

# **Sound Level Assessment of**

**Huasna Valley, CA**

**requested by  
Huasna Valley Association  
PO Box 1164  
Arroyo Grande, CA 93421**

February 17, 2008

***45dB.com***  
David Lord, PH.D.  
Acoustics Consulting

299 Albert Drive  
San Luis Obispo  
California 93405  
tel. 805.549.8046  
email: dl@45db.com

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# Sound Level Assessment of Huasna Valley, CA

## 1.0 Description and Criteria

This is a report of a recent sound level survey and assessment of Huasna Valley, California. The results of the survey are shown graphically in the following pages, and describe the overall sound levels from all existing sound sources during a relatively clear and wind-free period at the end of January 2009. This sound level survey and assessment will provide a baseline against which potential future activities in the Huasna Valley can be evaluated. The relationship of Huasna Valley to the surrounding region is described in Figure 1. Region Plan, page 4. The boundaries of the study area in Huasna Valley, the location of roadways, location of sound level meters, potential future noise sources and the location of the private weather station are shown in Figure 2. Huasna Valley Plan.

The sound level conditions are presented in metrics that may be evaluated against both the General Plan Noise Element of the County of San Luis Obispo, and the County's Exterior Noise Level Standards Ordinance. The Noise Element uses the metric "LDN" or day-night noise level, which is a single-number average sound level incorporating a penalty for sounds generated between 10 pm and 7 am. With regard to land use, potential noise conflict and noise mitigation measures, the noise level standards contained in the Noise Element of the General Plan of the County of Santa Barbara (rev. 1986) are referenced. The Noise Element sets a limit of LDN = 65 dBA for residential outdoor activity areas (pages 58-59) and a limit of LDN = 45 dBA for interior noise sensitive uses.

The County of San Luis Obispo Noise Ordinance uses the hourly equivalent sound level (Leq) as a standard of measurement. The noise ordinance stipulates that stationary noise sources shall not exceed 50 dB (Leq) during daytime hours, 7 a.m. to 10 p.m. and 45 dB (Leq) during nighttime hours 10 p.m. to 7 a.m. It also requires that at no time during the daytime hours shall the noise level exceed 70 dB. The text of the Noise Ordinance is reproduced in the Appendix of this report for reference. Also see the Appendix for definitions of acoustical terms and standards.

## 2.0 Existing Sound Levels

Observations and sound level measurements were made Thursday through Friday, January 29 through January 30, 2009. Continuous sound level measurements were made at four different sound level meter locations, shown in Figure 2. Acoustic modeling of Huasna Valley is based on the measurement data collected on these two days, and the known sound level propagation patterns in relation to terrain and sources of sound. A sample of sound level data and the relevant LDN calculation is shown in Figure 3. 24-hour Sound Level Measurement, on page 7. The acoustic model of sound level contours is shown in Figure 5. Existing Sound Level

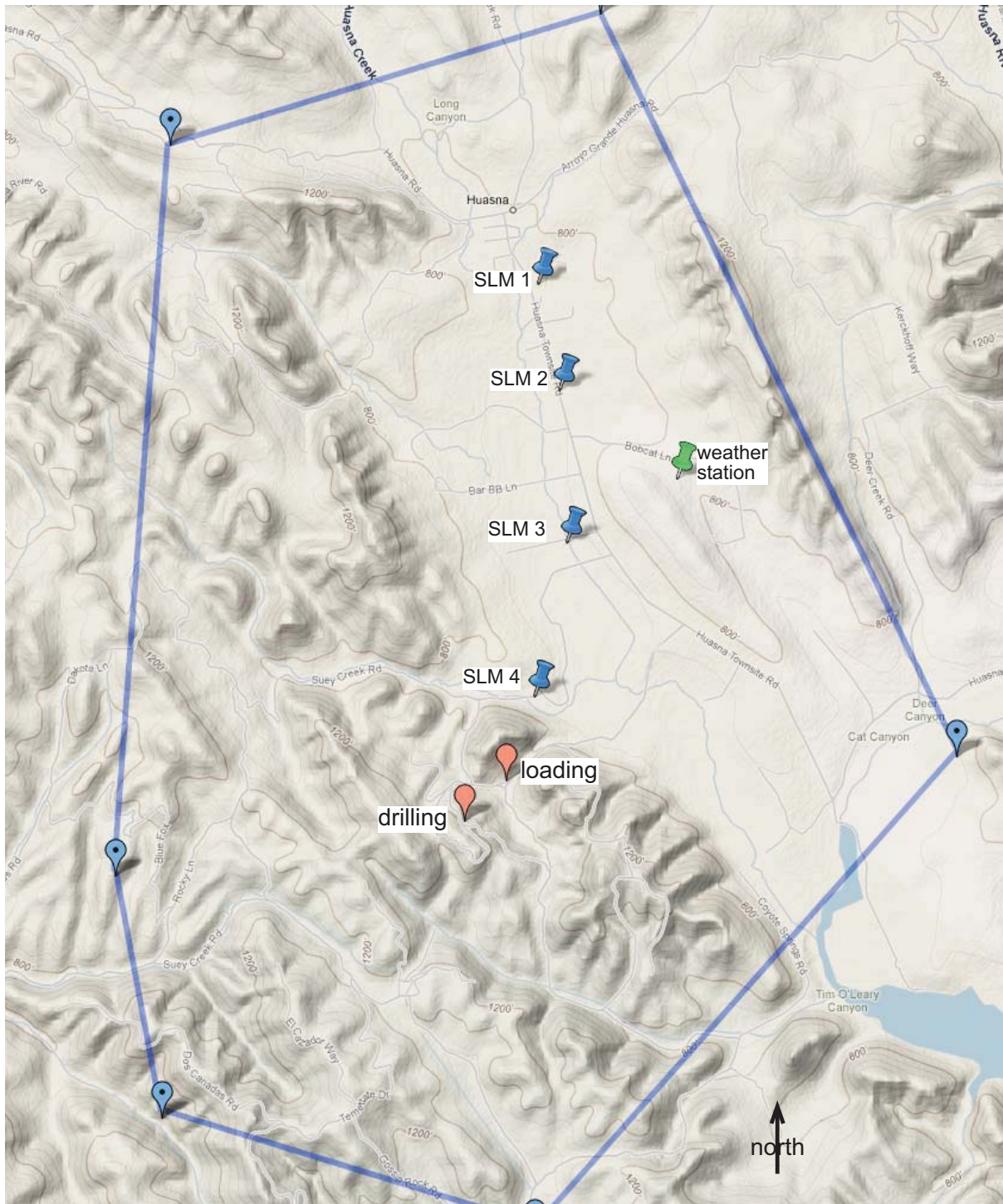
# Figure 1. Region Plan

Region Plan showing Huasna Valley in relation to the Pacific coast and Arroyo Grande.



## Figure 2. Huasna Valley Plan

Plan showing location of sound level meters, weather station and proposed future noise sources.

