CHAPTER 6 • NOISE ELEMENT

The Noise Element of the General Plan is a planning document which provides a policy framework for addressing potential noise impacts as the community grows and develops.

The content of the 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 *Guidelines for the Preparation and Content of Noise Elements of the General Plan* adopted and published by the California Office of Noise Control (ONC) in 1976.

Government code Section 65302 establishes the requirements for preparation of a Noise Element.

The ONC Guidelines require that major noise sources be quantified by preparing generalized noise exposure contours for current and projected conditions. The Noise Element shall be used as a guide for establishing land use patterns that minimize noise impacts on the Community and shall include measures and solutions to address existing and foreseeable noise conflicts.

According to the Government Code requirements, current and projected noise exposure information shall be included in the Noise Element for the following major noise sources:

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

Noise-sensitive uses identified by the Government Code and the City of Firebaugh include the following:

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

The Noise Element is intended to minimize future noise conflicts. A noise control ordinance may be used to address noise levels generated by existing and future local industrial, commercial, agricultural and residential uses,

which are not regulated by federal or state noise level standards.

The regulation of noise sources such as traffic on highways, freeways and other public roadways under State or federal jurisdiction, 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 control ordinance. The Noise Element addresses the prevention of noise conflicts from all of these sources.

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 presently exceeds 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 sources of noise and 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 will be considered by the Housing Element.

3. **Circulation**: The circulation system, which can be 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 must 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.

EXISTING AND FUTURE NOISE ENVIRONMENT

Overview of Sources

Based on the requirements of the Government Code and the field studies conducted during the preparation of the Noise Element, it was determined that there are several potentially significant sources of community noise within the City. These sources include:

- traffic on State Highway 33 and other local roads, particularly major streets, including 13th Street, Nees Avenue, Clyde Fannon Road, Saipan Street and Morris Kyle Drive, among others;
- aircraft operating from Firebaugh Municipal Airport.
- Railroad traffic
- Industrial operations, which are generally located west of State Highway 33.

SOUND AND THE HUMAN EAR

Because of the ability of the human ear to detect a wide range of sound pressure fluctuations, sound pressure levels are expressed in logarithmic units called decibels. The sound pressure level in decibels is calculated by taking the log of the ratio between the actual sound pressure and the reference sound pressure squared. The reference sound pressure is considered the absolute hearing threshold.

In addition, because the human ear is not equally sensitive to all sound frequencies, a specific frequency-dependent rating scale was devised to relate noise to human

Table 6-1:
ACOUSTICAL TERMINOLOGY

The following terminology has been used for purposes of the Noise Element:

Ambient Noise Level: The composite of noise from all sources near and far. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.

CNEL: Community Noise Equivalent Level. 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 p.m. to 10p.m. and ten decibels to sound levels in the night before 7 a.m. and after 10 p.m.

Decibel, dBA: A unit for describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micro-newtons per square meter).

DNL/L_{dn}: Day/Night Average Sound Level. The average equivalent sound level during a 24-hour day, obtained after addition often decibels to sound levels in the night after 10:00 p.m. and before 7:00 a.m.

L_{eq}: Equivalent Sound Level. 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.

L_{eq}(h): The hourly value of $L_{eq.}$

L_{max}: The maximum noise level recorded during a noise event

L_n: The sound level exceeded "n" percent of the time during a sample interval (L_{90}, L_{50}, L_{10}, etc.). L_{10} equals the level exceeded 10 percent of the time.

continued on following page

sensitivity. A dBA scale performs this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear. The basis for comparison is the faintest sound audible to the average ear at the frequency of maximum sensitivity. This dBA scale has been chosen by most authorities for purposes of environmental noise regulation. Typical indoor and outdoor noise levels are presented in Table 6-2.

Unfortunately, there is no completely satisfactory way to measure the subjective effects of noise, or of the corresponding reactions of annoyance and dissatisfaction. This is primarily because of the wide variation in individual thresholds of annoyance and habituation to noise over differing individual experiences with noise.

Thus, an important way of determining a person's subjective reaction to a new noise is the comparison of it to the existing environment, referred to as the "ambient" environment. In general, the more new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged by the hearers.

