Environmental Noise Assessment

Pleasant Valley Road (S.R. 49)/Patterson Drive Intersection Signalization Project

El Dorado County, California

Job # 2008-196

Prepared for:

North State Resources, Inc.

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and the El Dorado County Department of Transportation

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March 16, 2009

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INTRODUCTION

The Pleasant Valley Road and Patterson Drive roadway improvement project generally consists of approximately 1,800 feet of Pleasant Valley Road (State Route 49) and short portions of Ryan Drive and Lake Oaks Drive, and approximately 850 feet of Patterson Drive. The project site is located in western El Dorado County. The project improvements are intended to improve public safety and improve traffic flows through the area. Two traffic alternatives have been analyzed in this study. Existing residential development is located adjacent to the project area. This report provides an analysis of the potential noise impacts associated with operation of the alternatives. In addition, noise impacts associated with construction activities have also been evaluated.

Figure 1 shows the proposed project area of potential effect.

BACKGROUND ON NOISE AND ACOUSTICAL TERMINOLOGY [1]

Fundamentals of Acoustics

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

Noise is a subjective reaction to different types of sounds. Noise is typically defined as (airborne) sound that is loud, unpleasant, unexpected or undesired, and may therefore be classified as a more specific group of sounds. Perceptions of sound and noise are highly subjective. Often, someone's music is described as noise by another.

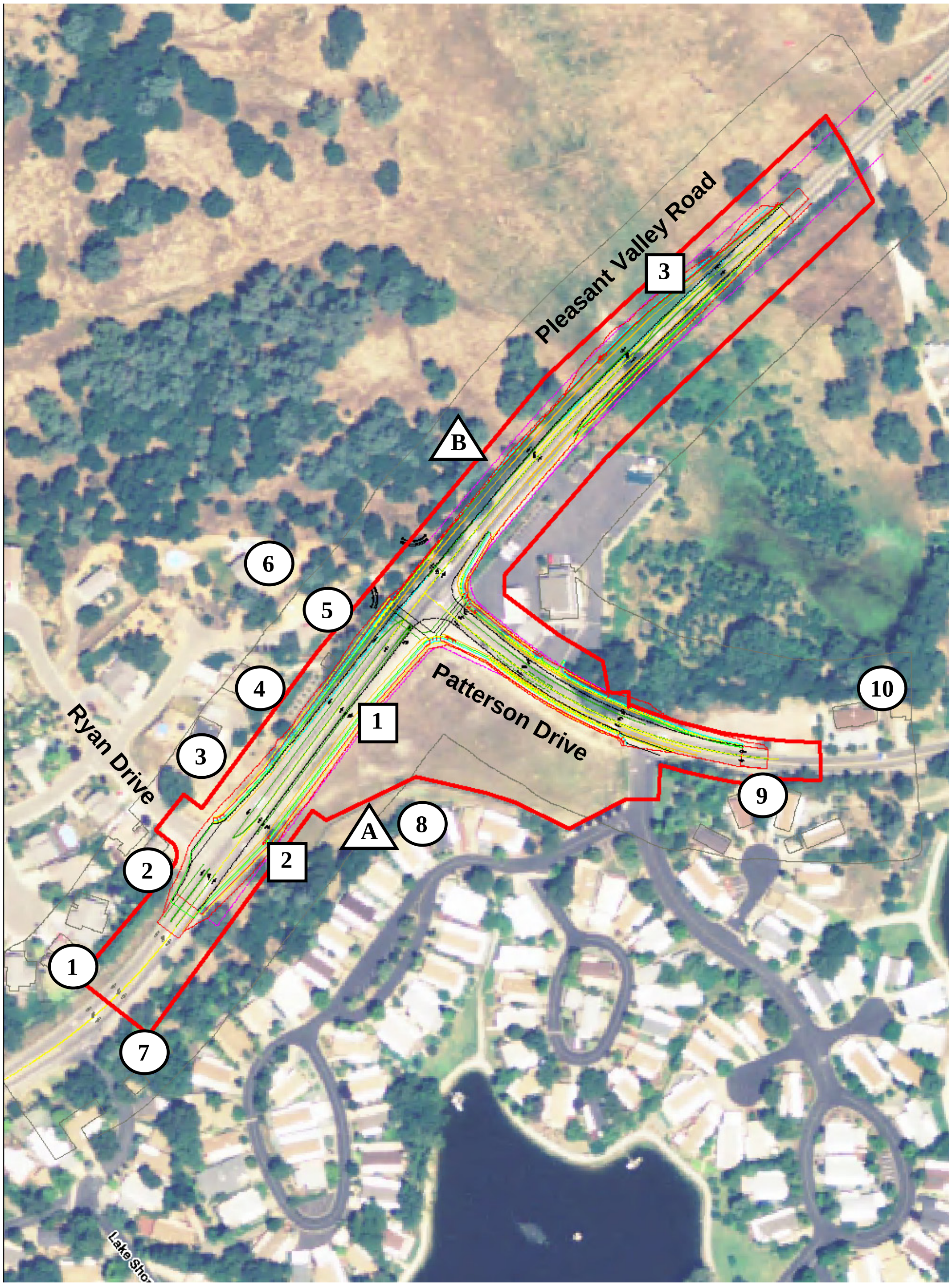
Measuring sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid this, the decibel scale was devised. The decibel scale uses the hearing threshold (20 micropascals), as a point of reference, defined as 0 dB. Other sound pressures are then compared to this reference pressure, and the logarithm is taken to keep the numbers in a practical range. The decibel scale allows a million-fold increase in pressure to be expressed as 120 dB, and changes in levels (dB) correspond closely to human perception of relative loudness.
The perceived loudness of sounds is dependent upon many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable, and can be approximated by A-weighted sound levels.

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

Figure 1

Pleasant Valley Road Improvement Project - El Dorado County, California

Project Site and Noise Measurement Locations



△ : 24 Hour Noise Measurement Site

□ : Short Term Noise Measurement Site

○ : Receiver Location

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There is a strong correlation between A-weighted sound levels (expressed as dBA) and the way the human ear perceives sound. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment. All noise levels reported in this section are in terms of A-weighted levels, but are expressed as dB, unless otherwise noted.

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

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

The day/night average level (L_{dn}) is based upon the average noise level over a 24-hour day, with a +10 decibel weighting applied to noise occurring during nighttime (10:00 p.m. to 7:00 a.m.) hours. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures. Because L_{dn} represents a 24-hour average, it tends to disguise short-term variations in the noise environment. Table 1 lists several examples of the noise levels associated with common noise sources.

Effects of Noise on People

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

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

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

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

Table 1
Typical Noise Levels

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

Source:Caltrans, Technical Noise Supplement, Traffic Noise Analysis Protocol. October 1998.

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

- Except in carefully controlled laboratory experiments, a change of 1 dBA cannot be perceived;
- Outside of the laboratory, a 3 dBA change is considered a just-perceivable difference;

- A change in level of at least 5 dBA is required before any noticeable change in human response would be expected; and
- A 10 dBA change is subjectively heard as approximately a doubling in loudness, and can cause an adverse response.

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

CRITERIA FOR ACCEPTABLE NOISE EXPOSURE

Noise level criteria pertaining to project generated noise levels are contained within the 2004 El Dorado County General Plan Health, Safety, and Noise Element. The following is a summary of selected noise-related Goals, Objectives, Policies and Criteria, which are relevant to this project.

> ***Goal 6.5: Acceptable Noise Levels***
> *Ensure that County residents are not subjected to noise beyond acceptable levels.*
>
> ***Objective 6.5.1: Protection of Noise-Sensitive Development***
> *Protect existing noise-sensitive developments (e.g., hospitals, schools, churches and residential) from new uses that would generate noise levels incompatible with those uses and, conversely, discourage noise-sensitive uses from locating near sources of high noise levels.*
>
> ***Policy 6.5.1.9***
> *Noise created by new transportation noise sources, excluding airport expansion but including roadway improvement projects, shall be mitigated so as not to exceed the levels specified in Table 6-1 at existing noise-sensitive land uses.*

Table 6-1 of the El Dorado County General Plan establishes the “Maximum Allowable Noise Exposure for Transportation Noise Source.” The General Plan establishes an exterior noise level criterion of 60 dB Ldn at the outdoor activity area of residential land uses impacted by transportation noise sources. Where it is not possible to reduce noise in outdoor activity areas to 60 dB Ldn or less using a practical application of the best-available noise reduction measures, an exterior noise level of up to 65 dB Ldn may be allowed provided that available exterior noise level reduction measures have been implemented. In addition, an interior noise level criterion of 45 dB Ldn is applied to all residential land uses. The intent of this interior standard is to provide a suitable environment for indoor communication and sleep.