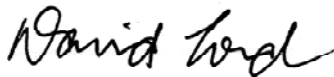


Contours, 24-hour LDN, on page 9, Figure 6. Existing Sound Level Contours, Daytime LEQ on page 10, and Figure 7. Existing Sound Level Contours, Nighttime LEQ on page 11.

### **3.0 Discussion and Conclusion.**

Existing sound levels in the Huasna Valley are typical of a rural, low-population-density, farming community, with low-speed road transportation, average agricultural activity and no through-roads. Typical sound level values in Huasna Valley range from a low that is near the floor of the sensitivity of most measuring instruments, about 20 dBA, to a high value of 65 dBA near the intersection of Huasna Valley Road and Huasna Township road, when there are passing diesel vehicles. At the quietest times in Huasna Valley, primarily in the early morning hours, the natural sounds of mammals and birds as well as farm animals are clearly audible over great distances, and dominate the soundscape. The acoustic model representations show that variable terrain elevations act as natural sound barriers. Normal exterior sound levels in the valley at residential sensitive receptor sites are typically in the same range as the county interior sound level standard of LDN = 45dBA

Wind may sometimes be a factor in the propagation of sound across the site. Wind speed during ambient sound level measurements on the site was below 10 m.p.h. and did not interfere with the precision or accuracy of this measurement. However, prevailing stronger winds from the north and west may affect the pattern of propagation of sound across the valley. Atmospheric conditions may also result in audibility of sounds at great distances from their source, as explained on page 14. The appendices at the end of the report contain details in support of the findings presented here.

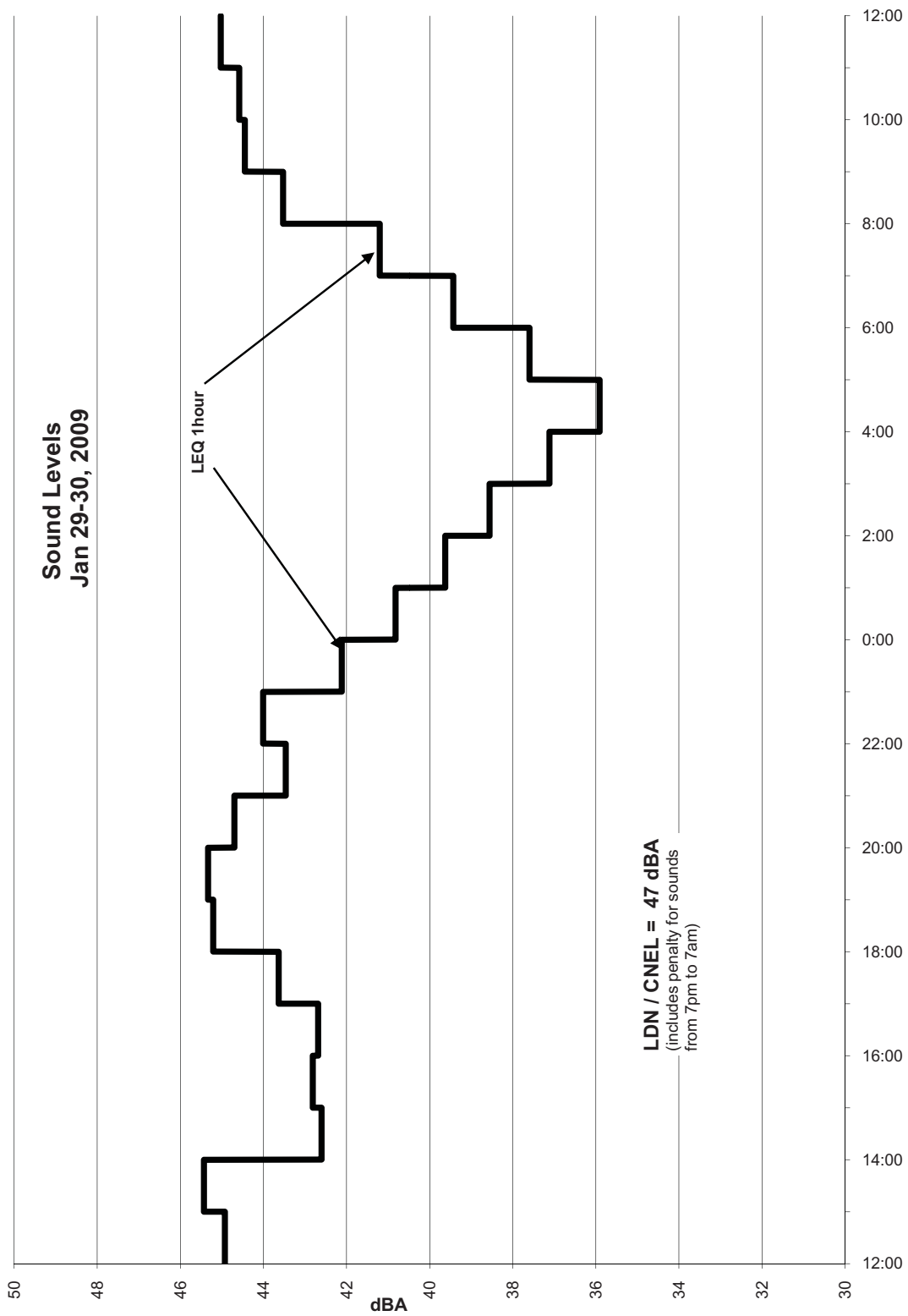


by David Lord, February 17, 2009

for 45dB.com, :

