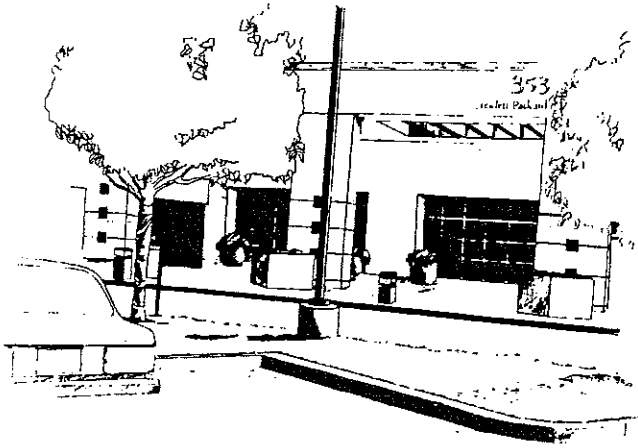




Chapter 6.
Noise Element



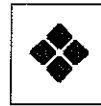
Noise Introduction

Noise Element Purpose

Noise is generally defined as unwanted sound. Whether a sound is unwanted depends on when and where it occurs, what the listener is doing when it occurs, characteristics of the sound (loudness, pitch and duration, speech or music content, irregularity) and how intrusive it is above background sound levels. The purpose of the Noise Element is to appraise existing noise problems in the community and to provide guidance to planners and developers for avoiding problems in the future.

The Noise Element also provides a basis for the regulations prescribed in City ordinances and implemented through the City's Code Enforcement program. In particular, the Noise Ordinance, amended in 1989 and included as part of Title 17 (Zoning) of the Foster City Municipal Code, establishes quantifiable noise standards for nuisance or single-event noise sources consistent with maintaining the health and tranquility within residential areas and the community as a whole.

This chapter is a major revision of the 1976 Noise Element of the Foster City General Plan. The Noise Element is most closely associated with the Land Use and Circulation Element and Residential Neighborhoods Conservation Element. Specific concerns include: (1) establishment of noise compatible land uses; (2) regulation of new



THE VISION OF FOSTER CITY AS PRESENTED IN THE NOISE ELEMENT

The Noise Element of the Foster City General Plan has three primary concerns:

■ *Preserve and Improve the "Quiet Ambiance" within Existing Neighborhoods.*

Provide a basis for enforcing noise standards to minimize the intrusive effects of nuisance or single-event noise sources (such as construction noise, amplified music, etc.) on the day-to-day quality of life in Foster City.

■ *Assure the Proper Development of Undeveloped Property.*

Integrate noise considerations with the Land Use and Circulation Element, and evaluate the impacts and appropriateness of new development with the noise environment of the City.

■ *Assure that Redevelopment of Developed or Underutilized Property Occurs in a Manner Compatible with Existing Land Uses.*

Establish mitigation measures for any changes in land use as are reasonably necessary to assure compatibility with the surrounding area.

development to limit noise impacts on noise-sensitive uses; (3) minimization of traffic noise; and (4) enforcement of noise standards to protect the existing quality of life.

State Law Requirements

A Noise Element has been required as part of local General Plans since 1971. The State Legislature adopted the California Noise Control Act of 1973, which defined the following findings and policy:

- (1) Excessive noise is a serious hazard to the public health and welfare.
- (2) Exposure to certain levels of noise can result in physiological, psychological, and economic damage.
- (3) There is a continuous and increasing bombardment of noise in the urban, suburban, and rural areas.

- (4) Government has not taken the steps necessary to provide for the control, abatement, and prevention of unwanted and hazardous noise.
- (5) It is the policy of the State to provide an environment for all Californians free from noise that jeopardizes their health or welfare.

To implement this policy, Section 65302(f) of the California Government Code requires each city to have a Noise Element as part of its General Plan (see excerpt from the Government Code). The Government Code states that the Noise Element should be prepared according to guidelines established by the State Department of Health Services, Office of Noise Control.

Summary of Key Noise Issues in Foster City

The two major sources of noise in Foster City are traffic noise, primarily from State Route 92, Highway 101 and major City arterial streets, and aircraft noise from San Francisco International Airport and San Carlos Municipal Airport. The Noise Element is particularly concerned with planning for land uses that are typically sensitive to noise impacts, including residential development, nursing homes, schools, wildlife sanctuaries, hospitals and treatment centers.

Noise impacting residential neighborhood quality of life is of special importance in the Foster City Noise Element. Examples of potential noise generators in residential neighborhoods include, among others, special events, retail center operations and the location of play areas (such as school and park play areas). The Noise Element establishes the basis for Code Enforcement and regulation through the Noise Ordinance to control nuisances such as off-hour truck unloading and trash pickup, barking dogs, loud music and vehicle noise.

STATE LAW REQUIREMENTS FOR NOISE ELEMENTS

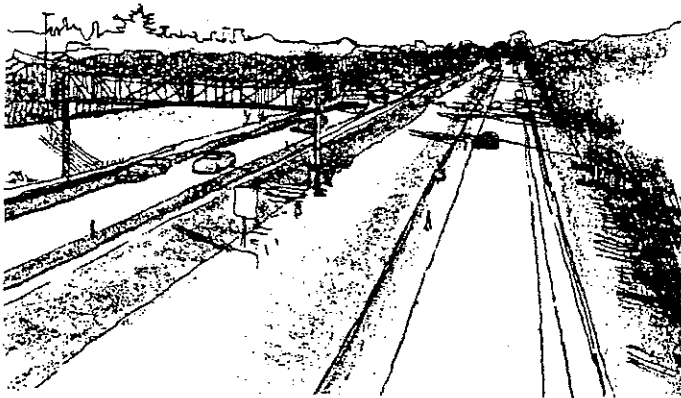
Government Code Section 65302(f): "A noise element which shall identify and appraise noise problems in the community. The noise element shall recognize the guidelines established by the Office of Noise Control in the State Department of Health Services and shall analyze and quantify, to the extent practicable, as determined by the legislative body, current and projected noise levels for all of the following sources:

- (1) Highway and freeways.
- (2) Primary arterials and major local streets.
- (3) Passenger and freight on-line railroad operations and ground rapid transit systems.
- (4) Commercial, general aviation, heliport, helistop, and military airport operations, aircraft overflights, jet engine test stands, and all other ground facilities and maintenance functions related to airport operation.
- (5) Local industrial plants, including, but not limited to, railroad classification yards.
- (6) Other ground stationary noise sources identified by local agencies as contributing to the community noise environment.

Noise contours shall be shown for all of these sources and stated in terms of community noise equivalent level (CNEL) or day-night average level (Ldn). The noise contours shall be prepared on the basis of noise monitoring or following generally accepted noise modeling techniques for the various sources identified in paragraphs (1) to (6), inclusive.

The noise contours shall be used as a guide for establishing a pattern of land uses in the land use element that minimizes the exposure of community residents to excessive noise.

The noise element shall include implementation measures and possible solutions that address existing and foreseeable noise problems, if any. The adopted noise element shall serve as a guideline for compliance with the state's noise insulation standards."