Table 6-1
ACOUSTICAL TERMINOLOGY
(continued)

L_n(h): The hourly value of L_n.

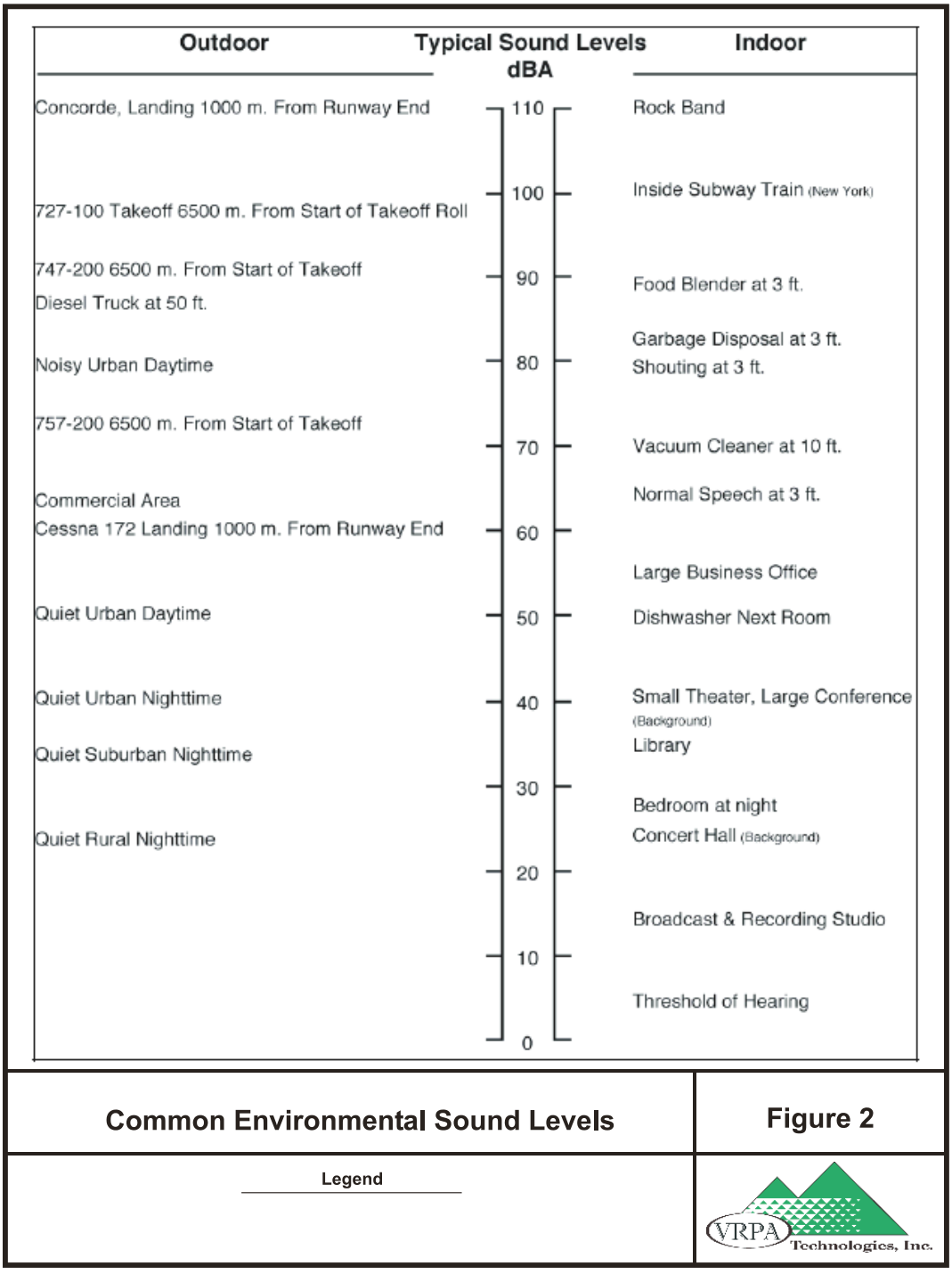
Noise Exposure Contours: Lines drawn about a noise source indicating constant levels of noise exposure. CNEL and DNL contours are frequently utilized to describe community exposure to noise.