### Figure 3. 24-hour Sound Level Measurement

Graph showing Leq for each hour over a 24-hour period, SLM 2



## Figure 4. LDN Calculation

Calculation of LDN from measured values

### LDN / CNEL Calculation

dl@45dB.com

### **45dB.com**

299 Albert Dr. San Luis Obispo, CA 93405

David Lord, Principal Consultant

tel 805.549.8046

### **Huasna Valley Study**

fax 805.888.2733

**Huasna, CA**

### **SLM**

Jan 29-30, 2009

LEQ (hour) calculated from 10-second continuous measurements

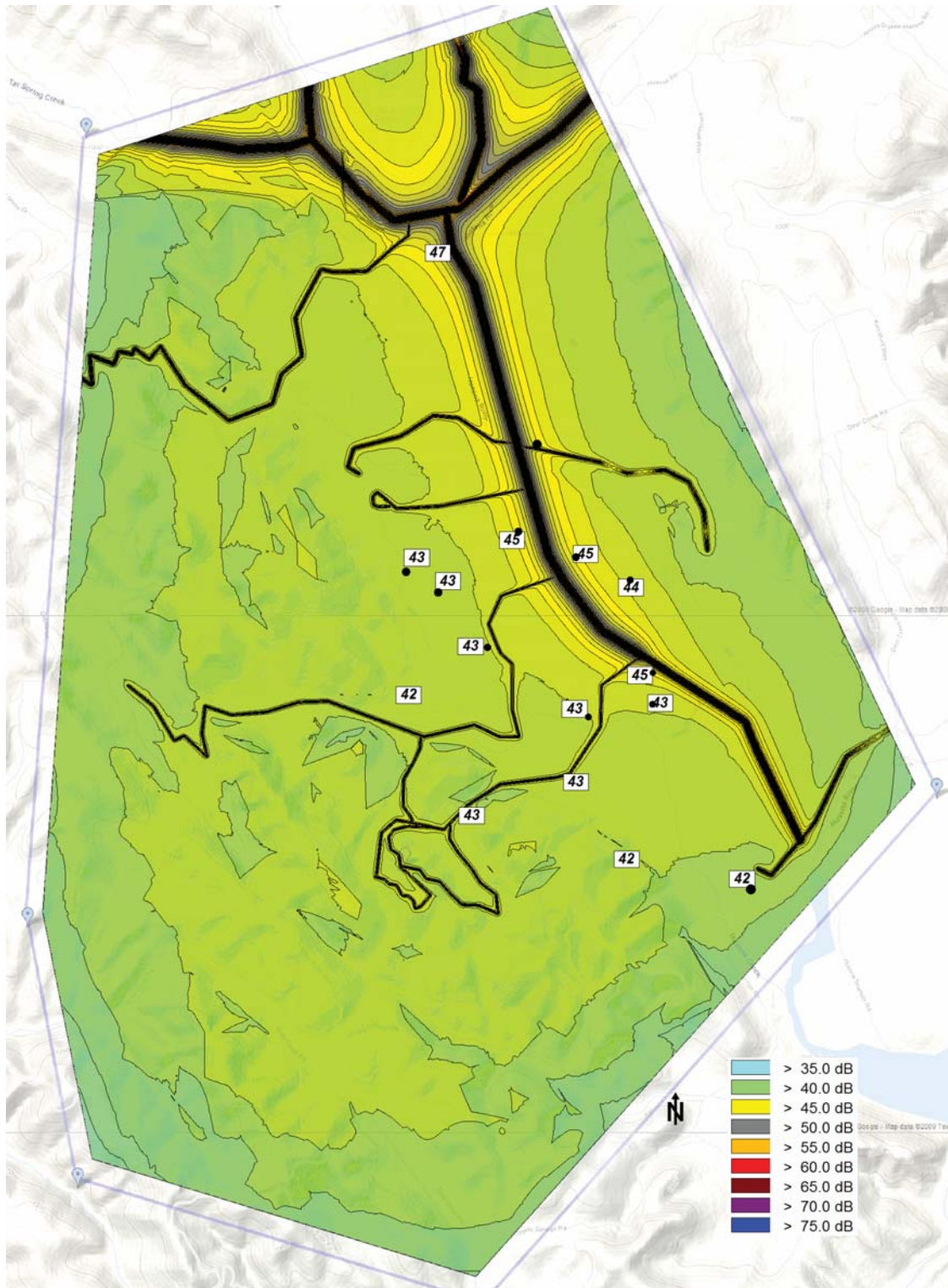
	dBa	hour	
Calculated DAY LEQ:	<b>41</b>	<b>0700</b>	
Calculated DAY LEQ:	<b>44</b>	<b>0800</b>	
Calculated DAY LEQ:	<b>44</b>	<b>0900</b>	
Calculated DAY LEQ:	<b>45</b>	<b>1000</b>	
Calculated DAY LEQ:	<b>45</b>	<b>1100</b>	
Calculated DAY LEQ:	<b>45</b>	<b>1200</b>	
Calculated DAY LEQ:	<b>45</b>	<b>1300</b>	
Calculated DAY LEQ:	<b>43</b>	<b>1400</b>	
Calculated DAY LEQ:	<b>43</b>	<b>1500</b>	
Calculated DAY LEQ:	<b>43</b>	<b>1600</b>	
Calculated DAY LEQ:	<b>44</b>	<b>1700</b>	
Calculated DAY LEQ:	<b>45</b>	<b>1800</b>	
Calculated DAY/EVE. LEQ:	<b>45</b>	<b>1900</b>	<b>43.0</b> LEQ 24 hrs:
Calculated DAY/EVE. LEQ:	<b>45</b>	<b>2000</b>	<b>44.1</b> LEQ Day 15hr:
Calculated DAY/EVE. LEQ:	<b>43</b>	<b>2100</b>	<b>44.0</b> LEQ Day 12hr:
Calculated NIGHT LEQ:	<b>44</b>	<b>2200</b>	<b>40.2</b> LEQ Night 9hr:
Calculated NIGHT LEQ:	<b>42</b>	<b>2300</b>	<b>44.6</b> LEQ Eve 3hr:
Calculated NIGHT LEQ:	<b>41</b>	<b>0000</b>	
Calculated NIGHT LEQ:	<b>40</b>	<b>0100</b>	
Calculated NIGHT LEQ:	<b>39</b>	<b>0200</b>	
Calculated NIGHT LEQ:	<b>37</b>	<b>0300</b>	
Calculated NIGHT LEQ:	<b>36</b>	<b>0400</b>	
Calculated NIGHT LEQ:	<b>38</b>	<b>0500</b>	
Calculated NIGHT LEQ:	<b>39</b>	<b>0600</b>	

(penalty added for evening or night hours)

