Environmental Noise Assessment

Fiddyment Alternative Site

Roseville, California

Job # 2010-121A

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NOISE

INTRODUCTION

The proposed Fiddyment Ranch Specific Plan Amendment 3 project (Proposed Project) is located within the City of Roseville, California. The project proposes to amend the West Roseville Specific Plan (WRSP) to accommodate up to 1,905 additional residential units in an area referred to as Fiddyment Ranch. Under the WRSP, the Fiddyment Ranch area is planned planned for development of 4,207 residential units. Under the proposed Fiddyment Ranch Specific Plan Amendment 3 project, buildout of the Fiddyment Ranch area would accommodate up to a total of 6,112 residential units.

A previous analysis of the noise impacts on the project site was conducted in September 2010. This analysis is intended to evaluate an alternative site which includes high density residential uses of approximately 25 units per acre. In addition, an additional 21,500 square feet of commercial use would also be allocated to the alternative site. The proposed alternative site is located at the northwest quadrant of the I-80 / Douglas Boulevard interchange. Currently this area contains commercial uses, some fast food uses, a gas station and automotive repair uses.

Potential noise sources which may impact the alternative site include traffic on I-80, Harding Boulevard and Douglas Boulevard, and adjacent light industrial noise sources.

The purpose of this analysis is to identify potential impacts and mitigation measures related to the project. Figure 1 shows the project site.

ACOUSTIC TERMINOLOGY¹

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: one person's music is another's headache.

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.

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

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 (Leq), 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 Leq is the foundation of the composite noise descriptor, Ldn, and shows very good correlation with community response to noise.

The day/night average level (Ldn) 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 Ldn represents a 24-hour average, it tends to disguise short-term variations in the noise environment. CNEL is similar to Ldn, but includes a +3 dB penalty for evening noise.

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

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.

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.					

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.

EXISTING CONDITIONS

The existing noise environment on the project site is defined primarily by traffic on I-80, Douglas Boulevard and Harding Boulevard. Some noise occurs due to commercial uses and parking lot use.

Existing Ambient Noise Levels

To quantify the existing ambient noise environment in the project vicinity, j.c. brennan & associates, Inc. conducted short-term noise level measurements at two locations in the center of the project site on February 23, 2011. The noise measurements were conducted to assess the overall noise environment associated with traffic, parking lot activities, and any commercial activities. Table 2 shows the results of the noise measurements.

The sound level meters were programmed to collect hourly noise level intervals at each site during the survey. The maximum value (Lmax) represents the highest noise level measured during an interval. The average value (Leq) represents the energy average of all of the noise measured during an interval. The median value (L50) represents the sound level exceeded 50 percent of the time during an interval.

Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meters were used for the ambient noise level measurement survey. 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 2Measured Ambient Noise LevelsFebruary 23, 2011						
		Measured Sound Levels				
Site	Description	Time	Leq	Lmax	L50	
А	30 feet south of Wells Fargo Building /	7:30 am	63.5 dBA	72.2 dBA	61 dBA	
	110 Harding Boulevard	3:20 pm	66.5 dBA	73.2 dBA	63 dBA	
В	North side of Ace Hardware Building /	8:15 am	64.2 dBA	74.1 dBA	61 dBA	
	108A Harding Boulevard	4:10 pm	66.4 dBA	72.8 dBA	62 dBA	
Source: j.c.	brennan & associates, Inc., 2011					

Existing Roadway Noise Levels

To predict existing noise levels due to traffic, the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA RD-77-108) was used. The model is based upon the Calveno reference noise emission 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 Leq values for free-flowing traffic conditions.

Due to significant shielding of I-80 on the project site, j.c. brennan & associates, Inc. conducted noise level measurements and concurrent counts of I-80 traffic at the project site on February 23, 2011. The purpose of the short-term traffic noise level measurements is to determine the accuracy of the FHWA model in describing the existing noise environment on the project site, accounting for shielding from local topography, actual travel speeds, and roadway grade. Noise measurement results were compared to the FHWA model results by entering the observed traffic volume, speed and distance as inputs to the FHWA model.

Based upon the calibration results, the FHWA Model was found to overpredict I-80 traffic noise levels on the project site between 5 dB and 6 dB, as shown in Table 3. Appendix B shows a complete listing of inputs to the FHWA Calibration Model. The overpredicted noise levels are due to shielding of the I-80 mainline by on-site topography. Based upon observations, the primary noise source was I-80 at the calibration locations, and the west bound off-ramp was not a significant noise source.