Noise Background

Introduction to Environmental Noise

Understanding environmental noise requires a familiarity with the physical description of noise and the way humans react to different noises. The important physical characteristics of environmental noise include frequency (pitch), amplitude (loudness) and duration. The effects of noise on people can be grouped in three general categories: (1) subjective effects, such as annoyance and nuisance; (2) interference with activities, such as speech and sleep; and (3) physiological effects, such as startle and hearing loss.

The standard unit of sound measurement, which includes both loudness and frequency, is the decibel, abbreviated "dBA". Filters are used with sound level measuring equipment to emphasize various frequency or pitch ranges. The "A" filter is most commonly used since it comes closest to matching the frequency response of the human ear. Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. The pressure fluctuation is caused by a vibrating object. It is received by the ear and perceived by the brain as sound.

Sound pressure levels measured in decibels are calculated on a logarithmic basis. An increase of 10 decibels represents a tenfold increase in sound pressure, or acoustic energy. Zero dBA is the faintest sound a good human ear can hear. Upper limits are approximately 140-160 dBA. The ear begins to feel pain at about 120 dBA.

DEFINITIONS OF COMMON NOISE TERMS

Decibel (dB): A decibel is a unit 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 micronewtons per square meter).

Frequency (Hz): Frequency is the number of complete pressure fluctuations per second above and below atmospheric pressure.

A-Weighted Sound Level (dBA): The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted.

L01, L10, L50, L90: The A-weighted noise levels that are exceeded 01%, 10%, 50%, and 90% of the time during the measurement period.

Equivalent Noise Level (Leq): The average A-weighted noise level during the measurement period.

Community Noise Equivalent Level (CNEL): The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels to levels in the evening from 7:00 PM to 10:00 PM and after addition of 10 decibels to sound levels in the night between 10:00 PM and 7:00 AM.

Day/Night Noise Level (Ldn): The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 PM and 7:00 AM.

Ambient Noise Level: The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.

Intrusive Noise: That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

The Effects of Noise

The noise environment has a significant impact on the City's overall quality of life. Environmental noise, in almost every case, produces effects which are subjective in nature or involve interference with

human activity. However, brief sounds at levels exceeding 70 dBA can produce temporary physiological effects such as constriction of blood vessels, changes in breathing and dilation of the pupils. Steady noises of 90 dBA have been shown to increase muscle tension and adversely affect simple decision making. Long-term exposure to levels exceeding 70 dBA can cause hearing loss.

Typical Sound Levels Measured in the Environment and Industry
A-Weighted Sound Pressure Level in Decibels

	140	
	130	Threshold of Pain
Civil Defense Siren (100')	120	
Jet Takeoff (200')	110	Rock Music Band Piledriver (50')
Riveting Machine	100	Ambulance Siren (100')
Diesel Bus (15')	90	Boiler Room Printing Press Plant
BART Train Passby (10')	80	Garbage Disposal in Home (3')
Pneumatic Drill (50')	70	Inside Sports Car (50 mph)
Freight Cars (100')	60	Data Processing Center Department Store
Vacuum Cleaner (10') Speech (1')	50	Private Business Office Light Traffic (100')
Auto Traffic Near Freeway	40	Typical Minimum Nighttime Levels - Residential Areas
Large Transformer (200') Average Residence	30	
Soft Whisper (5')	20	Recording Studio
Rustling Leaves	10	Mosquito (3')
Threshold of Hearing	0	

(100') = Distance in feet between source and listener

Source: Illingworth & Rodkin, 1991.

The degree of noise impact can depend on people's awareness and attitudes. People are more likely to object to noise they believe is unnecessary and less likely to object to sounds associated with safety concerns. Attitudes that can decrease noise impacts are whether one's employment is derived

MEDICAL AND ECONOMIC EFFECTS OF NOISE

Medical and Annoyance Effects of High Noise Levels: According to the Environmental Protection Agency (EPA), damage to the human ear can occur at about 70 dBA. Permanent hearing damage can occur at 80-85 dBA, if sustained over 8 hours a day over the course of a worker's career. Higher levels cause hearing damage in a shorter period of time. Noise above 40-45 dBA can disturb a sleeping person: whether a person awakens will depend on noise levels, type of noise, stage of sleep, age, and so on. Older people and persons who are ill are particularly susceptible to sleep interference caused by noise. Speech interference begins occurring at 45-50 dBA, and becomes severe at 60 dBA or above. Sounds above 70dBA can cause physical stress reactions, such as tightening of the stomach muscles, increased heartbeat and adrenaline flow. Over a period of time these reactions can lead to ulcers, intestinal malfunctions, and heart disease.

Economic Effects of High Noise Levels: Studies have found that work performance can be affected at noise levels of 65 dBA and above. Some effects of noise on work performance are as follows: Noise is more likely to reduce the accuracy of work than to reduce quantity. Complex tasks are more likely to be affected by noise. Higher frequency, intermittent and impulsive sounds are more disruptive than lower or more steady state sounds. Noise causes higher accident rates. Other adverse economic costs of noise are housing turnover, soundproofing for noise-producing equipment and noise-impacted buildings, and the costs of constructing noise barriers adjacent to noise sources.

from it, or whether the noise is viewed as a typical condition and there is little that can be done about it.

In any typical noise environment, about 10 percent of the population will object to any noise not of their own making and 25 percent will not react or complain at all, regardless of the level of noise being generated (Illingworth & Rodkin, 1991). Noise control measures then are most beneficial to the remaining 65 percent of the population who are neither ultrasensitive nor insensitive to noise.

Negative reaction to noise generally increases with the increase in difference between background, or ambient, noise and the noise generated from a particular source such as traffic or railroad operations. In most situations, noise control measures need to reduce noise by five to ten dBA in order to effectively reduce complaints.

People generally have the ability to distinguish one sound from a background of sounds, such as a telephone ringing over music. However, certain noise levels can render a sound inaudible, for example, when heavy trucks interfere with a conversation. Face-to-face conversation usually can proceed where the noise level is up to 66 dBA, group conversations up to 50 or 60 dBA, and public meetings up to 45 or 55 dBA, without interruption.

Sleep interference is more difficult to quantify, although studies have shown that progressively deeper levels of sleep require louder noise levels to cause a disturbance. The California Office of Noise Control (ONC) recommends that individual events within sleeping areas should not exceed 50 dBA in residential areas exposed to noise levels of 60 Ldn or greater. Interior noise standards of 45 Ldn will protect against sleep interference in most typical traffic noise environments.

Background Basis for Noise Standards

It is difficult to specify noise levels which are generally acceptable to everyone. What is annoying to one person may be unnoticed by another. Standards may be based on documented complaint activity in response to documented noise levels, or based on studies on the ability of people to sleep, talk or work under various noise conditions. All such studies, however, recognize that individual responses vary considerably. Standards usually address the needs of most of the population.

With this caution in mind, noise standards for planning purposes need to examine outdoor and indoor noise levels acceptable for different uses. The standards must relate to existing conditions in the City so that they are realistically enforceable and consistent with other General Plan objectives. The State Government Code requires that sound level information in noise elements of general plans be expressed in Ldn or CNEL, as described earlier.

