NOISE
IMPACT ANALYSIS

FOR

FULTON AVENUE DEVELOPMENT PROJECT
CITY OF SACRAMENTO, CA

PREPARED FOR:

KLEINFELDER, INC.
3077 FITE CICLE
SACRAMENTO, CA 95827

PREPARED BY:

AMBIENT
AIR QUALITY & NOISE CONSULTING
1374 57TH STREET
SACRAMENTO, CA 95819
CONTACT: KURT LEGLEITER
TEL/FAX: 916.456.7006

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INTRODUCTION

This report includes a summary of applicable regulations, a description of ambient noise conditions, and an analysis of potential noise impacts associated with the proposed project. Mitigation measures are recommended, as necessary, to reduce significant noise impacts.

CONCEPTS AND TERMINOLOGY

Acoustic Fundamentals

Noise is generally defined as sound that is loud, disagreeable, or unexpected. Sound, as described in more detail below, is mechanical energy transmitted in the form of a wave because of a disturbance or vibration.

Amplitude

Amplitude is the difference between ambient air pressure and the peak pressure of the sound wave. Amplitude is measured in decibels (dB) on a logarithmic scale. For example, a 65 dB source of sound, such as a truck, when joined by another 65 dB source results in a sound amplitude of 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by 3 dB). Amplitude is interpreted by the ear as corresponding to different degrees of loudness. Laboratory measurements correlate a 10 dB increase in amplitude with a perceived doubling of loudness and establish a 3 dB change in amplitude as the minimum audible difference perceptible to the average person (US EPA 1971).

Frequency

Frequency is the number of fluctuations of the pressure wave per second. The unit of frequency is the Hertz (Hz). One Hz equals one cycle per second. The human ear is not equally sensitive to sound of different frequencies. Sound waves below 16 Hz or above 20,000 Hz cannot be heard at all, and the ear is more sensitive to sound in the higher portion of this range than in the lower. To approximate this sensitivity, environmental sound is usually measured in A-weighted decibels (dBA). On this scale, the normal range of human hearing extends from about 10 dBA to about 140 dBA (U.S. EPA 1971).

Characteristics of Sound Propagation and Attenuation

Noise can be generated by a number of sources, including mobile sources, such as automobiles, trucks and airplanes, and stationary sources, such as construction sites, machinery, and industrial operations. Noise generated by mobile sources typically attenuates at a rate between 3.0 to 4.5 dBA per doubling of distance. The rate depends on the ground surface and the number or type of objects between the noise source and the receiver. For mobile transportation sources, such as highways, hard and flat surfaces, such as concrete or asphalt, have an attenuation rate of 3.0 dBA per doubling of distance. Soft surfaces, such as uneven or vegetated terrain, have an attenuation rate of about 4.5 dBA per doubling of distance from the source. Noise generated by stationary sources typically attenuates at a rate of approximately 6.0 to 7.5 dBA per doubling of distance from the source.

Sound levels can be reduced by placing barriers between the noise source and the receiver. In general, barriers contribute to decreasing noise levels only when the structure breaks the "line of sight" between the source and the receiver. Buildings, concrete walls, and berms can all act as

effective noise barriers. Wooden fences or broad areas of dense foliage can also reduce noise, but are less effective than solid barriers.

Noise Descriptors

The selection of a proper noise descriptor for a specific source is dependent upon the spatial and temporal distribution, duration, and fluctuation of the noise. The noise descriptors most often encountered when dealing with traffic, community, and environmental noise are defined below (Lipscomb and Taylor 1978).

- L_{max} (Maximum Noise Level): The maximum instantaneous noise level during a specific period of time.

- L_{min} (Minimum Noise Level): The minimum instantaneous noise level during a specific period of time.

- L_{eq} (Energy Equivalent Noise Level): The energy mean (average) noise level. The instantaneous noise levels during a specific period of time in dBA are converted to relative energy values. From the sum of the relative energy values, an average energy value (in dBA) is calculated.

- L_{dn} (Day-Night Noise Level): The 24-hour L_{eq} with a 10 dBA "penalty" for noise events that occur during the noise-sensitive hours between 10:00 p.m. and 7:00 a.m. In other words, 10 dBA is "added" to noise events that occur in the nighttime hours to account for increases sensitivity to noise during these hours.

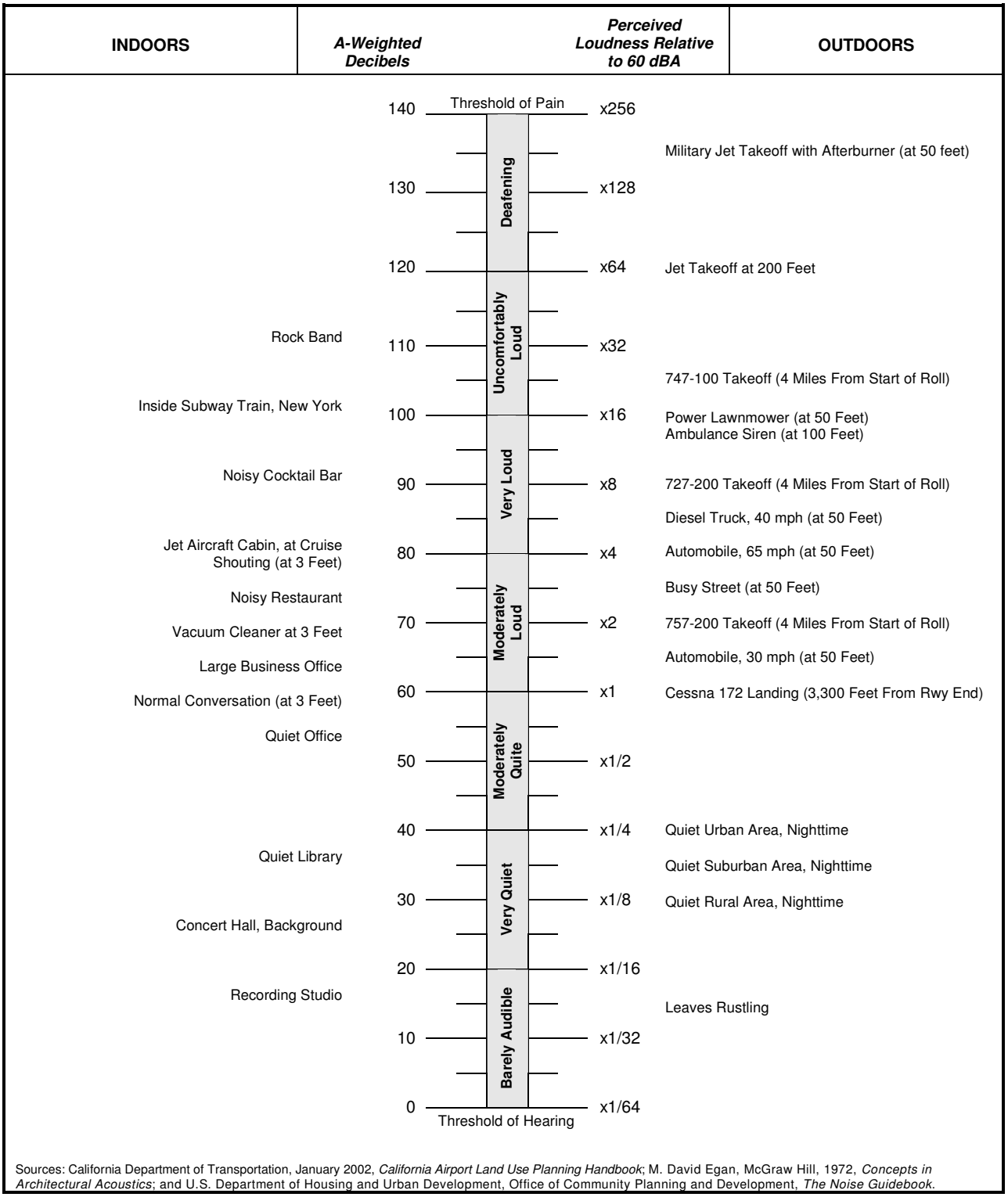
- CNEL (Community Noise Equivalent Level): The CNEL is similar to the L_{dn} described above, but with an additional 5 dBA "penalty" added to noise events that occur between the hours of 7:00 p.m. to 10:00 p.m. The calculated CNEL is typically approximately 0.5 dBA higher than the calculated L_{dn}.

- SEL (Single Event Noise Level): The SEL describes a receiver's cumulative noise exposure from a single noise event, which is defined as an acoustical event of short duration and involves a change in sound pressure above a reference value.

Human Response to Noise

The human response to environmental noise is subjective and varies considerably from individual to individual. Noise in the community has often been cited as a health problem, not in terms of actual physiological damage, such as hearing impairment, but in terms of inhibiting general well-being and contributing to undue stress and annoyance. The health effects of noise in the community arise from interference with human activities, including sleep, speech, recreation, and tasks that demand concentration or coordination. Hearing loss can occur at the highest noise intensity levels. When community noise interferes with human activities or contributes to stress, public annoyance with the noise source increases. The acceptability of noise and the threat to public well-being are the basis for land use planning policies preventing exposure to excessive community noise levels. Typical community noise levels are depicted in Exhibit 1.