	Table 3 Comparison of FHWA Modeled to Measured I-80 Traffic Noise						
Site	Autos	/ehicles/Hr. Med. Trk.	Hvy.Trk.	Speed (mph)	Dist. (Feet)	Measured Leq, dB	Modeled Leq, dB*
1	12,084	132	504	65	320'	65.0	71.1
2	11,196	120	444	65	475	63.3	68.1
* Acou	stically "so	ft" site assumed					

Traffic volumes for existing conditions were obtained from DKS Transportation Consultants for I-80, and from the City of Roseville Department of Public Works for Douglas Boulevard and Harding Boulevard. Truck percentages and vehicle speeds on the local area roadways were estimated from Caltrans data, and field observations. Once again the FHWA model was used to calculate the existing traffic noise levels on the project site. A -5 dB correction was assumed for I-80.

Table 4 shows the existing traffic noise levels in terms of Ldn at a reference distance of 100 feet from the centerlines of the existing project-area roadways identified in the traffic study (existing conditions). This table also shows the distances to existing traffic noise contours. A complete listing of the FHWA Model input data is contained in Appendix C.

Table 4 Existing Traffic Noise Levels and Distances to Contours Fiddyment Ranch Alternative Site – City of Roseville, California						
	Distance to Ldn Contours					
Roadway	Segment	Ldn @ 100 Feet	70 dB	65 dB	60 dB	
I-80	Adjacent to project site	74 dBA	191'	411'	885'	
Douglas Blvd.	Harding Blvd. – I-80 ramps	64 dBA	38'	81'	175'	
Harding Blvd.	Harding Blvd.Douglas Blvd Lead Hill Drive63 dBA32'70'15				150'	
Notes: Distances to traffic noise contours are measured in feet from the centerlines of the roadways. Source: FHWA-RD-77-108 with inputs from DKS Associates, Caltrans and j.c. brennan & associates, Inc. 2010 - 2011.						

REGULATORY CONTEXT

Federal

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

State

Title 24 of the California Code of Regulations establishes standards governing interior noise levels that apply to all new multifamily residential units (hotels, motels, apartments, condominiums, and other attached dwellings) in California. These standards require that acoustical studies be performed prior to construction at residential building locations where the existing exterior Ldn exceeds 60 dBA. Such acoustical studies are required to establish mitigation measures that will limit maximum Ldn noise levels to 45 dBA in any habitable room.

California Environmental Quality Act (CEQA) establishes guidelines for new projects in order to prevent significant, avoidable damage to the environment by requiring changes in projects through the use of alternatives or mitigation measures when the governmental agency finds the changes to be feasible. The CEQA guidelines that pertain to this project are discussed later in this document under the *Standards of Significance*.

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 IX-1 (*Table 4 of this report*). Noise mitigation measures may be required to reduce noise in outdoor activity areas and interior spaces to the levels specified in Table IX-1 (*Table 5 of this report*).

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 IX-3 (*Table 6 of this report*). Noise mitigation may be required to meet Table IX-3 performance standards.
- 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 IX-3 (*Table 6 of this report*).

Policies – General

- 9. Where noise mitigation measures are required to achieve the standards of Tables IX-1 (*Table 5 of this report*) and IX- 3 (*Table 6 of this report*), 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 5(Table IX-1 of the Roseville General Plan Noise Element)Maximum Allowable Noise Exposure Transportation Noise Sources

T	Outdoor Activity	Interior Spaces		
	Ldn/CNEL, dB	Ldn/CNEL, dB	Leq, 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 Ldn/CNEL or less using a practical application of the best-available noise reduction measures, an exterior noise level of up to 75 dB Ldn/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 6(Table IX-3 of the City of Roseville General Plan Noise Element)Performance Standards for Non-Transportation Noise Sources

Noise Level Descriptor	Daytime (7 a.m 10 p.m.)	Nighttime (10 p.m 7 a.m.)
Hourly Average (Leq)	50 dB	45 dB
Maximum Level (Lmax)	70 dB	65 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, 2020 General Plan.

City of Roseville Noise Ordinance:

The City of Roseville has a Municipal Code of Ordinances establishes noise level criteria for sensitive receptors. The criteria are identical to the performance standards in the General Plan Noise Element shown in Table 6 above. The ordinance also establishes exemptions for certain activities. The following exemptions which are pertinent to this project have been identified.

