Noise Element

CITY OF LAGUNA BEACH

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CITY OF LAGUNA BEACH

NOISE ELEMENT

Adopted by the City Council
March 15, 2005
Resolution No.05.030

LAGUNA BEACH NOISE ELEMENT OF THE GENERAL PLAN

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INTRODUCTION

The Noise Element of a General Plan is a comprehensive program for including noise management in the planning process. It is a tool for local planners to use in achieving and maintaining land uses that are compatible with environmental noise levels. The Noise Element identifies noise sensitive land uses and noise sources, and defines areas of noise impact for the purpose of developing programs to ensure that Laguna Beach residents will be protected from excessive noise intrusion. The original Noise Element of the General Plan for the City of Laguna Beach identified aircraft noise from Marine Corps Air Station El Toro as the primary noise source impacting the City. The base is now closed and motor vehicle traffic is the primary noise source in the City. Motor vehicle noise and other noise sources of concern within the City are addressed in the goals, policies and implementation program developed for the City.

It is important that the Noise Element be consistent with other elements of the General Plan. Of particular relevance are the Land Use and Transportation Circulation and Growth Management Element and Housing Element. Of these, the Transportation Circulation and Growth Management Element has the most direct effect on community noise levels. Review of these elements indicates that adequate consideration for noise is included and that the Noise Element is consistent with these General Plan Elements. In particular, the Transportation, Circulation, and Growth Management Element contains policies related to motor vehicle noise[1].

The Noise Element follows the revised State guidelines ("General Plan Guidelines," Governors Office of Planning and Research, November 1998, and Preliminary Draft of revised guidelines, Year 2002) and State Government Code Section 653021(f). The element quantifies the community noise environment in terms of noise exposure contours for both near and long-term levels of growth and traffic activity. The information will become a guideline for the development of land use policies to achieve compatible land uses and provide baseline levels and noise source identification for local noise ordinance enforcement.

[1] Transportation, Circulation, and Growth Management Element, policies 1A, 7A, 7B, and 7E.

The Element is divided into five sections and the Technical Appendix. Included in the Technical Appendix is detailed data and a glossary that defines a number of key terms used in noise assessments. The Noise Element is organized as follows:

1. ***BACKGROUND INFORMATION AND INVENTORY OF NOISE CONDITIONS*** describes the existing and future noise levels in the City, and provides some background and definitions helpful understanding community noise control issues.

2. ***ISSUE IDENTIFICATION*** presents the noise issues in the City that are to be addressed within the Noise Element.

3. ***FINDINGS*** section summarizes the noise environment and the implementation programs to minimize noise and land use conflicts.

4. ***GOAL STATEMENT*** defines the goals of the Noise Element.

5. ***GOALS, POLICIES, AND IMPLEMENTATION*** summarizes the policies to be implemented by the City to achieve these goals.

1.0 BACKGROUND INFORMATION AND INVENTORY OF NOISE CONDITIONS

This section contains a detailed description of the current and projected noise environment within the City. This description of the noise environment includes identification of noise sources and noise sensitive land uses, a community noise measurement survey and noise contour maps.

To define the noise exposure, this section of the report defines noise terminology, describes the noise measurement results and identifies the major sources of noise in the community. The sources of noise in Laguna Beach include: motor vehicles, aircraft overflights, construction, commercial areas, and general neighborhood noises. To completely assess the noise environment in the City, noise sensitive receptors must also be identified. As mandated by the State, noise sensitive receptors include, but are not limited to, areas containing schools, hospitals, rest homes, long-term medical or mental care facilities, or any other land use area deemed noise sensitive by the local jurisdiction.

Based upon the identification of the major noise sources and the location of sensitive receptors, a noise measurement survey was conducted. The survey has two functions. The first is to determine the existing noise levels at noise sensitive land uses. A second function is to obtain an accurate description of the ambient noise levels in various neighborhoods throughout the City.

Noise Contours for all of the major noise sources in Laguna Beach were developed. These contours were based upon traffic mix, traffic levels, and street conditions such as vehicle speed and roadway gradient. The contours are expressed in terms of the Community Noise Equivalent Level (CNEL). The existing conditions scenario is derived from the most recent traffic counts taken in the city.

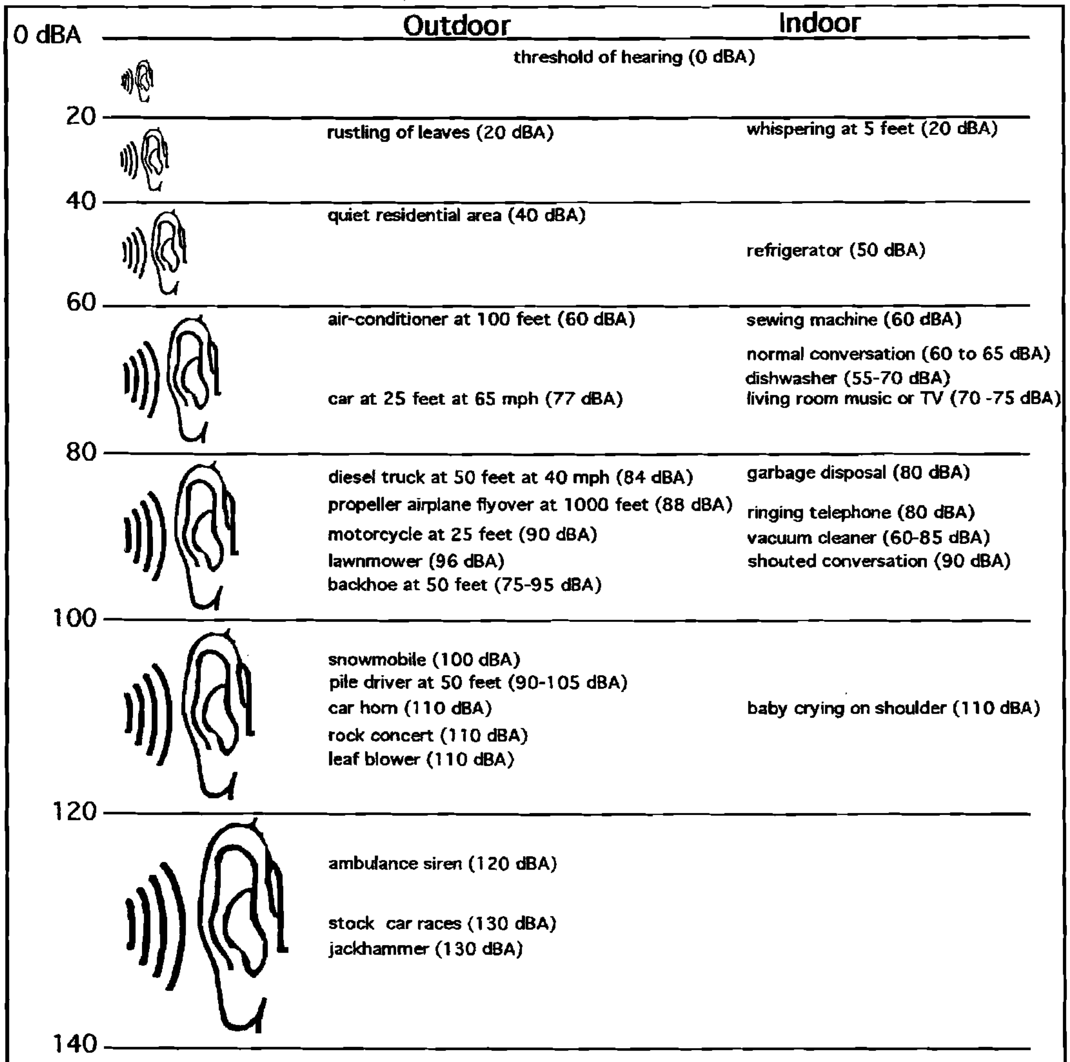
1.1 Definitions

Sound is technically described in terms of the loudness (amplitude) and frequency (pitch) of the sound. The standard unit of measurement of the loudness of sound is the Decibel (dB). Since the human ear is not equally sensitive to sound at all frequencies, a special frequency-dependent rating scale has been devised to relate noise to human sensitivity. The A-weighted decibel scale (dBA) performs this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear.

Decibels are based on the logarithmic scale. The logarithmic scale compresses the wide range in sound pressure levels to a more usable range of numbers in a manner similar to the way that the Richter scale is used to measure earthquakes. In terms of human response to noise, a sound 10 dBA higher than another is judged to be twice as loud; and 20 dBA higher four times as loud; and so forth. Everyday sounds normally range from 30 dB (very quiet) to 100 dB (very loud). Examples of various sound levels in different environments are shown in Exhibit 1.

Noise has been defined as unwanted sound and it is known to have several adverse effects on people. From these known effects of noise, criteria have been established to help protect the public health and safety and prevent disruption of certain human activities. This criteria is based on such known effects of noise on people as hearing loss (not generally a factor with community noise), communication interference, sleep interference, physiological responses and annoyance. Each of these potential noise impacts on people are briefly discussed in the following narratives:

> *HEARING LOSS* is, in general, not a concern in community noise problems. The potential for noise-induced hearing loss is more commonly associated with occupational noise exposures in heavy industry or very noisy work environments with long-term exposure. The Occupational Safety and Health Administration (OSHA) identifies a noise exposure limit of 90 dBA for 8 hours per day to protect from hearing loss. Noise levels in neighborhoods, even in very noisy airport environments near major international airports, is not sufficiently loud to cause hearing loss. It is significant to note that in recent years hearing loss is being caused more and more by recreational exposure to noise, such as off-road vehicle riding, loud music, target and skeet shooting, etc.



Sources: League For The Hard Of Hearing, www.lhh.org
Handbook of Noise Control, McGraw Hill, Edited byCyril Harris, 1979
Measurements by Mestre Greve Associates

Exhibit 1
Typical Sounds Levels in A-Weighted Decibels (dBA)

Laguna Beach General Plan Noise Element

COMMUNICATION INTERFERENCE is one of the primary concerns in environmental noise problems. Communication interference includes speech interference and activities such as watching television. Normal conversational speech is in the range of 60 to 65 dBA and any noise in this range or louder may interfere with speech. There are specific methods of describing speech interference as a function of distance between speaker and listener and voice level.

SLEEP INTERFERENCE is a major noise concern in noise assessment and, of course, is most critical during nighttime hours. Sleep disturbance is one of the major causes of annoyance due to community noise. Noise can make it difficult to fall asleep, create momentary disturbances of natural sleep patterns by causing shifts from deep to lighter stages and cause awakening. Noise may even cause awakening, which a person may or may not be able to recall.

Extensive research has been conducted on the effect of noise on sleep disturbance. Recommended values for desired sound levels in residential bedroom space range from 25 to 45 dBA. The lower noise level recommendations are generally for continuous noise sources such as heating and ventilating systems and the higher part of the recommended range is for intermittent noise such as outdoor noise event intrusion into the sleeping area.

PHYSIOLOGICAL RESPONSES are those measurable effects of noise on people, which are realized as changes in pulse rate, blood pressure, etc. While such effects can be induced and observed, the extent is not known to which these physiological responses cause harm or are sign of harm. Generally, physiological responses are a reaction to a loud short term noise such as a rifle shot or a very loud jet overflight.

ANNOYANCE is the most difficult of all noise responses to describe. Annoyance is a very individual characteristic and can vary widely from person to person. What one person considers tolerable can be quite unbearable to another of equal hearing capability. The level of annoyance, of course, depends on the characteristics of the noise (i.e.; loudness, frequency spectra, time, and duration), and how much activity interference (e.g. speech interference and sleep interference) results from the noise. However, the level of annoyance is also a function of the attitude of the receiver. Personal sensitivity to noise varies widely. It has been estimated that 2 to 10 percent of the population is highly susceptible to noise not of their own making, while approximately 20 percent are unaffected by noise. Attitudes are affected by the relationship between the person and the noise source. (Is it our dog barking or the neighbor's dog?) Whether we believe that someone is trying to abate the noise will also affect our level of annoyance.

Community noise is generally not a steady state and varies with time. Under conditions of non-steady state noise, some type of statistical metric is necessary in order to quantify noise exposure over a long period of time. Several rating scales have been developed for describing the effects of noise on people. They are designed to account for the above known effects of noise on people.

These scales are: the Equivalent Noise Level (LEQ), the Day Night Noise Level (LDN), and the Community Noise Equivalent Level (CNEL). These scales are described in the following paragraphs.

LEQ is the "energy" average noise level during the time period of the sample. It is a number that represents a decibel sound level. This constant sound level would contain an equal amount of energy as a fluctuating sound level over a given period of time. LEQ can be measured for any time period, but is typically measured for 15 minutes, 1 hour or 24 hours.

LDN is a 24 hour, time-weighted annual average noise level. Time-weighted refers to the fact that noise which occurs during certain sensitive time periods is penalized for occurring at these times. In the LDN scale, those events that take place during the night (10 pm to 7 am) are penalized by 10 dB. This penalty was selected to attempt to account for increased human sensitivity to noise during the quieter period of a day, where sleep is the most probable activity.

CNEL is similar to the LDN scale except that it includes an additional 5 dBA penalty for events that occur during the evening (7 pm to 10 pm) time period. Either LDN or CNEL may be used to identify community noise impacts within the Noise Element. Example noise environments in terms of the CNEL metric are shown in Exhibit 2.

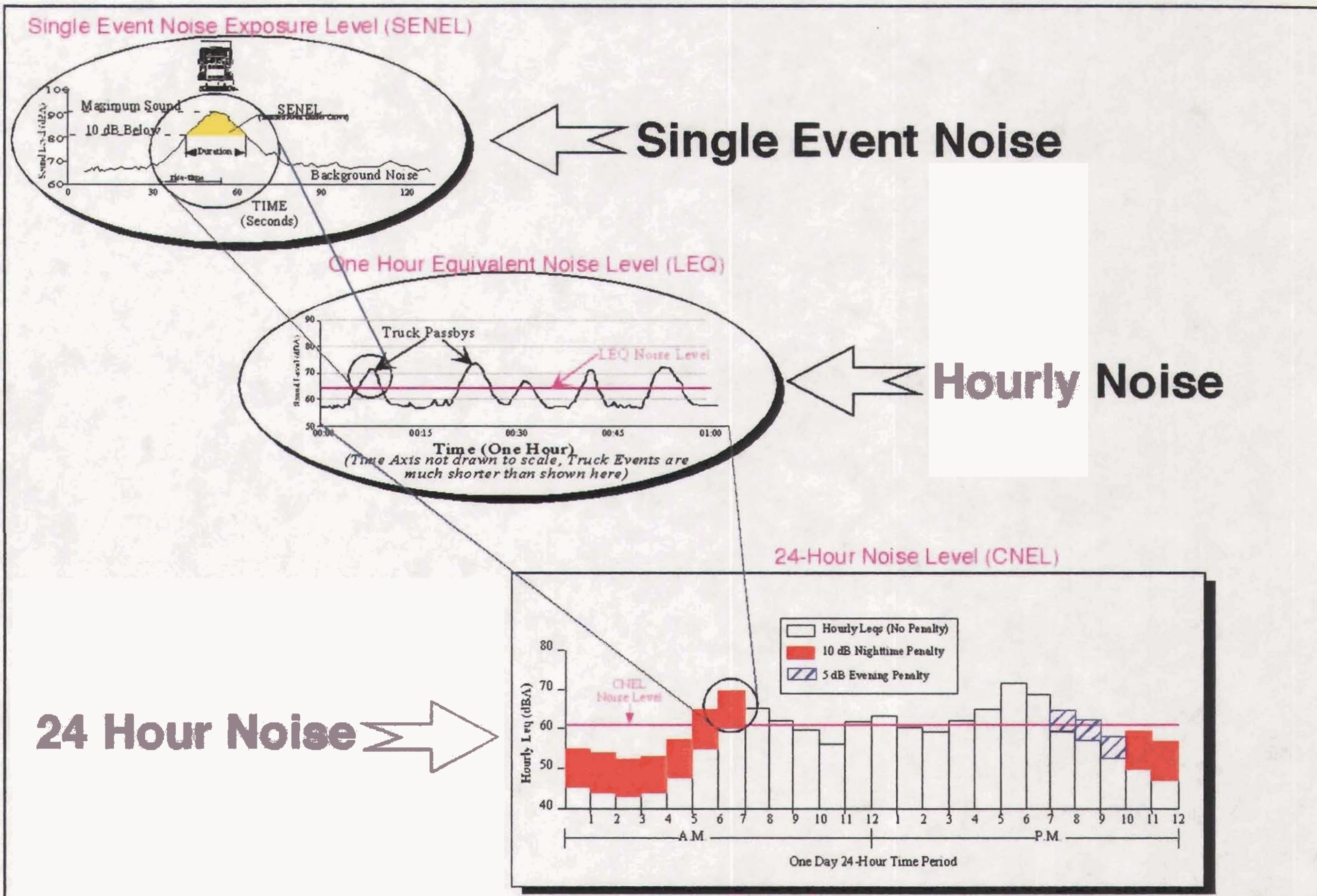


Exhibit 2
Single and Cumulative Noise Metric Definitions
Source: Mestre Greve Associates 1998

1.2 Noise Measurements

Twenty six sites were selected for measurement of the noise environment in Laguna Beach. A review of noise complaints and identification of major noise sources in the community provided the initial base for development of the community noise survey. The measurement locations were selected on the basis of proximity to major noise sources and noise sensitivity of the land use. The measurement locations are depicted in Exhibit 3.

There were three types of measurements conducted. At five locations noise measurements were made for a 24 hour period using a noise monitor that was installed in the private yard area of a residence. At sixteen sites noise measurements were made of the short term Leq values. These measurements provide a short 'snapshot' view of the noise environment. At five additional sites, short term Leq noise measurements were made prior to and during the summer festival season. These latter measurements were done to describe the change in noise environment associated with the increased activity during the summer months.

The results of the short term noise measurements are shown in Exhibit 4. These figures also depict the date and time of the measurement and the primary noise source affecting the noise environment. The quantities measured were the Equivalent Noise Level (Leq), the maximum noise level (Lmax) and the minimum noise levels. The results of the 24 hour long measurements are shown in Exhibit 5.

When examining the short term data shown in Exhibit 4 it is important to note that most of these sites were in the front yards of homes and are quite close to the road. These data are intended to identify noise levels over a broad range of the City and are not an assessment of impacts at these sites. In all cases the major sources of noise are motor vehicles on local streets. The predominant noise source is Coast Highway. Exhibit 4 shows this very clearly, the sites nearest Coast Highway are the loudest sited in the City. The maximum noise levels are usually due to trucks or loud cars. The minimums occur when traffic is very light or no cars are passing by. The instantaneous minimum noise levels ranged from 29 dBA on at Site 18 (Mystic View) to 52 dBA at Site 9 (residential behind Mosun Sushi and Club). The instantaneous maximum noise levels ranged from 59 dBA at Site 14 (Alta Laguna Park) to 89 dBA at Site 6 (Coast Highway) and Site 9 (residential behind Mosun Sushi and Club). The maximums at both locations were due to motor vehicle traffic. The logarithmic average or Leq noise levels ranged from 42 dBA at Site 14 (Alta Laguna Park) to 71 dBA at Site 2 (Coast Highway near Aliso Creek) and Site 6 (Coast Highway).

