dB	No	23	50	107	23	50	109
Junction	Woodcreek to Foothills	65	62.7	62.7	0.0	+3 dB	No	21	46	99	21	46	99
Junction	Foothills to Washington	65	63.4	63.4	0.0	+3 dB	No	24	51	110	24	51	110
Roseville Pkwy	Washington to Pleasant Grove	100	63.9	64.0	0.1	+3 dB	No	39	85	183	40	86	185
Roseville Pkwy	E. of Pleasant Grove	110	66.2	66.2	0.0	+3 dB	No	62	133	286	62	133	286
Sunset Bl. West	Pleasant Grove to Amoruso	150	55.4	57.9	2.5	+3 dB	No	16	34	74	23	50	108
Sunset Bl. West	Amoruso to Westbrook	150	55.0	58.3	**3.4**	+3 dB	**Yes**	15	32	70	25	54	116
Fiddyment	N. of Blue Oaks	105	63.2	63.2	0.1	+3 dB	No	37	79	170	37	80	173
Fiddyment	Blue Oaks to Pleasant Grove	90	64.1	64.1	0.0	+3 dB	No	36	78	168	36	78	168
Fiddyment	Pleasant Grove to Baseline	90	66.2	66.3	0.1	+3 dB	No	51	109	235	51	110	237
Woodcreek Oaks	N. of Blue Oaks	85	62.1	62.1	0.0	+3 dB	No	25	55	118	25	55	118
Woodcreek Oaks	Blue Oaks to Pleasant Grove	90	61.6	61.6	0.0	+3 dB	No	25	54	116	25	54	115
Woodcreek Oaks	Pleasant Grove to Junction	100	60.9	61.0	0.1	+3 dB	No	25	54	115	25	54	116
Woodcreek Oaks	Junction to Baseline	70	60.4	60.4	0.0	+3 dB	No	16	34	74	16	34	74
Foothills	N. of Blue Oaks	100	68.4	68.4	0.1	+3 dB	No	78	168	363	79	170	366
Foothills	Blue Oaks to	75	65.5	65.5	0.0	+3 dB	No	38	81	175	38	81	175

TABLE 10: PREDICTED CUMULATIVE (2035) AND CUMULATIVE (2035) PLUS PROJECT TRAFFIC NOISE LEVELS – PROPOSED PROJECT

			Traffic Noise Levels (L_{dn} dBA)					Distance to contours (feet) - Cumulative[2]			Distance to Contours (feet) - Cumulative Plus Project[2]		
	Pleasant Grove												
Foothills	Pleasant Grove to Junction	100	64.7	64.5	-0.2	+3 dB	No	45	96	207	43	93	201
Foothills	Junction to Baseline	75	66.2	66.2	0.0	+3 dB	No	42	90	195	42	91	195
Foothills	S. of Baseline	65	68.2	68.2	0.0	+3 dB	No	49	106	228	49	106	228
Washingt on	Blue Oaks to Roseville Pkwy	100	64.1	64.1	0.0	+3 dB	No	40	87	188	41	88	189
Washingt on	Roseville Pkwy to Pleasant Grove	110	61.9	61.9	0.0	+3 dB	No	32	68	146	32	68	147
Washingt on	Pleasant Grove to Junction	85	64.3	64.3	0.0	+3 dB	No	35	76	164	35	76	164
Washingt on	Junction Baseline	55	72.1	72.1	0.0	+3 dB	No	76	163	351	76	164	352

[1] Where existing noise levels are less than 60 dB an increase of 5 dB would be a significant increase. Additionally, any increase causing noise levels to exceed the City's Normally Acceptable 60 dB L_{dn} noise level standard at an existing outdoor activity area of a residential use would also be significant. Where existing noise levels exceed 60 dB but are less than 65 dB, an increase of 3 dB or more would be significant. Where existing noise levels exceed 65 dB, an increase of 1.5 dB or more would be significant.

[2] Distances to traffic noise contours are measured in feet from the centerlines of the roadways.

Table 11: Predicted 2035 CIP and 2035 CIP Plus Project Traffic Noise Levels – Proposed Project

Roadway	Segment	Distance (Feet)[1]	Traffic Noise Levels (L_{dn} dBA)			Significance Criteria[1]	Significant?	Distance to contours (feet) CIP[2]			Distance to Contours (feet) CIP Plus Project[2]		
			CIP	CIP + Project	Change			70 dB L_{dn}	65 dB L_{dn}	60 dB L_{dn}	70 dB L_{dn}	65 dB L_{dn}	60 dB L_{dn}
Blue Oaks	W. of Fiddyment	90	64.8	64.4	-0.3	+3 dB	No	40	87	187	38	83	178
Blue Oaks	Fiddyment to Woodcreek	95	66.6	66.7	0.1	+3 dB	No	56	122	262	58	124	268
Blue Oaks	Woodcreek to Foothills	110	66.8	66.9	0.1	+3 dB	No	68	146	315	69	148	319
Blue Oaks	Foothills to Washington	100	71.5	71.5	0.0	+3 dB	No	125	270	582	126	272	586
Pleasant Grove Bl.	W. of Fiddyment	75	65.3	65.5	0.2	+3 dB	No	37	79	170	38	81	175
Pleasant Grove Bl.	Fiddyment to Woodcreek	75	66.3	66.4	0.1	+3 dB	No	43	92	198	43	93	200
Pleasant Grove Bl.	Woodcreek to Foothills	100	65.8	65.9	0.1	+3 dB	No	52	113	244	53	114	246
Pleasant Grove Bl.	Foothills to Washington	75	67.4	67.4	0.0	+3 dB	No	51	109	234	51	109	235
Pleasant Grove Bl.	Washington to Roseville Pkwy	100	66.0	65.9	0.0	+3 dB	No	54	116	249	54	115	249
Pleasant Grove Bl.	Roseville Pkwy to SR 65	125	65.1	65.2	0.0	+3 dB	No	59	128	275	59	128	276
Pleasant Grove Rd.	North of Baseline	110	64.1	64.2	0.1	+3 dB	No	45	96	207	45	97	210
Baseline	W. of Fiddyment	110	65.5	64.3	-1.2	+3 dB	No	55	118	254	46	99	213
Baseline	Fiddyment to Junction	110	64.1	64.2	0.1	+3 dB	No	45	96	207	45	97	209
Baseline	Junction to Woodcreek	75	65.4	65.5	0.1	+3 dB	No	37	80	172	38	81	175

Baseline	Woodcreek to Foothills	75	65.7	65.7	0.0	+3 dB	No	39	83	179	39	84	180
Baseline	Foothills to Washington	50	69.2	69.2	0.0	+3 dB	No	44	95	205	44	96	206
Junction	Baseline to Woodcreek	75	63.0	63.2	0.2	+3 dB	No	26	55	119	26	57	122
Junction	Woodcreek to Foothills	65	63.5	63.7	0.2	+3 dB	No	24	52	112	25	54	115
Junction	Foothills to Washington	65	63.8	63.9	0.1	+3 dB	No	25	54	117	26	55	119
Roseville Pkwy	Washington to Pleasant Grove	100	63.7	63.8	0.1	+3 dB	No	38	81	175	38	83	178
Roseville Pkwy	E. of Pleasant Grove	110	66.2	66.2	0.0	+3 dB	No	61	132	285	36	79	169
Sunset Bl. West	Pleasant Grove to Amoruso	150	53.5	55.8	2.3	+3 dB	No	12	26	55	17	36	79
Sunset Bl. West	Amoruso to Westbrook	150	52.8	56.1	**3.3**	+3 dB	**Yes**	11	23	49	18	38	82
Fiddyment	N. of Blue Oaks	105	63.6	62.8	-0.8	+3 dB	No	39	84	182	35	75	161
Fiddyment	Blue Oaks to Pleasant Grove	90	63.9	63.9	0.0	+3 dB	No	35	75	163	35	76	163
Fiddyment	Pleasant Grove to Baseline	90	66.3	66.4	0.1	+3 dB	No	51	110	238	52	111	240
Woodcreek Oaks	N. of Blue Oaks	85	57.8	57.5	-0.4	+3 dB	No	13	28	61	12	27	58
Woodcreek Oaks	Blue Oaks to Pleasant Grove	90	61.2	61.0	-0.2	+3 dB	No	23	50	108	23	49	105
Woodcreek Oaks	Pleasant Grove to Junction	100	61.4	61.6	0.2	+3 dB	No	27	57	123	27	59	127
Woodcreek Oaks	Junction to Baseline	70	60.7	60.9	0.2	+3 dB	No	17	36	78	17	37	80
Foothills	N. of Blue Oaks	100	69.1	69.1	0.0	+3 dB	No	88	189	406	87	187	403
Foothills	Blue Oaks to Pleasant	75	65.8	65.8	0.0	+3 dB	No	39	84	181	39	84	182

	Grove												
Foothills	Pleasant Grove to Junction	100	64.6	64.6	0.0	+3 dB	No	43	93	201	43	93	201
Foothills	Junction to Baseline	75	66.2	66.2	0.0	+3 dB	No	42	90	193	42	90	193
Foothills	S. of Baseline	65	68.1	68.2	0.0	+3 dB	No	49	105	226	49	105	227
Washingt on	Blue Oaks to Roseville Pkwy	100	64.1	64.2	0.1	+3 dB	No	40	87	188	41	88	190
Washingt on	Roseville Pkwy to Pleasant Grove	110	61.8	61.8	0.0	+3 dB	No	31	67	145	31	68	146
Washingt on	Pleasant Grove to Junction	85	64.2	64.2	0.0	+3 dB	No	35	75	162	35	75	161
Washingt on	Junction Baseline	55	72.0	72.1	0.0	+3 dB	No	75	162	349	75	163	350

[1] Where existing noise levels are less than 60 dB an increase of 5 dB would be a significant increase. Additionally, any increase causing noise levels to exceed the City's Normally Acceptable 60 dB L_{dn} noise level standard at an existing outdoor activity area of a residential use would also be significant. Where existing noise levels exceed 60 dB but are less than 65 dB, an increase of 3 dB or more would be significant. Where existing noise levels exceed 65 dB, an increase of 1.5 dB or more would be significant.

