Noise

# REVISED

# NOISE ELEMENT OF THE GENERAL PLAN

# MAMMOTH LAKES, CALIFORNIA

**Adopted**
**June 18, 1997**

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# CHAPTER ONE

# INTRODUCTION

## 1.1 Purpose and Scope

The Noise Element of the General Plan is a planning document which provides a policy framework for addressing potential noise impacts encountered in the planning process.

The content of a Noise Element and the methods used in its preparation have been determined by the requirements of Section 65302 (f) of the California Government Code and by the *State of California General Plan Guidelines* published by the California Office of Planning and Research in 1990. The Guidelines require that major noise sources and areas containing noise-sensitive land uses be identified and quantified by preparing generalized noise exposure contours for current and projected conditions.

According to the Government Code requirements, noise exposure information should be included in a Noise Element for the following major noise sources:

1. Highways and freeways
2. Primary arterials and major local streets
3. Railroad operations
4. Aircraft and airport operations
5. Local industrial facilities
6. Other stationary sources

Noise-sensitive uses identified by the Government Code and by the Town of Mammoth Lakes include the following:

1. Residential development
2. Schools
3. Hospitals, nursing homes
4. Churches

5. Libraries

The Noise Element is directed at minimizing future noise conflicts. A noise ordinance, on the other hand, is directed at resolving existing noise conflicts. A noise ordinance may be used to address noise levels generated by existing industrial and residential uses, which are not regulated by federal or state noise level standards. The regulation of noise sources such as traffic on public roadways, railroad line operations and aircraft in flight is preempted by existing federal and/or state regulations, meaning that such sources generally may not be addressed by a noise ordinance. The Noise Element addresses the prevention of noise conflicts from all of these sources.

## 1.2 Relationship to Other Elements of the General Plan

The Noise Element is related to the Land Use, Housing, Circulation and Open Space Elements of the General Plan. Recognition of the interrelationship of noise and these four mandated elements is necessary to prepare an integrated general plan and to initiate changes which will reduce noise exposure to acceptable levels in areas where noise may presently exceed the levels set forth by the adopted policies of the Noise Element. The relationship between these elements is briefly discussed below:

1. Land Use: An objective of the Noise Element is to provide noise exposure information for use in the Land Use Element. When integrated with the Noise Element, the Land Use Element will show acceptable land uses in relation to existing and projected noise levels.

2. Housing: The Housing Element considers the provision of adequate sites for new housing and standards for housing stock. Since residential land uses are noise-sensitive, the noise exposure information of the Noise Element must be considered when planning the locations of new housing. The State Noise Insulation Standards may influence the locations and construction costs of multi-family dwellings, which should be considered by the Housing Element.

3. Circulation: The circulation system, which is a major source of noise, must be correlated with the Land Use Element. This is especially true for roadways which carry significant numbers of trucks. Noise exposure will thus be a decisive factor in

the location and design of new transportation facilities, and in the mitigation of noise produced by existing facilities upon existing and planned land uses.

4. Open Space: Excessive noise adversely affects the enjoyment of recreational pursuits in designated open space, particularly in areas where quiet is a valued part of the recreational experience. Thus, noise exposure should be considered in planning for this kind of open space use. Conversely, open space can be used to buffer noise-sensitive uses from noise sources by providing setbacks and visual screening.

### 1.3 Noise And Its Effects On People

Appendix A provides a discussion of the fundamentals of noise assessment, the effects of noise on people and criteria for acceptable noise exposure, and is a reference for use by the Town during the review of documents or proposals which refer to the measurement and effects of noise.

### 1.4 Definitions

1. A-Weighted Sound Level (dBA): Except as specified, all sound levels referred to in this policy document are in *A-weighted* decibels. A-weighting de-emphasizes the very low and very high frequencies of sound in a manner similar to the human ear. Most community noise standards utilize A-weighting, as it provides a high degree of correlation with human annoyance and health effects.

2. Community Noise Equivalent Level (CNEL): The average equivalent sound level during a 24-hour day, obtained after addition of approximately five decibels to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and ten decibels to sound levels in the night before 7:00 a.m. and after 10:00 p.m.

3. C-Weighted Day/Night Average Sound Level ($L_{Cdn}$): The average equivalent sound level during a 24-hour day, obtained after addition of ten *C-weighted* decibels to sound levels in the night after 10:00 p.m. and before 7:00 a.m.

4. C-Weighted Sound Level (dBC): C-weighting is essentially flat in response except in very low and very high frequencies. C-weighting is often used to judge human response to sonic booms, blasting and artillery fire.

5. Day/Night Average Sound Level ($L_{dn}$): The average equivalent sound level during a 24-hour day, obtained after addition of ten *A-weighted* decibels to sound levels in the night after 10:00 p.m. and before 7:00 a.m.

6. Equivalent Sound Level ($L_{eq}$): The sound level containing the same total energy as a time varying signal over a given sample period. $L_{eq}$ is typically computed over 1, 8 and 24-hour sample periods.

7. Maximum Sound Level ($L_{max}$): The maximum sound level recorded during a noise event.

8. New Development: Projects requiring land use approval or building permits, but excluding remodelling or additions to existing structures.

9. Noise-Sensitive Land Use: Residential land uses, transient lodging, schools, libraries, churches, hospitals and nursing homes.

10. Outdoor Activity Areas: Patios, decks, balconies, outdoor eating areas, swimming pool areas, yards of dwellings and other areas which have been designated for outdoor activities and recreation.

11. Stationary Noise Source: Any fixed or mobile source not preempted from local control by existing federal or state regulations. Examples of such sources include industrial and commercial facilities, and vehicle movements on private property.

12. Transportation Noise Source: Traffic on public roadways, railroad line operations and aircraft in flight. Control of noise from these sources is preempted by existing federal or state regulations. However, the effects of noise from transportation sources may be controlled by regulating the location and design of adjacent land uses.

# CHAPTER TWO

# EXISTING AND FUTURE NOISE ENVIRONMENT

## 2.1 Overview of Sources

Based on discussions with Town staff, the requirements of the Government Code and field studies conducted during the preparation of this document, it was determined that the following noise sources should be addressed in the Noise Element:

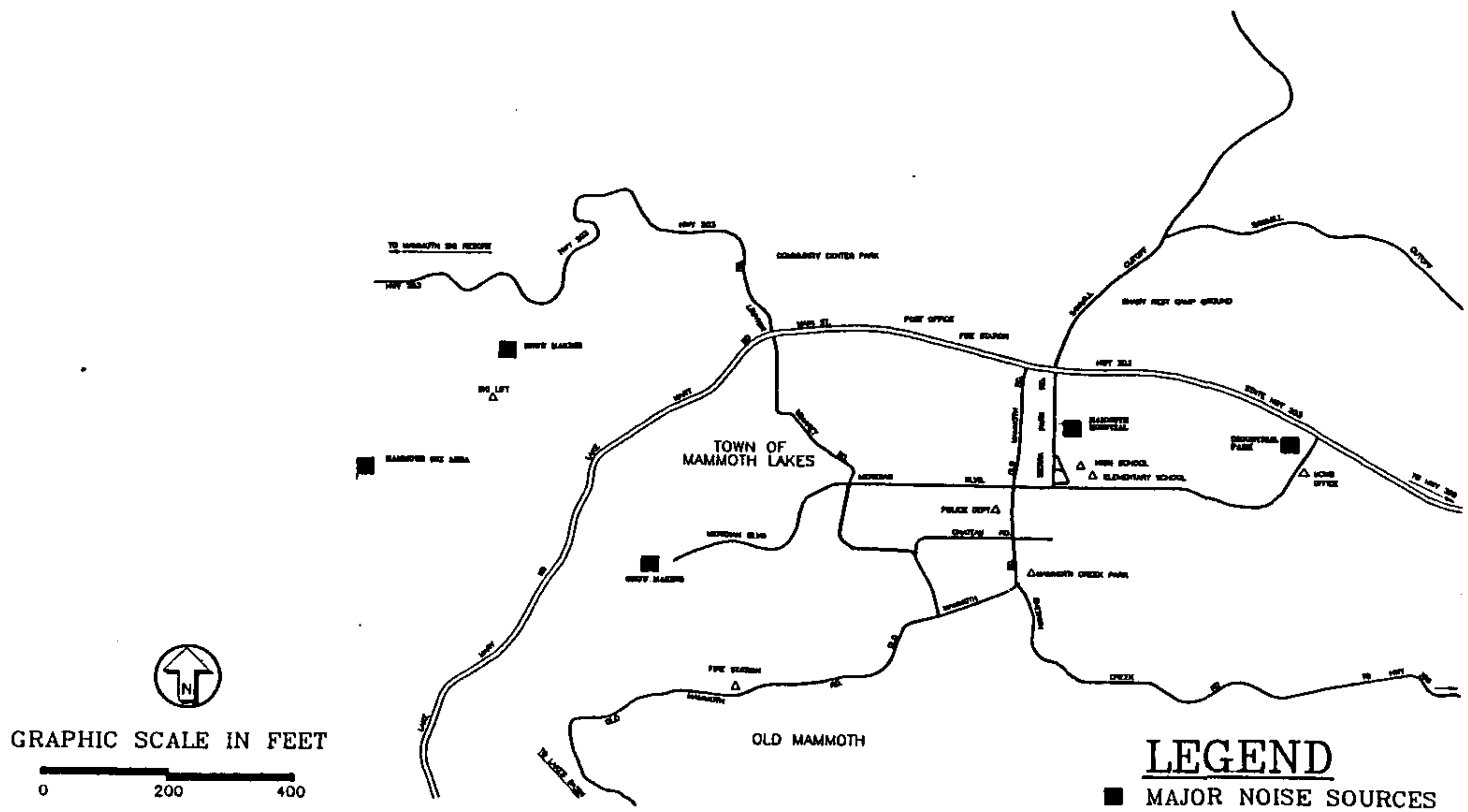
- Traffic on State Route 203 and Major Town Roadways
- Aircraft Operations at Mammoth/June Lakes Airport
- Helicopter Operations at Mammoth Hospital
- Snowmaking Operations
- Snow Removal Activities
- Avalanche Control
- Industrial Activities near State Route 203 and Meridian Boulevard

Figure 1 shows the locations of some of these sources.

## 2.2 Methods Used to Develop Noise Exposure Information

According to the Government Code and General Plan Guidelines, noise exposure contours should be developed in terms of the Day-Night Average Level ($L_{dn}$) or Community Noise Equivalent Level (CNEL). Both of these descriptors represent the weighted energy noise level for a 24-hour day after including a 10 dB penalty for noise levels occurring at night between the hours of 10:00 p.m. and 7:00 a.m. The CNEL descriptor additionally includes a penalty of about 5 dB for noise levels occurring during the evening hours of 7:00 p.m. and 10:00 p.m. The CNEL descriptor was developed to quantify aircraft noise, and its use is required when preparing noise exposure maps for airports within the State of California. The CNEL and $L_{dn}$ descriptors are generally considered to be equivalent to each other for most community noise environments within ±1.0 dB. The $L_{dn}$ descriptor has been used in this Noise Element to quantify noise from the above-described major noise sources.

