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APPENDIX C  
NOISE ASSESSMENT

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***THE VALLEY CHRISTIAN SCHOOLS  
PLANNED DEVELOPMENT REZONING PROJECT  
NOISE ASSESSMENT  
SAN JOSÉ, CALIFORNIA***

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## INTRODUCTION

This report presents the results of the noise assessment completed for the Valley Christian Schools (VCS) Planned Development (PD) Rezoning project in San José, California. The project would increase the allowed student population from 1,200 students (plus 100 allowed day care students) to 2,300 students at the existing junior and high school campus, and allow inbound school bus access on Diamond Heights Drive. This report evaluates the project's potential to result in significant impacts with respect to applicable CEQA guidelines. The report is divided into two sections. The Setting Section provides a brief description of the fundamentals of environmental noise, summarizes applicable regulatory criteria, and discusses the results of the ambient noise monitoring survey completed to document existing noise conditions. The Impacts and Mitigation Measures Section describes the significance criteria used to evaluate project impacts, provides a discussion of each project impact, and where necessary, presents mitigation measures to provide a compatible project in relation to adjacent noise sensitive land uses.

## SETTING

### Fundamentals of Environmental Noise

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound could be caused by its *pitch* or its loudness. *Pitch* is the height or depth of a tone or sound, depending on the relative rapidity (frequency) of the vibrations by which it is produced. Higher pitched signals sound louder to humans than sounds with a lower pitch. *Loudness* is intensity of sound waves combined with the reception characteristics of the ear. Intensity may be compared with the height of an ocean wave in that it is a measure of the amplitude of the sound wave.

In addition to the concepts of pitch and loudness, there are several noise measurement scales which are used to describe noise in a particular location. A *decibel (dB)* is a unit of measurement which indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 decibels represents a ten-fold increase in acoustic energy, while 20 decibels is 100 times more intense, 30 decibels is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 1.

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level or dBA*. This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This energy-equivalent sound/noise descriptor is called  $L_{eq}$ . The most common averaging period is hourly, but  $L_{eq}$  can describe any series of noise events of arbitrary duration.

The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends upon the distance the receptor is from the noise source. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

Since the sensitivity to noise increases during the evening and at night -- because excessive noise interferes with the ability to sleep -- 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level, CNEL*, is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 pm - 10:00 pm) and a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels. The *Day/Night Average Sound Level, DNL*, is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

**TABLE 1 Definition of Acoustical Terms Used in this Report**

<b>Term</b>	<b>Definition</b>
Decibel, dB	A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e.g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Sound Exposure Level, SEL	The total sound energy in a specific time period. The time period is defined as the start time and end time of a noise event such as an aircraft or automobile passby.
Equivalent Noise Level, $L_{eq}$	The average A-weighted noise level during the measurement period.
$L_{max}$ , $L_{min}$	The maximum and minimum A-weighted noise level during the measurement period.
$L_{01}$ , $L_{10}$ , $L_{50}$ , $L_{90}$	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, $L_{dn}$ or DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 pm and 7:00 am.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 pm to 10:00 pm and after addition of 10 decibels to sound levels measured in the night between 10:00 pm and 7:00 am.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Handbook of Acoustical Measurements and Noise Control, Harris, 1998, and Illingworth & Rodkin, Inc.

**TABLE 2 Typical Noise Levels in the Environment**

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
Jet fly-over at 1,000 feet	110 dBA	Rock band
Gas lawn mower at 3 feet	100 dBA	
Diesel truck at 50 feet at 50 mph	90 dBA	Food blender at 3 feet
Noisy urban area, daytime	80 dBA	Garbage disposal at 3 feet
Gas lawn mower, 100 feet	70 dBA	Vacuum cleaner at 10 feet
Commercial area	60 dBA	Normal speech at 3 feet
Heavy traffic at 300 feet	50 dBA	Large business office
Quiet urban daytime	40 dBA	Dishwasher in next room
Quiet urban nighttime	30 dBA	Theater, large conference room
Quiet suburban nighttime	20 dBA	Library
Quiet rural nighttime	10 dBA	Bedroom at night, concert hall
	0 dBA	Broadcast/recording studio

Source: Technical Noise Supplement (TeNS), Caltrans, November 2009.