Unfortunately, there is no completely satisfactory way to measure the subjective effects of noise or of the corresponding reactions of annoyance and dissatisfaction. This is primarily because of the wide variation in individual thresholds of annoyance and habituation to noise over differing individual experiences with noise. Thus, an important way of determining a person's subjective reaction to a new noise is the comparison of it to the existing environment to which one has adapted: the so-called "ambient" environment. In general, the more a new noise exceeds the



Sources: California Department of Transportation, January 2002, *California Airport Land Use Planning Handbook*; M. David Egan, McGraw Hill, 1972, *Concepts in Architectural Acoustics*; and U.S. Department of Housing and Urban Development, Office of Community Planning and Development, *The Noise Guidebook*.

EXHIBIT

TYPICAL NOISE LEVELS **1**

ambient noise level, the less acceptable the new noise will be judged. Regarding increases in A-weighted noise levels, knowledge of the following relationships will be helpful in understanding this analysis:

- Except in carefully controlled laboratory experiments, a change of 1 dB cannot be perceived by humans.
- Outside of the laboratory, a 3-dB change is considered a just-perceivable difference.
- A change in level of at least 5 dB is required before any noticeable change in community response would be expected. An increase of 5 dB is typically considered substantial.
- A 10-dB change is subjectively heard as an approximate doubling in loudness and would almost certainly cause an adverse change in community response.

ENVIRONMENTAL SETTING

EXISTING NOISE-SENSITIVE LAND USES

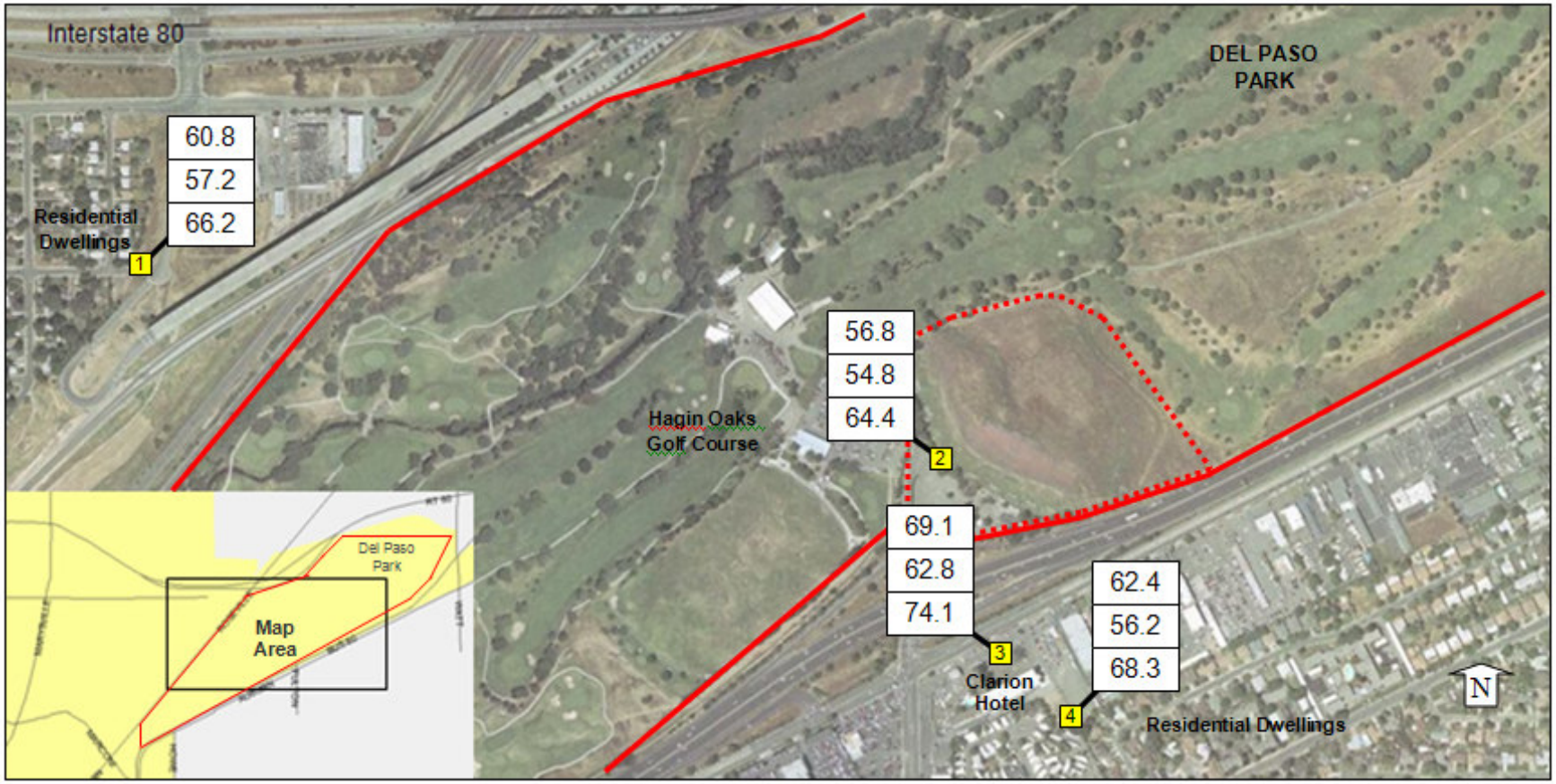
Noise-sensitive land uses are generally considered to include those uses which would result in noise exposure that could result in health-related risks to individuals, as well as places where quiet is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels that could result in increased levels of sleep disruption. Additional land uses such as parks, historic sites, cemeteries, and recreation areas are also considered sensitive to increases in exterior noise levels. Schools, churches, hotels, libraries, and other places, where low interior noise levels are essential, are also considered noise-sensitive land uses.

Existing noise-sensitive receptors in the vicinity of the project site include the Clarion Hotel, which is located approximately 550 feet south of the project site, south of Auburn Boulevard; as well as Haggin Oaks Golf Course, which is located adjacent to and west of the project site. The nearest residential land uses are located approximately 700 feet south of the project site, south of Auburn Boulevard. Residential land uses located to the west, west of Roseville Road, are in excess of approximately 3,200 feet from the project site. The Clarion Hotel and residential land uses located to the south of the project site are located outside the City of Sacramento boundary, within Sacramento County. Noise-sensitive land uses are identified in Exhibit 2.

AMBIENT NOISE SURVEY

An ambient noise survey was conducted by AMBIENT Air Quality & Noise Consulting on January 19, 2006 to document the existing noise environment at various locations within the project area. Short-term (15-minute) noise level measurements were taken at four locations, as shown in Exhibit 2, using a Larson Davis model 820 sound level meter at a height of approximately 4.5 feet above the ground surface. Measured noise levels in the project area are depicted in Exhibit 2.

Based on the measurements conducted, average daytime noise levels (in dBA L_{eq}) in the vicinity of the project site and nearby receptors generally range from the upper 50s to upper 60s, dependent primarily on distance from nearby roadways. The dominant noise source noted during the survey was vehicular traffic on Interstate 80 (I-80) to the north and the I-80 Business Loop to the south. Ambient noise levels at nearby receptors are also influenced, to a somewhat lesser extent, by nearby existing commercial land uses, as well as vehicle traffic along local roadways, include Auburn Boulevard, Fulton Avenue, and Roseville Road.



City of Sacramento Boundary

Del Paso Park

Proposed Project Site

Ambient Noise Measurement Locations

Leq	Average-Hourly Noise Level
Lmin	Minimum Noise Level
Lmax	Maximum Noise Level

Exhibit 2

REGULATORY CONTEXT

CITY OF SACRAMENTO GENERAL PLAN

The Noise Element of the City of Sacramento General Plan establishes land use compatibility standards for noise measured at the property line of noise-sensitive land use. The Noise Element establishes standards for various land use categories with respect to transportation and non-transportation noise sources and land use compatibility noise criteria. Table 1 presents the City of Sacramento land use compatibility standards applicable to new development, without implementation of noise mitigation. Mitigation measures should be considered if the proposed development would increase the average daily noise levels at a noise-sensitive land use by more than 4 dB or cause the overall level to exceed the "normally acceptable" standard for land use compatibility. New development is considered "conditionally acceptable" provided adequate noise insulation features have been incorporated in the design of the project. The City's noise exposure standards for land use compatibility are presented in Table 2 (City of Sacramento 1988).

The Noise Element of the City of Sacramento General Plan also contains policies designed to protect the community from the harmful and annoying effects of exposure to excessive noise. The following General Plan noise goals and policies are applicable to the proposed project (City of Sacramento 1988):

Goal A: Future development shall be compatible with the projected year 2016 noise environment.