**LDN: 47 dBA Day / Night Level Calculation**  
**C.N.E.L.: 48 dBA Community Noise Equivalent Level Calculation**

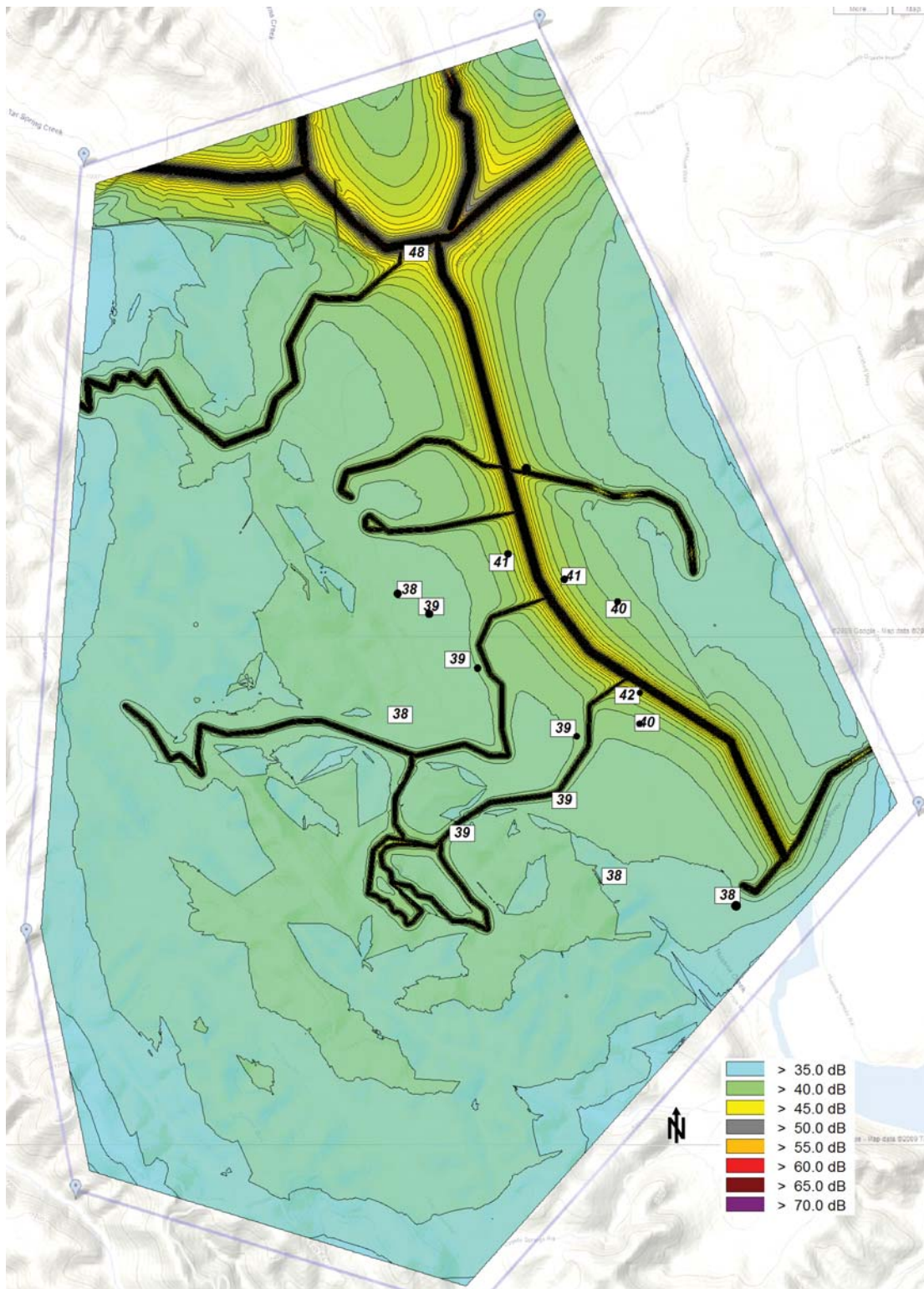
### Figure 5. Existing Sound Level Contours, 24-hour LDN

Sound level contours (LDN=dBA) 24-hour average sound levels near sensitive receptors are shown.



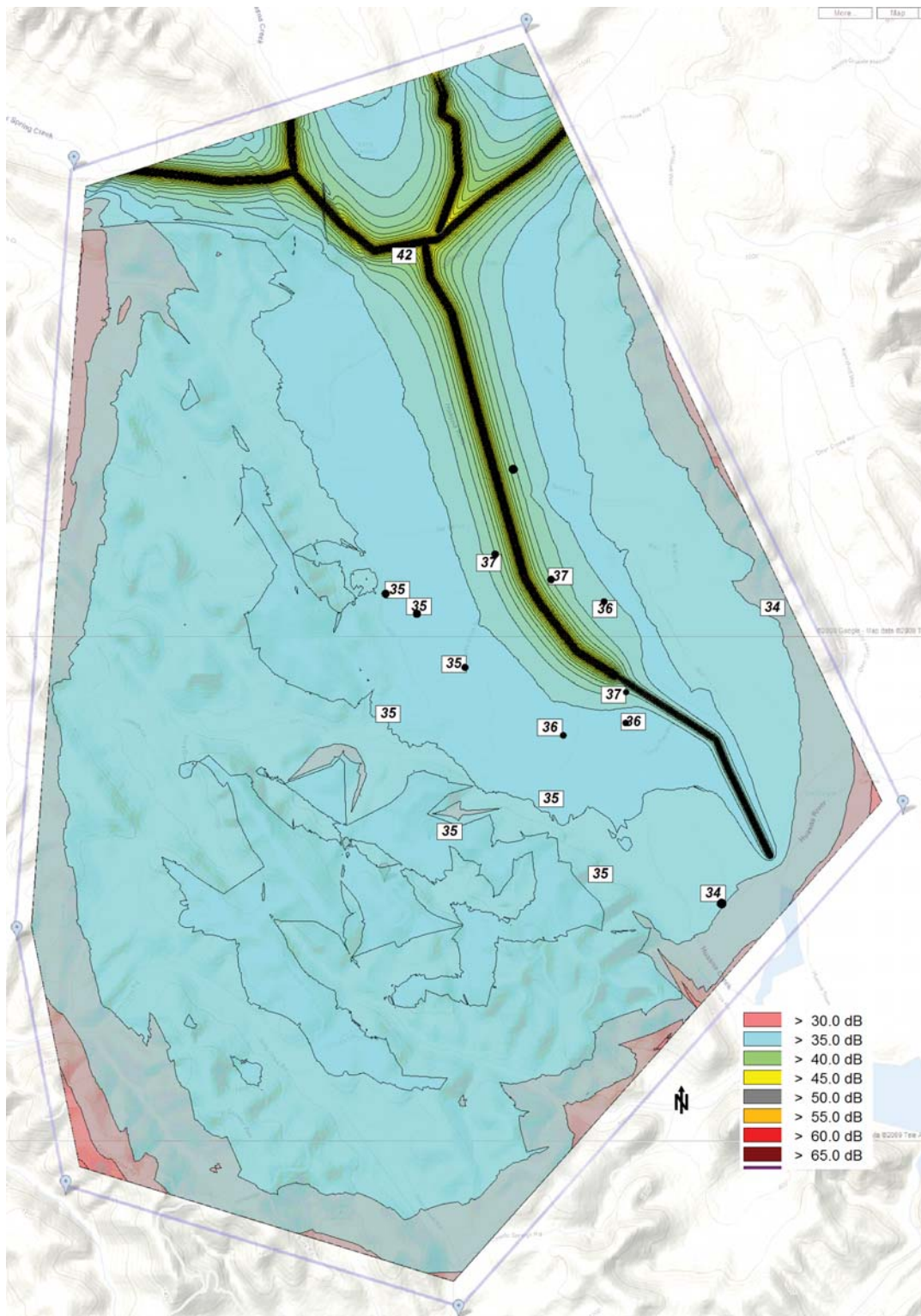
**Figure 6. Existing Sound Level Contours, Daytime LEQ**

Sound level contours (Daytime LEQ) one-hour daytime average sound levels near sensitive receptors are shown.



### Figure 7. Existing Sound Level Contours, Nighttime LEQ

Sound level contours (Nighttime LEQ) one-hour daytime average sound levels near sensitive receptors are shown.