[2] Distances to traffic noise contours are measured in feet from the centerlines of the roadways.

Table 9 shows the noise levels associated with traffic on the local roadway network under the existing and existing plus project traffic conditions. As indicated by Table 9, the related noise level increases under development of the proposed project are predicted to range between 0.1 to 8.7 dB. The predicted noise level increase of 8.7 dB would exceed the substantial increase criteria of 3 dB. This increase is predicted to occur on Blue Oaks Boulevard, west of Fiddyment Road.

Additionally, a 3.5 dB increase is predicted on Sunset Boulevard West from Pleasant Grove Road to Amoruso Way and a 4.3 dB increase is predicted for Pleasant Grove Road, north of Baseline. Therefore, these increases would be a **significant impact** according to CEQA checklist threshold (c) for Existing Plus Project conditions.

Table 10 shows the noise levels associated with traffic on the local roadway network under the cumulative and cumulative plus project traffic conditions. As indicated by Table 10, the related noise level increases under development of the proposed project are predicted to range between 0.1 to 3.4 dB. The predicted noise level increase of 3.4 dB would exceed the substantial increase criteria of 3 dB. This increase is predicted to occur on Sunset Boulevard West from Amoruso Way to Westbrook Boulevard. Therefore, this would be a **significant impact** according to CEQA checklist threshold (c) for Cumulative (2035) Plus Project conditions.

Table 11 shows the noise levels associated with traffic on the local roadway network under the 2035 CIP and 2035 CIP plus project traffic conditions. As indicated by Table 11, the related noise level increases under development of the proposed project are predicted to range between 0.1 to 3.3 dB. The predicted noise level increase of 3.3 dB would exceed the substantial increase criteria of 3 dB. This increase is predicted to occur on Sunset Boulevard West from Amoruso Way to Westbrook Boulevard. Therefore, this would be a **significant impact** according to CEQA checklist threshold (c) for 2035 CIP Plus Project conditions.

Tables 9-11 indicate that some noise sensitive receptors located along the project-area roadways are currently exposed to exterior traffic noise levels exceeding the City of Roseville 60 dB L_{dn} exterior noise level standard for residential uses. These receptors will continue to experience elevated exterior noise levels with implementation of the proposed project. However, no sensitive receptors are predicted to be exposed to exterior noise levels exceeding the City's 75 dB L_{dn} conditionally acceptable noise level standard. This portion of the impact would be **less than significant** under CEQA checklist threshold (a) under Existing Plus Project, Cumulative Plus Project, and CIP 2035 Plus Project conditions.

Mitigation for Impact 4.11-2 (Existing Plus Project Conditions): Mitigation measures for future traffic noise has already been constructed for the existing residential receptors located along the south side of Blue Oaks Boulevard, west of Fiddyment Road. These mitigation measures include a landscaped sound wall/earthen berm combination and were based upon project traffic volumes for cumulative roadway conditions. These mitigation measures will ensure that exterior and interior traffic noise levels under future conditions do not exceed the City's exterior noise level limits. However, even with these measures, existing receptors will experience a 8.7 dB increase in traffic noise levels under Existing Plus Project conditions due to increased traffic volumes on Blue Oaks Boulevard. Therefore, this impact will remain **significant and unavoidable** for Existing Plus Project conditions under CEQA checklist threshold (c).

For the residential receptors located adjacent to Sunset Boulevard West from Pleasant Grove Road to Amoruso Way and Pleasant Grove Road north of Baseline, the use of noise barriers to mitigate traffic noise is not feasible because these lots are accessed directly off Sunset Boulevard and

Pleasant Grove Road and driveway openings would negate any noise reduction that could otherwise be achieved by walls. One alternative mitigation measure could include speed reduction measures to limit vehicle travel speeds to 50 mph or less on these roadway sections. This would be a 5 mph reduction over the existing speed limits and would reduce traffic noise levels by 1 dB or more. This would reduce the total increase in traffic noise levels to 2.5 dB on Sunset Boulevard and 3.3 dB on Pleasant Grove Road. A 2.5 dB increase on Sunset Boulevard would be less than the 3 dB test of significance, but the 3.3 dB increase on Pleasant Grove Road would still exceed the 3 dB test of significance.

Another mitigation option could include the use Open Graded Asphalt Concrete (OGAC), also known as "quieter pavement." These types of overlay pavements have been shown to achieve long term noise reductions of approximately 3-5 dB. Use of this type of pavement would reduce traffic noise by a minimum of 3 dB. Therefore, the project's net increase would be approximately 0.5 to 1.3 dB and would be less than the 3 dB test of significance on these roadway segments. If either of these mitigation measures were employed, the impact to receptors along Sunset Boulevard West would be **less than significant** for Existing Plus Project conditions under CEQA checklist threshold (c). However, only the use of quieter pavement would reduce the impact on Pleasant Grove Road to less than significant under CEQA checklist threshold (c).

Mitigation for Impact 4.11-2 (Cumulative Plus Project Conditions): For the residential receptors located adjacent to Sunset Boulevard West from Amoruso Way to Westbrook Boulevard, the use of noise barriers to mitigate traffic noise is not feasible because these lots are accessed directly off Sunset Boulevard and driveway opening would negate any noise reduction that could otherwise be achieved by a sound wall. One alternative mitigation measure could include speed reduction measures to limit vehicle travel speeds to 50 mph or less on this section of roadway. This would be a 5 mph reduction over the existing speed limit and would reduce traffic noise levels by 1 dB or more. This would reduce the total increase in traffic noise levels to 2.4 dB or less. A 2.4 dB increase would be less than the 3 dB test of significance on this roadway segment. Another mitigation option could include the use Open Graded Asphalt Concrete (OGAC), also known as "quieter pavement." These types of overlay pavements have been shown to achieve long term noise reductions of approximately 3-5 dB. Use of this type of pavement would reduce traffic noise by a minimum of 3 dB. Therefore, the project's net increase would be approximately 0.4 dB and would be less than the 3 dB test of significance on this roadway segment. If either of these mitigation measures were employed, the impact to receptors along Sunset Boulevard West would be **less than significant** for Cumulative Plus Project conditions under CEQA checklist threshold (c).

Mitigation for Impact 4.11-2 (2035 CIP Plus Project Conditions): For the residential receptors located adjacent to Sunset Boulevard West from Amoruso Way to Westbrook Boulevard, the use of noise barriers to mitigate traffic noise is not feasible because these lots are accessed directly off Sunset Boulevard and driveway opening would negate any noise reduction that could otherwise be achieved by a sound wall. One alternative mitigation measure could include speed reduction measures to limit vehicle travel speeds to 50 mph or less on this section of roadway. This would be a 5 mph reduction over the existing speed limit and would reduce traffic noise levels by 1 dB or more. This would reduce the total increase in traffic noise levels to 2.3 dB or less. A 2.3 dB increase would be less than the 3 dB test of significance on this roadway segment. Another mitigation option could include the use Open Graded Asphalt Concrete (OGAC), also known as "quieter pavement." These types of overlay pavements have been shown to achieve long term noise reductions of approximately 3-5 dB. Use of this type of pavement would reduce traffic noise by a minimum of 3 dB. Therefore, the project's net increase would be approximately 0.3 dB and would be less than the 3 dB test of significance on this roadway segment. If either of these mitigation measures were employed, the impact to receptors along Sunset Boulevard West would be **less than significant** for Cumulative Plus Project conditions under CEQA checklist threshold (c).

<u>Significance after Mitigation:</u>
Existing Plus Project Significance: **Significant unavoidable**
Cumulative 2035 No Project: **Less than significant**.
Cumulative 2035 Plus Project Significance: **Less than significant with mitigation**.
2035 CIP No Project: **Less than significant**.
2035 CIP Plus Project Significance: **Less than significant with mitigation**

Impact 3 **Traffic Noise Impacts at Future Noise-Sensitive Land Uses Developed Within the Project Area.** Proposed residential land uses located adjacent to any of the major project-area arterial roadways may be impacted by exterior noise levels exceeding 60 dB L_{dn} and interior noise levels exceeding 45 dB L_{dn}. Because it is likely that residential uses will be developed within areas exposed to projected future traffic noise levels in excess of the applicable noise standards, this impact is considered significant according to the Project's Significance Criteria. This is considered to be a **potentially significant** impact.

Traffic Noise Levels at Proposed Residential Uses

The FHWA traffic noise prediction model was used to predict 2035 Plus Project traffic noise levels at the proposed residential land uses associated with the project. Please note that for this analysis, a combination of 2035 CIP Plus Project and 2035 Cumulative Plus Project traffic volumes were used. The higher of the two traffic volumes was used on each roadway segment, therefore, this analysis is considered conservative as some segments may experience lower traffic volumes than assumed. Table 12 shows the predicted traffic noise levels at the proposed residential uses adjacent to the major project-area arterial roadways. Table 12 also indicates the property line noise barrier heights required to achieve compliance with an exterior noise level standard of 60 dB L_{dn}.

Appendix D provides the complete inputs and results to the FHWA traffic noise prediction model and barrier calculations. The modeled noise barriers assume flat site conditions where roadway elevations, base of wall elevations, and building pad elevations are approximately equivalent.