- Policy 1: Require an acoustical report for any project which would be exposed to noise levels in excess of those shown as normally acceptable in Figure 3 (Table 6.4-4 of this EIR). The contents of the acoustical report shall be as described in the Noise Assessment Report Guidelines. No acoustical report shall be required where City staff have an existing residential report on file which is applicable.
- Policy 2: Require mitigation measures to reduce noise exposure to the "Normally Acceptable Levels" in Figure 3 (Table 3 of this EIR), except where such measures are not feasible.
- Policy 3: Land uses proposed where the exterior noise level would be below the "Normally Acceptable Levels" may be approved without any requirement for interior or exterior mitigation measures.

Goal C: Eliminate or minimize the noise impacts of future development on existing land uses in Sacramento.

- Policy 1: Review projects that may have noise generation potential to determine what impact they may have on existing uses. Additional acoustical analysis may be necessary to mitigate identified impacts.
- Policy 2: Enforce the City of Sacramento Noise Ordinance as the method to control noise from sources other than transportation sources.

Table 1
City of Sacramento
Maximum Acceptable Interior and Exterior Noise Levels for New Development

Noise Source	Land Use	Applicable Area		State Requirements [1]	Noise Element Requirements
		Interior	Exterior		
Traffic or fixed source (industrial plants, etc.)	Single-family	X		None	$L_{dn} \leq 45$ dB
	Single-family		X	None	$L_{dn} \leq 60$ dB in backyards
	Multifamily [3]	X		$L_{dn} \leq 45$ dB	$L_{dn} \leq 45$ dB
	Multifamily		X	None	$L_{dn} \leq 60$ dB in common outdoor use areas
	Schools	X		None	Noisiest hourly Leq $\leq$ 40 dB during school day
	Schools		X	None	$L_{dn} \leq 60$ dB
	Libraries	X		None	Noisiest hourly Leq $\leq$ 45 dB
	Libraries		X	None	None
Aircraft	Single-family	X		None	$L_{dn} \leq 45$ dB and maximum instantaneous levels of $\leq$ 50 dB in bedrooms and $\leq$ 55 in other habitable rooms [2]
	Single-family		X	CNEL $\leq$ 65 dB (State Aeronautics Noise Standards) requirement does not apply to Mather and McClellan AFB	CNEL $\leq$ 60 dB for Metro Airport CNEL $\leq$ 65 dB for all other areas
	Multifamily	X		$L_{dn} \leq 45$ dB	$L_{dn} \leq 45$ dB and maximum instantaneous levels of $\leq$ 50 dB in bedrooms and $\leq$ 55 in other habitable rooms [2]
	Multifamily		X	CNEL $\leq$ 65 dB (State Aeronautics Noise Standards) requirement does not apply to Mather and McClellan AFB	CNEL $\leq$ 60 dB for Metro Airport CNEL $\leq$ 65 dB for all other areas
	Schools	X		None	Noisiest hourly Leq $\leq$ 40 dB during school day
	Schools		X	CNEL $\leq$ 65 dB (State Aeronautics Noise Standards) requirement does not apply to Mather and McClellan AFB	CNEL $\leq$ 60 dB for Metro Airport CNEL $\leq$ 65 dB for all other areas
	Libraries	X		None	$L_{dn} \leq 45$ dB
	Libraries		X	None	None
Rail Traffic	Single-family	X		None	$L_{dn} \leq 45$ dB and maximum instantaneous levels of $\leq$ 50 dB in bedrooms and $\leq$ 55 in other habitable rooms [2]
	Single-family		X	None	$L_{dn} \leq 60$ dB
	Multifamily	X		$L_{dn} \leq 45$ dB unless there are less than 4 trains per day between 7 AM and 10 PM and there are no trains between 10 PM and 7 AM	$L_{dn} \leq 45$ dB and maximum instantaneous levels of $\leq$ 50 dB in bedrooms and $\leq$ 55 in other habitable rooms [2]
	Multifamily		X	None	$L_{dn} \leq 60$ dB
	Schools	X		None	Noisiest hourly Leq $\leq$ 40 dB during school day
	Schools		X	None	Maximum instantaneous levels $\leq$ 85 dB
	Libraries	X		None	Noisiest hour Leq $\leq$ 45 dB
	Libraries		X	None	None

[1] Projects for which U.S. Department of HUD financing is requested are subject to HUD noise requirements. The noise element requirements listed in this table are at least as stringent as the HUD requirements.
[2] The requirement for interior noise exposure is triggered when the exterior L_{dn} exceeds 60 dB.
[3] Multifamily includes hotels, motels, apartment houses and dwellings other than detached single-family dwellings as defined by Title 24, Part 2, California Administrative Code.
Source: City of Sacramento 1988

Table 2 City of Sacramento Acceptable and Unacceptable Noise Levels by Land Use Type, L_{dn} or CNEL				
Land Use	**Normally Acceptable (in dB)**	**Conditionally Acceptable (in dB)**	**Normally Unacceptable (in dB)**	**Clearly Unacceptable (in dB)**
Residential	< 60	60 to 70	70 to 75	> 75
Transient Lodging, Motels and Hotels	< 60	60 to 75	75 to 80	> 80
Schools, Libraries, Churches, Hospitals, Nursing Homes	< 60	60 to 70	70 to 80	> 80
Auditoriums, Concert Halls, Amphitheaters	Not Specified	< 70	> 70	Not Specified
Sports Arena, Outdoor Spectator Sports	Not Specified	< 75	> 75	Not Specified
Playgrounds, Neighborhood Parks	< 70	Not Specified	70 to 75	> 75
Golf Courses, Riding Stables, Water Recreation, Cemeteries	< 70	Not Specified	70 to 80	> 80
Office Building, Business, Commercial & Professional	< 65	65 to 80	> 80	Not Specified
Industrial Manufacturing , Utilities, Agriculture	< 70	70 to 80	> 80	Not Specified

Normally Acceptable: Specified land use is satisfactory based upon the assumption that any buildings are of normal construction without special noise requirements.
Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of noise reduction requirements is made and needed noise insulation features included in the design.
Normally Unacceptable: New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of noise reduction requirements must be made and needed noise insulation features included in this design.
Clearly Unacceptable: New construction or development clearly should not be undertaken.

Source: City of Sacramento 1988

CITY & COUNTY OF SACRAMENTO NOISE CONTROL ORDINANCE

The City and County of Sacramento Noise Control Ordinance sets limits for exterior and interior noise levels. The noise ordinance standards are summarized in Table 3. The ordinance generally limits exterior noise levels measured at residential, school, churches, hospital and agricultural land uses to a maximum of 55 dBA during any cumulative 30-minute period during the daytime hours (7:00 a.m. to 10:00 p.m.), and 50 dBA during any cumulative 30-minute period during the nighttime hours (10:00 p.m. to 7:00 a.m.). The ordinance sets somewhat higher noise limits for noise of shorter duration. Instantaneous noise events shall not exceed a maximum of 75 dBA in the day and 70 dBA at night. Noise standards for multi-family dwellings are based on established interior noise standards corresponding to the cumulative period of exposure.

Activities conditionally exempt from the noise standards include construction activities. The City Noise Control Code exempts noise generated by construction activities that occur between the hours of 7 a.m. and 6 p.m., Monday through Saturday, and between 9 a.m. and 6 p.m. on Sunday. The County Noise Control Code exempts noise generated by construction activities that occur between the hours of 6 a.m. and 8 p.m., Monday through Friday, and between 7 a.m. and 8 p.m. on Saturday and Sunday.

Table 3 City & County of Sacramento Noise Control Ordinance			
Land Use	**Period of Measurement**	**Maximum Acceptable Noise Standards**	
		Exterior Noise Standards[1]	**Interior Noise Standards**
Residential, School, Church, Hospital, Agricultural Land Uses	7:00 a.m. to 10:00 p.m.	55 dBA[2]	-
	10:00 p.m. to 7:00 a.m.	50 dBA[2]	-
Apartment, Condominium, Townhouse, Duplex, or Multi-dwelling Unit	10:00 p.m. to 7:00 a.m.[3] 5 minutes/hour: 15 minutes/hour: Any period of time:	-	45 dBA 50 dBA 55 dBA

This table presents of summary of the noise ordinance standards that are considered to be most applicable to the proposed project. Refer to the City of Sacramento Municipal Code – Chapter 8.68 Noise Control, for additional noise control standards and limitations pertaining to noise-generating operations.

1 The following noise standards, unless otherwise specifically indicated in City of Sacramento Municipal Code, shall apply to all properties within a designated noise area.