Background on Noise Standards

The Ldn noise descriptor was developed by the United States Environmental Protection Agency (EPA) in the early 1970's to assess the compatibility of residential development with various levels of environmental. The EPA, under the direction of the

United States Congress, determined that an Ldn of 55 dB is the level requisite to protect the public health and welfare in residential areas where outdoor use is important. Their recommendation included a 5 decibel factor of safety. Their studies indicate that at an Ldn of 60 decibels, there begin to be significant problems with speech interference outdoors and activity and sleep disturbance problems indoors. The noise level near State Route 92 clearly exceeds acceptable levels.

The outdoor noise environment throughout the United States varies considerably. Outdoor Day-Night Average (Ldn) sound levels can be as low as 30 to 40 dBA (Ldn) in wilderness areas and as high as 85-90 dBA (Ldn) in noisy industrial urban areas. The EPA has estimated that nearly half of the nation's metropolitan population live in areas exposed to levels between 55 to 60 dBA (Ldn). Generally, in Foster City, Ldn levels in residential areas and in backyard areas shielded by homes from major roads are below 60 dBA (Ldn).

Land Use Compatibility Standards

To provide a satisfactory noise environment and to minimize complaints about community noise, the City must have standards for evaluating compatibility with respect to outdoor and certain indoor noise levels. The purpose of a land use compatibility analysis is to screen projects which may require specific design considerations to mitigate noise impacts. The noise exposure contours, as described in the previous section, will be used in conjunction with the land use compatibility considerations to make such a determination. This could apply to both new and major redevelopment projects. A noise compatibility table is included below as a basis for determining land use compatibility with the City's noise environment.

The noise exposure in the compatibility table refers to the outdoor day/night average noise level (Ldn). A project in the "normally acceptable" category would be acceptable in terms of both its indoor/outdoor noise exposure without special noise abatement measures. Where outdoor noise exposure is less important, projects can be designed to provide acceptable interior environments in the "conditionally acceptable" category. This may involve providing air

Land Use Compatibility Standards

Land Use Category	Community Noise Exposure Ldn dB					
	55	60	65	70	75	80
Residential	█	█	█	█	█	█
Transient Lodging	█	█	█	█	█	█
Schools, Libraries, and Hospitals	█	█	█	█	█	█
Auditoriums and Concert Halls	█	█	█	█	█	█
Sports Arena	█	█	█	█	█	█
Playgrounds and Parks	█	█	█	█	█	█
Golf Courses and Riding Stables	█	█	█	█	█	█
Office Buildings and Business Commercial	█	█	█	█	█	█
Industrial and Manufacturing	█	█	█	█	█	█

NORMALLY ACCEPTABLE
Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal construction, without any special noise insulation requirements

CONDITIONALLY ACCEPTABLE
New construction or development should be undertaken only after a detailed analysis of noise reduction requirements is made and needed noise insulation features included in the design.

NORMALLY UNACCEPTABLE
New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in design.

CLEARLY UNACCEPTABLE
New construction or development clearly should not be undertaken.

Source: Derived from Land Use and Compatibility table developed by the California Office of Noise Control

construction can provide the higher end of the range). Typically, if outdoor noise is less than 60 dBA (Ldn), average wall and window construction will reduce noise levels below 45 dBA (Ldn), even with partially open windows. Closed windows and mechanical ventilation may be needed where outdoor noise levels are above 60 dBA (Ldn).

State Noise Insulation Standards

State Noise Insulation Standards are consistent with the Office of Noise Control residential Land Use Compatibility standards. In 1974, the State adopted Noise Insulation Standards (Title 25, State Administrative Code) for new hotels, motels, and dwellings other than single family detached dwellings. Those standards established 45 dBA (Ldn) as the maximum interior sound level (attributable to exterior sources) in any room. Where exterior sound levels are 60 dBA (Ldn) or above, acoustical analyses for projects are required to ensure that the structure has been designed to limit outside noise to the allowable interior levels.

The State Noise Insulation Standards also include standards to be met for sound transmission between units. One of the purposes of requiring noise elements in local general plans is to help implement State insulation regulations by identifying where special remedial measures are required.

Indoor Noise Standards

There is general concurrence that a day-night average of 45 decibels (45 dBA [L_{dn}]) is the highest acceptable residential interior noise level. However, this standard is not very protective against sleep disturbance. Establishing a local standard of 40 dBA (L_{dn}) for new bedrooms in any multiple family projects would protect against sleep interference and would encourage building designs which locate sensitive sleeping areas on the quieter side of the building. Such a standard would also be appropriate for sleeping rooms in hospitals and nursing homes, where people are particularly sensitive to sleep interference from noise.

The basis for establishing indoor noise levels for other uses would be to minimize disturbance, maintain adequate speech communication and protect against hearing loss. Appropriate interior noise levels in commercial buildings is dependent on the use of the space. For example, noise levels

conditioning so that windows can remain closed, or, at higher levels, sound rated windows and walls. Acoustical reports should be required where the noise exposure is "conditionally acceptable" or "normally unacceptable", especially for multiple family projects.

The intent of the 60dBA (Ldn) standard is to provide, either through design, location or insulation, for interior noise levels no greater than 45dBA (Ldn), which is generally accepted as the maximum acceptable noise level for most indoor residential activities. This assumes that the typical building reduces outdoor noise by 10-15 decibels with windows open and 20-24 decibels with windows closed (smaller windows and better

in private offices should generally be quieter than for word processing rooms. Therefore, interior noise level criterion should be the responsibility of the commercial occupant or project sponsor, provided they do not exceed Occupational Health and Safety Administration (OSHA) limits.

Background on Noise Control

Standards for vehicle noise, the major noise source impacting the City, are enforced through state law. Recent studies have shown that the most objectionable feature of traffic noise is the sound produced by vehicles equipped with illegal or faulty exhaust systems. In addition, such vehicles are often operated in a manner that causes tire squeal and excessively loud exhaust noise. There are a number of statewide vehicle noise regulations that can be enforced by local authorities as well as the California Highway Patrol. Specifically, Sections 23130, 23130.5, 27150, 27151, and 38275 of the California Vehicle Code, as well as excessive speed laws, may be applied to curtail this problem. Both the Highway Patrol and the State Department of Health Services (through local health departments) are available to aid local authorities in code enforcement and training pursuant to proper vehicle sound level measurements.

Nuisance noise problems control would fall under the City's Noise Ordinance §17.68.030, of the Zoning Code, which prohibits loud or unnecessary noises and establishes specific performance standards and hours of operation for noise generating activities. The City may also prosecute major noise problems under the "disturbing the peace" section of the State Penal Code which states: "Any person who maliciously and willfully disturbs another person by loud or unreasonable noise, or by tumultuous or offensive conduct . . . is guilty of a misdemeanor, and upon conviction by a court of competent jurisdiction shall be punished by fine not exceeding two hundred dollars, or by imprisonment in the county jail for not more than ninety days, or by both fine and imprisonment, or either, at the discretion of the court."

