

Introduction

Noise is part of everyday life in a community. 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.

In the City of San Rafael, vehicular traffic on the roadways is the single largest source of noise. Airplanes and mechanical equipment are also contributors, as are intermittent sources such as leafblowers and construction equipment. Average noise levels are highest along Highways 101 and 580 and along major traffic corridors. The City of San Rafael will continue its efforts to curb noise impacts from existing sources and will also take actions that prevent adverse levels of noise from being generated by new sources. Such efforts include encouraging the design of new development projects in a manner that minimizes the exposure of residents and workers to excessive levels of noise.

Exhibit 30: Typical Sound Levels

Common Outdoor Sound Levels	Noise Level Db (A)	Common Indoor Sound Levels
Commercial Airliner Takeoff at 1,000 feet	110	Rock Band
	100	Ambulance Siren at 100 feet
Gas Lawn Mower at 3 feet	90	Food Blender at 3 feet
Diesel Truck at 50 feet	80	Garbage Disposal at 3 feet
Noisy Urban Daytime	70	Shouting at 3 feet
	60	Vacuum Cleaner at 10 feet
Commercial Area		Normal Speech at 3 feet
Quiet Urban Daytime	50	Large Business Office
		Dishwasher Next Room
Quiet Urban Nighttime	40	Small Theatre
Quiet Suburban Nighttime		Large Conference Room
	30	
Quiet Rural Nighttime	20	Bedroom at Night
Rustling Leaves		Broadcast & Recording Studio
	10	Soft Whisper
	0	Threshold of Hearing

Effects of Noise on People

The noise environment has a significant impact on the City's overall quality of life. Below are some of the effects of noise on people.

How is Noise Measured?

Sound is the result of the vibration of an object, which is transmitted through the air in waves that in turn vibrate the eardrum. Sound is measured in a logarithmic scale using units called decibels (dB). Since the human ear does not hear all sounds equally, a special weighted decibel measurement (dBA) is used to simulate human hearing.

Ldn (Sound Level, day-night average) is the average dBA sound level during a 24-hour day. Sound levels during the night are weighted over those during daylight hours, by adding ten decibels to actual sound levels during the period from 10 p.m. to 7 a.m. to recognize the increased annoyance factor related to noise at night. Examples of typical sound levels are shown in Figure 30.

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. In San Rafael, Ldn levels in residential areas are as low as 45 dBA (Ldn) in quiet valleys shielded from major roads and as high as 65-75 dBA (Ldn) along highways and major roads.

- **Medical and Annoyance Effects.** According to the Environmental Protection Agency (EPA), 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. (EPA, 1974). 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. Damage to the human ear can occur at about 70 dBA. Sounds above 70 dBA 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. Permanent hearing damage can occur at 80- 85 dBA, if sustained over eight hours a day over the course of a worker's career. Higher levels cause hearing damage in shorter period of time.
- **Economic Effects.** 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 expense of constructing noise barriers adjacent to noise sources.

Basis for Noise Standards

Acceptable levels of noise vary from land use to land use. Also, in any one location, the noise level will vary over time, from the lowest background or ambient levels to that of passing airplanes or construction equipment. Various techniques have been developed that measure the effects of noise levels over a period of time.

It is difficult to specify noise levels that 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 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 general 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 policies. (See Appendices F and G for Noise Contours for 2001 and 2020.)

Addressing Noise Impacts in the General Plan

The General Plan seeks to limit the impacts of noise on residents and employees in two ways. First, the Plan contains standards to determine the suitability of new land uses depending upon the extent of noise exposure in the area. Second, Plan policies limit the extent of new noise sources that proposed development can add to existing noise levels in the surrounding area and through implementation of the City's Noise Ordinance, which limits what is commonly described as "nuisance noise."

GOAL 29: ACCEPTABLE NOISE LEVELS

It is the goal of San Rafael to have acceptable noise levels. *Excessive noise is a concern for many residents of San Rafael. These concerns can be managed with proper mitigation or through the implementation of the noise ordinance. The City of San Rafael recognizes the issue of noise and has standards to protect people from excessive, unnecessary and unreasonable noises from any and all sources in the community.*

Noise Impacts on New Projects

N-1. Noise Impacts on New Development.

Protect people in new development from excessive noise by applying noise standards in land use decisions. Apply the Land Use Compatibility Standards (see Exhibit 31) to the siting of new uses in existing noise environments. These standards identify the acceptability of a project based on noise exposure. If a project exceeds the standards in Exhibit 31, an acoustical analysis shall be required to identify noise impacts and potential noise mitigations. Mitigation should include the research and use of state-of-the-art abating materials and technology.