2 Cumulative duration of intrusive sound: It is unlawful for any person within the City to create any noise which causes the noise level on the affected property, when measured in the designated noise area, to exceed for the duration of time set forth following, the specified exterior noise standards in any one hour by (noise limits shall be reduced by 5 dBA for impulsive or simple tone noise, or noise consisting of speech or music):

A. 30 minute: +0 dBA
B. 15 minutes: +5 dBA
C. 5 minutes: +10 dBA
D. 1 minute: +15 dBA
E. Level not to be exceed for any time: +20

In addition to the above standards, interfering noise at schools, churches, hospitals, while the same is in use, which is 10 dBA or more greater than the ambient noise level at the building, shall be deemed excessive and unlawful. Residential use HVAC system equipment, such as pumps, fans, air conditioners, and cooling towers, shall not exceed 60 dBA at any point at least 1 foot inside the property line of the affected residential or agricultural property line, or 55 dBA when measured in the center of a neighboring patio or at the exterior window of the affected residential unit.

3 Based on cumulative periods of time during any one hour. Interior noise levels, when measured in the neighboring unit, shall not exceed the specified standards for the corresponding cumulative period of time during any hour.

Source: City of Sacramento 2006

GROUND-BORNE VIBRATION

There are no federal, state, or local regulatory standards for ground-borne vibration. However, various criteria have been established to assist in the evaluation of vibration impacts. For instance, the California Department of Transportation (Caltrans) has developed vibration criteria based on human perception and structural damage risks. For most structures, Caltrans considers a peak particle velocity (ppv) threshold of 0.2 inches per second to be the level at which architectural damage (i.e., minor cracking of plaster walls and ceilings) to normal structures may occur. Below 0.10 inches per second there is "virtually no risk of 'architectural' damage to normal buildings. Levels above 0.4 inches per second may possibly cause structural damage (Caltrans, 2002).

In terms of human annoyance, continuous vibrations in excess of 0.1 inches per second ppv are identified by Caltrans as the minimum perceptible level for ground vibration. Short periods of ground vibration in excess of 0.2 inches per second can be expected to result in increased levels of annoyance to people within buildings (Caltrans, 2002).

Impacts and Mitigation Measures

Methodology

To assess potential construction, area, and stationary source noise impacts, sensitive receptors and their relative exposure were identified. Noise levels of specific equipment expected to be used during site reclamation, construction and operation were determined and resultant noise levels at sensitive receptors were calculated assuming a noise attenuation rate of 6 dBA per doubling of distance of the source.

The FHWA Traffic Noise Model (FHWA 1988) was used to model traffic noise levels along primarily affected roadways, based on data obtained from the traffic analysis prepared for this project. The project's contribution to the baseline traffic noise levels along area roadways was determined by comparing the predicted noise levels at 100 feet from the centerline of the near travel lane with and without project-generated traffic.

Ground-borne vibration levels associated with the proposed project were determined based on documentation obtained from existing environmental documentation. Resultant noise levels were compared to the recommended Caltrans' standards for determination of level of impact.

Thresholds of Significance

The following thresholds of significance were used to determine whether implementation of the proposed project would result in a significant noise impact:

Short-term Construction Noise Impacts**.** Short-term construction noise impacts would be considered significant if construction-generated noise would result in a substantial increase (i.e., 4 dBA, or greater) in ambient noise levels during the nighttime hours (i.e., 10:00 p.m. to 7:00 a.m.) at nearby residential or hotel land uses that would exceed City and County of Sacramento Noise Control Standards and result in increased levels of sleep disruption to occupants. The City/County exterior noise standard is 50 dBA during the nighttime hours for any cumulative 30-minute period. Instantaneous noise events shall not exceed a maximum of 70 dBA during the nighttime hours. Acceptable nighttime interior noise levels for noise-sensitive land uses are typically limited to a maximum of 45 dBA for any cumulative 30-minute period (refer to Table 3). An interior noise level of 45 dBA L_{eq} is also considered by many agencies, including the U.S. EPA, to be the recommended threshold for the protection of building occupants from sleep interference during the nighttime hours (US EPA 1971, 1981; Sutter 1991).

Long-term Traffic Noise Impacts. Long-term traffic noise impacts would be considered significant if implementation of the proposed project would result in a substantial increase in average-daily traffic noise levels (i.e., 4 dBA, or greater) that would exceed applicable noise criteria for land use compatibility. The City's/County's "normally acceptable" noise criteria for residential and hotel land uses is 60 dBA L_{dn}/CNEL (City of Sacramento 1988, County of Sacramento 1993.) The City's "normally acceptable" noise criteria for golf courses is 70 dBA L_{dn}/CNEL (refer to Table 2).

Long-term Stationary-Source Noise Impacts. Long-term stationary-source noise impacts would be considered significant if implementation of the proposed project would result in noise levels that would exceed the City and County of Sacramento Noise Control Standards at existing nearby noise-sensitive land uses. The City's/County's exterior noise standard is 55 dBA during daytime hours and 50 dBA during the nighttime hours for any cumulative 30-minute period. Instantaneous noise events shall not exceed a maximum of 75 dBA in the daytime hours and 70 dBA at nighttime hours (refer to Table 3).

Exposure of Sensitive Receptors or Generation of Excessive Vibration Levels. Short- and long-term vibration impacts would be significant if construction or operation of the proposed project would result in the exposure of sensitive receptors to or generate excessive vibration levels. The California Department of Transportation (Caltrans) considers a peak particle velocity (ppv) threshold of 0.2 inches per second to be the level at which architectural damage (i.e., minor cracking of plaster walls and ceilings) to normally-constructed buildings may occur. Short periods of ground vibration in excess of 0.2 inches per second can be expected to result in increased levels of annoyance to people within buildings (Caltrans 1996, 2002).

Impacts and Mitigation Measures

IMPACT 1

Short-term Reclamation and Construction Noise. *Short-term construction-generated noise levels could result in a substantial increase in ambient noise levels at that could exceed applicable noise standards. Activities occurring during the nighttime hours may result in increased levels of sleep disruptions to occupants of nearby residential dwellings and transient housing. This would be a* ***significant*** *impact.*

Proposed Project

The proposed project would include remediation of the project site to remove soil contaminants resulting from past use as a trapshoot club. Remediation activities would include removal of contaminated soils, importation and placement of clean fill, and construction of an asphalt cap on top of the clean fill. Implementation of the proposed project would also require grading, in addition to the grading associated with remediation, and construction of building pads, roadways, and parking lots.

Construction equipment required for site remediation and construction-related activities would include various off-highway types of equipment, including excavators, graders, loaders, haul trucks, and cranes. Typical noise levels of individual construction equipment are presented in Table 4 and, as shown, can range from 74 to 89 dBA at 50 feet.

Site Reclamation & Grading

As noted above, remediation activities would include the excavation of contaminated soils, the importation of fill material, and site grading activities in preparation of onsite facility construction. Grading and excavation activities can result in average-hourly noise levels of up to approximately 89 dBA L_{eq} at 50 feet, depending on the specific equipment required. Final capping of the site by application of asphalt paving materials would require fewer pieces of equipment. Average-hourly noise levels associated with paving activities typically average approximately 84 dBA L_{eq} at 50 feet (U.S. EPA 1971.)

Assuming a maximum average-hourly noise level of 89 dBA L_{eq} at 50 feet, predicted noise levels at nearby land uses would be approximately 71 dBA L_{eq} at Haggin Oaks Golf Course, and approximately 69 dBA L_{eq} at the Clarion Hotel. Predicted noise levels at the nearest residential dwellings located to the south and west of the project site would be approximately 65 dBA L_{eq} and 53 dBA L_{eq}, respectively.

Table 4 Typical Construction Equipment Noise Levels	
Equipment	**Typical Noise Level (dBA) 50 feet from Source**
Backhoe	80
Compactor	82
Dozer	85
Grader	85
Loader	85
Truck	88
Air Compressor	81
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Crane, Mobile	83
Generator	81
Impact Wrench	85
Jack Hammer	88
Caisson Drill	89
Paver	89
Pneumatic Tool	85
Pump	76
Roller	74
Saw	76
Sources: Federal Transit Administration 2006	

As discussed earlier in this report, construction-related activities occurring during the daytime hours are exempt from the requirements of the City and County Noise Control Ordinance. Activities occurring during the more noise-sensitive nighttime hours would, however, be subject to the City's noise control ordinance. During the quieter nighttime hours, construction-generated noise levels associated with onsite reclamation and grading may result in a substantial increase in ambient noise levels that could exceed the City and County Noise Control Ordinance standards. In addition, assuming an average exterior-to-interior building noise reduction of 15 dB (with windows partially open), predicted interior nighttime noise levels within the nearest night-sensitive receptors (i.e., Clarion Hotel and residential dwellings located south of the project site) could approach levels of approximately 54 dBA L_{eq}. Predicted interior noise levels would exceed the commonly applied interior sleep-disturbance noise threshold of 45 dBA L_{eq}. As a result, noise generated by site reclamation and grading activities during the nighttime hours would be considered ***significant***.