Policy 6.5.1.12

When determining the significance of impacts and appropriate mitigation for new development projects, the following criteria shall be taken into consideration.

A. *Where existing or projected future traffic noise levels are less than 60 dB Ldn at the outdoor activity areas of residential uses, an increase of more than 5 dBA Ldn caused by a new transportation noise source will be considered significant;*
B. *Where existing or projected future traffic noise levels range between 60 and 65 dB Ldn at the outdoor activity areas of residential uses, an increase of more than 3 dB Ldn caused by a new transportation noise source will be considered significant; and*
C. *Where existing or projected future traffic noise levels are greater than 65 dB Ldn at the outdoor activity areas of residential uses, an increase of more than 1.5 dBA Ldn caused by a new transportation noise will be considered significant.*

Table 2 is commonly used to show expected public reaction to changes in environmental noise levels. This table was developed on the basis of test subjects' reactions to changes in the levels of steady-state pure tones or broad-band noise and to changes in levels of a given noise source. It is probably most applicable to noise levels in the range of 50 to 70 dBA, as this is the usual range of voice and interior noise levels.

Table 2
Subjective Reaction to Changes in Noise Levels of Similar Sources

Change in Level, dBA	Subjective Reaction	Factor Change in Acoustical Energy
1	Imperceptible (Except for Tones)	1.3
3	Just Barely Perceptible	2.0
6	Clearly Noticeable	4.0
10	About Twice (or Half) as Loud	10.0

Source: Architectural Acoustics, M. David Egan, 1988.

EXISTING NOISE ENVIRONMENT IN THE PROJECT VICINITY

Background Noise Environment

The ambient noise environment in the immediate project vicinity is defined primarily by local traffic on Pleasant Valley Road (S.R. 49) and Patterson Drive.

To generally quantify existing ambient noise levels at the project site and the adjacent residential uses, j.c brennan & associates, Inc. conducted continuous noise level measurements at two locations adjacent to the project site, for a period of 3 days. Noise level measurements were conducted on September 5th through September 7th, 2008. This represents a Friday, Saturday and Sunday. Noise measurement locations are shown on Figure 1. The following is a short description of each noise level measurement location:

- Site A is a continuous noise measurement site which is located at in the back yard of Unit 70 of the Lake Oaks Mobile Home Park. The noise measurement site was located west of Patterson Road, on the south side of Pleasant Valley Road. The monitor was located 150 feet from the centerline of Pleasant Valley Road.
- Site B is a continuous noise measurement site which is located at on a vacant parcel (APN # 329:280:15). The noise measurement site was located east of Patterson Drive and north of Pleasant Valley Road. The monitor was located 120 feet north of Pleasant Valley Road.

Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meters were used for the noise level measurement survey. The meters were calibrated before and after use with an LDL Model CA200 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all pertinent specifications of the American National Standards Institute for Type 1 sound level meters (ANSI S1.4). The noise level meters were programmed to collect the maximum (Lmax), average during interval period (Leq), and median (L50) values for each interval period during the ambient noise survey. The Lmax represents the highest noise level measured at any time during the interval period. The Leq represents the energy average of all of the noise measured by the sound level meter over the interval period.

The noise measurement results provided a correlation between the measured peak hour traffic noise level and the overall measured Ldn value.

The noise level measurement survey results are provided in Table 3. Appendix B graphically shows the results of the continuous 24-hour measurement data.

Table3 Existing Ambient Noise Monitoring Results										
			Average Measured Hourly Noise Levels, dBA							
					Daytime (7:00 am - 10:00 pm)			Nighttime (10:00 pm - 7 am)		
Site	Location	Date	Ldn	Peak Hour Leq	Leq	L50	Lmax	Leq	L50	Lmax
Continuous 24-hour Noise Measurement Site										
A	Unit 70 of the Lake Oaks Mobile Home Park. South of Pleasant Valley Road	Sept. 5, 2008	62 dB	62 dB	60 dB	57 dB	70 dB	54 dB	48 dB	71 dB
		Sept. 6, 2008	60 dB	60 dB	59 dB	56 dB	78 dB	51 dB	47 dB	68 dB
		Sept. 7, 2008	59 dB	64 dB	58 dB	55 dB	77 dB	50 dB	45 dB	68 dB
B	Vacant Parcel North of Pleasant Valley Road APN # 329:280:15	Sept. 5, 2008	61 dB	60 dB	58 dB	56 dB	75 dB	53 dB	45 dB	70 dB
		Sept. 6, 2008	58 dB	58 dB	56 dB	54 dB	76 dB	50 dB	44 dB	67 dB
		Sept. 7, 2008	57 dB	58 dB	55 dB	53 dB	74 dB	48 dB	41 dB	67 dB
Source – j.c. brennan & associates, Inc. - 2008										

Existing Traffic Noise Levels:

j.c. brennan & associates, Inc. employs the Federal Highway Administration (FHWA) Highway Traffic Noise Model (TNM) version 2.5 for the prediction of traffic noise levels. The model is based upon the CALVENO noise emission factors for automobiles, medium trucks and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, topography, distance to the receiver, and the acoustical characteristics of the site. The TNM model can also account for changes in traffic noise levels due to signalized intersections or stop sign controlled intersections. Inputs to the TNM model are based upon the existing and proposed roadway geometrics, traffic control, peak hour traffic volumes, travel speeds, and surrounding land forms. The TNM model provides predicted peak hour traffic noise levels using the Leq descriptor. To predict Ldn values, the difference between the measured peak hour Leq and Ldn values described in Table 3 are used. Based upon the results of Table 3, the predicted Leq values are essentially the same as the assumed Ldn values.

Noise level measurements and concurrent counts of traffic on Pleasant Valley Road were conducted at 3 locations along the project site. The purpose of the short-term traffic noise level measurements were to determine the accuracy of the TNM model in describing the existing noise environment on the project site, while accounting for existing site conditions such as topography, actual travel speeds, and roadway grade. Noise measurement results were compared to the TNM model results by entering the observed traffic volume, speed, and distance as inputs to the TNM model.

Instrumentation used for the measurements was a Larson Davis Laboratories (LDL) Model 824 precision integrating sound level meter and frequency analyzer which was calibrated in the field before use with an LDL CAL200 acoustical calibrator.

Table 4 shows the results of the traffic noise calibration. Appendix C provides the complete inputs and results of the TNM model calibration procedures. Figure 1 shows the traffic noise measurement sites.

Table 4
Comparison of TNM Model to Measured Traffic Noise Levels

Site	Roadway	Speed (mph)	Dist. (Feet)	Measured Leq, dB	Modeled Leq, dB	Δ in dB
1	Pleasant Valley Road	35	35’	66 dB	65 dB	-1 dB
2	Pleasant Valley Road	35	85’	62 dB	61 dB	-1 dB
3	Pleasant Valley Road	35	40’	68 dB	68 dB	0 dB

Source - j.c. brennan & associates, Inc. 2008
Traffic Noise Model version 2.5

The TNM Model was found to predict traffic noise levels within 1 dB of the measured noise levels for Site 1 through 3. Therefore, no offsets were assumed in the TNM modeling of existing and future traffic.

To assess the existing traffic noise levels, the TNM model was used. Peak hour traffic volumes provided by Fehr & Peers Traffic Consultants (*Traffic Report for the Pleasant Valley Road/Patterson Drive Intersection PSR, Prepared by Fehr & Peers Transportation Consultants, January 24, 2008*) were used as direct inputs to the model. Truck mix percentages were based upon Caltrans truck counts along that segment of Pleasant Valley Road (S.R. 49). Traffic noise levels for existing conditions include both the peak hour and Ldn values, and are shown for Receivers R1 through R10. All receiver locations are shown on Figure 1. Table 5 shows the TNM predicted traffic noise levels for the existing conditions at each of the 10 receivers. A complete listing of the TNM Model inputs for existing traffic conditions is provided in Appendix C.