# FIGURE 1
## LOCATION OF MAJOR NOISE SOURCES
## TOWN OF MAMMOTH LAKES

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To supplement the $L_{dn}$ noise descriptor, the hourly $L_{eq}$ and $L_{max}$ descriptors have been used to characterize noise levels from stationary noise sources that are addressed in this Noise Element. Because many stationary noise sources operate sporadically, the hourly $L_{eq}$ and $L_{max}$ are more useful for predicting noise conflicts from such sources than is the $L_{dn}$. The $L_{dn}$, by definition, is a modified average noise exposure over 24 hours. If a noise source operates only a few hours a day, averaging the noise over 24 hours may under-estimate its nuisance potential. Since the $L_{dn}$ descriptor is required by the Government Code for Noise Elements, noise exposure from stationary noise sources also has been described using this descriptor.

Analytical noise modeling techniques were used to develop generalized noise contours for existing and future conditions. Analytical noise modeling techniques generally use source-specific data, including descriptions of noise-generating equipment or activities, hours of operation, seasonal fluctuations, and average levels of noise from source operations. Analytical methods have been developed for many environmental noise sources, including roadways, railroad line operations, railroad yard operations, industrial plants and aircraft/airport operations. Such methods will produce reliable results as long as data inputs and assumptions are valid for the sources being studied.

The noise exposure information developed during the preparation of the Noise Element does not include all conceivable sources of industrial or commercial noise within the Town of Mammoth Lakes, but rather focuses on the existing sources of noise which have been identified by the Town as being significant. As the policies of this Noise Element are applied in the future, it is likely that other potentially significant sources will be identified.

### 2.3 Roadways

The Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (FHWA-RD-77-108) was used to develop $L_{dn}$ contours for State Route 203 and major Town roadways. The FHWA Model is the analytical method currently favored by most state and local agencies, including Caltrans, for highway traffic noise prediction. The model is based upon reference energy emission levels for automobiles, medium trucks (2 axles) and heavy trucks (3 or more axles), with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site., The FHWA Model was developed to predict hourly $L_{eq}$ values for free-flowing traffic conditions, and is generally considered to be accurate within $\pm$ 1.5 dB. The model assumes a clear view of traffic with no shielding at the receiver location. To predict $L_{dn}$ values, it is necessary to determine the hourly distribution of traffic for a typical day and adjust the traffic volume input data to yield an equivalent hourly traffic volume. The Calveno traffic noise emission curves were used as recommended by Caltrans to more accurately calculate noise levels generated by California traffic.

Existing (1994) and future (2009) traffic volumes used to calculate traffic noise levels were based on the traffic study performed by Robert Kahn, John Kain & Associates, Inc.[1] The winter weekend daily volumes from Reference 1 were adjusted by 60%[2] to more accurately reflect annual average conditions. Truck volumes were estimated by the Town. The Day/Night distribution of traffic was based on assumptions used by BBA for comparable streets, since these data were unavailable from any other source. Vehicle speeds assumed during the traffic noise modelling process were the posted vehicle speeds.

Table I lists the distances of the existing and future 60 and 65 dB $L_{dn}$ contours from roadway centers, along with input data used in the FHWA Model. Maps on file with the Town of Mammoth Lakes show the approximate location of the contours. Note that contour distances less than 50 feet are not shown on the maps.

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[1] Robert Kahn, John Kain & Associates, Inc., *Mammoth Transportation Model Final Report, Town of Mammoth Lakes, California,* April 13, 1995.

[2] Telephone conversation with William Taylor, Mammoth Lakes Planning Department, on September 15, 1995.

TOWN OF MAMMOTH LAKES

| Roadway | AADT | | %D/N[2] | %MT[3] | %HT[4] | Speed (MPH) | Distance to $L_{dn}$ Contours (Ft.)[1] | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1994 | | 2009 | |
| | 1994 | 2009 | | | | | 65 dB | 60 dB | 65 dB | 60 dB |
| **Route 203:** | | | | | | | | | | |
| Meridian-Sierra Park | 3,600 | 8,500 | 90/10 | 2.5 | 2.5 | 45 | 36 | 77 | 63 | 136 |
| Sierra Park-Lake Mary | 9,700 | 13,400 | 90/10 | 2.5 | 2.5 | 35 | 49 | 105 | 60 | 130 |
| Lake Mary-Hillside | 3,500 | 12,400 | 90/10 | 2.5 | 2.5 | 30 | 23 | 49 | 53 | 114 |
| Hillside-Main Lodge | 4,300 | 5,600 | 90/10 | 2.5 | 2.5 | 35 | 28 | 61 | 34 | 73 |
| **Lake Mary Road:** | | | | | | | | | | |
| Main-Davison | 4,100 | 5,600 | 90/10 | 1 | 2 | 35 | 25 | 53 | 31 | 66 |
| Davison-Crystal Crag | 1,100 | 1,600 | 90/10 | 1 | 2 | 35 | 10 | 22 | 13 | 29 |
| **Minaret Road:** | | | | | | | | | | |
| Lake Mary-Meridian | 3,000 | 15,400 | 90/10 | .5 | 1 | 40 | 22 | 46 | 64 | 138 |
| Meridian-Old Mammoth | 1,700 | 10,000 | 90/10 | .5 | 1 | 35 | 12 | 26 | 39 | 83 |
| South of Old Mammoth | --- | 3,800 | 90/10 | .5 | 1 | 35 | -- | -- | 20 | 44 |
| **Meridian Boulevard:** | | | | | | | | | | |
| Route 203-Old Mammoth | 1,000 | 4,000 | 90/10 | 1 | 2 | 45 | 14 | 30 | 35 | 76 |
| Old Mammoth-Minaret | 3,400 | 9,100 | 90/10 | .5 | 1 | 40 | 23 | 50 | 45 | 97 |
| Minaret-Majestic Pines | 2,300 | 6,700 | 90/10 | .5 | 1 | 40 | 18 | 39 | 37 | 79 |
| **Old Mammoth Road:** | | | | | | | | | | |
| Route 203-Meridian | 6,900 | 9,700 | 90/10 | .5 | 2 | 30 | 31 | 68 | 39 | 85 |
| Meridian-Sherwin Creek | 5,600 | 6,700 | 90/10 | .5 | 2 | 30 | 27 | 59 | 31 | 66 |
| Sherwin Creek-Ski Trail | 2,600 | 4,300 | 90/10 | .5 | 2 | 40 | 22 | 47 | 31 | 66 |

[1]Distances from roadways centers
[2]Day/Night traffic split (day=10 a.m.-7 p.m.; night=10 p.m.-7 a.m.)
[3]Medium Trucks
[4]Heavy Trucks

Sources: Reference 1
Brown-Buntin Associates, Inc.

## 2.4 Snow Removal

Snow removal is performed by the Town of Mammoth Lakes on city streets and by individuals on private property. During the winter, snow removal on city streets can occur 24 hours per day. The Town operates four loaders with blades, three loaders with blower attachments, one road grader with blade, and two plow/cinder trucks. Table II summarizes noise levels from some of this equipment measured under actual operating conditions with chains.

**TABLE II**

**SUMMARY OF NOISE LEVELS FROM TOWN OF MAMMOTH LAKES SNOW REMOVAL EQUIPMENT**

| | | | dBA | |
|---|---|---|---|---|
| **Equipment** | **Distance** | **Position/Operation** | **Range** | **$L_{eq}$** |
| 966D | 100′ | Behind | 76-77 | 76.5 |
| 966D | 100′ | Behind-Under Load | 78-80 | 78.6 |
| 966D | 100′ | Passby-Full Load | 68-77 | 74.0 |
| 950F | 100′ | Passby w/Back-up Bells | 69-87 | 80.7 |
| 950F | 100′ | Bells Only | 76-78 | --- |
| 950F | 100′ | Engine Only | 74-75 | --- |
| 950F | 100′ | Blade Dragging | 81-85 | --- |

Source: Brown-Buntin Associates, Inc.

## 2.5 Snow Making

According to Mr. Dennis Agee, Planning Director for Mammoth Mountain Ski Area, snow making equipment is located near Warming Hut II at the west end of Canyon Boulevard is proposed for the base of Chair 15 at the west end of Meridian Boulevard. Snow making may occur during the day or night depending on weather conditions.

During the night, the SMI Silentstorm Snowmaker is used, which is an airless type of snow maker. Airless snow makers are reported to produce lower noise levels than typical snow making systems that expel air and water through a nozzle at high pressure. During the day, typical air/water equipment may be used. Up to 10 snow making guns may operate simultaneously.

Based on measurements conducted by BBA of many air/water snow makers, noise levels at 50 feet from the side of nozzles ranged from about 81 to 94 dBA. At the same distance from the side of the SMI Silentstorm Snowmaker, the level measured by BBA was 71 dBA.

