Integrated Mosquito and Vector Management Programs

APPENDIX

D

NOISE TECHNICAL REPORT

Noise Technical Report

Project Name: Integrated Mosquito and Vector Management Programs for Nine Districts

Date: June 2013

Prepared for:

Alameda County Mosquito Abatement District
Alameda County Vector Control Services District
Contra Costa Mosquito and Vector Control District
Marin/Sonoma Mosquito and Vector Control District
Napa County Mosquito Abatement District
Northern Salinas Valley Mosquito Abatement District
San Mateo County Mosquito and Vector Control District
Santa Clara County Vector Control District
Solano County Mosquito Abatement District

Prepared by:

Grant Visual Technology GVT

5010 Landybank Court, Reno, NV 89519 USA

In association with

Cardno ENTRIX
Shaping the Future

Cardno ENTRIX
2300 Clayton Road, Suite 200, Concord, CA 94520 USA

This Page Intentionally Left Blank

Table of Contents

Tables

Figures

Acronyms

°C	degrees Celsius
°F	degrees Fahrenheit
AB	Assembly Bill
ACMAD	Alameda County Mosquito Abatement District
ACVCSD	Alameda County Vector Control Services District
ADT	average daily trips
ANSI	American National Standards Institute
Caltrans	California Department of Transportation
CCMVCD	Contra Costa Mosquito and Vector Control District
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CDPH	California Department of Public Health
CDPR	California Department of Pesticide Regulation
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CNEL	Community Noise Equivalent Level
dB	decibel
dBA	decibels, A-weighted scale
District	California Department of Food and Agriculture
DNL	day-night noise level (also Ldn)
DoD	U.S. Department of Defense
DOT	U.S. Department of Transportation
FHWA	Federal Highway Administration
HT	heavy trucks
Hz	Hertz
kHz	kiloHertz
L10-90	percentile sound levels (L1.7, L8.3, L10, L50, and L90)
Ldn	day-night equivalent noise level (also DNL)
Leq	time-averaged integrated equivalent noise level
Lmax	maximum sound level
Lmin	minimum sound level
LOR	local ordinances and regulations
Lp	sound pressure level (also SPL)
LT	light trucks or long-term

Lw	sound power level
MSMVCD	Marin/Sonoma Mosquito Vector Control District
MVC	mosquito and vector control
NCMAD	Napa County Mosquito Abatement District
NSVMAD	Northern Salinas Valley Mosquito Abatement District
PK15	Peak Noise Level
SCCVCD	Santa Clara County Vector Control District
SCMAD	Solano County Mosquito and Vector Control District
SEL	single event level
SMCMVCD	San Mateo County Mosquito and Vector Control District
SP7	SoundPLAN™ Version 7
SPL	sound pressure level (also Lp)
TNM	Traffic Noise Model
USEPA	U.S. Environmental Protection Agency

1 Introduction

This report provides technical information regarding the physical properties of noise; federal, state, and local noise regulations; noise generated by equipment and vehicles that would be used in each of the alternatives being considered in the Integrated Mosquito and Vector Management Programs Programmatic Environmental Impact Report, as well as Best Management Practices that would be implemented. The Integrated Mosquito and Vector Management Programs (Programs) would be implemented by nine mosquito abatement and/or vector control districts in northern California. The nine districts are: Alameda County Mosquito Abatement District (ACMAD), Alameda County Vector Control Services District (ACVCSD), Contra Costa Mosquito and Vector Control District (CCMVCD), Marin/Sonoma Mosquito and Vector Control District (MSMVCD), Napa County Mosquito Abatement District (NCMAD), Northern Salinas Valley Mosquito Abatement District (NSVMAD), San Mateo County Mosquito and Vector Control District (SMCMVCD), Santa Clara County Vector Control District (SCCVCD), and the Solano County Mosquito Abatement District (SCMAD).The Programs provide for mosquito and/or vector control activities within each District's Program Area. The nine District Program Areas include both the areas within the Districts and the surrounding counties where the Districts may provide mosquito and/or other vector management services when requested.

The immediate nine District Service Areas are located in the following nine counties of the state: Alameda, Contra Costa, Marin, Monterey, Napa, San Mateo, Santa Clara, Solano, and Sonoma. Control activities may also be provided in areas adjacent to the District Service Areas upon request of the adjacent jurisdictions to protect the health and safety of residents in adjacent jurisdictions. Actions that would be taken outside of the nine Districts' Service Areas are the same types of actions undertaken within the Districts' Service Areas and in similar types of habitats or sites. Therefore, the nine District Program Areas addressed in this report also include the ten surrounding counties: Mendocino, Merced, Lake, Sacramento, San Benito, San Francisco, San Joaquin, Santa Cruz, Solano, Stanislaus, Yolo, and the portion of Monterey County south of the NSVMAD.

1.1 Report Organization

This report discusses potential noise sources and regulatory requirements that may be applicable to Program implementation by the individual Districts. Following this Introduction (Section 1), are the following:

> Fundamentals of sound including equipment noise sources (Section 2)

> Noise criteria including regulatory standards and local noise ordinances (Section 3)

> Noise generated by District equipment (Section 4)

> Best management practices to reduce unwanted noise (Section 5)

This Page Intentionally Left Blank

2 Fundamentals of Sound

Perceptible acoustical sensations can be generally classified into two broad categories: sound and vibration.

2.1 Sound and Noise

Sound is a disturbance in an elastic medium resulting in an audible sensation. Sound is also defined as mechanical energy transmitted from a vibrating or flowing source by longitudinal (or compression) waves through a compressible medium such as air. The term “noise” is both qualitative and quantitative, and is typically referred to as "unwanted” sound.

2.1.1 Vibration

Vibration is a disturbance in a solid elastic medium, which may produce a detectable motion. This differentiation between sound and vibration is most relevant for environmental noise studies when industrial or construction noise sources produce high energy waves at low frequencies that are below human audible thresholds but match the frequency response of nearby structures. These frequencies are typically less than 31 Hertz (Hz). This energy causes vibrations similar to earthquakes. Sources with audible components in addition to the vibration-producing low-frequency energy are typically heard after initial vibrations start and sometimes end depending on distance from the source.

2.2 Physiological and Physical Parameters

Sound can be further characterized by both physiological and physical parameters. These parameters include the following:

> Loudness, as a subjective or perceived noise level that is a qualitative physiological sensation

> Loudness as a numerical scale, using “A-weighted” decibels and by sones (units of perceived loudness)

> Annoyance from high-energy low-frequency single events. This events have well-documented annoyance factors on nearby human receptors. The percentage of annoyed listeners is dependent on the following conditions (U.S. Army 2005):

- Intensity
- Duration
- Repetition
- Abruptness of onset or cessation
- Background or ambient noise levels
- Interference with activity
- Previous experiences within the community
- Time of day
- Fear of personal danger from the noise sources
- Socioeconomic status and education level of the community
- The extent people believe that the noise could be controlled

> Sound intensity, the average flow of sound energy through a unit area in a sound field. Sound intensity is a vector quantity with both magnitude and direction.

> Frequency spectrum - the rate of oscillation in cycles per second.

> Wavelength, the distance between successive wave compressions and expansions.

> Energy content as sound pressure level, L_p (also written as SPL). The ear responds to sound pressure as sound waves represent oscillations of pressure just below atmospheric pressure (expansion of longitudinal wave) and just above atmospheric pressure (compression). These pressure oscillations cause the inner ear to vibrate. Sound level meters are also sensitive to these oscillations.

In particular, the SPL has become the most common descriptor used to characterize the loudness of an ambient or environmental sound level. Noise ordinances typically express SPL as “noise level” in dBA at a particular distance. Sound pressure is affected by geophysical properties such as air temperature, pressure, humidity, rain or snow, and wind, as well as physical barriers such as terrain, and the walls of structures. Sound energy dissipates with increasing distance from the source due to absorptive surfaces such as grass, trees, and water. Due to these factors, the noise level perceived by a receptor at a certain location depends on the following parameters:

> Distance between the noise source and the receptor

> Presence or absence of absorptive surfaces

> The amount of mitigative noise features between the receptor and noise source, including intervening terrain, structures, foliage, and ground cover

> Cumulative noise impacts from reflective surfaces, such as building facades, concrete, asphalt, water bodies, etc.

> Current weather conditions (snow, wind, rain) and weather-related ground cover (snow, mud, wet or dry ground)

2.3 Physical Properties of Sound

Sound levels are affected by distance from the source to receiver (propagation) and by localized atmospheric conditions. These are further described below.

2.3.1 Sound Propagation

In an ideal atmosphere without wind, temperature gradients, humidity or ground effects sound levels decay as 6 dB per doubling of distance from a stationary source due to geometrical spreading. If a source generates a level of 90 dBA at 50 feet, then geometrical spreading implies a level of 70 dBA at a distance of 500 feet from the source. If the source is moving, then the maximum level will obey the same relationship, but the exposure time is also a function of sideline distance. For a moving source, the time averaged integrated level (Leq) will decay as 3 dB per doubling of sideline distance (cylindrical spreading), providing the integration time is the constant and extends until the sound level has decayed to 10 dB below its peak level. In this case, if a source generates a Leq of 70 dBA during a drive by in which the source passes 50 feet from the observer at its closest point, then the Leq at 500 feet will be 60 dBA. These simple scaling laws are modified in reality by local atmospheric propagation effects. At low wind speeds and at distances of less than 100 feet, atmospheric propagation effects are small and can be ignored. At larger distances, atmospheric propagation will modify the decay of the sound level with distance. In addition, ground effects can be important at small distances from the source and will depend on the ground cover and the height of the source and receiver above the ground.

Figure 2-1 provides a range of noise levels in the ideal atmosphere at increasing sound power levels. Sound Power is the sound level generated at the noise source. Additionally, color shading delineates the

threshold of pain (purple), noise levels that would typically exceed regulatory thresholds (red), and noise levels that may exceed regulatory thresholds depending on time of day and time-weighting (yellow). Noise levels within the white and green bands are typically within or below regulatory thresholds.