Significant Existing Noise Generators

A noise monitoring survey was conducted in November, 1990 as part of the preparation of the

updated Noise Element. Data gathered during the recent preparation of the East Third Avenue/State Route 92 Interchange EIR and the Vintage Park EIR were also used to quantify the existing noise environment. The noise measurement locations are shown in the Noise Element Technical Appendix.

All noise measurements were conducted with Larson-Davis Laboratories Model LDL-700 integrating sound level meters equipped with Bruel & Kjaer Type 4176 pre-polarized condenser microphones. These meters meet the electrical frequency response criteria for American National Standards Institute Standard S1.4-1971 for Type 1 (precision) sound level meters. Sound meters were calibrated before and after each measurement.

Existing Traffic Noise

The major traffic noise sources in Foster City are the Bayshore Freeway (U.S. 101) and State Route 92; and primary arterials including East Hillsdale Boulevard, East Third Avenue, Metro Center Boulevard, Edgewater Boulevard, Beach Park Boulevard, Foster City Boulevard, and Shell Boulevard. Continuous 24-hour noise measurements and measurements of shorter duration recently have been made along most of these streets either for other projects over the past three years, or in preparation of the Noise Element.

The Noise Element Technical Appendix summarizes the results of the various 24-hour measurements and shows the normalized Ldn noise levels at 100 feet from the center of the road. In addition, short term measurements are included. The 100-foot distance was used to standardize the noise readings.

The highest noise levels are generated along the Bayshore Freeway and State Route 92. The Ldn at a distance of 100 feet from the centerline of these highways range from 77 to 82 decibels. East Hillsdale Boulevard is the next most significant traffic noise source generating an Ldn of 67 to 72 dB at a distance of 100 feet from the centerline of the road, depending upon the traffic volume and speed along a given section of the roadway. Other major streets such as Foster City Boulevard, Edgewater Boulevard, Shell Boulevard, and East Third Avenue, generate Ldn levels between 65 to 68 decibels at a distance of 100 feet from the centerline of the roadway.

Existing Aircraft Noise

Aircraft preparing for landing at San Francisco International Airport and general aviation from the San Carlos Municipal Airport are also significant noise sources in the City of Foster City. Jet aircraft noise is most significant in the northeastern portion of Foster City. Planes on their final approach to the San Francisco International Airport fly at an altitude as low as 1500 feet over Foster City. During the noise monitoring survey jet aircraft generated maximum noise levels of up to 90 decibels. In Foster City, Neighborhoods #1, #2 and #3 are particularly impacted by aircraft overflights.

Two parallel approach paths are used for landings in the San Francisco International Airport and it is, therefore, quite common for two planes at a time to be landing and for several others to be circling overhead waiting to land. The westernmost path is above the eastern portion of Foster City. The other path is over the Bay. Most of the larger aircraft use the landing path above Foster City. The aircraft fly over Foster City in an attempt to achieve an early line-up with the runway while they lock onto the navigational system of the Airport.

The Noise Abatement Office of the San Francisco International Airport has a noise monitor (#12) located at the corner of Gull Avenue and Beach Park Boulevard which collects aircraft data continuously. The data collected is used to calculate the CNEL (or noise exposure levels) at that location. The airport is required by law to report aircraft noise exposure in terms of the CNEL. The CNEL is generally within 1 decibel (dB) of the Ldn.

Data collected at the various monitors around the airport are used to predict the noise exposure contours (CNEL) around the San Francisco International Airport which are published in the "Quarterly Noise Report" (issued by the San Mateo County Planning Division). At noise monitor #12 and for the year ending December 31, 1989, the daily CNEL varied between 52 decibels to 77 decibels. The quarterly CNEL's between 1987 and 1989 ranged from 58 to 65 decibels and the annual CNEL for the same years ranged from 59 to 62 decibels. The average quarterly CNEL over the time period of 1987 to 1989 was 61 dB and the average annual CNEL for the same time period was

60 decibels.

The Technical Appendix includes a summary of the noise data collected at monitor #12 between 1987 and 1989. Based on data collected by monitor #12 and during the monitoring conducted by Illingworth & Rodkin as part of the Noise Element update, the annual average 60 dB CNEL noise contour due to aircraft operations at the San Francisco International Airport is shown on the noise exposure map. During the monitoring survey, several general aviation planes flew over the city generating A-weighted maximum noise levels up to 70 decibels. Most of these planes originated from the San Carlos Municipal Airport and their flying patterns were quite random. The 55-CNEL noise contour published by the San Mateo County Planning Division for the San Carlos Municipal Airport is outside the city limits of Foster City.

Other Significant Existing Noise Generators

As shown in the sidebar on the next page, other "nuisance" noise sources also impact on the quality of life in Foster City. Examples of potential noise generators in residential neighborhoods include, among others, special events, retail center operations and the location of play areas (such as school and park play areas). The Noise Element establishes the basis for Code Enforcement and regulation through the Noise Ordinance to control nuisances such as off-hour truck unloading and trash pickup, barking dogs, loud music and vehicle noise.

The Noise Element is also concerned with planning for land uses that are typically sensitive to noise impacts, including residential development, nursing homes, schools, wildlife sanctuaries, hospitals and treatment centers. These issues are identified in the Planning for Potential Noise Impacts in Foster City table at the end of the Noise Background section. Specific issues covered include:

- (1) Parking Area Noise.
- (2) Play Area Noise.
- (3) Trash Pick-up.
- (4) Park Noise.
- (5) Retail Area Noise.
- (6) Traffic Noise.
- (7) Aircraft Noise.
- (8) Rooftop Heating and Cooling Equipment.
- (9) Noise from Civic Events.
- (10) Miscellaneous Sources.

POTENTIAL NOISE GENERATORS IN RESIDENTIAL AREAS

- (1) **Churches:** Parking lots, special events or regular services that begin early or late in the day.
- (2) **Schools:** Play areas that are too close to residential development and parking lots.
- (3) **Retail Centers:** Loading docks, very early or late unloading of trucks and trash pick up.
- (4) **Restaurants:** Noisy customers and amplified music or other entertainment.
- (5) **Parks:** Location of play equipment too close to residential development, too many people in the park for a special event or weekly sports (such as Little League or soccer), parking and traffic related noise and late night use by children and events.
- (6) **Traffic:** Traffic from freeways and arterial streets, loud vehicles (motorcycles, emergency vehicles, honking horns, street sweepers).
- (7) **Personal Equipment:** Noise from leaf blowers and other small machinery, such as power saws, drills, lawn mowers and garden equipment.
- (8) **Construction:** Construction related noise.
- (9) **Nuisances:** Barking dogs and illegal vehicles.
- (10) **Aircraft Overflights:** Especially in Neighborhoods 1, 2 and 3.
- (11) **Special Events:** Fourth of July, City Birthday and Art and Wine Festival.
- (12) **Mechanical Equipment:** Rooftop HVAC equipment running in the early morning or late evening near residential development.
- (13) **Music:** Loud music, car radios and instrumental music (rock bands performing in garages).
- (14) **Children Playing:** Children playing in front yards, streets, parks and school yards, especially during early or late times.