TABLE 12: 2035 CIP PLUS PROJECT / 2035 CUMULATIVE PLUS PROJECT TRAFFIC NOISE LEVELS AT PROPOSED RESIDENTIAL USES

Roadway	Segment	Approximate Residential Setback, feet[1]	ADT	Predicted Traffic Noise Levels, dB L_{dn} [2]				
				No Wall	6' Wall	7' Wall	8' Wall	9' Wall
Westbrook Blvd	South of Road A	350	31,300	59	--	--	--	--
Westbrook Blvd	Road A to Road B	280	31,300	55[3]	--	--	--	--
Westbrook Blvd	Road B to Road C	90	18,500	60[3]	--	--	--	--
Westbrook Blvd	Road C to Road D	90	18,500	60[3]	--	--	--	--
Westbrook	Road D to Road E	90	16,700	60[3]	--	--	--	--

TABLE 12: 2035 CIP PLUS PROJECT / 2035 CUMULATIVE PLUS PROJECT TRAFFIC NOISE LEVELS AT PROPOSED RESIDENTIAL USES

Roadway	Segment	Approximate Residential Setback, feet[1]	ADT	Predicted Traffic Noise Levels, dB L_{dn} [2]				
				No Wall	6' Wall	7' Wall	8' Wall	9' Wall
Blvd								
Westbrook Blvd	North of Road E	90	16,700	60[3]	--	--	--	--
Road - A	West of Westbrook Blvd	65	7,100	58	--	--	--	--
Road - A	East Of Westbrook Blvd	65	8,100	59	--	--	--	--
Road - B	East Of Westbrook Blvd	65	3,700	55	--	--	--	--
Road - C	West of Westbrook Blvd	65	3,600	55	--	--	--	--
Road - D	West of Westbrook Blvd	65	4,700	56	--	--	--	--
Road - D	East Of Westbrook Blvd	65	10,200	60	--	--	--	--
Road - E	West of Westbrook Blvd	220	1,300	43	--	--	--	--
All Internal Roads	Estimated Less Than 3500 ADT	65	3,500	55	--	--	--	--
Placer Pkwy	LDR - West of Westbrook Blvd	150	18,600	68	64	64	63	63
Placer Pkwy	MDR - West of Westbrook Blvd	150	18,600	68	64	64	63	63
Placer Pkwy	HDR - East of Westbrook Blvd	250	33,500	68	63	62	62	61

[1] Setback distances are measured in feet from the centerlines of the roadways to the center of residential backyards.
[2] The modeled noise barriers assume that Placer Parkway may be elevated by 15 feet relative to the project site. The noise barrier design should be reviewed when detailed grading plans are available for the proposed project and the Placer Parkway project.
[3] Assumes that outdoor activity areas will be shielded by an intervening building(s). This is a preferred site design measure to reduce exterior noise and is preferred over the use of sound walls.
-- Meets the City of Roseville's exterior noise criterion without mitigation.
Source: FHWA-RD-77-108 with inputs from Fehr & Peers, and j.c. brennan & associates, Inc. 2014.

The Table 12 data indicate that noise barriers ranging in height from 6-9 feet could be used to reduce exterior noise levels to approximately 61-63 dB L_{dn} at the proposed residential uses located along the future Placer Parkway. These noise levels exceed the City's 60 dB L_{dn} exterior noise level standard but comply with the City's conditionally acceptable noise level standard of 75 dB L_{dn}. Achieving the City's 60 dB L_{dn} standard is not considered feasible using any other practical noise reduction measures as the City has a sound wall height limit of 7 feet. It should be noted that noise barrier heights of 8-9 feet can be achieved by constructing a 2-3 foot tall berm with a 6-7 foot tall sound wall on top. This would achieve heights of 8-9 feet and still comply with the City's 7 foot sound wall height limit.

Additionally, interior noise levels could exceed the City's 45 dB L_{dn} interior noise level standard. Modern residential construction typically provides an exterior-to-interior noise level reduction of 25 dB. First floor noise exposures at the residential uses along the project roadways are predicted to range between 55-68 dB L_{dn}.

Noise levels at 2nd/3rd floor levels are typically 2-3 dB louder, or 58-71 dB L_{dn}. Based upon a typical exterior-to-interior noise level reduction of 25 dB, interior noise levels would range between 33-46 dB L_{dn}. Therefore, interior noise levels could exceed the City's 45 dB L_{dn} interior noise level standard. Therefore, noise control measures would be required for these uses.

At this time no building plans are available for the proposed project. Therefore, specific interior noise control measures cannot be recommended at this time. However, it is likely that windows and doors facing Placer Parkway would need to have a sound transmission class (STC) rating of 30-35 would be required for second or third floor facades to meet the 45 dB L_{dn} interior noise level standard. Such measures should be reviewed when building plans are available.

Mitigation for Impact 3:

MM 3a: Sound walls and/or landscaped berm combinations should be constructed along the proposed residential uses located along the Placer Parkway alignment. The Table 12 data indicate that noise barriers ranging in height from 6-9 feet could be used to reduce exterior noise levels to approximately 61-63 dB L_{dn} at the proposed residential uses located along the future Placer Parkway. These noise levels exceed the City's 60 dB L_{dn} exterior noise level standard but comply with the City's conditionally acceptable noise level standard of 75 dB L_{dn}. Achieving the City's 60 dB L_{dn} standard is not considered feasible using any other practical noise reduction measures as the City has a sound wall height limit of 7 feet. It should be noted that noise barrier heights of 8-9 feet can be achieved by constructing a 2-3 foot tall berm with a 6-7 foot tall sound wall on top. This would achieve heights of 8-9 feet and still comply with the City's 7 foot sound wall height limit. Figure 8 shows a preliminary barrier placement design.

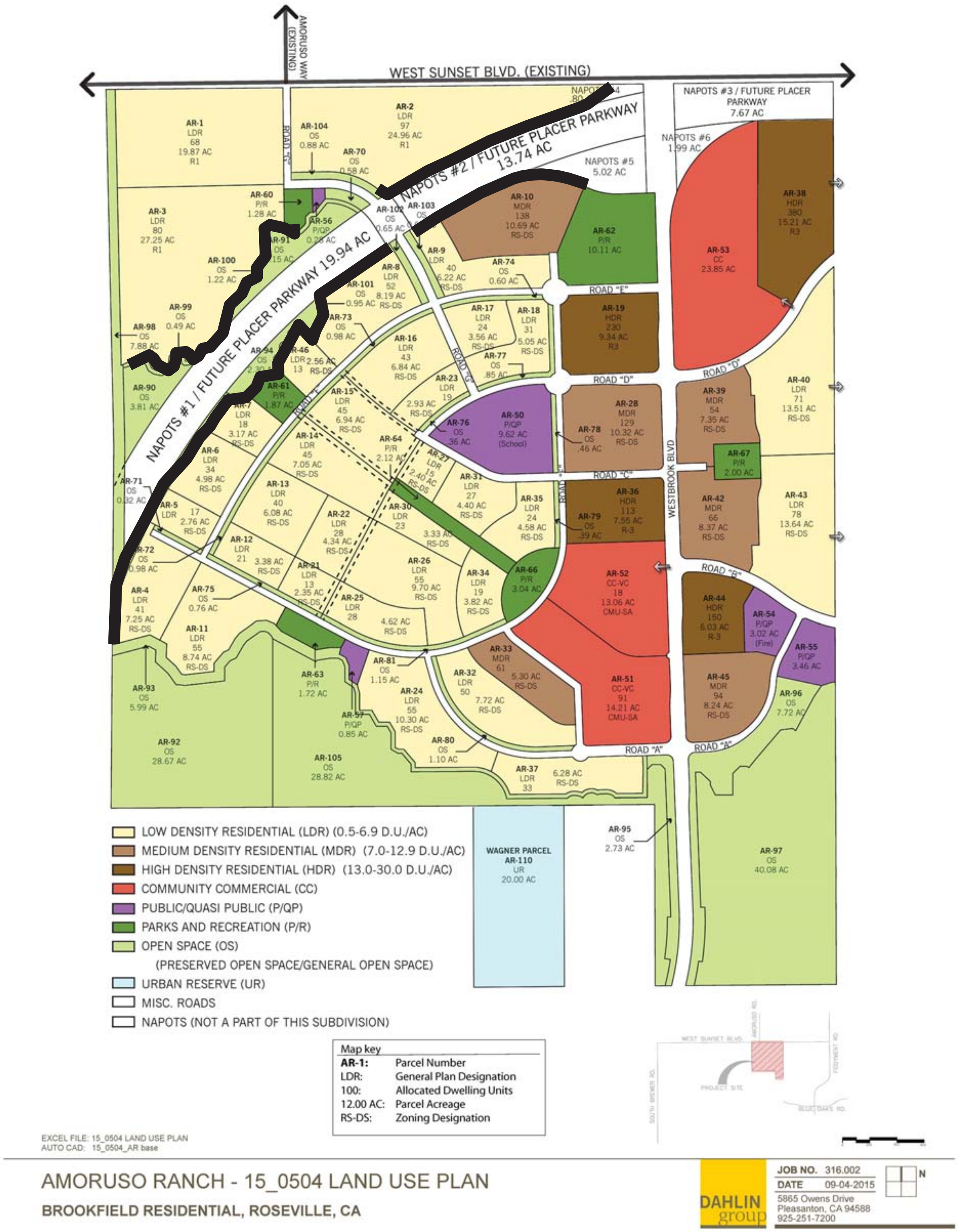
MM 3b Noise barrier walls should be constructed of concrete panels, concrete masonry units, earthen berms, or any combination of these materials. Wood is not recommended due to eventual warping and degradation of acoustical performance.

MM 3c A detailed analysis of interior noise levels shall be conducted when building plans are available for the residential uses adjacent to the proposed Placer Parkway alignment. The analysis shall detail noise control measures that are required to achieve compliance with the City of Roseville 45 dB L_{dn} interior noise level standard. Such analysis shall be conducted by a qualified acoustical consultant recognized by the City of Roseville.