### 2.6 Business/Industrial Site Near Meridian Boulevard and Commerce Drive

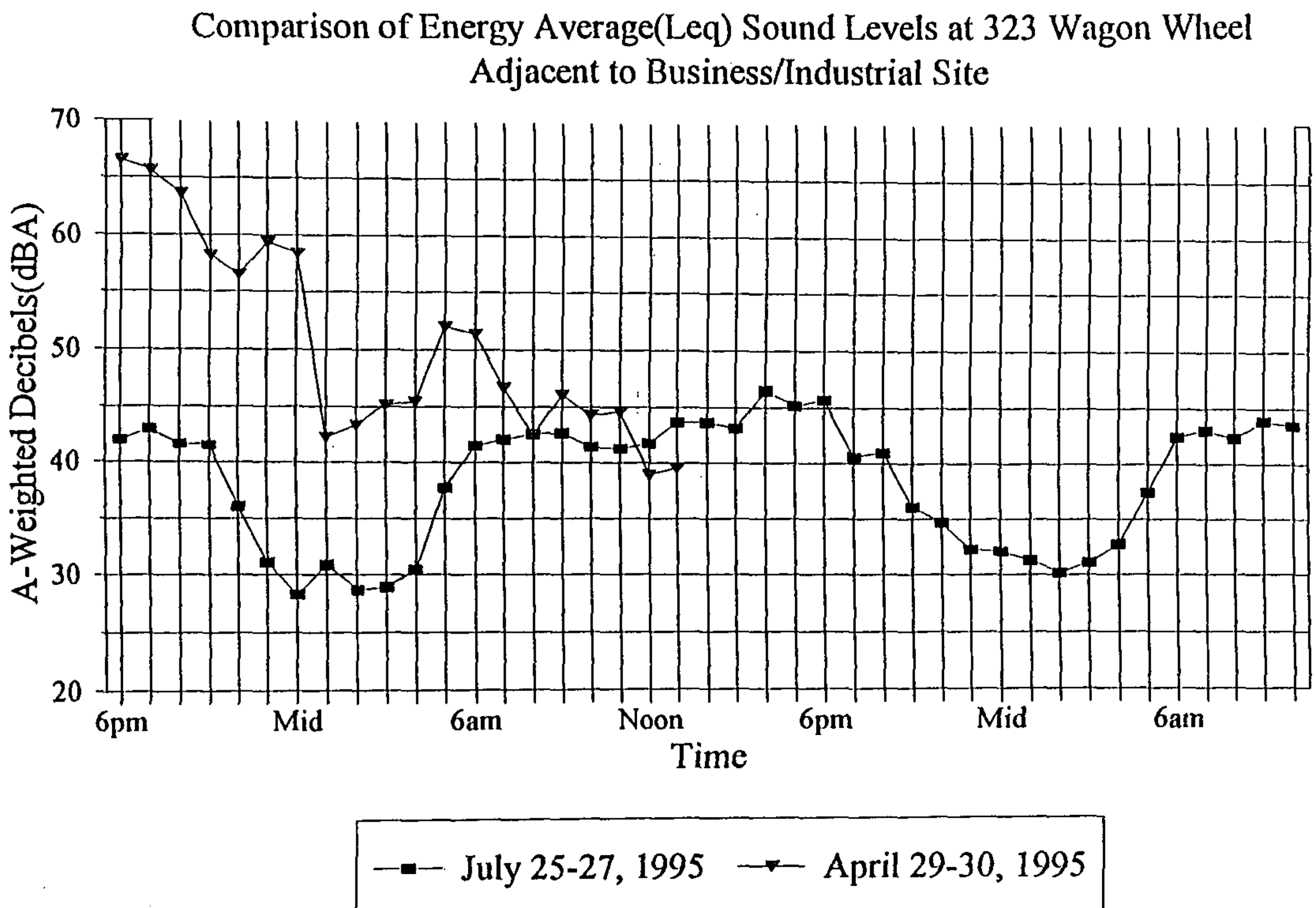
This facility includes the Town equipment yard, Mammoth Disposal, an asphalt batch plant and concrete batch plant. Sound level measurements were conducted at 323 Wagon Wheel, which represents a typical residential site adjacent to the industrial area. Figure 2 shows hourly sound level measurements at this site during April and July 1995. The sound levels measured in April were during a stormy and windy period and therefore do not represent sound levels from the business/industrial park. From July 25-27, 1995, however, the weather was calm and the levels shown in Figure 2 fairly represent the total noise environment, including activities at the business/industrial site. The July hourly levels are generally under 45 dBA, $L_{eq}$ which would satisfy most land use compatibility criteria.

### 2.7 Avalanche Control Noise Impacts

Mammoth Mountain Ski Area and the U.S. Forest Service uses various explosive devices to break-up excessive snow accumulations that may create avalanches near ski slopes in the Mammoth Mountain area. Hand-thrown explosive charges and explosive shells propelled by 106 m.m. recoilless rifles are mainly used for this purpose. During a season of heavy snow accumulation, such as 1994-95, about 1700 hand charges and 800 propelled charges may be used. Avalanche control is normally done from about 6:00 a.m. to 8:30 a.m., before the ski lifts are in operation. Three gun sites are located in the Mammoth ski area. Gun #2, that is located on the south slope of Lincoln Mountain and fires shells into the north side of Mammoth Mountain and the Dragon's Back, is responsible for most of the audible cannon fire in the Town of Mammoth Lakes. Guns #1 and #3 are situated so that their muzzle blasts and shell detonations are not as noticeable in the community.

Test firings of Gun #2 were conducted on May 30, 1995 from about 7:00 a.m.-8:00 a.m. The temperature was about 40°-50°F in the Town of Mammoth Lakes, with no wind and a clear sky. Three locations were selected in the community that represent sites where worst-case noise exposure would be expected due to proximity and almost unobstructed line-of-

## Figure 2


Comparison of Energy Average(Leq) Sound Levels at 323 Wagon Wheel
Adjacent to Business/Industrial Site
A-Weighted Decibels(dBA)
70
60
50
40
30
20
6pm
Mid
6am
Noon
6pm
Mid
6am
Time
July 25-27, 1995
April 29-30, 1995



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sight to the gun and target area. These locations are south of Lake Mary Road and are shown in Figure 3. Results of test firings are shown in Table III.

North of Lake Mary Road, muzzle blasts and shell detonations from Gun #2 are generally shielded from residences by Lincoln Mountain. However, explosions from hand-thrown charges along the north and east slopes of Lincoln Mountain and near Lake Mary Road are reportedly quite noticeable in this area. Hand charges are also used by the Tamarack avalanche control crew. Although more hand charges are used for avalanche control than gun firings, it is believed that individual noise impacts from hand charges are not as severe as those from gun firings.

From the data in the Table III and the estimated number of shells fired per day in the avalanche season, it is possible to calculate the noise level in terms of the Day/Night Average Level ($L_{dn}$) using A-weighted decibels and the Day/Night Average Level using C-weighted decibels ($L_{Cdn}$). C-weighted decibels and the $L_{Cdn}$ descriptor are often used by the military to characterize the annoyance from high-energy impulsive noise, such as sonic booms and artillery fire[3].

[3]American National Standards Institute, *Methods of Assessment of High-Energy Impulsive Sounds with Respect to Residential Communities, Appendix A, 1986.*

# FIGURE 3

NOISE MEASUREMENT LOCATIONS FOR
AVALANCHE CONTROL GUN AND COMMUNITY NOISE SURVEY

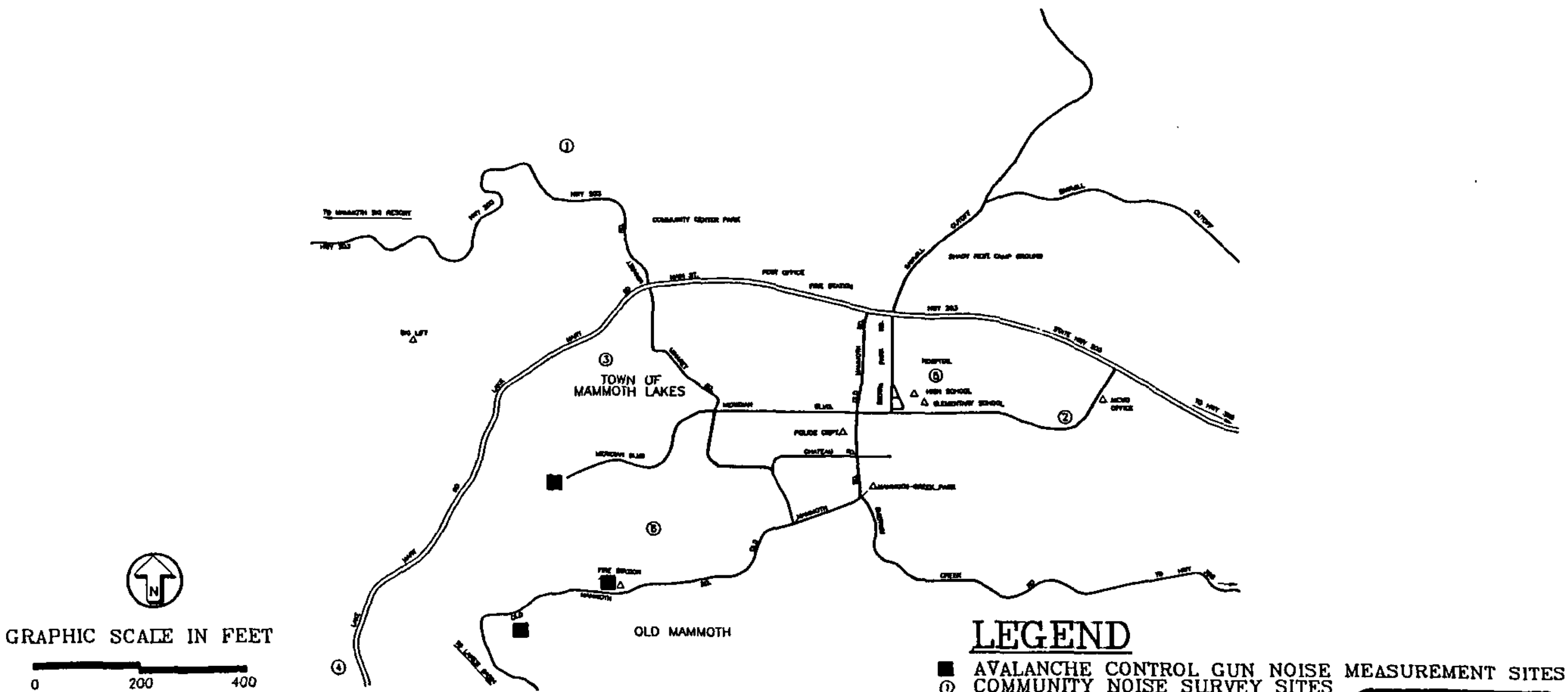


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TABLE III

SUMMARY OF MUZZLE BLAST AND SHELL
DETONATION NOISE LEVELS FROM GUN NO. 2
MAY 30, 1995

| | Decibels | | |
|---|---|---|---|
| **Location** | **Unwtd. Peak** | **$L_{max}$ (A-Wtd., Fast Response)** | **SEL (A-Wtd, Fast Response)** |
| **W. End of Meridian** | | | |
| *Shot No. 1* | | | |
| Muzzle | --- | 58 | 67 |
| Shell | 110 | 71 | |
| *Shot No. 2* | | | |
| Muzzle | --- | 58 | 70 |
| Shell | 106 | 77 | |
| *Shot No. 3* | | | |
| Muzzle | --- | 53 | 73 |
| Shell | 114 | 79 | |
| **Log Mean** | **111** | | **71** |
| **Fire Station on Old Mammoth Rd.** | | | |
| *Shot No. 1* | | | |
| Muzzle | --- | 63 | 70 |
| Shell | 107 | 67 | |
| *Shot No. 2* | | | |
| Muzzle | --- | 54 | 72 |
| Shell | 112 | 78 | |
| *Shot No. 3* | | | |
| Muzzle | --- | 54 | 64 |
| Shell | 103 | 68 | |
| **Log Mean** | **109** | | **70** |
| **Red Fir Rd.** | | | |
| *Shot No. 1* | | | |
| Muzzle | --- | 64 | 63 |
| Shell | 106 | 63 | |
| *Shot No. 2* | | | |
| Muzzle | --- | 61 | 64 |
| Shell | 104 | 66 | |
| *Shot No. 3* | | | |
| Muzzle | --- | 71 | 71 |
| Shell | 103 | --- | |
| **Log Mean** | **105** | | **68** |

Notes:
- Shot No. #1 was in Mammoth Mountain; Shot No. 2 was in the middle of the Dragon's Back; and Shot No. #3 was in the tail of the Dragon's Back.
- SEL values include sound energy from both the muzzle blast and shell detonation.