#### 4.0 REFERENCES

1. American National Standards Institute, Inc. 2004. *ANSI 1994 American National Standard Acoustical Terminology*. ANSI S.1.-1994, (R2004) , New York, NY.
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3. Berglund, Birgitta, World Health Organization. 1999. *Guidelines for Community Noise* chapter 4, Guideline Values.
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8. California Resources Agency. 2007. *Title 14. California Code of Regulations Chapter 3. Guidelines for Implementation of the California Environmental Quality Act Article 5. Preliminary Review of Projects and Conduct of Initial Study Sections, 15060 to 15065*.
9. Federal Highway Administration. 2006. *FHWA Roadway Construction Noise Model User's Guide Final Report*. FHWA-HEP-05-054 DOT-VNTSC-FHWA-05-01.
10. Harris, Cyril.M., editor. 1979 *Handbook of Noise Control*.

## 5.0 APPENDIX I: Notes, Definitions

TERM	DEFINITION
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise or sound at a given location. The ambient level is typically defined by the LEQ level.
Background Noise Level	The underlying, ever-present lower level noise that remains in the absence of intrusive or intermittent sounds. Distant sources, such as traffic, typically make up the background. The background level is generally defined by the L90 percentile noise level.
Sound Level, dB	Sound Level. Ten times the common logarithm of the ratio of the square of the measured A-weighted sound pressure to the square of the standard reference pressure of 20 micropascals, SLOW time response, in accordance with ANSI S1.4-1971 (R1976) Unit: decibels(dB).
dBA or dB(A):	A-weighted sound level. The ear does not respond equally to all frequencies, but is less sensitive at low and high frequencies than it is at medium or speech range frequencies. Thus, to obtain a single number representing the sound level of a noise containing a wide range of frequencies in a manner representative of the ear's response, it is necessary to reduce the effects of the low and high frequencies with respect to the medium frequencies. The resultant sound level is said to be A-weighted, and the units are dBA. The A-weighted sound level is also called the noise level.
Equivalent Sound Level LEQ	Because sound levels can vary markedly in intensity over a short period of time, some method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, one describes ambient sounds 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 LEQ. In this report, both a 15 minute and an hourly period is used.
Day-Night Sound Level LDN	LDN is the A-weighted equivalent sound level for a 24 hour period with an additional 10 dB imposed on the equivalent sound levels for night time hours of 10 p.m. to 7 am.
Percentile Sound Level (Ln)	The noise level exceeded during n percent of the measurement period, where n is a number between 0 and 100 (e.g., L90)
Subjective Loudness Changes.	In addition to precision measurement of sound level changes, there is a subjective characteristic which describes how most people respond to sound: <ul style="list-style-type: none"> <li>•A change in sound level of 3 dBA is <i>barely perceptible</i> by most listeners.</li> <li>•A change in level of 6 dBA is <i>clearly perceptible</i>.</li> <li>•A change of 10 dBA is perceived by most people as being <i>twice</i> (or <i>half</i>) as loud.</li> </ul>
Time weighting	Different, internationally recognized, meter damping characteristics are available on sound level measuring instruments: Slow (S), Fast (F) and Impulse (I). In this community sound level measurement, the Fast (F) response time is used.

## 6.0 Atmospheric Effects Associated with Noise Propagation

In the California coastal climate, it is sometimes observed that amplified music and traffic noise is substantially higher than expected at distances of 1/2 mile or farther from the sound source. It is evident that these higher than normal sound levels are caused by atmospheric conditions. The atmospheric conditions in the California coastal areas that contribute to higher than normal sound levels are addressed in the following sections.

The atmospheric parameters that affect sound propagation are:

- Absorption:** As sound propagates through a uniform atmosphere, some of the sound energy is absorbed by temperature and humidity-dependent processes. The sound energy absorbed increases dramatically at frequencies greater than 1,000 Hz. As a result, high frequencies tend to disappear at distances greater than 1/4 mile from the source. Changes in temperature and humidity generally result in relatively small changes (1 to 3 dB) in the overall A-weighted sound level.
- Thermal and wind gradients:** The effective speed of sound in air is a function of air temperature and wind speed. Similar to the way that light is bent at an air/water interface because of the different speeds of light in the two media, sound waves are refracted, or bent, when sound speed varies because of wind and thermal gradients.
- Turbulence:** Turbulence causes scattering of sound and will result in short-term temporal variations in sound levels. With the relatively stable conditions and low wind speeds that occur frequently in this area, sound level fluctuations due to turbulence are relatively low (estimated to be  $\pm 2$  dB).

Normal atmospheric conditions result in a temperature decrease with increasing altitude. On a typical clear sunny day, solar radiation heats the ground, which in turn heats the air in contact with the ground. The result is that the warmest air is at ground level and air temperature tends to decrease with elevation. This condition of decreasing temperature with increasing altitude is called the normal *temperature lapse rate*.

After sunset, the ground cools faster than the air causing air temperature to increase with elevation. Air temperature increasing with elevation is referred to as a *temperature inversion*. Another type of inversion, called an advective inversion, results from a horizontal inflow of cold air. This might be air blowing in from cold water to a coastal area. Along the California coast, winds frequently blow onshore, passing over the cold ocean waters before reaching land. When this occurs, the air at ground level may be colder than the air above it,

A third type of surface inversion takes place at night in valleys, when cold, dense air flows downslope under the influence of gravity, draining off the slopes and uplands, and into the valleys. The air in the valley bottoms is colder than the air above. Other types of inversions may also develop under various conditions. As illustrated in Figure 1B and Figure 1C, a temperature lapse causes sound waves to bend up creating a sound shadow and a temperature inversion causes sound waves to bend down and increase the sound at the ground level. Sound fields that are created by atmospheric conditions

(a) **Neutral Conditions** (Figure 1A): Sound propagates equally in all directions. Completely neutral conditions almost never exist although neutral conditions are a reasonable assumption within several hundred feet of a noise source.

(b) **Temperature Lapse Shadow Zone** (Figure 1B): The normal mid-day temperature lapse on clear, sunny days creates a shadow zone around noise sources, resulting in quiet conditions a relatively short distance away from a noise source.

(c) **Temperature Inversion** (Figure 1C): The temperature inversion conditions that form on most clear nights cause sound waves to curve downward and result in increased sound levels a good distance away from the noise source. The result is that sound levels near freeways tend to be relatively high between sunset and about one hour after sunrise.

(d) **Uniform Wind Gradient** (Figure 1D): Some hilly areas in the Central Coast are characterized by light winds except for a few strong wind events per year. As such, sound levels are rarely controlled by upwind shadow zones and downwind sound amplification.

(e) **Complex Sound Fields** (Figure 1E): The combination of nighttime temperature inversions and the down-slope drainage air flow creates complex sound fields. This type of sound field may be common in hilly areas inland from the coast.

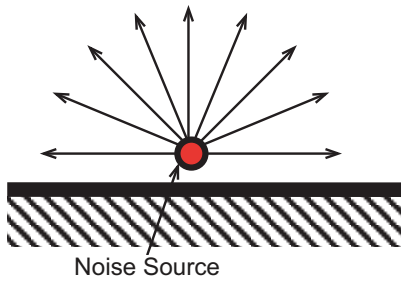
Average sound levels are driven by daytime lapse conditions that tend to reduce sound levels and nighttime inversion conditions that tend to increase sound levels. The increased sound levels under inversion conditions may cause community annoyance.