MM 3d: Mechanical ventilation shall be installed in all residential uses to allow residents to keep doors and windows closed, as desired for acoustical isolation.

MM 3e: For residential receptors constructed adjacent to the future Placer Parkway/Westbrook Boulevard intersection/interchange, a detailed noise analysis should be conducted when the intersection/interchange geometrics and grading designs are available.

<u>Significance after Mitigation:</u> **Less than Significant**.



Amoruso Ranch Specific Plan

Figure 8: Noise Barrier Locations

Legend

: Noise Barrier

j.c. brennan & associates
consultants in acoustics

Figure Prepared November 2015

Impact 4 **Roseville Energy Park (REP) Noise Impacts at Future Noise-Sensitive Land Uses Developed Within the Project Area.** Proposed residential land uses may be exposed to audible noise from operations at the REP. However, while the REP was audible at the project site, noise levels were not measured to exceed City standards. This is considered to be a **less than significant** impact.

REP Noise Levels at Proposed Residential Uses

REP noise levels were observed to be less than 41 dB L_{eq} during normal operations. Louder noise levels are typically associated with startup of the REP or during periods of peak operations. Average noise level operations for the REP relative to the Amoruso Ranch project site are presented on Figure 6. The Figure indicates that the project site would fall outside of the 50 dB L_{eq} and 45 dB L_{eq} noise contour zones of the REP. Therefore, noise levels are not predicted to exceed the City's 55 dB L_{eq} noise level standard for municipal power plants. Therefore, this would be a less than significant impact.

Impact 5 **Impacts of Commercial Noise Sources on Planned Noise-Sensitive Uses in the Project Area.** Because the zoning of the commercial uses would allow for certain activities which could generate significant non-transportation noise, the potential for adverse noise impacts exists, even though it cannot be fully quantified at this time. This is considered to be a **potentially significant** impact.

Title 19 (Zoning) of the City of Roseville Municipal Code outlines the types of uses allowed in Community Commercial zones. The following a summary of the allowed uses which are principally permitted:

Community Assembly
Community Services
Essential Services
Libraries
Public Parking Services
College, Elementary, and Secondary Schools
Grooming and Pet Stores
Veterinary Clinic
Gasoline Sales
Banks and Financial Services
Bar and Drinking Places
Business Support Services
Amusement Center
Indoor Entertainment
Indoor Sports and Recreation
Community Care Facility
Day Care Center
Fast Food and Drive Through Restaurant

Convenience Store
Full Service Restaurant
Maintenance and Repair
Medical Services
Office, Professional
Retail Sales and Services
Vocational Schools

A summary of other uses which are conditionally permitted or administratively permitted include the following:

General Hospital Services
Private Elementary and Secondary Schools
Single-Family, Two-Family, and Multifamily Dwellings
Veterinary Hospital
Automotive Repairs
Automotive Sales
Car Wash and Detailing
Building Material Stores
Outdoor Sports and Recreation
Nightclubs
Storage, Personal Storage Facility
Commercial Laundries

The above-listed permitted uses primarily include indoor activities, with a few exterior noise sources that could exceed the City's exterior noise level standards at the boundary line of sensitive residential uses. Examples of exterior noise sources include parking lots, mechanical equipment, drive-through speakers. Some of the conditionally permitted uses include more substantial exterior noise sources such as car washes, automotive repair, and outdoor recreation. These types of noise sources are more likely to result in exceedance of the City's exterior noise level standards at sensitive receptor locations.

Table 12 lists various noise levels associated with different types of uses that could be approved on the Community Commercial parcels.

TABLE 13: POTENTIAL NON-TRANSPORTATION NOISE LEVEL FOR VARIOUS LAND USES

Use	L_{eq}[1] at 100 feet	Noise Sources	Distance to Noise Contours, feet							
			No Wall		6' Wall		7' Wall		8' Wall	
			50 dB	45 dB	50 dB	45 dB	50 dB	45 dB	50 dB	45 dB
Auto Repair, tire shop	57	Typical service center activities	231	411	130	231	116	206	103	184
Loading Docks	64	Truck deliveries, loading/unloading	473	842	266	473	237	422	211	376
Fast Food Drive Through	45	Car idling, drive through speaker	53	95	30	53	27	48	24	42
Car Wash	63	Car idling, blowers, mechanical equipment.	447	794	251	447	224	398	200	355
Truck Circulation	54	Heavy truck deliveries, approximately 5 per hour.	156	278	88	156	78	139	70	124
Busy Parking Lot	54	Typical busy retail type parking lot, vehicle movements, door slamming, people conversing, etc.	158	281	89	158	79	141	71	126
Vendor Deliveries	53	Typical bread, food, dairy, UPS, FexEx type deliveries, etc.	133	237	75	133	67	119	60	106

[1] Maximum noise levels for these noise source are generally 10-15 dB higher than the average (L_{eq}) values. Because the City's maximum (L_{max}) noise level standards are 20 dB higher than the L_{eq} standards, compliance with the L_{eq} standard will also result in compliance with the L_{max} standard. Therefore, typical Lmax noise levels are not shown in this Table.

Based upon the Table 12 data, exterior noise levels from non-transportation noise sources may exceed the City of Roseville 50 dB L_{eq} daytime and 45 dB L_{eq} nighttime noise level standards at distances of up to 376 feet. The exact degree of noise exposure will depend on the specific use. Table 12 is intended to indicate the likely range of noise levels associated with the various potential uses. However, this list is not exhaustive and higher noise levels could occur depending on the exact use.

Mitigation for Impact 5:

For all commercial uses within 500 feet of residential uses, the developer shall implement the following or equally effective measures:

- Where commercial land uses adjoin residential property lines, the following measures shall be included in the design of the commercial use. If the primary noise sources are parking lot noise, HVAC equipment and light truck deliveries, then 6-7 foot tall masonry walls shall be constructed to provide adequate isolation of parking lot and delivery truck activities. HVAC equipment shall be located either at ground level, or when located on roof-tops the building facades shall include parapets for shielding.

- Where commercial uses adjoin common residential property lines, and loading docks or truck circulation routes face the residential areas, the following mitigation measures shall be included in the project design:

  - Loading docks and truck delivery areas shall be a minimum distance of 211 feet from residential property lines;
  - Property line barriers shall be 8 feet in height. Circulation routes for trucks shall be located a minimum of 80-feet from residential property lines;
  - Loading dock and truck deliveries shall be limited to daytime hours;
  - All heating, cooling and ventilation equipment shall be located within mechanical rooms where possible;
  - All heating, cooling and ventilation equipment shall be shielded from view with solid barriers;
  - Emergency generators shall comply with the local noise criteria at the nearest noise-sensitive receivers;
  - In cases where loading docks or truck delivery circulation routes are located less than 211 feet from residential property lines or if nighttime deliveries are required, an acoustical evaluation shall be submitted to verify compliance with the City of Roseville Noise Level Performance Standards.

- Conditionally permitted uses which include more substantial exterior noise sources such as car washes, automotive repair, and outdoor recreation shall have a noise study prepared documenting compliance with the City of Roseville Noise Level Performance Standards at the nearest sensitive receptors.

<u>Significance after Mitigation:</u> **Less than Significant**.

Impact 6 **Impacts of Neighborhood Park and School Noise Sources on Planned Noise-Sensitive Uses in the Project Area.** Noise from active recreation parks and school playgrounds could generate noise levels in excess of the City of Roseville standards. This is considered to be a **potentially significant** impact.

Neighborhood Parks or School Playgrounds:

Children playing at neighborhood parks or school playgrounds are often considered potentially significant noise sources which could adversely affect adjacent noise-sensitive land uses. Typical noise levels associated with groups of approximately 50 children playing at a distance of 50 feet generally range from 55 to 60 dB L_{eq}, with maximum noise levels ranging from 70 to 75 dB L_{max}. It is expected that the playground areas would be utilized during daytime hours. Therefore, noise levels from the playgrounds would need to comply with the City of Roseville 50 dB L_{eq} and 70 dB L_{max} exterior noise level standards at the nearest residential uses. Based upon the reference noise level data discussed above, the 50 dB L_{eq} noise contour would be located approximately 158 feet from the center of park or playground areas. The 70 dB L_{max} contour would be located at approximately 90 feet from the center of park or playground areas.

Given the proximity of most parks to residential uses, the potential for exceedance of the City of Roseville noise standards exists, depending on the orientation and proximity of the play areas to those nearest residences, the number of children using the play areas at a given time, and the types of activities the children are engaged in.

If park or playground areas are separated from residential uses by local roadways, no additional mitigation measures would typically be considered necessary. However, where neighborhood parks abut residential uses, a 6-foot tall sound wall, or 160 foot setback to play areas should be considered. With construction of a 6-foot tall sound wall, park or playground noise would typically be reduced by 5 dB. Therefore, with a 6-foot tall sound wall, the 50 dB L_{eq} noise contour would be located approximately 90 feet from the center of park or playground areas. The 70 dB L_{max} contour would be located at approximately 28 feet from the center of park or playground areas.

Mitigation for Impact 6:

MM 6: 6 foot tall sound walls, or 160 foot setbacks adjacent to active recreation areas, should be included in the project design where neighborhood parks or schools abut residential uses.

Significance after Mitigation: **Less than Significant**.

Impact 7 **Impacts of Aviation Noise on Planned Noise-Sensitive Uses in the Project Area.** Aviation noise from the McClellan Airfield could exceed allowable standards and be a cause for sleep disturbance to new sensitive receptors established as part of the proposed project. This is considered to be a **potentially significant** impact.