Source: Brown-Buntin Associates, Inc.

Based on Forest Service estimates, about 20-30 shells per day may be discharged from Gun #2 during the avalanche season. Assuming half of the shells are fired before 7:00 a.m., the $L_{dn}$ and $L_{Cdn}$ values were calculated at the three test locations noted above. Table IV lists the calculated values.

**TABLE IV**

**RANGE OF A-WEIGHTED AND C-WEIGHTED DAY/NIGHT AVERAGE LEVELS AT TEST LOCATIONS IN THE TOWN OF MAMMOTH LAKES AVALANCHE CONTROL GUN NO. 2**

| | Day/Night Average Level, dB | |
|---|---|---|
| **Location** | **A-weighted ($L_{dn}$)** | **C-weighted ($L_{Cdn}$)** |
| W. End of Meridian | 42-44 | 56-58 |
| Fire Station on Old Mammoth Rd. | 41-43 | 54-56 |
| Red Fir Rd. | 39-41 | 50-52 |

Source: Brown-Buntin Associates, Inc.

From Table IV, it can be seen that $L_{Cdn}$ values ranged from about 50-58 dB. According to research sponsored by the National Research Council[4], between 3 and 9 percent of the populace can be expected to be highly annoyed by $L_{Cdn}$ values ranging from 50 to 58 dB.

## 2.8 Helicopter Noise Impacts

Helicopters are occasionally used to transport patients to the Mammoth Hospital. The severity of noise impacts due to the helicopters depends on their frequency of use, the time of day or night when flights occur, the types of helicopter used, and whether helicopters fly near noise-sensitive uses when approaching and leaving the hospital. The FAA requires that the Day/Night Average Level ($L_{dn}$) be used to describe land use compatibility with respect to helicopter noise exposure.

[4]Committee on Hearing, Bioacoustics and Biomechanics, WG84, *Assessment of Community Response to High-Energy Impulsive Sounds*, National Research Council, 1981.

Additionally, the FAA recommends that the subjective impact of helicopter noise impacts may be determined by comparing Sound Exposure Levels (SEL's) of helicopter flights to background noise levels at residential areas (The SEL measures the total sound energy of a single helicopter passby). More helicopter flights are allowed when background noise levels are high, according to the FAA's recommendations.

Table V lists helicopter SEL's measured by BBA during other studies at residential locations near hospitals. The residences generally were within a 1-mile radius of the hospital. The SEL's in Table V should not be construed as those that would necessarily occur at residential areas near Mammoth Hospital.

**TABLE V**

**REPRESENTATIVE NOISE LEVELS OF MEDICAL HELICOPTERS MEASURED AT NEARBY RESIDENTIAL AREAS**

| Hospital | Helicopter | SEL, dB |
|---|---|---|
| Clovis Community Hospital, Clovis | Fairchild-Hiller FH-110 | 81-89 |
| Kern Medical Center, Bakersfield | Aerospatiale AS-350B | 83-86 |
| Kern Medical Center, Bakersfield | A-Star 350B | 83-99 |
| UCLA Medical Center, Westwood | Augusta A-109 | 74-92 |
| UCLA Medical Center, Westwood | Bell 205 | 72-90 |
| UCLA Medical Center, Westwood | BK-117 | 81-96 |

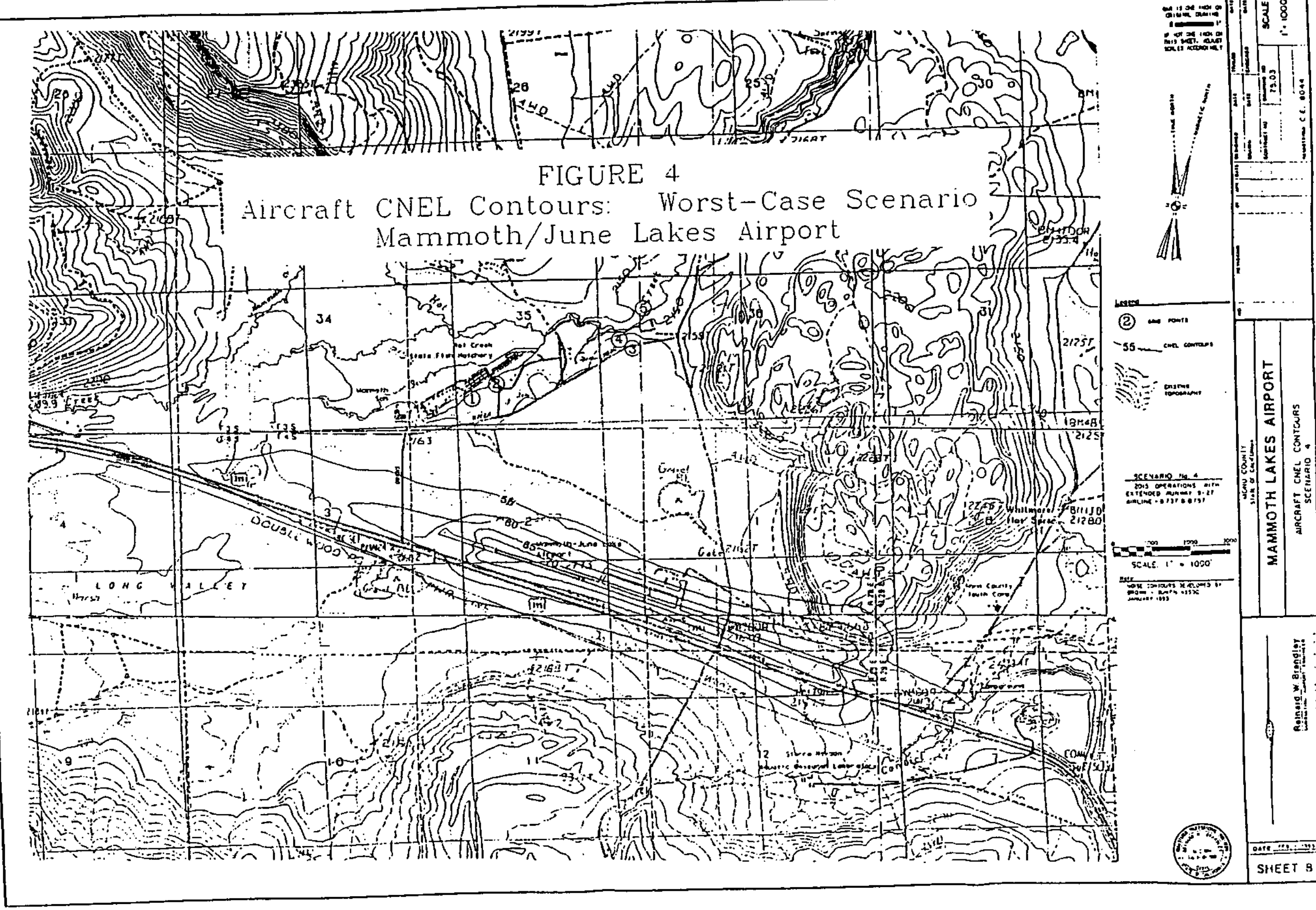
Source: Brown-Buntin Associates, Inc.

## 2.9 Mammoth/June Lakes Airport

Figure 4 shows CNEL contours for Mammoth/June Lake Airport. The scenario shown represents Year 2015 conditions, including the use of Boeing 737 and 757 aircraft. This scenario represents worst-case conditions around the airport.

The contours were prepared in January, 1995 for Reinhard W. Brandley, Consulting Airport Engineer using Version 4.11 of the Integrated Noise Model (INM). The INM is the standard aircraft noise prediction model, and is the method preferred by Caltrans Division of Aeronautics and the Federal Aviation Administration (FAA) for land use compatibility planning. The operations data used in the model were provided by Reinhard W. Brandley.

# FIGURE 4
## Aircraft CNEL Contours: Worst-Case Scenario
## Mammoth/June Lakes Airport



## CHAPTER THREE

## COMMUNITY NOISE SURVEY

### 3.1 Community Noise Survey

A community noise survey was conducted within the Town of Mammoth Lakes during the winter (April 29-30, 1995) and summer (July 25-27, 1995) to document background noise levels in different seasons within areas where noise-sensitive land uses are located. Short-term monitoring was conducted at three sites three times a day. Continuous noise monitoring was conducted at two sites to record the variation of noise levels through a full 24-hour period. The data collected during the survey included the $L_{eq}$ and observed maximum noise levels. The measurement sites at 319 Grindelwald, 107 Sugar Pine and the end of Waterford Street are typical residential areas away from major noise sources. The house at 323 Wagon Wheel is near the industrial/commercial site which is described in Chapter 2.6. The knoll between Mammoth High School and Mammoth Hospital represents these two noise-sensitive uses. The measurement site at the south side of lower Twin Lakes represents a recreational area.

Noise monitoring sites, measured noise levels and estimated $L_{dn}$ values at each site are described in Table VI. Hourly variations in noise levels at the long-term monitoring site are shown in Figures 5-10. Monitoring site locations are shown on Figure 3.

The April, 1995 community noise survey data shown in Table VI and Figures 5-10 were obtained during windy conditions and are more representative of wind noise than community sources. The July, 1995 measurements indicate relatively quiet conditions in the community. The most common and significant noise source in Mammoth Lakes is traffic. At residential locations away from major roads, the residual noise environment consists of local traffic, birds, running water and miscellaneous sounds from domestic use. To preserve quiet conditions in the community, noise level standards and policies (see Chapter Four) have been adopted to prevent degradation of the existing noise environment as much as possible.

