Noise
Existing Conditions Report

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1. Introduction

This paper examines existing noise conditions in Riverside. The purpose of this paper is to provide a context for the General Plan Noise Element by identifying current noise conditions. The information presented in this report will be used by the City to develop noise element policies and objectives and to define the programs that will implement those policies.

The purpose of the Noise Element is to identify and appraise existing noise problems in the community, and to provide guidance to avoid noise and land use incompatibility problems in the future. The Element will address existing and projected noise sources in the community and identifies ways to reduce existing and potential noise impacts. In particular, the Noise Element will contain policies and programs to achieve and maintain noise levels compatible with various types of land uses. These policies and programs will emphasize the need to control noise through land use regulation, as well as enforcement of other City ordinances

The State of California recognizes the relationship between noise and noise sensitive uses and has adopted State Guidelines for Noise Elements. A mandated component of a municipal General Plan, the Noise Element will satisfy the requirements of State planning law, including Government Code Section 65302(f). The Element will also comply with California Health and Safety Code Section 56050.1 guidelines for Noise Elements.

Future noise conditions from short- and long-term growth will be quantified and identified as noise exposure contours. This noise information will serve as the basis for developing guidelines for identifying compatible land uses, identifying the proper distribution of land uses on the General Plan Land Use Policy Map, and establishing proper development standards.

2. Noise – Background Information

Noise is often defined as annoying or unwanted sound that causes or tends to cause an adverse psychological or physiological effect or human beings. In order to define noise problems and to establish a regulatory scheme to deal with noise that is both fair and effective, it is necessary to understand some of the basic characteristics of sound and how it affects people and their activities. Some of the most important

characteristics are identified briefly in Table 1. This table also provides general comments about how these characteristics are considered in planning.

While sound levels can be easily measured, the variability in subjective and physical response to sound complicates the analysis of its impact on people.

Sound is created when an object vibrates and radiates part of its energy as acoustic pressure waves through a medium such as air, water, or a solid. The ear, the hearing mechanism of humans and most animals, receives these sound pressure waves and converts them to neurological impulses which are transmitted to the brain for interpretation. The interpretation by the auditory system and the brain depends on the characteristics of the sound, and on the characteristics of the person hearing it.

There are two parameters that are used technically to describe the sound environment at any instant in time: amplitude (or sound power) and frequency (or pitch). These two characteristics affect the way people respond to sound.

Amplitude of a sound is a measure of the pressure or force that a sound can exert. Subjectively, we say a sound is louder if it has a greater amplitude than another sound. Thus the amplitude of sounds can be described either in measurable magnitude or in relative terms of loudness.

Physically, sound pressure is measured in units of decibels (dB). The sound pressure scale is based on the ratio of the energy of the sound energy to a reference pressure which is approximately the least sound pressure that people can perceive. Zero dB means the lowest level normally audible, but does not mean zero sound pressure.

Frequency of a sound is expressed in units of cycles per second, or Hertz (Hz), referring to the number of times per second the acoustic pressure wave peaks. Subjectively, a sound that has more cycles per second than another is higher pitched. The human hearing system is not equally sensitive to sound at all frequencies, and is most sensitive to sounds in the frequency range of human speech, from 400 to 2000 cycles per second. The most sensitive people can hear sounds ranging from a little below 20 Hz to somewhat above 20,000 Hz. As people age, their sensitivity to high frequencies tends to fall. Acoustical energy at frequencies above the range of human hearing is referred to as ultrasonic, or ultrasound. At frequencies below the range of human hearing, acoustical energy is referred to as infrasonic, or infrasound, and is

experienced as vibration.