## REGULATORY BACKGROUND

Applicable regulatory criteria presented in Appendix G of the State CEQA Guidelines and the City of San José Noise Element of the General Plan are as follows:

**State CEQA Guidelines.** The significance of environmental noise impacts resulting from a proposed project are evaluated based on the California Environmental Quality Act (CEQA) guidelines. CEQA asks the following applicable<sup>1</sup> questions. Would the project result in:

- Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

**City of San José General Plan.** The Environmental Leadership Chapter in The Envision San José 2040 General Plan sets forth policies related to noise and vibration control in the City of San José. The following policy would apply to the proposed project:

**EC-1.2** Minimize the noise impacts of new development on land uses sensitive to increased noise levels (Categories 1, 2, 3 and 6) by limiting noise generation and by requiring use of noise attenuation measures such as acoustical enclosures and sound barriers, where feasible. The City considers significant noise impacts to occur if a project would:

- Cause the DNL at noise sensitive receptors to increase by five dBA DNL or more where the noise levels would remain “Normally Acceptable”; or
- Cause the DNL at noise sensitive receptors to increase by three dBA DNL or more where noise levels would equal or exceed the “Normally Acceptable” level.

### Existing Noise Environment

Valley Christian School is located east of Monterey Road and south of Senter Road in San José, California. Single-family residential subdivisions surround the project site in all directions.

Noise monitoring was completed at the site and in the site vicinity between May 17, 2012 and May 22, 2012 in order to quantify existing ambient noise levels. The noise monitoring survey included three long-term measurements (LT-1 through LT-3) and one short-term (2-hour) measurement (ST-1), as shown in Figure 1. The existing noise environment at the site and in the vicinity results primarily from vehicular traffic on local roadways and aircraft over-flights. The daily trend in noise levels at Sites LT-1, LT-2, and LT-3 are shown in Figures 2-19.

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<sup>1</sup> Questions b), e), and f) are not applicable to the proposed project and have been omitted from further analysis.

Long-term noise measurement LT-1 was located at the northeast corner of Skyway Drive and Houndshaven Way, approximately 75 feet from the center of Skyway Drive. The sound level meter was placed about 12 feet above the ground. Noise levels measured at this site were primarily the result of traffic along Skyway Drive with hourly average noise levels ranging from 54 to 64 dBA  $L_{eq}$  during the day and from 44 to 56 dBA  $L_{eq}$  at night. The day-night average noise level (DNL) at this measurement location ranged from 60 to 62 dBA DNL.

Noise measurement location LT-2 was approximately 30 feet from the center of Diamond Heights Drive, near River View Drive residences. In the absence of intermittent school traffic on Diamond Heights Drive and other school activities, the noise environment at this location was primarily the result of aircraft over-flights and distant traffic along Senter Road traffic. The noise measurement site was located close to Diamond Heights Drive, and maximum instantaneous noise levels from bus passby events were approximately 5 to 15 dBA higher at Site LT-2 than the maximum instantaneous noise levels received at the nearby residential property line (see Site ST-1, discussed below). Hourly average noise levels at Site LT-2 ranged from 52 to 65 dBA  $L_{eq}$  during the day and from 40 to 58 dBA  $L_{eq}$  at night. The calculated DNL at this location ranged from 61 to 62 dBA DNL on weekdays and from 55 to 57 dBA DNL on weekends.

Long-term measurement LT-3 was located along Diamond Heights Drive, approximately 300 feet from the center of Senter Road. Traffic along Diamond Heights Drive was the predominant noise source at the site, and similar to Site LT-2, the proximity of the measurement location to the roadway yielded higher maximum instantaneous noise levels than those measured at residences further from Diamond Heights Drive. Hourly average noise levels ranged from 53 to 68 dBA  $L_{eq}$  during the day and from 44 to 62 dBA  $L_{eq}$  at night. The DNL at this location ranged from 62 to 64 dBA DNL on weekdays and 59 dBA DNL on weekends.