Building Construction

The construction of onsite buildings and related facilities, including the construction of foundations and erection of buildings, can result in average-hourly noise levels of approximately 78 to 85 dBA L_{eq} at 50 feet (U.S. EPA 1971.) Assuming a maximum average-hourly noise level of 85 dBA Leq at 50 feet, predicted noise levels at nearby land uses would be approximately 64 dBA L_{eq} at Haggin Oaks Golf Course, and approximately 62 dBA L_{eq} at the Clarion Hotel. Predicted noise levels at the nearest residential dwellings located to the south and west of the project site would be approximately 60 dBA L_{eq} and 48 dBA L_{eq}, respectively.

As discussed earlier in this report, construction-related activities occurring during the daytime hours are exempt from the requirements of the City and County Noise Control Ordinance. Activities occurring during the more noise sensitive evening and nighttime hours would, however, be subject to the City's noise control ordinance. During the quieter nighttime hours, construction-generated noise levels associated with onsite reclamation and grading may result in a substantial increase in ambient noise levels that could exceed the City and County Noise Control Ordinance standards. In addition, assuming an average exterior-to-interior building noise reduction of 15 dB (with windows partially open), predicted interior nighttime noise levels within the nearest night-sensitive receptors (i.e., Clarion Hotel and residential dwellings located south of the project site) could approach levels of approximately 47 dBA L_{eq}. Predicted interior noise levels would exceed the commonly applied interior sleep-disturbance noise threshold of 45 dBA L_{eq}. As a result, noise generated by onsite building construction during the nighttime hours would be considered ***significant***.

Jack-and-Bore Tunneling

Services to the project site are anticipated to be provided by installing conduit below I-80 Business Loop by a process commonly referred to as "jack and bore" tunneling. Jack-and-bore tunneling is a trenchless pipe or conduit installation method, which utilizes hydraulic jacks to push conduit (i.e., pipes) horizontally through the ground. It is a multi-stage process consisting of constructing a temporary horizontal jacking platform, an entrance pit and a receiving pit. The conduit is then jacked by manual control along the starting alignment track with simultaneous excavation of the soil being accomplished by a rotating cutting head in the leading edge of the conduit. The ground up soil (spoil) is transported back to the entrance pit by helical wound auger flights rotating inside the conduit. The receiving pit is used to recover the cutting head.

Major noise-generating equipment most often required for jack-and-bore tunneling typically include a mobile crane, which is used to lower equipment and conduit into the pit, material haul trucks, power generators, and air compressors. Individual equipment maximum noise levels from these types of equipment, as noted in Table 4, would range from approximately 81 to 88 dBA and would be primarily limited to areas near the entrance pit associated with the use of the support equipment (e.g., crane, trucks, etc.). Noise generated by the boring machine would be located several feet below surface grade and, as a result, would not be anticipated to result in a substantial contribution to predicted noise levels at nearby receptors during daytime hours.

The entrance pit would be located on the south side of Auburn Boulevard and the exit pit would be located on the southern boundary of the project site, north of I-

80. Distances from the entrance pit to the nearest receptors would be approximately 560 feet to the Clarion Hotel and approximately 415 feet to the nearest residential dwelling (located south of Auburn Boulevard). The Clarion Hotel and nearby residential dwellings would be largely shielded from direct line of sight to the entrance pit by existing intervening building. Haggin Oaks Golf Course would be located approximately 1,300 feet from the entrance pit.

Based on the distances identified above and assuming a maximum noise level of 88 dBA L_{eq} at 50 feet from the entrance pit, predicted noise levels would be approximately 62 dBA L_{eq} at the Clarion Hotel and approximately 65 dBA at the nearest residential dwelling. Predicted noise levels at Haggin Oaks Golf Course and residential dwellings located west of the project site would be approximately 60 and 50 dBA Leq, respectively.

The City and County of Sacramento typically limit construction activities to the daytime hours, in accordance with the hours noted in the local noise ordinances. However, long-term interruptions during the boring process can result in the cutting head and/or conduit getting stuck which can impede the boring process. As a result, once boring begins, it typically progresses continuously until the conduit has been fully installed. Boring may, therefore, need to occur during the evening and nighttime hours. Assuming that all equipment (e.g., crane, trucks, generators, compressors) were operating simultaneously, construction-generated noise levels during the quieter nighttime hours may result in a substantial increase in ambient noise levels at nearby receptors that could exceed local noise ordinance requirements.

In addition, based on the above predicted noise levels and assuming an average exterior-to-interior building noise reduction of 15 dB (with windows partially open), predicted interior nighttime noise levels within the nearest night-sensitive receptors (i.e., Clarion Hotel and residential dwellings located south of the project site) could approach levels of approximately 50 dBA L_{eq}. Predicted interior noise levels would exceed the commonly applied interior sleep-disturbance noise threshold of 45 dBA L_{eq}. As a result, noise generated by jack-and-bore tunneling during the nighttime hours would be considered ***significant***.

Fulton Avenue Extension

Grading and excavation activities associated with roadway improvement and construction projects can result in average-hourly noise levels of approximately 78 to 88 dBA L_{eq} at 50 feet, depending on the specific equipment required. Noise levels associated with subsequent paving activities typically average approximately 84 dBA L_{eq} at 50 feet (U.S. EPA 1971.)

Assuming a maximum average-hourly noise level of 88 dBA L_{eq} at 50 feet, predicted noise levels at nearby land uses would be approximately 74 dBA L_{eq} at Haggin Oaks Golf Course, and approximately 66 dBA L_{eq} at the Clarion Hotel. Predicted noise levels at the nearest residential dwellings located to the south and west of the project site would be approximately 62 dBA L_{eq} and 52 dBA L_{eq}, respectively.

As discussed earlier in this report, construction-related activities occurring during

the daytime hours are exempt from the requirements of the City and County Noise Control ordinances. Activities occurring during the more noise-sensitive evening and nighttime hours would, however, be subject to the City's noise control ordinance. During the quieter nighttime hours, construction-generated noise levels associated with onsite reclamation and grading may result in a substantial increase in ambient noise levels that could exceed the City and County Noise Control Ordinance standards. In addition, assuming an average exterior-to-interior building noise reduction of 15 dB (with windows partially open), predicted interior nighttime noise levels within the nearest night-sensitive receptors (i.e., Clarion Hotel and residential dwellings located south of the project site) could approach levels of approximately 55 dBA L_{eq}. Predicted interior noise levels would exceed the commonly applied interior sleep-disturbance noise threshold of 45 dBA L_{eq}. As a result, noise associated with the extension of Fulton Avenue during the nighttime hours would be considered ***significant***.

Mitigation Measure 1

- Construction activities (excluding jack-and-bore tunneling and activities that would result in a safety concern to the public or construction workers) shall be limited to between the daytime hours of 7 a.m. and 6 p.m., Monday through Saturday, and between 9 a.m. and 6 p.m. on Sunday, in accordance with local noise ordinance requirements.

- If jack-and-bore tunneling is required to occur during the nighttime hours, use of construction equipment and material deliveries during the nighttime hours shall be minimized to the maximum extent feasible. Fixed and stationary equipment (e.g., compressors, cranes, generators) to be operated during the nighttime hours shall be shielded from direct line-of-site to nearby night-sensitive noise receptors (i.e., Clarion Hotel and residential dwellings located south of the project site (refer to Exhibit 2)) by placement within enclosures or below surface grade, by use of temporary sound barriers/curtains, or by placement behind intervening structures or material storage piles, sufficient to interrupt line-of-sight to the nearest night-sensitive noise receptors identified above.

- Construction equipment shall be equipped with mufflers, in accordance with manufacturers' specifications.

Significance After Mitigation

With implementation of the above mitigation measures, construction activities would be largely limited to the daytime hours, in accordance with the City's noise control ordinance, with the likely exception of jack-and-bore tunneling activities. Jack-and-bore tunneling during the nighttime hours may, however, be required. Noise generated by jack-and-bore tunneling would be primarily associated with the operation of the boring machine, as well as power generators and compressors required to operate the machine. The boring machine would be located several feet below the surface and, with implementation of the above mitigation measures, support equipment (e.g., generators and compressors) would be required to be shielded from direct line of sight to nearby receptors. With mitigation and assuming windows at nearby receptors are partially open, predicted maximum interior noise levels would be approximately 50 dBA L_{eq} at the nearest residence and approximately 47 dBA L_{eq} at the Clarion Hotel. With

windows closed, predicted interior noise levels would be reduced by an additional approximately 10 dB and would not exceed the 45 dBA L_{eq} threshold. Nonetheless, interior nighttime noise levels at nearby noise-sensitive receptors, with windows partially open, could potentially exceed the commonly applied interior noise threshold of 45 dBA L_{eq}. Due to engineering and construction constraints, relocation of the entrance pit is not possible. It is also important to note that, due to public safety concerns, roadway construction activities may also be required during the nighttime hours. Implementation of the above mitigation measures would help to reduce roadway construction noise levels; however, predicted interior noise levels at nearby receptors would, still be anticipated to exceed the commonly applied interior noise threshold of 45 dBA L_{eq} (with windows partially open). As a result, construction activities associated with the proposed project are considered to have a ***significant and unavoidable*** temporary Impact to nearby receptors.