**Figure 5**

# Background Noise Environment
## 107 Sugar Pine, April 29-May 1, 1995

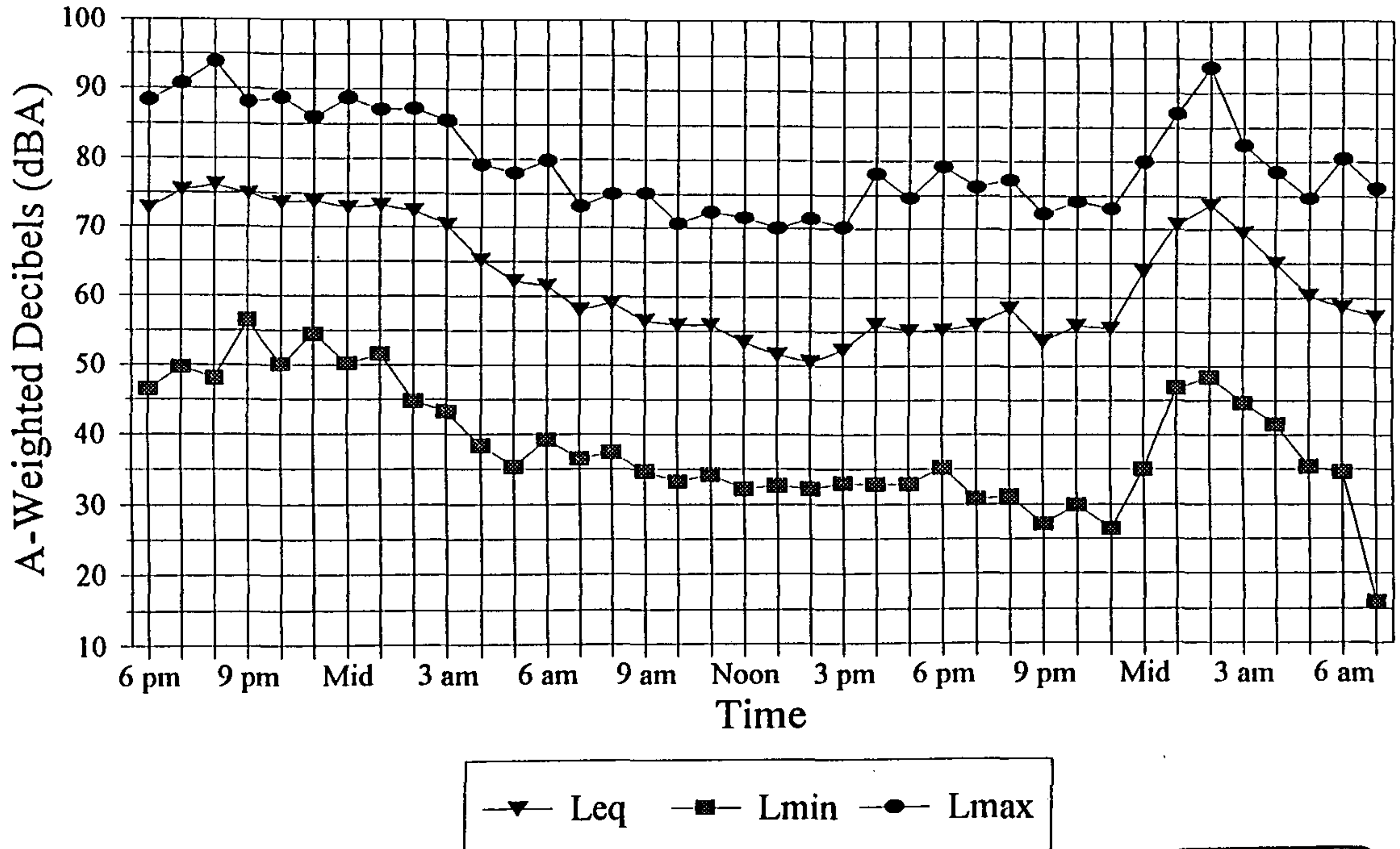



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**Figure 6**

# Background Noise Environment
## 107 Sugar Pine, July 25-27, 1995

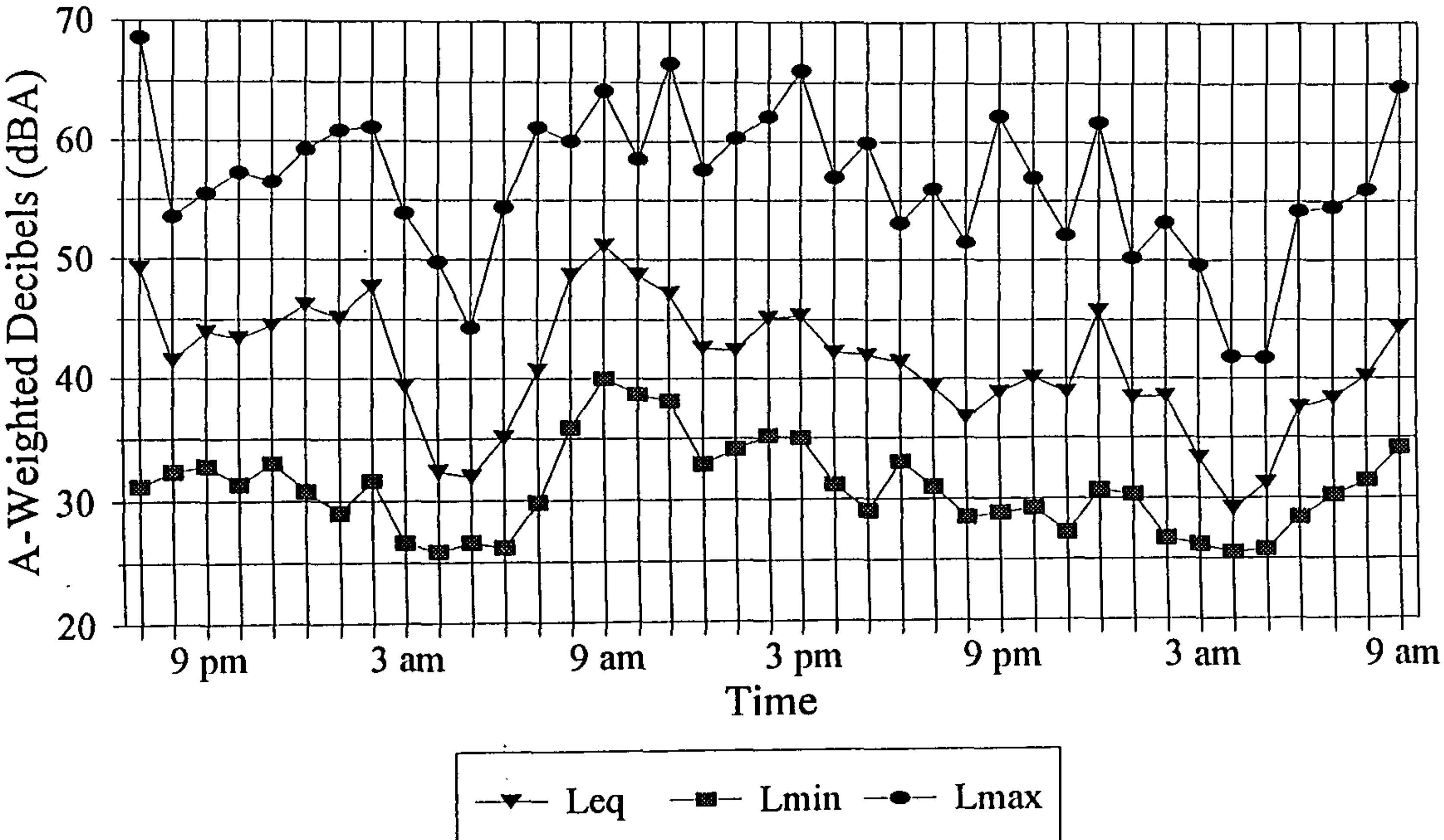


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**Figure 7**

# Background Noise Environment
## 394 Grindelwald, April 29-May 1, 1995

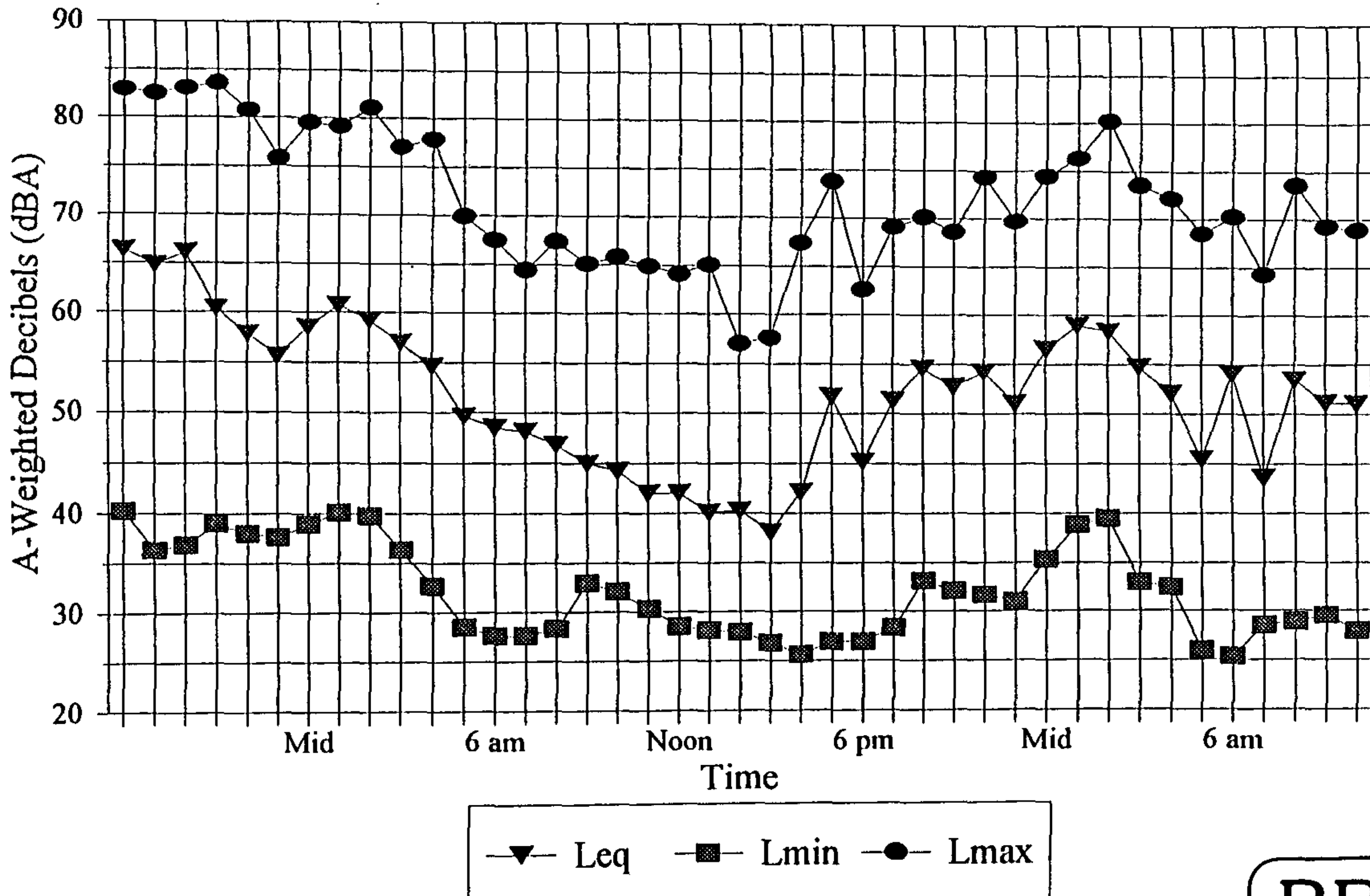