Sound focusing and sound de-focusing can occur in certain combinations of wind and temperature gradients. Sound focusing tends to be in the downwind direction from the noise source and the de-focusing in the upwind direction. Focusing/de-focusing effects can occur intermittently over 30- to 60- minute periods or can be a fairly consistent occurrence over a period of several days.

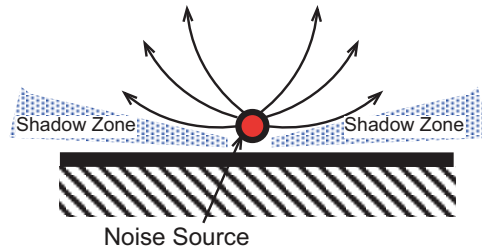
Some field studies of the interaction between atmospheric conditions and sound propagation have shown that sound levels may vary by as much as 5 to 10 dB at distances greater than 1/4 mile from a noise source. The subjective effect of this increase and decrease in sound level surpasses the threshold of significance (3 dB) and can be perceived as a doubling of sound level (10 dB). Atmospheric effects on noise propagation may therefore result in the audibility of sounds, with resulting annoyance for some people.

### Figure 8. Diagrams of Sound Refraction Effects

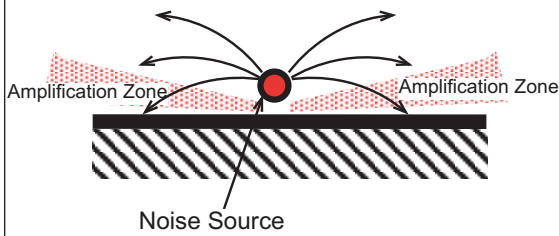
Sound refraction effects due to different atmospheric conditions are shown below:



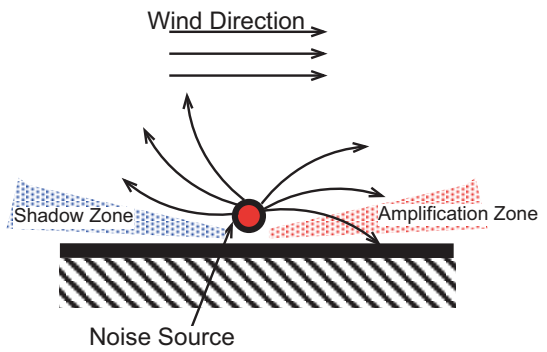
**A. Neutral Conditions**



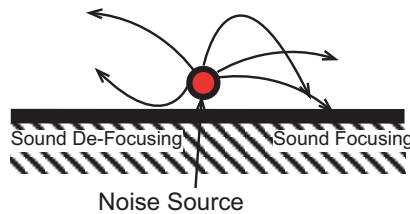
**B. Temperature Lapse Conditions**



**C. Temperature Inversion Conditions**



**D. Uniform Wind Gradient**



**E. Complex Combination of Wind and Temperature Gradients**

## 7.0 APPENDIX II: Measurements and Calculation Methods

### 7.1 Wind Measurement

Sound level measurements become less reliable when average wind speed is greater than 11 m.p.h. at the measurement site. Therefore, wind speed and direction were measured periodically at the measurement sites and the results are correlated with wind data from a nearby established weather station. A Larson Davis WS 001 windscreen is used as wind protection for all microphones and is left in place at all times.

Wind speed and direction were noted throughout the measurement period and compared with data from the private weather station located in Huasna Valley and cross-checked with San Luis Obispo regional airport NOAA weather station located approximately 27 km northwest of the project site. A magnetic compass was used to estimate wind direction. A Davis Turbo Wind meter was used to measure wind speed at the measurement site. The Turbo Wind meter is a high performance wind speed indicator with exceptional accuracy.

### 7.2 Precision of Sound Level Meters.

The American National Standards Institute (ANSI) specifies several types of sound level meters according to their precision. Types 1,2, and 3 are referred to as “precision,” “general-purpose,” and “survey” meters, respectively. Most measurements carefully taken with a type 1 sound level meter will have an error not exceeding 1 dB. The corresponding error for a type 2 sound level meter is about 2 dB. The sound level meters used for measurements shown in this report are Larson-Davis Laboratories Model 812 and Model 820. These meters meet all requirements of ANSI s1.4, IEC 651 for Type 1 accuracy and include the following features: 110 dB dynamic range for error free measurements. Measures FAST, SLOW, Unweighted PEAK, Weighted PEAK, Impulse, Leq, LDOD, LOSHA, Dose, Time Weighted Average, SEL, Lmax, Lmin, LDN. Time history sampling periods from 32 samples per second up to one sample every 255 seconds.

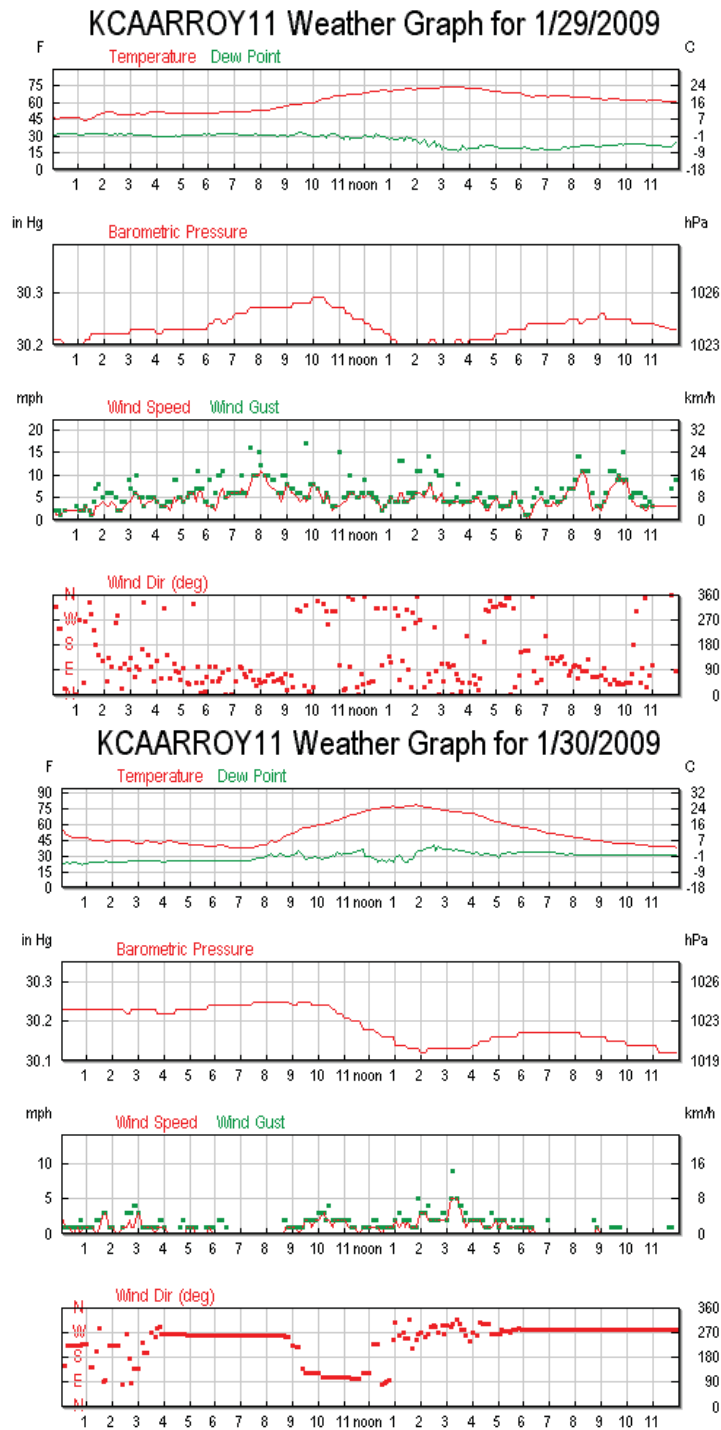
Field calibration of the meter is accomplished before and after all field measurements with an external calibrator. Laboratory calibration of the all instruments is performed at least biannually and accuracy can be traced to the U.S. National Institute of Science and Technology standard.