Sound Power Level (L_w) of Noise Source (dB*)	Distance from Noise Source to Outdoor Receiver (Feet)											
	1	2	4	8	16	32	64	125	250	500	1000	2000
	Sound Pressure Level (Lp)											
150	144	138	132	126	120	114	108	102	96	90	84	78
140	134	128	122	116	110	104	98	92	86	80	74	68
130	124	118	112	106	100	94	88	82	76	70	64	58
120	114	108	102	96	90	84	78	72	66	60	54	48
110	104	98	92	86	80	74	68	62	56	50	44	38
108	102	96	90	84	78	72	66	60	54	48	42	36
106	100	94	88	82	76	70	64	58	52	46	40	34
104	98	92	86	80	74	68	62	56	50	44	38	32
102	96	90	84	78	72	66	60	54	48	42	36	30
100	94	88	82	76	70	64	58	52	46	40	34	28
98	92	86	80	74	68	62	56	50	44	38	32	26
96	90	84	78	72	66	60	54	48	42	36	30	24
94	88	82	76	70	64	58	52	46	40	34	28	22
93	87	81	75	69	63	57	51	45	39	33	27	21
92	86	80	74	68	62	56	50	44	38	32	26	20
91	85	79	73	67	61	55	49	43	37	31	25	19
90	84	78	72	66	60	54	48	42	36	30	24	18
89	83	77	71	65	59	53	47	41	35	29	23	17
88	82	76	70	64	58	52	46	40	34	28	22	16
87	81	75	69	63	57	51	45	39	33	27	21	15
86	80	74	68	62	56	50	44	38	32	26	20	14
85	79	73	67	61	55	49	43	37	31	25	19	13
84	78	72	66	60	54	48	42	36	30	24	18	12
83	77	71	65	59	53	47	41	35	29	23	17	11
82	76	70	64	58	52	46	40	34	28	22	16	10
81	75	69	63	57	51	45	39	33	27	21	15	9
80	74	68	62	56	50	44	38	32	26	20	14	8
79	73	67	61	55	49	43	37	31	25	19	13	7
78	72	66	60	54	48	42	36	30	24	18	12	6
77	71	65	59	53	47	41	35	29	23	17	11	5
76	70	64	58	52	46	40	34	28	22	16	10	4
75	69	63	57	51	45	39	33	27	21	15	9	3
74	68	62	56	50	44	38	32	26	20	14	8	2
73	67	61	55	49	43	37	31	25	19	13	7	1
72	66	60	54	48	42	36	30	24	18	12	6	0
71	65	59	53	47	41	35	29	23	17	11	5	
70	64	58	52	46	40	34	28	22	16	10	4	
69	63	57	51	45	39	33	27	21	15	9	3	
68	62	56	50	44	38	32	26	20	14	8	2	
67	61	55	49	43	37	31	25	19	13	7	1	
66	60	54	48	42	36	30	24	18	12	6	0	
65	59	53	47	41	35	29	23	17	11	5		
64	58	52	46	40	34	28	22	16	10	4		
63	57	51	45	39	33	27	21	15	9	3		
62	56	50	44	38	32	26	20	14	8	2		
61	55	49	43	37	31	25	19	13	7	1		
60	54	48	42	36	30	24	18	12	6	0		

Figure 2-1 Noise Level Attenuation Due to Geometric Spreading in an Ideal Atmosphere

2.3.2 Effects of Local Atmospheric Conditions

During periods of strong sunshine, the ground surface temperature is increased, and this causes heating of the lower atmosphere. These conditions cause the air temperature to decrease with height, which is referred to as a temperature lapse. When a temperature lapse exists, sound rays are refracted upwards, and a shadow zone is formed a few hundred feet from the source (Glegg 2005). In contrast, during the nighttime hours there is significant cooling of the ground, and the atmospheric temperature increases with height, causing a temperature inversion. This causes sound to be trapped in the lower atmosphere, and sound levels can exceed those expected from spherical spreading. Furthermore, focusing effects can occur from temperature inversions and higher sound levels may be observed in a local area at relatively large distances from the source (Hubbard 1995).

Wind gradients close to the ground can cause the same effects as temperature gradients. Sound propagating upwind is refracted upwards and forms a shadow zone. Sound propagating downwind is refracted downwards and is louder than expected (Hubbard 1995). Sound is also attenuated by molecular absorption as it propagates. This is a strong function of humidity, and frequency and standard curves are available to make corrections for atmospheric absorption of this type. Typically excess attenuations of 5 dB per 1,000 feet of propagation can be expected at 2 kiloHertz (kHz) for a relative humidity of 50-90 percent and temperatures over 60 degrees Fahrenheit (˚F) (Beranek 1971).

An example of excess attenuation over a lake in Europe shows an additional 2-5 dB of attenuation per kilometer over and above atmospheric absorption. Sound level measurements from this study also show that a shadow zone can be formed by a temperature lapse. At a distance of 650 feet in the downwind direction sound levels exceed expected values at 250 Hz by 1 dB, but in the upwind direction the levels are 10 dB lower than expected (Beranek 1971).

2.3.3 Ground Effects

When a source and/or receiver are placed aboveground an interference effect takes place that modifies the measured sound level. At very low frequencies, the spectral levels are increased by 6 dB (at all distances) and at higher frequencies a series of interference dips occur where the spectral level is reduced to zero. When the source and receiver are 4 feet above ground and separated by 50 feet over a hard surface, the first interference dip occurs at 439 Hz. At a source and receiver separation of 300 feet the first separation dip occurs at 2,636 Hz. The ground effect increases the dBA level by 3 dB over a free field level (i.e., the level that would occur if the ground were not present) for a broadband source when the interference dip is at a frequency of approximately 1,000 Hz or less. When the frequency of the first ground interference dip exceeds 20 kHz, then the dBA level is increased by 6 dB relative to the free field level. For propagation over hard surfaces the ground effect, therefore, reduces the geometrical spreading loss of the dBA level when the source and receiver are less than 2,400 feet apart. This effect is relatively small unless propagation takes place over soft ground cover, in which case the effect of ground absorption can be significant. Figure 2-2 illustrates the shadow zone created by a downwind noise source (upper portion), and also illustrates the focusing phenomena created by temperature inversion, upwind noise source, and ground/water surfaces (lower portion).

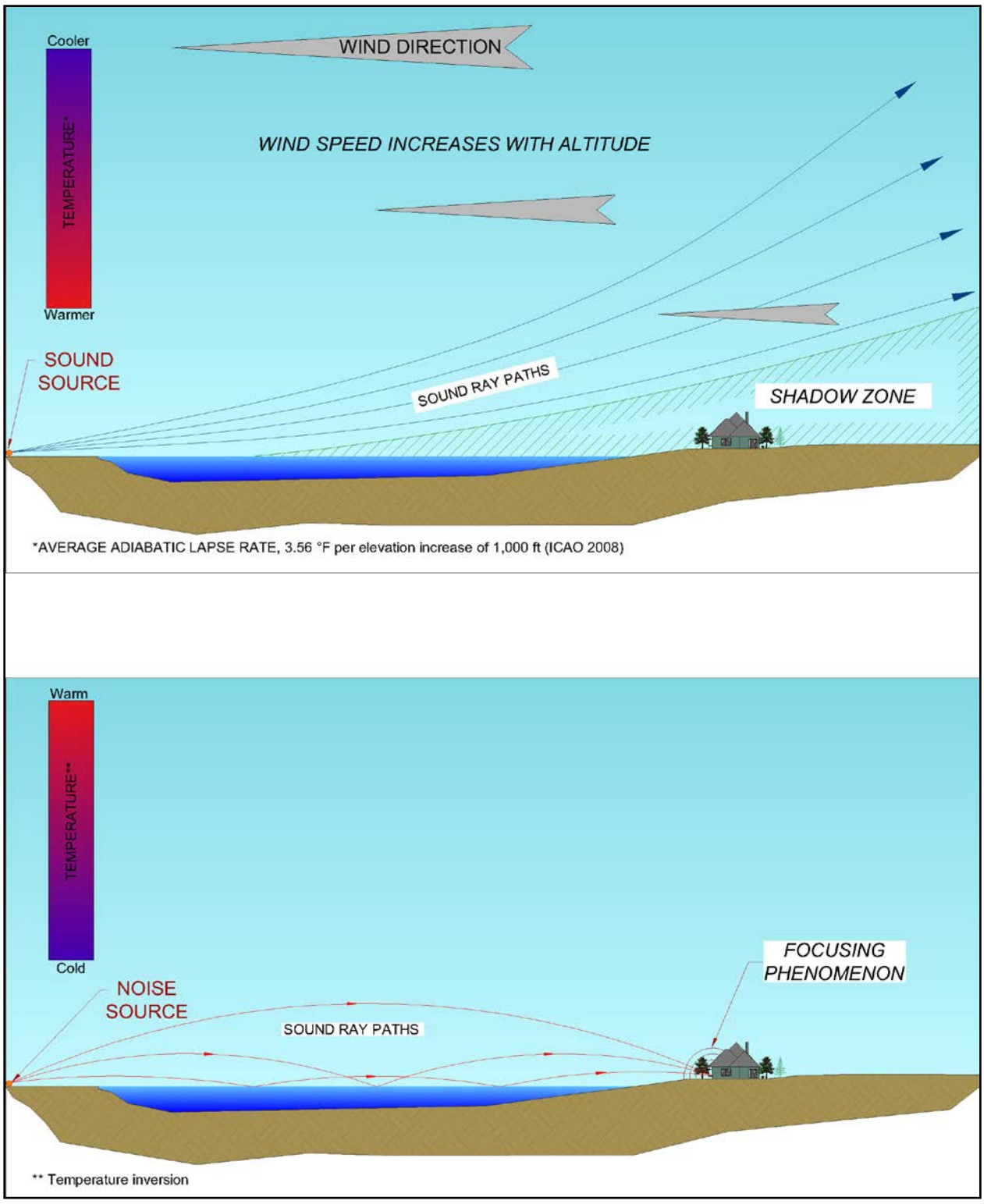

Figure 2-2 Ground Effect and Wind and Temperature Inversion

2.3.4 Reflection, Refraction, Absorption, and Transmission Losses

The sound level measured at a specific location at a discrete time is the sum of all noise source SPLs that converge at that point. Sound will refract around hard edges, be absorbed by foliage, structural materials, and the various atmospheric conditions previously described. Reflection will occur at hard surfaces where sound is not completely absorbed and/or scattered. Sound that reflects back to a source is called an echo. Transmission loss through structural materials such as walls and windows reduce sound pressure the most. Figure 2-3 illustrates these concepts.