Table 1. Characteristics of Noise

Noise Characteristic	What is Measured, Units of Measurement	Effects on People and Human Activities
Loudness or Sound Pressure	Energy content of sound waves in the air. Unweighted sound pressure level in decibels (dB)	Noise distracts attention from tasks, interferes with verbal communication, and prevents or disturbs sleep. At high levels or for long periods, noise causes temporary or permanent hearing loss. At very high levels, noise causes pain. Louder sounds have greater effects, subject to the further considerations below.
Frequency or Pitch	Frequency (cycles per second, or Hertz (Hz) of pressure waves. Frequency distribution by octave or 1/3 octave band. Overall sound pressure level weighted by frequency, such as A-weighting (dB(A))	The human ear is most sensitive to sounds in the range of human speech, less sensitive to high or low frequencies at the same sound energy.
Tonal content	Pure tones or energy distribution by octave or 1/3 octave frequency band. Special weightings such as Effective Perceived Noise Level in decibels (EPNDB), or simple penalty weightings for pure tones.	High tonal content means identifiable whines or hums, which can be particularly annoying compared to random noise of the same sound energy.
Information content (music, voice, sirens, etc.)	Judgement that sound includes voice, music, etc. No standard measurement scheme or weighting.	Information content draws attention to sounds compared to more random noise of the same sound energy.
Impact noise	Rapid increase in sound pressure or repetitive impacts. Fast response on sound meters used to measure impact noise.	Impact noise (helicopter rotor blade noise, jackhammers, etc.) can be more annoying than other noises of the same sound energy.
Duration of noise events as percentage of 24-hour or other period.	Hourly or other time-averaged energy level (L_{eq}) or statistical sound levels identifying the level exceeded a given percentage of the time (L_{10}, L_{50})	A noise which lasts longer or is constant has more impact than one of the same sound energy that occurs only occasionally or for a short period of time.
Degree of intrusion of noise events over background noise levels	Difference between peak and ambient noise levels. Statistical sound levels, peak noise levels compared to average or ambient.	Individual distinct noise events such as aircraft overflights or loud vehicle passby events of a given noise level are more intrusive if they occur in a quiet environment.
Time of day	24-hour or annual average level with weightings for evening and night noise such as CNEL or L_{dn}.	People and their activities are generally more sensitive to noise during the nighttime hours because (1) background noise is generally lower, making noise of a given noise level more intrusive,

Noise Characteristic	What is Measured, Units of Measurement	Effects on People and Human Activities
		and (2) sleep is easily interrupted by noise.
Importance of noise source	Judgement of social value of noise source.	People are generally willing to accept more disturbance from noise they consider necessary, such as from trash collection, emergency vehicle sirens, police helicopters, etc.

Table 2. Noise Levels for Common Noise Sources

Common Outdoor Activities	*Noise Levels (dbA)*	*Common Indoor Activities*
	110	Rock Band
Jet Fly-over at 1000 feet	105	
	100	
Gas Lawnmower at 3 feet	95	
	90	
	85	Food Blender at 3 feet
Diesel Truck going 50 mph at 50 feet	80	Garbage Disposal at 3 feet
Noisy Urban Area during Daytime	75	
Gas Lawnmower at 100 feet	70	Vacuum Cleaner at 10 feet
Commercial Area	65	Normal Speech at 3 feet
Heavy Traffic at 300 feet	60	
	55	Large Business Office
Quiet Urban Area during Daytime	50	Dishwasher in Next Room
	45	
Quiet Urban Area during Nighttime	40	Theater, Large Conference Room (background)
Quiet Suburban Area during Nighttime	35	
	30	Library
Quiet Rural Area during Nighttime	25	Bedroom at Night, Concert Hall (background)
	20	
	15	Broadcast/Recording Studio
	10	
	5	
Lowest Threshold of Human Hearing	0	Lowest Threshold of Human Hearing

Source: California Department of Transportation, *Technical Noise Supplement*, 1998.

Noise-Sensitive Land Uses. The term "noise-sensitive land uses" refers to land uses that are particularly sensitive to noise at levels commonly found in the urban environment. Within the Noise Element, the term "noise-sensitive land use" is

considered to include all uses in Figure 1 for which the "normally unacceptable" impact category begins at a noise level of 70 dB CNEL or less. This category includes all residential uses, schools, hospitals, churches, outdoor spectator sports facilities, performing arts facilities, and hotels and motels.