Table 5
TNM Predicted Existing Traffic Noise Levels

Receiver #	Address	Predicted Traffic Noise Level
		Peak Hour Leq / Ldn
#1	3601 Sawyer Court	64 dB
#2	3572 Ryan Drive	64 dB
#3	3567 Ryan Drive	62 dB
#4	3296 Grace Court	63 dB
#5	3305 Grace Court	67 dB
#6	3303 Grace Court	58 dB
#7	Lake Shore & Pleasant Valley W of Patterson	62 dB
#8	70 Gold Dust Drive	59 dB
#9	Quail Court, Backing Patterson Drive	58 dB
#10	4265 Patterson Drive	56 dB

Source - j.c. brennan & associates, Inc. 2008
Traffic Noise Model version 2.5

IMPACTS

Traffic Noise Impacts

Two Alternatives have been analyzed for potential noise impacts. The alternatives have been evaluated based upon Future 2017 Conditions, and Future 2025 Conditions.

The alternatives which are analyzed are as follows:

Alternative 1: This alternative is in effect the No-Project Alternative. The intersection control remains as a multi-way stop, and the lane configurations remain the same.

Alternative 2: This alternative includes installing a traffic signal and installing a left-turn lane on the southbound Pleasant Valley Road approach.

The TNM model accounts for the effects of signalization at the intersection, as compared to a stop sign control.

j.c. brennan & associates, Inc. used the TNM model to calculate the changes in traffic noise levels associated with proposed project alternatives. Tables 6 and 7 show the results of the traffic noise modeling. Based upon the analysis the traffic noise levels at each of the identified residential receivers, the project will not result in an increase in traffic noise levels. In many cases the overall noise levels are predicted to decrease after the project is implemented. Decreases in traffic noise levels are generally related to changes in traffic control at the intersection.

Table 6
(2017) Existing and Predicted Future Noise Levels With & Without Project
Pleasant Valley – Patterson Road El Dorado County, California

Receivers Predicted Noise Levels (Ldn / Leq, dBA)				
Receiver #	Address	ALT 1 - No Project	ALT 2 – Proposed Project	Δ
#1	3601 Sawyer Court	66 dB	66 dB	0 dB
#2	3572 Ryan Drive	66 dB	66 dB	-1 dB
#3	3567 Ryan Drive	65 dB	64 dB	-1 dB
#4	3296 Grace Court	66 dB	64 dB	-1 dB
#5	3305 Grace Court	69 dB	68 dB	-1 dB
# 6	3303 Grace Court	61 dB	60 dB	-1 dB
# 7	Lake Shore & Pleasant Valley	64 dB	64 dB	0 dB
# 8	70 Gold Dust Drive	62 dB	61 dB	-1 dB
# 9	Quail Court, Backing Patterson Drive	60 dB	60 dB	0 dB
#10	4265 Patterson Drive	58 dB	57 dB	0 dB
Source: j.c. brennan & associates, Inc., Caltrans, Fehr & Peers Transportation Consultants, Cal Trans 2007 HWY Truck Count, FHWA TNM 2.5				

Table 7
(2025) Existing and Predicted Future Noise Levels With & Without Project
Pleasant Valley – Patterson Road El Dorado County, California

Receivers Predicted Noise Levels (Ldn / Leq, dBA)				
Receiver#	Address	ALT 1 - No Project	ALT 2 – Proposed Project	Δ
#1	3601 Sawyer Court	68 dB	68 dB	0 dB
#2	3572 Ryan Drive	68 dB	67 dB	0 dB
#3	3567 Ryan Drive	67 dB	66 dB	-1 dB
#4	3296 Grace Court	67 dB	66 dB	-1 dB
#5	3305 Grace Court	71 dB	70 dB	-1 dB
# 6	3303 Grace Court	62 dB	61 dB	-1 dB
# 7	Lake Shore & Pleasant Valley	66 dB	66 dB	0 dB
# 8	70 Gold Dust Drive	64 dB	63 dB	-1 dB
# 9	Quail Court, Backing Patterson Drive	61 dB	61 dB	0 dB
#10	4265 Patterson Drive	59 dB	59 dB	0 dB

Source: j.c. brennan & associates, Inc., Caltrans, Fehr & Peers Transportation Consultants, Cal Trans 2007 HWY Truck Count, FHWA TNM 2.5

Construction Noise Impacts

Construction noise impacts are temporary and short-term in nature, and would largely consist of noises from trucks, equipment operations, back-up signals, and similar common construction-related noise. The General Plan Noise Element has established **Policy 6.5.11** which states the following:

> *The standards outlined in Tables 6-3, 6-4, and 6-5 (of the Noise Element) shall apply to those activities associated with actual construction of a project as long as such construction occurs between the hours of 7 a.m. and 7 p.m., Monday through Friday, and 8 a.m. and 5 p.m. on weekends, and on federally recognized holidays. Exceptions are allowed if it can be shown that construction beyond these times is necessary to alleviate traffic congestion and safety hazards.*

County standards for construction noise use a maximum exterior noise level of 75 dBA, and an hourly average noise level of 55 dBA Leq at the building facades of residential uses.

Construction noise levels may result in a temporary increase in background noise levels. This impact is not considered significant.

CUMULATIVE NOISE IMPACTS

Cumulative noise increases generally accrue as traffic volumes increase due to development or other causes. The General Plan anticipates increased development and associated increases in traffic volumes due to the implementation of the General Plan. Additional development results in increased traffic and resulting increased traffic noise levels. Although the project itself is not anticipated to result in a significant increase in traffic noise, a cumulative increase in local traffic noise levels is anticipated in the project area.

As previously noted, General Plan Policy 6.5.1.12 states as follows.

> *When determining the significance of impacts and appropriate mitigation for new development projects, the following criteria shall be taken into consideration.*
>
> A. *Where existing or projected future traffic noise levels are less than 60 dB Ldn at the outdoor activity areas of residential uses, an increase of more than 5 dBA Ldn caused by a new transportation noise source will be considered significant;*
> B. *Where existing or projected future traffic noise levels range between 60 and 65 dB Ldn at the outdoor activity areas of residential uses, an increase of more than 3 dB Ldn caused by a new transportation noise source will be considered significant; and*
> C. *Where existing or projected future traffic noise levels are greater than 65 dB Ldn at the outdoor activity areas of residential uses, an increase of more than 1.5 dBA Ldn caused by a new transportation noise will be considered significant.*

Based upon the analysis the traffic noise levels at each of the identified residential receivers, the project will not result in an increase in traffic noise levels. In many cases the overall noise levels are predicted to decrease after the project is implemented. Decreases in traffic noise levels are generally related to changes in traffic control at the intersection.

MITIGATION

No significant project-specific or cumulative noise impacts have been identified; therefore, no mitigation is required.

Appendix A
Acoustical Terminology

Acoustics The science of sound.

Ambient Noise The distinctive acoustical characteristics of a given space consisting of all noise sources audible at that location. In many cases, the term ambient is used to describe an existing or pre-project condition such as the setting in an environmental noise study.

Attenuation The reduction of an acoustic signal.

A-Weighting A frequency-response adjustment of a sound level meter that conditions the output signal to approximate human response.

Decibel or dB Fundamental unit of sound, A Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell.

CNEL Community Noise Equivalent Level. Defined as the 24-hour average noise level with noise occurring during evening hours (7 - 10 p.m.) weighted by a factor of three and nighttime hours weighted by a factor of 10 prior to averaging.

Frequency The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz.

Ldn Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.

Leq Equivalent or energy-averaged sound level.

Lmax The highest root-mean-square (RMS) sound level measured over a given period of time.

L(n) The sound level exceeded a described percentile over a measurement period. For instance, an hourly L50 is the sound level exceeded 50% of the time during the one hour period.

Loudness A subjective term for the sensation of the magnitude of sound.

Noise Unwanted sound.

Peak Noise The level corresponding to the highest (not RMS) sound pressure measured over a given period of time. This term is often confused with the "Maximum" level, which is the highest RMS level.

RT_{60} The time it takes reverberant sound to decay by 60 dB once the source has been removed.

Sabin The unit of sound absorption. One square foot of material absorbing 100% of incident sound has an absorption of 1 sabin.

SEL A rating, in decibels, of a discrete event, such as an aircraft flyover or train passby, that compresses the total sound energy into a one-second event.

Threshold of Hearing The lowest sound that can be perceived by the human auditory system, generally considered to be 0 dB for persons with perfect hearing.

Threshold of Pain Approximately 120 dB above the threshold of hearing.

Impulsive Sound of short duration, usually less than one second, with an abrupt onset and rapid decay.

Simple Tone Any sound which can be judged as audible as a single pitch or set of single pitches.