9.24.030 Exemptions

Sound or noise emanating from the following sources and activities are exempt from the provisions of the noise ordinance:

A. Sound sources typically associated with residential uses (e.g., Children at play, air conditioning and similar equipment, but not including barking dogs).

B. Sound sources associated with property maintenance (e.g., lawn mowers, edgers, blowers, pool pumps, power tools, etc.), provided such activities take place between the hours of 8:00 a.m. and 9:00 p.m.

D. The normal operation of public and private schools typically consisting of classes and other school-sponsored activities.

G. 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 shall be fitted with factory installed muffling devices and that all construction equipment shall be maintained in good working order.

9.24.120 Sound Limits for Industrial Properties

Notwithstanding the provisions of Section 9.20.100 (Table 6 of this document), it is unlawful for any person to create any sound, or to allow the creation of any sound, on property with an industrial

zoning designation that is owned, leased, occupied or otherwise controlled by such person where an industrial land use shares a common property line with a sensitive receptor or is separated from a sensitive receptor by a roadway, which causes the exterior sound level when measured at the property line of any affected sensitive receptor to exceed the ambient sound level by seven dBA, or exceed the sound level standards as set forth in (Table 5 of this document) by seven dBA, whichever is greater.

9.24.130 Sound Limits for Events on Public Property

Notwithstanding the provisions of Section 9.24.100, sound sources associated with outside activities on public property (e.g. athletic events, sporting events, fairs, and entertainment events) between the hours of 8:00 a.m. and 10:30 p.m., Sunday through Thursday, and between the hours of 8:00 a.m. and 11:00 .m. on Fridays, Saturdays, and city-recognized holidays, shall not exceed 80 dBA, Lmax at the property line of the property on which the event is being held.

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 7 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,		Factor Change in		
DBA	Subjective Reaction	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 Acc	oustics, M. David Egan, 1988.			

Vibration Criteria

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

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

Human and structural response to different vibration levels is influenced by a number of factors,

including ground type, distance between source and receptor, duration, and the number of perceived vibration events.

Though the City of Roseville does not have vibration criteria, Table 8, which was developed by Caltrans, shows the vibration levels which would normally be required to result in damage to structures. The vibration levels are presented in terms of peak particle velocity in inches per second.

Table 8 indicates that the threshold for damage to structures ranges from 2 to 6 in/sec. One-half this minimum threshold or 1 in/sec p.p.v. is considered a safe criterion that would protect against architectural or structural damage. The general threshold at which human annoyance could occur is notes as 0.1 in/sec p.p.v.

Table 8				
	Effe	ects of Vibration on People and 2	Buildings	
Peak Particle Velocity inches/second	Peak Particle Velocity mm/second	Human Reaction	Effect on Buildings	
0006	0.15	Imperceptible by people	Vibrations unlikely to cause damage of any type	
.00602	0.5	Range of Threshold of perception	Vibrations unlikely to cause damage of any type	
.08	2.0	Vibrations clearly perceptible	Recommended upper level of which ruins and ancient monuments should be subjected	
0.1	2.54	Level at which continuous vibrations begin to annoy people	Virtually no risk of architectural damage to normal buildings	
0.2	5.0	Vibrations annoying to people in buildings	Threshold at which there is a risk of architectural damage to normal dwellings	
1.0	25.4		Architectural Damage	
2.0	50.4		Structural Damage to Residential Buildings	
6.0	151.0		Structural Damage to Commercial Buildings	
Source: <u>Survey of Earth-borne Vibrations due to Highway Construction and Highway Traffic</u> , Caltrans 1976.				

IMPACTS AND MITIGATION MEASURES

Generally, a project may have a significant effect on the environment if it will substantially increase the ambient noise levels for adjoining areas or expose people to severe noise levels. In practice, more specific professional standards have been developed. These standards state that a noise impact may be considered significant if it would generate noise that would conflict with local planning criteria or ordinances, or substantially increase noise levels at noise-sensitive land uses.