Significant Future Changes to the Existing Noise Environment in Foster City

In general, the noise environment in Foster will remain as it is. The area exposed to highway traffic noise from the Bayshore Freeway and State Route 92 is expected to increase in impacting-distance an

average of 11% and 7% respectively. Those streets anticipated to have between a 3 decibel to 4 decibel increase in Ldn between 1990 conditions and build-out of the City (year 2005) include the following street segments. It should be noted that a 10 decibel increase results in a doubling of the noise level and a 3 to 4 decibel increase is considered to be a just-perceivable difference.

- (1) State Route 92 between Foster City Boulevard and the San Mateo Bridge.
- (2) Beach Park Boulevard between Marlin and Foster City Boulevard.
- (3) Edgewater Boulevard between Metro Center Boulevard and East Hillsdale Boulevard.
- (4) East Third Avenue between Lakeside and Foster City Boulevard.
- (5) Metro Center between Vintage and Shell.
- (6) Vintage Park Drive between Chess Drive and Metro Center Boulevard.
- (7) Chess Drive between Hansen and Vintage.

Noise Exposure Contour Maps

A Noise Contour map (Map GP-15) was prepared by Illingworth & Rodkin as part of the Noise Element update showing the future (year 2005) Ldn noise contours for the Bayshore Freeway, State Route 92 and primary arterials. This information is also shown in tabular form on the following pages and in the Technical Appendix. The existing and future Ldn along each of the major streets in the City of Foster City was calculated using a traffic noise prediction model (Federal Highway Administration model, FHWA-RD-77-108) which takes into account the traffic volume, the speed of the traffic, the percentage of the traffic that are trucks and buses, and the daytime variation of noise levels measured along the various roadway facilities. Noise levels predicted by the model and measured during the monitoring were well in agreement with each other.

The maps also show the 60-CNEL noise contour due to aircraft activity from the San Francisco International Airport. A larger scale version of the map (at a scale of 1 inch equals 800 feet) is available at the Planning Department. A reduced version is included at the end of this section.

Appendices

Foster City Noise Element Background Report (1991) and Foster City General Plan EIR Noise Section (January, 1993), Illingworth & Rodkin. Page 6-9

Existing (1990) and Future (2010) Traffic Noise Contour Distances*

Location		ADT	MPH	Truck %	Ldn @ Ldn Contour Distance (in Feet from Centerline)					
					50 Ft.	80 Ldn	75 Ldn	70 Ldn	65 Ldn	60 Ldn
BAYSHORE FREEWAY										
<i>Exist</i>	SR-92-	214,000	55	3%	85	137	294	634	1,366	2,943
<i>Future</i>	Hillsdale Blvd	222,830	55	3%	85	140	302	651	1,403	3,023
<i>Exist</i>	Hillsdale Blvd-	203,000	55	3%	85	132	284	612	1,319	2,841
<i>Future</i>	Marine World Pkwy	236,313	55	3%	85	146	314	677	1,459	3,144
BEACH PARK BOULEVARD										
<i>Exist</i>	Gull-	4,921	35	1%	63	0	0	0	30	93
<i>Future</i>	Marlin	4,800	35	1%	63	0	0	0	29	91
<i>Exist</i>	Marlin-	3,673	35	1%	61	0	0	0	0	70
<i>Future</i>	Foster City Blvd	8,200	35	1%	65	0	0	0	49	134
<i>Exist</i>	Foster City Blvd-	4,548	35	1%	62	0	0	0	27	86
<i>Future</i>	Shell	5,700	35	1%	63	0	0	0	34	105
<i>Exist</i>	Shell-	13,836	35	1%	67	0	0	26	83	190
<i>Future</i>	Edgewater	11,200	35	1%	66	0	0	0	67	165
CHESS DRIVE										
<i>Exist</i>	Hansen-	7,184	25	1%	61	0	0	0	0	65
<i>Future</i>	Vintage Park	15,000	25	1%	63	0	0	0	43	122
<i>Exist</i>	Vintage Park-	7,981	25	2%	68	0	0	0	32	101
<i>Future</i>	SR 92 Ramps	9,200	25	2%	68	0	0	0	37	111
<i>Exist</i>	SR 92 Ramps-	20,839	25	2%	59	0	0	27	84	192
<i>Future</i>	Foster City Blvd	23,300	25	2%	55	0	0	30	94	207
EDGEWATER BOULEVARD										
<i>Exist</i>	SR-92-	22,429	35	2%	70	0	0	54	144	309
<i>Future</i>	Metro Center Blvd	26,300	35	2%	71	0	0	64	160	344
<i>Exist</i>	Metro Center Blvd-	17,707	35	2%	69	0	0	43	123	264
<i>Future</i>	E. Hillsdale Blvd	31,800	35	2%	72	0	0	77	181	391
<i>Exist</i>	E. Hillsdale Blvd-	21,382	35	1%	69	0	0	41	118	255
<i>Future</i>	Beach Park Blvd	21,500	35	1%	69	0	0	41	119	255
<i>Exist</i>	Beach Park Blvd-	19,966	35	0%	67	0	0	28	88	198
<i>Future</i>	Biscayne	20,200	35	0%	68	0	0	28	89	200
<i>Exist</i>	Biscayne-	8,938	35	0%	64	0	0	0	40	118
<i>Future</i>	Baffin	9,200	35	0%	64	0	0	0	42	120

*Notes

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- (3) "Truck %" is the percentage of Average Daily Traffic volume (ADT) which is heavy trucks.

Existing (1990) and Future (2005) Traffic Noise Contour Distances* (continued)