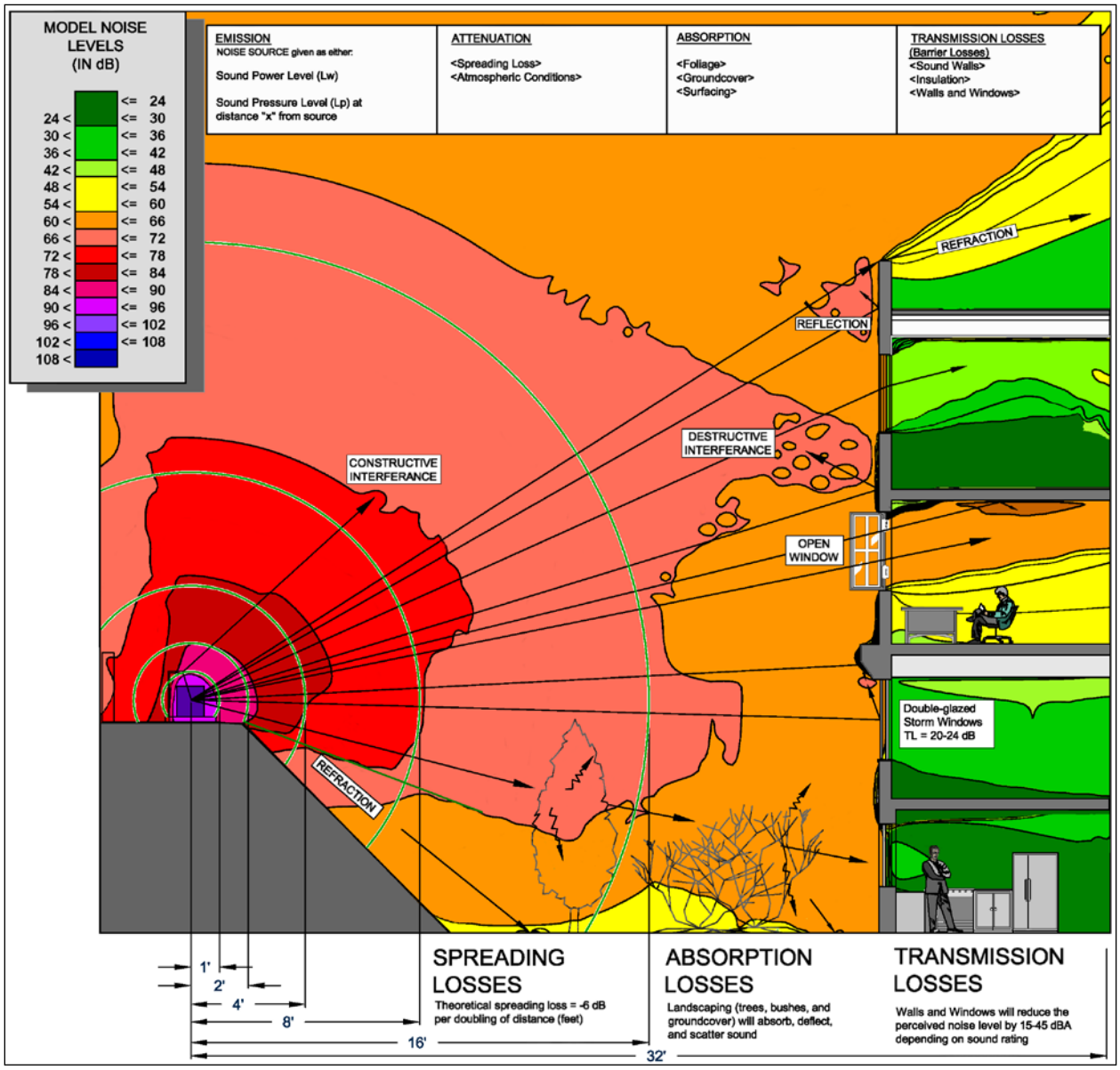

Figure 2-3 Emission, Attenuation, Absorption, and Transmission Loss

2.3.5 Sound Level Measurement

The dB scale is used to quantify sound intensity. Because SPLs can vary by over 1 million times within the range of human hearing, a logarithmic loudness scale (similar to the Richter Scale used for earthquake intensity) is used to keep sound intensity numbers within a manageable range. Since the human ear is not equally sensitive to all sound frequencies within the entire spectrum, noise measurements are weighted more heavily within those frequencies of maximum human sensitivity (middle A and its higher harmonics) in a process called "A-weighting," written as dBA.

Noise measurement metrics used for this analysis are as follows:

> Equivalent sound level (L_{eq}), the average sound level calculated from instantaneous measurements recorded over a specific period of time.

> Maximum sound level (L_{max}) reached during a sampling period. The L_{max} value is the peak noise level that occurred during the measurement period.

> Minimum sound level (L_{min}) reached during a sampling period. The L_{min} value obtained for a particular monitoring location typically reflects ambient conditions.

> Percentile sound levels (L_{90}, L_{50}, and L_{10}) are sound levels that exceed the percentile value during the measurement period.

> Community Noise Equivalent (CNEL): the average of the daytime measurement, evening measurement +5 dBA, and the night measurement +10 dBA.

> Day Night Level (L_{dn}): The day-night sound levelevaluator is recommended by the Environmental Protection Agency and used by most federal agencies as a land-use planning tool. It describes the average daily acoustic energy over the period of 1 year—meaning that moments of quiet are averaged together with moments where loud noises can be heard.

2.3.6 Community Noise Levels

Community noise levels depend on the intensity of nearby human activity. Noise levels are generally considered low when ambient levels are below 45 dBA, moderate in the 45 to 60 dBA range, and high above 60 dBA. In rural and undeveloped areas, L_{dn} can be below 35 dBA. Levels above 75 to 80 dBA are more common near major freeways and airports. Although people often accept the higher levels associated with very noisy urban areas, they nevertheless are considered to be adverse to public health. California uses a stricter equivalent sound level definition (CNEL), which uses the L_{dn} and adds a 5-dB penalty to sound measurements between 10:00 PM and 7:00 AM.

2.3.7 Noise Level Acceptance Criteria

The surrounding land uses dictate what noise levels would be considered acceptable or unacceptable. In rural and undeveloped areas away from roads and other human activity, the day-to-night difference is normally small. Because of diurnal activity, nighttime ambient levels in urban environments are about 7 dB lower than the corresponding daytime levels. Nighttime noise is a concern because of the likelihood of disrupting sleep. Noise levels above 45 dBA at night can result in the onset of sleep interference. At 70 dBA, sleep interference effects become considerable (USEPA 1974).

2.4 Noise Sources

Environmental noise sources are segregated into four categories: single event, mobile, stationary-temporary, and stationary-permanent. Examples of typical stationary and mobile noise sources in are presented in Table 2-1; noise sources that are most applicable to the equipment that would be used by the nine Districts in the Program alternatives are shown in bold. Construction noise sources are always

temporary and are typically mobile, but they may be stationary or single event. Construction noise sources are provided in more detail in Table 2-2.

Table 2-1 Typical Stationary and Mobile Noise Source Sound Levels in dBA

Noise Source	Sound Level in dBA at 50 feet[(1)]	Category
Sprayer, hand-held	**10-20**	**MOBILE**
Noise at ear level from rustling leaves	20	STATIONARY-TEMPORARY
Room in a quiet dwelling at midnight	32	STATIONARY
Soft whisper at 5 feet	34	STATIONARY-TEMPORARY
Large Department Store	50 to 65	STATIONARY-TEMPORARY
Room with window air conditioner	55	STATIONARY-PERMANENT
Leaf Blower/Vac	**55-105**	**MOBILE**
Conversational Speech	60 to 75	STATIONARY
Pump Station Equip. with Noise Abatement	62	STATIONARY-PERMANENT
Sprayer, powered, truck- or trailer-mounted	**65-105**	**MOBILE**
Passenger Car	69	MOBILE
Vacuum cleaner in private home at 10 feet	69	STATIONARY
Tractor, Agricultural at operator's seat	**76-110**	**MOBILE**
Ringing alarm at 2 feet	80	STATIONARY
Brush/Weed Cutter at operator	**90-97**	**MOBILE**
Roof-top Air Conditioner	85	STATIONARY-PERMANENT
Small Bulldozer (Cat D3) or Excavator (Cat 320)	**74-80**	**MOBILE**
Heavy Bulldozer	87	MOBILE
ATV at 5 to 15 feet	**87-109**	**MOBILE**
Heavy city traffic	90	MOBILE
Lawn mower at operator	**91-98**	**MOBILE**
Chain saw at operator	**100-120**	**MOBILE**
Jet aircraft at 500 feet overhead	115	MOBILE
Human pain threshold	120	--
Construction Blast	120 to 145	SINGLE EVENT

Sources: Noise Control Reference Handbook, Industrial Acoustics Company, 1979.

Notes:

Bold indicates Program equipment

[1] Noise level in dBA at approximately 50 feet unless otherwise noted in description

2.4.1 Traffic, Heavy Equipment, and Construction Noise

Although the nine Districts' ongoing mosquito and vector control activities do not involve heavy construction equipment besides bulldozers (for occasional use only), the information is provided for reference purposes.

Heavy equipment and construction noise sources and corresponding noise levels in the adjacent or nearby area will greatly fluctuate depending on the purpose of construction and the particular type, number, and duration of use of various types of construction equipment involved. Program equipment inventories include heavy equipment. The effect of construction noise on nearby receptors depends upon how much noise is generated by each individual piece of equipment; the distance between construction activities and the nearest noise-sensitive receptors; the frequency, type, and duration of noise produced; and the ambient noise levels at the receptors. At a distance of 50 feet, noise levels would be between 68 to 96 Leq. Noise levels in this range would be substantially higher than the ambient noise levels experienced by sensitive receptors in typical rural commercial, recreational, and residential environments.

For traffic noise, a change in noise levels of less than 3 dBA is not discernible to the general population. An increase in average noise levels of 3 dBA is considered barely perceptible, while an increase of 5 dBA is considered readily perceptible to most people (Caltrans 1998).

2.4.2 Characteristics of Groundborne Vibration

Vibrating objects in contact with the ground radiate vibration waves through various soil and rock strata to the foundations of nearby buildings. As the vibration propagates from the foundation throughout the remainder of the building, the vibration of floors and walls may cause perceptible vibration from the rattling of windows or a rumbling noise. The rumbling sound caused by the vibration of room surfaces is called groundborne noise. When assessing annoyance from groundborne noise, vibration is typically expressed as root mean square (rms) velocity in units of decibels of 1 micro-inch per second. To distinguish vibration levels from noise levels, the unit is written as "VdB." Human perception to vibration starts at levels as low as 67 VdB and sometimes lower. Annoyance due to vibration in residential settings starts at approximately 70 VdB. Groundborne vibration is almost never annoying to people who are outdoors. Although the motion of the ground may be perceived, without the effects associated with shaking of building components, the motion does not provoke the same adverse human reaction. In extreme cases, excessive groundborne vibration has the potential to cause structural damage to buildings. Common sources of groundborne vibration include trains and construction activities such as blasting, pile driving, and operating heavy earthmoving equipment.

Program equipment capable of producing ground-borne vibration is limited to bulldozer use. Excessive ground-borne vibration typically occurs when earthwork equipment encounters hard rock during construction, but such actions are not part of the Program alternatives. Occasional use of a small bulldozer may be required for activities such as vegetation clearance and unimproved road maintenance, but this would not result in human annoyance or structural damage from vibration. Similarly, light trucks, which would be used for each of the Program alternatives, would not be capable of producing substantial amounts of vibration.

2.4.3 Critical and Sensitive Receptors

Some land uses are generally regarded as being more sensitive to noise than others due to the types of population groups or activities involved. The definition of critical and sensitive receptors varies by jurisdiction, but in general, critical receptors are those that cannot be interrupted or disturbed by project noise. These include, but are not limited to, police and fire stations, high security operations, noise-sensitive industry, hospitals, nursing homes, and other long-term medical care facilities. Sensitive population groups include children and the elderly and sensitive land uses. These sensitive land uses include residential (single- and multi-family, mobile homes, dormitories, and similar uses), guest lodging, parks and outdoor recreation areas, schools, libraries, churches, and places of public assembly.

Biological receptors with the potential to be adversely affected by noise are primarily terrestrial wildlife species but may include water birds. The concern is whether the use of equipment could increase ambient noise levels. An additional concern is whether short-term or temporary increases in noise levels could affect sensitive wildlife receptors such as nesting eagles or other special-status raptors disrupting nesting, interrupting feeding of nestlings, or causing nest abandonment.