Noise Issues

Local Roadway Traffic Noise

Traffic noise from arterial streets and freeways has been identified as a major noise source in Riverside. An ambient monitoring program was initiated to provide a sampling of traffic noise throughout the City. Computer modeling is then applied to estimate traffic noise levels based on the number of vehicles on each roadway, the mix of vehicle types, percentages of vehicles using the roadway in the daytime, evening and nighttime hours, vehicle speed, and roadway configuration. During peak hours, traffic on Riverside streets are heavily congested causing higher noise levels compared to noise levels during non-peak hours. Local roadway traffic noise will be a particular issue with regard to residential infill development along Riverside's arterial streets and railroad tracks.

Freeway Noise

Freeways are a major noise source for many jurisdictions. Riverside is traversed by the 91, 60 and the 215 freeways. Freeway traffic volumes are expected to increase due to rapid development of Riverside and the Inland Empire in general, as well as planned freeway expansion projects. The additional traffic on freeways would increase noise levels along its extent. Residential uses along or in close proximity to freeways are impacted by vehicle noise. Although sound walls have been constructed along many portions of the 91 and 60 Freeways, freeway noise will remain an issue for noise sensitive uses, such as residential development.

Airport Noise

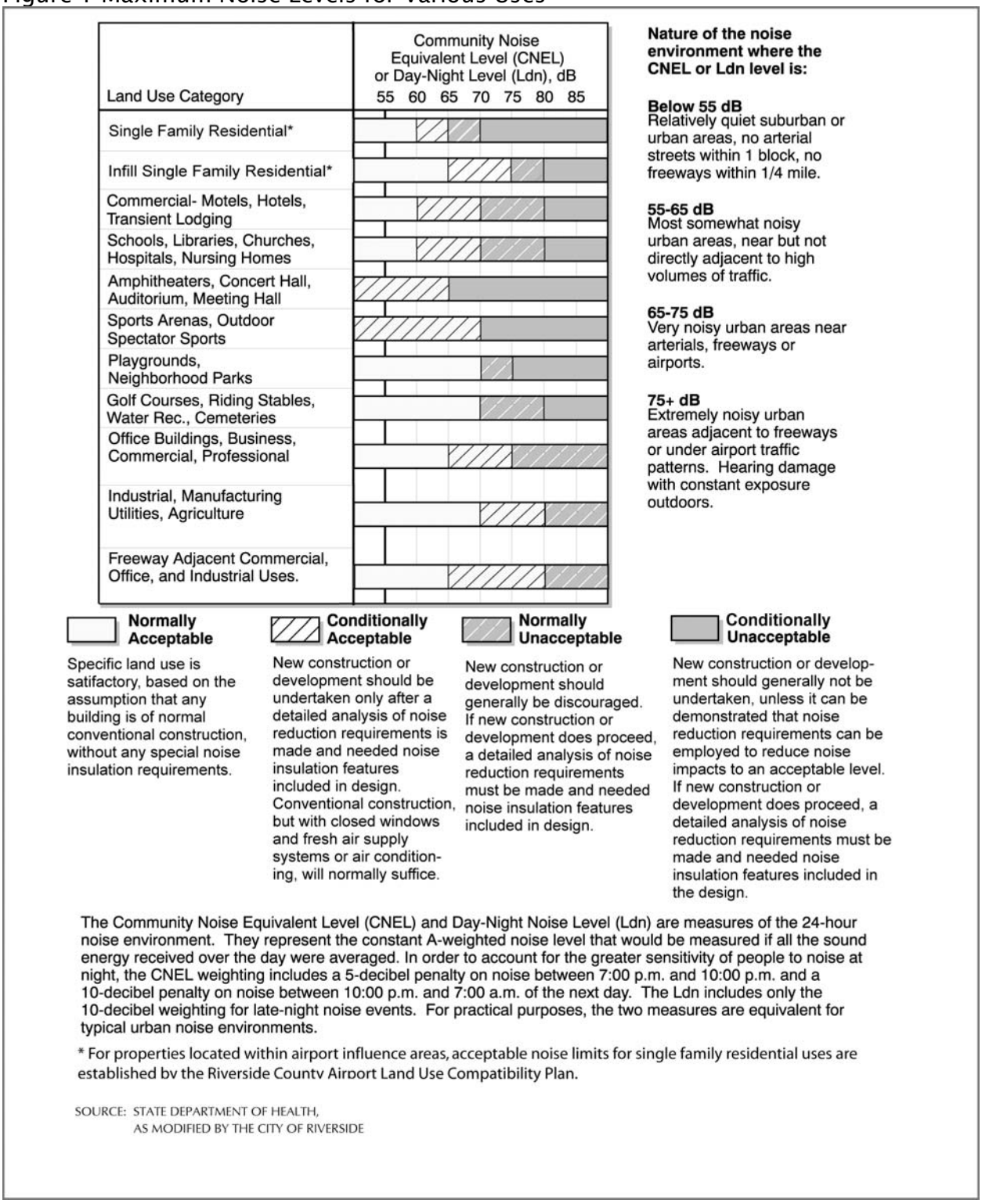
There are two airports which contribute substantial levels of noise in the vicinity of their facilities. Riverside Municipal Airport (RAL) is a general aviation airport with an annual 110,000 annual flight operations. RAL covers a total of 451 acres and includes two runways. The March Air Reserve Base (MARB) is home to the 452nd Air Mobility Wing of the U.S. Air Force, and is anticipated to be developed as an "inland port" in the coming decades. Aircraft operations utilizing the March Air Reserve Base result in