Standards of Significance

CEQA guidelines state that implementation of the project would result in significant noise impacts if Page 12 of 19 the project would result in either of the following:

- a. Exposure of persons to or generation of noise levels in excess of standards established in the City of Roseville General Plan. Specifically, exterior and interior noise levels shown in Table 5 for residential uses exposed to transportation noise sources, and the Table 6 standards for residential uses exposed to non-transportation noise sources.
- b. Exposure of persons to or generation of excessive groundborne vibrations or groundborne noise levels.
- c. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project, as defined by Table 7. For this analysis, an increase of more than 4 dB is considered a significant impact.
- d. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project, as defined by Table 7.
- e. 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, where the project would expose people residing or working in the area to excessive noise levels.
- f. For a project within the vicinity of a private airstrip, where the project would expose people residing or working in the project area to excessive noise levels.

The project site is not located within two miles of an airport.

Method of Analysis

Traffic Noise Impact Assessment Methodology

To assess future traffic noise impacts on the project site the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA RD-77-108) was used. The model is based upon the CALVENO reference noise emission 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 Leq values for free-flowing traffic conditions. To predict traffic noise levels in terms of Ldn, it is necessary to adjust the input volume to account for the day/night distribution of traffic.

Average daily traffic volumes were provided by the project traffic consultant and Caltrans. Truck usage and vehicle speeds on the local area roadways were estimated from field observations and Caltrans data. The predicted traffic noise levels on the local roadway network for future conditions are provided in terms of Ldn at a standard distance of 100 feet from the centerlines of the project-area roadways. In addition, distances to the noise contours are also developed.

Commercial Land Use Impact Methodology

Commercial retail uses can also produce noise which may affect adjacent sensitive land uses. These noise sources can be continuous and may contain tonal components which may be annoying to individuals who live in the nearby vicinity. In addition, noise generation from fixed noise sources associated with the project may vary based upon climatic conditions, time of day and existing ambient noise levels. The primary noise sources generally include truck deliveries, on-site truck circulation, trash pickup, parking lot use, HVAC equipment and loading docks.

Mechanical Equipment

Heating, air conditioning and ventilation equipment can be a primary noise source associated with commercial or retail uses. These types of equipment are often mounted on roof tops, located on the ground or located within mechanical rooms. The noise sources can take the form of fans, pumps, air compressors, chillers or cooling towers.

Noise levels from these types of equipment can vary significantly. Noise levels from these types of sources generally range between 45 dB to 70 dB at a distance of 50 feet. However, numerous noise control strategies can be utilized to mitigate noise levels to less than significant levels.

Loading Docks

Loading docks and their associated activities have a potential to produce noise levels which exceed the noise level criteria at adjacent noise sensitive land uses. Noise sources associated with loading docks include trucks idling, truck circulation on the sites, refrigeration units on trucks, pallets dropping and fork lifts operating on the site.

Noise monitoring conducted at loading docks indicate that typical hourly average noise levels at a distance of 50 feet can range between 55 dB Leq and 60 dB Leq, and maximum noise levels range between 80 dB and 84 dB at a distance of 50 feet.

Generally sound walls and setbacks can be used to mitigate loading dock and truck circulation noise impacts. These strategies can be utilized individually or in combination with one another.

Construction Noise Impact Methodology

During the construction phases of the project, noise from construction activities would add to the noise environment in the immediate project vicinity. Activities involved in construction would generate maximum noise levels, as indicated in the analysis of this impact, ranging from 85 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 and on-site grading. A significant project-generated noise source would include truck traffic associated with transport of heavy materials and equipment to and from construction sites and the movement of heavy construction equipment on the project site, especially during site grading. This noise increase would be of short duration, and would likely occur primarily during daytime hours. Construction activities would need to comply with the City of Roseville Noise Ordinance criteria.

Construction Vibration Impact Methodology

The types of construction vibration impact include human annoyance and building structural damage. Human annoyance occurs when construction vibration rises significantly above the threshold of perception. Building damage can take the form of cosmetic or structural. Table 9 shows the typical vibration levels produced by construction equipment.

Table 9 Vibration Levels for Varying Construction Equipment					
	Peak Particle Velocity @ 25 feet	Approximate Velocity Level @ 25 feet			
Type of Equipment	(inches/second)	(VdB)			
Large Bulldozer	0.089	87			
Loaded Trucks	0.076	86			
Small Bulldozer	0.003	58			
Auger/drill Rigs	0.089	87			
Jackhammer	0.035	79			
Vibratory Hammer	0.070	85			
Vibratory Compactor/roller 0.210 94					
Source: Federal Transit Administration, Tra	nsit Noise and Vibration Impact Assessme	ent Guidelines, May 2006			

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 potentially significant impact.