SEL or SENEL: Sound Exposure Level or Single Event Noise Exposure Level. The level of noise accumulated during a single noise event, such as an aircraft overflight, with reference to the duration of one second. More specifically, it is the time-integrated A-weighted squared sound pressure for a stated time interval or event, based on a reference pressure of 20 micropascals and the reference duration of one second

Sound Level: The sound pressure level in decibels as measured on a sound level meter using the A-weighing filter network. The A-weighing filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the response of the human ear and gives good correlation with subjective reactions to noise.

Note: *CNEL and DNL represent daily levels of noise exposure averaged on an annual basis,* while L_n *represents the average noise exposure for a shorter time period, typically one hour.*

Table 6-2: *Common Environmental Sound Levels*



Common Environmental Sound Levels	Figure 2
Legend	VRPA Technologies, Inc.

With regard to increases in A-weighted noise levels, knowledge of the following relationships will be helpful in understanding this report:

- Except in carefully controlled laboratory experiments, a change of 1 dB cannot be perceived by humans.
- Outside of the laboratory, a 3 dB change is considered a just-perceivable difference.
- A change in level of at least 5 dB is required before any noticeable change in community response would be expected.
- A 10 dB change is subjectively heard as approximately a doubling in loudness.

NEGATIVE EFFECTS OF NOISE ON HUMANS

Negative effects of noise exposure include physical damage to the human auditory system, interference, and disease. Exposure to noise may result in physical damage to the auditory system, which may lead to gradual or traumatic hearing loss. Gradual hearing loss is caused by sustained exposure to moderately high noise levels over a period of time, while traumatic hearing loss is caused by sudden exposure to extremely high noise levels over a short period of time. However, gradual and traumatic hearing loss both may result in permanent hearing damage. In addition, noise may interfere with or interrupt sleep, relaxation, recreation, and communication.

Although most interference may be classified as annoying, the inability to hear a warning signal may be considered dangerous. Noise may also be a contributor to diseases associated with stress, such as hypertension, anxiety, and heart disease. The degree to which noise contributes to such diseases is dependent upon the noise frequency, bandwidth, level, and exposure time.

Noise may also be a contributor to diseases associated with stress, such as hypertension, anxiety, and heart disease.

CHARACTERISTICS OF SOUND PROPAGATION AND ATTENUATION

Noise can be generated by a number of sources, including mobile sources such as automobiles, trucks, and airplanes, and stationary sources such as construction sites, machinery, and industrial operations. Noise generated by mobile sources typically attenuates (is reduced) at a rate between 3.0 and 4.5 dBA per doubling of distance. The rate depends on the ground surface and the number or type of objects between the noise source and the receiver. Hard and flat surfaces, such as concrete or asphalt, have an attenuation rate of 3.0 dBA per doubling of distance. Soft surfaces, such as uneven or vegetated terrain, have an attenuation rate of about 4.5 dBA per doubling of distance. Noise generated by stationary sources typically attenuates at a rate between 6.0 and about 7.5 dBA per doubling of distance. Sound levels can be reduced by placing barriers between the noise source and the receiver. In general, barriers contribute to decreasing noise levels only when the structure breaks the "line of sight" between the source and the receiver. Buildings, concrete walls, and berms can all act as effective noise barriers. Wooden fences or broad areas of dense foliage can also reduce noise, but are less effective than solid barriers.

In general, barriers contribute to decreasing noise levels only when the structure breaks the "line of sight" between the source and the receiver.

METHODOLOGY

When preparing a noise analysis, guidelines set by affected agencies must be followed. Acoustical terminology used for this element is documented in Table 6-1. In analyzing noise levels, the Federal Highway Administration's (FHWA) Highway Traffic Noise Prediction methodology must be applied. Safety concerns must also be analyzed to determine the need for appropriate mitigation resulting from increased noise due to increased traffic resulting from growth facilitated by the General Plan and other evaluations such as the need for noise barriers and other noise abatement improvements. Unless otherwise stated, all sound levels reported are in A-weighted decibels (dBA). 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 use A-weighting, as it

provides a high degree of correlation with human annoyance and health effects.