No Project

No new development or associated construction noise would occur in the project area under the No Project Alternative; therefore, ***no impact*** would occur related to short-term exposure to construction-generated noise.

No mitigation measures are required.

IMPACT 2

Long-Term Operational Traffic Noise. *Implementation of the proposed project would not result in substantial increases in traffic noise levels that would exceed the noise criteria for land use compatibility at nearby land uses. This would be a* ***less-than-significant*** *impact.*

Proposed Project

The increase in daily traffic volumes resulting from implementation of the proposed project would generate increased noise levels along nearby roadway segments. The FHWA Traffic Noise Model (FHWA 1988) was used to predict traffic noise levels along affected roadways for baseline traffic conditions, with and without implementation of the proposed project, based on the trip distribution estimates obtained from the traffic analysis prepared for this project. The project's contribution to the baseline traffic noise levels along area roadways was determined by comparing the predicted noise levels with and without project-generated traffic under baseline conditions. Predicted traffic noise levels are summarized in Table 5.

As depicted in Table 5, implementation of the proposed project would not result in a substantial increase (i.e., 4 dBA, or greater) on primarily affected roadways, with the exception of the existing portion of Fulton Avenue located north of Business 80. Existing land uses located along Fulton Avenue, north of Business 80, are limited to the Haggin Oaks Golf Course. The City's "normally acceptable" land use compatibility noise criterion for golf courses is 70 dBA L_{dn}/CNEL. Predicted traffic noise levels at this land use, with implementation of the proposed project, would be approximately 57 dBA L_{dn}/CNEL, or less. Although implementation of the proposed project would result in a substantial increases in traffic noise levels along Fulton Avenue located north of Business 80, predicted noise levels from this roadway segment would not exceed the City's "normally acceptable" noise criteria for land use compatibility at adjacent existing or proposed land uses (Table 2). In addition, given the close proximity to Business 80, predicted traffic noise levels along this roadway segment would be largely masked by vehicle traffic

noise from Business 80. As a result, this impact is considered ***less than significant***.

Table 5 Predicted Increases in Traffic Noise Levels Baseline Conditions			
Roadway Segment	L_{dn}/CNEL (dBA) at 100 feet		
	Baseline	Baseline Plus Project	Increase
Auburn Boulevard, West of I-80 Business EB off ramps	60.46	60.64	0.18
Auburn Boulevard, I-80 Business EB off ramps to Fulton Avenue	60.46	60.81	0.35
Auburn Boulevard, East of Fulton Avenue	61.19	61.46	0.27
Fulton Avenue, North of I-80 Business	51.63	57.26	5.63
Fulton Avenue, South of I-80 Business	62.62	62.86	0.24
Notes: Traffic noise levels were predicted using the FHWA Traffic Noise Model based on data obtained from the traffic analysis prepared for this project.			

No mitigation measures are required.

No Project

No new development would occur in the project area under the No Project Alternative; therefore, ***no impact*** related to traffic noise would occur.

No mitigation measures are required.

IMPACT 3

Stationary and Area-Source Noise. *Noise levels generated by stationary sources on the project site would not result in a substantial increase in ambient noise levels that would exceed the noise standards of the City of Sacramento or County of Sacramento Noise Control Ordinances at existing nearby noise-sensitive land uses. This impact would be a* ***less-than-significant****.*

Proposed Project

The proposed project consists of an approximately 20-acre portion of the approximately 456-acre Haggin Oaks Golf Complex, located north of Business 80 and east of Fulton Avenue. The proposed project site would be subdivided into a 10.8-acre parcel and a 6.7-acre parcel. A new auto dealership is proposed for the 10.8-acre parcel and the 6.7-acre parcel would be paved and used for parking. The remainder of the project site (2.5 acres) would be used for rights of way purposes.

Noise generated by proposed onsite uses would be primarily associated with onsite automotive servicing and repair activities, as well as the occasional sounding of vehicle alarms and use of exterior public address systems. Noise levels associated with automotive repair activities and exterior public address systems/vehicle alarms and resultant impacts to nearby sensitive receptors are discussed separately, as follows:

Automotive Repair Activities

The proposed automotive dealership would include facilities such as an automotive service center, including lube, oil, and body/paint shop. Noise generated by automotive service centers is predominantly associated with the use

of small hand-held pneumatic tools (power sanders, grinders, impact wrenches). Other equipment operations such as lifts, compressed air nozzles, air compressors, and tire changers would generate a lesser degree of noise impact. Typical A-weighted noise levels for hand-held pneumatic tools and compressors typically average between 75 and 81 dBA at 50 feet (EPA 1971, FTA 2006). Operational noise from onsite automotive repair facilities would occur within the proposed automotive maintenance and repair facilities and would be limited to daytime hours of operation.

Assuming a maximum noise level of 85 dBA at 50 feet and an average interior-to-exterior noise reduction of 15 dBA with garage bay doors partially open, predicted maximum noise levels at the Clarion Hotel and the Haggin Oaks Golf Course would be approximately 46 dBA, and approximately 44 dBA at the nearest residences, which are located south of the project site, south of Auburn Boulevard. Predicted maximum noise levels at the residences located west of the project site, west of Roseville Road, would be approximately 33 dBA. Assuming that activities were to occur continuously over an approximate 30 minute period, predicted noise levels at nearby receptors would not exceed the City and County of Sacramento corresponding daytime noise standard of 50 dBA, as well as applicable intermittent noise standards.

Public Address Systems & Vehicle Alarms

Noise events associated with public address systems and vehicle alarms typically occur for brief periods of time (i.e., typically 1 minute or less in duration) and can reach levels of approximately 80 to 100 dBA at 10 feet. Assuming a maximum noise level of 100 dBA, predicted intermittent exterior noise levels at the Clarion Hotel and the Haggin Oaks Golf Course would be approximately 62 dBA. Exterior noise levels at the nearest residences, which are located south of the project site, south of Auburn Boulevard, would be approximately 60 dBA. Predicted exterior noise levels at the residences located west of the project site, west of Roseville Road, would be approximately 49 dBA. Predicted intermittent noise levels at nearby receptors would not exceed the City's corresponding noise standard of 70 dBA. Because such noise events would occur intermittently and for brief periods of time (i.e., typically 1 minute or less in duration), substantial increases in average-hourly noise levels at nearby receptors would not be anticipated.

Impact Summary

As noted in Exhibit 2, average-hourly ambient daytime noise levels in the vicinity of nearby noise-sensitive land uses range from the upper 50's to the upper 60's, with intermittent maximum noise levels ranging from the mid-60's to mid-70's. In comparison to the ambient noise levels measured at nearby receptors, the predicted operational noise levels noted above would be largely masked by ambient daytime noise levels. Operational noise associated with the proposed land uses would not result in a substantial increase in ambient daytime noise levels at nearby noise-sensitive land uses that would exceed the City's corresponding average or maximum intermittent noise standards. In addition, because operational hours of the proposed automotive dealership would be limited to daytime hours, noise-related impacts to nearby receptors during the more noise-sensitive nighttime hours would not be anticipated. As a result, operational noise levels associated with the proposed uses would be considered ***less than significant***.

No mitigation measures are required.

No Project

No new development would occur in the project area under the No Project Alternative; therefore, ***no impact*** would occur related to stationary- and area-source noise.

No mitigation measures are required.

IMPACT 4

Exposure of sensitive receptors or generation of excessive vibration levels. *Short-term construction-generated vibration levels would not exceed Caltrans' minimum thresholds for the prevention of structural damage or human annoyance. In addition, the long-term operation of the proposed project would not include any major sources of vibration. This would be a* ***less-than-significant*** *impact.*

Proposed Project

The effects of ground vibration can vary from no perceptible effects at the lowest levels, low rumbling sounds and detectable vibrations at moderate levels, and slight damage to nearby structures at the highest levels. At the highest levels of vibration, damage to structures is primarily architectural (e.g., loosening and cracking of plaster or stucco coatings) and rarely result in structural damage.

There are no federal, state, or local regulatory standards for vibration. However, various criteria have been established to assist in the evaluation of vibration impacts. For instance, the California Department of Transportation (Caltrans) has developed vibration criteria based on human perception and structural damage risks. For most structures, Caltrans considers a peak particle velocity (ppv) threshold of 0.2 inches per second to be the level at which architectural damage (i.e., minor cracking of plaster walls and ceilings) to normal structures may occur. Below 0.10 inches per second there is "virtually no risk of 'architectural' damage to normal buildings. Levels above 0.4 inches per second may possibly cause structural damage (Caltrans, 2002).