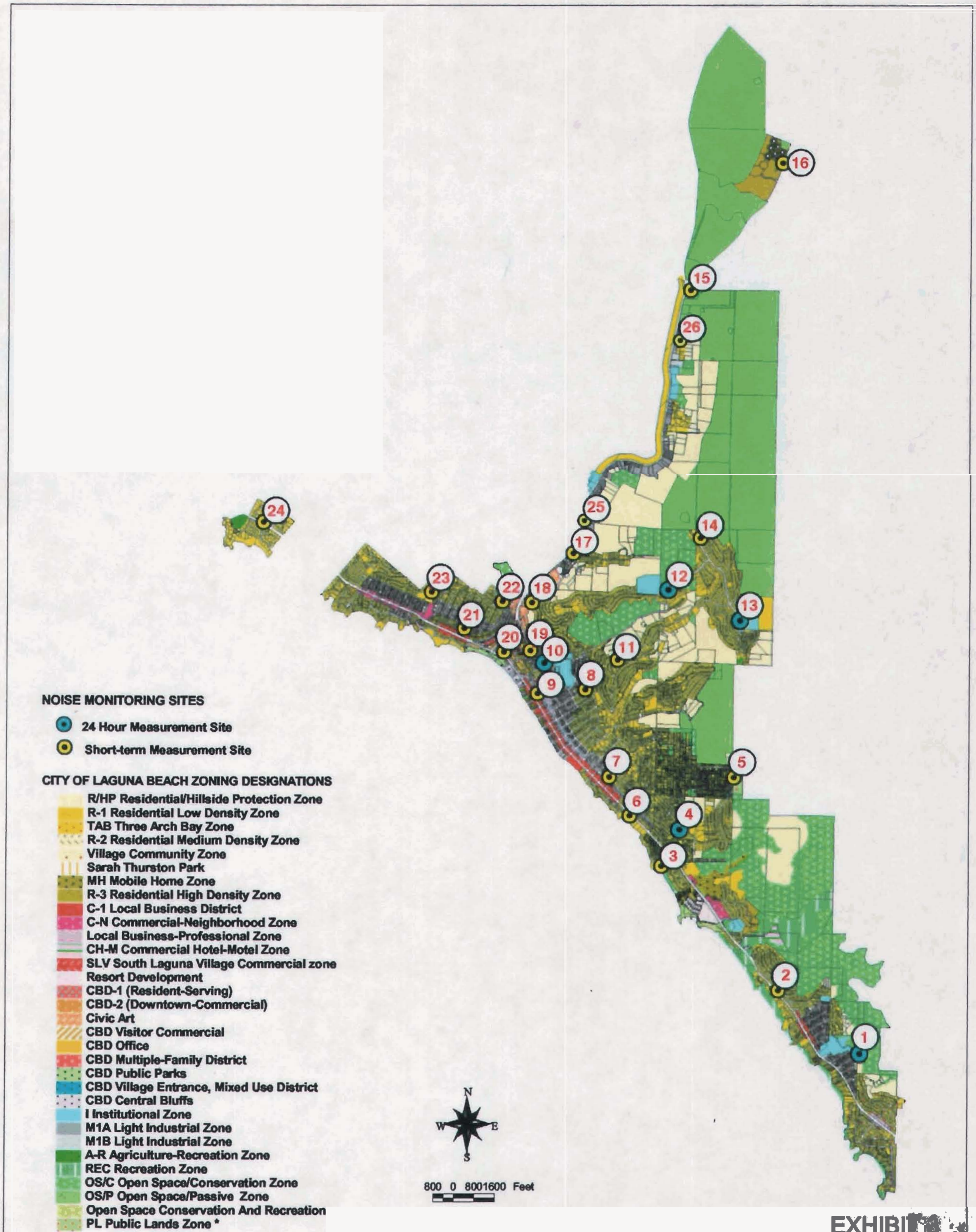
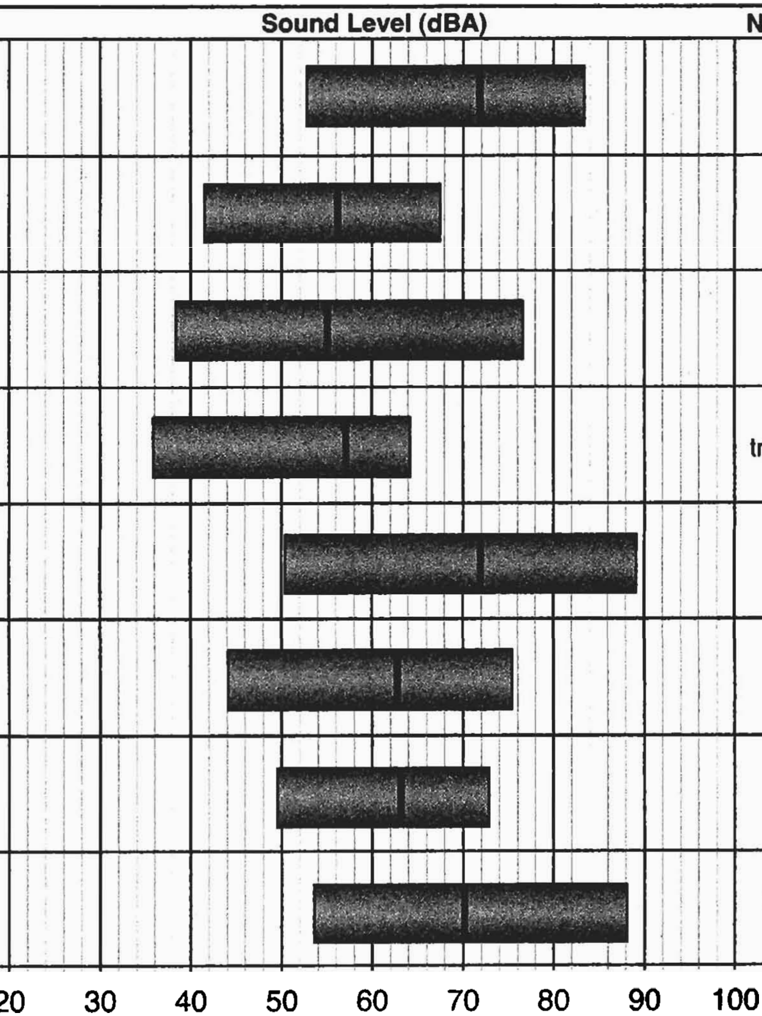
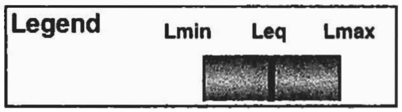


EXHIBIT
NOISE MONITORING SITES

Exhibit 4
Graphic Summary of Short-Term Ambeint Noise Measurment Results

Site	Location	Date	Time	Land Use	Noise Sources
2	Pacific Coast Hwy. south of Aliso Creek	6/11	7:30 a.m.	Res	traffic
3	9 Lagunita	6/15 (before festivals)	3:00 p.m.	Res.	beach / neighborhood activity
3	9 Lagunita	7/6 (during festivals)	2:35 p.m.	Res.	beach / neighborhood activity
5	Moulton Meadows Park	6/18	2:15 p.m.	Park	traffic, park activity
6	2419 Pacific Coast Hwy.	6/11	8:20 a.m.	Res.	traffic
7	1860 Glenneyre	6/11	8:55 a.m.	Res.	traffic
8	corner of Thalia Street and Wendt	6/18	8:05 a.m.	Res.	traffic
9	Mosun Sushi & Club M 680 S. Pacific Coast Hwy	6/15	11:15 p.m.	Comm.	traffic, night club music

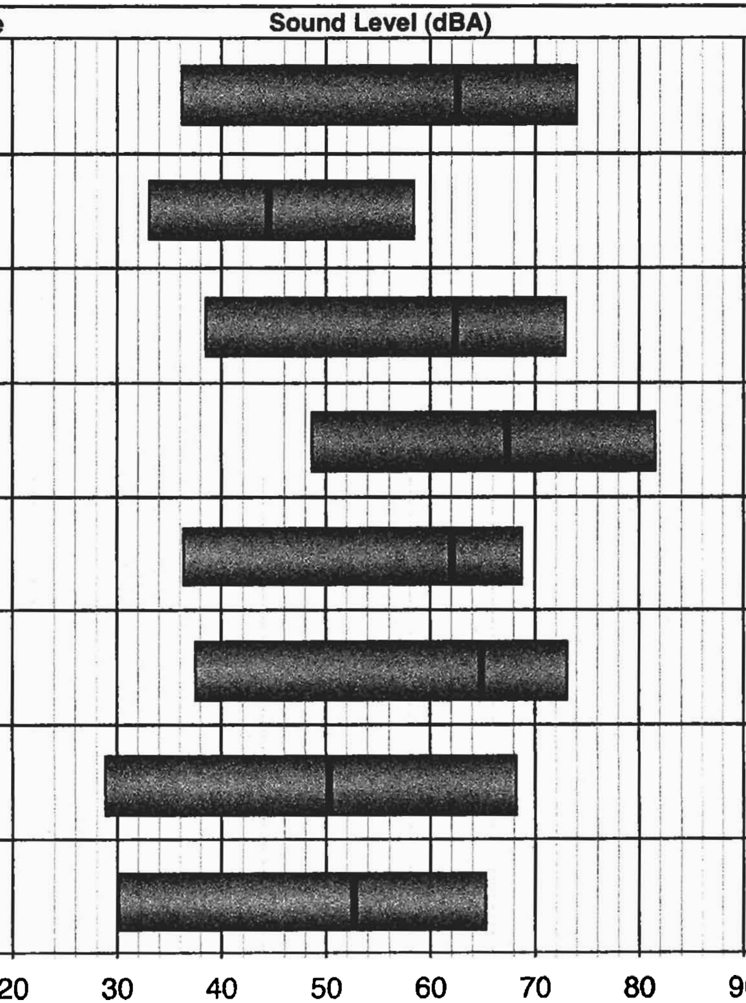


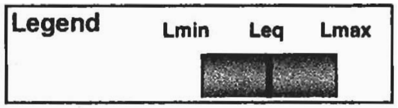


City of Laguna Beach Noise Element
Mestre Greve Associates

Exhibit 4 (cont'd)
Graphic Summary of Short-Term Ambeint Noise Measurment Results

Site	Location	Date	Time	Land Use	Noise Sources
11	1585 Temple Hills Drive	6/11	10:15 a.m.	Res	traffic
14	Alta Laguna Park	6/11	10:40 a.m.	Park	neighborhood activity
15	El Toro Road and Phillips Street	6/19	10:00 a.m.	Res.	business activity
16	corner of El Toro Road & Canyon Hills	6/18	10:45 a.m.	Res.	traffic
17	corner of Canyon Acres Drive and Arroyo Drive	6/19 (before festivals)	8:45 p.m.	Res.	traffic
17	corner of Canyon Acres Drive and Arroyo Drive	7/17 (during festivals)	8:25 p.m.	Res.	traffic
18	Mystic View	6/18 (before festivals)	8:00 p.m.	Res.	neighborhood activity
18	Mystic View	7/17 (during festivals)	9:20 p.m.	Res.	neighborhood activity





City of Laguna Beach Noise Element
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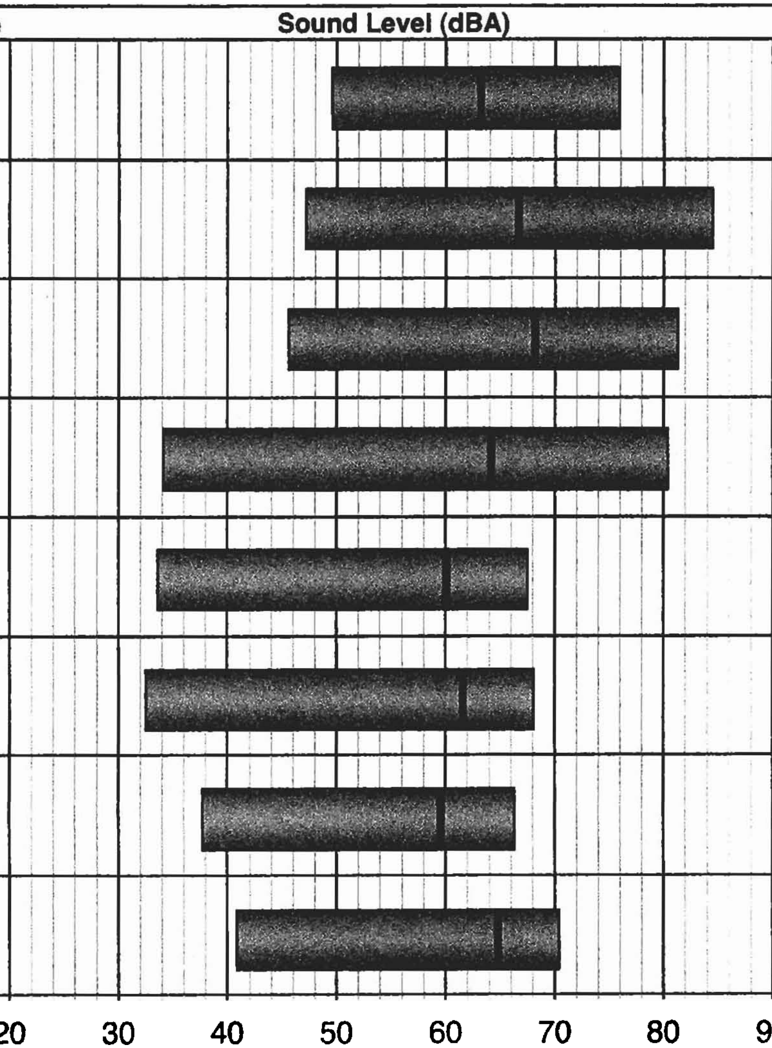
Exhibit 4 (cont'd)
Graphic Summary of Short-Term Ambeint Noise Measurment Results

Site	Location	Date	Time	Land Use	Noise Sources
19	3rd Street between Mermaid Street and Park Avenue	6/18	10:00 a.m.	Res	traffic
20	Hennessy's Tavern 213 Ocean Ave	6/15 (before festivals)	10:40 p.m.	Comm.	traffic, nightclub, music
20	Hennessy's Tavern 213 Ocean Ave	7/20 (during festivals)	10:45 p.m.	Comm.	traffic, nightclub, music
21	corner of Cypress Street and Holly Street	7/2	8:30 a.m.	Res.	traffic
22	end of Linden Street	6/18 (before festivals)	9:00 p.m.	Res.	festival / neighborhood activity
22	end of Linden Street	7/17 (during festivals)	9:00 p.m.	Res.	festival / neighborhood activity
23	Riddle Field	6/11	11:15 a.m.	Park	traffic
24	Pacific Coast Highway and E. Irvine Cove Way	8/13	3:25 p.m.	Res.	traffic



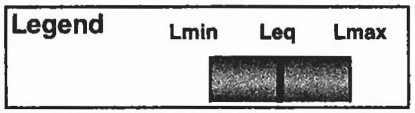


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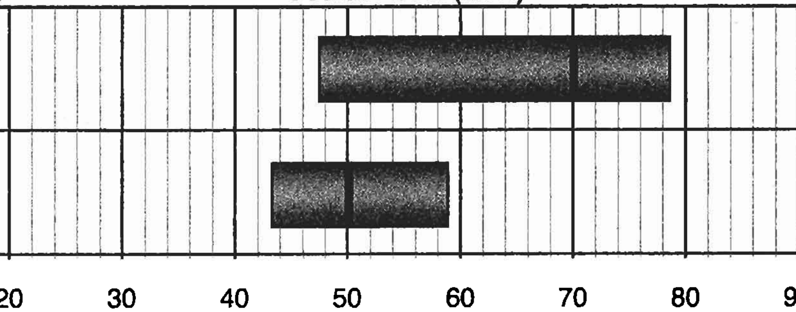
Exhibit 4 (cont'd)

Graphic Summary of Short-Term Ambeint Noise Measurment Results

Site	Location	Date	Time	Land Use	Sound Level (dBA)	Noise Sources
25	1875 Laguna Cyn Rd	1/7/04	1:45 p.m.	Comm.		traffic
26	20371 Sun Valley Rd	1/7/04	2:40 p.m.	Res		traffic, kennel



Legend Lmin Leq Lmax

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Exhibit 5
SITE 1 - Graphic Summary of 24 Hour Ambient Noise Measurement Results
1 Hillhaven Ranch Way (near South Coast Medical Center)

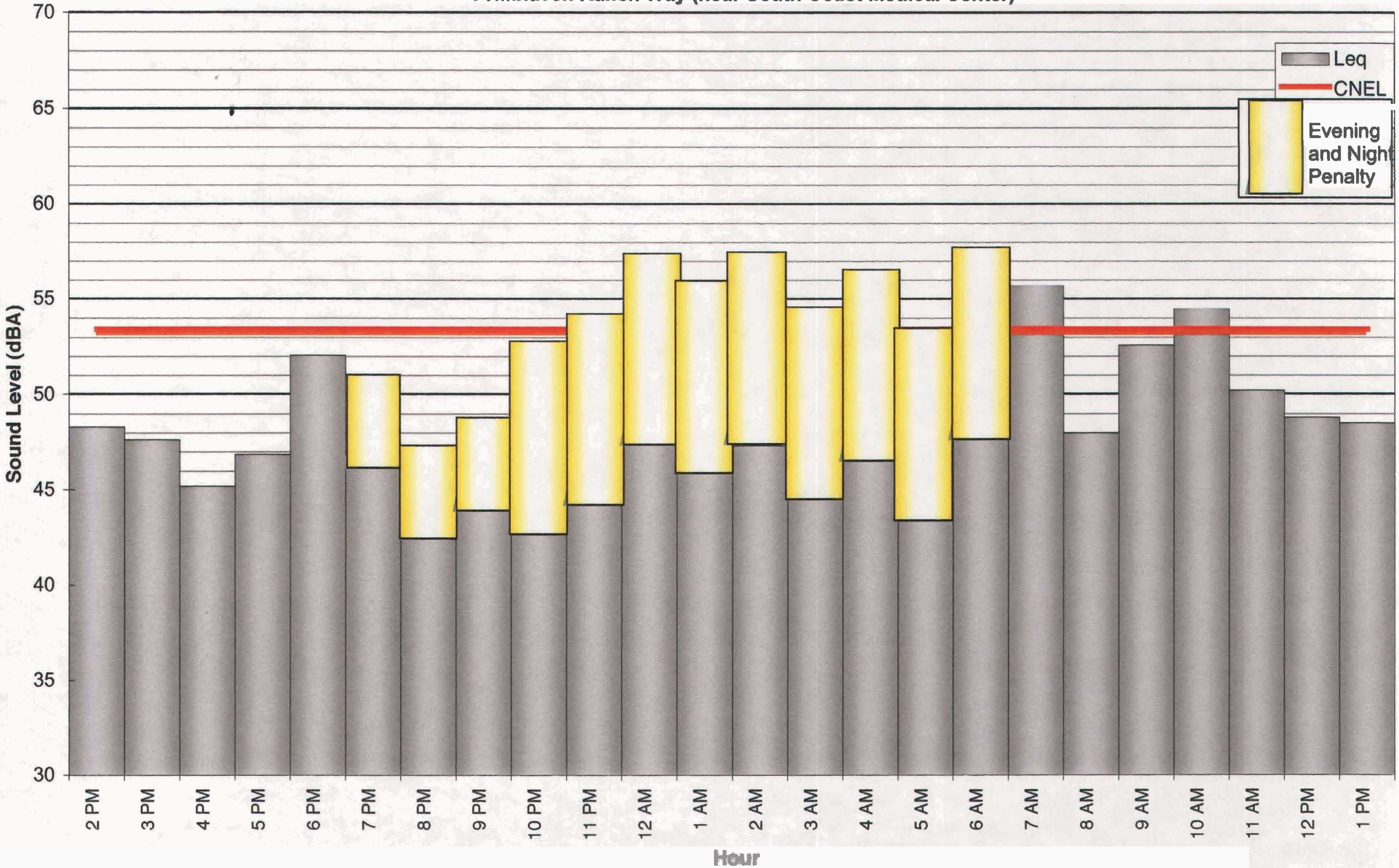


Exhibit 5 (cont'd)