Construction Noise Impact Assessment Methodology

During the construction phases of the project, noise from construction activities would add to the noise environment in the immediate project vicinity. Activities involved in typical construction and demolition would generate maximum noise levels, as indicated in Table 10, ranging from 76 to 90 dB at a distance of 50 feet.

A significant project-generated noise source would include truck traffic associated with transport of heavy materials and equipment to and from construction sites and the movement of heavy construction equipment on the project site. This noise increase would be of short duration, and would occur primarily during daytime hours, as regulated by the City of Roseville Noise Ordinance.



Backhoe	78		
Compactor	83		
Compressor (air)	78		
Concrete Saw	90		
Dozer	82		
Dump Truck	76		
Excavator	81		
Generator	81		
Jackhammer	89		
Pneumatic Tools	85		
Source: <i>Roadway Construction Noise Model User's Guide</i> . Federal Highway Administration. FHWA-HEP-05-054. January 2006.			

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 applicable noise standards, provided that all construction equipment is fitted with factory installed muffling devices and maintained in good working order. This impact is considered **potentially-significant**.

Mitigation for Impact 1

The following mitigation measures are required for the Proposed Project to minimize construction noise impacts.

- *MM1a:* Construction activities shall comply with the requirements of the City of Roseville Noise Ordinance.
- *MM1b:* 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.
- *MM1c*: 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.

Significance after Mitigation: Less-than-significant.

Impact Traffic Noise Impacts at Future Noise-Sensitive Land Uses Developed Within the

2 Project Area. Proposed residential land uses located adjacent to any of the major projectarea arterial roadways may be impacted by exterior noise levels exceeding 60 dB Ldn and interior noise levels exceeding 45 dB Ldn. 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.

An analysis of future traffic noise levels was conducted for the project site.

Table 11 Future Traffic Noise Levels and Distances to Contours Fiddyment Ranch Alternative Site – City of Roseville, California						
			Distance to Ldn Contours			
Roadway	Segment	Ldn @ 100 Feet	70 dB	65 dB	60 dB	
I-80	Adjacent to project site	75 dBA	214'	460'	991'	
Douglas Blvd.	Harding Blvd. – I-80 ramps	64 dBA	40'	86'	185'	
Harding Blvd.	Harding Blvd.Douglas Blvd.Lead Hill Drive60 dBA23'50'107'					
Notes: Distances to traffic noise contours are measured in feet from the centerlines of the roadways. Source: FHWA-RD-77-108 with inputs from DKS Associates, Caltrans and j.c. brennan & associates, Inc. 2010 - 2011.						

Based upon the above analysis contained in Table 11, traffic noise levels on the project site could exceed 65 dB Ldn. In addition, 2^{nd} and 3^{rd} floor residential facades could exceed exterior noise levels of 70 dB Ldn.

The degree by which traffic noise levels will exceed the City of Roseville exterior noise level standard will depend on the proximity of the proposed noise-sensitive uses to the major roadways within the project vicinity, and the individual noise generation of those roadways. 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. **Therefore, this impact is considered potentially significant in need of mitigation.**

Mitigation for Impact 2:

MM 2a: Locate outdoor activity areas for residential uses outside of the 60 dB Ldn noise level contours. As an alternative, locate primary outdoor activity areas on portions of the project site which are shielded from traffic noise levels.

MM 2b: An analysis of traffic noise levels and specific mitigation measures on future High Density Residential uses should be required once tentative maps for this site are available. The analysis shall be conducted by a qualified acoustical consultant and should specify the measures required to achieve compliance with the City of Roseville 60 dB Ldn exterior noise level standard at the outdoor activity areas. In addition, a interior noise level analysis should be conducted by a qualified acoustical consultant and should specify the measures required to achieve compliance with the City of Roseville 45 dB Ldn interior noise level standard.

Significance after Mitigation: Less than Significant.

Impact Impacts of Existing Commercial Land Uses on Noise-Sensitive Uses in the Project Area. Based upon background noise measurements conducted on the site, it is likely that on-site noise sources will exceed the City of Roseville stationary noise source criteria contained in Table IX-3 of the General Plan Noise Element (Table 6 of this report). Due to the fact that a site plan is not available for the site, it is not feasible to identify specific noise impacts associated with the existing commercial land uses. This would be a potentially significant impact.