3 Regulatory Criteria

The noise nuisance criteria are derived from local noise ordinances, state laws, and/or federal regulations/standards. These criteria are programmatically evaluated in the PEIR to determine potential noise impacts from Program operations on receptors within the Program area.

3.1 Regulatory Setting

Federal regulations, standards, and guidelines; California state law; and local ordinances and regulations (LOR) pertaining to environmental noise are cited in this section. The LOR citations include all county ordinances and select city ordinances within the District Service Areas. Counties that do not have specific noise ordinances are either referenced as deferring to state or federal regulations, or if a noise element exists in a specific general plan, that element is cited.

3.2 Federal Standards

The federal noise standards or guidelines discussed in this section are applicable and relevant or to-be-considered during implementation of Program alternatives on federal lands including national wildlife refuges. Noise regulations and standards are provided for the following agencies:

> U.S. Department of Transportation (DOT) – Federal Aviation Administration (FAA)

> U.S. Department of Transportation (DOT) – Federal Highway Administration (FHWA)

> U.S. Environmental Protection Agency (USEPA)

3.2.1 U.S. Environmental Protection Agency (USEPA)

The USEPA has developed guidelines on recommended maximum noise levels to protect public health and welfare (EPA 1974). The USEPA does not enforce these regulations, but rather offers them as a planning tool for state and local agencies. The table below provides examples of protective noise levels recommended by the USEPA.

Table 3-1 USEPA Designated Noise Safety Levels

Effect	Noise Level	Area
Hearing Loss	Leq (24)<70 dB	All areas
Outdoor Activity Interference and Annoyance	Ldn <55 dB	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use.
	Leq (24)<55 dB	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor Activity Interference and Annoyance	Ldn <45 dB	Indoor residential areas
	Leq (24)<45 dB	Other indoor areas with human activities such as schools, etc.

Source: USEPA, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, March 1974.

L_{eq} (24) = Represents the sound energy averaged over a 24-hour period.

L_{dn} = Represents the Leq with a 10 dB nighttime weighting.

3.2.2 Federal Aviation Administration

The major parts of CFR Title 14: Aeronautics and Space, Chapter I: Federal Aviation Administration, Department of Transportation, Subchapter C, for fixed-wing aircraft noise and Subchapter H for helicopter noise, were reviewed for applicability to existing and potential Program flight operations, specifically:

Part 36: Noise Standards: Aircraft Type And Airworthiness Certification

Noise data from aircraft power plants, propellers, and combinations of each by aircraft type are well documented as each aircraft type must be certified by the FAA under Part 36 prior to use by general and commercial aviation.

The fixed-wing aircraft proposed for aerial spraying is an Air Tractor 502 . This aircraft make, model, engines, and propellers, as a system, are exempt from noise standards because the aircraft was manufactured for agricultural-type operations, including aerial spraying, exclusively. The helicopters proposed for aerial spraying have FAA noise certifications. Sound level data for the helicopters are presented in Section 4.

Part 91: Flight Operations

Elements of Part 91 are provided as a reference. Altitude limitations governing agricultural operations are given in Part 137, Agricultural Operations.

Fixed-wing aircraft not operating under an Instrument Flight Rules, emergencies, during takeoff or landing, or Part 137 are required to maintain the altitudes listed in Section 91.119 - Minimum Safe Altitudes: General (a)-(d). Section 91.119 (a), (b), and (c) are provided below.

Except when necessary for takeoff or landing, no person may operate an aircraft below the following altitudes:

(a) Anywhere. An altitude allowing, if a power unit fails, an emergency landing without undue hazard to persons or property on the surface.

(b) Over congested areas. Over any congested area of a city, town, or settlement, or over any open air assembly of persons, an altitude of 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft.

(c) Over other than congested areas. An altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure.

Section 137.49 – Operations over other than Congested Areas

Notwithstanding Part 91 of this chapter, during the actual dispensing operation, including approaches, departures, and turnarounds reasonably necessary for the operation, an aircraft may be operated over other than congested areas below 500 feet above the surface and closer than 500 feet to persons, vessels, vehicles, and structures, if the operations are conducted without creating a hazard to persons or property on the surface.

Section 137.51 – Operation over Congested Areas: General

(a) Notwithstanding Part 91 of this chapter, an aircraft may be operated over a congested area at altitudes required for the proper accomplishment of the agricultural aircraft operation if the operation is conducted:

  (1) With the maximum safety to persons and property on the surface, consistent with the operation, and

  (2) In accordance with the requirements of paragraph (i) of this section

(i) No person may operate an aircraft over a congested area except in accordance with the requirements of this paragraph.

(3) Prior written approval must be obtained from the appropriate official or governing body of the political subdivision over which the operations are conducted.

(4) Notice of the intended operation must be given to the public by some effective means, such as daily newspapers, radio, television, or door-to-door notice.

(5) A plan for each complete operation must be submitted to, and approved by appropriate personnel of the FAA Flight Standards District Office having jurisdiction over the area where the operation is to be conducted. The plan must include consideration of obstructions to flight, the emergency landing capabilities of the aircraft to be used, and any necessary coordination with air traffic control.

(6) Single engine aircraft must be operated as follows:

(i) Except for helicopters, no person may take off a loaded aircraft, or make a turnaround over a congested area.

(ii) No person may operate an aircraft over a congested area below the altitudes prescribed in Part 91 of this chapter except during the actual dispensing operation, including the approaches and departures necessary for that operation.

(iii) No person may operate an aircraft over a congested area during the actual dispensing operation, including the approaches and departures for that operation, unless it is operated in a pattern and at such an altitude that the aircraft can land, in an emergency, without endangering persons or property on the surface.

(7) Multiengine aircraft must be operated as follows:

(i) No person may take off a multiengine airplane over a congested area except under conditions that will allow the airplane to be brought to a safe stop within the effective length of the runway from any point on takeoff up to the time of attaining, with all engines operating at normal takeoff power, 105 percent of the minimum control speed with the critical engine inoperative in the takeoff configuration or 115 percent of the power-off stall speed in the takeoff configuration, whichever is greater, as shown by the accelerate stop distance data. In applying this requirement, takeoff data is based upon still-air conditions, and no correction is made for any uphill gradient of 1 percent or less when the percentage is measured as the difference between elevations at the end points of the runway divided by the total length. For uphill gradients greater than 1 percent, the effective takeoff length of the runway is reduced 20 percent for each 1 percent grade.

(ii) No person may operate a multiengine airplane at a weight greater than the weight that, with the critical engine inoperative, would permit a rate of climb of at least 50 feet per minute at an altitude of at least 1,000 feet above the elevation of the highest ground or obstruction within the area to be worked or at an altitude of 5,000 feet, whichever is higher. For the purposes of this subdivision, it is assumed that the propeller of the inoperative engine is in the minimum drag position, that the wing flaps and landing gear are in the most favorable positions, and that the remaining engine or engines are operating at the maximum continuous power available.

(iii) No person may operate any multiengine aircraft over a congested area below the altitudes prescribed in Part 91 of this chapter except during the actual dispensing operation, including the approaches, departures, and turnarounds necessary for that operation.

Section 137.53 – Operation over Congested Areas: Pilots And Aircraft

(a) General. No person may operate an aircraft over a congested area except in accordance with the pilot and aircraft rules of this section.

(b) Pilots. Each pilot in command must have at least:

(1) 25 hours of pilot-in-command flight time in the make and basic model of the aircraft, at least 10 hours of which must have been acquired within the preceding 12 calendar months.

(2) 100 hours of flight experience as pilot in command in dispensing agricultural materials or chemicals.

(c) Aircraft.

(1) Each aircraft must –

(i) If it is an aircraft not specified in paragraph (c)(1)(ii) of this section, have had within the preceding 100 hours of time in service a 100-hour or annual inspection by a person authorized by Part 65 or 145 of this chapter, or have been inspected under a progressive inspection system.

(ii) If it is a large or turbine-powered multiengine civil airplane of U.S. registry, have been inspected in accordance with the applicable inspection program requirements of Section 91.409 of this chapter.

(2) If other than a helicopter, it must be equipped with a device capable of jettisoning at least one-half of the aircraft's maximum authorized load of agricultural material within 45 seconds. If the aircraft is equipped with a device for releasing the tank or hopper as a unit, there must be a means to prevent inadvertent release by the pilot or other crewmember.

3.2.3 Federal Highway Administration

Title 23, Part 772 requires comprehensive noise studies using modeling for new construction or reconstruction of highways. The principle tool for evaluating noise impacts due to increased vehicular traffic is the Traffic Noise Model (TNM) latest version.

3.3 State Noise Standards and Guidelines

State noise standards and guidelines include CEQA, the California Department of Parks and Recreation General Plan, land use compatibility regulations and the California Vehicle Code. Elements of these are summarized below.

3.3.1 Department of Parks and Recreation General Plan

Statewide guidelines for General Plans published in 1998 indicate that levels under 70 Ldn should be acceptable to receptors in parks (OPR 1998).

The California Department of Parks and Recreation, Off-Highway Motor Vehicle Recreation Division published a comprehensive OHV noise study in September 2005 as required by Public Resources Code Section 5090.32(0). This division is responsible for enforcing OHV noise emissions violations on land regulated by the State (OPR 2005b).

3.3.2 Land Use Compatibility

The California Government Code § 65302(f) encourages each local government entity to conduct noise studies and implement a noise element as part of their General Plan. In addition, the California Office of Planning and Research published guidelines for evaluating the compatibility of various land uses as a

function of community noise exposure, and these are listed in Table 3-2 below. In general, noise levels less than 60 dBA Ldn are acceptable for all land uses, including residences, schools, and other noise-sensitive receptors. The State considers noise levels less than 70 dBA Ldn to be normally acceptable for playgrounds and neighborhood parks (OPR 1998).

It is important to note that the noise levels referred to above only consider permanent, stationary new noise sources. None of the operations involved in the Program are permanent, stationary noise sources so the table is provided for reference only.

Table 3-2 Land Use Compatibility for Community Noise Environment – Permanent Stationary Noise Sources

Land use category	Community Noise Exposure – L_{dn} or CNEL in dBA						
	50	55	60	65	70	75	80
Residential – Low Density Single Family, Duplex, Mobile Home							
Residential – Multifamily							
Transient Lodging – Motel, Hotel							
Schools, Libraries, Churches, Hospitals, Nursing Homes							
Auditorium, Concert Hall, Amphitheaters							
Sports Arena, Outdoor Spectator Sports							
Playgrounds, Neighborhood Parks							
Golf Courses, Riding Stables, Water Recreation, Cemeteries							
Office Buildings, Business Commercial and Professional							
Industrial, Manufacturing, Utilities, Agriculture							

LEGEND

	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: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are 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 requirement must be made and needed noise insulation features included in the design.
	Clearly Unacceptable: New construction or development generally should not be undertaken.

Source: State of California General Plan Guidelines, Office of Planning and Research, June 1998.'