The following Type 1 Sound Level Meter was used for this study: The sound level meter is factory calibrated as three separate components; the body of the meter itself plus the preamplifier and the microphone, each of which has a Certificate of Calibration and Conformance. When calibrated, the instrument is certified as meeting factory specifications; Normal elapsed time between factory calibrations should not exceed two years.

The following four Type 1 recording sound level meters were used for this survey: Larson Davis model 812 Sound Level Meters, Serial Numbers 0292, 0433, 0433. and a Larson Davis model 820 Sound Level Meter, Serial Number 1079. Factory calibration certificates of for the sound level meters, the Preamps and the Microphones, each calibrated separately, are

## Figure 9. Weather Conditions During Measurement

From private weather station KCAARROY11 data on January 29-30, 2009



available. The calibrator used in this study was a Larson Davis CA250 Acoustic Calibrator, Serial Number 1931. Certificate of Calibration and Conformance, Certificate Number 2006-66284. The instrument meets factory specifications per Procedure D0001.8192. The instrument was found to be in calibration as received. Full calibration report available on request. The above instruments meet factory specifications per ANSI S1.4 1983.

### 7.3 Sound Level Measurement Method

The protocol for conducting sound level measurements is prescribed in detail by the American Society for Testing and Materials (ASTM) in their E 1014 publication and the Caltrans Traffic Noise Analysis Protocol. The procedures and standards in those documents are met or exceeded for sound level measurements shown in this report. The standards of ASTM E 1014 are exceeded by using Type 1 sound level meters for all measurements in this report instead of the less accurate Type 2 meters. Therefore, the precision of the measurements in this report is likely to be better than +/- 2 dB as stated in ASTM E1014.

#### Caltrans Noise Measurement Guidelines

Caltrans makes available general guidelines for taking into account environmental elements in noise measurements. The following is an excerpt from their guidelines. The Traffic Noise Analysis Protocol (hereafter referred to as the Protocol) contains Caltrans noise policies, which fulfill the highway noise analysis and abatement/mitigation requirements stemming from the following State and Federal environmental statutes:

- California Environmental Quality Act (CEQA)
- National Environmental Policy Act (NEPA)
- Title 23 United States Code of Federal Regulations, Part 772 “Procedures for Abatement of Highway Traffic Noise and Construction Noise” (23 CFR 772)
- Section 216 et seq. of the California Streets and Highways Code

### 7.4 Meteorological conditions, discussion

Wind speed and direction, temperature profiles, relative humidity, and sky conditions can cause changes in noise measurement results at normal receiver distances from the transportation noise source. Information concerning these effects is made part of the documentation accompanying the noise measurement data. Without it, there is no baseline against which subsequent measurements can be compared. The prevailing wind direction is expressed in degrees clockwise from the north direction, or it can be expressed as a direction on a 16-point compass, where north is 0 degrees, east is 90 degrees, south is 180 degrees and west is 270 degrees. Wind, air temperature, and humidity observations are ideally made at the average height above the ground that noise is traveling between the source and the receiver. The minimum height should be at least 1.5 meter, or 5 feet, above the ground. In addition to the wind, temperature and humidity observations, sky conditions are also documented.

Meteorological conditions can affect noise measurements in two ways: they can affect the measurement instruments directly, or they can affect the actual noise levels. Wind speeds of 5 meters per second, or 11 miles per hour, create a wind noise of about 45 dBA on a typical ½” microphone with windscreen. This means that measurements of noise below 55 dBA will be contaminated under these conditions. Extreme hot or cold temperatures and humidity can also affect the operation of noise measurement instruments. High humidity or rapid changes in temperature can cause droplets of moisture to form on the microphone diaphragm, creating a popping noise. This can contaminate the noise measurement. Rain, or wet pavement will change tire-pavement noise characteristics, altering traffic noise both in level and frequency. Changes in wind speed and direction relative to the location of the noise source and receiver can cause changes in the magnitude and direction of wind shear. This can result in refraction effects that can redirect sound energy away from or toward a receiver and change overall noise levels.

For normal roadway traffic noise measurements, meteorological conditions are restricted as follows: If wind speeds, regardless of direction, are greater than 5 meters per second, or 11 miles per hour, those measurements are not included in the noise analysis. For research or special studies this criterion is often lower, depending on the objectives of the study. Temperatures and humidity are within the operational ranges specified for the equipment used. [reference: Caltrans Traffic Noise Analysis Protocol For New Highway Construction and Highway Reconstruction Projects, October, 1998]

## 7.5 Noise Contour Modeling

On-site sound level measurements described above were used to calibrate CADNA/A, an acoustical modeling program which is in conformance with the algorithms of the Federal Highway Administration Highway Traffic Noise Model (TNM 2.5). The TNM 2.5 model is the analytical method currently favored for traffic noise prediction by most state and local agencies. It is applied to federal and state roadway projects by the California Department of Transportation (Caltrans). The TNM is based upon the CALVENO noise emission factors for automobiles, medium trucks and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the project site. In addition, sound level measurements were performed over 24-hour periods at two locations to describe ambient sound levels in the project area, and to derive suitable LDN day/night traffic noise distribution factors for traffic noise modeling.