Location		ADT	MPH	Truck %	Ldn @ Ldn Contour Distance (in Feet from Centerline)					
					50 Ft.	80 Ldn	75 Ldn	70 Ldn	65 Ldn	60 Ldn
EAST HILLSDALE BOULEVARD										
<i>Exist</i>	Norfolk-	38,030	40	2%	74	0	39	114	246	531
<i>Future</i>	Altair Avenue	50,000	40	2%	75	0	51	137	296	637
<i>Exist</i>	Altair Avenue-	26,626	40	2%	72	0	27	86	194	419
<i>Future</i>	Edgewater	32,900	40	2%	73	0	33	104	224	482
<i>Exist</i>	Edgewater-	24,800	40	2%	72	0	25	80	185	399
<i>Future</i>	Shell Blvd	30,300	40	2%	73	0	31	97	212	456
<i>Exist</i>	Shell Blvd-	17,761	35	2%	69	0	0	43	123	265
<i>Future</i>	Foster City Blvd	18,500	35	2%	70	0	0	45	126	272
<i>Exist</i>	Foster City Blvd-	11,998	35	1%	67	0	0	0	72	173
<i>Future</i>	Pilgrim Drive	12,000	35	1%	67	0	0	0	72	173
<i>Exist</i>	Pilgrim Drive-	14,389	35	1%	67	0	0	0	86	195
<i>Future</i>	Beach Park Blvd	14,200	35	1%	67	0	0	0	85	194
EAST THIRD AVENUE										
<i>Exist</i>	Anchor-	13,570	45	2%	71	0	0	57	147	318
<i>Future</i>	Mariners Island	24,900	45	2%	73	0	33	103	221	476
<i>Exist</i>	Lakeside-	7,927	45	2%	68	0	0	33	103	222
<i>Future</i>	Marsh Drive	20,500	45	2%	72	0	27	85	194	418
<i>Exist</i>	Marsh Drive-	7,597	45	2%	68	0	0	32	100	216
<i>Future</i>	Foster City Blvd	18,900	45	2%	72	0	0	79	184	296
<i>Exist</i>	Foster City Blvd-	5,369	45	2%	67	0	0	--	71	171
<i>Future</i>	SR 92 (future)	28,000	45	2%	74	0	37	111	239	515
FOSTER CITY BOULEVARD										
<i>Exist</i>	East Third Ave-	8,921	35	2%	66	0	0	0	68	167
<i>Future</i>	Vintage Park Drive	9,000	35	2%	66	0	0	0	69	168
<i>Exist</i>	Vintage Park Drive-	10,452	35	2%	67	0	0	25	80	186
<i>Future</i>	Chess Drive	11,900	35	2%	68	0	0	29	91	203
<i>Exist</i>	Chess Drive-	27,197	35	2%	71	0	0	66	163	352
<i>Future</i>	Metro Center Blvd	37,800	35	2%	73	0	0	92	203	438
<i>Exist</i>	Metro Center Blvd-	23,931	35	2%	71	0	0	58	150	323
<i>Future</i>	East Hillsdale Blvd	25,700	35	2%	71	0	0	62	157	339
<i>Exist</i>	East Hillsdale Blvd-	21,636	35	1%	69	0	0	41	119	257
<i>Future</i>	Balclutha Drive	23,200	35	1%	69	0	0	44	125	269

***Notes**

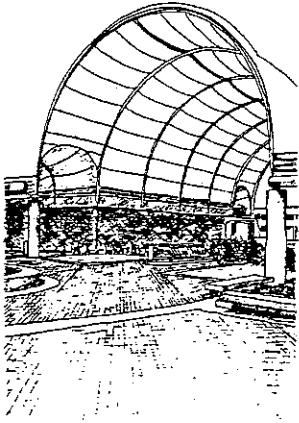
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Existing (1990) and Future (2005) Traffic Noise Contour Distances* (continued)

Location	ADT	MPH	Truck %	Ldn @ Ldn Contour Distance (in Feet from Centerline)						
				50 Ft.	80 Ldn	75 Ldn	70 Ldn	65 Ldn	60 Ldn	
EAST HILLSDALE BOULEVARD (continued)										
<i>Exist</i>	Balclutha Drive-	14,970	35	1%	68	0	0	28	90	201
<i>Future</i>	Bounty Drive	16,500	35	1%	68	0	0	31	99	214
<i>Exist</i>	Bounty Drive	14,408	35	1%	67	0	0	27	87	196
<i>Future</i>	Marlin Avenue	15,900	35	1%	68	0	0	30	95	209
<i>Exist</i>	Marlin Avenue-	2,598	35	0%	59	0	0	0	0	41
<i>Future</i>	Beach Park Blvd	3,800	35	0%	61	0	0	0	0	60
METRO CENTER BOULEVARD										
<i>Exist</i>	Edgewater-	5,092	35	1%	63	0	0	0	31	97
<i>Future</i>	Vintage Park	8,950	35	1%	65	0	0	0	54	142
<i>Exist</i>	Vintage Park-	8,184	35	1%	65	0	0	0	49	134
<i>Future</i>	Shell	18,600	35	1%	68	0	0	35	108	232
<i>Exist</i>	Shell	19,544	35	2%	70	0	0	47	131	282
<i>Future</i>	Foster City Blvd	22,100	35	2%	70	0	0	54	142	306
SHELL BOULEVARD										
<i>Exist</i>	Metro Center Blvd-	7,273	30	2%	64	0	0	0	41	119
<i>Future</i>	East Hillsdale Blvd	10,600	30	2%	66	0	0	0	60	153
<i>Exist</i>	East Hillsdale Blvd-	13,734	35	1%	67	0	0	26	82	189
<i>Future</i>	Bounty Drive	15,900	35	1%	68	0	0	30	95	209
<i>Exist</i>	Bounty Drive-	12,058	35	1%	67	0	0	0	72	174
<i>Future</i>	Catamaran	13,000	35	1%	67	0	0	0	78	183
<i>Exist</i>	Catamaran-	7,331	35	1%	64	0	0	0	44	125
<i>Future</i>	Beach Park Blvd	7,900	35	1%	65	0	0	0	47	131
STATE ROUTE 92										
<i>Exist</i>	Edgewater Blvd-	92,600	55	4%	82	77	180	388	837	1,803
<i>Future</i>	Foster City Blvd	140,000	55	4%	84	110	237	512	1,102	2,375
<i>Exist</i>	Foster City Blvd	65,800	55	4%	80	54	144	309	666	1,435
<i>Future</i>	San Mateo Bridge	11,800	55	4%	83	98	212	456	983	2,119
VINTAGE PARK DRIVE										
<i>Exist</i>	Metro Center Blvd-	6,262	30	1%	62	0	0	0	26	83
<i>Future</i>	Chess Drive	12,700	30	1%	65	0	0	0	54	142
<i>Exist</i>	Chess Drive-	4,555	30	1%	61	0	0	0	0	61
<i>Future</i>	Lakeside	14,100	30	1%	66	0	0	0	59	152

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- (3) "Truck %" is the percentage of Average Daily Traffic volume (ADT) which is heavy trucks.



Noise Goals, Policies and Programs

Introduction

The City of Foster City generally has a quiet noise environment. The relatively quiet environment of the City is one of the key qualities that make Foster City an attractive place to live. Any changes in the noise environment would have a significant impact on the City's overall quality of life. The Noise Element identifies and appraises noise problems in the community as a basis for the goals, policies and

implementing actions necessary to maintain conditions desirable and appropriate for Foster City. Noise contours of major roadways and aircraft noise have been identified to design land uses appropriately to reduce noise impacts. Noise policies establish noise standards for new or potential changes in land uses, and recommend potential solutions to existing problems.

Noise Goals

N-A

Assure that the Noise Impacts of New Development or Redevelopment of Property is Done in a Manner that is Compatible with Existing Land Uses

Assure the appropriateness of new development with the noise environment of Foster City and establish mitigation measures for any changes in land use as are reasonably necessary to assure compatibility with the surrounding area.

N-B

Preserve and Improve the "Quiet Ambiance" Within Existing Neighborhoods

Protect neighborhoods by providing an acceptable noise level throughout the community and by identifying and alleviating or minimizing existing noise problems where possible.