First, existing "baseline" traffic noise levels are established based on previously collected traffic data and using Traffic Noise Model (TNM) Version 2.5. TNM 2.5 is an FHWA Traffic Noise Prediction Program. Once existing levels are established, future levels, based on expected traffic growth, are calculated and compared to both the existing noise level and the maximum allowable noise exposure based on the General Plan. The Noise Element identifies a maximum exterior noise exposure level of 60 L_{dn} dB for outdoor residential and recreational areas. For interior areas a maximum of 45 L_{dn} dB is required.

EXISTING TRAFFIC NOISE

Existing traffic noise levels were evaluated using the TNM 2.5 Prediction Model. Traffic volumes collected from the 2030 Circulation Element were entered into the model to estimate noise levels at nearby sensitive receptors.

To assess the traffic noise impacts from adjacent roads the first step is to determine the baseline or existing noise condition. The second is to then compare the baseline to future level results, based on expected traffic growth, and the maximum allowable noise exposure.

To assess existing noise conditions, VRPA Technologies (noise consultant retained by the City) staff compiled current traffic counts and existing geometric conditions. Staff conducted noise level measurements within the planning area on June 5, 2007. The purpose of the measurements was to evaluate the accuracy of the model in describing traffic noise exposure within the planning area. The planning area and noise-monitoring sites are shown in Map 6-1. The noise-monitoring sites represent nearby sensitive receptors and land uses.

Noise monitoring equipment consisted of an Extech Type 2 sound level meter datalogger. Noise measurements were conducted in terms of the equivalent energy sound level (L_{eq}). Measured L_{eq} were compared to L_{eq} values calculated (predicted) by the Sound 2000 model. Traffic volumes, truck mix and vehicle speeds were used as inputs to the model.

Results of the noise analysis are reflected in Table 6-3. The existing noise levels at each receptor are currently below the City of Firebaugh's General Plan standards for exterior noise.

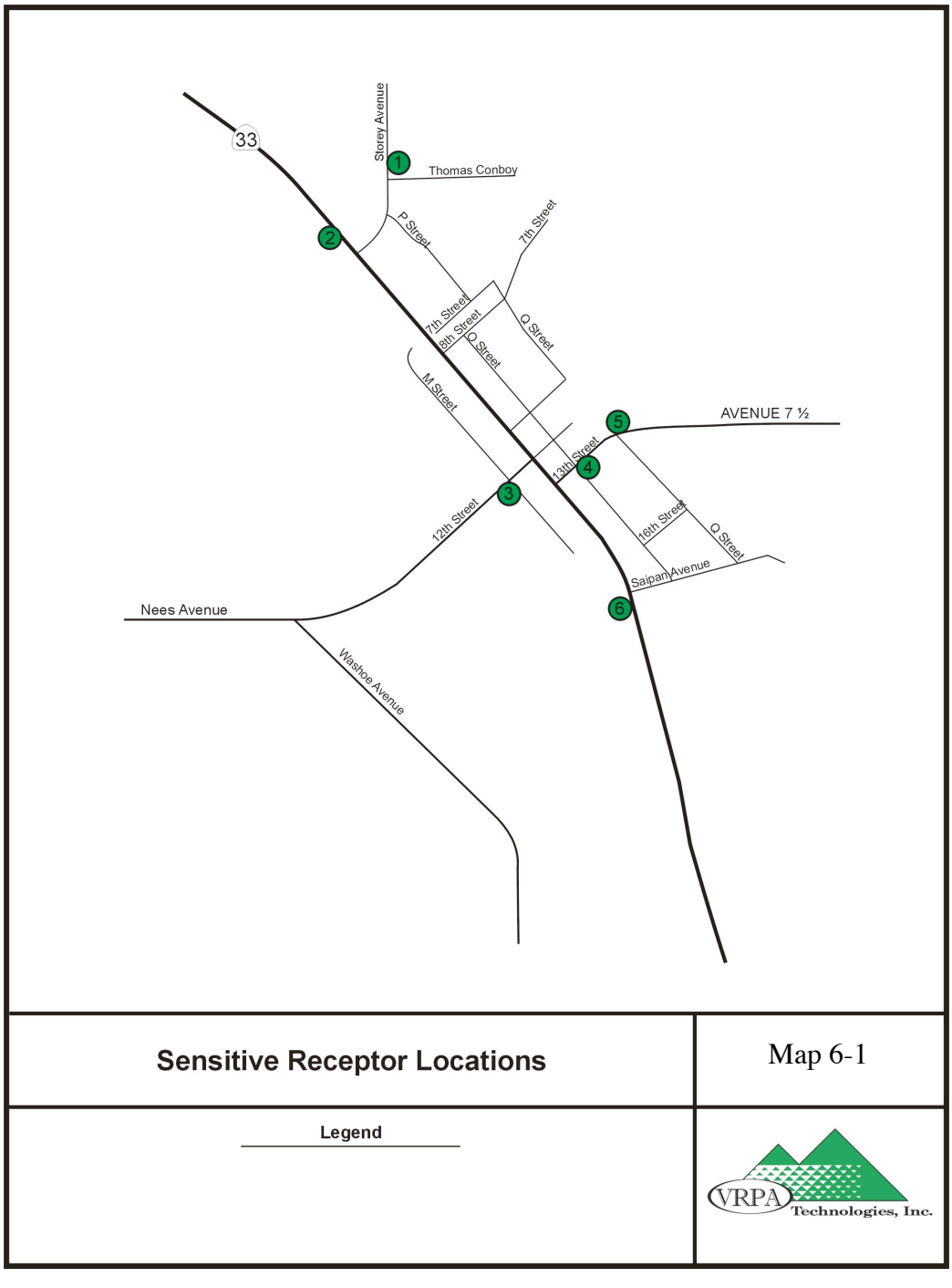
Table 6-3
Noise Impacts for Existing and Future Conditions