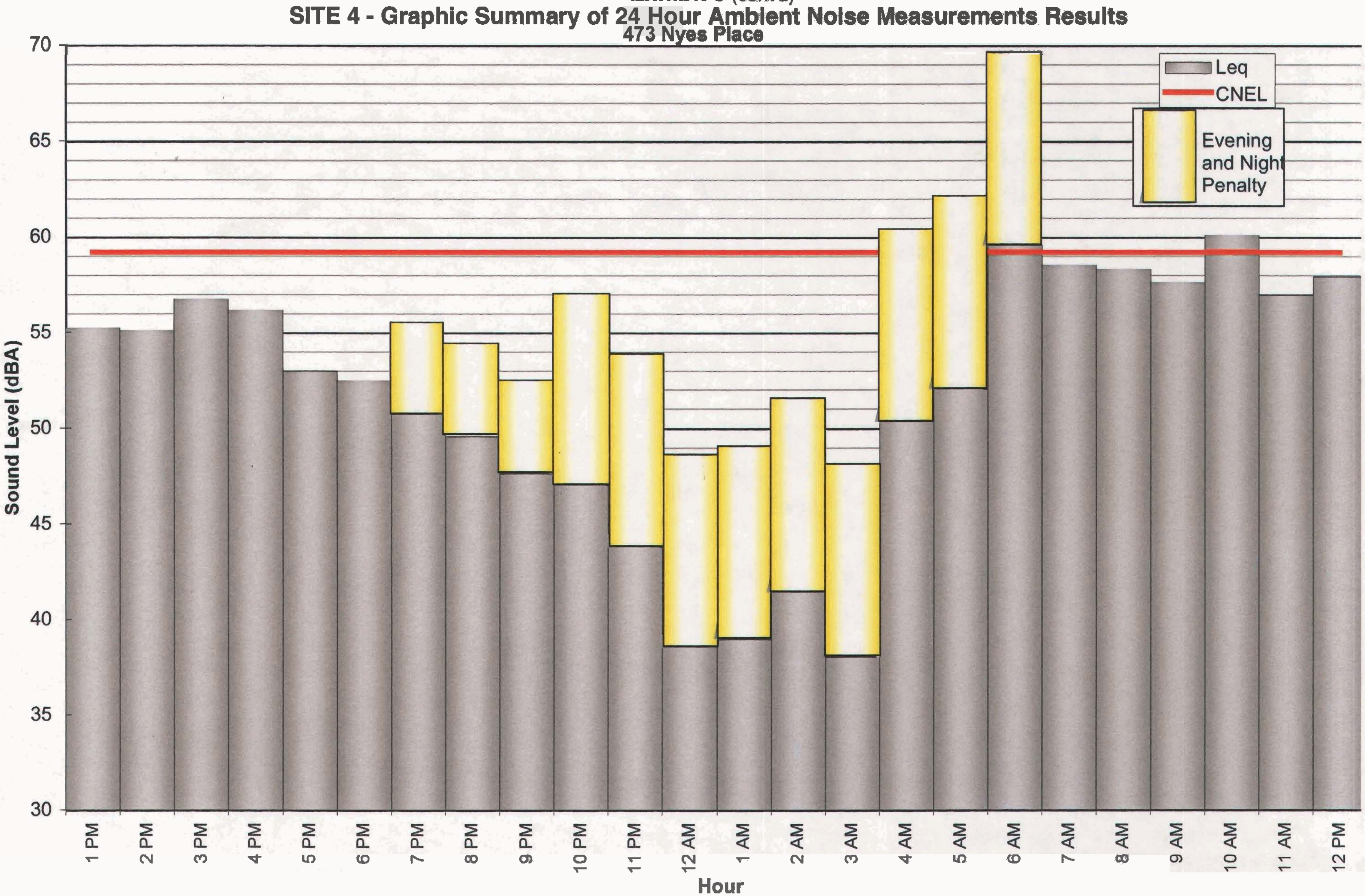
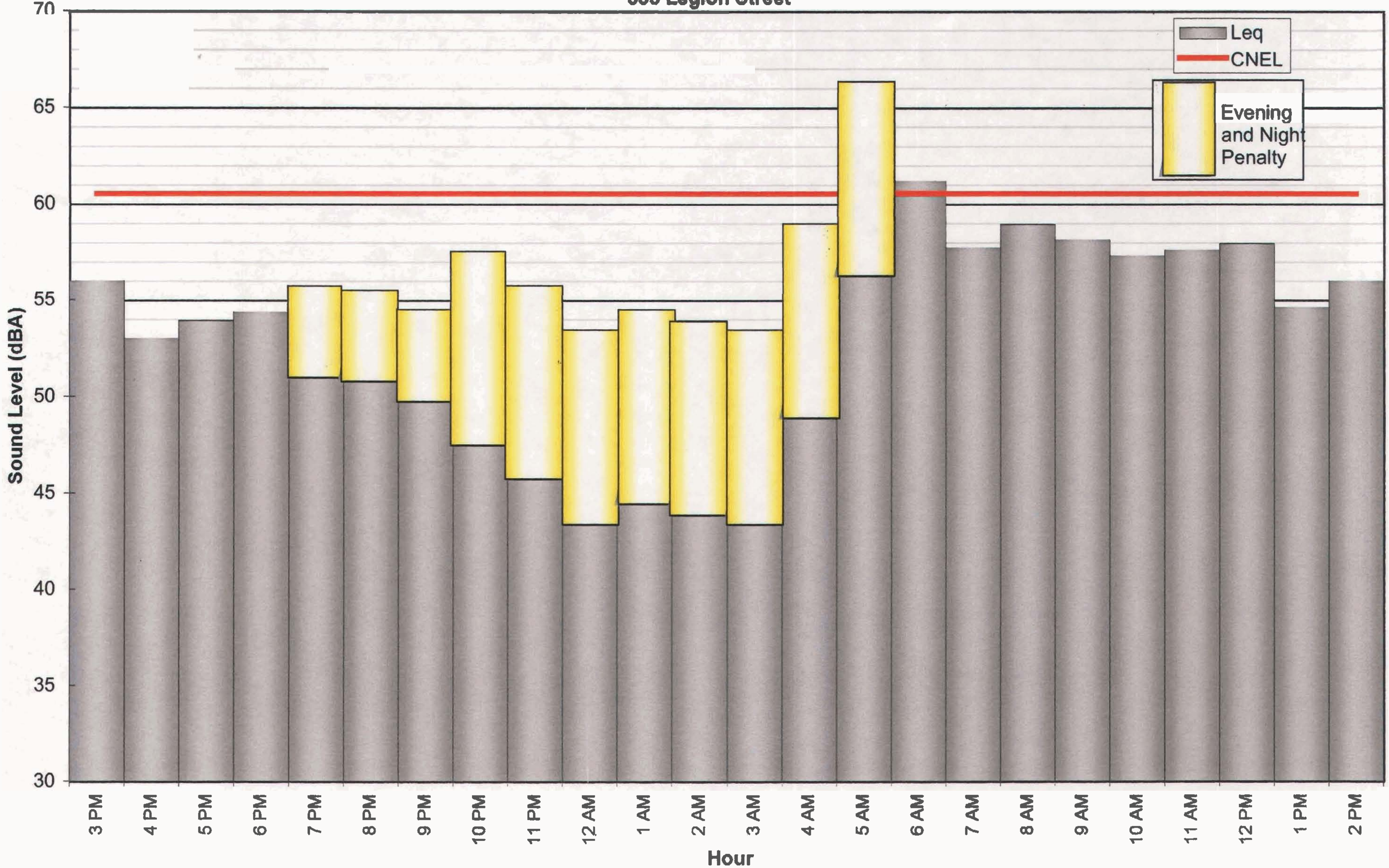


Exhibit 5 (cont'd)

SITE 10 - Graphic Summary of 24 Hour Ambient Noise Measurements Results

555 Legion Street



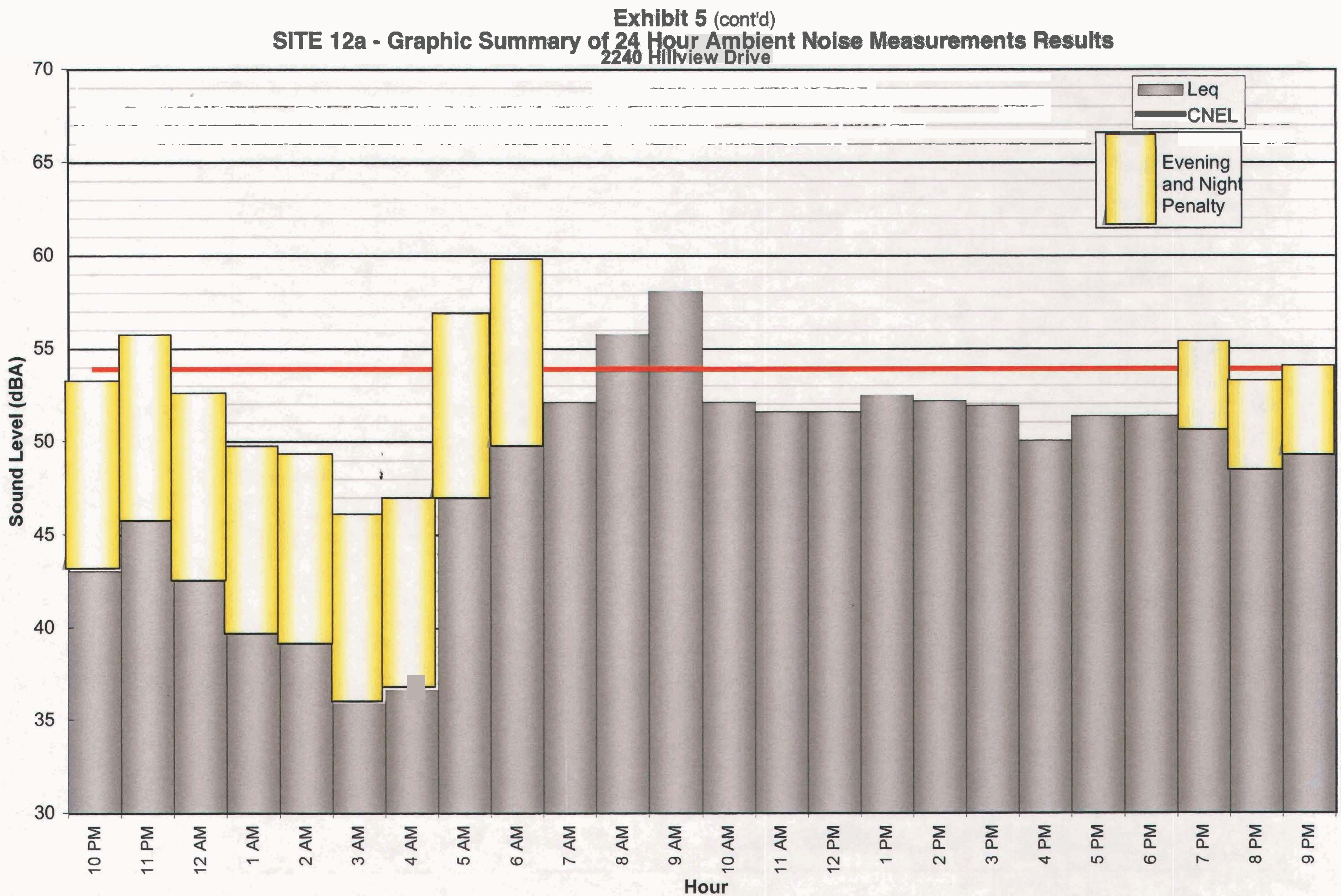
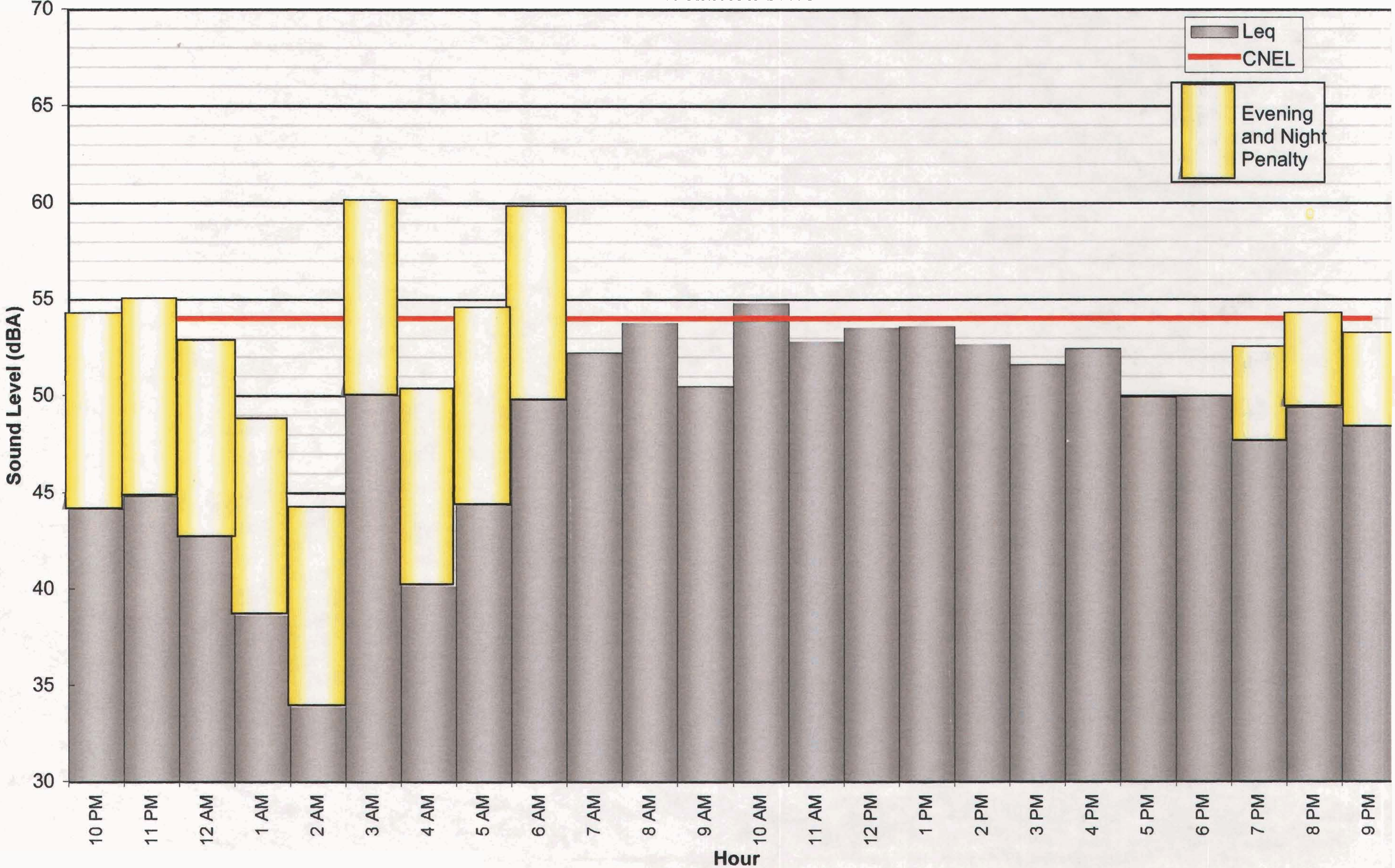


Exhibit 5 (cont'd)
SITE 12a - Graphic Summary of 24 Hour Ambient Noise Measurements Results
2240 Hillview Drive
Leq
CNEL
Evening and Night Penalty
Sound Level (dBA)
70
65
60
55
50
45
40
35
30
10 PM
11 PM
12 AM
1 AM
2 AM
3 AM
4 AM
5 AM
6 AM
7 AM
8 AM
9 AM
10 AM
11 AM
12 PM
1 PM
2 PM
3 PM
4 PM
5 PM
6 PM
7 PM
8 PM
9 PM
Hour

Exhibit 5 (cont'd)