In general, where these land uses adjoin residential property lines, mitigation measures should be included. The primary noise sources are parking lot noise, HVAC equipment and light truck deliveries. In this case, 6-7 foot tall sounds walls would typically provide adequate isolation of parking lot and delivery truck activities. HVAC equipment should be located either at ground level or when located on roof-tops, the building facades should 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 should be included in the project design:

- Loading docks and truck delivery areas should maintain a minimum distance of 30 feet from residential property lines;
- Property line barriers should be 6 to 8 feet in height. Circulation routes for trucks should be located a minimum of 30-feet from residential property lines;
- All heating, cooling and ventilation equipment should 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 100 feet from residential property lines, an acoustical evaluation shall be submitted to verify compliance with the City of Roseville Noise Level Performance Standards.

Mitigation for Impact 3:

MM 3: Where commercial uses abut residential property lines or loading docks/truck circulation routes face residential areas, the following mitigation measures should be included in the project design:

- Loading docks and truck delivery areas should maintain a minimum distance of 30 feet from residential property lines;
- Property line barriers should be 6 to 8 feet in height. Circulation routes for trucks should be located a minimum of 30-feet from residential property lines;
- All heating, cooling and ventilation equipment should be located within mechanical rooms where possible;
- All heating, cooling and ventilation equipment shall be shielded from view with solid barriers or building parapets;
- Emergency generators shall comply with the City of Roseville Municipal Code Noise Ordinance at the nearest noise-sensitive receivers.
- Delivery/loading activities shall comply with the requirements of the City of Roseville Municipal Code Noise Ordinance.

Significance after Mitigation: Less than Significant

Impact Construction Vibration. The primary construction activities associated with the project would occur when the infrastructure such as roadways and utilities are constructed. Some construction is expected to occur within the vicinity of existing residences. However, comparing Table 9 which contains the criteria for acceptable vibration levels to Table 10, which shows potential vibration impacts, it is not expected that vibration impacts would occur which would cause any structural damage. This impact is considered to be less than significant.

Mitigation for Impact 9: None Required

Appendix A

Acoustical Terminology

- **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 dBFundamental 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.CNELCommunity Noise Equivalent Level. Defined as the 24-hour average noise level with noise occurring
during evening hours (7 10 p.m.) weighted by a factor of three and nighttime hours weighted by a
factor of 10 prior to averaging.
- **Frequency** The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz.
- Ldn Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.
- Leq Equivalent or energy-averaged sound level.
- Lmax The highest root-mean-square (RMS) sound level measured over a given period of time.
- L(n) The sound level exceeded a described percentile over a measurement period. For instance, an hourly L50 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.
- 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.

 Threshold
 The sound absorption of 1 sabin.
- of HearingThe 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.



Project Information:	Job Number:	2010-121
	Project Name:	Fiddyment Alt Site
	Roadway Tested:	I-80 Sito 1
	Test Date:	February 23, 2011
Veather Conditions:	Temperature (Fahrenheit):	50
	Relative Humidity:	mod
	Wind Speed and Direction:	5
	Cloud Cover:	mod
Sound Level Meter:	Sound Level Meter:	LDL Model 820
	Calibrator:	LDL Model CAL200
	Weter Calibrated:	Immediately before and after test
	weter Settings.	A-weighted, slow response
licrophone:	Microphone Location:	On Project Site
	Distance to Centerline (feet):	320
	Microphone Height:	5 feet above ground
	Intervening Ground (Hard or Soft):	Soft
	Elevation Relative to Road (feet):	intervening topo
Roadway Condition:	Pavement Type	concrete
	Pavement Condition:	good
	Posted Maximum Speed (mph):	65
"aat Daramatara		4.40 0.04
est Parameters.	Test Duration (minutes):	4.40 AM
	Observed Number Automobiles:	1007
	Observed Number Medium Trucks:	11
	Observed Number Heavy Trucks:	42
	Observed Average Speed (mph):	65
Nodel Calibration:	Measured Average Level (L _{eq}):	65.0
	Level Predicted by FHWA Model:	71.1
	Difference:	6.1 dB
Conclusions:		
	:	c brennan & associate