Receptor	Existing *Leq* Measured	Existing Leq Predicted	Diff. (Model Calibration Amount)	Future 2030 Predicted
Receptor 1	51.1	55.0	3.9	54.9
Receptor 2	55.5	57.8	2.3	56.3
Receptor 3	59.5	58.0	1.5	62.6
Receptor 4	57.1	50.8	6.3	60.7
Receptor 5	60.0	53.1	6.9	63.2
Receptor 6	56.5	59.8	3.3	60.2

Source: VRPA Technologies, 2007

Map 6-1

Sensitive Receptor Locations



GOALS, OBJECTIVES AND ACTION PLANS

The goals of the City of Firebaugh Noise Element are:

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

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

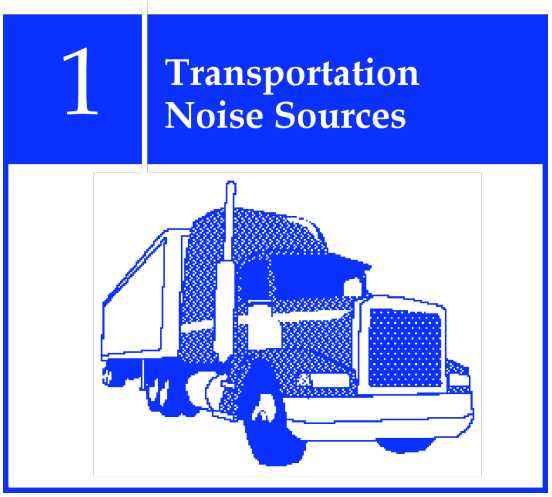
3. To preserve the tranquility of residential areas by preventing noise-producing uses from encroaching upon existing or planned noise-sensitive uses.

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

Objectives

The following specific objectives have been adopted by the City of Firebaugh to accomplish the goals of the Noise Element:

ISSUE ONE: **Transportation Noise Sources**



1. New development of noise-sensitive land uses (residential, schools, health-care facilities, libraries, churches, etc.) shall not be permitted in areas exposed to existing or projected future levels of noise from transportation noise sources which exceed 60 dB Ldn/CNEL in outdoor activity areas and 45 dB Ldn/CNEL in interior spaces.

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

        Time Frame: Ongoing
        Responsibility: City Planner

    b. Where the development of a project may result in land uses being exposed to existing or projected future noise levels exceeding the levels specified by the policies of the Noise Element, the City shall require an acoustical analysis 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 a building permit. The requirements for the content of an acoustical analysis are given in Table 6-4.