SITE 12b - Graphic Summary of 24 Hour Ambient Noise Measurements Results

2240 Hillview Drive



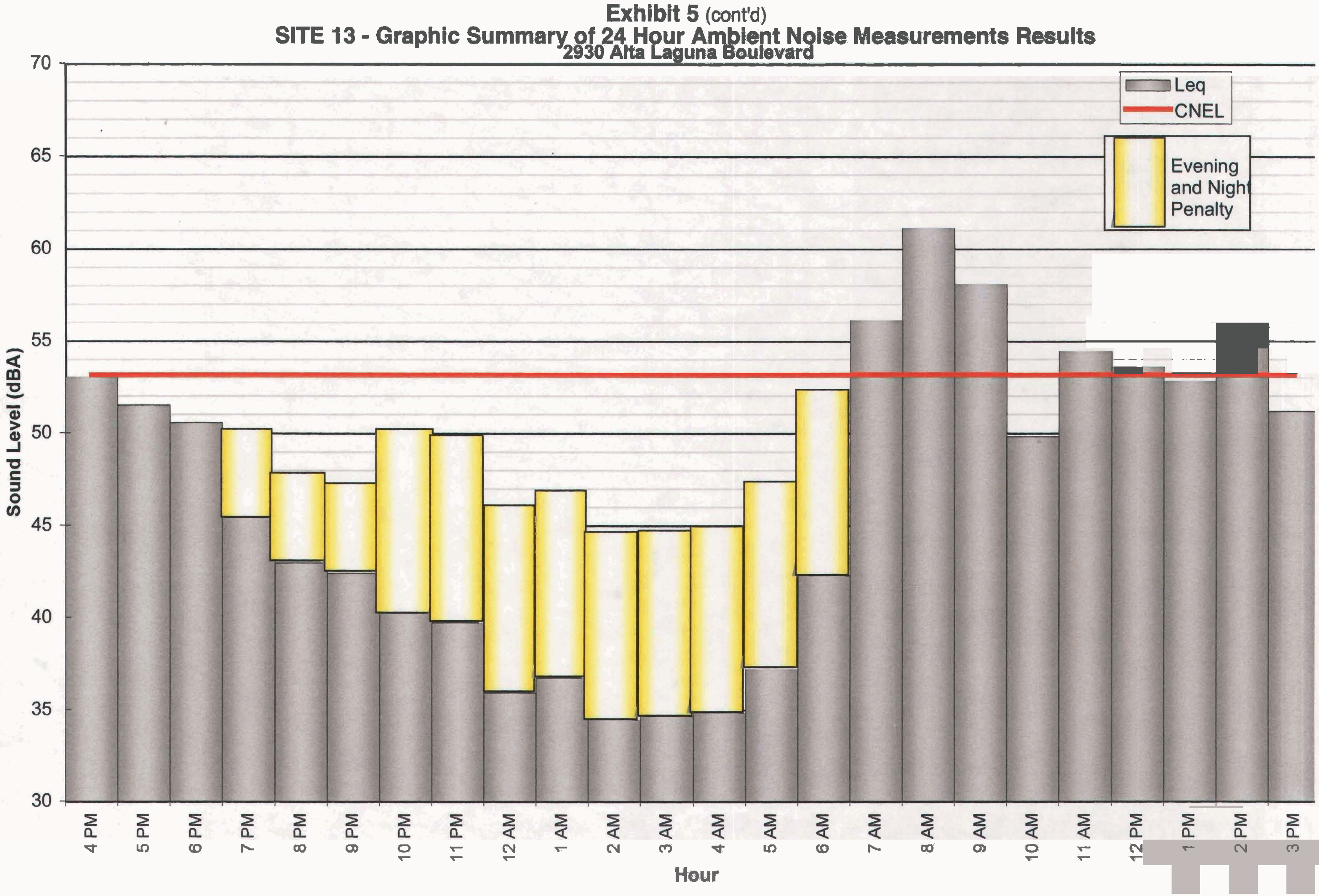


Exhibit 5 (cont'd)
SITE 13 - Graphic Summary of 24 Hour Ambient Noise Measurements Results
2930 Alta Laguna Boulevard
Leq
CNEL
Evening and Night Penalty
Sound Level (dBA)
70
65
60
55
50
45
40
35
30
4 PM
5 PM
6 PM
7 PM
8 PM
9 PM
10 PM
11 PM
12 AM
1 AM
2 AM
3 AM
4 AM
5 AM
6 AM
7 AM
8 AM
9 AM
10 AM
11 AM
12 PM
1 PM
2 PM
3 PM
Hour

In examining Exhibit 5 the daily twenty-four hour variation in noise levels can be seen. The horizontal line in Exhibit 5 is the CNEL (weighted 24 hour logarithmic average). The hours that have high peaks usually correspond to heavy traffic hours or some very loud peak noise events(s). There is a morning peak hour after which traffic noise remains somewhat consistent throughout the day. In the evening traffic and noise decrease to very low levels. These are typical variations for a suburban area. In Laguna Beach the morning peak hour is more pronounced than the evening peak hour. For example, Site 13 located on Alta Laguna Boulevard and overlooking Top of the World Elementary school has a very pronounced peak period for 7 to 9 am associated with the start of school. It is significant to note that the measurements made on Park Avenue (site 12) were influenced by construction noise. At this location the construction at Thurston Middle School, a new home on Park Avenue, and remodeling activity on Hillview Drive all contributed to the increase in noise. The extremely low noise levels measured at night at this location (34 dBA hourly Leq) is lower than is typically measured in an urban or suburban environment, and contrasts with the construction trucks operating on Park Avenue during the day (58 dBA hourly Leq with maximum noise levels near 80 dBA). The low night noise levels reflect the lack of activity in the hills of Laguna and the large distance from Coast Highway. The range of CNEL of sites tested measured from a low of 53 dBA (Site 13 on Alta Laguna and Site 5 on Nyes Place) to a high of 61 (site 10 on Legion Street).

1.3 Sources of Noise.

The sources of noise in Laguna Beach fall into three basic categories. These are: motor vehicle noise, aircraft overflights, and stationary sources. Each of these sources and their impacts on the noise environment of Laguna Beach are summarized in the following paragraphs.

The most common sources of noise in Laguna Beach are transportation related noise sources. These include automobiles, trucks, motorcycles, and aircraft. Motor vehicle noise is of concern because it is characterized by a high number of individual events which often create a sustained noise level and its proximity to areas sensitive to noise exposure. Aircraft operations, though infrequent, may generate high noise levels that can be disruptive to human activity.

The City of Laguna Beach is served by 2 major highways (Coast Highway and Laguna Canyon Road), a small number of arterial roadways, and the local street system. Traffic noise on surface streets is a significant source of noise within the community, particularly Coast Highway.

The City of Laguna Beach has commercial sources of noise at a number of locations throughout the City. The primary commercial noise sources are the restaurants and bars that serve the downtown area. Other commercial sources include the large supermarkets located in the City. The types of noise disturbance from these activities can range from short-duration, loud events such as trucks accessing the facility to continuous noise such as from refrigeration units or compressors. Late night activity associated with restaurants and bars is also a concern (noise measurement locations 9 and 20 were located outside very active restaurants and bars). Also, during the summer months the three local art festivals are the source of some noise. The Pageant of the Masters includes orchestra music and amplified public address system and the Sawdust Festival includes live music. Note also that the festival grounds are used for special events at various times of the year and these events may include live music or amplified recorded music. The City of Laguna Beach also sponsors a 'concert in park' series during the summer at Bluebird Park. It should also be noted that on weekends a small number of the local restaurants currently attract motorcycle enthusiasts to the City.

1.4 Noise Sensitive Receptors.

The City of Laguna Beach has a number of noise sensitive land uses. Within the City are three public, several private schools, day care centers, retirement homes and a hospital. The majority of land uses within the City are noise sensitive residential uses. The distribution of these residential areas varies from lower density single family homes in the hillside areas, higher density single family homes in the downtown village and coastal areas, to higher density apartments, duplexes and condominiums in the downtown and coastal areas.

1.5 Community Noise Contours.

The noise contours for the City of Laguna Beach are presented in Exhibits 6 and 7 for existing and future conditions respectively. The existing contours are based on the existing conditions of traffic volumes and other sources of noise in the community. The traffic volumes and speeds used to generate the noise contours are detailed in the appendix. Note that the future traffic volumes were estimates using an assumed linear growth rate of 1% per year for the next 20 years. The use of this growth rate is not based on any traffic projections, but is used to show how noise may change as traffic increases. This growth rate was used on Coast Highway, Laguna Canyon Road and El Toro Road only. The rational for this assumption is that traffic growth on the local streets in Laguna Beach is limited by the very small amount of housing development that may occur. The major roads like Coast Highway and Laguna Canyon may experience future increases in traffic as a result of greater visitor traffic to the City. The historical traffic numbers for these roads are presented in the appendix.

The noise contours were generated using a mathematical model developed by the Federal Highway Administration ("FHWA Highway Traffic Noise Prediction Model," FHWA-RD-77-108, December 1978 including the noise characteristics of a typical California population of motor vehicles as published by Caltrans - Calveno Noise Curve). The FHWA model uses traffic volume, vehicle mix, average vehicle speed, roadway geometry, and sound propagation path characteristics to predict hourly A-weighted Leq values adjacent to a road. Vehicle mix is reported in terms of the number of automobiles, medium trucks, and heavy trucks. The truck categories are defined in the FHWA model by number of axles and weight. In order to compute a CNEL value for roadways the hourly data for a 24 hour period are used according to the CNEL formula. Vehicle distribution over the 24 hour day must be known, i.e., the percent of vehicles in the daytime period (7 am to 7 pm), evening period (7 pm to 10 pm) and night period (10 pm to 7 am). The mix of automobiles, medium trucks and heavy trucks has an effect on noise levels. The assumption used to model noise is based on known traffic mix data. For arterial roadways the vehicle mix data are obtained from mix data collected by the County of Orange during extensive surveys of 53 intersections within the County. The arterial roadway mix data are provided in Table 1.

Table 1

Arterial Roadway Vehicle Mix Data
(Traffic distribution per time of day in percent of Average Daily Traffic – ADT)

VEHICLE TYPE	DAY	EVENING	NIGHT	TOTAL
Automobile	75.51	12.57	9.34	97.42
Medium Truck	1.56	0.09	0.19	1.84
Heavy Truck	0.64	0.02	0.08	0.74

Noise contours represent lines of equal noise exposure, just as the contour lines on a topographic map are lines of equal elevation. The contours shown on the map are the 60, 65 and 70 dB CNEL noise level. The noise contours presented can be used as a guide for land use planning (see Section 3.0, Findings). The 60 dB CNEL contour defines the Noise Referral Zone. This is the noise level for which noise considerations should be included when making land use policy decisions.

The contours presented in this report are a graphic representation of the noise environment. These distances to contour values are also shown in tabulated format in the appendix. Topography and intervening buildings or barriers have a very complex effect on the propagation of noise. To present a worst case estimate, the topographic affect is not included in these contours to present a worst case projection. Exhibit 6 presents the CNEL noise contours for existing conditions and Exhibit 7 presents estimated contours for 20 years in the future (2023).

Large format mapping is available at the City and on the City of Laguna Beach Website:

http://www.lagunabeachcity.org/about/gis.htm

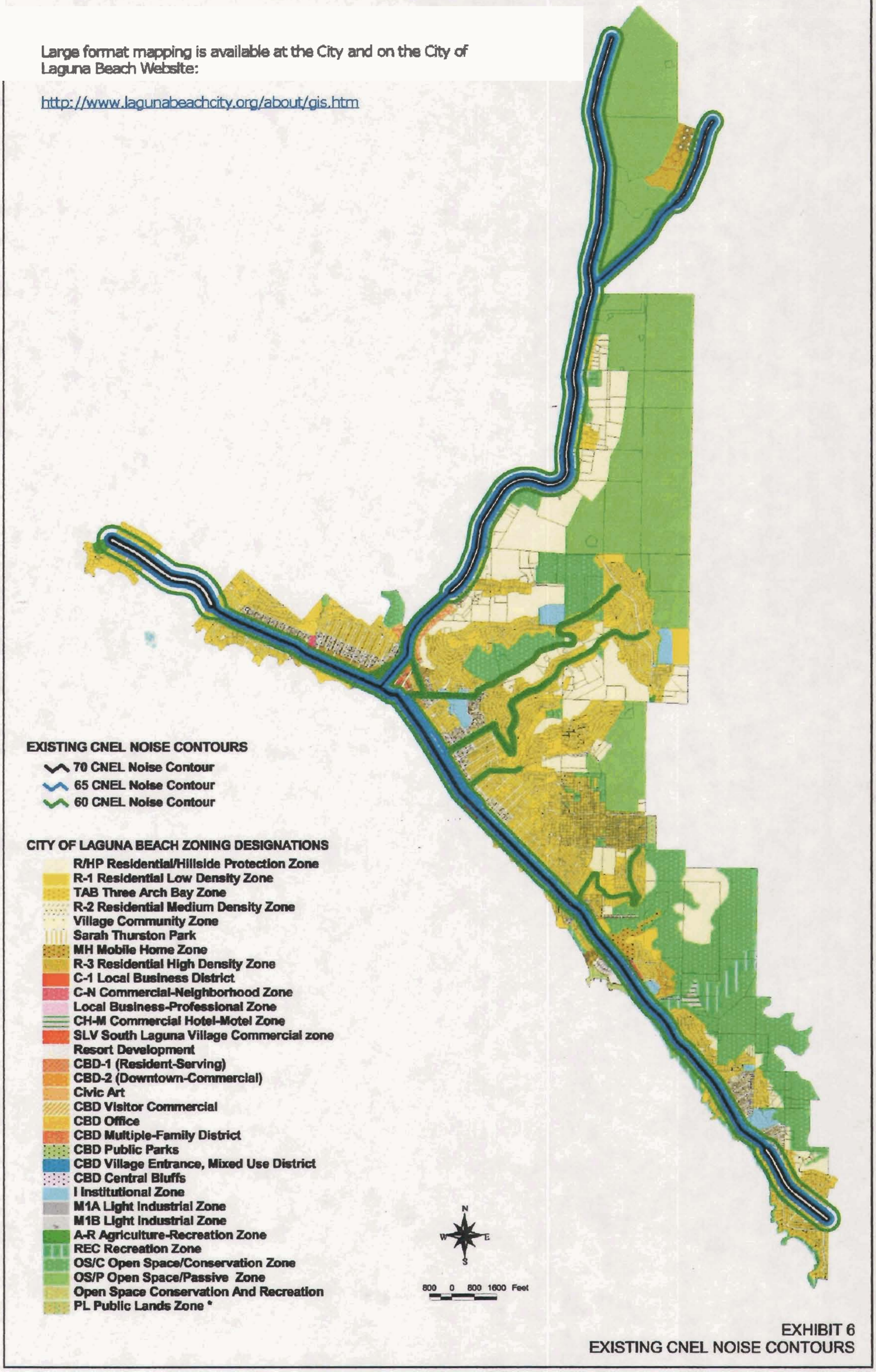


EXHIBIT 6
EXISTING CNEL NOISE CONTOURS

Large format mapping is available at the City and on the City of Laguna Beach Website:

http://www.lagunabeachcity.org/about/gis.htm

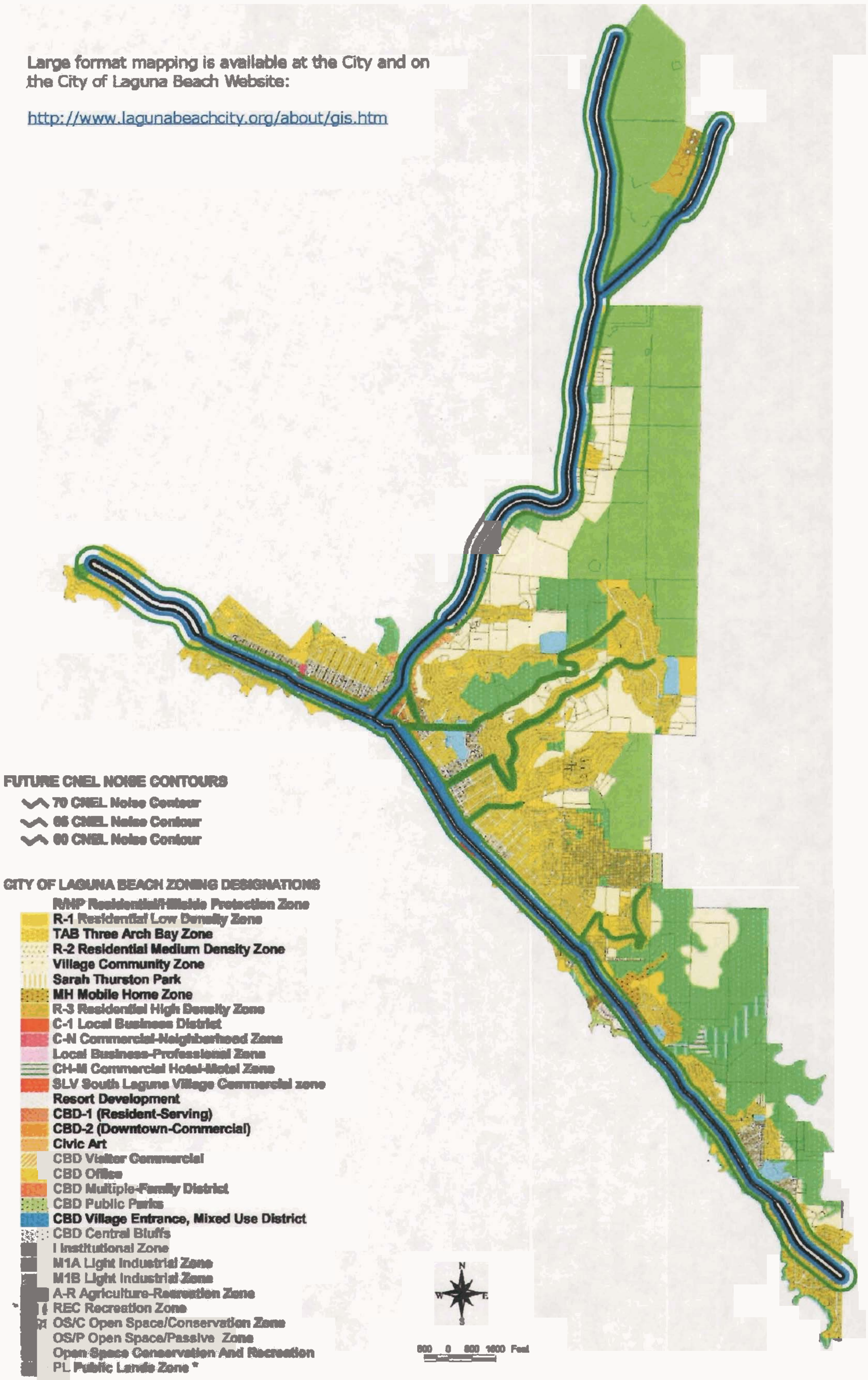


EXHIBIT 7
FUTURE CNEL NOISE CONTOURS

2.0 ISSUE IDENTIFICATION

The City of Laguna Beach, located along the coast in southern Orange County, is subject to a variety of different types of noise typical of an suburban area. The City adopted a General Plan Noise Element in 1974. This document provided a comprehensive description of existing noise levels, but lacked a comprehensive set of implementing actions needed to accomplish the goals of reducing urban noise.

It is important to note that the City of Laguna Beach is essentially built out, and thus experiences a set of noise problems unique to a mature city, unlike the land use planning problems facing undeveloped areas with high growth rates.

In this update of the General Plan Noise Element, the technical description of noise in Laguna Beach has been updated and a series of comprehensive goals, policies, and implementing actions are developed. The process of updating the Noise Element included a review of existing City policies concerning environmental noise.

Noise problems were grouped into the following 5 categories: late-night entertainment, construction and maintenance, machinery, passenger and delivery vehicles, and general population noise. A summary of these issues is as follows:

- Late night entertainment noise concerns restaurants and bars. The primary noise sources are people and their automobiles at very late hours and live or recorded music emanating from the establishments.

- Construction and maintenance noise concerns both the noise from home or commercial maintenance or remodeling and adequate consideration of construction noise impacts during the planning, review and approval of projects in or adjacent to established residential areas.

  Machinery noise concerns use of mechanical equipment in or near residential areas and includes air conditioners, pool and spa mechanical equipment, other mechanical equipment that may be associated with home hobbies such as woodworking equipment, automobile maintenance and other equipment associated with the artist community such as kilns, mechanical equipment used in sculpting, etc.