Appendix B, Site A

2008-196 Pleasant Valley Road / Patterson Drive
24hr Continuous Noise Monitoring
Friday, September 05, 2008

Hour	Leq	Lmax	L50	L90
0:00	49.1	69.4	44.7	43.2
1:00	47.8	63.6	44.8	43.1
2:00	47.9	66.8	45.5	44.2
3:00	49.7	70.9	43.6	41.6
4:00	50.8	70.6	44.1	41.3
5:00	54.2	68.9	50.2	43.6
6:00	59.2	79.3	56.1	49.6
7:00	62.4	80.6	59.1	55.4
8:00	59.6	71.4	58.1	53.3
9:00	58.8	75.3	56.6	51.5
10:00	58.0	70.0	56.7	52.0
11:00	58.7	76.1	56.5	52.1
12:00	59.9	77.5	56.9	52.4
13:00	59.2	73.8	57.1	52.8
14:00	59.4	75.0	57.4	53.6
15:00	60.3	75.7	58.3	54.7
16:00	61.0	88.2	57.5	53.4
17:00	59.8	80.8	57.6	53.9
18:00	59.0	73.0	57.1	52.3
19:00	59.6	77.7	56.6	52.6
20:00	60.9	85.6	54.7	50.0
21:00	55.3	71.8	53.6	49.2
22:00	56.4	71.4	53.8	46.8
23:00	54.5	80.3	49.1	45.5

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	62.4	55.3	59.7	59.2	47.8	54.0
Lmax (Maximum)	88.2	70.0	76.8	80.3	63.6	71.2
L50 (Median)	59.1	53.6	56.9	56.1	43.6	48.0
L90 (Background)	55.4	49.2	52.6	49.6	41.3	44.3

Computed Ldn, dB	61.8
% Daytime Energy	86%
% Nighttime Energy	14%

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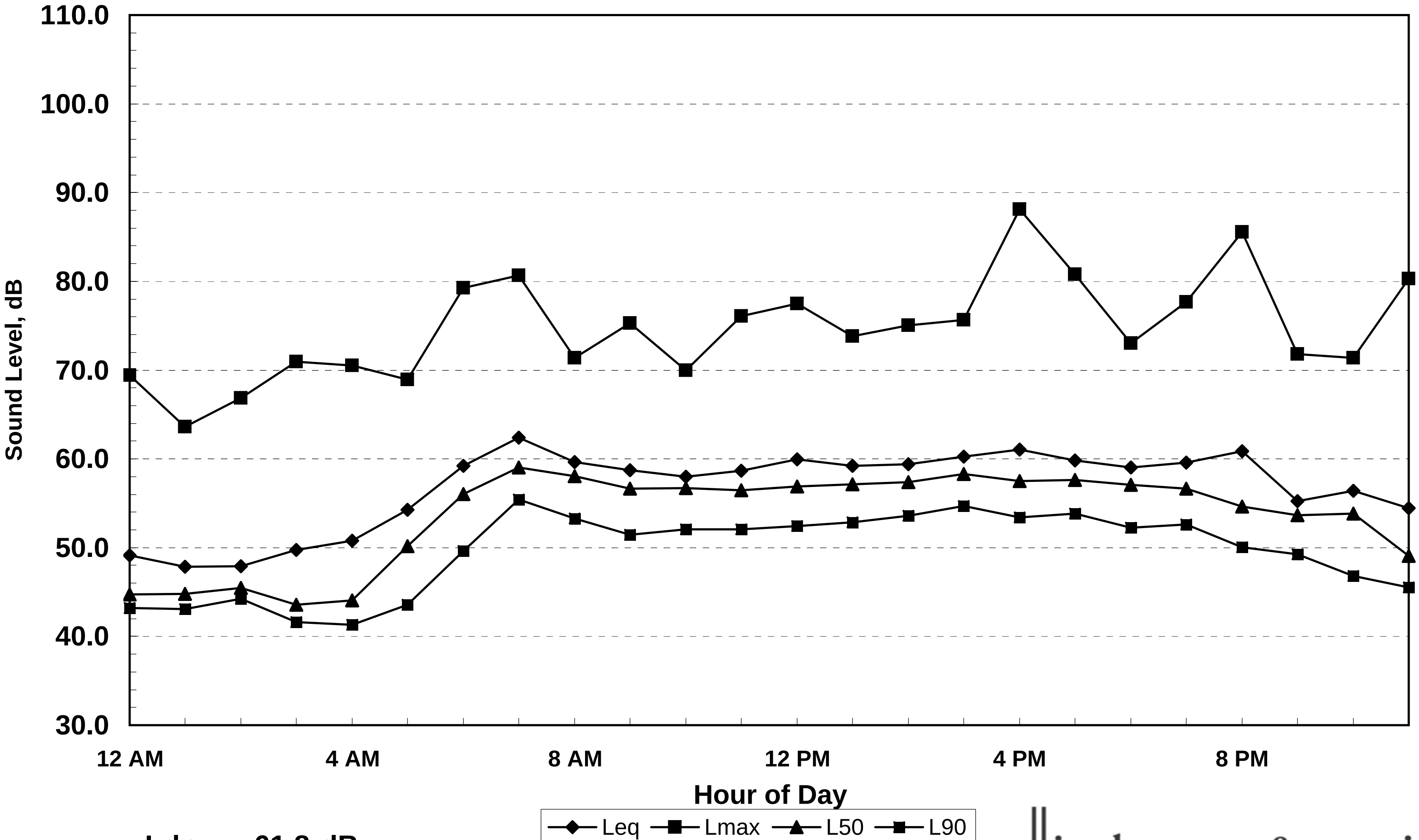
Appendix B, Site A
24hr Continuous Noise Monitoring
2008-196 Pleasant Valley Road / Patterson Drive
Friday, September 05, 2008



Ldn = 61.8 dB

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Appendix B, Site A

2008-196 Pleasant Valley Road / Patterson Drive

24hr Continuous Noise Monitoring

Saturday, September 06, 2008

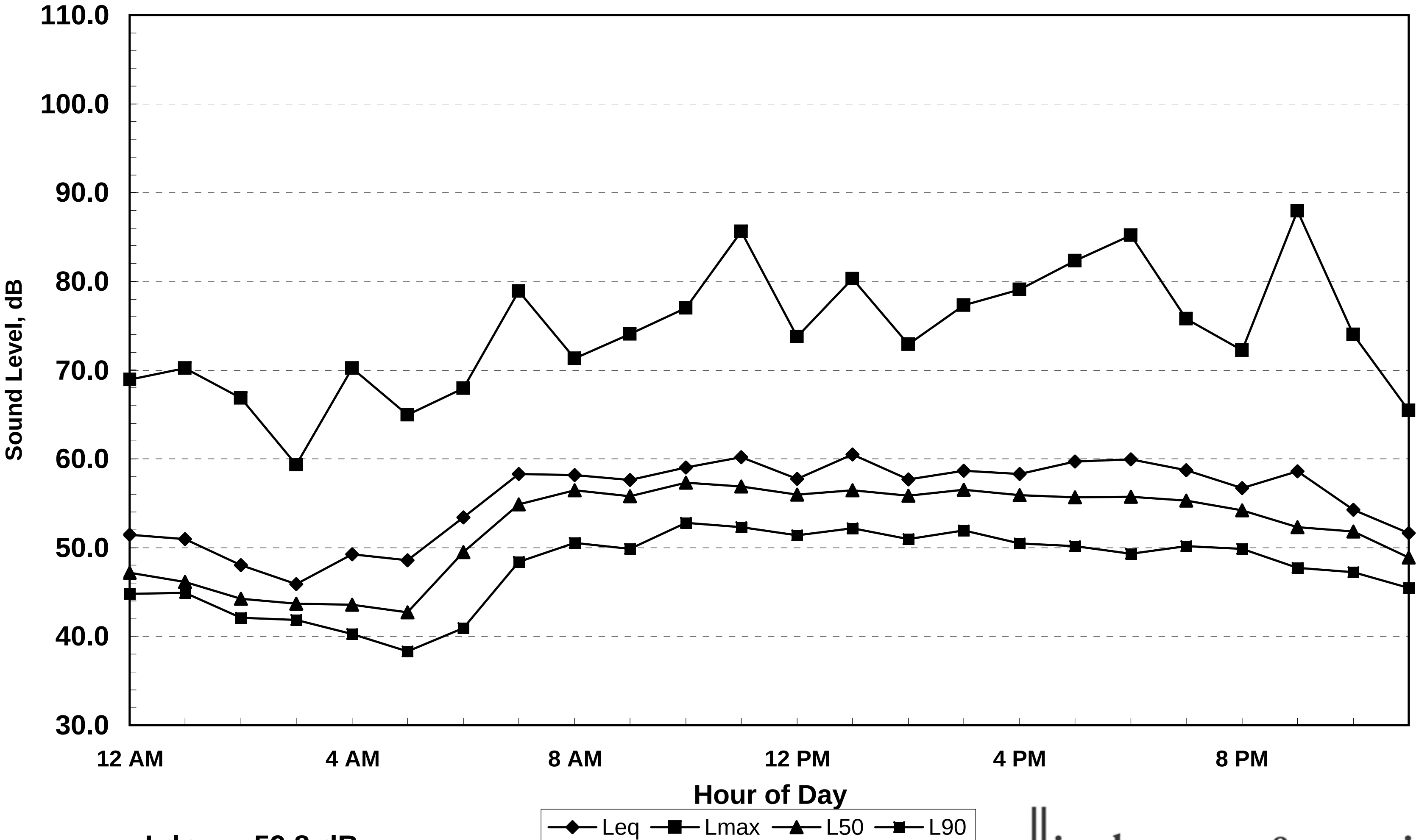
Hour	Leq	Lmax	L50	L90
0:00	51.4	68.9	47.2	44.8
1:00	50.9	70.2	46.2	44.9
2:00	48.0	66.8	44.3	42.1
3:00	45.9	59.3	43.7	41.9
4:00	49.3	70.2	43.6	40.3
5:00	48.6	64.9	42.7	38.3
6:00	53.4	67.9	49.5	40.9
7:00	58.3	78.9	54.9	48.4
8:00	58.2	71.3	56.5	50.5
9:00	57.6	74.1	55.8	49.8
10:00	59.0	77.0	57.3	52.8
11:00	60.2	85.6	56.9	52.3
12:00	57.8	73.8	56.0	51.4
13:00	60.5	80.3	56.4	52.2
14:00	57.7	72.9	55.8	51.0
15:00	58.7	77.3	56.5	51.9
16:00	58.3	79.1	55.9	50.5
17:00	59.7	82.3	55.7	50.2
18:00	59.9	85.2	55.7	49.3
19:00	58.8	75.8	55.3	50.1
20:00	56.7	72.2	54.2	49.8
21:00	58.6	87.9	52.3	47.7
22:00	54.3	74.0	51.8	47.2
23:00	51.6	65.5	48.9	45.5