        Time Frame: Ongoing, during project review
        Responsibility: City Planner

2. Noise created by new transportation noise sources, including roadway improvement projects, shall be mitigated so as not to exceed 60 dB Ldn/CNEL within the outdoor activity areas and 45 dB Ldn/CNEL in interior spaces of existing noise sensitive land uses.

    a. The City 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.

Time Frame: Ongoing, during project review
Responsibility: City Planner

b. The City shall request the the Sheriff's office and the California Highway Patrol to actively enforce the California Vehicle Code sections relating to adequate vehicle mufflers and modified exhaust systems.

Time Frame: Annually, ongoing
Responsibility: Police Chief

3. The City shall continue to work cooperatively with the Fresno County Airport Land Use Commission to implement the County's Airport Land Use Plan. Projects that are proposed within the control areas of the Airport Land Use Plan shall be referred to the County for review, consistent with policies contained in the Plan.

a. The City Planner shall review projects and refer them to the County Airport Land Use Commission for review and action, consistent with requirements of the Fresno County Airport Land Use Plan, including applicable noise standards.

Time Frame: Ongoing, during project reviews
Responsibility: City Planner

Table 6-4
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. Where actual field measurements cannot be conducted, all sources of information used for calculation purposes shall be fully described. When the use being studied is a commercial use, all noise sources related to the service and maintenance of the facility shall be considered, including parking lot and landscape maintenance, refuse collection and truck loading/unloading activities.

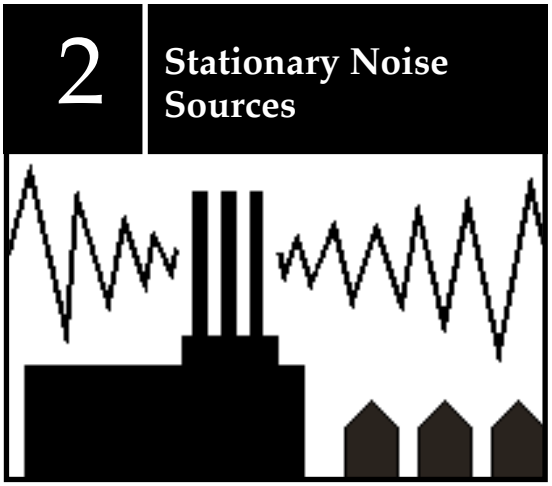
D. Estimate existing and projected (20 years) noise levels, and compare those levels to the adopted policies of the Noise Element. Projected future noise levels shall take into account noise from planned streets, highways and road connections.

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.

G. Describe a post-project assessment program which could be used to evaluate the effectiveness of the proposed mitigation.

ISSUE TWO: **Stationary Noise Sources:**



1. 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 6-5.

    a. The City shall not permit new stationary sources that exceed maximum allowable decibel levels established by this Element.

        Time Frame: Ongoing, during project reviews
        Responsibility: City Planner

    b. The City shall require compliance with the State Noise Insulation Standards and Chapter 35 of the Uniform Building Code (UBC) concerning interior noise exposure for multi-family housing, hotels and motels.

        Time Frame: Ongoing
        Responsibility: Police Department and Code Enforcement officer

2. 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 6-6 on lands used or designated for noise-sensitive uses.

    a. The City 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.

        Time Frame: Ongoing
        Responsibility: City Planner, Police Department

    b. The City shall periodically review and update the Noise Element to ensure that noise exposure information and specific policies are consistent with changing conditions within the City and with noise

control regulations or policies enacted after the adoption of this element.

Time Frame: Every five years
Responsibility: City Planner

3. New noise-sensitive uses that are proposed within 1,000 feet of an existing industrial use, or new industrial uses that are proposed within 1,000 feet of existing noise-sensitive uses should be further investigated to determine if noise levels satisfy the standards shown in Table 6-6.

   a. The Planning Director shall implement this requirement on a case by case basis.

   Time Frame: Ongoint, during project reviews
   Responsibility: City Planner

Table 6-5
Maximum Allowable Noise Exposure - Stationary Sources (1)

	Daytime (7 a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)
Hourly Leq. 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.

Table 6-6
Maximum Allowable Noise Exposure-Stationary Noise Sources (1)

	Daytime (7 am to 10 pm)	Nighttime (10 pm to 7 am)
Hourly Leq, dB	55	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.