- Passenger and delivery vehicle noise is a primary noise source in Laguna Beach and is associated with the motor vehicle traffic in the City. In addition to automobiles, motorcycles are a contributor to noise levels. The Circulation Element is the part of the General Plan that sets policy for motor vehicle movements within the City.

- General population noise recognizes that in higher density urban areas the noise is higher than in lower density rural environments. The more people are put together the greater the noise. In such neighborhoods it may be advantageous to use a mediation technique to help neighbors resolve their differences and and be more considerate of their noise.

Noise mitigation can be distilled into three major topics. These include Transportation Noise Control, Noise and Land Use Planning Integration, and Community Noise Control for Non-Transportation Noise Sources. These are described below.

2.1 Transportation Noise Control

Within the City of Laguna Beach are a number of transportation related noise sources including major arterials, aircraft overflight corridors, and collector roadways. These sources are major contributors of noise in Laguna Beach. Cost effective strategies to reduce their influence on the community noise environment are part of a Noise Element. However, the City of Laguna Beach is limited in controlling certain noise sources due to preemption by Federal and State law. Specifically, Federal law preempts the City from adopting any regulation of aircraft in flight. Federal Air Regulation Part 36 establishes noise standards for aircraft and Federal Air Regulation Part 91 contains operating flight rules and limits the operation of aircraft to aircraft meeting the Part 36 noise standards. The California Motor Vehicle Code establishes noise limits for motor vehicles in several sections of the code. Included in the Motor Vehicle Code (MVC) are the following sections that govern vehicle noise limits: Sections 27200 (new vehicle sales), 27204 (vehicle noise limits), 27150 (adequate muffler), 27151 (muffler modification), 27150.3 (no whistle-tip muffler), 27202 (motorcycle limits), 27150.2 (exhaust systems), and 27007 (sound amplification devices). In addition there are limits on off-road vehicle noise emissions in other sections of the Code.

2.2 Noise and Land Use Planning Integration

Information relative to the existing and forecast noise environment within Laguna Beach should be integrated into future land use planning decisions. This Element presents the noise environment in order that the City may include noise impact considerations in development programs.

2.3 Community Noise Control for Non-Transportation Noise Sources

Residential land uses and areas identified as noise sensitive must be protected from excessive noise from non-transportation sources including commercial activities, construction noise, late-night entertainment, spa and pool equipment and air-conditioner noise to name a few. These impacts are most effectively controlled through the adoption and application of a City Noise Ordinance.

3.0 FINDINGS

The predominant noise sources in Laguna Beach, as in most other communities, come from mobile noise sources, including motor vehicles. A number of arterial roadways expose the City to significant noise levels, particularly in those areas directly adjacent to Coast Highway. Aircraft operating to and from John Wayne Airport, helicopter operations, and aircraft (including but not limited to aerial banner towing aircraft) operating parallel to the coast result in some single event disturbance from overflights. The noise environment in Laguna Beach varies from the busy high density corridor along Coast Highway to the lower density residential communities on the hillsides.

Other sources of noise within the City are from non-transportation sources including commercial activities, construction activities and associated vehicular truck traffic. Within the City are a number of restaurants and bars that cater to a late night patronage.

Noise affects all types of land uses and activities, although some are more sensitive to high noise levels than others. Land uses identified as noise sensitive include residences of all types; hospitals, rest homes, places of worship and schools. Within the City are a number of public and private schools, and day care centers (generally in-home day care centers).

As described in Section 1.5, the noise environment for Laguna Beach can be described using noise contours developed for the major noise sources within the City. The noise contours are used to identify areas of existing or potential noise impacts. The contours are developed for existing conditions and future conditions estimated for 20 years in the future and are presented in Exhibits 6 and 7 respectively. Both the 60 and 65 dB CNEL contour levels are shown on these maps. Any existing or proposed land use within a 65 Ldn contour should be considered for noise mitigation programs. For example, within the 60 dB CNEL contour, which represents a "Noise Referral Zone," any proposed noise sensitive land use should be evaluated on a project specific basis and the project may require mitigation to meet City or State standards. The 65 CNEL represents zones where residential development should be carefully reviewed to ensure that proper mitigation is included as part of the project to ensure that no private outdoor yard or patio areas are exposed to noise levels above 65 CNEL.

The sources of noise in Laguna Beach can be divided into two basic categories, transportation sources and non-transportation sources. A local government has little direct control of transportation noise at the source because of preemption by the State and Federal Government. State and Federal agencies have the responsibility to control the noise from the source, such as vehicle noise emission levels. The most effective method the City has to mitigate transportation noise is through reducing the impact of the noise onto the community. Measures that can be used to reduce noise include, but is not limited to noise barriers, land use planning, site design review, circulation improvements, truck access restrictions. Note that truck access restrictions on public streets are difficult to implement for existing uses. However, during the project planning review for conditional use permits or other land use permits, truck mitigation conditions of approval can be included such as providing access from non-residential streets, restricting the hours of delivery, or submission an approved truck route plan.

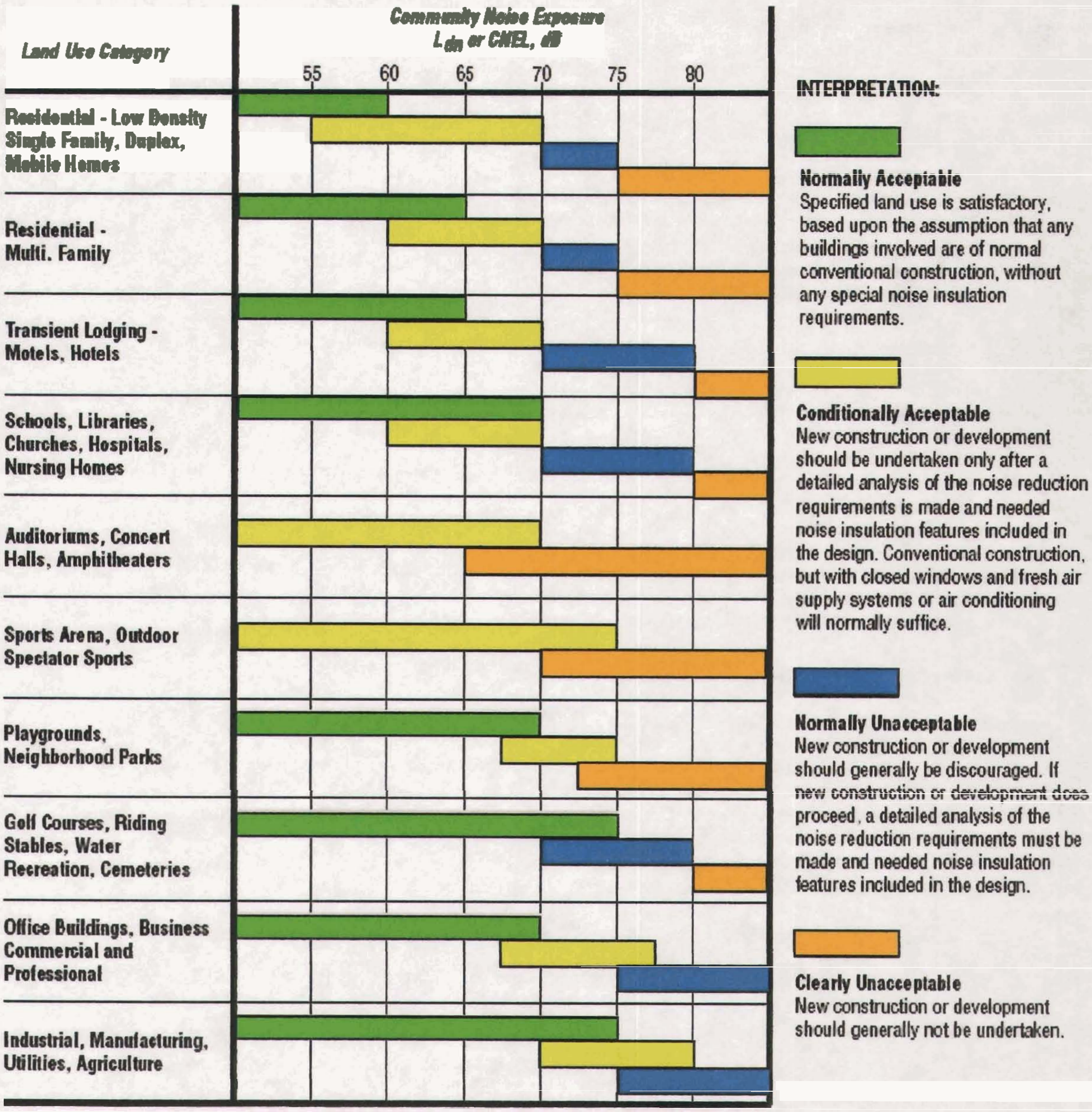
Mitigation through the design and construction of a noise barrier (wall, berm, or combination wall/berm) is the most common way of alleviating traffic noise impacts for new development. The effect of a noise barrier is critically dependent on the geometry between the noise source and the receiver. A noise barrier effect occurs when the "line of sight" between the source and receiver is penetrated by the barrier. The greater the penetration, the greater the noise reduction. It is difficult and often impossible to retrofit such noise barriers into existing neighborhoods. Along Coast Highway a few homes were developed with or added noise barriers where the access to the home is from another street. However, most of the homes adjacent to Coast Highway have curb cut access from Coast Highway or are located on hillsides or bluffs overlooking Coast Highway making noise barrier construction impractical or impossible (a space in the noise barrier for the curb cut access would render the noise barrier ineffective).

Noise concerns should be incorporated into land use planning to reduce future noise and land use incompatibilities. This can be achieved by establishing standards and criteria that specify acceptable limits of noise for various land uses throughout the City. These criteria are designed to integrate noise considerations into land use planning to prevent noise/land use conflicts. Table 2 presents the recommended criteria used to assess the compatibility of proposed land uses with the noise environment. These criteria are the basis for the development of specific Noise Standards. These recommended Standards, presented in Table 3, presents the recommended City policies related to land uses and acceptable noise levels. These tables are the primary tools, which allow the City to ensure integrated planning for compatibility between land uses and outdoor noise.

The Land Use/Noise Compatibility Matrix shown in Table 2 is used in the land planning stage of the development process. It is used to identify project opportunities and constraints. In conjunction with the Noise Contour Maps (Exhibits 6 and 7), this matrix may be used to determine whether a certain type of land use is appropriate in a particular CNEL zone. For example, a residential use in a 60-70 CNEL zone would only be appropriate with certain mitigation. This matrix is particularly helpful to assist in the layout and design of large mixed-use projects because it identifies the noise sensitivities of various land use types. Such consideration permits the location and layout of noise sensitive uses in lower noise exposure areas.

The Interior and Exterior Noise Standards shown in Table 3 are the actual design standards to be used in the project design stage. Compliance with these standards should be required in the Conditions of Approval or other project requirements and evaluated as part of City Development Review and building permit plan check.

The most effective method to control community noise impacts from non-transportation noise sources is through application of the Community Noise Ordinance. The City should consider amending the Community Noise Ordinance to help ensure that City residents are not exposed to excessive noise levels from non-transportation noise sources. The Noise Ordinance is designed to protect quiet residential areas from stationary noise sources. The noise levels encouraged by the ordinance are typical of a quiet residential area. It should be noted, as will be discussed later, that while some noise problems are resolved through



source: State of California, "General Plan Guidelines," 1998

Table 2

Noise/Land Use Compatibility Table

Table 3

INTERIOR AND EXTERIOR NOISE STANDARDS

LAND USE CATEGORIES			
CATEGORIES	**USES**	**INTERIOR[1]** **CNEL**	**EXTERIOR[2]** **CNEL**
RESIDENTIAL	Single Family, Two Family, Multiple Family	45[(3)]	65
	Mobile Home	45	65
COMMERCIAL INDUSTRIAL INSTITUTIONAL	Hotel, Motel, Transient Lodging	45	65
	Commercial Retail, Bank Restaurant	55	-----
	Office Building, Research and Development, Proffesiional Offices, City Office Building	50	-----
	Amphitheatre, Concert Hall Auditorium, Meeting Hall	45	-----
	Gymnasium (Multipurpose)	50	-----
	Sports Club	55	-----
	Manufacturing, Warehousing Wholesale, Utilities	65	-----
	Movie Theatres	45	-----
INSTITUTIONAL	Hospital, School's Classroom	45	65
	Church, Library	45	-----
OPEN SPACE	Parks	-------	65

INTERPRETATION

1. Indoor environment excluding: Bathrooms, toilets, closets, corridors.
2. Outdoor environment limited to:
   Private yard of single family
   Multi-family private patio or balcony which is served by a means of exit from inside.
   Hospital patio
   School's playground
   Hotel and motel recreation area
3. Noise level requirement wih closed windows. Mechanical ventilating system or other means of natural ventialtion shall be provided as of Chapter 12, Sec. 1205 of UBC.

measurements and code enforcement actions, there are some problems that should be addressed on the human side of the issue through some form mediation program.

4.0 GOAL STATEMENT

Based on issues, background, inventory and understanding of noise concerns in Laguna Beach, the following are statements of the desired objectives of the Noise Element for the City of Laguna Beach.

1. *Provide for the reduction of noise where the noise environment is unacceptable, where feasible.*

2. *Protect and maintain those areas having acceptable noise environments.*

3 *Provide sufficient information concerning the community noise levels so that noise can be objectively considered in land use planning decisions.*

The following section, Section 5, lists the goals, policies and implementation actions.

5.0 POLICIES AND IMPLEMENTATION

In order to achieve the goals of the Noise Element, the following goals, policies and implementation actions are necessary:

Goal 1: ***Provide for measures to reduce noise impacts from transportation noise sources:***

Policy 1.1 Investigate the opportunity to construct barriers to mitigate sound emissions where necessary and where feasible. Actively participate in the development of noise abatement plans for arterial roads and rapid transit, and the planning of road improvements that may affect traffic in Laguna Beach. (Action 1.1)

Policy 1.2 Ensure the inclusion of noise mitigation measures in the design of new roadway projects in Laguna Beach. (Action 1.6)

Policy 1.3 Attempt to reduce transportation noise through proper design and coordination of routing. (Action 1.2)

Policy 1.4 Ensure the effective enforcement of City, State and Federal noise levels by all appropriate City Departments. (Action 1.3)

Policy 1.5 Include noise considerations in evaluating revisions to the Transportation Circulation and Growth Management Element. (Action 1.6)

Action 1.1 Coordinate with Caltrans regarding any roadway improvements in or affecting Laguna Beach traffic with respect to existing noise sensitive land uses. The City should ensure the employment of noise mitigation measures in the design or improvement of arterial roadways consistent with funding capability and support efforts by the California Department of Transportation to provide for acoustical protection for existing noise sensitive land uses affected by these projects.

Action 1.2 Provide for continued evaluation of truck movements and routes in the City to provide effective separation from residential or other noise sensitive land uses. Included shall be a review of desired truck routes and establishment of truck prohibitions on noise sensitive streets (prohibit through traffic, exempts local deliveries). Include truck route and access conditions of approval in review of new land uses that have truck delivery components.

Action 1.3 Encourage the enforcement of State Motor Vehicle noise standards for cars, trucks, and motorcycles through coordination with the California Highway Patrol and Laguna Beach Police Department. Encourage adoption by the state, legislation that prohibits the modification of motorcycles exhaust systems that result in noise levels in excess of those permitted in the Motor Vehicle Code.

Action 1.4 Evaluate regularly the Master Plan of Arterial Highways and transportation planning efforts of the Orange County Transportation Agency and the Transportation Corridor Agency for opportunities to reduce noise impacts or prevent noise impacts in Laguna Beach.

Action 1.5 Evaluate consistency between Noise and Transportation Circulation and Growth Management Elements upon next Transportation Circulation Element update.

Action 1.6 Encourage incorporation of traffic calming techniques in public projects and private developments which result in a reduction of traffic noise levels.

Goal 2: ***Incorporate noise considerations into land use planning decisions. These measures will be achieved through the following policies as they apply to completed projects, not construction actions.***

Policy 2.1 Establish acceptable limits of noise for various land uses throughout the community. Zoning changes should be consistent with the compatibility of the projected noise environment. (Action 2.1)

Policy 2.2 Ensure acceptable noise levels near schools, hospitals, residences and other noise sensitive areas. (Action 2.2)

Policy 2.3 Encourage acoustical mitigation design in new construction. (Action 2.3)

Action 2.1 Establish standards that specify acceptable limits of noise for various land uses throughout the City as part of the Zoning Ordinance. These criteria are designed to fully integrate noise considerations into land use planning to prevent new noise/land use conflicts. Table 2 shows criteria recommended to assess the compatibility of proposed land uses with the noise environment. These criteria are the basis for the development of specific Noise Standards. The recommended standards, presented in Table 3, define the City policies related to land uses and acceptable noise levels. These tables are the primary tools which allow the City to ensure noise integrated planning for compatibility between land uses and outdoor noise. For any project in an area louder than 60 CNEL contour, the project should be flagged for review for compliance with interior noise level standards.

Action 2.2 Through the Zoning Ordinance, incorporate noise reduction features during site planning to mitigate anticipated noise impacts on affected noise sensitive land uses. The noise referral zones identified in Exhibits 6 and 7 (areas exposed to noise levels greater than 60 dB CNEL) can be used to identify locations of potential conflict. New developments would be permitted only if appropriate mitigation measures are included such that the standards contained in this Element are met.

Action 2.3 Continue to Enforce the State of California Uniform Building Code that specifies that the indoor noise levels for residential living spaces not exceed 45 dB CNEL due to the combined effect of all noise sources. The State requires implementation of this standard when the outdoor noise levels exceed 60 dB CNEL. The Noise Referral Zones (60 dB CNEL) can be used to determine when this standard needs to be addressed. The Uniform Building Code (specifically, the California Administrative Code, Title 24, Part 6, Division T25, Chapter 1, Subchapter 1, Article 4, Sections T25-28) requires that "Interior community noise levels (CNEL/LDN) with windows closed, attributable to exterior sources shall not exceed an annual CNEL or LDN of 45 dB in any habitable room." The code requires that this standard be applied to all new hotels, motels, apartment houses and dwellings other than detached single-family dwellings. The City should also, as a matter of policy, apply this standard to single family dwellings.