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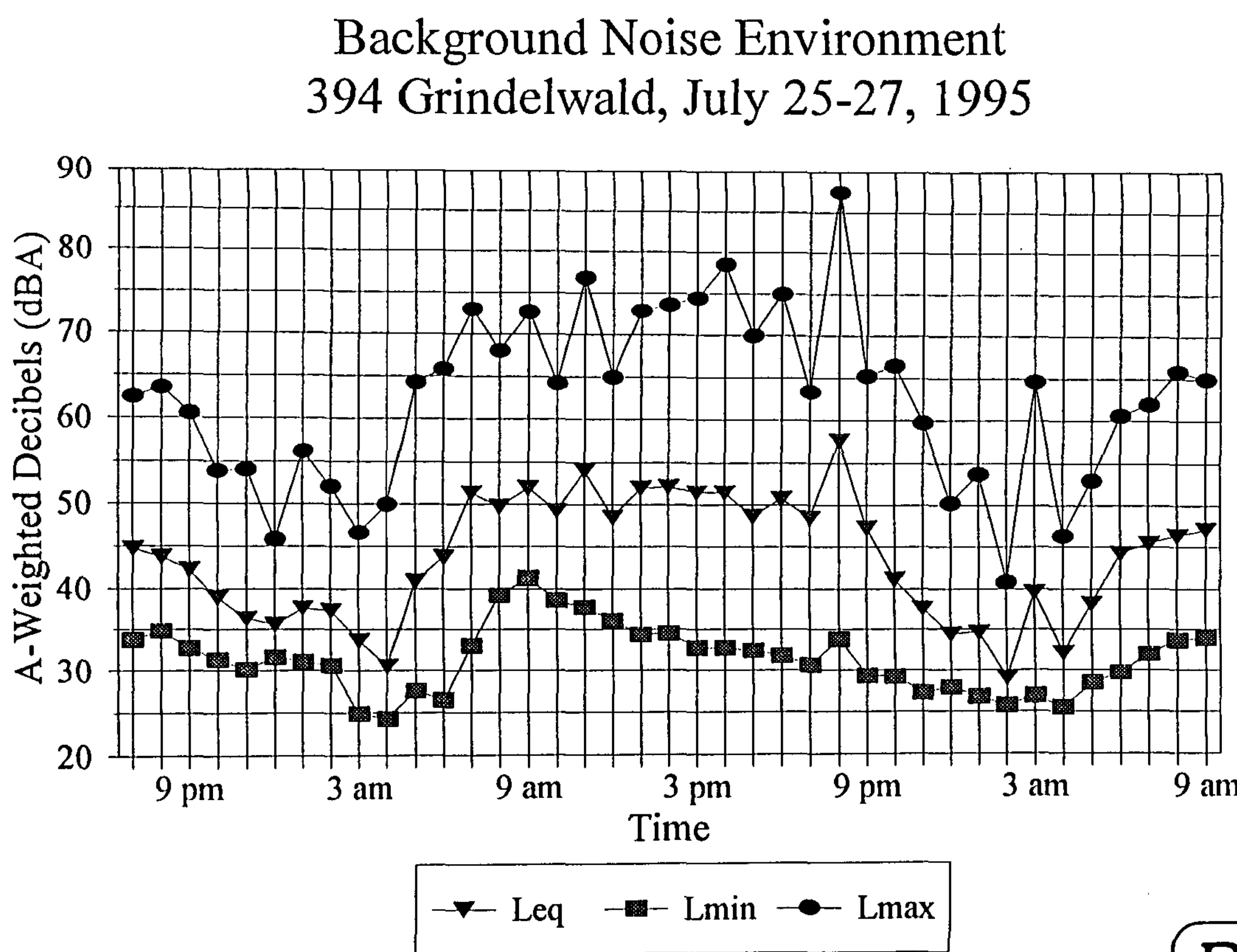
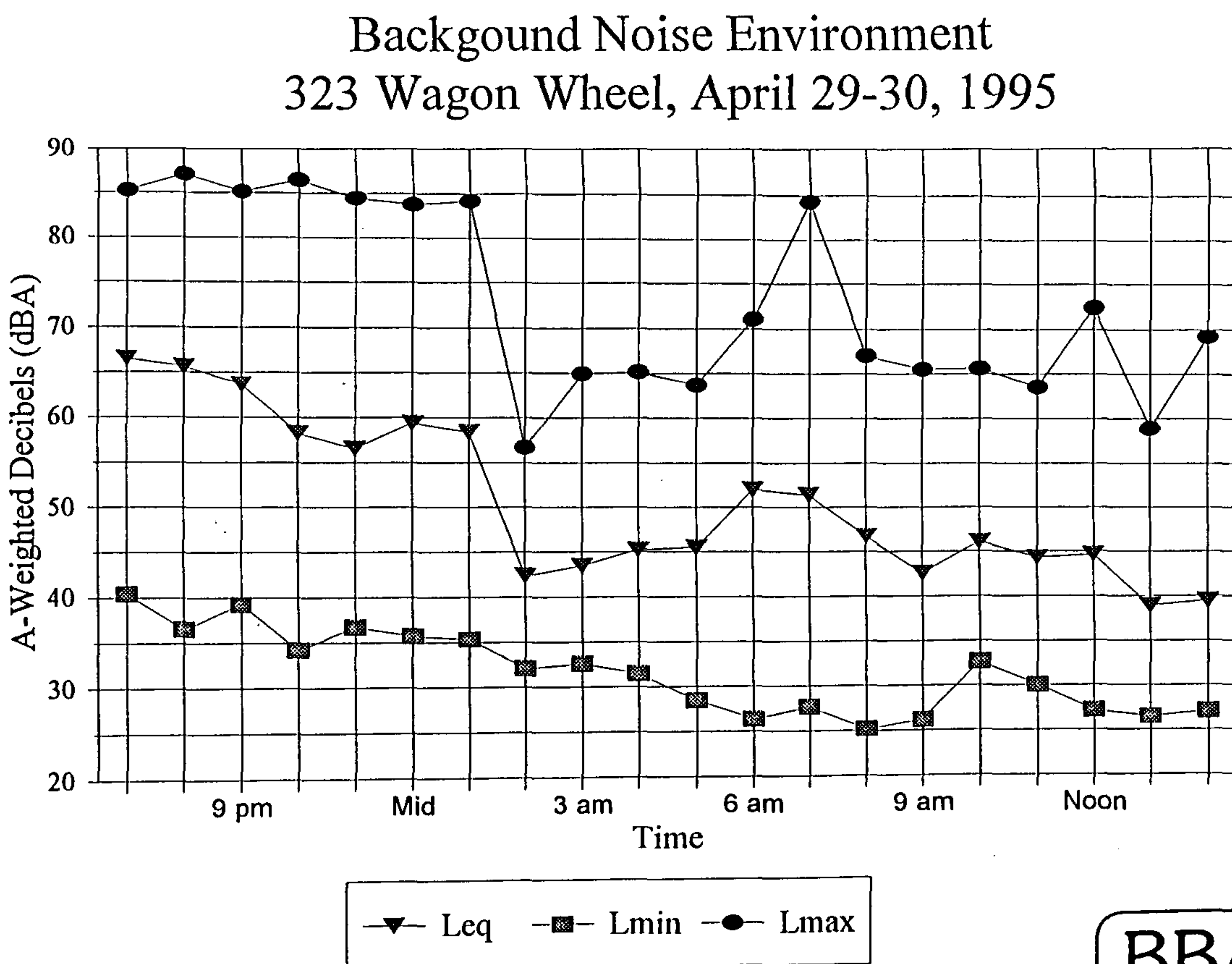
**Figure 8**



Background Noise Environment
394 Grindelwald, July 25-27, 1995
A-Weighted Decibels (dBA)
90
80
70
60
50
40
30
20
9 pm
3 am
9 am
3 pm
9 pm
3 am
9 am
Time
Leq
Lmin
Lmax

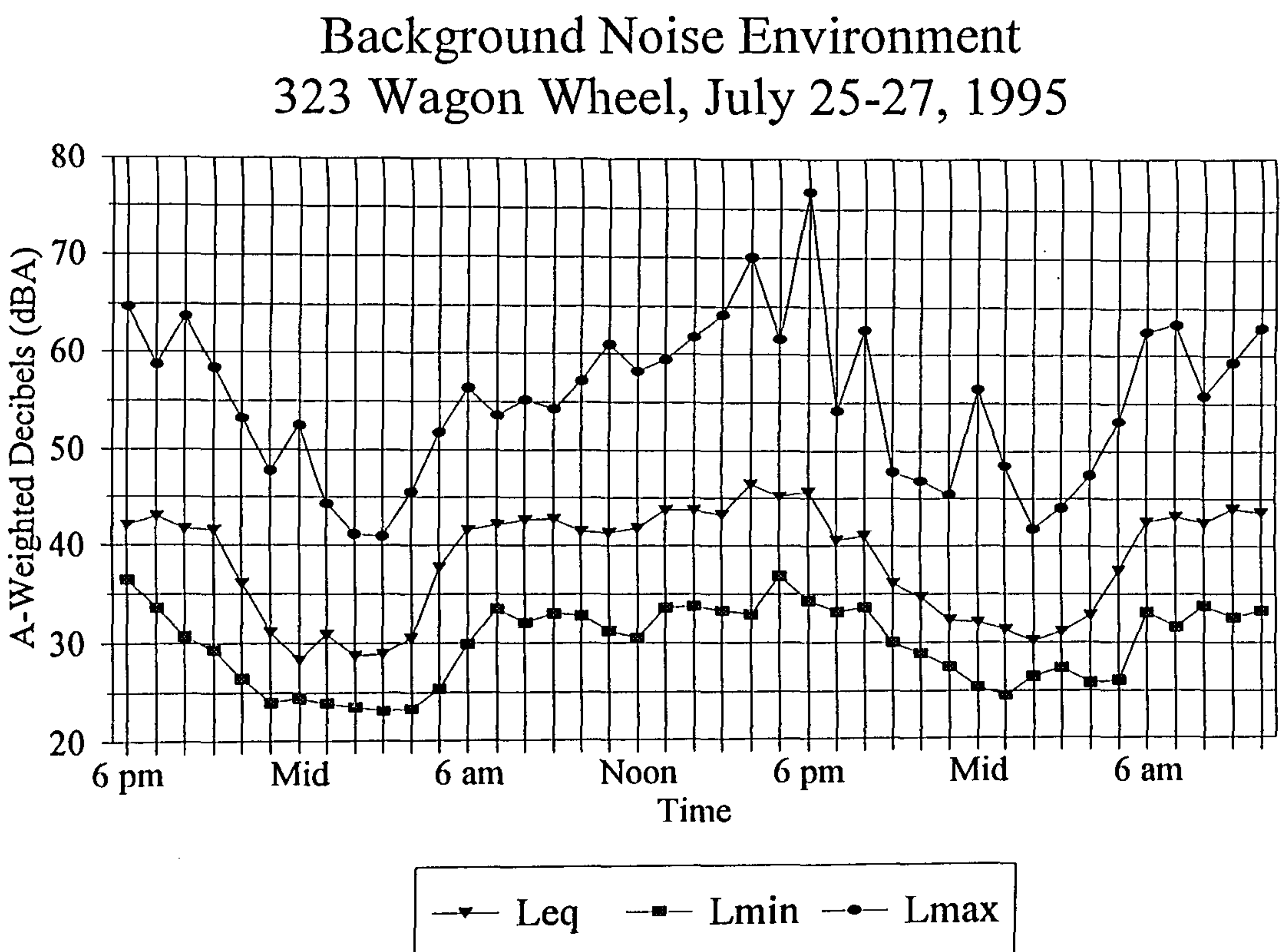

BBA

**Figure 9**


Backgound Noise Environment
323 Wagon Wheel, April 29-30, 1995
A-Weighted Decibels (dBA)
90
80
70
60
50
40
30
20
9 pm
Mid
3 am
6 am
9 am
Noon
Time
Leq
Lmin
Lmax