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	60.5	56.7	58.8	54.3	45.9	51.1
Lmax (Maximum)	87.9	71.3	78.2	74.0	59.3	67.5
L50 (Median)	57.3	52.3	55.7	51.8	42.7	46.4
L90 (Background)	52.8	47.7	50.5	47.2	38.3	42.9

Computed Ldn, dB	59.8
% Daytime Energy	91%
% Nighttime Energy	9%

j.c. brennan & associates
consultants in acoustics

Appendix B, Site A
24hr Continuous Noise Monitoring
2008-196 Pleasant Valley Road / Patterson Drive
Saturday, September 06, 2008



Ldn = 59.8 dB

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Appendix B, Site A

2008-196 Pleasant Valley Road / Patterson Drive

24hr Continuous Noise Monitoring

Sunday, September 07, 2008

Hour	Leq	Lmax	L50	L90
0:00	52.0	69.6	47.1	44.9
1:00	49.1	64.3	46.1	45.1
2:00	48.2	67.4	45.4	40.6
3:00	46.8	66.1	42.5	40.4
4:00	46.1	63.7	43.2	38.2
5:00	48.4	67.7	40.7	37.3
6:00	50.6	68.6	45.3	38.6
7:00	54.8	74.2	50.5	43.2
8:00	56.4	73.1	54.4	47.8
9:00	58.1	76.9	55.6	49.4
10:00	57.5	73.1	56.1	50.9
11:00	58.4	79.2	55.6	50.2
12:00	57.7	74.2	55.8	51.6
13:00	57.0	73.1	54.9	49.2
14:00	59.6	82.3	55.0	48.9
15:00	57.9	81.0	54.5	48.5
16:00	57.0	73.9	54.6	48.6
17:00	57.2	74.9	54.9	48.4
18:00	64.2	90.4	54.3	47.5
19:00	57.4	78.6	54.1	48.6
20:00	56.1	71.6	53.7	49.3
21:00	54.1	76.0	50.0	45.0
22:00	51.6	73.1	47.0	44.0
23:00	50.6	73.7	45.7	44.0

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	64.2	54.1	58.3	52.0	46.1	49.7
Lmax (Maximum)	90.4	71.6	76.8	73.7	63.7	68.2
L50 (Median)	56.1	50.0	54.3	47.1	40.7	44.8
L90 (Background)	51.6	43.2	48.5	45.1	37.3	41.5

Computed Ldn, dB	58.9
% Daytime Energy	92%
% Nighttime Energy	8%

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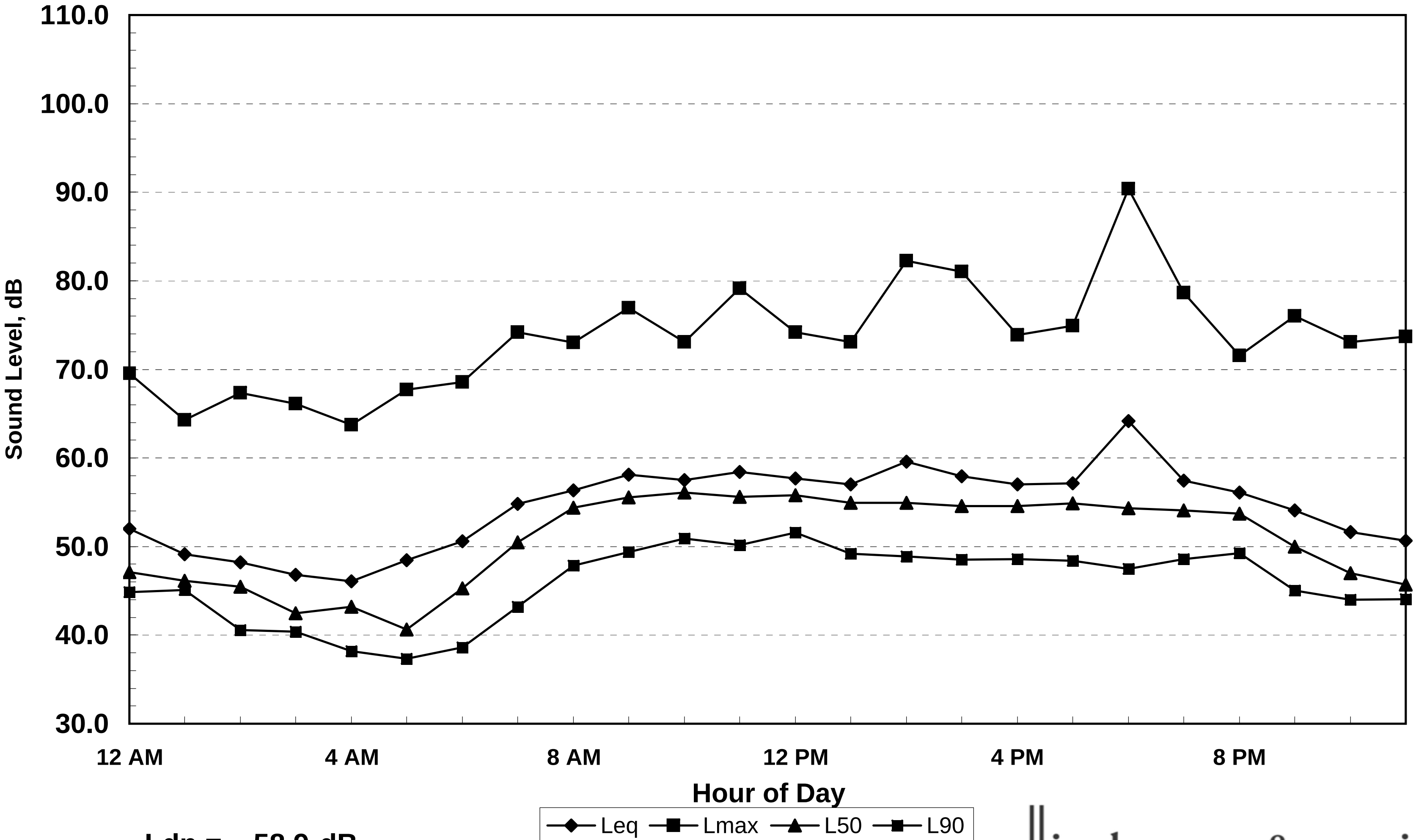
consultants in acoustics