substantial levels of noise over the southeastern portion of the City (in addition to several unincorporated areas immediately adjacent to the City). Activities at the March Air Reserve Base continue to represent the City's largest single source of noise. With the development of the "inland port", operations at MARB are anticipated to grow in the future.

Railroad Noise

The Union Pacific Railroad (UPRR) and the Burlington North Santa Fe Railroad (BNSF) both have rail lines that generally travel along major roadway corridors. Train noise, however intermittent, is a major source of noise due to its magnitude. Train noise results from the locomotive engine, wheel-on-rail noise, and train whistles near at-grade roadway crossings. Riverside's rail lines carry both freight as well as Metrolink service.

Figure 1 Maximum Noise Levels for Various Uses



Industrial Noise

Industrial uses are another source of noise that can have a varying degree of impact on adjacent uses. A variety of mechanical equipment, generators, and vehicles all contribute to noise levels at industrial sites. There are also many areas in Riverside where residential uses are in close proximity to industrial uses. In addition, the new General Plan may create new light-industrial areas in the southwestern and northeastern corners of the City.

Construction Noise

Construction noise typically involves the loudest common urban noise events. Construction activities could involve the following noise intensive phases – demolition, trenching/grading and building construction. Construction equipment involves large diesel engines, power and air tools, truck deliveries and hauling, as well as construction worker commutes.

Construction activity is temporary at any given location, but can be substantially disruptive to adjacent uses during the construction period. Construction results from both private land development activity and from public agency activity to construct utilities, streets and public buildings. The City through Municipal Code Section 7.35.010.B.5 currently regulates the allowable hours of construction activity to 7:00 a.m. to 7:00 p.m. on weekdays and 8 a.m. to 5 p.m. on Saturdays. No construction activities are allowed on Sunday or federal holidays such that the sound creates a noise disturbance across a residential or commercial property line. In addition, the municipal code also limits noise levels from construction activities to the maximum permitted exterior noise level for the affected land use.

Mechanical Equipment Noise

Mechanical equipment is used extensively in buildings to provide heating, cooling, air circulation and water supply. Mechanical equipment that produces noise includes motors, pumps and fans. Frequently, this equipment includes components of pure tone noise from the rotational frequency of motors. Although noise levels are generally low from these sources at nearby properties, the fact that such sources may operate continuously and may include pure tones that make them audible at a substantial distance makes them a potentially important noise source.

Portable Power Equipment

Portable power equipment includes devices such as leaf blowers, lawn mowers,

portable generators, electric saws and drills, and other similar equipment. The noise source may result from the motor, from the working surface of the tool on the work piece, from noise of blowers and fans, or a combination of these sources. Portable power equipment is ubiquitous in the modern city, and can produce very high noise levels at the location of the work.