Exterior Noise Level Standard:

Figure 9 indicates that the 60 dB CNEL "Theoretic Capacity" noise contour for McClellan Airfield would remain south of Elverta Road. Therefore, exterior noise levels from aircraft operations are not predicted to exceed the City of Roseville 60 dB L_{dn}/CNEL exterior noise level standard on the project site. Additionally, aircraft operations are not predicted to exceed the City's 45 dB L_{dn}/CNEL interior noise level standard on the project site.

Sleep Disturbance:

The California Airport Noise Regulations provides a discussion on the potential for sleep disturbance from aircraft operations. The following are excerpts from that study:

> *The extent to which environmental noise disturbs human sleep patterns varies greatly from individual to individual as well as from one time to another for any particular individual. Whether an individual is aroused by a noise depends upon the individual's sleep state and sleep habits, the loudness or suddenness of the noise, the information value of the noise (a child crying, for example), and other factors.*
>
> *Early studies of the effects of noise on sleep disturbance produced varying results. A major factor in these differences, though, is whether the study evaluated people sleeping in a laboratory or in their own homes. Generally laboratory studies have shown considerably more sleep disturbance than is evident in field studies. More recent studies, all conducted in the field, have produced relatively consistent results. These studies have included:*
>
> - *A 1990 British Study;*
> - *A 1992 U.S. Air Force study on residents near Castle Air Force Base and Los Angeles International Airport; and*
> - *A 1995 study comparing the effects of the closure of Stapleton International Airport with the opening of Denver International Airport.*
>
> *In 1997, the Federal Interagency Committee on Aviation Noise (FICAN) sought to put the subject to rest with publication of a recommended new dose-response curve predicting awakening. This curve was calculated using data from the above three studies, among others. The 1997 FICAN curve represents the upper limit of the observed field data and should be interpreted as predicting the maximum percent of the exposed population expected to be behaviorally awakened.*

For the purposes of evaluating the potential for sleep disturbance due to interior noise from aircraft operations over the project site, j.c. brennan & associates, Inc. utilized the methods described in ANSI/ASA S12.9-2008/Part 6, along with the FICAN research, as described in Annex B of the ANSI procedures. The ANSI procedures calculate the probability of behavioral awakenings while accounting for the predicted mean indoor sound exposure level (SEL) at the future residential uses on the project site and the number of observed nighttime aircraft events. Appendix E provides the complete inputs and results of the sleep disturbance calculations.

Noise monitoring conducted at Site B on the Amoruso Ranch project site did not see any SEL aircraft events exceeding 75 dB during nighttime hours. The only SEL event exceeding 75 dB occurred at 5:23 p.m. on January 6, 2014. The measured SEL for this event was 82.6 dB. While nighttime overflights were not observed during the ambient noise level survey for the project, some nighttime activity is known to occur. During the 7 days of noise monitoring aircraft operations, at the Creekview Specific Plan project site to the south, one nighttime (10:00 p.m. to 7:00 a.m.) event occurred having an SEL of 75 dB or greater. The event occurred on December 14, 2006 at 12:49 a.m. and resulted in an SEL of 82.6 dB.

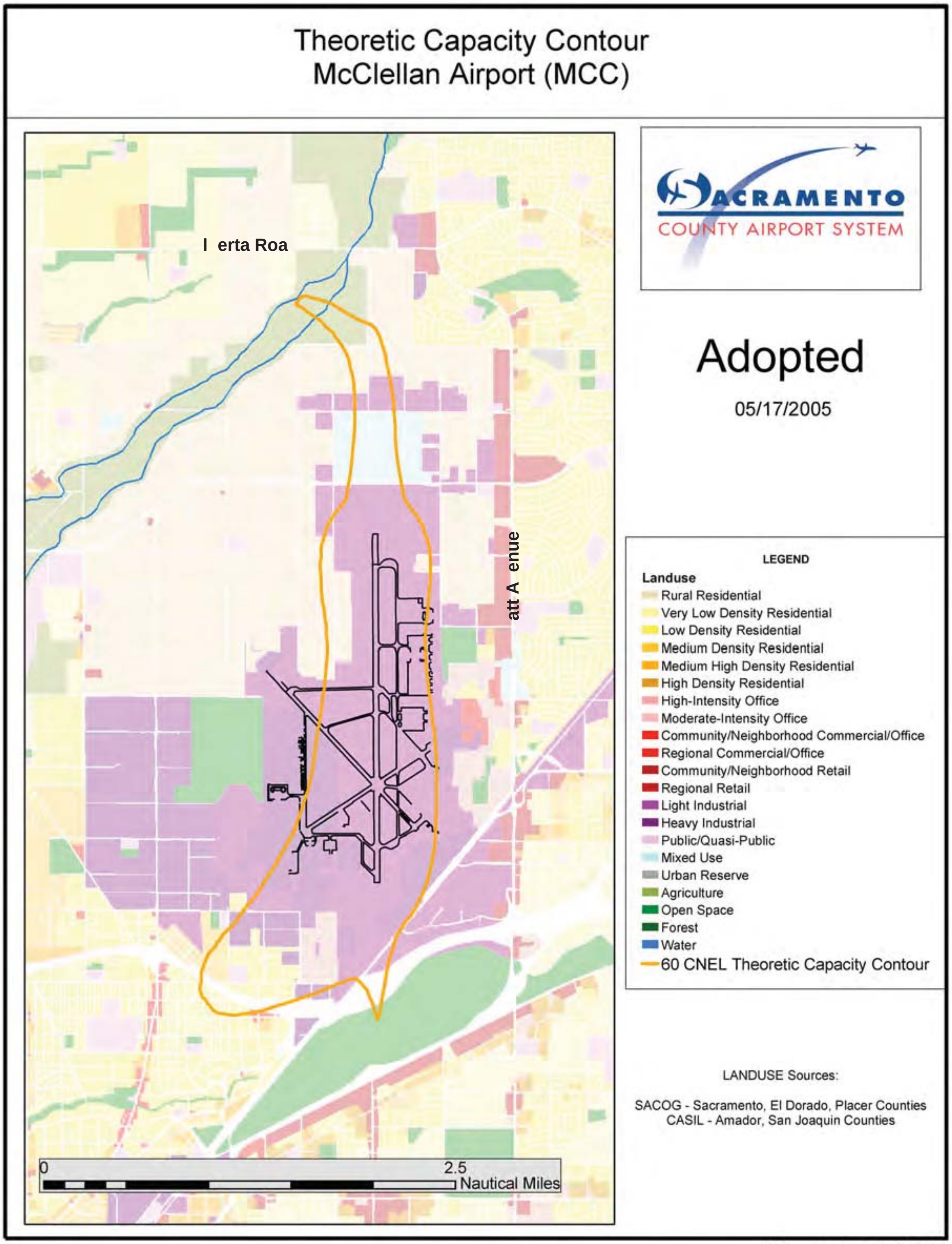
Using one nighttime SEL of 82.6 dB, and assuming that typical construction practices will achieve an exterior to interior noise level reduction of 25 dB with the windows in the closed position, the interior SEL would be approximately 57.6 dB. Based upon the ANSI procedures, the maximum percent awakened would be approximately 2.6 percent. FICAN explained that, “because the adopted curve represents the upper limit of the data presented, it should be interpreted as predicting the maximum percent of the exposed population expected to be behaviorally awakened, or the maximum percent awakened” (FICAN 1997).

While the maximum percent awakened is considered to be fairly low, there is still a potential for annoyance to future residents in the Amoruso Ranch Specific Plan area. Therefore, this impact is considered **potentially significant**.

Mitigation for Impact 7:

MM7: Buyers and renters in the Amoruso Ranch Specific Plan area should be notified that aircraft flyovers occur during the daytime and nighttime periods.

<u>Significance after Mitigation:</u> **Less than Significant**.



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Amoruso Ranch Specific Plan

Figure : Mc lellan Airport oise ontour

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Figure Prepared ctober 2014

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 (Hz).
L_{dn}	Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.
Leq	Equivalent or energy-averaged sound level.
L_{max}	The highest root-mean-square (RMS) sound level measured over a given period of time.
$L_{(n)}$	The sound level exceeded a described percentile over a measurement period. For instance, an hourly L_{50} is the sound level exceeded 50% of the time during the one hour period.
Loudness	A subjective term for the sensation of the magnitude of sound.
Noise	Unwanted sound.
NRC	Noise Reduction Coefficient. NRC is a single-number rating of the sound-absorption of a material equal to the arithmetic mean of the sound-absorption coefficients in the 250, 500, 1000, and 2,000 Hz octave frequency bands rounded to the nearest multiple of 0.05. It is a representation of the amount of sound energy absorbed upon striking a particular surface. An NRC of 0 indicates perfect reflection; an NRC of 1 indicates perfect absorption.
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	Sound Exposure Level. SEL is s rating, in decibels, of a discrete event, such as an aircraft flyover or train passby, that compresses the total sound energy into a one-second event.
STC	Sound Transmission Class. STC is an integer rating of how well a building partition attenuates airborne sound. It is widely used to rate interior partitions, ceilings/floors, doors, windows and exterior wall configurations.
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.
Impulsive	Sound of short duration, usually less than one second, with an abrupt onset and rapid decay.
Simple Tone	Any sound which can be judged as audible as a single pitch or set of single pitches.