Appendix B, Site A
24hr Continuous Noise Monitoring
2008-196 Pleasant Valley Road / Patterson Drive
Sunday, September 07, 2008



Ldn = 58.9 dB

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Appendix B, Site B

2008-196 Pleasant Valley Road / Patterson Drive
24hr Continuous Noise Monitoring, Site B
Friday, September 05, 2008

Hour	Leq	Lmax	L50	L90
0:00	47.2	66.0	39.9	37.7
1:00	45.8	64.2	37.7	35.4
2:00	45.0	64.2	37.6	35.2
3:00	48.3	70.1	39.2	36.8
4:00	50.1	68.8	41.9	37.3
5:00	55.3	75.6	50.0	41.7
6:00	58.7	80.3	55.6	49.3
7:00	60.4	73.7	59.0	55.5
8:00	58.3	70.7	57.0	52.5
9:00	57.2	75.4	54.5	49.6
10:00	55.9	72.3	54.4	48.7
11:00	57.2	75.3	54.1	47.6
12:00	57.3	71.7	55.0	49.7
13:00	57.4	70.6	55.2	49.8
14:00	58.6	75.5	55.9	51.9
15:00	58.4	73.3	55.9	51.7
16:00	58.6	79.0	55.6	51.2
17:00	58.4	77.9	55.7	51.0
18:00	57.9	76.7	55.7	50.2
19:00	58.3	74.5	55.8	50.5
20:00	57.1	80.9	53.0	47.3
21:00	54.6	69.4	53.1	47.3
22:00	55.3	74.7	52.3	43.4
23:00	51.6	70.1	46.0	40.3

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	60.4	54.6	57.9	58.7	45.0	53.1
Lmax (Maximum)	80.9	69.4	74.5	80.3	64.2	70.4
L50 (Median)	59.0	53.0	55.3	55.6	37.6	44.4
L90 (Background)	55.5	47.3	50.3	49.3	35.2	39.7

Computed Ldn, dB	60.6
% Daytime Energy	83%
% Nighttime Energy	17%

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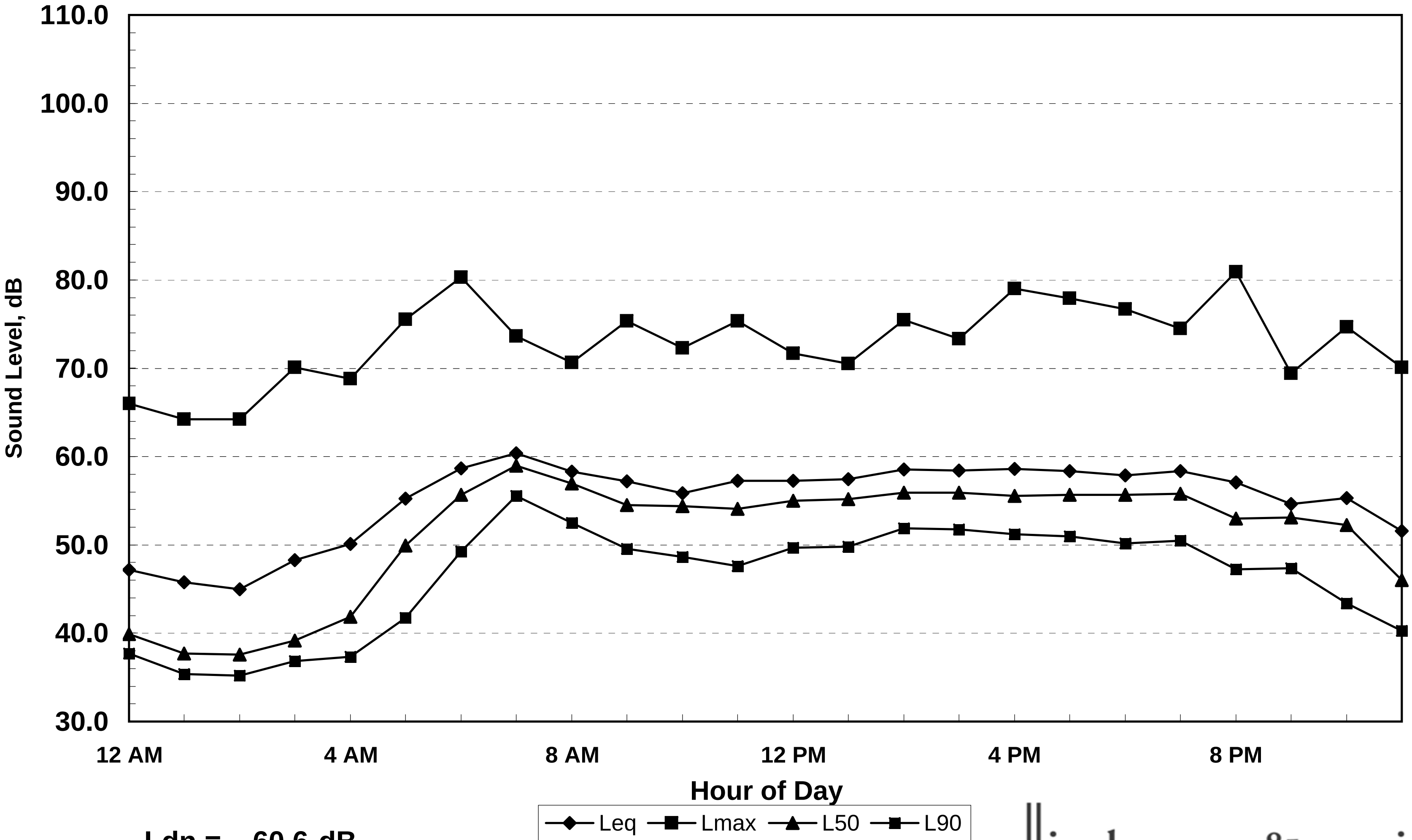
Appendix B, Site B
24hr Continuous Noise Monitoring, Site B
2008-196 Pleasant Valley Road / Patterson Drive
Friday, September 05, 2008



Ldn = 60.6 dB

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consultants in acoustics

Appendix B, Site B

2008-196 Pleasant Valley + Patterson Roads

2008-196 Pleasant Valley Road / Patterson Drive

Saturday, September 06, 2008

Hour	Leq	Lmax	L50	L90
0:00	51.6	75.1	44.3	39.1
1:00	49.6	70.6	41.5	38.4
2:00	46.8	65.2	39.7	36.5
3:00	43.7	59.8	38.2	36.3
4:00	48.3	65.0	38.5	35.8
5:00	49.4	66.1	42.0	33.3
6:00	52.6	64.8	49.2	40.1
7:00	57.6	75.9	54.7	48.6
8:00	57.5	72.3	55.2	49.3
9:00	55.9	71.7	53.5	47.6
10:00	56.9	72.5	54.5	49.1
11:00	56.3	76.2	54.1	49.4
12:00	56.4	75.9	54.1	48.9
13:00	58.0	78.5	54.6	48.8
14:00	56.3	77.9	53.9	48.0
15:00	57.1	74.9	55.0	49.4
16:00	56.7	75.5	54.0	47.4
17:00	56.2	75.7	53.8	47.2
18:00	56.4	78.6	53.1	45.1
19:00	58.3	78.5	53.9	47.5
20:00	55.7	74.9	52.1	46.2
21:00	55.6	81.6	50.8	45.3
22:00	52.8	67.1	50.5	44.7
23:00	50.9	67.5	46.4	41.5

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	58.3	55.6	56.8	52.8	43.7	50.2
Lmax (Maximum)	81.6	71.7	76.0	75.1	59.8	66.8
L50 (Median)	55.2	50.8	53.8	50.5	38.2	43.4
L90 (Background)	49.4	45.1	47.9	44.7	33.3	38.4