Short-term noise measurement location ST-1 was at the westernmost property line of #351 River View Drive, approximately 65 feet from the center of Diamond Heights Drive. Noise levels from vehicles along Diamond Heights Drive were documented over an approximate two-hour period, beginning at 1:00 PM on May 17, 2012. Table 3 summarizes the data collected at the short-term measurement site. A review of these data shows that inbound school buses generate maximum instantaneous noise levels ranging from about 70 to 73 dBA  $L_{max}$  and single-event noise levels (SEL) of about 79 dBA. For comparative purposes, autos and light-duty pick-up trucks generated maximum instantaneous noise levels ranging from about 54 to 61 dBA  $L_{max}$  and single-event noise levels ranging from 62 to 64 dBA. Aircraft on approach to Mineta San José International Airport generated maximum instantaneous noise levels ranging from about 64 to 65 dBA  $L_{max}$  and single-event noise levels ranging from 75 to 77 dBA.

**TABLE 3 Summary of Short-Term Noise Measurement Data, dBA**

Vehicle Type	Time	L <sub>max</sub>	L <sub>eq</sub>	SEL
Auto <sup>1</sup>	1322	--	--	--
School Bus	1325	73	68	79
Auto <sup>1</sup>	1339	--	--	--
School Bus	1344	70	64	79
Aircraft	1354	64	60	75
Aircraft	1400	65	62	77
Auto	1407	61	54	64
Pick-up Truck	1407	54	53	62
School Bus	1409	71	66	79
Auto <sup>1</sup>	1419	--	--	--

1. Auto passby not measurable above other ambient noise sources.

## **NOISE IMPACTS AND MITIGATION MEASURES**

### **Significance Criteria**

Paraphrasing from Appendix G of the CEQA Guidelines, a project would normally result in significant noise impacts if ambient noise levels at sensitive receptors would be substantially increased over a permanent, temporary, or periodic basis. The following criteria were used to evaluate the significance of environmental noise resulting from the project:

- A significant impact would be identified if auto or bus traffic generated by the project would substantially increase noise levels at sensitive receptors in the vicinity. The City of San José considers significant noise impacts to occur if a project would cause the DNL at noise sensitive receptors to increase by five dBA DNL or more where the noise levels would remain “Normally Acceptable” (60 dBA DNL or less) or three dBA DNL or more where the noise levels would exceed “Normally Acceptable” levels.

**Impact 1: Project-Generated Traffic Noise.** The proposed project would not generate a substantial permanent noise level increase at noise sensitive uses in the vicinity. **This is a less-than significant impact.**

*Traffic Noise Increases along the Local Roadway Network*

Under the existing PD zoning, 1,200 total students (plus 100 allowed day care students) are permitted at the campus. The enrollment at the campus during the 2011-2012 school year was 1,850 students (610 junior high and 1,240 senior high). As part of the PD rezoning, the school would be permitted to expand student enrollment to 2,300 students.

Existing Plus Project Conditions

As described previously, the project would add approximately 450 students above the enrollment during the 2011-2012 school year. Traffic noise increases attributable to the project, above existing conditions were calculated by comparing existing traffic volumes in 2012 to existing plus project traffic volumes<sup>2</sup>. A review of the turning movement data presented for these traffic scenarios indicates that traffic noise levels along roadways serving the project site would increase by 1 dBA DNL or less above existing conditions.

Allowed Student Population Plus Project Conditions

The Transportation Impact Analysis prepared for the project establishes the traffic associated with 1,300 students as the environmental baseline for the existing school site (background conditions). The traffic impacts assuming a total increase of 1,000 students was then analyzed in the traffic study (background plus project conditions).

The background plus project traffic volumes were compared to the background traffic volumes to quantify the noise increase attributable to the project (enrollment to 2,300 students) compared to the existing PD zoning enrollment of 1,200 students (plus 100 allowed day care students). Traffic noise levels along roadways serving the project site are calculated to increase by 2 dBA DNL or less as a result of the project when compared to the background traffic volumes that represent the environmental baseline. The project would not result in a substantial increase in noise levels at sensitive residential receptors in the vicinity and the impact is less-than-significant.