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Appendix B

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

Predicted Levels

Project #: 2011-143 Amoruso Ranch Specific Plan
Description: 2035 Cumulative + Project Amoruso Ranch (Sheet 2 of 2)
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	From	To	Autos	Medium Trucks	Heavy Trucks	Total
26	Woodcreek Oaks	Pleasant Grove	Junction	59.5	51.6	53.4	61.0
27	Woodcreek Oaks	Junction	Baseline	58.9	51.0	52.8	60.4
28	Foothills	N. of Blue Oake		67.2	58.6	60.1	68.4
29	Foothills	Blue Oaks	Pleasant Grove	64.3	55.7	57.2	65.5
30	Foothills	Pleasant Grove	Junction	63.3	54.7	56.2	64.5
31	Foothills	Junction	Baseline	65.0	56.4	57.9	66.2
32	Foothills	S. of Baseline		66.9	58.3	59.8	68.2
33	Washington	Blue Oaks	Roseville Pkwy	62.9	54.3	55.8	64.1
34	Washington	Roseville Pkwy to Pleasant Grove		60.7	52.0	53.5	61.9
35	Washington	Pleasant Grove	Junction	63.0	54.4	55.9	64.3
36	Washington	Junction	Baseline	70.9	62.2	63.7	72.1
37	Sunset West	Pleasant Grove	Amoruso	57.0	47.2	48.1	57.9
38	Sunset West	Amoruso	Westbrook	57.4	47.7	48.6	58.3
39	Pleasant Grove	N. of Baseline		63.5	53.7	54.6	64.4

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Appendix B

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

Predicted Levels

Project #: 2011-143 Amoruso Ranch Specific Plan
Description: 2035 C P No Project Amoruso Ranch (Sheet 2 of 2)
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	From	To	Autos	Medium Trucks	Heavy Trucks	Total
26	Woodcreek Oaks	Pleasant Grove	Junction	59.9	52.0	53.8	61.4
27	Woodcreek Oaks	Junction	Baseline	59.2	51.3	53.1	60.7
28	Foothills	N. of Blue Oake		67.9	59.3	60.8	69.1
29	Foothills	Blue Oaks	Pleasant Grove	64.5	55.9	57.4	65.8
30	Foothills	Pleasant Grove	Junction	63.3	54.7	56.2	64.6
31	Foothills	Junction	Baseline	64.9	56.3	57.8	66.2
32	Foothills	S. of Baseline		66.9	58.3	59.7	68.1
33	Washington	Blue Oaks	Roseville Pkwy	62.9	54.3	55.7	64.1
34	Washington	Roseville Pkwy to Pleasant Grove		60.6	51.9	53.4	61.8
35	Washington	Pleasant Grove	Junction	63.0	54.3	55.8	64.2
36	Washington	Junction	Baseline	70.8	62.2	63.7	72.0
37	Sunset West	Pleasant Grove	Amoruso	52.6	42.8	43.8	53.5
38	Sunset West	Amoruso	Westbrook	51.9	42.1	43.0	52.8
39	Pleasant Grove	N. of Baseline		63.2	53.4	54.4	64.1

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Appendix B

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

Predicted Levels

Project #: 2011-143 Amoruso Ranch Specific Plan
Description: 2035 C P + Project Amoruso Ranch (Sheet 2 of 2)
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	From	To	Autos	Medium Trucks	Heavy Trucks	Total
26	Woodcreek Oaks	Pleasant Grove	Junction	60.1	52.2	54.0	61.6
27	Woodcreek Oaks	Junction	Baseline	59.4	51.5	53.3	60.9
28	Foothills	N. of Blue Oake		67.8	59.2	60.7	69.1
29	Foothills	Blue Oaks	Pleasant Grove	64.5	55.9	57.4	65.8
30	Foothills	Pleasant Grove	Junction	63.3	54.7	56.2	64.6
31	Foothills	Junction	Baseline	64.9	56.3	57.8	66.2
32	Foothills	S. of Baseline		66.9	58.3	59.8	68.2
33	Washington	Blue Oaks	Roseville Pkwy	62.9	54.3	55.8	64.2
34	Washington	Roseville Pkwy to Pleasant Grove		60.6	52.0	53.5	61.8
35	Washington	Pleasant Grove	Junction	62.9	54.3	55.8	64.2
36	Washington	Junction	Baseline	70.8	62.2	63.7	72.1
37	Sunset West	Pleasant Grove	Amoruso	54.9	45.1	46.0	55.8
38	Sunset West	Amoruso	Westbrook	55.2	45.4	46.4	56.1
39	Pleasant Grove	N. of Baseline		63.3	53.5	54.5	64.2

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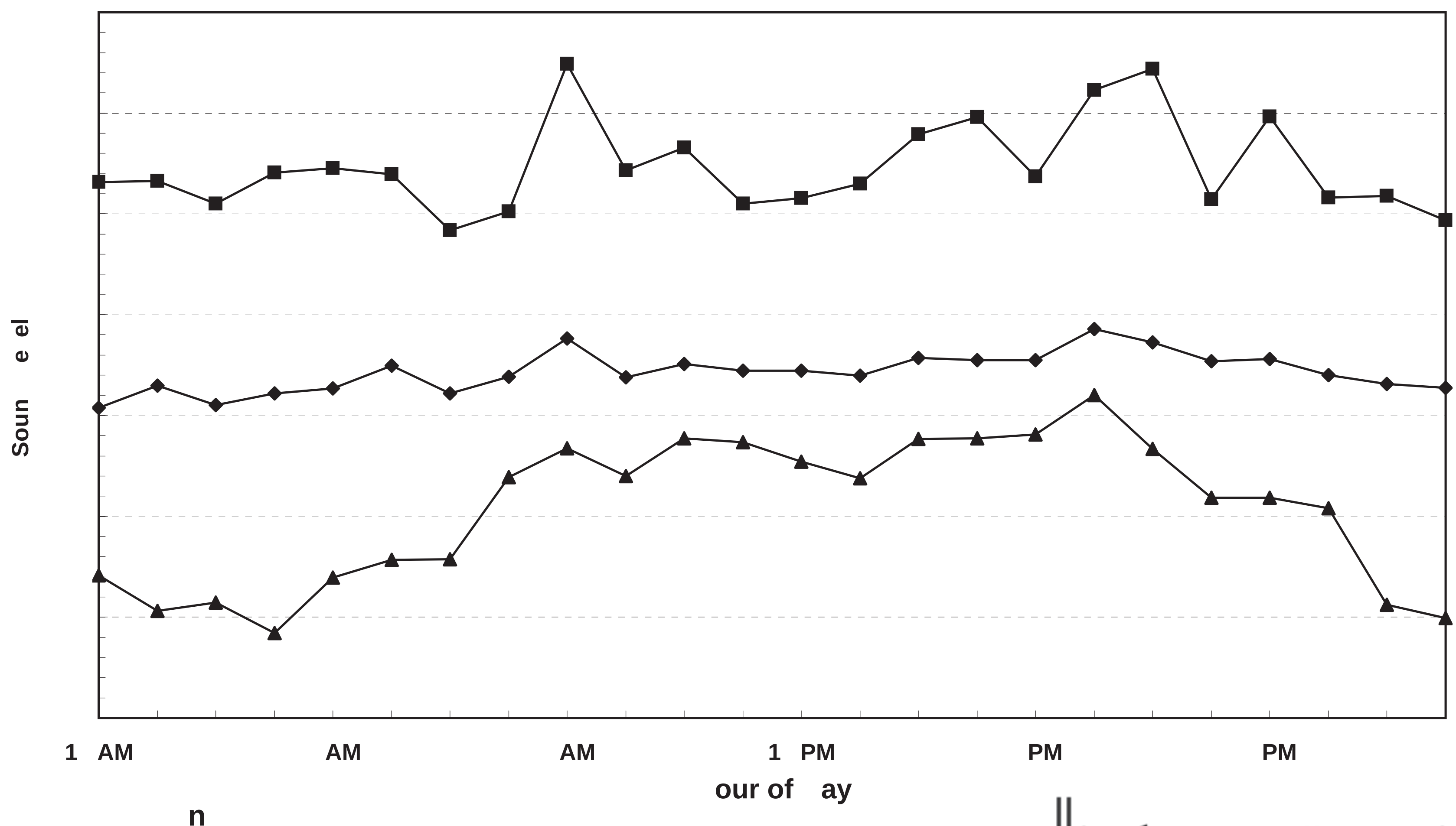