BBA

**Figure 10**




BBA

## TABLE VI

## SUMMARY OF COMMUNITY NOISE SURVEY RESULTS
## TOWN OF MAMMOTH LAKES

| | | Sound Level, dBA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | April, 1995 | | | | | July, 1995 | | | | |
| Site No. | Location | $L_D$ | $L_N$ | $L_{max}$ | $L_{dn}$ | Sources | $L_D$ | $L_N$ | $L_{max}$ | $L_{dn}$ | Sources |
| 1 | 319 Grindelwald[1] | 57 | 56 | 84 | 63 | Wind | 51 | 39 | 78 | 50 | Unknown |
| 2 | 323 Wagon Wheel[1] | 60 | 55 | 86 | 63 | Wind | 43 | 35 | 77 | 44 | Unknown |
| 3 | 107 Sugar Pine[1] | 68 | 70 | 94 | 76 | Wind | 46 | 43 | 69 | 50 | Unknown |
| 4 | So. side Lower Twin Lakes | 50[2] | 60[3] | 62 | 64-68[4] | Wind, traffic | 53[2] | 52[3] | 72 | 57-61[4] | Traffic, water |
| 5 | Knoll Betw. Mammoth H.S. & Hospital | 50[2] | 48[3] | 65 | 53-57[4] | Wind | 60[2] | 50[3] | 59 | 58-62[4] | Traffic |
| 6 | End of Waterford St. | 46[2] | 42[3] | 58 | 47-51[4] | Wind | 48[2] | 47[3] | 64 | 52-56[4] | Water, birds |

[1]24-hour measurement sites.
[2]$L_D$ calculated from two 15-minute samples obtained from 7 a.m.-10 p.m.
[3]$L_N$ calculated from one 15-minute sample obtained from 10 p.m.-7 a.m.
[4]$L_{dn}$ estimated from $L_D$ and $L_N$.

# CHAPTER FOUR

# GOALS AND POLICIES

## 4.1 Goals

The goals of the Town of Mammoth Lakes Noise Element are:

*1. To protect the citizens of the Town from the harmful and annoying effects of exposure to excessive noise.*

*2. To protect the economic base of the Town by preventing incompatible land uses from encroaching upon existing or planned noise-producing uses.*

*3. To preserve the tranquility of residential areas by preventing noise-producing uses from encroaching upon existing or planned noise-sensitive uses.*

*4. To educate the citizens of the Town concerning the effects of exposure to excessive noise and the methods available for minimizing such exposure.*

## 4.2 Policies

The following specific policies have been adopted by the Town of Mammoth Lakes to accomplish the goals of the Noise Element:

**Prevention of Adverse Noise Impacts due to Transportation Noise Sources:**

**Policy 4.2.1** New development of noise-sensitive land uses shall not be permitted in areas exposed to existing or projected future levels of noise from transportation noise sources which exceed 60 dB $L_{dn}$ in outdoor activity areas or 45 dB $L_{dn}$ in interior spaces.

**Policy 4.2.2** Noise created by new transportation noise sources, including roadway improvement projects, shall be mitigated so as not to exceed 60 dB $L_{dn}$ within outdoor activity areas and 45 dB $L_{dn}$ within interior spaces of existing noise-sensitive land uses.

## Prevention of Adverse Noise Impacts due to Stationary Noise Sources:

**Policy 4.2.3** New development of noise-sensitive land uses shall not be permitted where the noise level from existing stationary noise sources exceeds the noise level standards of Table VII.

**Policy 4.2.4** Noise created by new proposed stationary noise sources or existing stationary noise sources which undergo modifications that may increase noise levels shall be mitigated so as not to exceed the noise level standards of Table VII at noise-sensitive uses.

**TABLE VII**

**MAXIMUM ALLOWABLE NOISE EXPOSURE-STATIONARY NOISE SOURCES[1]**

| | Daytime (7 a.m. to 10 p.m.) | Nighttime (10 p.m. to 7 a.m.) |
|---|---|---|
| Hourly $L_{eq}$, dB | 50 | 45 |
| Maximum level, dB | 70 | 65 |

[1]As determined at the property line of the receiving land use. When determining the effectiveness of noise mitigation measures, the standards may be applied on the receptor side of noise barriers or other property line noise mitigation measures.

## Control of Existing Noise Nuisances:

**Policy 4.2.5** The provisions of the existing noise ordinance of the Town of Mammoth Lakes (Chapter 8.16 of the Municipal Code) should be consistent with the goals and policies of the Noise Element, and be appropriate for the specific needs of the Town.

# CHAPTER FIVE

## IMPLEMENTATION MEASURES

To achieve compliance with the policies of the Noise Element, the Town of Mammoth Lakes shall undertake the following implementation program. The implementation program focuses on the prevention of new noise-related land use conflicts by requiring that new development be reviewed to determine whether it complies with the policies in Chapter 3.

5.1 The Town shall review new public and private development proposals to determine conformance with the policies of this Noise Element.

5.2 The Town shall require an acoustical analysis in those cases where a project potentially threatens to expose noise-sensitive land uses to excessive noise levels. The presumption of excessive noise levels shall be based on the location of new noise-sensitive uses to known noise sources (see Table I and Noise Contour Maps on file with the Town of Mammoth Lakes), or staff's professional judgement that a potential for adverse noise impacts exists. Acoustical analyses shall be required early in the review process so that noise mitigation may be included in the project design. For development not subject to environmental review, the requirements for an acoustical analysis shall be implemented prior to the issuance of building permits. The requirements for the content of an acoustical analysis are given in Appendix B.

5.3 The Town shall develop and employ procedures to ensure that noise mitigation measures required pursuant to an acoustical analysis are implemented in the development review and building permit processes.

5.4 The Town shall develop and employ procedures to monitor compliance with the policies of the Noise Element after completion of projects where noise mitigation measures have been required.

5.5 The Town shall enforce the State Noise Insulation Standards (California Code of Regulations, Title 24) and Chapter 35 of the Uniform Building Code (UBC) concerning interior noise exposure for multi-family housing, hotels and motels.

5.6 The Town shall request the California Highway Patrol, the sheriff's office and the police department to actively enforce the California Vehicle Code sections relating to adequate vehicle mufflers and modified exhaust systems.

5.7 The Town shall periodically review and update the Noise Element to ensure that noise exposure information and specific policies are consistent with changing conditions within the Town and with noise control regulations or policies enacted after the adoption of this element.

5.8 The Town shall revise its noise ordinance so that its noise limits are consistent with those of the Noise Element, the language of the noise ordinance is clear and concise, and that potential noise nuisances that are unique to the Town, such as snow making equipment, are appropriately regulated.

APPENDIX A

# NOISE AND ITS EFFECTS ON PEOPLE

## Fundamentals of Noise Assessment:

Noise is often defined simply as unwanted sound, and thus is a subjective reaction to characteristics of a physical phenomenon. The descriptors of community noise in current use are the results of many years of effort to translate objective measurements of sound into measures of subjective reaction to noise. Before elaborating on these descriptors, it is useful to discuss some fundamental concepts of sound.

Sound is defined as any pressure variation in air that the human ear can detect. If the pressure variations occur frequently enough (at least 20 times per second), they can be heard and hence are called sound. The number of pressure variations per second is called the frequency of sound, and is expressed as cycles per second, now called Hertz (Hz) by international agreement.

The speed of sound in air is approximately 770 miles per hour, or 1,130 feet/second. Knowing the speed and frequency of a sound, one may calculate its wavelength, the physical distance in air from one compression of the atmosphere to the next. An understanding of wavelength is useful in evaluating the effectiveness of physical noise control devices such as mufflers or barriers, which depend upon either absorbing or blocking sound waves to reduce sound levels.

To measure sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid this, the decibel (dB) scale was devised.

The decibel scale uses the hearing threshold as a point of reference, defined as 0 dB. Other sound pressures are then compared to the reference pressure, and the logarithm is taken to keep the numbers in a practical range. Use of the decibel scale allows a million-fold increase in pressure to be expressed as 120 dB. Another useful aspect of the decibel scale is that changes in levels (dB) correspond closely to human perception of relative loudness.

The perceived loudness of sounds is dependent upon many factors, including sound pressure level and frequency content. In the range of usual environmental noise levels, perception of loudness is relatively predictable, and can be approximated by weighting the frequency response of a sound level measurement device (called a sound level meter) by means of the standardized A-weighting network. There is a strong correlation between A-weighted sound levels and community response to noise. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment. Figure A-1 illustrates typical A-weighted sound levels due to recognizable sources.