*Bus Traffic Noise Increases along Diamond Heights Drive*

Under the existing PD zoning, Diamond Heights Drive is limited to use as an emergency vehicle access (EVA). Ambient noise measurements and observation made in May 2012 indicate that the EVA is currently used by autos (ingress and egress) and buses (ingress only). With the project, buses will use Diamond Heights Drive as an ingress route to the campus, and Skyway Drive will continue to be used as the egress from the school campus.

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<sup>2</sup> Valley Christian Schools Transportation Impact Analysis, Fehr & Peers Associates, Inc., April, 2012

Fehr & Peers counted the number of buses on Diamond Heights Drive in May 2012. The counts resulted in 13 buses (13 inbound, 0 outbound) in the AM peak hour and 4 buses (4 inbound, 0 outbound) in the PM peak hour on Diamond Heights Drive. Approximately 42 bus trips utilize Diamond Heights Drive on a daily basis.

Worst-hour average noise levels ( $L_{eq}$ ) and daily average noise levels (DNL) resulting from buses along Diamond Heights Drive, as documented in May 2012, were calculated based on the measured noise data and bus trip counts provided by the traffic engineer. During the AM peak hour, buses generate a worst-hour noise level of approximately 55 dBA  $L_{eq}$ . The worst-hour noise level generated by buses during the PM peak hour is approximately 48 dBA  $L_{eq}$ . From these data, the day-night average noise level generated by buses along Diamond Heights Drive is calculated to be 51 dBA DNL assuming that 42 buses are distributed over three morning hours (6:00 AM to 9:00 AM) and three afternoon hours (2:00 PM to 5:00 PM).

Bus noise level calculations were then compared to the ambient noise data collected on Saturday, May 19, 2012 and Sunday, May 20, 2012, which are assumed in this analysis to credibly represent existing conditions without traffic along Diamond Heights Drive. The comparison showed that bus traffic along Diamond Heights Drive would result in AM peak hour noise levels approximately 2 to 5 dBA  $L_{eq}$  above ambient hourly average noise levels during the 7:00 AM and 8:00 AM hours measured over the weekend. The addition of 42 bus trips would increase daily average noise levels measured over the weekend by approximately 1 to 2 dBA DNL. DNL noise levels at the nearest residential property line are calculated to range from 57 to 58 dBA DNL assuming up to 42 bus trips per day along Diamond Heights Drive.

With the increase in enrollment, Fehr & Peers estimates that the number of buses on Diamond Heights Drive will reach 20 buses in the AM peak hour and 5 buses in the PM peak hour. Consistent with the increases in bus trips expected as a result of the project during the AM and PM peak hours, this analysis assumes that up to 63 bus trips will utilize Diamond Heights Drive on a daily basis at full enrollment (2,300 students).

Worst-hour average noise levels and daily average noise levels resulting from buses along Diamond Heights Drive, assuming increased enrollment at VCS, would be 56 dBA  $L_{eq}$  during the AM peak hour (20 buses per hour) and 50 dBA  $L_{eq}$  during the PM peak hour (5 buses per hour). The day-night average noise level generated by buses along Diamond Heights Drive is calculated to reach 53 dBA DNL assuming that 63 buses are similarly distributed over three morning hours (6:00 AM to 9:00 AM) and three afternoon hours (2:00 PM to 5:00 PM). At full enrollment, the worst-hour noise level during the AM peak hour would exceed ambient hourly average noise levels during the 7:00 AM and 8:00 AM hours by 3 to 6 dBA  $L_{eq}$ . The addition of 63 bus trips would increase daily average noise levels by approximately 2 dBA DNL, with future day-night average noise levels ranging from 57 to 59 dBA DNL.

The City of San José considers significant noise impacts to occur if a project would cause the DNL at noise sensitive receptors to increase by five dBA DNL or more where the noise levels would remain “Normally Acceptable” (60 dBA DNL or less). The noise increase resulting from project bus trips is calculated to be 2 dBA DNL less, and noise levels would remain below 60

dBA DNL. Therefore, the impact resulting from bus traffic along Diamond Heights Drive would be less-than-significant.

**Mitigation 1:**           **None required.**



**Figure 1: Noise Monitoring Locations**