Goal 3: ***Develop measures to control non-transportation noise impacts.***

Policy 3.1 Establish a new revised Community Noise Ordinance to mitigate noise conflicts. (Actions 3.1 and 3.2)

Policy3.2 Improve enforcement of required noise mitigation measures in building design. (Action 3.3)

Policy 3.3 Consider new means of controlling late night noise from bars and restaurants (Action 3.4)

Policy 3.4 Establish and maintain coordination among the city agencies involved in noise abatement. (Action 3.5)

Action 3.1 Amend the existing noise ordinance to ensure that City residents are not exposed to excessive noise levels from stationary noise sources. The purpose of the ordinance is to protect people from non-transportation related noise sources such as music, machinery and pumps and air conditioners. The Noise Ordinance does not apply to motor vehicle noise on public streets, but it does apply to vehicles on private property. The Noise Ordinance is designed to protect quiet residential areas from stationary noise sources. The noise levels encouraged by the Ordinance are typical of a quiet residential area. The Noise Ordinance should establish specific noise level limits that can be enforced by scientific measurements, but should also recognize that some neighborhood noise problems are best handled through action by public safety personnel (for example, loud parties, barking dogs, or other activities that may be difficult to make noise measurements or the measurements may interfere with the activity, i.e., causing the dog to bark) and some through enhanced communication between neighbors. This latter idea is meant to address the more human side of noise complaints between neighbors.

To address the human side of some noise problems, particularly those between arguing or feuding neighbors (residential or commercial or mixed use), enhanced communication between neighbors may bring the best resolution to these types of problems. The City should encourage mediation to address these problems.

Action 3.2 Review and revise the Noise Ordinance to address observed difficulties in enforcing the existing ordinance. This revision should include, consideration of the following concepts:

1. Specific noise level limits for various land uses for day and night periods with specific guidance to project applicants on where the noise measurements are to be taken.

2. Consider using the noise metric "Equivalent Noise Level", (Leq) measurement to facilitate easier and quicker measurements. This will reduce the complexity of equipment needed to do the measurements and result in a clearer more readily usable measurement result.

Action 3.3 Require that new commercial projects, to be built near existing residential land use, demonstrate compliance with the City Noise Ordinance prior to approval of the project. Require that all Building Permit applicants, including contractors, sign a form acknowledging requirements of the noise ordinance, and assuming responsibility for compliance with the Noise Ordinance. This is particularly important for the non-resident contractor installing mechanical equipment.

Goal 4: Develop measures to control construction noise impacts.

Policy 4.1 Consider incorporating the following provisions into the Noise Ordinance to address the problems of construction noise:

Action 4.1 Clearly state the permitted hours of construction and expressly prohibit construction on Saturday, Sunday and Holidays.

Action 4.2 Consider exempting the resident/builders in single family zones from the Saturday, Sunday, and Holiday construction ban for maintenance purposes only, provided such maintenance is limited to the hours specified in the Noise Ordinance or meets the noise limits set in the Noise Ordinance.

Action 4.3 During the environmental review of all projects requiring extensive construction, determine the proximity of the site to the established residential areas. If the project will involve pile driving, night time truck hauling, blasting, 24 hour pumping (important in coastal excavations), or any other very high noise equipment, the environmental review shall include a construction noise alternative analysis. From this analysis specific mitigation measures shall be developed to mitigate potential noise impacts. This may include but not be limited to:

- requirements to use quieter, potentially costlier construction techniques.

- notification of adjacent residents (homeowner and renters) of time, duration, and location of construction.
- relocation of residents to hotels during noisy construction period.
- developer reimbursement to City for 24 hour on-site inspection to verify compliance with required mitigation.
- limit hours of operation of equipment 15 dB above noise ordinance limits to the hours of 10am to 4pm.

Application of the foregoing measures should be determined on a project by project basis depending on the type of noise generation proposed and the source proximity to established residential areas. It should also be recognized sufficient data may not be available to determine the extent of construction noise mitigation required until preparation of construction drawings. In this case, the construction noise mitigation analysis must be submitted for review as part of building permit, plan check procedures.

Appendix 1
Traffic Data
And Distance to CNEL Contours

Laguna Beach Noise Element						
Existing Traffic Noise Contours						
Road			**CNEL 100'**	**Distance To Contour From CL (ft)**		
Link	**ADT**	**Speed**	**From CL**	**70**	**65**	**60**
PCH						
East of Newport Coast	48,000	55	71.7	131	281	606
Mid Link	36,000	55	70.5	108	232	501
West of Broadway	42,000	35	66.7	60	129	278
East of Broadway	45,000	35	67.0	63	135	291
Mid Link	43,000	35	66.8	61	131	282
West of Crown Valley	47,000	45	69.6	94	202	435
Laguna Canyon						
North of CH	29,000	35	65.0	47	101	217
South of El Toro	39,000	45	68.8	83	178	384
North of El Toro	36,000	45	68.4	78	169	364
El Toro Road						
North of Laguna Canyon	17,000	45	65.2	48	103	221
South of Aliso Creek	32,000	45	67.9	73	156	337
Nyes Place						
200 Block	3,882	25	54.0	9	18	40
300 Block	2,621	25	52.3	7	14	31
400 Block	2,733	25	52.5	7	15	31
444	2,084	25	51.3	6	12	26
500 Block	1,747	25	50.5	5	11	23
585	1,747	25	50.5	5	11	23
700 Block	1,757	25	50.5	5	11	23
Balboa 700	2,220	25	51.6	6	13	27
777	2,018	25	51.1	6	12	26
Bluebird Canyon Drive						
500 Block	3,202	30	54.6	9	20	44
1400 Block	467	25	44.8	2	4	10
Cliff Dr.						
200 Block	5,060	30	56.6	13	27	59
900 Block	813	25	47.2	3	7	14
Cress						
400 Block	2,615	30	53.7	8	18	38
300 Block	2,733	30	53.9	8	18	39
400 Block	2,972	30	54.3	9	19	41
500 Block	2,510	30	53.5	8	17	37
700 Block	3,851	25	53.9	9	18	39
Glenneyre						
1000 Block	8,899	30	59.0	19	40	86
2400 Block	1,457	25	49.7	4	10	21
Hillcrest Drive						
800 Block	3,379	30	54.8	10	21	45
1400 Block	2,289	30	53.1	8	16	35
1600 Block	404	30	45.6	2	5	11
Ocean Ave						
200 Block	3,132	25	53.1	7	16	34
200 Block	2,736	25	52.5	7	15	31
Park Ave						
above 3rd St.	7,526	25	56.9	13	29	62
Below 3rd St	3,817	25	53.9	8	18	39
800 Block	6,044	25	55.9	11	25	53
900 Block	4,730	25	54.8	10	21	45
1000 Block	3,591	45	58.4	17	36	78
Just Below Hidden Valley	4,853	45	59.7	21	44	96
2200 Block	3,601	35	56.0	12	25	54
2500 Block	3,020	35	55.2	10	22	48
Short Street						
600 Block	3,421	25	53.4	8	17	37
Summit Drive						
900 Block	3,384	25	53.4	8	17	36
1055	3,444	25	53.5	8	17	37
1127	3,380	25	53.4	8	17	36
Temple Hills Drive						
1000 Block	4,871	35	57.3	14	31	66
2000 Block	2,105	35	53.7	8	18	38
3000 Block	1,072	35	50.7	5	11	24
Thalia						
Between Wendt & Temple Hills	5,942	30	57.3	14	31	66
Third Street						
300 Block	8,645	25	57.5	15	31	68
400 Block	5,562	25	55.5	11	23	50

Laguna Beach Noise Element						
Future (2023) Traffic Noise Contours						
Road			**CNEL 100'**	**Distance To Contour From CL (ft)**		
Link	**ADT**	**Speed**	**From CL**	**70**	**65**	**60**
CH						
East of Newport Coast	59,746	55	72.7	151	326	702
Mid Link	44,810	55	71.4	125	269	579
West of Broadway	52,278	35	67.6	69	149	321
East of Broadway	56,012	35	67.9	73	156	337
Mid Link	53,523	35	67.7	70	152	327
West of Crown Valley	58,502	45	70.5	108	234	503
Laguna Canyon						
North of CH	36,097	35	66.0	54	117	251
South of El Toro	48,544	45	69.7	96	206	444
North of El Toro	44,810	45	69.4	91	196	421
El Toro Road						
North of Laguna Canyon	21,160	45	66.1	55	119	256
South of Aliso Creek	39,831	45	68.9	84	181	390
Nyes Place						
200 Block	3,882	25	54.0	9	18	40
300 Block	2,621	25	52.3	7	14	31
400 Block	2,733	25	52.5	7	15	31
444	2,084	25	51.3	6	12	26
500 Block	1,747	25	50.5	5	11	23
585	1,747	25	50.5	5	11	23
700 Block	1,757	25	50.5	5	11	23
Balboa 700	2,220	25	51.6	6	13	27
777	2,018	25	51.1	6	12	26
Bluebird Canyon Drive						
500 Block	3,202	30	54.6	9	20	44
1400 Block	467	25	44.8	2	4	10
Cliff Dr.						
200 Block	5,060	30	56.6	13	27	59
900 Block	813	25	47.2	3	7	14
Cress						
400 Block	2,615	30	53.7	8	18	38
300 Block	2,733	30	53.9	8	18	39
400 Block	2,972	30	54.3	9	19	41
500 Block	2,510	30	53.5	8	17	37
700 Block	3,851	25	53.9	9	18	39
Glenneyre						
1000 Block	8,899	30	59.0	19	40	86
2400 Block	1,457	25	49.7	4	10	21
Hillcrest Drive						
800 Block	3,379	30	54.8	10	21	45
1400 Block	2,289	30	53.1	8	16	35
1600 Block	404	30	45.6	2	5	11
Ocean Ave						
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900 Block	4,730	25	54.8	10	21	45
1000 Block	3,591	45	58.4	17	36	78
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2200 Block	3,601	35	56.0	12	25	54
2500 Block	3,020	35	55.2	10	22	48
Short Street						
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900 Block	3,384	25	53.4	8	17	36
1055	3,444	25	53.5	8	17	37
1127	3,380	25	53.4	8	17	36
Temple Hills Drive						
1000 Block	4,871	35	57.3	14	31	66
2000 Block	2,105	35	53.7	8	18	38
3000 Block	1,072	35	50.7	5	11	24
Thalia						
Between Wendt & Temple Hills	5,942	30	57.3	14	31	66
Third Street						
300 Block	8,645	25	57.5	15	31	68
400 Block	5,562	25	55.5	11	23	50

Future traffic volumes assume 1% per year growth along Laguna Canyon, PCH and El Toro Roa

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Appendix 2
Noise Effects Information

Table of Contents

Exhibits

Tables

BACKGROUND INFORMATION AND METHODOLOGY

1. Introduction

This section presents background information on the characteristics of noise and summarizes the methodologies used to study the noise environment. This section will give the reader an understanding of the metrics and methodologies used to assess noise impacts. This section is divided as follows:

- *Properties of sound that are important for technically describing sound*
- *Acoustic factors influencing human subjective response to sound.*
- *Potential disturbances to humans and health effects due to sound.*
- *Sound rating scales used in this study*
- *Summary of noise assessment criteria*

2. Characteristics of Sound

Sound Level and Frequency. Sound can be technically described in terms of the sound pressure (amplitude) and frequency (similar to pitch). Sound pressure is a direct measure of the magnitude of a sound without consideration for other factors that may influence its perception.

The range of sound pressures that occur in the environment is so large that it is convenient to express these pressures as sound pressure levels on a logarithmic scale which compresses the wide range of sound pressures to a more usable range of numbers. The standard unit of measurement of sound is the Decibel (dB) which describes the pressure of a sound relative to a reference pressure.

The frequency (pitch) of a sound is expressed as Hertz (Hz) or cycles per second. The normal audible frequency for young adults is 20 Hz to 20,000 Hz. Community noise, including aircraft and motor vehicles, typically ranges between 50 Hz and 5,000 Hz. The human ear is not equally sensitive to all frequencies, with some frequencies judged to be louder for a given signal than others. As a result of this, various methods of frequency weighting have been developed. The most common weighting is the A-weighted noise curve (dBA). The A-weighted decibel scale (dBA) performs this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear. In the A-weighted decibel, everyday sounds normally range from 30 dBA (very quiet) to 100 dBA (very loud). Most community noise analyses are based upon the A-weighted decibel scale. Examples of various sound environments, expressed in dBA, are presented in Exhibit A-1.

Propagation of Noise. Outdoor sound levels decrease as the distance from the source increases, and as a result of wave divergence, atmospheric absorption and ground attenuation. Sound radiating from a source in a homogeneous and undisturbed manner

dBA	Outdoor	Indoor
0 dBA	threshold of hearing (0 dBA)	
20	rustling of leaves (20 dBA)	whispering at 5 feet (20 dBA)
40	quiet residential area (40 dBA)	refrigerator (50 dBA)
60	air-conditioner at 100 feet (60 dBA) car at 25 feet at 65 mph (77 dBA)	sewing machine (60 dBA) normal conversation (60 to 65 dBA) dishwasher (55-70 dBA) living room music or TV (70 -75 dBA)
80	diesel truck at 50 feet at 40 mph (84 dBA) propeller airplane flyover at 1000 feet (88 dBA) motorcycle at 25 feet (90 dBA) lawnmower (96 dBA) backhoe at 50 feet (75-95 dBA)	garbage disposal (80 dBA) ringing telephone (80 dBA) vacuum cleaner (60-85 dBA) shouted conversation (90 dBA)
100	snowmobile (100 dBA) pile driver at 50 feet (90-105 dBA) car horn (110 dBA) rock concert (110 dBA) leaf blower (110 dBA)	baby crying on shoulder (110 dBA)
120	ambulance siren (120 dBA) stock car races (130 dBA) jackhammer (130 dBA)	
140		

Sources: League For The Hard Of Hearing, www.lhh.org
Handbook of Noise Control, McGraw Hill, Edited byCyril Harris, 1979
Measurements by Mestre Greve Associates

Exhibit A-1
Typical Sounds Levels in A-Weighted Decibels (dBA)

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travels in spherical waves. As the sound wave travels away from the source, the sound energy is dispersed over a greater area decreasing the sound power of the wave. Spherical spreading of the sound wave reduces the noise level at a rate of 6 dB per doubling of the distance.

Atmospheric absorption also influences the levels received by the observer. The greater the distance traveled, the greater the influence of the atmosphere and the resultant fluctuations. Atmospheric absorption becomes important at distances of greater than 1000 feet. The degree of absorption varies depending on the frequency of the sound as well as the humidity and temperature of the air. For example, atmospheric absorption is lowest (i.e., sound carries farther) at high humidity and high temperatures. A schematic diagram of how weather including temperature gradients and wind can affect sound propagation is shown in Exhibit A-2. Turbulence and gradients of wind, temperature and humidity also play a significant role in determining the degree of attenuation. Certain conditions, such as inversions, can channel or focus the sound waves resulting in higher noise levels than would result from simple spherical spreading. Absorption effects in the atmosphere vary with frequency. The higher frequencies are more readily absorbed than the lower frequencies. Over large distances, the lower frequencies become the dominant sound as the higher frequencies are attenuated.

Duration of Sound. Annoyance from a noise event increases with increased duration of the noise event, i.e., the longer the noise event, the more annoying it is. The "*effective duration*" of a sound is the time between when a sound rises above the background sound level until it drops back below the background level. Psycho-acoustic studies have determined the relationship between duration and annoyance and the amount a sound must be reduced to be judged equally annoying for increased duration. Duration is an important factor in describing sound in a community setting.

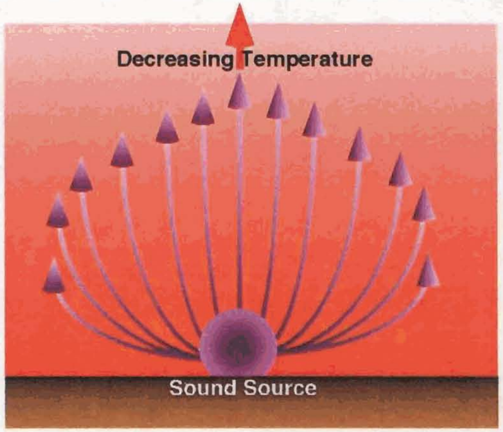
The relationship between duration and noise level is the basis of the equivalent energy principal of sound exposure. Reducing the acoustic energy of a sound by one half results in a 3 dB reduction. Doubling the duration of the sound increases the total energy of the event by 3 dB. This equivalent energy principal is based upon the premise that the potential for a noise to impact a person is dependent on the total acoustical energy content of the noise. Defined in subsequent sections of this study, noise metrics such as CNEL, DNL, LEQ and SENEL are all based upon the equal energy principle.

Change in Noise. The concept of change in ambient sound levels can be understood with an explanation of the hearing mechanism's reaction to sound. The human ear is a far better detector of relative differences in sound levels than absolute values of levels. Under controlled laboratory conditions, listening to a steady unwavering pure tone sound that can be changed to slightly different sound levels, a person can just barely detect a sound level change of approximately one decibel for sounds in the mid-frequency region. When ordinary noises are heard, a young healthy ear can detect changes of two to three decibels. A five decibel change is readily noticeable while a 10 decibel change is judged by most people as a doubling or a halving of the loudness of the sound. It is typical in environmental documents to consider a 3 dB change as potentially discernable.

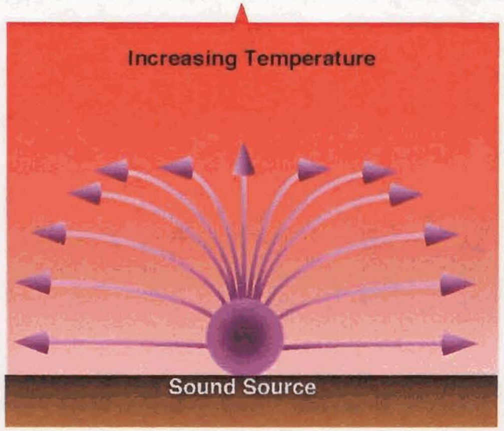
Exhibit A-2

THE EFFECTS OF WEATHER ON SOUND PROPAGATION

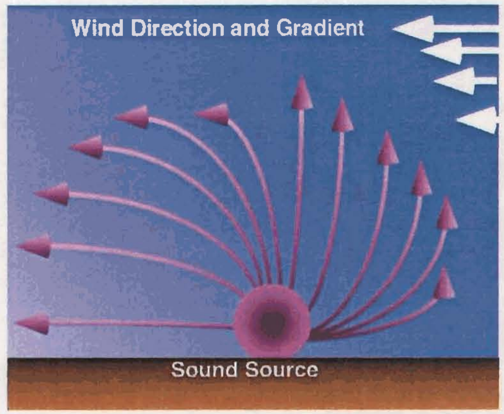
Refraction of sound in an atmosphere with a normal lapse rate. Sound rays are bent upwards.



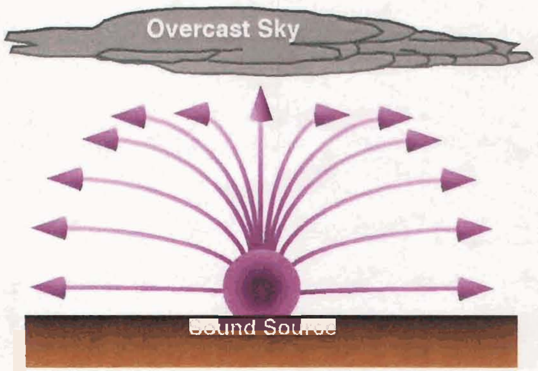
Refraction of sound in an atmosphere with an inverted lapse rate. Sound rays are bent downward.