N-1a. Acoustical Studies. Require acoustical studies for all new residential projects within the projected L_{dn} 60 dB noise contours (see Exhibit 31) so that noise mitigation measures can be incorporated into project design. Acoustical studies shall identify noise sources and contain a discussion of the existing and future noise exposure and the mitigation measures that may be used to achieve the appropriate outdoor and indoor noise standards.

Responsibility: Community Development

Timeframe: Ongoing

Resources: Fees

Exhibit 31
Land Use Compatibility Standards
for New Development

Exterior Noise Exposure to the Site
L_{dn} (dB)

Land Use	50	55	60	65	70	75	80
Residential, Hotels, Motels							
Schools, Libraries, Churches, Hospitals, Nursing Homes							
Auditoriums, Concert Halls, Amphitheaters							
Sports Arena, Outdoor Spectator Sports							
Playgrounds, Neighborhood Parks							
Other Outdoor Recreation and Cemeteries							
Office and Other Commercial Uses							
Industrial, Manufacturing, Utilities, Agriculture							

Interior Noise Exposure
L_{dn} (dB)

	35	40	45	50	55	60	65
Bedrooms in Residential units not in Downtown							
Other Rooms in Residential Units not in Downtown							
Bedrooms in Residential units in Downtown							
Hotels, Motels, Downtown Multifamily							

- Normally Acceptable – Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
- Conditionally Acceptable – Specific land use may be permitted only after detailed analysis of the noise reduction requirements and needed noise insulation features included in the design.
- Clearly Unacceptable – New construction of development clearly should not be undertaken.

N-2. Exterior Noise Standards for Residential Use Areas.

The exterior noise standard for backyards and/or common usable outdoor areas in new residential development is up to Ldn of 60 dB. In common usable outdoor areas in Downtown, mixed-use residential, and high density residential districts, up to Ldn of 65 dB may be allowed if determined acceptable through development review.

See N1-a (Acoustical Studies).

N-3. Planning and Design of New Development.

Encourage new development to be planned and designed to minimize noise impacts from outside noise sources.

N-3a. Noise Mitigation. Require, where appropriate, the following mitigation measures to minimize noise impacts on proposed development projects:

1. **Site planning.** Proper site planning is the first mitigation measure that should be investigated to reduce noise impacts. By taking advantage of the natural shape and terrain of the site, it often is possible to arrange the buildings and other uses in a manner that will reduce and possibly eliminate noise impacts. Specific site planning techniques include:
 - a. Increasing the distance between the noise source and the receiver;
 - b. Placing non-noise sensitive land uses such as parking lots, maintenance facilities, and utility areas between the source and the receiver;
 - c. Using non-noise sensitive structures such as garages to shield noise-sensitive areas; and
 - d. Orienting buildings to shield outdoor spaces from a noise source.
2. **Architectural layout of buildings.** In many cases, noise reduction can be attained by careful layout of noise-sensitive spaces. Bedrooms, for example, should be placed away from freeways. Quiet outdoor spaces can be provided next to a noisy highway by creating a U-shaped development, which faces away from the highway.
3. **Noise Barriers.** Absorptive types of noise barriers or walls should be used to reduce noise levels from ground transportation noise sources and industrial sources. A barrier must interrupt the line of sight between the noise source and the receiver in order to reduce noise level both outdoors and indoors. A barrier should provide at least L_{dn} 5 dB of noise reduction to achieve a noticeable change in noise levels.
4. **Construction modifications.** If site planning, architectural layout, noise barriers, or a combination of these measures does not achieve the required noise reduction, then mitigation should be facilitated through construction modification to walls, roofs, ceilings, doors, windows.
5. **Alternatives to Sound Walls.** Encourage new development to identify alternatives to the use of sound walls to ease noise impacts.

Responsibility: Community Development

Timeframe: Ongoing

Resources: Fees

Noise Impacts on Existing Development

N-4. Noise from New Nonresidential Development.

Design nonresidential development to minimize noise impacts on neighboring uses.

- a. **Performance Standards for Uses Affecting Residential Districts.** New nonresidential development shall not increase noise levels in a residential district by more than L_{dn} 3 dB, or create noise impacts that would increase noise levels to more than L_{dn} 60 dB at the property line of the noise receiving use, whichever is the more restrictive standard.
- b. **Performance Standards for Uses Affecting Nonresidential and Mixed Use Districts.** New nonresidential projects shall not increase noise levels in a nonresidential or mixed-use district by more than L_{dn} 5 dB, or create noise impacts that would increase noise levels to more than L_{dn} 65 dB (Office, Retail) or L_{dn} 70 dB (Industrial), at the property line of the noise receiving use, whichever is the more restrictive standard.
- c. **Waiver.** These standards may be waived if, as determined by an acoustical study, there are mitigating circumstances (such as higher existing noise levels), and no uses would be adversely affected.