Noise Policies

New Development, Changes in Use or Redevelopment of Property

- N-1 **Land Use Compatibility Standards.** New development exposed to transportation noise sources must meet acceptable exterior noise level standards. The "normally acceptable" noise standards for new land uses are established in the Noise and Land Use Compatibility Guidelines (see Noise Element Background section) as modified below:
- a. The goal for maximum outdoor noise levels in residential areas is an Ldn of 60 dB. This level is a requirement to guide the design and location of future development and a goal for the reduction of noise in existing development. However, 60 Ldn is a goal which cannot necessarily be reached in all residential areas within the realm of economic or aesthetic feasibility. This goal will be applied where outdoor use is a major consideration (e.g., backyards in single-family housing developments and recreation areas in multi-family housing projects). The outdoor standard will not normally be applied to the small decks associated with apartments and condominiums but these will be evaluated on a case-by-case basis. Where the city determines that providing an Ldn of 60 dB or lower outdoors is not feasible, the outdoor goal may be increased to an Ldn of 65 dB.
 - b. The indoor noise level as required by the State of California Noise Insulation Standards must not exceed an Ldn of 45 dB in multi-family dwellings. This indoor criterion shall also be the maximum acceptable indoor noise level in new single-family homes.
 - c. Interior noise levels in new single-family and multi-family residential units exposed to an Ldn of 60 dB or greater should be limited to a maximum instantaneous noise level in the bedrooms of 50 dBA. Maximum instantaneous noise levels in other rooms should not exceed 55 dB.
 - d. Appropriate interior noise levels in commercial, industrial, and office buildings are a function of the use of space. For example, the noise level in private offices should generally be quieter than for data processing rooms. Interior noise levels in offices generally should be maintained at 45 Leq (hourly average) or less.
 - e. If an area currently is below the desired noise standard, an increase in noise up to the maximum should not necessarily be allowed. The impact of a proposed project on an existing land use should be evaluated in terms of the increase in existing noise levels and potential for adverse community impact, regardless of the compatibility guidelines.
- N-2 **Noise Contour Map.** The City will review development proposals to assure consistency with noise standards by using the noise contours shown on map GP-15 (a large scale version of this map is available at the Foster City Community Development Department).

N-3 **Acoustical Studies.** The City will use the noise guidelines and contours to determine if additional noise studies are needed for a proposed new development.

N-4 **Residential and Other Noise Sensitive Uses in Commercial or Industrial Areas.** New residential or other noise sensitive development or activities will not be allowed where the noise level due to commercial or industrial noise sources will exceed the noise level standards as set forth in the table below, as modified:

**Noise and Land Use Compatibility Standards
for Industrial and Commercial Noise Sources**

Category	Cumulative Duration of Noise Event in Any One-Hour Period (in minutes)	Exterior Noise Level Standards	
		Daytime (7 am - 10 pm)	Nighttime (10 pm - 7 am)
1	30	50	45
2	15	55	50
3	5	60	55
4	1	65	60
5	0	70	65

- a. In the event the measured ambient noise level exceeds the applicable noise level standard in any category expressed in the table, the applicable standard will be adjusted so as to equal the ambient noise level to establish a noise standard capable of being enforced through the City's Noise Ordinance.
- b. Each of the noise level standards specified in the table above will be reduced by 5 dB for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises due to the greater annoyance factor associated with these types of noise.

N-5 **Mitigating Impacts on Surrounding Uses.** The City will require proposals to reduce noise impacts on adjacent properties through the following and other means, as appropriate:

- a. Screen and control noise sources such as parking, outdoor activities and mechanical equipment.
- b. Increase setbacks for noise sources from adjacent dwellings.
- c. Wherever possible do not remove fences, walls or landscaping that serve as noise buffers, although design, safety and other impacts must be addressed.
- d. Use soundproofing materials and double glazed windows.
- e. Control hours of operation, including deliveries and trash pickup to minimize noise impacts.

- N-6 **Noise Sensitive Uses.** The City will protect schools, hospitals, libraries, churches, convalescent homes and other noise sensitive uses from noise levels exceeding those allowed in residential areas. Projects located near noise sensitive uses should be oriented away from noise sources unless mitigation measures are included in development plans and regulation occurs of the activities or uses generating noise that might cause noise disturbances for noise sensitive uses.
- N-7 **Compliance with State Noise Insulation Standards.** The adopted Noise Element will serve as a guideline for compliance with the State's noise insulation standards. Recognizing the need to provide acceptable habitation environments, State law requires noise insulation of new multi-family dwellings constructed within the 60 dB Ldn noise exposure contours. It is a function of the Noise Element to provide noise contour information around all major sources in support of the sound transmission control standards (Chapter 2-35, Part 2, Title 24, California Administrative Code).

Protect Existing Neighborhoods

- N-8 **Protecting Existing Residential Areas.** Protect the noise environment in existing residential areas. In general, the city will require the evaluation of mitigation measures for projects that would cause the Ldn to increase by 3 dB or more, if the increase would result in an Ldn greater than 60 dB or if the Ldn already exceeds 60 dB. Projects with the potential to generate significant adverse community controversy must also be evaluated. Noise created by commercial or industrial sources associated with new projects, developments or new or existing activities conducted by existing developments or companies shall be controlled so as not to exceed the noise level standards set forth in "Noise and Land Use Compatibility Standards for Industrial and Commercial Noise Sources" table as measured at any affected residential land use.
- N-9 **Noise Source Control.** The City will work with property owners and will enforce noise standards to control noise at its source to maintain existing noise levels to assure that noise levels do not exceed acceptable noise standards as established in the Noise and Land Use Compatibility Guidelines.
- N-10 **City Street Improvements.** City street improvements will be designed to reduce noise levels in adjacent areas. The City will require soundwalls, earth berms, setbacks and other noise reduction techniques as conditions of development approval and as appropriate given design, use, site layout and other considerations.
- N-11 **Coordination with Other Agencies.** Encourage other agencies to reduce noise levels generated by roadways, airports, and other facilities. The City will work with the county Airport Land Use Commission (ALUC), State Office of Noise Control (ONC) and other agencies to reduce noise generated from sources outside the City's jurisdiction.
- N-12 **Enforcement Approach.** The City will administer the policies identified in the Noise Element and comply with State requirements for certain other noise control programs through specific local enforcement programs.

- N-13 **Noise Ordinance.** The City will apply the quantitative noise ordinance standards (Chapter 17.68, General Performance Standards) throughout the City.
- N-14 **Vehicle Noise.** The City will strive to reduce traffic noise levels, especially as they impact residential area and will continue enforcement of vehicle noise standards through noise readings and enforcement actions.