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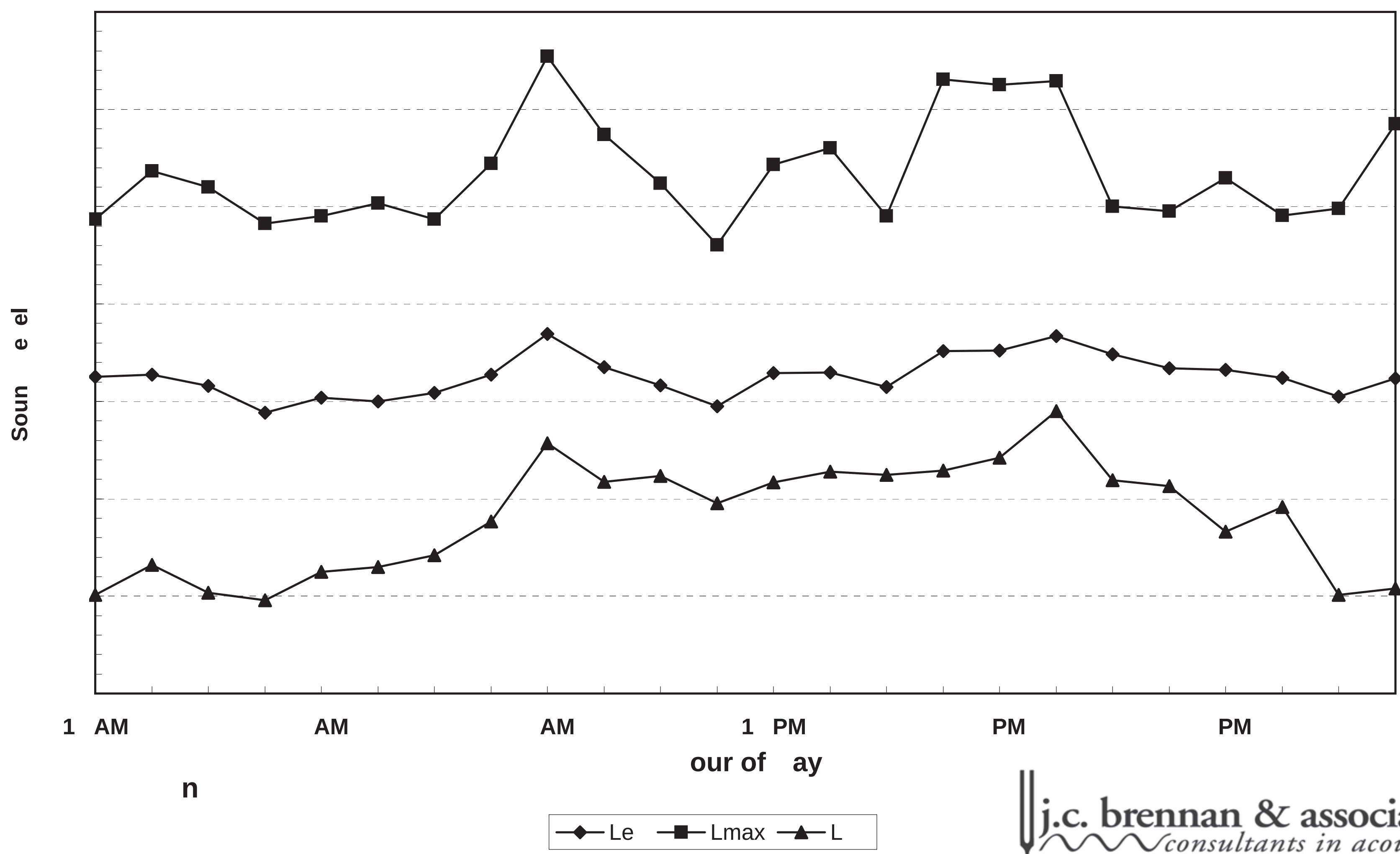

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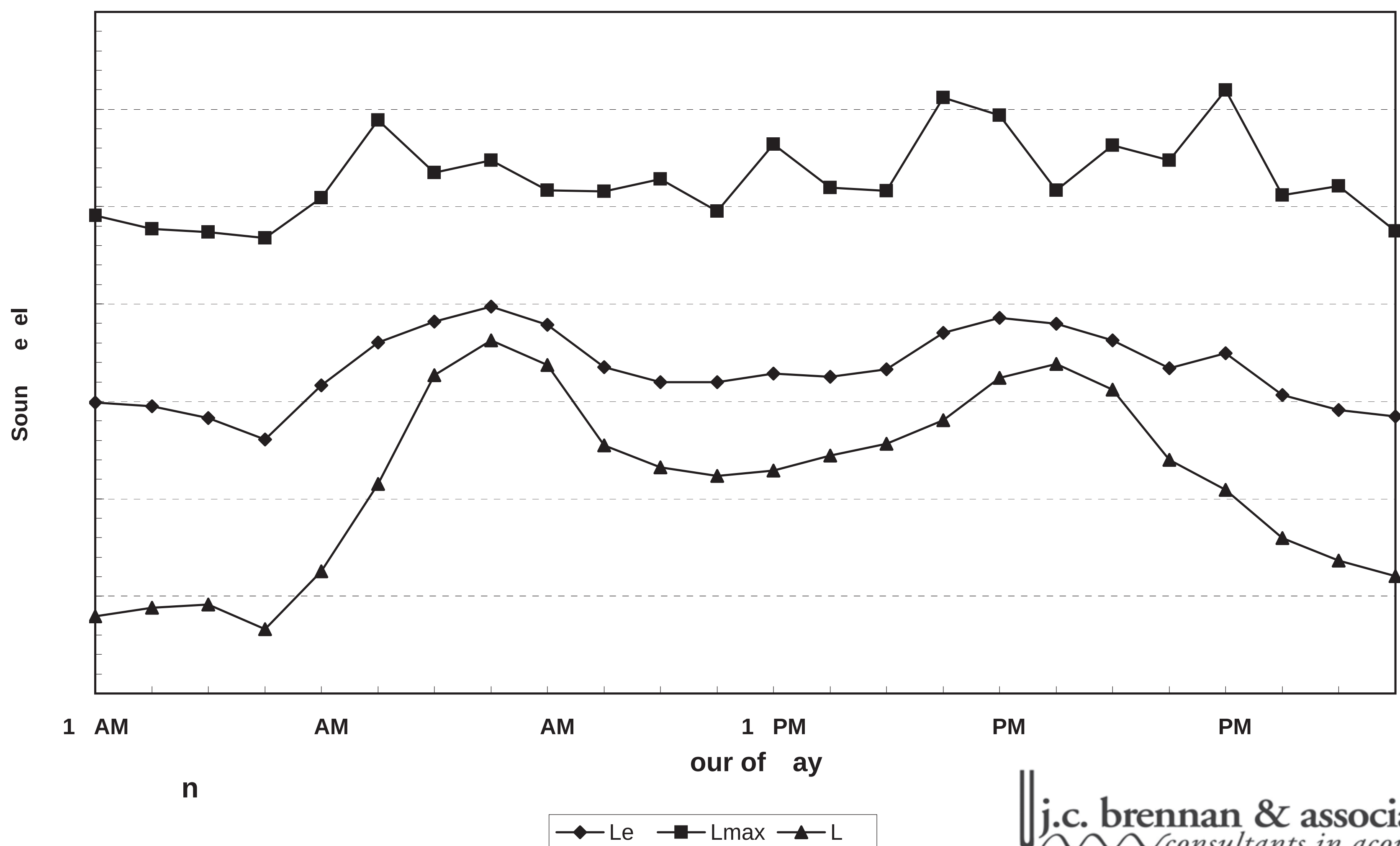

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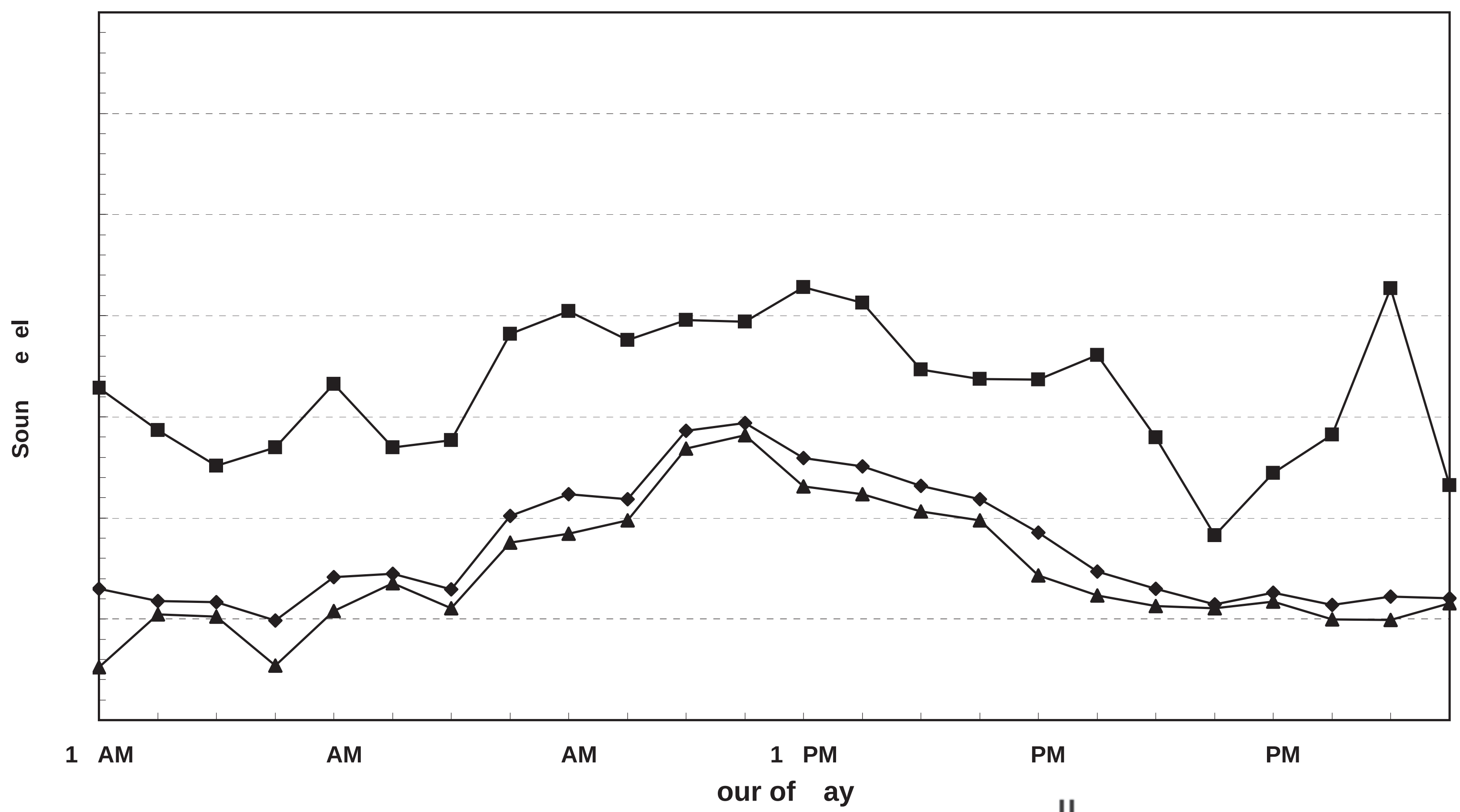