N-4a. Require Acoustical Study. Identify through an acoustical study noise mitigation measures to be designed and built into new nonresidential and mixed-use development, and encourage absorptive types of mitigation measures between noise sources and residential districts.

Responsibility: Community Development

Timeframe: Ongoing

Resources: Fees

N-5. Traffic Noise from New Development

Minimize noise impacts of increased off-site traffic caused by new development.

Where the exterior L_{dn} is 65 dB or greater at a residential building or outdoor use area and a plan, program, or project increases traffic noise levels by more than L_{dn} 3 dB, reasonable noise mitigation measures shall be included in the plan, program or project.

N-5a. Traffic Noise Studies. Require acoustical studies to evaluate potential off-site noise impacts resulting from traffic generated by new development.

Responsibility: Community Development

Timeframe: Ongoing

Resources: Fees

N-6. Traffic Noise.

Attempt to minimize traffic noise through land use policies, law enforcement, and street improvements.

N-6a. Enforce Speed Limits. Enforce speed limits on roads generating numerous noise complaints.

Responsibility: Police Department

Timeframe: Ongoing

Resources: Police Department Operating Budget

N-6b. Mixed-Use. Develop land use districts to allow housing close to offices and services to reduce the amount of traffic from local trips.

Responsibility: Community Development

Timeframe: Short Term

Resources: Staff Time

N-6c Coordination with Local and State Agencies. Coordinate with CalTrans, Marin Countywide Planning Agency, Congestion Management Agency and other agencies to achieve noise reduction along Pt. San Pedro Road, Highways 101 and 580, and the Sonoma Marin Area Rail Transit corridor.

Responsibility: Community Development
Timeframe: Short Term
Resources: Staff Time

N-6d. Vehicle Code. Enforce the California Vehicle Code regarding noisy vehicles.

Responsibility: Police Dept.
Timeframe: Ongoing
Resources: Police Department Operating Budget

N-6e. Street Improvements. Pursue feasible cost-effective new street paving technologies to minimize traffic noise.

Responsibility: Public Works
Timeframe: Long Term
Resources: Staff Time

N-6f. Widening of US 101 and 580. Encourage Caltrans to mitigate highway noise impacts as a part of the US 101 widening project. Review and comment, as necessary, on any proposed sound walls in San Rafael. Encourage Caltrans to use noise mitigation measures other than walls if they can be shown to be effective. These measures may include alternative pavement types and sound-absorptive treatments on existing and future noise barriers.

Responsibility: Public Works, City Council
Timeframe: Short Term
Resources: Staff Time

See C-21a (Traffic Calming Program).

N-7. Airport/Heliport.

To the extent allowed by federal and state law, consider and mitigate noise impacts of any changes in facilities or operations that require use permit mitigations or other land use permits at the San Rafael Airport in north San Rafael and the heliport in East San Rafael (see Noise Contours for San Rafael Airport and Heliport in Exhibits 32 and 33).

See LU-2a (Development Review).

N-8. Sonoma Marin Area Rail Transit.

If a commuter rail service or other use is developed along the Sonoma Marin Area Rail Transit right-of-way, minimize noise impacts on existing development.

N-8a. Future Transitway Mitigation Measures. A detailed noise assessment and appropriate mitigation measures should be prepared for any rail project on the Sonoma Marin Area Rail Transit right-of-way. The analysis should address the City's noise standards and the Federal Transit Administrations (FTA) guidelines.

Responsibility: Community Development or Joint Powers Authority
Timeframe: Long Term
Resources: Potential Taxes (Sales)