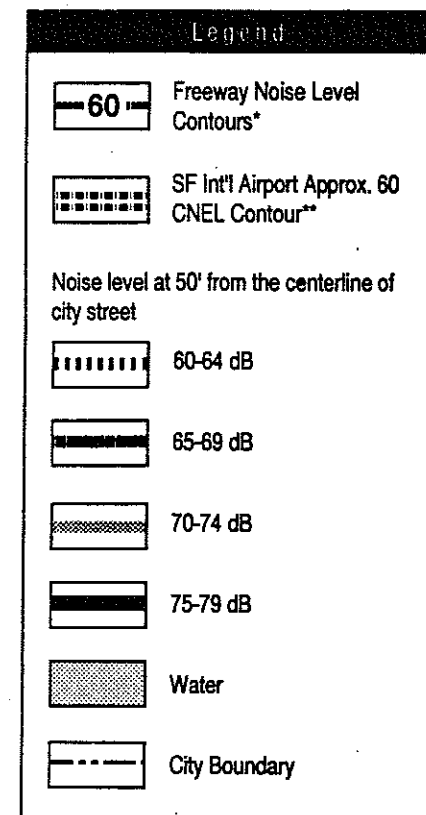
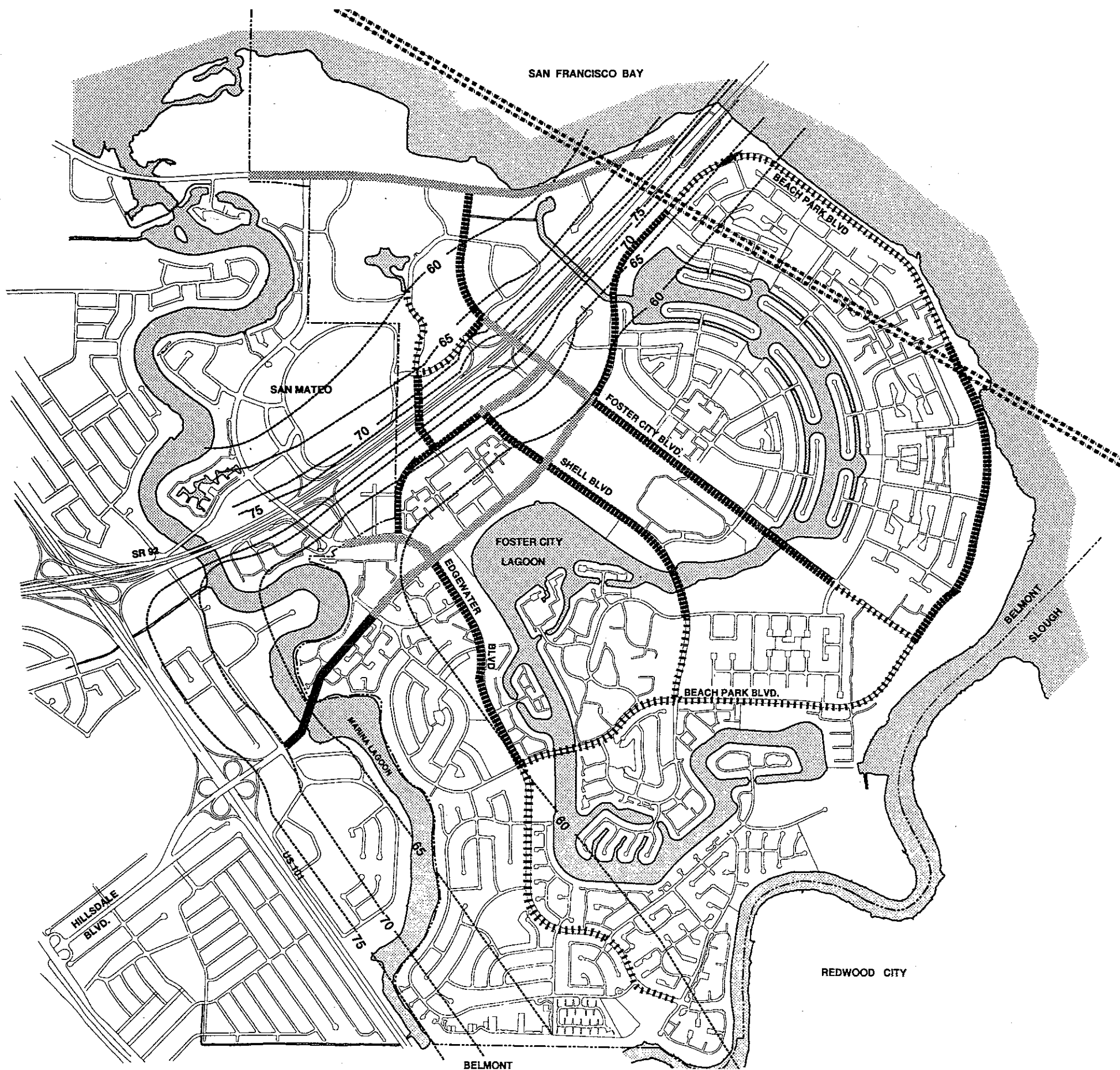
Noise Programs

- N-a **Noise Ordinance and Vehicular Noise Abatement Publicity and Staff Training.**
The City will provide publicity regarding the Noise Ordinance and will train Police, Public Works and Community Development Department personnel as needed in the use of noise measurement equipment to enforce the Noise Ordinance and vehicular noise standards, and to monitor noise levels throughout the City.
- Responsibility: Police Department, Community Development Department and Public Works Department.
Timeline: Ongoing.
- N-b **Periodic Noise Monitoring.** City staff will periodically monitor residential noise generators and will develop noise reduction and abatement measures that can be applied to limit noise and phase in mitigation.
- Responsibility: Community Development Department.
Timeline: Ongoing.
- N-c **Purchase of City Vehicles and Equipment.** The City will consider noise criteria in the purchase of new vehicles, their components and other equipment.
- Responsibility: City Manager's Department.
Timeline: Ongoing.
- N-d **Regulation of Special Events.** The City will evaluate and improve control mechanisms to minimize the noise impacts of special events, including:
- a. Planning for overflow potential (parking, crowds).
 - b. Establishment of citation mechanism.
 - c. Establishment of a formal review of past performance.
 - d. Informing neighborhood residents about events.
- Responsibility: Community Development Department, Police and Public Works Departments.
Timeline: 1993 and ongoing.
- N-e **Coordination of Complaint Information and Enforcement.** The City will establish improved coordination of complaint information between the Planning, Police and Public Works Departments and will continue code enforcement programs.
- Responsibility: Community Development Department, Police Department and Public Works Department.
Timeline: Ongoing.

- N-f **BFI Contract.** The City will review the hours of the refuse collection operation for BFI and will establish and enforce performance standards as appropriate.
- Responsibility: City Manager's Department and City Council.
Timeline: Annually.
- N-g **Airport Noise Mitigation.** The City will work with the relevant agencies to minimize adverse noise impacts associated with expansion and ongoing operations at the San Francisco International Airport.
- Responsibility: City Council.
Timeline: Ongoing.

Noise Element Program Summary

Noise Program	Agency Responsible							Time Frame	
	CC	PC	CDA	CD	CE	P/R	PW		Other
N-a				**			**	Police	Ongoing
N-b				**					Ongoing
N-c								CM	Ongoing
N-d				**			**	Police	1993; ongoing
N-e				**			**	Police	Ongoing
N-f	**							CM	Annually
N-g	**								Ongoing



*Based on the year 2010 traffic projections. Source: Illingworth & Rodkin.

**Based on data gathered by Airport Monitor #12 and published in the "Quarterly Noise Report" and San Francisco International Airport Master Plan. Final EIR, 1992.

This base map was developed primarily for General Planning usage. The City of Foster City is not responsible nor liable for use of this map beyond its intended purpose.

May 1993

GP-15