Amplified Sound

Amplified sound includes noise from personal or home audio equipment, automotive audio equipment, loudspeakers on sound trucks or in fixed installations used for paging, and amplified sound used for music or theatrical performances. Because this sound typically includes music or speech, it is potentially more detectable and more annoying than other sounds of the same noise level. Because of the potential for noise generation from amplified sound, Municipal Code Section 7.35.010.B.1 and 7.35.010.B.2 provides limitations on time and magnitude of noise for these sources.

Summary of Existing Noise Levels in Riverside

To measure the existing noise levels in Riverside, an ambient noise monitoring study was conducted to assess current noise levels at a variety of land uses proximate to major sources. Both 24-hour noise measurements as well as measurements during the peak hour traffic periods were taken. City staff identified 20 locations for noise monitoring. Noise measurements were taken at 20 locations throughout the City, listed in Table 3, along with a summary of the monitored existing noise levels.

The primary major sources of persistent noise generated by activities within the City are from major roadway arterials throughout the City, the 91, 60 and the 215 freeways, the Union Pacific and BNSF railroads, the Riverside Municipal Airport and March Air Reserve Base.

Table 3 Summary of Existing Noise Level Measurements

Receptor Number	Location	Leq	Minimum	Maximum	CNEL
24 – Hour Measurements					
1	10505 Salisbury Side Yard	–	39.9	93.6	61.5
2	4312 Collett Rear Yard	–	31.7	84.7	63.5
5	10000 Ontario Street Rear Yard	–	31.9	84.5	56.5
7	3485 Crowell Front Porch	–	39.7	76.9	61.6
9	5320 Mountain View Front Yard	–	32.7	80.9	65.5
10	End of Overlook Parkway City Property	–	32.7	80.9	49.5
12	5185 Monterrey Rear Yard	–	45.4	89.8	70.9
13	4333 Mission Inn Front Yard	–	33.0	95.3	65.6
14	2161 Buckskin Rear Yard	–	33.1	83.8	60.5
18	20394 Julius Way	–	49.3	81.4	74.0
Short Term Measurements					
3	Corner of Collett and Pierce (AM)	57.6	44.6	75.2	–
3	Corner of Collett and Pierce (Mid-day)	58.4	43.7	75.9	–
3	Corner of Collett and Pierce (PM)	62.8	46.9	82.9	–
4	4185 Acacia Front Yard (AM)	55.4	45.5	70.3	–
4	4185 Acacia Front Yard(Mid-day)	56.8	47.4	74.3	–
4	4185 Acacia Front Yard (PM)	58.6	49.9	69.6	–
6	Corner Monroe and Stark Sidewalk (AM)	64.6	45.5	78.7	–
6	Corner Monroe and Stark Sidewalk (Mid-day)	64.5	47.8	76.4	–
6	Corner Monroe and Stark Sidewalk(PM)	66.0	48.7	80.4	–
8	6937 Del Rosa Front Yard(AM)	49.8	41.9	63.9	–
8	6937 Del Rosa Front Yard(Mid-day)	52.3	434	68.6	–
8	6937 Del Rosa Front Yard(PM)	50.1	43.9	64.9	–
11	Corner of Victoria and Lincoln At Bike Path(AM)	64.1	51.9	79.5	–
11	Corner of Victoria and Lincoln At Bike Path(Mid-day)	62.9	44.6	77.9	–
11	Corner of Victoria and Lincoln At Bike Path(PM)	61.4	48.7	78.1	–
15	Corner Kansas and MLK Church Parking Lot(AM)	56.5	43.5	72.7	–
15	Corner Kansas and MLK Church Parking Lot(Mid-day)	53.5	41.4	68.5	–
15	Corner Kansas and MLK Church Parking Lot(PM)	55.7	48.6	66.7	–
16	Corner Kansas and University Rear Alleyway(AM)	63.5	53.1	81.6	–
16	Corner Kansas and University Rear Alleyway(Mid-day)	61.5	50.2	71.7	–
16	Corner Kansas and University Rear Alleyway(PM)	63.4	53.8	79.2	–
17	Corner King Ave and Arabian Way Shoulder(AM)	58.6	42.3	75.1	–
17	Corner King Ave and Arabian Way Shoulder(Mid-day)	55.7	42.0	70.9	–
17	Corner King Ave and Arabian Way Shoulder(PM)	59.7	48.3	78.6	–
19	Corner Valencia Hill and Watkins Right of Way(AM)	60.6	42.6	76.7	–
19	Corner Valencia Hill and Watkins Right of Way(Mid-day)	60.6	41.1	78.1	–
19	Corner Valencia Hill and Watkins Right of Way(PM)	59.7	46.8	71.9	–
20	5009 Golden Right of Way(AM)	63.8	42.9	77.7	–
20	5009 Golden Right of Way(Mid-day)	63.1	43.5	77.1	–
20	5009 Golden Right of Way(PM)	65.8	47.1	80.2	–