CNEL = Community Noise Equivalent Level

dBA = A-weighted decibel(s)

Ldn = Day-Night Noise Level

3.3.3 California Vehicle Code

Noise from highway vehicles and off-highway equipment is regulated by the Department of Motor Vehicles with cooperation from the California Highway Patrol. Off-highway motor vehicles manufactured between 1975 and 1986 must not exceed 86 dBA, and those manufactured after 1986 must not exceed 82 dBA when measured at 50 feet from the centerline of travel (Vehicle Code Section 38370). Heavy highway vehicles manufactured after 1987 must emit less than 80 dBA (Vehicle Code Sections 27204 and 27206).

3.4 Selected Noise Ordinances within the Districts

Local ordinances and regulations (LOR) were obtained for selected localities within each of the nine Districts. Alameda County MAD and VCSD are combined. Selections were determined by geographical position, and, where identified during research, municipalities that have had historical noise issues related to similar Program-type operations.

Table 3-3 Summary of County and City Noise Ordinances or General Plan Elements Cited

Municipality	Ordinance Title/Description
Alameda County[(1)]	Alameda County General Ordinance Code, Title 6 Health and Safety, Chapter 6.60 Noise
Albany	Chapter VIII Law Enforcement, 8-1 Noise
Berkeley	Berkeley Municipal Code, Title 13, Chapter 13.40 Community Noise
Piedmont	Piedmont City Code, Chapter 12: Offenses – Misc. Sec. 12.8 Noise Declared Nuisance
Oakland	City of Oakland General Plan, Noise Element
San Leandro	Ordinance No. 2003-005
Contra Costa County[(2)]	County of Contra Costa, Noise Element, Contra Costa County General Plan, Chapter 11
Brentwood	Title 9 Public Peace, Morals, and Welfare, Chapter 32, Noise Regulations
El Cerrito	Title 10 Public Peace, Morals and Welfare, Chapter 10.30 Noise
Richmond	City of Richmond, Ordinance 14-11, Chapter 9.52, Community Noise Ordinance
San Ramon	Draft San Ramon General Plan 2030, Noise Element
Marin County[(1)]	Marin County Code of Ordinances, Title 6, Chapter 6.7-Loud and Unnecessary Noises
Fairfax	Municipal Code of Ordinances, Title 8, Chapter 8.20: Noise Control 8.20.050
Novato	The Novato General Plan, Chapter 5 Safety and Noise
San Rafael	San Rafael Code of Ordinances, Title 8, Morals and Conduct, Section 8.13, Noise.
Monterey County[(3)]	County of Monterey, Title 10 Health and Safety, Chapter 10.60 Noise Control
Monterey	City of Monterey City Code, Chapter 38 - Zoning Ordinance, Part I -- General Provisions
Salinas	Salinas Code of Ordinances, Chapter 21A. – Noise Regulation
Napa County[(1)]	County of Napa Municipal Code, Title 8 Chapter 8.16 Noise Control Regulations
Calistoga	City of Calistoga 2003 General Plan, Noise Element
Napa	City of Napa Municipal Code, Title 8, Chapter 8.08 Noise Control Regulations
Saint Helena	City of St Helena Code of Ordinances, Chapter 8.24, Noise
San Mateo County[(1)]	San Mateo County General Plan, Noise Element
Brisbane	Brisbane Municipal Code, Title 9 Public Peace, Morals, and Welfare
Redwood City	Redwood City New General Plan, Section 4.10 Noise and Vibration

Municipality	Ordinance Title/Description
San Mateo City	City Code Title VII – Health, Sanitation & Public Nuisances, 7.30 Noise Regulations
Woodside	Town of Woodside General Plan 2012, Noise Element
Santa Clara County[(1)(4)]	Code of Ordinances, Title B, Division B11, Chapter VIII Control of Noise and Vibration
Gilroy	City of Gilroy Zoning Ordinance, Section 41
San Jose	Title 10 Public Peace, Morals, and Welfare, Chapter 10-16.
Solano County[(2)]	Solano County General Plan, Health and Safety Element, Noise
Benicia	City of Benicia Code of Ordinances, Chapter 8.20, Noise
Los Gatos	Los Gatos General Plan 2020, Chapter 10
Sonoma County[(2)]	Sonoma County General Plan GP2020, Noise Element
Petaluma	City of Petaluma General Plan, Noise Element 10-P-3
Sebastopol	City of Sebastopol Noise Ordinance
Santa Rosa	Santa Rosa City Code, Title 17 Environmental Protection, Chapter 17-16 Noise

Notes:

(1) Noise LOR exempts Federal or State Preempted Activities.

(2) No county noise ordinance.

(3) Exemption based on distance but not specifically for public agency operations.

(4) Specific exemption for government helicopter noise.

3.4.1 Summary of LORs

The typical LOR requires non-residential operations such as construction or other noise-emitting activities related to commercial, industrial, and governmental operations to begin not before 7 am and end between 6 and 8 pm. Many limit work to non-weekend days, and some to Monday through Saturday. If operations are to occur outside of these periods, activities would either be required to comply with exterior and interior noise limits at residential and other sensitive receptors, or acquire a permit with the appropriate regulating agency. **Most noise ordinances exempt emergency operations and government operations where actions protect human health from exposure to potentially dangerous environmental and anthropogenic pathways.**

Seven of the nine counties within the Program area have specific noise ordinances. For example, Marin County allows for exceptions to their noise ordinance for emergency work [Section 6.70.030 (5) c]; and "emergency" is defined as "*a sudden, unexpected occurrence demanding immediate action to prevent or mitigate loss of, or damage to life, health, property, or essential public services (Section 22.130.030)*" (Marin County 2013). Of these seven counties with noise ordinances, six counties exempt actions performed by government entities are regulated by state or federal laws directly. The remaining county exempts all noise based on distance to the nearest occupied dwelling.

The typical noise ordinance generically states "it is unlawful for any person to operate any installed mechanical equipment if the maximum noise level exceeds 50 to 60 dBA at any point at least 1 foot inside the property line of the affected residential property and 3 to 5 feet above ground level." When measured from a distance of 50 feet, municipal vehicles and vehicles supporting government operations cannot exceed 70 to 85 dBA. Noise levels cannot exceed the ambient level by 10 dBA or more at schools, churches or hospitals. Municipal ordinances provide a single value for maximum noise levels permitted; the ranges given are from review of selected ordinances in the table above.

Many ordinances allow for very loud noise emissions on a short-term basis. The loudest noise may exceed the ordinance limit by, for example, 20 to 25 dB, but would be permitted for only 5 to 15 minutes. Noise that exceeds the ordinance limit by 10 to 15 dB may be permitted for up to an hour. Many Program noise sources fall within these parameters based on total time of use proposed and would not likely exceed ordinance limits at a single location.

4 Program Equipment and Vehicles Noise

The nine Districts provided tables of equipment and vehicles that would be used under each Program alternative with total time and days of use for each of five potential land use types that could be affected: residential, commercial, industrial, agricultural, and open space. Tables 4-1 through 4-9 below show the types of equipment and vehicles that would be used by each District, but they also include noise levels generated by each type of equipment or vehicles at distances of 50 feet and 400 feet from the source.

The noise levels are based on manufacturer data sheets, referenced studies, and noise databases. Where generic equipment names were given, either a range of sound levels or the maximum referenced level are provided. The maximum usage for multiples of the same equipment type for hours per day and days of per quarter is given. Equipment that is not loud enough to affect sensitive receptors for any operational use (i.e. is less than 45 dBA) are listed as "not of concern," abbreviated as NOC.

Table 4-1 Alameda County Mosquito Abatement District Vehicles and Equipment

Type of Vehicle/Equipment	Hours\day[1]	Days/Quarters				Noise Data in dBA at Indicated Distance		Notes
		Q1	Q2	Q3	Q4	50 feet	400 feet	
Pickup Truck 5.4L V8	4	50	57	55	45	83	65	At 35 mph. See also Note (2)
Pickup Truck 5.0L V8 (2)	3	53	60	55	50	83	65	
Pickup Truck 4.6L V8 (2)	2.5	58	60	58	55	83	65	
Pickup Truck 4.3L V6	4	0	0	1	0	83	65	
Pickup Truck 4.0L V6 (4)	3	55	60	55	40	83	65	
Pickup Truck 3.0L V6	6	0	43	62	22	83	65	
Cargo Van	2	8	15	6	5	83	65	
Jeep (2)	6	0	33	62	22	83	65	
SUV	2	20	15	20	15	83	65	
2001 6x6 Polaris ATV	2	1	2	0	0	87	69	(3)
Maruyama Mist Duster MD155DX	0.75	8	5	7	0	NOC		
Gas Spray Rig in Truck (2)	0.25	30	15	0	0	66	48	(4)
Electric Spray Rig (6)	0.15	0	10	20	1	63	45	
Leaf Blower	0.25	1	0	0	0	76	58	
Brush Cutter	0.5	0	0	0	1	63	45	
Chainsaw	0.5	0	0	0	1	70	50	
2008 ARGO 8/Wheel Avenger	4	30	15	0	0	87	69	(3)
2010/2012 ARGO 8/Wheel 750 HDI EFI (2)	4	30	15	0	0	87	69	(3)
Gas Spray Rig in Argo (3)	4	30	15	0	0	66	48	(4)
1968 Bell 206 Jet Ranger helicopter	4	0	1	0	0		84-87	(5)

Type of Vehicle/Equipment	Hours\day[1]	Days/Quarters				Noise Data in dBA at Indicated Distance		Notes
		Q1	Q2	Q3	Q4	50 feet	400 feet	
1989 Bell 206 Jet Ranger helicopter	4	0	1	0	0		84-87	(5)
1960 Hiller Soloy helicopter	4	0	1	0	0		83-89	Assumed (5)
Isolair Air spray system model 3900 (helicopter-mounted)	*						NOC	(6)
Isolair 4400 bucket system (helicopter-mounted)	*						NOC	
Isolair 4500 broadcaster (helicopter-mounted)	*						NOC	

NOC = Not of Concern

Notes:

(1) Locations will vary throughout listed period of use.

(2) Single hour time-weighted noise levels at 50 and 400 feet are 45 dBA and 34 dBA, respectively per TNM 2.5 Lookup Tables. Sound levels for vehicles varies greatly depending on speed, acceleration, braking, road type, and condition of vehicle. The values provided are very conservative.

(3) ATV range from reference California, 2005b.

(4) Based on sound power levels for typical 2.5-horsepower gasoline engine

(5) The noise values for aircraft (both fixed-wing and rotocraft) noise are approximately 500 feet from point of measure per FAA type certification. Aerial applications are done in response to elevated levels of larval mosquito production in large often difficult to access areas and are not necessarily used every year.