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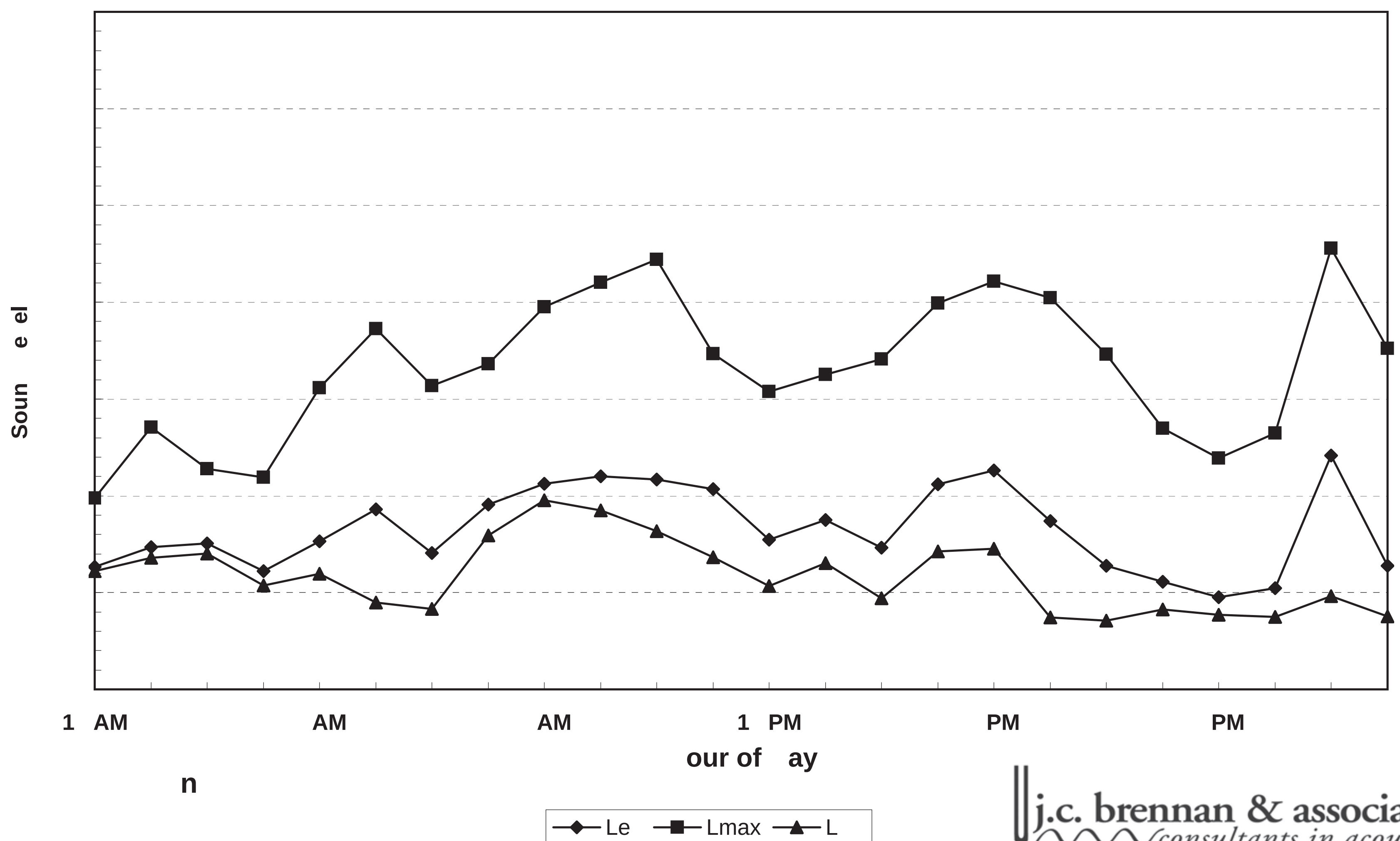

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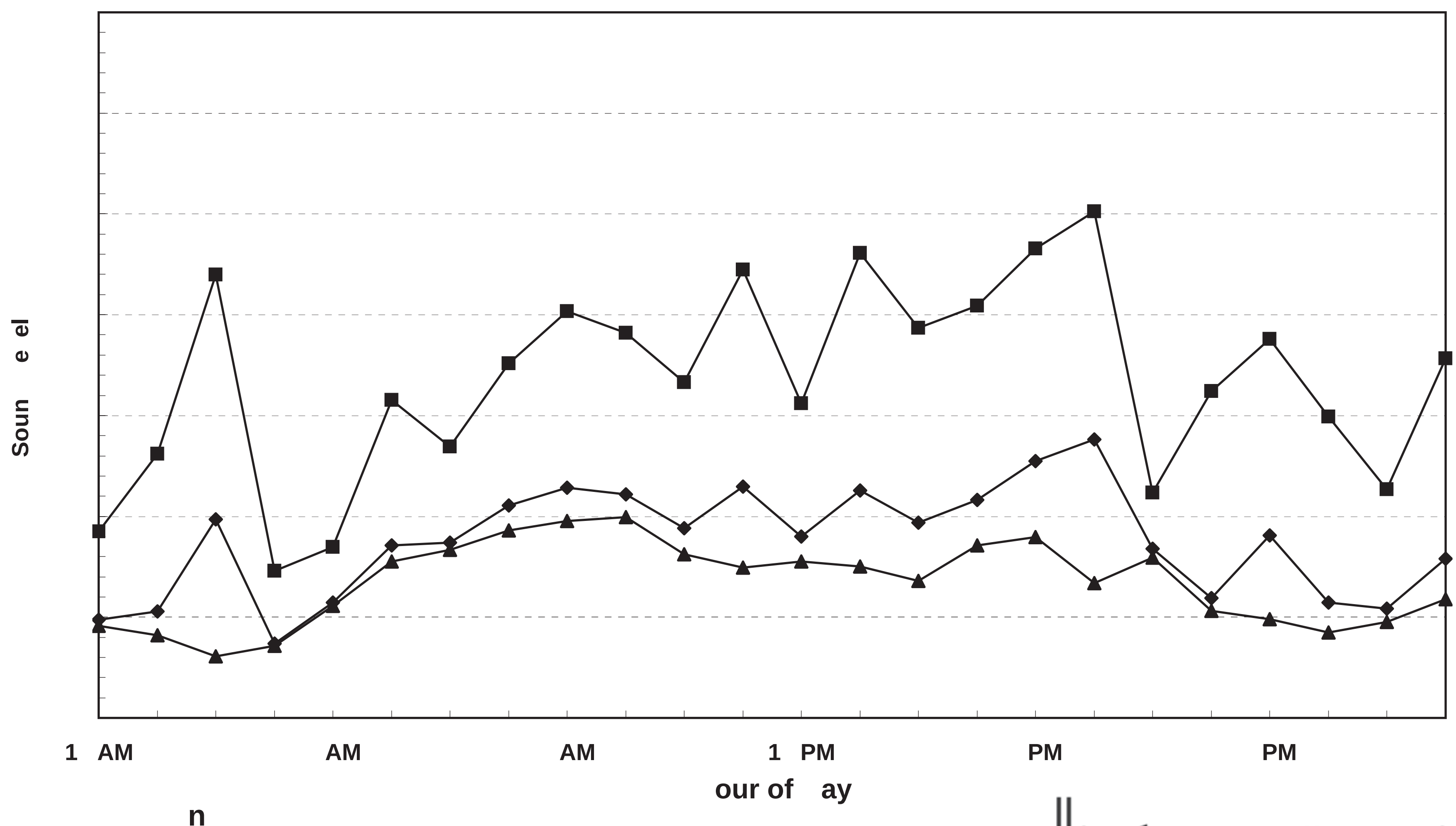

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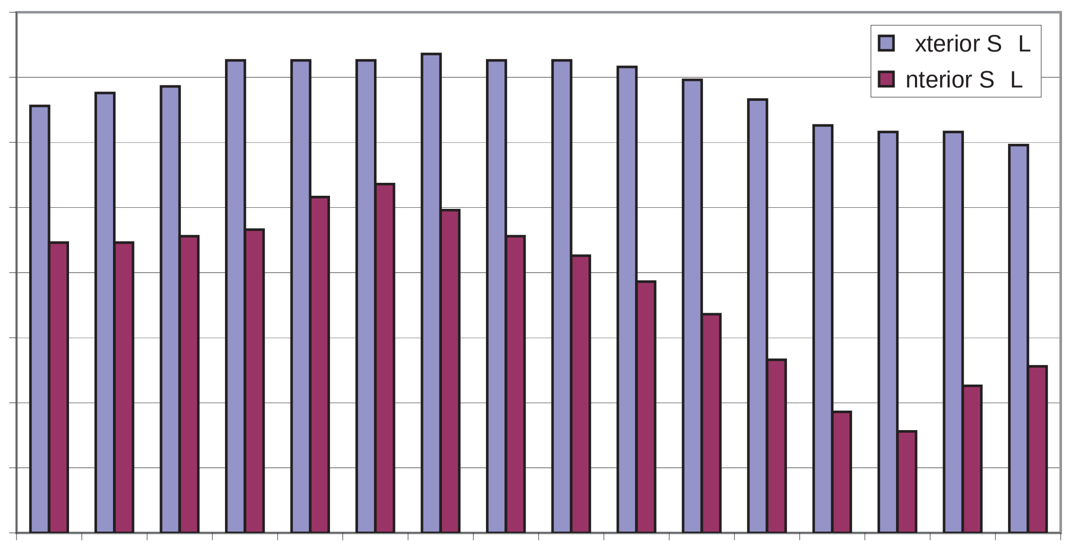

Source *ANSI/ASA S12.9-2008 / Part 6 - Qunatities and Procedures for Description and Measurement of Environmental Sound - Part 6: Methods for Estimation of Awakenings Associated with Outdoor Noise Events Heard in Homes.*

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