Computed Ldn, dB	58.4
% Daytime Energy	88%
% Nighttime Energy	12%

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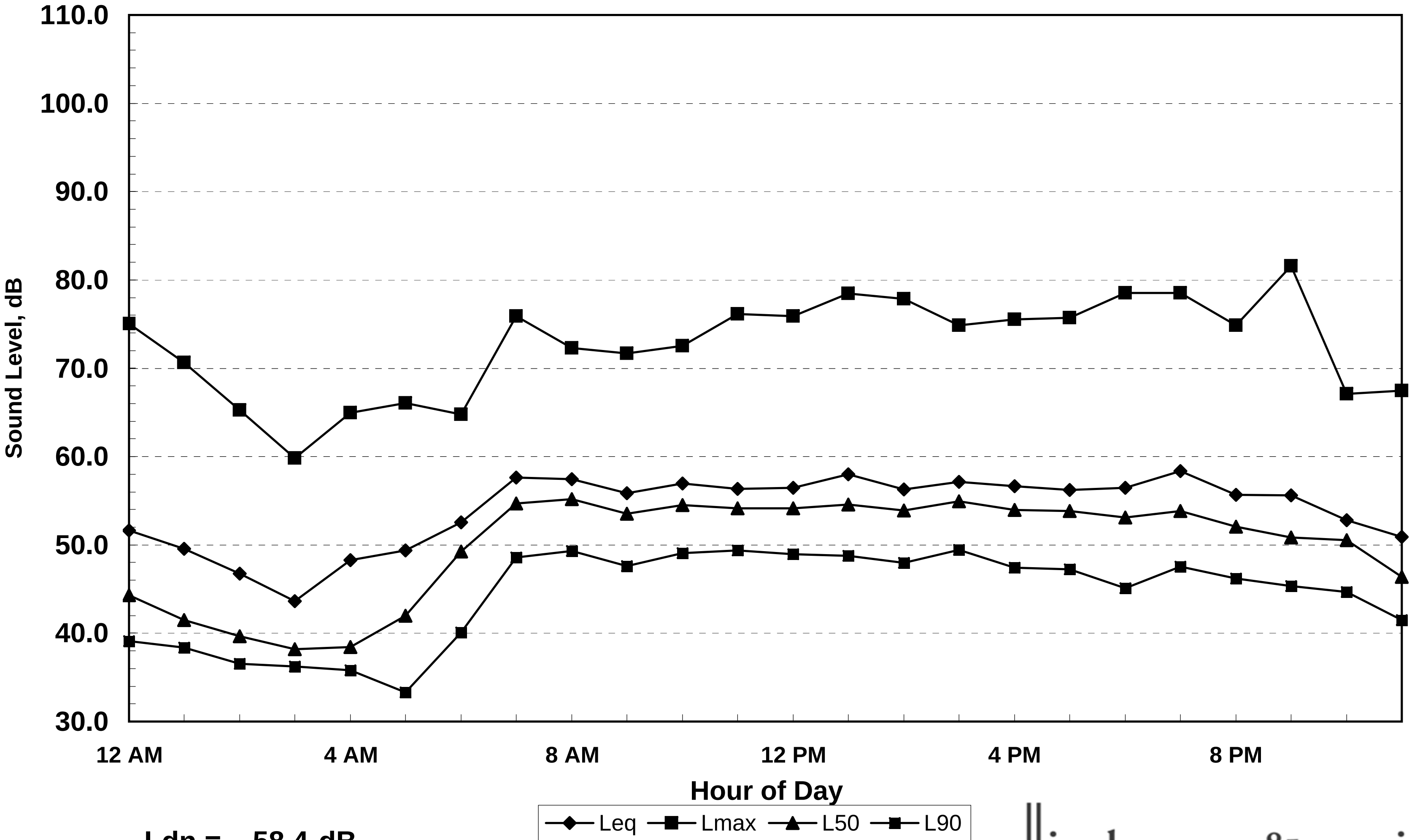
Appendix B, Site B
2008-196 Pleasant Valley Road / Patterson Drive
2008-196 Pleasant Valley + Patterson Roads
Saturday, September 06, 2008



Ldn = 58.4 dB

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Appendix B, Site B

2008-196 Pleasant Valley Road / Patterson Drive
24hr Continuous Noise Monitoring
Sunday, September 07, 2008

Hour	Leq	Lmax	L50	L90
0:00	51.6	76.7	43.5	38.6
1:00	46.3	64.5	39.8	37.4
2:00	45.5	65.9	38.9	37.2
3:00	43.7	59.6	38.6	36.1
4:00	44.1	62.2	35.9	33.2
5:00	47.3	65.1	38.7	32.7
6:00	50.8	75.4	43.5	34.5
7:00	53.0	76.5	48.8	41.5
8:00	55.4	75.2	52.8	45.6
9:00	56.6	75.3	53.1	47.0
10:00	54.9	71.0	53.0	47.5
11:00	56.2	75.9	53.9	48.4
12:00	55.7	69.3	53.8	48.3
13:00	55.8	76.5	52.4	46.4
14:00	57.6	79.1	52.2	46.2
15:00	55.8	76.7	52.2	45.8
16:00	55.0	74.4	52.5	45.7
17:00	56.0	73.8	52.1	44.7
18:00	56.7	81.9	52.3	44.5
19:00	55.5	70.1	52.9	46.3
20:00	53.6	68.0	51.9	45.7
21:00	52.1	69.6	48.4	41.5
22:00	50.6	72.5	44.9	39.9
23:00	47.1	62.6	40.3	36.6

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	57.6	52.1	55.5	51.6	43.7	48.3
Lmax (Maximum)	81.9	68.0	74.2	76.7	59.6	67.2
L50 (Median)	53.9	48.4	52.2	44.9	35.9	40.5
L90 (Background)	48.4	41.5	45.7	39.9	32.7	36.2

Computed Ldn, dB	56.8
% Daytime Energy	90%
% Nighttime Energy	10%

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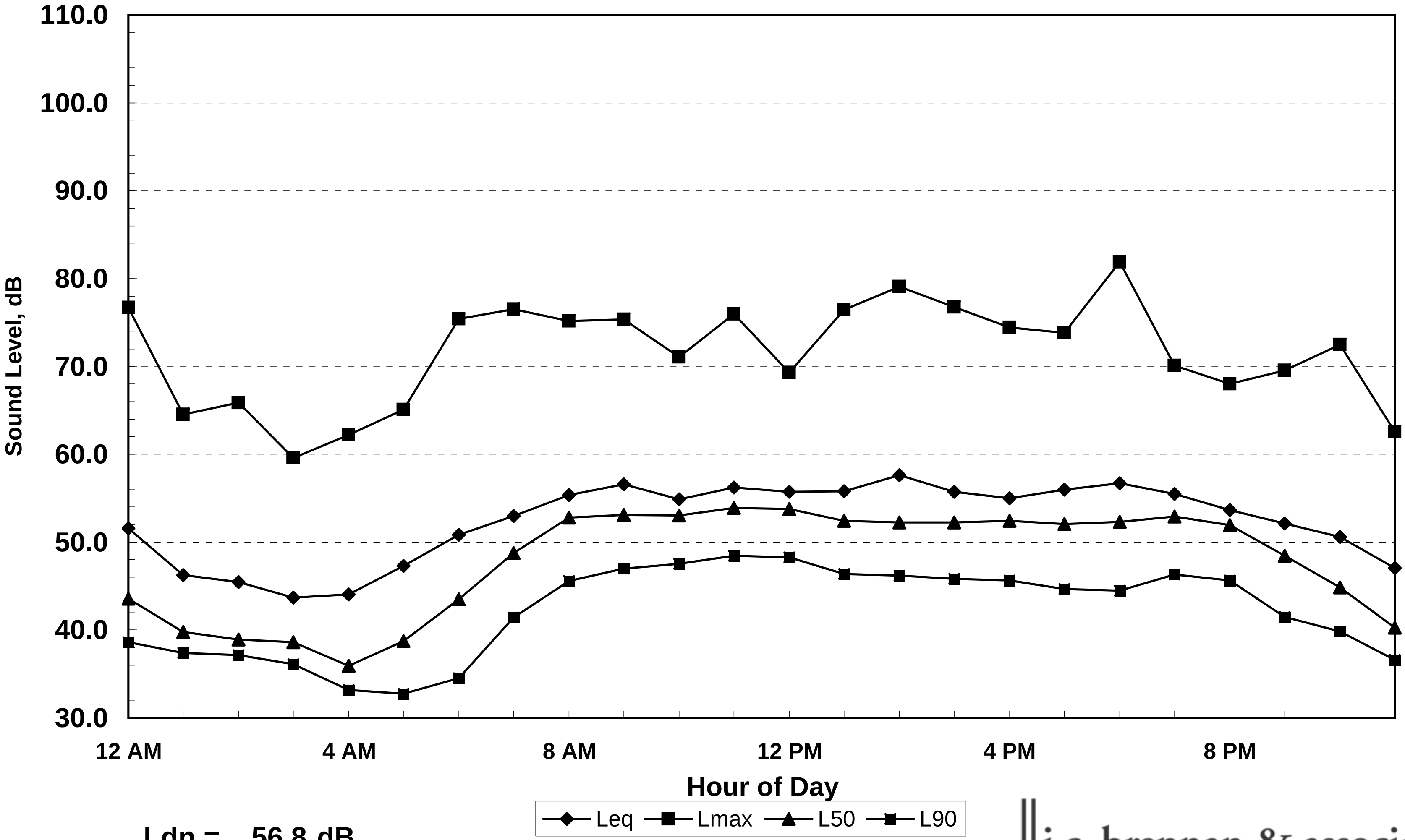
Appendix B, Site B
24hr Continuous Noise Monitoring
2008-196 Pleasant Valley Road / Patterson Drive
Sunday, September 07, 2008