	Project Name:	
	Doodwov Testad	Fiddyment Alt Site
	Test Location	I-60 Site 2
	Test Date:	February 23, 2011
Weather Conditions:	Temperature (Fahrenheit):	50
	Relative Humidity: Wind Speed and Direction:	mod
	Cloud Cover:	o mod
Sound Level Meter:	Sound Level Meter:	LDL Model 820
	Calibrator:	LDL Model CAL200
	Meter Calibrated: Meter Settings:	Immediately before and after test A-weighted, slow response
Microphone:	Microphone Location:	On Project Site
	Distance to Centerline (feet):	475 E fact chouse ground
	Intervening Ground (Hard or Soft):	Soft
	Elevation Relative to Road (feet):	intervening topo
Roadway Condition:	Pavement Type	concrete
	Pavement Condition:	good
	Posted Maximum Speed (mph):	65
Fest Parameters:	Test Time:	5:30 PM
	Test Duration (minutes):	5
	Observed Number Automobiles:	933
	Observed Number Heavy Trucks:	37
	Observed Average Speed (mph):	65
Model Calibration:	Measured Average Level (L _{eq}):	63.3
	Level Predicted by FHWA Model:	68.1
	Dinerence.	4.0 GD
Conclusions:		
	11	

									$\left(\right)$
lighway T Alt Site Exist	raffic Noise Prediction Mod ing	la							
way Name	Segment Description	ADT	Day % Eve % 1	vight % T	Med. %	6 Hvy. Frucks	Speed	Distance	Offset (dB)
Sivd Sivd	Along Project Site Harding to I-80 Douglas to Lead Hill	159,000 44,575 35,653	87 87	6 6 6 –		4	92 72 72	100	μ
				Uj.c.	bren	nan 8 onsulta	X assc nts in a	coustics coustics	

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

Heavy Medium 2010-121a Fiddyment Alt Site Existing Ldn Soft Project #: Description: Ldn/CNEL: Hard/Soft:

Total	74	64	63	
Trucks	68.5	59.7	58.7	
Trucks	59.0	55.0	54.1	
Autos	72.7	60.3	59.3	
Segment Description	Along Project Site	Harding to I-80	Douglas to Lead Hill	
Roadway Name	1-80	Douglas Blvd	Harding Blvd	
Segment	1	2	ო	

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

Project #: 2010-121a Description: Fiddyment Alt Site Existing Ldn/CNEL: Ldn Hard/Soft: Soft

	55	1907	376	324
se Contours	60	885	175	150
Traffic Noi	65	411	81	70
Distances to	70	191	38	32
	75	89	17	15
	Segment Description	Along Project Site	Harding to I-80	Douglas to Lead Hill
	Roadway Name	1-80	Douglas Blvd	Harding Blvd
	Segment	-	2	ო

	Offset Distance (dB)	100 100 100 Ociates <i>acoustics</i>
	vy. Ks Speed	65 25 25 n & ass <i>ultants in</i>
	. Med. % H rucks Truc	brenna V ^{cons}
	e % Night % T	
	Day % Eve	87 87
<u>–</u>	ADT	188,400 48,447 21,377
Fraffic Noise Prediction Mod	Segment Description	Along Project Site Harding to I-80 Douglas to Lead Hill
- 77-108 Highway T t Sheet 2010-121a Fiddyment Alt Site Fugu Ldn	Roadway Name	I-80 Douglas Blvd Harding Blvd
Appendix C FHWA-RD Data Inpu Project #: Description: Ldn/CNEL: Hard/Soft	Segment	- 0 m 4 m m r m o 0 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2

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

-121a	ment Alt Site Fugure		
2010	Fiddy	Ldn	Soft
Project #:	Description:	Ldn/CNEL:	Hard/Soft:

Total	75	64	60
Heavy Trucks	69.3	60.0	56.5
Medium Trucks	59.8	55.4	51.8
Autos	73.4	60.6	57.1
Segment Description	Along Project Site	Harding to I-80	Douglas to Lead Hill
Roadway Name	I-80	Douglas Blvd	Harding Blvd
Segment	~	2	с

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

Project #: 2010-121a Description: Fiddyment Alt Site Fugure Ldn/CNEL: Ldn Hard/Soft: Soft

9	55	2136	398	230
se Contour	60	991	185	107
Traffic Nois	65	460	86	50
Distances to	70	214	40	23
	75	66	18	-
	Segment Description	Along Project Site	Harding to I-80	Douglas to Lead Hill
	Roadway Name	1-80	Douglas Blvd	Harding Blvd
	Segment	-	2	ო