This computer modeling tool, licensed by Datakustik GmbH, is an internationally accepted acoustical modeling software program, used by many acoustics and noise control professional offices in the U.S. and abroad. The software has been validated by comparison with actual values in many different settings. The program has a high level of reliability and follows methods specified by the International Standards Organization in their ISO 9613-2 standard, “Acoustics – Attenuation of sound during propagation outdoors, Part 2: General Method of Calculation.” The standard states that, “this part of ISO 9613 specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level ... under meteorological conditions favorable

to propagation from sources of known sound emissions. These conditions are for downwind propagation ... under a well-developed moderate ground-based temperature inversion, such as commonly occurs at night.” The computer modeling software takes into account source sound power levels, surface reflection and absorption, atmospheric absorption, geometric divergence, meteorological conditions, walls, barriers, berms, and terrain variations. The CADNA/A software uses a grid of receivers covering the project site.

## 8.0 Appendix II: Exterior Noise Level Standards, County of San Luis Obispo

### 23.06.044 - Exterior Noise Level Standards:

The exterior noise level standards of this section are applicable when a land use affected by noise is one of the following noise-sensitive uses which are defined in the Land Use Element and Local Coastal Plan: residential uses listed in Table O, Framework for Planning, except for residential accessory uses and temporary dwellings; health care services (hospitals and similar establishments only); hotels and motels; bed and breakfast facilities; schools (pre-school to secondary, college and university, specialized education and training); churches; libraries and museums; public assembly and entertainment; offices, and outdoor sports and recreation.

(a) No person shall create any noise or allow the creation of any noise at any location within the unincorporated areas of the county on property owned, leased, occupied or otherwise controlled by such person which causes the exterior noise level when measured at any of the preceding noise-sensitive land uses situated in either the incorporated or unincorporated areas to exceed the noise level standards in the following table. When the receiving noise-sensitive land use is outdoor sports and recreation, the following noise level standards shall be increased by 10 dB.

EXTERIOR NOISE LEVEL STANDARDS		
	Daytime 7a.m. to 10 p.m.	Nighttime 10 p.m. to 7 a.m.
Hourly Equivalent Sound Level (Leq, dB)	50	45
Maximum level, dB	70	65

(b) In the event the measured ambient noise level exceeds the applicable exterior noise level standard in subsection (a), the applicable standard shall be adjusted so as to equal the ambient noise level plus one dB.

(c) Each of the exterior noise level standards specified in subsection (a) shall be reduced by five dB for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises.

(d) If the intruding noise source is continuous and cannot reasonably be discontinued or stopped for a time period whereby the ambient noise level can be measured, the noise level measured while the source is in operation shall be compared directly to the exterior noise level standards.

[Amended 1992, Ord 2556]

## **9.0 Qualifications of Preparer**

### **David Lord, Ph.D., Principal Consultant**

For more than 20 years, David Lord has worked with architects, engineers, building contractors and public agencies to assess and solve problems in acoustics, noise and vibration. Dr. Lord is recognized as an acoustical consultant by several municipal and county planning departments and has provided acoustical consulting services for projects located in the following counties in California: San Luis Obispo, Santa Barbara, Orange, San Bernardino, Ventura and Los Angeles. David Lord is approved by the Department of Defense as an acoustical consultant at Vandenberg Air Force Base and at the Naval Facilities Engineering Command, Port Hueneme.

### **Community Noise Assessment**

Projects have ranged in scale and complexity from residential to commercial and institutional developments. All noise assessments rigorously follow Caltrans and ASTM standard procedures, while adhering to local planning standards and noise ordinances and the Uniform Building Code. Recent projects include: Environmental Impact Report noise chapter for a Metrolink station in Orange County; noise assessment for an automobile service center, a retail food market, a community theater, a water treatment plant, various wineries, a boutique hotel, a remote, 600 acre religious retreat site, an annual rodeo and tractor pull event, a metal salvage yard, etc. Residential neighbor-noise assessments range from animal noise to motorcycle noise, to stationary mechanical noise issues.

### **Room Acoustics**

Consulting projects undertaken in room acoustics range in scale from 50- to 400-seat spaces, such as church sanctuaries and restaurants. Consultation begins preferably with the architect early in design and continues through construction and occupancy. Music sources are evaluated and matched to the shape, the volume and the absorptivity of the space, using energy/time/frequency analysis tools. Recent projects include the Katsuya Restaurant at Hollywood and Vine; the Vina Robles Winery Refectory, and the United Methodist Church, San Luis Obispo.

### **Instrumentation**

Sound and vibration measurements are made with multiple, state-of-the-art, data-logging, integrating, Type I instruments and a real time analyzer. Long-term total sound monitoring is conducted with high-resolution digital sound recorders. Sound transmission and reverberation studies are made with a real-time analyzer following ASTM procedures. Each instrument is factory calibrated annually to meet U.S. National Institute of Standards and Technology requirements and has a current Certificate of Calibration and Conformance.

**Recent Projects in California.** Partial list; References provided on request.

1. Bradley Square, Santa Maria, California; Housing Development 120 units. Transportation noise assessment, mitigation recommendations, noise-resistant construction design.

2. Por La Mar Nursery commercial horticulture development, worker housing, Santa Barbara / Goleta, California. Transportation noise assessment, noise resistant housing design.
3. Fess Parker Wine Center, Lompoc California, with Pults & Associates, Architects. CEQA Environmental Impact Assessment for Noise, City of Lompoc.
4. San Ysidro Ranch, Montecito, with Mechanical Engineering Consultants, Santa Barbara. Total sound level monitoring, recording, assessment and mitigation design.
5. Santa Maria Country Club, Santa Maria, California; room acoustics solutions for conference, dining and meeting rooms.
6. State Street, City of Santa Barbara, consultant to several entertainment establishments for entertainment noise mitigation and conflict resolution.
7. Expert testimony for Allen Hutkin, Attorney at Law, San Luis Obispo, noise nuisance cases.
8. Environmental Impact Report, Noise Impact Assessment for Enos Ranchos and Mahoney Ranch General Plan Amendment/Zone Change/Specific Plan Amendment/Annexation, Santa Maria, CA, with Science Applications International Corporation (SAIC)
9. Environmental Impact Report, Noise Impact Assessment, including rail noise issues, for Westgate Metrolink Station, Placentia, CA, with Crawford, Multari and Clark Associates.
10. Expert testimony for William S. Walter, Attorney, eminent domain compensation case, San Luis Obispo, CA.
11. QAD Inc., Summerland, CA. Chiller installation noise assessment and mitigation design evaluation to meet County of Santa Barbara noise standards.

### **Academic Qualifications**

David Lord is a Professor Emeritus of Architecture at California Polytechnic State University, San Luis Obispo, where he developed the curriculum and taught courses in community noise and acoustical engineering.

David Lord holds the Master of Architecture degree from the University of California, Berkeley, with a specialization in architectural acoustics. David Lord earned the Ph.D. degree from the University of London, Bartlett School of Architecture.

### **Memberships**

David Lord is a member of the American Society of Heating, Refrigerating and Air Conditioning Engineers, the Acoustical Society of America, the American Institute of Physics, the Institute of Noise Control Engineering, and the Audio Engineering Society.