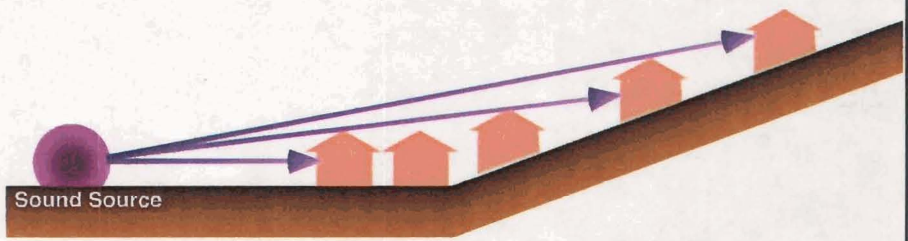
Refraction of sound in an atmosphere with a wind present. Sound rays are bent in the direction of the wind.



Refraction of sound in an atmosphere with overcast sky conditions. Sound rays are bent downward.



Propagation of sound over terrain. Ground absorption and shielding may be present for buildings at the same elevation as the source. No shielding is present for buildings which can 'see' the source.



Source: Adapted from Vancouver International Airport, Noise Management Report.

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Masking Effect. The ability of one sound to limit a listener from hearing another sound. is known as the masking effect. The presence of one sound effectively raises the threshold of audibility for the hearing of a second sound. For a signal to be heard, it must exceed the threshold of hearing for that particular individual and exceed the masking threshold for the background noise.

The masking characteristics of sound depend on many factors including the spectral (frequency) characteristics of the two sounds, the sound pressure levels and the relative start time of the sounds. Masking effect is greatest when the frequencies of the two sounds are similar or when low frequency sounds mask higher frequency sounds. High frequency sounds do not easily mask low frequency sounds.

3. Factors Influencing Human Response to Sound

Many factors influence sound perception and annoyance. This includes not only physical characteristics of the sound but also secondary influences such as sociological and external factors. Molino, in the *Handbook of Noise Control* [2] describes human response to sound in terms of both acoustic and non-acoustic factors. These factors are summarized in Table A-1.

Sound rating scales are developed in reaction to the factors affecting human response to sound. Nearly all of these factors are relevant in describing how sounds are perceived in the community. Many non-acoustic parameters play a prominent role in affecting individual response to noise. Background sound, an additional acoustic factor not specifically listed, is also important in describing sound in rural settings. Researchers have indentified the effects of personal and situational variables on noise annoyance, and have identified a clear association of reported annoyance and various other individual perceptions or beliefs.

Thus, it is important to recognize that non-acoustic factors as well as acoustic factors contribute to human response to noise.

Table A-1
Factors that Affect Individual Annoyance to Noise

Primary Acoustic Factors
- Sound Level
- Frequency
- Duration

Secondary Acoustic Factors
- Spectral Complexity
- Fluctuations in Sound Level
- Fluctuations in Frequency
- Rise-time of the Noise

Localization of Noise Source

Non-acoustic Factors
Physiology
Adaptation and Past Experience
How the Listener's Activity Affects Annoyance
Predictability of When a Noise will Occur
Is the Noise Necessary?
Individual Differences and Personality
Source: C. Harris, 1979

4. Sound Rating Scales

The description, analysis, and reporting of community sound levels is made difficult by the complexity of human response to sound and myriad sound-rating scales and metrics developed to describe acoustic effects. Various rating scales approximate the human subjective assessment to the "loudness" or "noisiness" of a sound. Noise metrics have been developed to account for additional parameters such as duration and cumulative effect of multiple events.

Noise metrics are categorized as single event metrics and cumulative metrics. Single event metrics describe the noise from individual events, such as one aircraft flyover. Cumulative metrics describe the noise in terms of the total noise exposure throughout the day. Noise metrics used in this study are summarized below:

Single Event Metrics

- **Frequency Weighted Metrics (dBA).** In order to simplify the measurement and computation of sound loudness levels, frequency weighted networks have obtained wide acceptance. The A-weighting (dBA) scale has become the most prominent of these scales and is widely used in community noise analysis. Its advantages are that it has shown good correlation with community response and is easily measured. The metrics used in this study are all based upon the dBA scale.

- **Maximum Noise Level.** The highest noise level reached during a noise event is, not surprisingly, called the "Maximum Noise Level," or Lmax. For example, as an aircraft approaches, the sound of the aircraft begins to rise above ambient noise levels. The closer the aircraft gets the louder it is until the aircraft is at its closest point directly overhead. Then as the aircraft passes, the noise level decreases until the sound level again settles to ambient levels. Such a history of a flyover is plotted at the top of Exhibit A-3. It is this metric to which people generally instantaneously respond when an aircraft flyover of loude vehicle like a truck or motorcycle passes by.

- **Single Event Noise Exposure Level (SENEL) or Sound Exposure Level (SEL).** Another metric that is reported is the Single Event Noise Exposure Level (SENEL). This metric is essentially equivalent to the Sound Exposure (SEL) metric. It is computed from dBA sound levels. Referring again to the top of Exhibit A-3, the shaded area, or the area

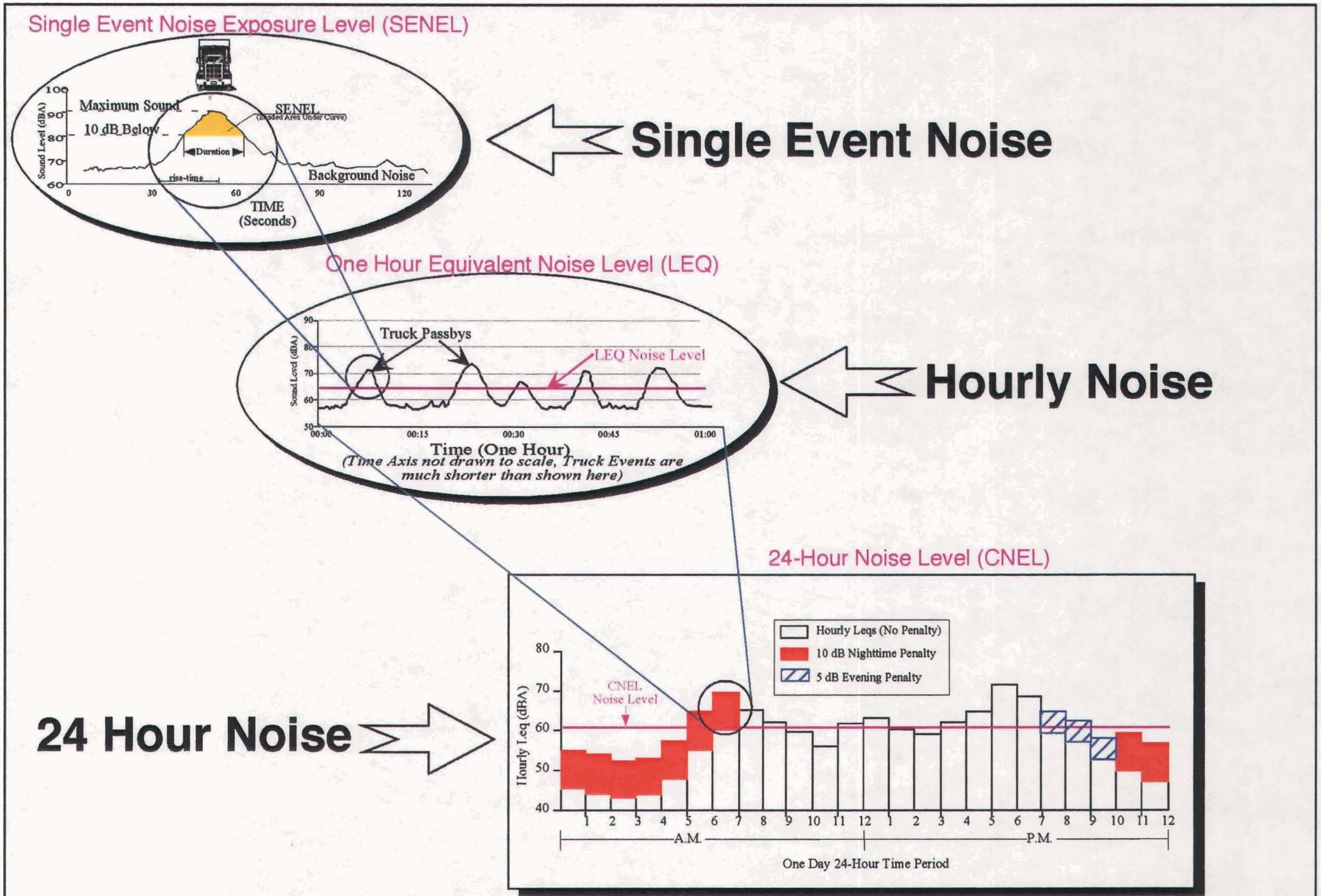

Exhibit A-3

Single and Cumulative Noise Metric Definitions

Source: Mestre Greve Associates 1998

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within 10 dB of the maximum noise level, is the area from which the SENEL is computed. The SENEL value is the integration of all the acoustic energy contained within the event. Speech and sleep interference research can be assessed relative to Single Event Noise Exposure Level data.

The SENEL metric takes into account the maximum noise level of the event and the duration of the event. Single event metrics are a convenient method for describing noise from individual aircraft events. This metric is useful in that airport noise models contain aircraft noise curve data based upon the SENEL metric. In addition, cumulative noise metrics such as LEQ, CNEL and DNL can be computed from SENEL data.

Cumulative Metrics

Cumulative noise metrics assess community response to noise by including the loudness of the noise, the duration of the noise, the total number of noise events and the time of day these events occur into one single number rating scale.

- **Equivalent Noise Level (Leq).** Leq is the sound level corresponding to a steady-state A-weighted sound level containing the same total energy as several SEL events during a given sample period. Leq is the "energy" average noise level during the time period of the sample. It is based on the observation that the potential for noise annoyance is dependent on the total acoustical energy content of the noise. This is graphically illustrated in the middle graph of Exhibit A-3. Leq can be measured for any time period, but is typically measured for 15 minutes, 1 hour or 24-hours. Leq for a one hour period is used by the Federal Highway Administration for assessing highway noise impacts. Leq for one hour is called Hourly Noise Level (HNL) in the California Airport Noise Regulations and is used to develop Community Noise Equivalent Level (CNEL) values for aircraft operations.

- **Community Noise Equivalent Level (CNEL).** CNEL is a 24-hour, time-weighted energy average noise level based on the A-weighted decibel. It is a measure of the overall noise experienced during an entire day. The term "time-weighted" refers to the penalties attached to noise events occurring during certain sensitive time periods. In the CNEL scale, noise occurring between the hours of 7 pm and 10 pm is penalized by approximately 5 dB. This penalty accounts for the greater potential for noise to cause communication interference during these hours, as well as typically lower ambient noise levels during these hours. Noise that takes place during the night (10 pm to 7 am) is penalized by 10 dB. This penalty was selected to attempt to account for the higher sensitivity to noise in the nighttime and the expected further decrease in background noise levels that typically occur in the nighttime.

CNEL is graphically illustrated in the bottom of Exhibit A-3. Examples of various noise environments in terms of CNEL are presented in Exhibit A-4. CNEL is specified for use in the California by local planning agencies in their General Plan Noise Element for land use compatibility planning.

- **Day Night Noise Level (DNL).** The DNL index is very similar to CNEL but does not include the evening (7 pm to 10 pm) penalty that is included in CNEL. It does include the nighttime (10 pm to 7 am) penalty. Typically DNL is about 1 dB lower than CNEL, although

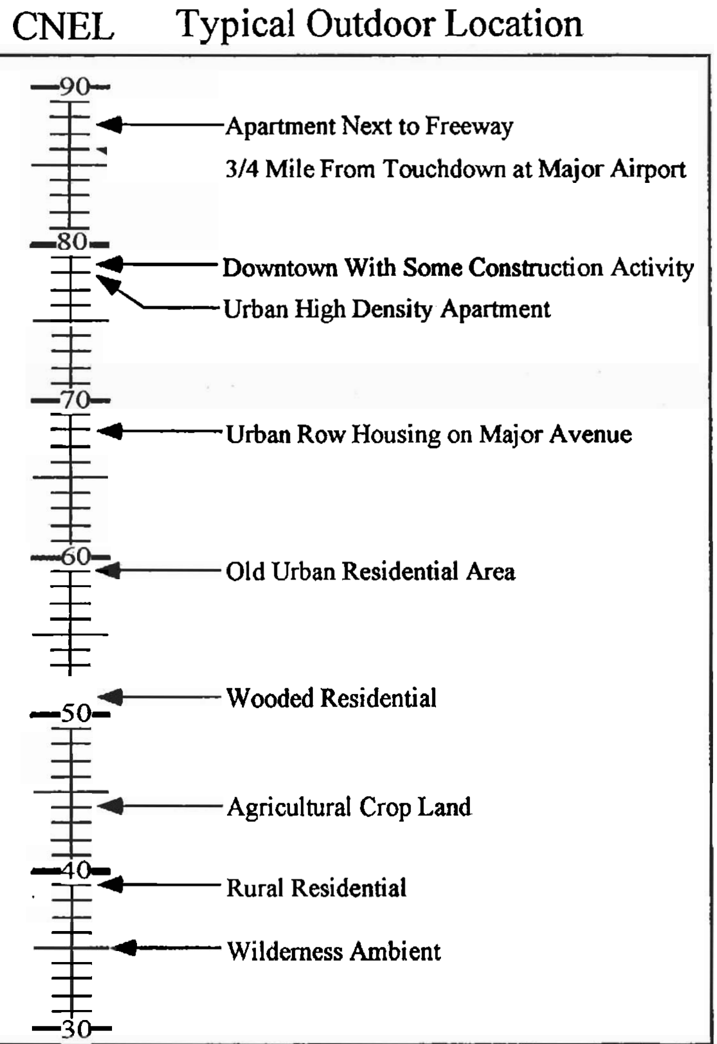

Exhibit A-4

Examples of Typical Outdoor CNEL Levels

Source: Adapted from "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare With an Adequate Margin of Safety", EPA, 1974

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the difference may be greater if there is an abnormal concentration of noise events in the 7 to 10 pm time period. DNL is specified for use in all States except California.

5. Effects of Noise On Humans

Noise, often described as unwanted sound, is known to have several adverse effects on humans. From these known adverse effects of noise, criteria have been established to help protect the public health and safety and prevent disruption of certain human activities. These criteria are based on effects of noise on people such as hearing loss (not a factor with typical community noise), communication interference, sleep interference, physiological responses and annoyance. Each of these potential noise impacts on people are briefly discussed in the following narrative:

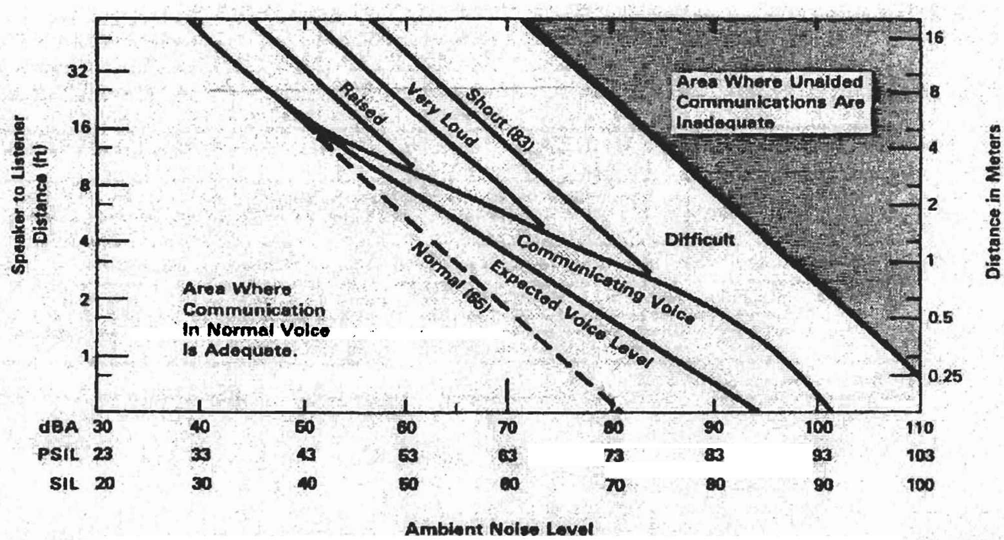
- Hearing Loss is generally not a concern in community noise problems, even very near a major airport or a major freeway. The potential for noise induced hearing loss is more commonly associated with occupational noise exposures in heavy industry, very noisy work environments with long term exposure, or certain very loud recreational activities such as target shooting, motorcycle or car racing, etc. The Occupational Safety and Health Administration (OSHA) identifies a noise exposure limit of 90 dBA for 8 hours per day to protect from hearing loss (higher limits are allowed for shorter duration exposures). Noise levels in neighborhoods, even in very noisy neighborhoods, are not sufficiently loud to cause hearing loss.

- Communication Interference is one of the primary concerns in environmental noise problems. Communication interference includes speech interference and interference with activities such as watching television. Normal conversational speech is in the range of 60 to 65 dBA and any noise in this range or louder may interfere with speech. There are specific methods of describing speech interference as a function of distance between speaker and listener and voice level. Exhibit A-5 shows the relation of quality of speech communication with respect to various noise levels.

- Sleep Interference is a major noise concern in noise assessment and, of course, is most critical during nighttime hours. Sleep disturbance is one of the major causes of annoyance due to community noise. Noise can make it difficult to fall asleep, create momentary disturbances of natural sleep patterns by causing shifts from deep to lighter stages and cause awakening. Noise may even cause awakening which a person may or may not be able to recall.

Extensive research has been conducted on the effect of noise on sleep disturbance. Recommended values for desired sound levels in residential bedroom space range from 25 to 45 dBA with 35 to 40 dBA being the norm. Some years ago (1981) The National Association of Noise Control Officials published data on the probability of sleep disturbance with various single event noise levels. Based on laboratory experiments conducted in the 1970's, this data indicated noise exposure, at 75 dBA interior noise level event will cause noise induced awakening in 30 percent of the cases.

However, recent research from England has shown that the probability for sleep disturbance is less than what had been reported in earlier research. These recent field



Permissible Distance Between a Speaker and Listeners for Specified Voice Levels and Ambient Noise Levels

(The Levels in Parantheses Refer to Voice Levels Measured One Meter From the Mouth.)