(6) Delivery vehicle noise is greater than 3 dB above equipment noise therefore the equipment noise is NOC

Table 4-2 Alameda County Vector Control Services District Vehicles and Equipment

Type of Vehicle/Equipment	Hours\day[1]	Days/Quarter				Noise Data in dBA at indicated distance		Notes
		Q1	Q2	Q3	Q4	50 feet	400 feet	
GMC Pickup Truck	8	90	91	92	92	83	65	At 35 mph. See also Note (2)
Ford Pickup Truck	8	90	91	92	92	83	65	
Dodge Pickup Truck	8	90	91	92	92	83	65	

Notes:

(1) Locations will vary throughout listed period of use.

(2) Single hour time-weighted noise levels at 50 and 400 feet are 45 dBA and 34 dBA, respectively per TNM 2.5 Lookup Tables.

Table 4-3 Contra Costa Mosquito and Vector Control District Vehicles and Equipment

Type of Vehicle/Equipment	Hours\day[1]	Days/Quarter				Noise Data in dBA at indicated distance		Notes
		Q1	Q2	Q3	Q4	50 feet	400 feet	
Chevy Pickup Truck[(15)]	2	30	65	65	30	83	65	At 35 mph. See also Note (2)
Chevy Pickup Truck[(7)]	2.75	0	65	65	0	83	65	
Chevy Pickup Truck[(3)]	1.5	15	30	30	15	83	65	
Chevy Pickup Truck[(6)]	0.5	0	5	5	0	83	65	
Toyota SUV[(2)]	1.0	8	8	8	8	83	65	
Chevy Sedan[(1)]	0.5	12	12	12	12	83	65	
Chevy Van[(1)]	1.0	2	0	0	2	83	65	
Hand Sprayer – Mozzie ULV Model 250[(2)]	2		1	7		87	69	Based on range of other hand sprayers
A-1 Mist Blower[(1)]	1.2		1	8		NOC		
Clarke-Cougar ULV[(1)]	2.5			9		63	45	Varies by nozzle and RPM
Maruyama Mist Duster MD155DX[(3)]	1.75	4	22	15		NOC		
Stihl SR420[(1)]	0.5		1			74	56	
Colt-T ULV[(1)]	0.75		6	8		87	69	Based on range of other ULV sprayers
LECO P-1 ULV[(2)]	1.0		1			87	69	Based on Range of other ULV sprayers
Gregor Boat[(1)]	0.5		1			90	72	
Argo ATV[(7)]	2.0	2	7.5	3.5		87	69	(3)
Polaris ATV[(2)]	1.0		8	10		87	69	(3)
1968 Bell 206 Jet Ranger helicopter	1		1				84-87	(4)
1989 Bell 206 Jet Ranger helicopter	1		1				84-87	(4)
1960 Hiller Soloy helicopter	1		1				83-89	Assumed (4)

NOC = Not of Concern

Notes:

(1) Locations will vary throughout listed period of use.

(2) Single hour time-weighted noise levels at 50 and 400 feet are 45 dBA and 34 dBA, respectively per TNM 2.5 Lookup Tables. Sound levels for vehicles varies greatly depending on speed, acceleration, braking, road type, and condition of vehicle. The values provided are very conservative.

(3) ATV range from reference California, 2005b.

(4) The noise values for aircraft (both fixed-wing and rotocraft) noise are approximately 500 feet from point of measure. Aerial applications are done in response to elevated levels of larval mosquito production in large often difficult to access areas and are not necessarily used every year.

Table 4-4 Marin-Sonoma Mosquito and Vector Control District Vehicles and Equipment

Type of Vehicle/Equipment (#)	Hours\day[1]	Days/Quarter				Noise Data in dBA at indicated distance		Notes
		Q1	Q2	Q3	Q4	50 feet	400 feet	
Chevy 3500 truck	1.0	4	15	15	2	85	67	At 35 mph. See also Note (2)
Ford F-250 truck (12)	2.0	50	60	60	40	83	65	
Ford F-250 truck 4x4 (9)	3.0	45	60	60	40	83	65	
Ford F-150 truck 4x4 (5)	1.5	10	15	15	5	83	65	
Ford F-350 truck (3)	3.0	10	15	15	5	85	67	
Ford Ranger truck 2x4 (3)	1.5	15	40	40	5	83	65	
Ford Ranger truck 4x4	0.5	3	5	5	1	83	65	
Ford F-550 4x4 (2)	3.0	5	15	15	2	85	67	
Intelli Truck 3500	1.0	3	4	1	0	85	67	
Chevy HD 2500 truck (3)	2.0	50	66	66	45	85	67	
Chevy W4500	1.0	0	1	3	0	85	67	
Ford Explorer (3)	1.0	32	48	48	32	83	65	
Ford Explorer 4x4	0.5	0	2	2	1	83	65	
Ford E-150 Van	1	0	7	7	1	83	65	
Dump Truck 5-ton	0.5	0	0	0	2	87	69	
Chevy Traverse	1.5	6	6	6	3	83	65	
Chevy 1500 Truck (2)	1.5	35	50	50	30	83	65	
Toyota Prius HB Three	2	63	63	63	63	83	65	
John Deere Tractor	2.0	0	2	1	0	76	58	
Argo Avenger (off-road) (5)	1	20	20	20	10	87	69	(3)
Argo Conquest (off-road) (4)	1	20	20	20	10	87	69	(3)
Arctic Cat 500 TBX (off- road) (2)	1	5	5	5	1		69	(3)
Kawasaki 400 (off- road)	1	5	5	5	1	87	69	(3)
Kawasaki 650 (off-road) (3)	2.5	10	20	30	15	87	69	(3)
Dondi Rotary Ditcher DMR35-B	1	1	0	0	1	NOC		
GO-4 Catch Basin Rig	2	1	5	5	5	NOC		
Komatsu (off-road)	2	0	2	2	0	87	69	(3)
Gator (off-road)	1	0	1	1	0	87	69	(3)
Pistenbully PB100 Mower	2.0	1	0	0	1	80	58	Estimated
Pistenbully 72F-H Mower	1.5	0	1	1	0	80	58	Estimated
Nifty-Fifty with Intelli reel	1	10	15	15	1	NOC		
Backpack fogger (Curtis Dynaflow) (5)	0.5	2	20	10	1	NOC		
Becomist Fogger (3)	1	2	15	10	2	50	NOC	

Type of Vehicle/Equipment (#)	Hours\day[1]	Days/Quarter				Noise Data in dBA at indicated distance		Notes
		Q1	Q2	Q3	Q4	50 feet	400 feet	
Electramist fogger	1	1	3	3	2	50	NOC	Assumed
Mozzie Fog Fogger	1	0	3	3	0	75	57	Based on ULV Fogger Range
Mozzie granular applicator	1	3	3	3	2	NOC		
Solo MD 150 DX [(5)]	1	10	30	30	15	NOC		Appears to be Maruyama Model #
Solo MD 155DX [(2)]	1	10	30	30	15	NOC		Appears to be Maruyama Model #
High Pressure sprayer	0.5	1	10	10	1	65	47	Generic. Approx. value listed
Echo Chainsaw	1.0	10	0	0	10	90	72	Varies by model, max. value listed
Echo hedge trimmer	1.0	5	0	0	5	51	NOC	Varies by model; value approx
Husqvarna Weedeater [(2)]	1.0	10	0	0	10	67	49	Varies by model; max value listed
Husqavarna Chainsaw [(2)]	0.5	5	0	0	5	72	54	Varies by model; max. value listed
Intelli sprayer 150	1.0	5	10	10	1	NOC		
Intelli sprayer 50	1.0	5	10	10	1	NOC		
'01 International 8000; 2,500-Gal Water Truck	2.0	2	2	2	1	75-88	57-70	Depends on gear and speed
'99 International 4700; 2,000-gal water truck	1.0	1	2	2	1	75-88	57-70	
'97 Ford Louisville 2,000-Gal water truck	1.0	1	1	1	1	75-88	57-70	
'99 Ford F550 Flat Bed 4X4 ruck	1.0	1	2	2	1	85	67	(2)
'05 Dodge 2,500 4X4 truck	1.0	3	3	3	2	85	67	
Airboat	1.0	2	10	10	5	85-95	67-77	At minimum speed to maintain planning conditions (4)
Grizzly 17 ft. Boat	1.0	1	1	1	1	75-85	57-67	Depends on engine
Klamath Boat	0.5	1	1	1	1	75-85	57-67	Depends on engine
Bell 206 Jet Ranger helicopter	2.0	2	5	5	2		84-87	(5)
1960 Hiller Soloy helicopter	2.0	1	1	1	1		84-89	Assumed (5)

NOC = Not of Concern

(1) Locations will vary throughout listed period of use.

(2) Single hour time-weighted noise levels at 50 and 400 feet are 45 dBA and 34 dBA, respectively per TNM 2.5 Lookup Tables. Sound levels for vehicles varies greatly depending on speed, acceleration, braking, road type, and condition of vehicle. The values provided are very conservative.

(3) ATV range from reference California, 2005b.

(4) Reference: Glegg, et.al., 2005

(5) The noise values for aircraft (both fixed-wing and rotocraft) noise are approximately 500 feet from point of measure. Aerial applications are done in response to elevated levels of larval mosquito production in large often difficult to access areas and are not necessarily used every year.

Table 4-5 Napa County Mosquito and Vector Control District Vehicles and Equipment

		Days/Quarter				Noise Data in dBA at indicated distance		
Type of Vehicle/Equipment (#)	**Hours\day[1]**	**Q1**	**Q2**	**Q3**	**Q4**	**50 feet**	**400 feet**	**Notes**
Chevy Pickup Trucks [6]	4.5	55	54	57	51	83	65	At 35 mph. See also Note (2)
Toyota Pickup Trucks [3]	3	4	28	20	11	83	65	
Jeep Wrangler	5.4	5	5	12	0	83	65	
Daewoo Forklift	0.5	12	8	6	10	64	46	Model-specific; max. value listed
Echo Chainsaw CS330T	2	5	0	0	10	90	72	Model-specific; max. value listed
FloTech Trash Pump	0.5	0	4	6	10	70	52	Model-specific; max. value listed
Stihl Blower BR420	1	0	3	3	1	53	NOC	Approx.
Stihl Weed Wackers [3]	6	10	0	5	10	66	48	Model-specific; max value listed
Northstar Pressure Washer	0.5	10	16	15	10	48	NOC	
Intellispray 9TBE	6	4	15	1	28	NOC		
JD9 ULV	4	0	3	2	0	75	57	Max. value listed
Intellispray 5SDE [4]	5.9	9	21	22	28	NOC		
Wisconsin Robin ULV	3	0	3	2	0	75	57	Max. value listed
Pioneer Backpack Fogger	2	0	12	10	0	NOC		
50-gal Polaris Spot Sprayer	4	3	4	3	1	87	69	
Maruyama Back Sprayers [2]	5	12	17	9	6	NOC		
London Fog 18-20 ULV [2]	2.5	0	13	6	0	61	NOC	Varies by model, nozzle, & rpm
London Fog XKE	1.5	0	5	0	0	61	NOC	Varies by model, nozzle, & rpm
Hand Sprayer, London Fog Colt	1	0	6	2	0	61	NOC	Varies by model, nozzle, & rpm
Tracker Boat	4	3	6	6	3	75-85	57-67	Depends on engine
Argo Sprayers [3]	5.7	5	6	2	2	66	48	
Polaris ATV [2]	5.1	6	15	2	1	87	69	(3)
Argo ATV [3]	4	4	7	6	3	87	69	(3)
Bell 206 Jet Ranger Helicopter	3	4	2	2	0		84-87	(5)
Hiller Soloy Helicopter	3	4	2	2	0		83-89	Assumed (5)

NOC = Not of Concern

[1] Locations will vary throughout listed period of use.