In terms of human annoyance, continuous vibrations in excess of 0.1 inches per second ppv are identified by Caltrans as the minimum level perceptible level for ground vibration. Short periods of ground vibration in excess of 0.2 inches per second can be expected to result in increased levels of annoyance to people within buildings (Caltrans, 2002).

The proposed project would not involve the long-term use of any equipment or processes that would result in potentially significant levels of ground vibration. Site preparation and building construction activities associated with the proposed project are anticipated to require the use of various types of off-highway equipment (e.g., graders, backhoes, off-highway trucks) that might result in intermittent increases in ground vibration. Ground vibration generated by construction equipment spreads through the ground and diminishes in strength with distance. Construction activities can result in varying degrees of ground vibration, depending on the equipment used and activities being performed. The ground vibration levels associated with various types of construction equipment are depicted in Table 6.

Table 6 Representative Vibration Source Levels for Construction Equipment	
Equipment	**Peak Particle Velocity at 25 feet (in/sec)**
Large Bulldozer	0.089
Loaded Trucks	0.076
Jackhammer	0.035
Small Bulldozer	0.003
Caisson Drilling	0.089
Source: U.S. Department of Transportation, 1995	

Ground vibration levels associated with site preparation and building construction, as noted in Table 6, would result in maximum vibration levels of approximately 0.089 inches per second ppv at 25 feet. The ground vibration level identified in Table 6 for caisson drilling (i.e., 0.089 inches per second at 25 feet) would be representative of levels anticipated for jack-and-bore tunneling. However, because jack-and-bore tunneling would occur several feet below the surface, ground-borne vibration levels at the surface would likely be less than those commonly experienced when caisson drilling occurs near the surface.

Construction activities are not anticipated to be conducted within 25 feet of any existing structures. As a result, predicted ground vibration levels at nearby structures would not be anticipated to exceed the minimum perceptible threshold 0.1 inches per second ppv for human annoyance, nor would ground vibration levels be anticipated to exceed the minimum threshold of 0.2 inches per second ppv for structural damage. In addition, jack-and-bore tunneling beneath the I-80 Business Loop would be anticipated to result in minimal ground vibration at the surface of the roadways and would not exceed ground-vibration levels commonly associated with surface vehicle traffic (i.e., 0.4-0.6 inches per second ppv (Caltrans 2002).) As a result, jack-and-bore tunneling would not result in structural damage to I-80. This impact is considered ***less than significant***.

No mitigation measures are required.

No Project

No new development or associated construction noise would occur in the project area under the No Project Alternative; therefore, ***no impact*** would occur related to construction-period noise.

No mitigation measures are required.

IMPACT 5

Cumulative Traffic Noise. *Implementation of the proposed project would not result in a substantial increase in traffic noise levels that would exceed the City's noise criteria for land use compatibility at nearby land uses. This would be a* ***less than significant*** *impact.*

Proposed Project

The increase in daily traffic volumes resulting from implementation of the proposed project would generate increased noise levels along nearby roadway segments. The FHWA Traffic Noise Model (FHWA 1988) was used to predict traffic noise levels along affected roadways for baseline traffic conditions, with and without implementation of the proposed project, based on the trip distribution estimates

obtained from the traffic analysis prepared for this project. The project's contribution to the cumulative traffic noise levels along area roadways was determined by comparing the predicted noise levels with and without project-generated traffic under cumulative conditions. Predicted traffic noise levels are summarized in Table 7.

Table 7
Predicted Increases in Traffic Noise Levels
Future Cumulative Conditions

Roadway Segment	L_{dn}/CNEL (dBA) at 100 feet		
	Cumulative	Cumulative Plus Project	Increase
Auburn Boulevard, West of I-80 Business EB off ramps	61.11	61.27	0.16
Auburn Blvd., I-80 Business EB off ramps to Fulton Ave.	60.58	60.92	0.34
Auburn Boulevard, East of Fulton Avenue	62.18	62.39	0.21
Fulton Avenue, North of I-80 Business	52.15	57.40	5.25
Fulton Avenue, South of I-80 Business	63.08	63.30	0.22

Notes: Traffic noise levels were predicted using the FHWA Traffic Noise Model based on data obtained from the traffic analysis prepared for this project.

As depicted, implementation of the proposed project would not result in a substantial increase (i.e., 4 dBA, or greater) on primarily affected roadways, with the exception of Fulton Avenue located north of Business 80. Existing land uses located along Fulton Avenue, north of Business 80, are limited to the Haggin Oaks Golf Course. The City's "normally acceptable" land use compatibility noise criteria for golf courses is 70 dBA L_{dn}/CNEL. Predicted future cumulative traffic noise levels along Fulton Avenue, with implementation of the proposed project, would be approximately 57 dBA L_{dn}/CNEL. Although implementation of the proposed project would result in a substantial increases in traffic noise levels along the existing portion of Fulton Avenue located north of Business 80, predicted traffic noise levels would not exceed the City's "normally acceptable" noise criteria for adjacent land uses. In addition, given the close proximity of this land use to I-80 Business Loop, predicted traffic noise levels along this roadway segment would be largely masked by vehicle traffic noise from I-80. As a result, this impact is considered ***less than significant***.

No mitigation measures are required.

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APPENDIX A

NOISE PREDICTION MODELING

TRAFFIC NOISE MODELING

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

BASELINE WITHOUT PROJECT

RUN NAME: AUB W OF 80EB OFFRAMPS RUN DATE: 5/29/06
ADT: 8611 SPEED: 40 ACTIVE HALF WIDTH (FT): 6
SITE CHARACTERISTICS: SOFT GRADE (PERCENT): .5
CNEL AT 100 FT FROM NEAR TRAVEL LANE CENTERLINE = 60.46
* * DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	55.7	119.4	256.9

RUN NAME: AUBURN 80 EB OFFRAMP TO FULTON RUN DATE: 5/29/06
ADT: 11007 SPEED: 40 ACTIVE HALF WIDTH (FT): 18
SITE CHARACTERISTICS: SOFT GRADE (PERCENT): .5
CNEL AT 100 FT FROM NEAR TRAVEL LANE CENTERLINE = 60.46
* * DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	67.6	141.4	302.6

RUN NAME: AUBURN E OF FULTON RUN DATE: 5/29/06
ADT: 13036 SPEED: 40 ACTIVE HALF WIDTH (FT): 18
SITE CHARACTERISTICS: SOFT GRADE (PERCENT): .5
CNEL AT 100 FT FROM NEAR TRAVEL LANE CENTERLINE = 61.19
* * DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	75.1	158.0	338.7

RUN NAME: FULTON N OF 80 WB RAMPS RUN DATE: 5/29/06
ADT: 2262 SPEED: 30 ACTIVE HALF WIDTH (FT): 6
SITE CHARACTERISTICS: SOFT GRADE (PERCENT): .5
CNEL AT 100 FT FROM NEAR TRAVEL LANE CENTERLINE = 51.63
* * DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	0.0	0.0	66.5

RUN NAME: FULTON S OF AUBURN RUN DATE: 5/29/06
ADT: 25131 SPEED: 35 ACTIVE HALF WIDTH (FT): 18
SITE CHARACTERISTICS: SOFT GRADE (PERCENT): .5
CNEL AT 100 FT FROM NEAR TRAVEL LANE CENTERLINE = 62.62
* * DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	92.6	196.4	421.6

BASELINE WITH PROJECT

RUN NAME: AUBURN W OF I80 RUN DATE: 100306
ADT: 8975 SPEED: 40 ACTIVE HALF WIDTH (FT): 6
SITE CHARACTERISTICS: SOFT GRADE (PERCENT): .5
CNEL AT 100 FT FROM NEAR TRAVEL LANE CENTERLINE = 60.64
* * DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *
70 CNEL 65 CNEL 60 CNEL 55 CNEL
--- --- --- ---
0.0 57.2 122.7 264.1

RUN NAME: AUB I80 TO FULTON RUN DATE: 100306
ADT: 11938 SPEED: 40 ACTIVE HALF WIDTH (FT): 18
SITE CHARACTERISTICS: SOFT GRADE (PERCENT): .5
CNEL AT 100 FT FROM NEAR TRAVEL LANE CENTERLINE = 60.81
* * DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *
70 CNEL 65 CNEL 60 CNEL 55 CNEL
--- --- --- ---
0.0 71.1 149.1 319.4

RUN NAME: AUB E OF FULTON RUN DATE: 100306
ADT: 13877 SPEED: 40 ACTIVE HALF WIDTH (FT): 18
SITE CHARACTERISTICS: SOFT GRADE (PERCENT): .5
CNEL AT 100 FT FROM NEAR TRAVEL LANE CENTERLINE = 61.46
* * DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *
70 CNEL 65 CNEL 60 CNEL 55 CNEL
--- --- --- ---
0.0 78.1 164.7 353.0