Exhibit A-5

Speech Interference and Noise Levels

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studies conducted during the 1990's and using new sophisticated techniques indicate that awakenings can be expected at a much lower rate than had been expected based on earlier laboratory studies. This research showed that once a person was asleep, it is much more unlikely that they will be awakened by a noise. The significant difference in the recent English study is the use of actual in-home sleep disturbance patterns as opposed to laboratory data that had been the historic basis for predicting sleep disturbance. Some of this research has been criticized because it was conducted in areas where subjects had become habituated to aircraft noise. On the other hand, some of the earlier laboratory sleep studies had been criticized because of the extremely small sample sizes of most laboratory studies and because the laboratory was not necessarily a representative sleep environment. The 1994 British sleep study compared the various causes of sleep disturbance using in home sleep studies. This field study assessed the effects of nighttime aircraft noise on sleep in 400 people (211 women and 189 men; 20-70 years of age; one per household) habitually living at eight sites adjacent to four U.K. airports, with different levels of night flying. The main finding was that only a minority of aircraft noise events affected sleep, and, for most subjects, that domestic and other non-aircraft factors had much greater effects. As shown in the Exhibit A-6, aircraft noise was a minor contributor among a host of other factors which lead to awakening response.

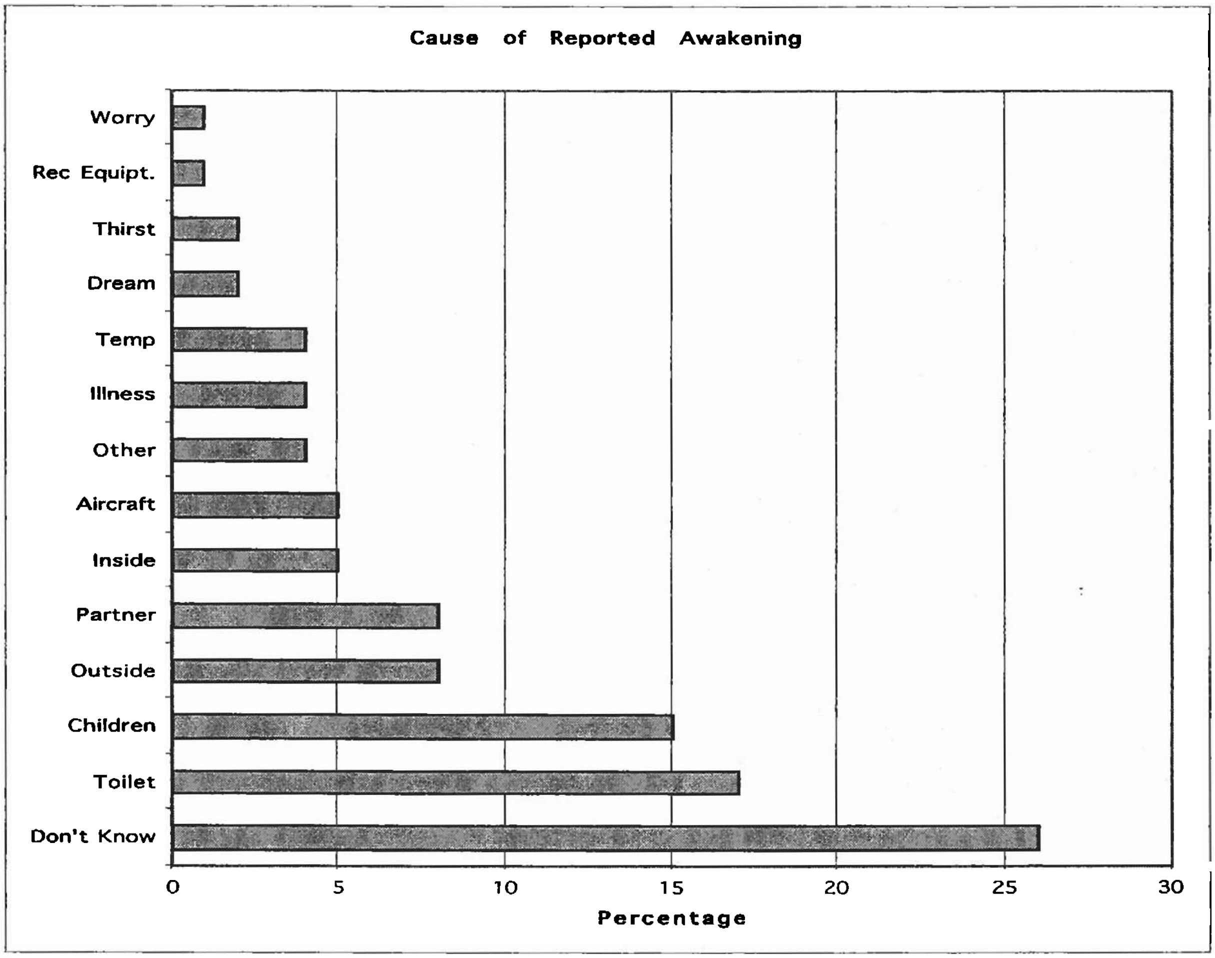

Exhibit A-6.
Causes and Prevalence of All Awakenings
(Total awakenings = 6,457. Each subject could have reported more than one awakening each night.)

The Federal Interagency Committee on Noise (FICON) in 1992 in a document entitled *Federal Interagency Review of Selected Airport Noise Analysis Issues* recommended an interim dose-response curve for sleep disturbance based on laboratory studies of sleep disturbance. In June of 1997, the Federal Interagency Committee on Aviation Noise (FICAN) updated the FICON recommendation with an updated curve based on the more recent in-home sleep disturbance studies which show lower rates of awakening compared to the laboratory studies. FICAN recommended a curve based on the upper limit of the data presented and therefore considers the curve to represent the "maximum percent of the exposed population expected to be behaviorally awakened," or the "maximum awakened." The FICAN recommendation is shown on Exhibit A-7. This is a very conservative approach. A more common statistical curve for the data points reflected in Exhibit A-7, for example, would indicate a 10% awakening rate at a level of approximately 100 dB SENEL,

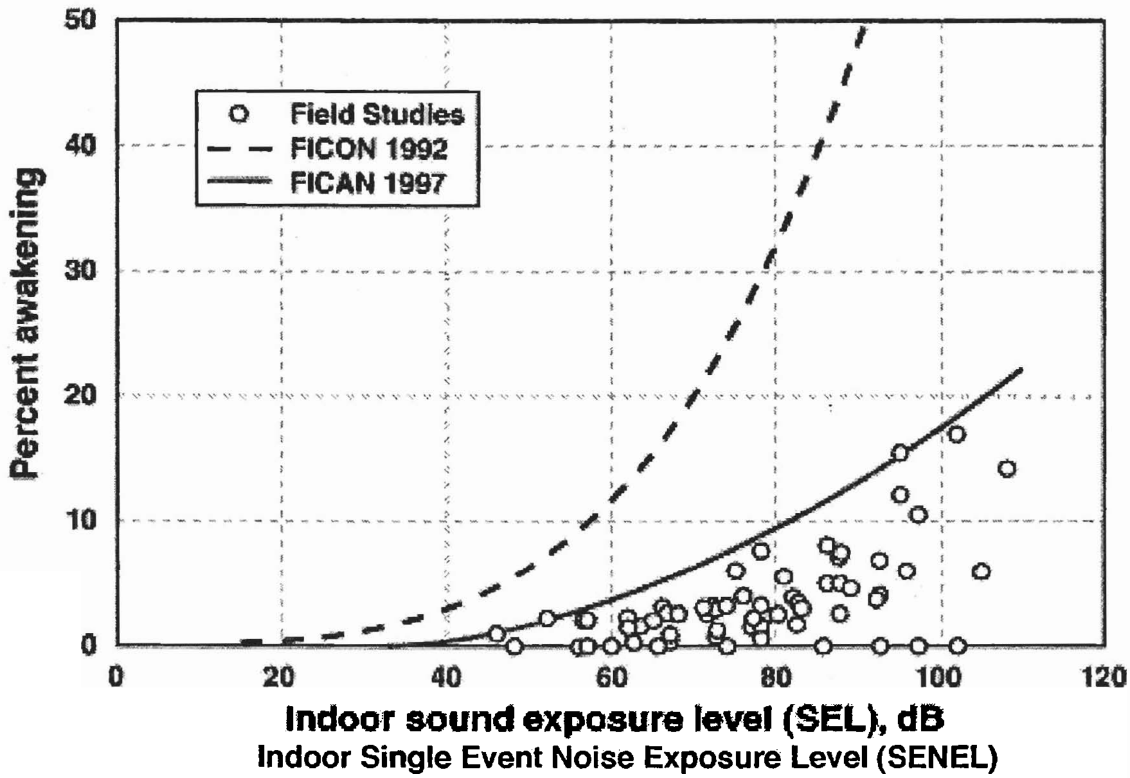

Exhibit A-7
Sleep Interference and Noise Level
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while the "maximum awakened" curve reflected in Exhibit A-7 shows the 10% awakening rate being reached at 80 dB SENEL. (The full FICAN report can be found on the internet at www.fican.org.)

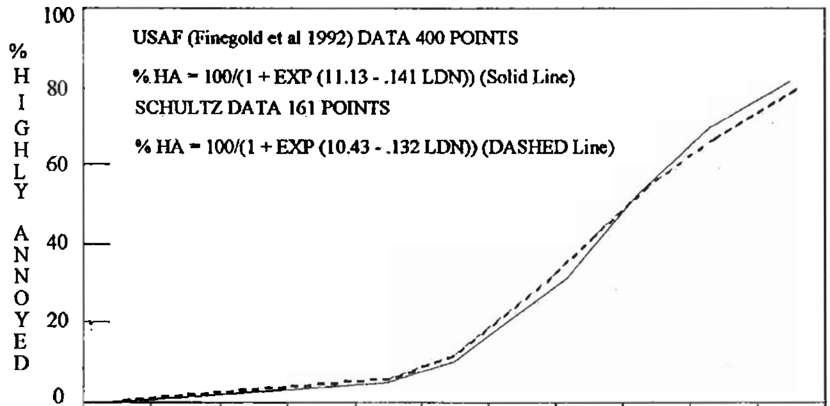
- Physiological Responses are those measurable effects of noise on people which are realized as changes in pulse rate, blood pressure, etc. While such effects can be induced and observed, the extent is not known to which these physiological responses cause harm or are a sign of harm. Generally, physiological responses are a reaction to a loud short term noise such as a rifle shot or a very loud jet over flight.

Health effects from noise have been studied around the world for nearly thirty years. Scientists have attempted to determine whether high noise levels can adversely affect human health-apart from auditory damage-which is amply understood. These research efforts have covered a broad range of potential impacts from cardiovascular response to fetal weight and mortality. Yet while a relationship between noise and health effects seems plausible, it has yet to be convincingly demonstrated--that is, shown in a manner that can be repeated by other researchers while yielding similar results.

While annoyance and sleep/speech interference have been acknowledged, health effects, if they exist, are associated with a wide variety of other environmental stressors. Isolating the effects of aircraft noise alone as a source of long term physiological change has proved to be almost impossible. In a review of 30 studies conducted worldwide between 1993 and 1998, a team of international researchers concluded that, while some findings suggest that noise can affect health, improved research concepts and methods are needed to verify or discredit such a relationship. They called for more study of the numerous environmental and behavioral factors than can confound, mediate or moderate survey findings. Until science refines the research process, a direct link between aircraft noise exposure and non-auditory health effects remains to be demonstrated.

- Annoyance is the most difficult of all noise responses to describe. Annoyance is a very individual characteristic and can vary widely from person to person. What one person considers tolerable can be quite unbearable to another of equal hearing capability. The level of annoyance, of course, depends on the characteristics of the noise (i.e.; loudness, frequency, time, and duration), and how much activity interference (e.g. speech interference and sleep interference) results from the noise. However, the level of annoyance is also a function of the attitude of the receiver. Personal sensitivity to noise varies widely. It has been estimated that 2 to 10 percent of the population is highly susceptible to annoyance from any noise not of their own making, while approximately 20 percent are unaffected by noise. Attitudes are affected by the relationship between the person and the noise source (Is it our dog barking or the neighbor's dog?). Whether we believe that someone is trying to abate the noise will also affect our level of annoyance.

Annoyance levels have been correlated to CNEL levels. Exhibit A-8 relates DNL noise levels to community response from two of these surveys. One of the survey curves presented in Exhibit A-8 is the well known Schultz curve, developed by Theodore Schultz. It displays the percent of a populace that can be expected to be annoyed by various DNL (CNEL in California) values for residential land use with outdoor activity areas. At 65 dB DNL the Schultz curve predicts approximately 14% of the exposed population reporting



Day Night Average Sound Level in dB		40	45	50	55	60	65	70	75	80	85	90
Calculated % HA Points	USAF	0.41	0.831	1.66	3.31	6.48	12.29	22.1	36.47	53.74	70.16	82.64
	SCHULTZ	0.576	1.11	2.12	4.03	7.52	13.59	23.32	37.05	53.25	68.78	81.0

Exhibit A-8

Comparison of logistic fits to original 161 data points of Schultz (1978) and USAF analysis with 400 points (data provided by USAF Armstrong Laboratory).

Source: Ficon 1992

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themselves to be "highly annoyed." At 60 dB DNL this decreases to approximately 8% of the population.

However, the Schultz curve and recent updates include data having a very wide range of scatter with communities reporting much higher percentages of population highly annoyed at these noise exposure levels. For example, under contract to the FAA, Bolt Beranek & Newman conducted community attitude surveys in the residential areas south of John Wayne Airport in Orange County in 1981 as part of a study of possible "power cutback" departure procedures. That study concluded that the surveyed population (principally in Santa Ana Heights and various Newport Beach neighborhoods) had more highly annoyed individuals at various CNEL levels than would be predicted by the Schultz curve. When plotted similar to the Schultz curve, this survey, indicated the populations in Santa Ana Heights and Newport Beach were approximately 5 dB CNEL more sensitive to noise than the average population predicted by the Schultz curve. While the precise reasons for this increased noise sensitivity were not identified, it is possible that non-acoustic factors, including political or the socio-economic status of the surveyed population may have played an important role in increasing the sensitivity of this community during the period of the survey. Annoyance levels have never been correlated statistically to single event noise exposure levels in airport related studies.

- School Room Effects. Interference with classroom activities and learning from aircraft noise is an important consideration and the subject of much recent research. Studies from around the world indicate that vehicle traffic, railroad and aircraft noise can have adverse effects on reading ability, concentration, motivation, and long term learning retention. A complicating factor in this research is the extent of background noise from within the class room itself. The studies indicating the most adverse effects examine cumulative noise levels equivalent to 65 CNEL or higher and single event maximum noise levels ranging from 85 to 95 dBA. In other studies the level of noise is unstated or ambiguous. According to these studies, a variety of adverse school room effects can be expected from *interior* noise levels equal to or exceeding 65 CNEL and or 85 dBA SEL.

Some interference with classroom activities can be expected with noise events which interfere with speech. As discussed in other sections of this report, speech interference begins at 65 dBA which is the level of normal conversation. Typical construction attenuates outdoor noise by 20 dBA with windows closed and 12 dBA with windows open. Thus some interference of class room activities can be expected at outdoor levels of 77 to 85 dBA.

6. Noise/Land Use Compatibility Guidelines

Noise metrics quantify community response to various noise exposure levels. The public reaction to different noise levels has been estimated from extensive research on human responses to exposure of different levels of aircraft noise. Noise standards generally are expressed in terms of the DNL 24-hour averaging scale based on the A-weighted decibel. Utilizing these metrics and surveys, agencies have developed standards for assessing the compatibility of various land uses with the noise environment. There are no single event noise based noise/land use compatibility criteria that have been adopted by the Federal Government or the State of California.

This section presents information regarding noise and land use criteria useful in the evaluation of noise impacts. Agencies including the EPA, the State of California, the County of Orange and most cities have developed noise/land use compatibility criteria. A summary of some of the more pertinent regulations and guidelines are presented in the following paragraphs.

Environmental Protection Agency Noise Assessment Guidelines

- **Environmental Protection Agency, "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety".**

In March 1974, in response to a federal statutory mandate, the EPA published this document (EPA 550/9-74-004) describing 55 dB DNL as the requisite level with an adequate margin of safety for areas with outdoor uses, including residences and recreational areas. This document does not constitute EPA regulations or standards. Rather, it is intended to "provide State and Local governments as well as the Federal Government and the private sector with an informational point of departure for the purpose of decision-making". Note that these levels were developed for suburban type uses. In some urban settings, the noise levels will be significantly above this level, while in some wilderness settings, the noise levels will be well below this level. The EPA "levels document" does not constitute a standard, specification or regulation, but identifies safe levels of environmental noise exposure without consideration for achieving these levels or other potentially relevant considerations.

State of California

- The State of California requires that all municipal General Plans contain a Noise Element. The requirements for the Noise element of the General Plan include describing the noise environment quantitatively using a cumulative noise metric such as CNEL or DNL, establishing noise/land use compatibility criteria, and establishing programs for achieving and/or maintaining compatibility. Noise elements shall address all major noise sources in the community including mobile and stationary sources.

- Californian Noise Insulation Standards apply to all multi-family dwellings built in the State. Single family residences are exempt from these regulations. With respect to community noise sources, the regulations require that all multi-family dwellings with exterior noise exposures greater that 60 dB CNEL must be sound insulated such that the interior noise level will not exceed 45 dB CNEL. These requirements apply to all roadway, rail, and airport noise sources.

- The Aeronautics Division of the California State Department of Transportation (Caltrans), enforces the California Airport Noise Regulations. These regulations establish 65 dB CNEL as a noise impact boundary within which there shall be no incompatible land uses. This requirement is based, in part, upon the determination in the Caltrans regulations that 65 dB

CNEL is the level of noise which should be acceptable to "...a reasonable man residing in the vicinity of an airport."

County of Orange

• The General Plan Noise Element of the County of Orange establishes noise/land use planning criteria for the unincorporated areas of the County. These noise guidelines and standards cover roadway noise, rail noise, and airport noise including military and civilian airports. The County has adopted noise standards for various land uses in terms of CNEL and Leq. For residential land uses the County has established a maximum exterior noise level standard of 65 dB CNEL for private outdoor living areas and an interior standard of 45 dB CNEL. The County of Orange uses the 60 dB CNEL contour as a threshold for review of projects in order to screen projects and ensure that the 65 dB CNEL exterior and 45 dB CNEL interior criteria are met. In other words, projects located within the 60 dB CNEL contour are required to submit detailed acoustical studies ensuring compliance with the County noise standards.

Additionally, the County of Orange provides insurance that the 45 dB CNEL interior noise limit for habitable rooms of residential units is met with windows open or windows closed (not necessarily both). Specifically, homes with windows closed will provide at least a 20 dB outdoor to indoor noise reduction (based on typical pre-1981 construction practice and Uniform Building Code requirements, newer homes provide additional noise reduction). Homes with windows open will provide a 12 dB outdoor to indoor noise reduction (largely independent of date of construction). The County, therefore, requires that new homes with exterior noise exposure greater than 57 dB CNEL (45 dB plus 12 dB) provide some means of mechanical ventilation in order to ensure that residents are able to close windows and obtain fresh air at a rate specified in the Uniform Building Code. New homes subject to this requirement are typically air-conditioned or supplied with a fresh air switch as part of the forced air heating unit. Prior to the incorporation of South Laguna into the City of Laguna Beach the County of Orange General Plan was the operative guideline for planning in South Laguna.