[2] Single hour time-weighted noise levels at 50 and 400 feet are 45 dBA and 34 dBA, respectively per TNM 2.5 Lookup Tables. Sound levels for vehicles varies greatly depending on speed, acceleration, braking, road type, and condition of vehicle. The values provided are very conservative.

[3] ATV range from reference California, 2005b.

[4] Reference: Glegg, et.al., 2005

[5] The noise values for aircraft (both fixed-wing and rotocraft) noise are approximately 500 feet from point of measure. Aerial applications are done in response to elevated levels of larval mosquito production in large often difficult to access areas and are not necessarily used every year.

Table 4-6 Northern Salinas Valley Mosquito Abatement District Vehicles and Equipment

Type of Vehicle/Equipment (#)	Hours\day[1]	Days/Quarter				Noise Data in dBA at indicated distance		Notes
		Q1	Q2	Q3	Q4	50 feet	400 feet	
Chevy Silverado 4X4	16 hrs/mo	23	23	23	23	83	65	At 35 mph. See also Note (2)
Dodge Ram 50 Right hand drive	10 hrs/yr	23	23	23	23	83	65	
Jeep Liberty 4X4	2 hrs/mo	23	23	23	23	83	65	
Jeep Wrangler 4X4	4 hrs/mo	23	23	23	23	83	65	
Ford F-150 4X4 Flare Side	16 hrs/yr	23	23	23	23	83	65	
Ford F-150 4X4 [3]	4 hrs/day	23	23	23	23	83	65	
Ford F-150 Xl	4 hrs/day	23	23	23	23	83	65	
Ford F-350 4X4	16 hrs/mo	23	23	23	23	85	63	(2)
Ford Windstar Sport SE	8 hrs/mo	23	23	23	23	83	65	(2)
Stihl Chainsaw 028 AV Super	8 hrs/yr	23	23	23	23	90	72	Generic Range
Stihl Chainsaw 011AV	8 hrs/yr	45	45	45	0	90	72	Generic Range
Stihl Leaf Blower BG 65	0	00	45	45	0	69	51	
Bean Pump	8 hrs/mo	23	23	23	23	NOC		
Maruyama Backpack Blower	12 hrs/yr	23	23	23	23	NOC		
Cat 320 Excavator	150 hrs/yr	15	32	32	15	56	NOC	Assumes light duty
Cat D3 Dozer	100 hrs/yr	15	32	32	15	62	NOC	Assumes light duty
John Deere 6420 with Flail Mulch Mower S900 (PTO)	100 hrs/yr	15	32	15	15	80		Generic Tractor Range
Blow Mite Granule Spreader (backpack)	8 hrs/yr	23	23	23	23	NOC		
Robin Micro Gen Fogger	8 hr/yr	23	23	23	23	NOC		
Mozzie Fogger – Arro-Gun System	8 hrs/yr	23	23	23	23	NOC		
Mozzie Granular Applicator, Arro-Gun System	8 hrs/yr	23	23	23	23	NOC		
GPI Model 1505 Fuel Transfer	8 hrs/year	23	23	23	23	54	NOC	
Argo ATV	8 hrs/mo	23	23	23	23	87		(3)
Argo Sprayer System	8 hrs/mo	23	23	23	23	66	48	
Valco Flat Bottom Boat (go devil engine/prop)	8 hrs/mo	23	23	23	23	85-95		Assumed
Bell Jet Ranger	40/yr	23	23	23	23		84-87	

NOC = Not of Concern

(1) Locations will vary throughout listed period of use.

(2) Single hour time-weighted noise levels at 50 and 400 feet are 45 dBA and 34 dBA, respectively per TNM 2.5 Lookup Tables. Sound levels for vehicles varies greatly depending on speed, acceleration, braking, road type, and condition of vehicle. The values provided are very conservative.

(3) ATV range from reference California, 2005b.

(4) Reference: Glegg, et.al., 2005

(5) The noise values for aircraft (both fixed-wing and rotocraft) noise are approximately 500 feet from point of measure. Aerial applications are done in response to elevated levels of larval mosquito production in large often difficult to access areas and are not necessarily used every year.

Table 4-7 San Mateo County Mosquito and Vector Control District Vehicles and Equipment

Type of Vehicle/Equipment (#)	Hours\day[1]	Days/Quarter				Noise Data in dBA at indicated distance		Notes
		Q1	Q2	Q3	Q4	50 feet	400 feet	
Chevy 2500 pickup truck 4x4						83	65	At 35 mph. See also Note (2)
Ford F-150 pickup truck 4x4						83	65	
Hyundai Sonata Hybrid						83	65	
Ford Escape Hybrid 4x4						83	65	
Jeep Wrangler (Right Hand Drive)						83	65	
Ford Ranger pickup truck 4x4						83	65	
Nissan Frontier Pro4X pickup truck 4x4						83	65	
Toyota Sienna Van	2	15	15	15	15	83	65	
Nurse Rig 200 gal tank and sprayer	3	5	3	30	15	NOC		
Argo Avenger (off road)	4	5	5	0	5	87	59	(3)
Fork Lift - hydraulic	>1	5	5	5	5	59-63	NOC	Generic range
Porta-Pak ULV Backpack Sprayer	>1	2	10	10	2	75	57	
Maruyama Power Mister/Duster Backpack Sprayer	>1	5	10	10	5	NOC		
Curtis Dyna-Fog Twister XL ULV Backpack Sprayer	>1					NOC		
Clark Grizzly ULV Truck Mounted Sprayer	12	20	20	20	20	87	59	Based on USDA Report; Varies by nozzle, RPM
Univar Dynajet ULV Electric Truck Mounted Sprayer	12*	20	20	20	20	50	NOC	70 dB at nozzle
Hotsy High Pressure Washer	1	50	50	50	50	65	47	Estimated
Dewalt 10” Compound Miter Saw DW703	>1	>1	>1	>1	>1	66	48	Estimated
Dewalt 14” Multicutter Metal Saw	>1	>1	>1	>1	>1	83	61	Approx.
Chicken coops for sentinel chickens						44-90		Varies by Chicken/Rooster type, and activity level
Stihl Chainsaw 026	1	2	5	3	3	90	72	Generic Range Given
Stihl Chainsaw 021	1	2	5	3	3	90	72	Generic Range Given
Stihl Chainsaw 039	>1	>1	>1	>1	>1	90	72	Generic Range Given
Stihl Chainsaw 290	1	2	5	3	3	73	55	

Type of Vehicle/Equipment (#)	Hours\day[1]	Days/Quarter				Noise Data in dBA at indicated distance		Notes
		Q1	Q2	Q3	Q4	50 feet	400 feet	
Stihl Chainsaw 260	1	2	5	3	3	81	63	
ECHO Chainsaw CS 301	2	4	10	6	6	90	72	Generic Range Given
Stihl Trimmer HS 85	6		60	30		51	NOC	Approx. Generic Value Given
ECHO Weedeater SRM 225	2		5	5		69	51	Generic Range given
Stihl Weedeater FS 250	2		5	5		76	58	
05 Dodge 2500 4X4 truck	5	1	1	3	1	83	65	(2)
GTO Airboat	3	10	10	20	20	85-95		(4)
GTO Airboat 50 gallon spray tank	5	0	0	15	15	NOC		(6)
Klamath Boat 14’	3	2	2	2	2	75-85	57-67	Depends on engine
Klamath Boat 18’	2	5	5	5	5	75-85	57-67	Depends on engine
Argo Avenger (off road)	16	40	20	0	12	87		(3)
1989 Bell 206 Jet Ranger helicopter	4	2	2	2	2		84-87	(5)
Isolair Air spray system model 3900 (helicopter-mounted)	8	2	0	0	0	NOC		(6)
Isolair 4500 broadcaster (helicopter-mounted)	2	0	2	2	0	NOC		(6)

NOC = Not of Concern

(1) Locations will vary throughout listed period of use.

(2) Single hour time-weighted noise levels at 50 and 400 feet are 45 dBA and 34 dBA, respectively per TNM 2.5 Lookup Tables. Sound levels for vehicles varies greatly depending on speed, acceleration, braking, road type, and condition of vehicle. The values provided are very conservative.

(3) ATV range from reference California, 2005b.

(4) Reference: Glegg, et.al., 2005

(5) The noise values for aircraft (both fixed-wing and rotocraft) noise are approximately 500 feet from point of measure. Aerial applications are done in response to elevated levels of larval mosquito production in large often difficult to access areas and are not necessarily used every year.

(6) Delivery vehicle noise is greater than 3 dB above equipment noise therefore the equipment noise is NOC.

Table 4-8 Santa Clara County Vector Control District Vehicles and Equipment

Type of Vehicle/Equipment (#)	Hours\day[1]	Days/Quarter				Noise Data in dBA at indicated distance		Notes
		Q1	Q2	Q3	Q4	50 feet	400 feet	
Ford Personnel Van(1)	1	30	30	30	30	83	65	At 35 mph. See also Note (2)
Dodge Pickup truck(1)	2	30	30	30	30	83	65	
Ford F150 (14)	3	60	60	60	60	83	65	
Dodge ¾ ton(1)	4	0	60	60	10	85	67	
GMC ½ ton(5)	2	5	30	30	5	85	67	
Ford Escape(1)	1	20	20	20	20	83	65	
Ford F250(10)	3	60	60	60	60	83	65	
Ford Ranger(5)	6	25	60	60	15	83	65	
Ford Expedition	1	45	45	45	45	83	65	
International flatbed truck	1	3	2	2	3	85	67	
Fork Lift(1)	1	10	10	10	10	59	NOC	
Argo Avenger ATV(2)	2 .75 hrs	13	13	13	13	87	59	(3)
Kabota	1.44 hrs	3	3	3	3	76	58	Generic Tractor Range Given
Boat	12 min	0.5	0.5	0.5	0.5	NOC		Based on limited time of use
Yamaha Quads(2)	2.6 hrs	14	14	14	14	87	59	(3)
Argo Conquest	3 hrs	8	8	8	8	87	59	(3)
Alpine Helicopter Services	45 min	1	0	0	0	NOC		Based on limited time of use

NOC = Not of Concern

(1) Locations will vary throughout listed period of use.

(2) Single hour time-weighted noise levels at 50 and 400 feet are 45 dBA and 34 dBA, respectively per TNM 2.5 Lookup Tables. Sound levels for vehicles varies greatly depending on speed, acceleration, braking, road type, and condition of vehicle. The values provided are very conservative.

(3) ATV range from reference California, 2005b.