RUN NAME: FULTON NORTH OF I80 RUN DATE: 100306
ADT: 8263 SPEED: 30 ACTIVE HALF WIDTH (FT): 6
SITE CHARACTERISTICS: SOFT GRADE (PERCENT): .5
CNEL AT 100 FT FROM NEAR TRAVEL LANE CENTERLINE = 57.26
* * DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *
70 CNEL 65 CNEL 60 CNEL 55 CNEL
--- --- --- ---
0.0 0.0 73.1 157.1

RUN NAME: FULTON S OF AUB RUN DATE: 100306
ADT: 26571 SPEED: 35 ACTIVE HALF WIDTH (FT): 18
SITE CHARACTERISTICS: SOFT GRADE (PERCENT): .5
CNEL AT 100 FT FROM NEAR TRAVEL LANE CENTERLINE = 62.86
* * DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *
70 CNEL 65 CNEL 60 CNEL 55 CNEL
--- --- --- ---
0.0 95.9 203.7 437.5

CUMULATIVE WITHOUT PROJECT

RUN NAME: AUB W OF I80 RUN DATE: 100306
ADT: 10000 SPEED: 40 ACTIVE HALF WIDTH (FT): 6
SITE CHARACTERISTICS: SOFT GRADE (PERCENT): .5
CNEL AT 100 FT FROM NEAR TRAVEL LANE CENTERLINE = 61.11
* * DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *
70 CNEL 65 CNEL 60 CNEL 55 CNEL
--- --- --- ---
0.0 61.5 131.9 283.8

RUN NAME: AUB 80 TO FUL RUN DATE: 100306
ADT: 11320 SPEED: 40 ACTIVE HALF WIDTH (FT): 18
SITE CHARACTERISTICS: SOFT GRADE (PERCENT): .5
CNEL AT 100 FT FROM NEAR TRAVEL LANE CENTERLINE = 60.58
* * DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *
70 CNEL 65 CNEL 60 CNEL 55 CNEL

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-------  -------   -------   -------
   0.0      68.7      144.0      308.3

   RUN NAME: FULTON S OF AUB         RUN DATE: 100306
ADT:  27930      SPEED:  35      ACTIVE HALF WIDTH (FT):  18
SITE CHARACTERISTICS: SOFT     GRADE (PERCENT):  .5
CNEL AT 100 FT FROM NEAR TRAVEL LANE CENTERLINE =  63.08
* *  DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *
70 CNEL  65 CNEL   60 CNEL   55 CNEL
-------  -------   -------   -------
   0.0      99.1      210.6      452.3

   RUN NAME: AUB E OF FUL         RUN DATE: 100306
ADT:  16360      SPEED:  40      ACTIVE HALF WIDTH (FT):  18
SITE CHARACTERISTICS: SOFT     GRADE (PERCENT):  .5
CNEL AT 100 FT FROM NEAR TRAVEL LANE CENTERLINE =  62.18
* *  DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *
70 CNEL  65 CNEL   60 CNEL   55 CNEL
-------  -------   -------   -------
   0.0      86.7      183.5      393.9

   RUN NAME: FULTON N OF 80         RUN DATE: 100306
ADT:  2550      SPEED:  30      ACTIVE HALF WIDTH (FT):  6
SITE CHARACTERISTICS: SOFT     GRADE (PERCENT):  .5
CNEL AT 100 FT FROM NEAR TRAVEL LANE CENTERLINE =  52.15
* *  DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *
70 CNEL  65 CNEL   60 CNEL   55 CNEL
-------  -------   -------   -------
   0.0       0.0       0.0       72.0
```

CUMULATIVE WITH PROJECT

```
   RUN NAME: AUBURN W OF I80         RUN DATE: 100306
ADT:  10360      SPEED:  40      ACTIVE HALF WIDTH (FT):  6
SITE CHARACTERISTICS: SOFT     GRADE (PERCENT):  .5
CNEL AT 100 FT FROM NEAR TRAVEL LANE CENTERLINE =  61.27
* *  DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *
70 CNEL  65 CNEL   60 CNEL   55 CNEL
-------  -------   -------   -------
   0.0      62.9      135.0      290.6

   RUN NAME: AUB I80 TO FULTON         RUN DATE: 100306
ADT:  12251      SPEED:  40      ACTIVE HALF WIDTH (FT):  18
SITE CHARACTERISTICS: SOFT     GRADE (PERCENT):  .5
CNEL AT 100 FT FROM NEAR TRAVEL LANE CENTERLINE =  60.92
* *  DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *
70 CNEL  65 CNEL   60 CNEL   55 CNEL
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   0.0      72.2      151.7      325.0

   RUN NAME: AUB E OF FULTON         RUN DATE: 100306
ADT:  17201      SPEED:  40      ACTIVE HALF WIDTH (FT):  18
SITE CHARACTERISTICS: SOFT     GRADE (PERCENT):  .5
CNEL AT 100 FT FROM NEAR TRAVEL LANE CENTERLINE =  62.39
* *  DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *
70 CNEL  65 CNEL   60 CNEL   55 CNEL
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   0.0      89.5      189.7      407.2

   RUN NAME: FULTON NORTH OF I80         RUN DATE: 100306
ADT:  8551      SPEED:  30      ACTIVE HALF WIDTH (FT):  6
SITE CHARACTERISTICS: SOFT     GRADE (PERCENT):  .5
CNEL AT 100 FT FROM NEAR TRAVEL LANE CENTERLINE =  57.40
* *  DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *
70 CNEL  65 CNEL   60 CNEL   55 CNEL
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0.0 0.0 74.8 160.7

RUN NAME: FULTON S OF AUB RUN DATE: 100306
ADT: 29370 SPEED: 35 ACTIVE HALF WIDTH (FT): 18
SITE CHARACTERISTICS: SOFT GRADE (PERCENT): .5
CNEL AT 100 FT FROM NEAR TRAVEL LANE CENTERLINE = 63.30
* * DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL * *
70 CNEL 65 CNEL 60 CNEL 55 CNEL
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0.0 102.3 217.7 467.7

PREDICTED CONSTRUCTION NOISE LEVELS

	Noise Level (Leq)			
Site Reclamation & Grading	89.00			
Distance from Receptor (feet)	(dB)	Shielding (NRC)	(dB)	Description
50	89.00			Reference Noise Level
525	68.58	0.00	68.58	Clarion Hotel
800	64.92	0.00	64.92	Res S of Fulton Avenue
400	70.94	0.00	70.94	Haggin Oaks Golf Course
3250	52.74	0.00	52.74	Res W of Roseville Rd

	Noise Level (Leq)			
Building Construction	85	(EPA 1971)		
Distance from Receptor (feet)	(dB)	Shielding (NRC)	(dB)	Description
50	85.00			Reference Noise Level
700	62.08	0.00	62.08	Clarion Hotel
900	59.89	0.00	59.89	Res S of Fulton Avenue
550	64.17	0.00	64.17	Haggin Oaks Golf Course
3400	48.35	0.00	48.35	Res W of Roseville Rd

	Noise Level (Leq)			
Jack and Bore Tunneling	88.00	(EPA 1971)		
Distance from Receptor (feet)	(dB)	Shielding (NRC)	(dB)	Description
50	88.00			Reference Noise Level
560	67.02	0.00	67.02	Clarion Hotel
415	69.62	0.00	69.62	Res S of Fulton Avenue
1300	59.70	0.00	59.70	Haggin Oaks Golf Course
4100	49.72	0.00	49.72	Res W of Roseville Rd

	Noise Level (Leq)			
Fulton Avenue Extension	88.00	(EPA 1971)		
Distance from Receptor (feet)	(dB)	Shielding (NRC)	(dB)	Description
50	88.00			Reference Noise Level
650	65.72	0.00	65.72	Clarion Hotel
1050	61.56	0.00	61.56	Res S of Fulton Avenue
260	73.68	0.00	73.68	Haggin Oaks Golf Course
3150	52.01	0.00	52.01	Res W of Roseville Rd

PREDICTED OPERATIONAL NOISE LEVELS

	Max. Noise Level			
Automotive Repair Facility	80.00	(EPA 1971; Ambient Measurement Data, 2005)		
Distance from Receptor (feet)	(dB)	Shielding (NRC)*	(dB)	Description
50	80.00			Reference Noise Level
800	55.92	15.00	40.92	Clarion Hotel
1000	53.98	15.00	38.98	Res S of Fulton Avenue
825	55.65	15.00	40.65	Haggin Oaks Golf Course
3750	42.50	15.00	27.50	Res W of Roseville Rd

*Assumes garage bay doors partially opened.

PA System/Vehicle Alarm	100.00	(EPA 1971; Ambient Measurement Data, 2005)		
Distance from Receptor (feet)	(dB)	Shielding (NRC)*	(dB)	Description
10	100.00			Reference Noise Level
800	61.94	0.00	61.94	Clarion Hotel
1000	60.00	0.00	60.00	Res S of Fulton Avenue
825	61.67	0.00	61.67	Haggin Oaks Golf Course
3750	48.52	0.00	48.52	Res W of Roseville Rd