Riverside Municipal Code: Noise Standards

§ 7.25 EXTERIOR SOUND LEVEL LIMITS.

There are typically two categories of exterior sound level limits. Some pertain to individuals creating noise that is a nuisance. There are also noise level limits used for noise compatibility for specific land uses.

In regards to the individuals creating noise that is a nuisance, sources of this type of noise could be from the use of radios, television sets, musical instruments, loud speakers, animals, loading/unloading activities, construction activities, domestic power tools, powered model vehicles, signal devices and vehicle repair and testing. These sources of nuisance noise are regulated under Municipal Code Section 7.35.010.B. The limits established by the aforementioned code section provides a more stringent limit to noise as compared to those established for noise compatibility in land use planning.

In terms of City planning for land use compatibility to noise exposure, the City provides levels of acceptable noise exposure based on the sensitivity of specific land uses (Municipal Code Section 7.25.010). As shown in Figure 1, residences, schools, libraries, churches, hospitals and nursing homes represent those land uses which are considered the most noise sensitive. Recreational, office and commercial uses are considered less sensitive to noise; industrial, utility and agricultural uses represent land uses which are the least sensitive to noise exposure.

These levels of acceptability for noise exposure based on land use sensitivity provide city planners with an objective gauge of how noise may adversely affect land uses and a determination if mitigation is necessary to meet the City's noise level limits. For this reason, planning of land uses is necessary to avoid incompatibilities due to noise exposure.

In addition to the maximum noise levels for various land uses shown in Figure 1, the following excerpt from Municipal Code Section 7.25.010 also establishes more specific noise level limits based on duration of exceedance:

A. Unless a variance has been granted as provided in this chapter, it shall be unlawful for any person to cause or allow the creation of any noise which exceeds the following:

1. The exterior noise standard of the applicable land use category, up to five decibels, for a cumulative period of more than thirty minutes in any hour; or

2. The exterior noise standard of the applicable land use category, plus five decibels, for a cumulative period of more than fifteen minutes in any hour; or

3. The exterior noise standard of the applicable land use category, plus ten decibels, for a cumulative period of more than five minutes in any hour; or

4. The exterior noise standard of the applicable land use category, plus fifteen decibels, for a cumulative period of more than one minute in any hour; or

5. The exterior noise standard of the applicable land use category, plus twenty decibels or the maximum measured ambient noise level, for any period of time.

B. If the measured ambient noise level exceeds that permissible within any of the first four noise limit categories, the allowable noise exposure standard shall be increased in five decibel increments in each category as appropriate to encompass the ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level.

Summary

The numerous "visioning" efforts and reports conducted before and during the General Plan update process yielded several citizens comments and concerns relative to train

noise, roadway noise, and noise from congregations of students. These and other issues are addressed in the previous Noise Element, as well as in the Riverside Municipal Code. The updated Noise Element will include proactive measures to limit additional sensitive-user noise exposure as well as to address existing exposure issues. These measures will be based upon updated noise contour map as well as consideration of future land uses and future traffic levels.

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