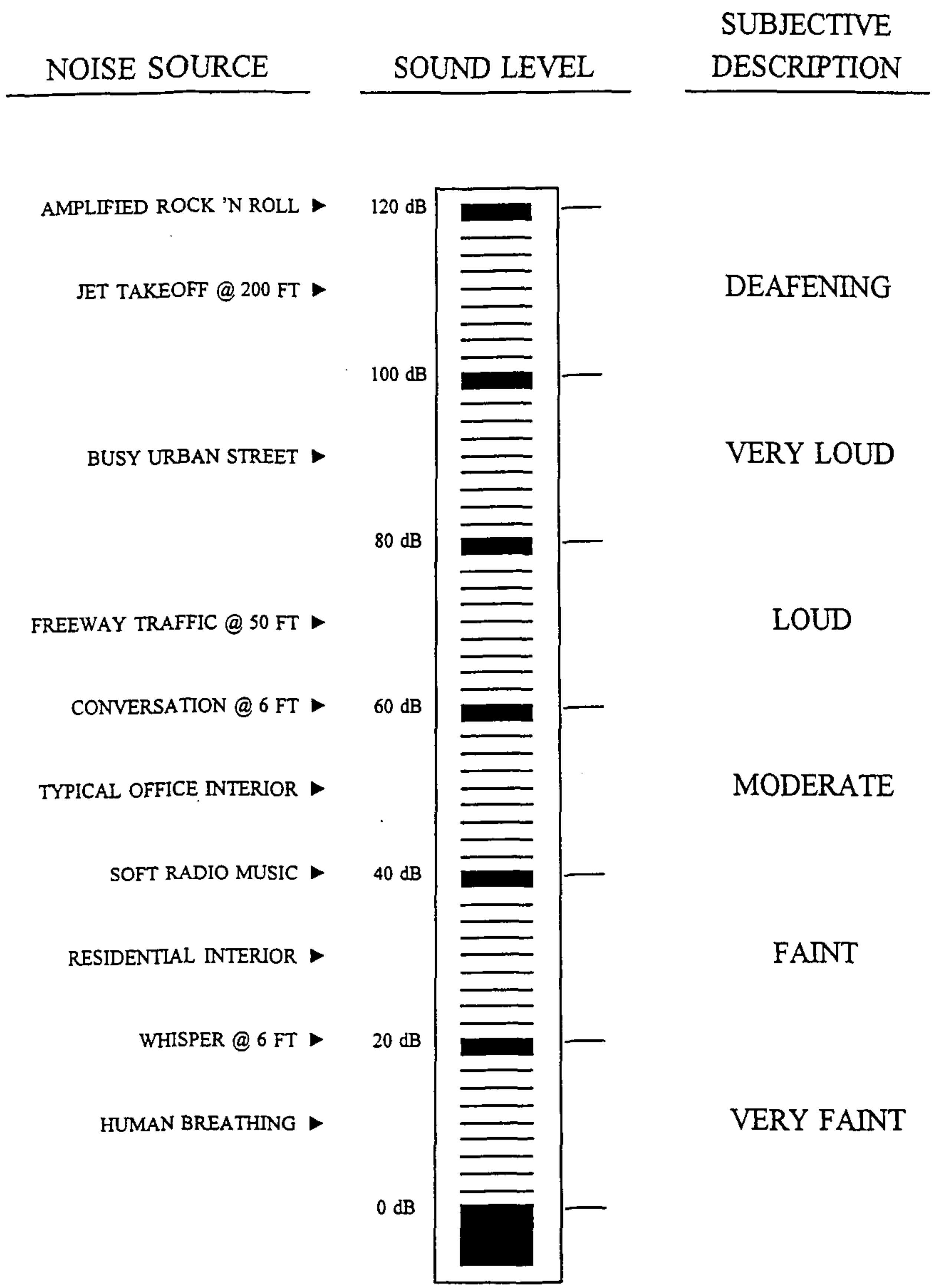
It is common to describe community noise in terms of the "ambient" noise level, which is defined as the all-encompassing noise level associated with a given noise environment. A common statistical tool to measure the ambient noise level is the average, or equivalent, sound level ($L_{eq}$), which is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

Two composite noise descriptors are in common use today: $L_{dn}$ and CNEL. The $L_{dn}$ (day-night average level) is based upon the average hourly $L_{eq}$ over a 24-hour day, with a +10 decibel weighting applied to nighttime (10:00 p.m. to 7:00 a.m.) $L_{eq}$ values. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were subjectively twice as loud as daytime exposures. The CNEL (Community Noise Equivalent Level), like $L_{dn}$, is also based upon the weighted average hourly $L_{eq}$ over a 24-hour day, except that an additional 4.77 decibel penalty is applied to evening (7:00 p.m. to 10:00 p.m.) hourly $L_{eq}$ values.

The CNEL was developed for the California Airport Noise Regulations, and is applied specifically to airport/aircraft noise assessment. The $L_{dn}$ scale is a simplification of the CNEL concept, but the two will usually agree, for a given situation, within 1 dB. Like the $L_{eq}$, these descriptors are also averages and tend to disguise variations in the noise environment. Because $L_{dn}$ and CNEL presume increased evening or nighttime sensitivity, they are best applied as criteria for land uses where nighttime noise exposures are critical to the acceptability of the noise environment, such as residential developments.

figure A-1 EXAMPLES OF NOISE LEVELS

# EXAMPLES OF SOUND LEVELS



Noise in the community has often been cited as being a health problem, not in terms of actual physiological damage, such as hearing impairment, but in terms of inhibiting general well-being and contributing to undue stress and annoyance. The health effects of noise in the community arise from the interference with human activities such as sleep, speech, recreation, and tasks demanding concentration or coordination. When community noise interferes with human activities or contributes to stress, public annoyance with the noise source increases, and the acceptability of the environment for people decreases. This decrease in acceptability and the threat to public well-being is the basis for land use planning policies directed towards the prevention of exposure to excessive community noise levels. There are also economic affects of community noise: reduction in property values, inefficiency in the workplace and lost hours due to stress.

To control noise from existing fixed sources, many jurisdictions have adopted community noise control ordinances. Such ordinances are intended to abate noise nuisances and to control noise from existing sources. They may also be used as planning tools if applied to the potential creation of a nuisance, or to potential encroachment of sensitive uses upon noise-producing facilities. Community noise control ordinances are generally designed to resolve noise problems on a short-term basis (usually by means of hourly noise level criteria), rather than on the basis of 24-hour or annual cumulative noise exposures.

**Criteria for Acceptable Noise Exposure:**

The *Guidelines for the Preparation and Content of the Noise Element of the General Plan* prepared by the State Health Department in 1976, includes recommendations for exterior and interior noise level standards to be used by local jurisdictions to identify and prevent the creation of incompatible land uses due to noise. The Health Department *Guidelines* contain a land use compatibility table which describes the compatibility of different land uses with a range of environmental noise levels in terms of $L_{dn}$ or CNEL. An exterior noise environment of 50 to 60 dB $L_{dn}$ or CNEL is considered to be "normally acceptable" for residential uses according to those guidelines. The recommendations in the Health Department *State Guidelines* also note that, under certain conditions, more restrictive standards may be appropriate. As an example, the standards for quiet suburban and rural communities may be reduced by 5 to 10 dB to reflect lower existing outdoor noise levels.

The U.S. Environmental Protection Agency (EPA) also prepared guidelines for community noise exposure in the publication *Information on the Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.* These guidelines are based upon assumptions regarding acceptable noise levels which consider occupational noise exposure as well as noise exposure in the home. The guidelines recognize an exterior noise level of 55 dB $L_{dn}$ as a goal to protect the public from hearing loss, activity interference, sleep disturbance and annoyance. The EPA notes, however, that this level is not a regulatory goal, but is a level defined by a negotiated scientific consensus without concern for economic and technological feasibility or the needs and desires of any particular community. The EPA and other governmental agencies have adopted suggested land use compatibility guidelines which indicate that residential noise exposures of 55 to 65 dB $L_{dn}$ are within acceptable limits.

For control of noise nuisances, a community noise control ordinance is the most appropriate tool. The State Health Department has prepared a *Model Community Noise Control Ordinance* which contains recommended noise standards in terms of "time-weighted" sound levels. The time-weighting concept allows discrimination of both short- and long-term noise exposures, and sets allowable levels for each. The *Model* recommends more stringent standards for residential land uses than for commercial and industrial, with the most stringent standards recommended for "rural suburban" situations. The primary exterior noise standard for rural residential uses is 50 dB in the daytime hours (7 a.m. to 10 p.m.), and 40 dB at night. The standard is expressed in terms of the level exceeded for 30 minutes of an hour, equivalent to the median level, or $L_{50}$. This ordinance format is successfully applied in many California cities and counties.

In addition to the A-weighted noise level, other factors should be considered in establishing criteria for noise sensitive land uses. For example, sounds with noticeable tonal content such as whistles, horns, or droning or high-pitched sounds may be more annoying than the A-weighted sound level alone will suggest. Many noise standards apply a penalty, or correction, of 5 dB to such sounds. The effects of unusual tonal content will generally be more of a concern at nighttime, when residents may notice the sound in contrast to previously-experienced background noise.

Because many rural residential areas experience very low noise levels, residents may express concern about the loss of "peace and quiet" due to the introduction of a sound which was not audible previously. In very quiet environments, the introduction of virtually any change in local activities will cause an increase in noise levels. A change in noise level and the relative loss of "peace and quiet" is the inevitable result of land use or activity changes in such areas. Audibility of a new noise source and/or increases in noise levels within recognized acceptable limits are not usually considered to be significant noise impacts, but these concerns should be addressed and considered in the planning and environmental review processes.

Table A-1 is commonly used to show expected public reaction to changes in environmental noise levels. This table was developed on the basis of test subjects' reactions to changes in the levels of steady-state pure tones or broad-band noise, or to changes in levels of a given noise source. It is probably most applicable to noise levels in the range of 50 to 70 dB, the usual range of voice and interior noise levels. It is probably not directly applicable to public perception of identifiable intrusive noise sources in very quiet environments because of the difference in frequency content between background noise sources and intrusive sounds, as well as the fact that the absolute amount of energy required to make a given change in sound pressure level is much smaller at low noise levels than at higher levels. Table A-1 should therefore only be applied in a general manner to show the relationship between changes in sound energy, sound pressure levels and subjective reaction.

The comparisons of subjective reaction outlined in Table A-1 are not applicable to noise exposures which are very quiet or very loud. For example, a whisper which is increased by 10 decibels, e.g., from 20 dB to 30 dB, remains a whisper, and would still be described as quiet. In contrast, an increase in the noise level of a diesel locomotive from 90 dB to 100 dB would be a change from a loud noise to a very loud noise. Thus the subjective reaction to a 10 dB change in either case may be different, even though the change in level is the same.

**TABLE A-1**

**SUBJECTIVE REACTION TO CHANGES IN NOISE LEVELS OF SIMILAR SOURCES**

| Increase in Sound Pressure Level, dB | Relative Increase in Acoustical Energy | Subjective Reaction |
|---|---|---|
| 1 | 1.26 times | Minimum Detectable Change (Lab) |
| 3 | 2.0 times | Usually Noticeable Change |
| 5 | 3.2 times | Definitely Noticeable Change |
| 10 | 10.0 times | Twice as Loud as Before |

Sources: Various, reported by Brown-Buntin Associates, Inc.

# APPENDIX B

## REQUIREMENTS FOR AN ACOUSTICAL ANALYSIS

An acoustical analysis prepared pursuant to the Noise Element shall:

A. Be the financial responsibility of the applicant.

B. Be prepared by a qualified person experienced in the fields of environmental noise assessment and architectural acoustics.

C. Include representative noise level measurements with sufficient sampling periods and locations to adequately describe local conditions and significant noise sources. Where actual field measurements cannot be conducted, all sources of information used for calculation purposes shall be fully described.

D. Estimate existing and projected (20 years) noise levels and compare those levels to the adopted policies of the Noise Element. Projected future noise levels shall take into account noise from planned streets, highways and road connections.

E. Recommend appropriate mitigation to achieve compliance with the adopted policies of the Noise Element, giving preference to proper site planning and design over mitigation measures which require the construction of noise barriers or structural modifications to buildings which contain noise-sensitive land uses.

F. Estimate noise exposure after the prescribed mitigation measures have been implemented.