San Rafael Airport Noise Contours

- San Rafael City Limit
- Planning Area

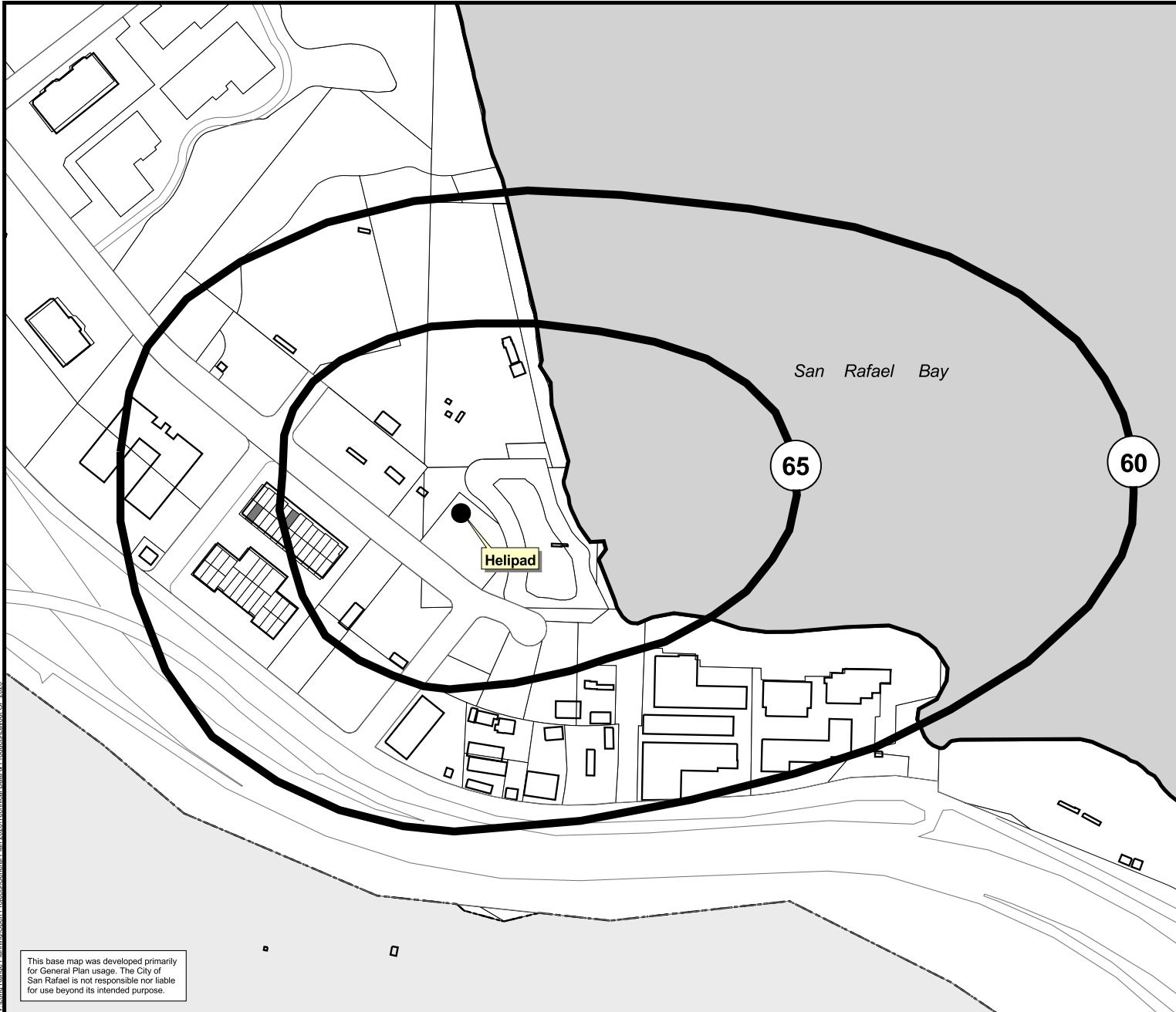
Note: Noise contours reflect conditions as of 2003



RUNWAY

This base map was developed primarily for General Plan usage. The City of San Rafael is not responsible nor liable for use beyond its intended purpose.

Heliport Noise Contours



Note: Noise contours reflect conditions as of 2003



0 100 200 300 Feet

0 100 200 300 400 Feet

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N-9. Nuisance Noise.

Minimize impacts from noise levels that exceed community sound levels.

N-9a. Enforce and Update the Noise Ordinance. Enforce and update, as necessary, the City's Noise Ordinance that addresses common noise nuisances including amplified music, outdoor mechanical equipment and construction activities.

Responsibility: Police Department

Timeframe: Ongoing

Resources: Staff Time

N-10b. Mitigation for Construction Activity Noise. Through environmental review, identify mitigation measures to minimize the exposure of neighboring properties to excessive noise levels from construction-related activity.

Responsibility: Community Development

Timeframe: Ongoing

Resources: Fee

N-10c. Noise Specifications. Include noise specifications in requests for equipment information and bids for new City equipment and consider this information as part of evaluation of the bids.

Responsibility: Public Works

Timeframe: Ongoing

Resources: Staff Time, Capital Improvements

N-10d. San Rafael Rock Quarry. Seek to minimize noise impacts of the quarry and brickyard operations through cooperative efforts with the County of Marin through its code enforcement and land use entitlement processes.

Responsibility: Community Development

Timeframe: Ongoing

Resources: Staff Time

See NH-143a (San Rafael Rock Quarry Plan) and NH-144a (Rock Quarry Impacts).