Ldn = 56.8 dB

j.c. brennan & associates
consultants in acoustics

j.c. brennan & associates, Inc.							**16 March 2009**						
W. O. Winegar							**TNM 2.5**						
							Calculated with TNM 2.5						
RESULTS: SOUND LEVELS													
PROJECT/CONTRACT:		**El Dorado County**											
RUN:		**APPENDIX C - EXISTING NO PROJECT**											
BARRIER DESIGN:		**INPUT HEIGHTS**						**Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.**					
ATMOSPHERICS:		**68 deg F, 50% RH**											

Receiver Name	**No.**	**#DUs**	**Existing LAeq1h**	**No Barrier LAeq1h Calculated**	**Crit'n**	**Increase over existing Calculated**	**Crit'n Sub'l Inc**	**Type Impact**	**With Barrier Calculated LAeq1h**	**Noise Reduction Calculated**	**Goal**	**Calculated minus Goal**
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
R 1	8	3	0.0	63.6	66	63.6	10	----	63.6	0.0	8	-8.0
R 2	9	1	0.0	63.6	66	63.6	10	----	63.6	0.0	8	-8.0
R 3	10	1	0.0	62.3	66	62.3	10	----	62.3	0.0	8	-8.0
R 4	11	1	0.0	63.0	66	63.0	10	----	63.0	0.0	8	-8.0
R 5	12	1	0.0	66.9	66	66.9	10	Snd Lvl	66.9	0.0	8	-8.0
R 6	13	1	0.0	58.0	66	58.0	10	----	58.0	0.0	8	-8.0
R 7	14	1	0.0	61.6	66	61.6	10	----	61.6	0.0	8	-8.0
R 8	15	4	0.0	59.3	66	59.3	10	----	59.3	0.0	8	-8.0
R 9	17	4	0.0	58.2	66	58.2	10	----	58.2	0.0	8	-8.0
R 10	18	2	0.0	55.8	66	55.8	10	----	55.8	0.0	8	-8.0

Dwelling Units	**# DUs**	**Noise Reduction Min**	**Avg**	**Max**
		dB	**dB**	**dB**
All Selected	19	0.0	0.0	0.0
All Impacted	1	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

j.c. brennan & associates, Inc. 16 March 2009
W. O. Winegar TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS

PROJECT/CONTRACT: El Dorado County
RUN: APPENDIX C - 2017 NO PROJECT
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
R 1	8	3	0.0	66.1	66	66.1	10	Snd Lvl	66.1	0.0	8	-8.0
R 2	9	1	0.0	66.1	66	66.1	10	Snd Lvl	66.1	0.0	8	-8.0
R 3	10	1	0.0	64.8	66	64.8	10	----	64.8	0.0	8	-8.0
R 4	11	1	0.0	65.5	66	65.5	10	----	65.5	0.0	8	-8.0
R 5	12	1	0.0	69.4	66	69.4	10	Snd Lvl	69.4	0.0	8	-8.0
R 6	13	1	0.0	60.5	66	60.5	10	----	60.5	0.0	8	-8.0
R 7	14	1	0.0	64.1	66	64.1	10	----	64.1	0.0	8	-8.0
R 8	15	4	0.0	61.8	66	61.8	10	----	61.8	0.0	8	-8.0
R 9	17	4	0.0	60.1	66	60.1	10	----	60.1	0.0	8	-8.0
R 10	18	2	0.0	57.8	66	57.8	10	----	57.8	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	19	0.0	0.0	0.0
All Impacted	5	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

j.c. brennan & associates, Inc.
W. O. Winegar

16 March 2009
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS

PROJECT/CONTRACT: El Dorado County
RUN: APPENDIX C - 2025 NO PROJECT
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier LAeq1h Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
R 1	8	3	0.0	68.0	66	68.0	10	Snd Lvl	68.0	0.0	8	-8.0
R 2	9	1	0.0	67.8	66	67.8	10	Snd Lvl	67.8	0.0	8	-8.0
R 3	10	1	0.0	66.6	66	66.6	10	Snd Lvl	66.6	0.0	8	-8.0
R 4	11	1	0.0	67.3	66	67.3	10	Snd Lvl	67.3	0.0	8	-8.0
R 5	12	1	0.0	71.1	66	71.1	10	Snd Lvl	71.1	0.0	8	-8.0
R 6	13	1	0.0	61.7	66	61.7	10	----	61.7	0.0	8	-8.0
R 7	14	1	0.0	65.9	66	65.9	10	----	65.9	0.0	8	-8.0
R 8	15	4	0.0	63.5	66	63.5	10	----	63.5	0.0	8	-8.0
R 9	17	4	0.0	61.1	66	61.1	10	----	61.1	0.0	8	-8.0
R 10	18	2	0.0	58.8	66	58.8	10	----	58.8	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	19	0.0	0.0	0.0
All Impacted	7	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

j.c. brennan & associates, Inc. **16 March 2009**
W. O. Winegar **TNM 2.5**
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: El Dorado County
RUN: APPENDIX C - ALT 2 2017
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier LAeq1h Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
R 1	8	3	0.0	66.0	66	66.0	10	Snd Lvl	66.0	0.0	8	-8.0
R 2	9	1	0.0	65.6	66	65.6	10	----	65.6	0.0	8	-8.0
R 3	10	1	0.0	63.9	66	63.9	10	----	63.9	0.0	8	-8.0
R 4	11	1	0.0	64.4	66	64.4	10	----	64.4	0.0	8	-8.0
R 5	12	1	0.0	67.8	66	67.8	10	Snd Lvl	67.8	0.0	8	-8.0
R 6	13	1	0.0	59.1	66	59.1	10	----	59.1	0.0	8	-8.0
R 7	14	1	0.0	64.0	66	64.0	10	----	64.0	0.0	8	-8.0
R 8	15	4	0.0	60.8	66	60.8	10	----	60.8	0.0	8	-8.0
R 9	17	4	0.0	59.8	66	59.8	10	----	59.8	0.0	8	-8.0
R 10	18	2	0.0	57.4	66	57.4	10	----	57.4	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	19	0.0	0.0	0.0
All Impacted	4	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

j.c. brennan & associates, Inc. **16 March 2009**
W. O. Winegar **TNM 2.5**
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: El Dorado County
RUN: APPENDIX C - ALT 2 2025
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
R 1	8	3	0.0	68.0	66	68.0	10	Snd Lvl	68.0	0.0	8	-8.0
R 2	9	1	0.0	67.4	66	67.4	10	Snd Lvl	67.4	0.0	8	-8.0
R 3	10	1	0.0	65.8	66	65.8	10	----	65.8	0.0	8	-8.0
R 4	11	1	0.0	66.2	66	66.2	10	Snd Lvl	66.2	0.0	8	-8.0
R 5	12	1	0.0	69.5	66	69.5	10	Snd Lvl	69.5	0.0	8	-8.0
R 6	13	1	0.0	60.4	66	60.4	10	----	60.4	0.0	8	-8.0
R 7	14	1	0.0	65.9	66	65.9	10	----	65.9	0.0	8	-8.0
R 8	15	4	0.0	62.5	66	62.5	10	----	62.5	0.0	8	-8.0
R 9	17	4	0.0	60.7	66	60.7	10	----	60.7	0.0	8	-8.0
R 10	18	2	0.0	58.5	66	58.5	10	----	58.5	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	19	0.0	0.0	0.0
All Impacted	6	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0