Table 4-9 Solano County MAD Vehicles and Equipment

Type of Vehicle/Equipment (#)	Hours\day[1]	Days/Quarter				Noise Data in dBA at indicated distance		Notes
		Q1	Q2	Q3	Q4	50 feet	400 feet	
Chevrolet Astro Van	1	60	60	60	50	83	65	At 35 mph. See also Note (2)
Ford Pickup Trucks[(7)]	4	50	60	60	50	83	65	
Clark Forklift	0.5	5	5	5	5	68	50	
Kubota Tractor	1	5	5	5	5	76	58	Generic Tractor Range Given
Pro-Mist 25HD	1	0	10	2	8	50	NOC	
Leco 500 ULV Fogger x2	2	0	5	2	8	87	69	Varies by model, nozzle, & RPM
London Fog M.A.G. ULV Fogger x3	2	0	15	15	5	61	NOC	
Colt handheld ULV Fogger x 6	0.5	0	10	4	0	66	48	(4)
Snapper Rear Engine Riding Mower	1	10	10	10	10	65	47	
Toro Push Mower	1	5	5	5	5	61	NOC	
Stihl 025 Chainsaw	.1	1	1	0	0	90	72	
Stihl FS83 Weedeater	0.5	10	15	15	10	59	NOC	
Stihl HS Hedge trimmer	1	0	2	2	0	63	NOC	
Stihl BG55 Leaf Blower	1	10	15	15	10	69	51	
Craftsman 24” Leaf Vac	1	1	0	0	1	55-75	57	Varies by model and type (gas/electric)
Maruyama MD155DX Backpack Sprayer	1	5	10	10	0	NOC		
Argo ATV Magnum	2	0	0	0	2	87	69	(3)
Argo ATV Conquest	4	0	0	5	15	87	69	(3)
Argo ATV Avenger	4	4	8	8	20	87	69	(3)
Argo ATV Avenger	3	15	10	6	10	87	69	(3)
Honda ATV TRX500FM	3	0	8	8	0	87	69	(3)
Honda ATV TRX400FE	2	0	6	6	0	87	69	(3)
Honda ATV TRX350FM	3	0	15	15	0	87	69	(3)
Honda ATV TRX300FW[(2)]	1	0	2	2	0	87	69	(3)
Invader boat 19	2	0	0	4	0	75-85	57-67	Varies by power setting
Achilles Inflatable boat	2	0	0	2	0	75-85	57-67	Varies by power setting

Type of Vehicle/Equipment (#)	Hours\day[1]	Days/Quarter				Noise Data in dBA at indicated distance		Notes
		Q1	Q2	Q3	Q4	50 feet	400 feet	
1968 Bell 206 Jet Ranger helicopter	2	2	0	0	0		84-87	(5)
1989 Bell 206 Jet Ranger helicopter	2	2	0	0	0		84-87	(5)
1960 Hiller Soloy helicopter	2	2	0	0	0		84-87	Estimated (5)
Isolair Air spray system model 3900 (helicopter-mounted)	2	6	0	0	0	NOC		(6)
Isolair 4400 bucket system (helicopter-mounted)	1	2	0	0	0	NOC		(6)
Isolair 4500 broadcaster (helicopter-mounted)	4	4	6	10	14	NOC		(6)
Fixed Wing Aircraft Air Tractor 502	4	4	6	10	14	NA		Not Applicable – Agricultural aircraft are exempt under FAR 36.1(a)(2) and 36.1583.

NA = Not Applicable

NOC = Not of Concern

(1) Locations will vary throughout listed period of use.

(2) Single hour time-weighted noise levels at 50 and 400 feet are 45 dBA and 34 dBA, respectively per TNM 2.5 Lookup Tables. Sound levels for vehicles varies greatly depending on speed, acceleration, braking, road type, and condition of vehicle. The values provided are very conservative.

(3) ATV range from reference California, 2005b.

(4) Based on sound power levels for typical 2.5-horsepower gasoline engine.

(5) The noise values for aircraft (both fixed-wing and rotocraft) noise are approximately 500 feet from point of measure. Aerial applications are done in response to elevated levels of larval mosquito production in large often difficult to access areas and are not necessarily used every year.

(6) Delivery vehicle noise is greater than 3 dB above equipment noise therefore the equipment noise is NOC.

5 Best Management Practices

The following Best Management Practices could be implemented by any of the Districts for any operations that use equipment that may generate noise levels approaching or above significance thresholds at sensitive receptors for even short periods of time.

> Measure 1: Provide Advance Notices. Provide nearby residents and businesses 48-72 hours of advanced notice of project activities, schedule, anticipated traffic, and potential noise issues. The advance notice will describe the potential noise disruption and the steps the District or its contractor plans to take to minimize the noise (for example, by enclosing and muffling equipment, limiting idling and engine brake use). If the activities are delayed due to operational issues or weather delays of more than 1 week, an additional notice will be provided.

> Measure 2: Provide Liaison and Hotline for Nuisance Complaints. The District will provide a liaison to respond to concerns of noise from Program operations. Procedures for reaching the liaison via telephone or in person will be included in notices distributed and posted in accordance with Measure 1. Nuisance complaints filed with the liaison, and the approach used to resolve the complaint, will be reported to the District.

> Measure 3: Properly Maintain Equipment. The application contractor will properly maintain and tune engines of all applicable equipment and maintain properly functioning mufflers on all internal combustion engines to minimize noise levels. Perform noise reduction maintenance during routine maintenance for each vehicle serviced.

> Measure 4: Follow Established Procedures for Aircraft Operations. The District will implement feasible and appropriate measures to ensure aircrew stay within the flight plan published. Measures include daily preflight and post-op briefings, written flight envelope procedures, and review of recorded Global Positioning System (GPS) flight data (including altitude). Complaints filed with the District contractor and the approach used by the aerial application contractor(s) to resolve the complaint will be reported to the District.

> Measure 5: Follow Established Procedures for Airboat Operations. The District will implement feasible and appropriate measures to ensure operators stay within the treatment area published. Measures include daily tailgate meetings and post-operational briefings, mapped operational areas that are permitted with recorded GPS route data. Complaints filed with the District contractor and the approach used by the aerial application contractor(s) to resolve the complaint will be reported to the District.

This Page Intentionally Left Blank

6 References

American National Standards Institute Standard S1.1-1994 (R2004). Acoustic Terminology.

Beranek, L.L. 1971. Noise and Vibration Control.

Bolt, Baranek, and Newman. 1971. Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances.

Cify of San Rafael. 2012. San Rafael Code of Ordinances, Title 8, Morals and Conduct, Section 8.13, Noise. Available online at: http://search.municode.com/html/16610/level2/TIT8MOCO_CH8.13NO.html.

City of Albany. 1988. Code of the City of Albany, Chapter VIII Law Enforcement, 8-1 Noise. Available online at: http://clerkshq.com/default.ashx?clientsite=albany-ca.

City of Berkeley. 2009. Berkeley Municipal Code, Title 13 Public Peace, Morals And Welfare, Chapter 13.40 Community Noise Available online at: http://www.ci.berkeley.ca.us/bmc/berkeley_municipal_code/title_13/40/index.html.

City of Brisbane. 2008. Brisbane Municipal Code, Title 9 Public Peace, Morals, and Welfare. Available online at: http://www.ci.brisbane.ca.us/municode/index.htm.

City of Callistoga. 2003. City of Calistoga General Plan, Noise Element. Available online at: http://www.google.com/search?q=calistoga+ca+noise+ordinance&oq=calistoga+ca+noise+ordinance&sourceid=chrome&ie=UTF-8.

City of El Cerrito. 2008. El Cerrito Municipal Code, Title 10 Public Peace, Morals and Welfare, Chapter 10.30 Noise. Available online at: http://ordlink.com/codes/elcerrito/.

City of Gilroy. 2007. Zoning Ordinance, Section 41. Available online at: http://www.cityofgilroy.org/cityofgilroy_files/city_hall/community_development/planning/zoning_ordinance/Sec41_2007.pdf.

City of Los Gatos. General Plan 2020, Chapter 10, Noise. Available online at: http://www.losgatosca.gov/documents/Community Development/Planning/2020 General Plan by Chapters/10_Noise.PDF.

City of Monterey. 2009. City of Monterey City Code, Chapter 38 - Zoning Ordinance, Part I -- General Provisions. Available online at: http://www.codepublishing.com/ca/monterey/.

City of Morgan Hill. 2013. Title 8 – Health and Safety, Chapter 8.28, Noise. Available online at: http://library.municode.com/HTML/16502/level3/SUHITA_TIT8HESA_CH8.28NO.html#SUHITA_TIT8HESA_CH8.28NO_8.28.010COFIDE#SUHITA_TIT8HESA_CH8.28NO_8.28.010COFIDE.

City of Napa. 2013. Napa Municipal Code, Title 8 Health and Safety, Chapter 8.08 Noise Control Regulations. Available online at: http://qcode.us/codes/napa.

City of Novato. 2009. Novato General Plan, Chapter 5, Safety and Noise. Available online at: http://www.ci.novato.ca.us/cd/gp/gpchap5.html.

City of Richmond. Ordinance NO. 14-11. Available online at: http://www.ci.richmond.ca.us/archives/66/14-11%20N.S.%20Repealing%20and%20adding%20chapters%20relating%20to%20Community%20Noise%20-%20CONFORMED.doc.pdf.

City of Saint Helena. 2013. Code of Ordinances, Chapter 8.24, Noise. Available online at: http://www.codepublishing.com/CA/sthelena/frameless/index.pl?path=../html/StHelena08/StHelena0824.html.

City of Salinas. 1995. Code of Ordinances, Chapter 21A, Noise Regulation. Available online at: http://library.municode.com/index.aspx?clientId=16597.

City of San Jose. 2012: Title 10 Public Peace, Morals and Welfare,Chapter 10.16 Offenses Against Public Peace. Available online at: http://www.nonoise.org/lawlib/cities/sanjose.htm.

City of San Mateo. 2006. San Mateo Municipal Code, Title VII – Health, Sanitation & Public Nuisances, 7.30 Noise Regulations. Available online at: http://www.cityofsanmateo.org/index.aspx?NID=402.

City of San Ramon. 2005. San Ramon General Plan 2030, Draft. Available online at: http://www.sanramon.ca.gov/gprc/draft-gp/gpnoise.pdf.

City of Santa Rosa. 2013. Santa Rosa City Code, Title 17 Environmental Protection, Chapter 17-16 Noise. Available online at: http://qcode.us/codes/santarosa/.

City of Sebastopol. 2013. Noise Ordinance. Available online at: http://www.docstoc.com/docs/42651243/City-of-Sebastopol-Noise-Ordinance.

County of Alameda. 2013. Alameda County General Ordinance Code, Title 6 Health and Safety, Chapter 6.60 Noise. Avalilable online at http://search.municode.com/html/16425/level2/TIT6HESA_CH6.60NO.html

County of Contra Costa. 2005. Contra Costa County General Plan, Noise Element, Chapter 11. Available online at: http://www.co.contra-costa.ca.us/depart/cd/current/advance/GeneralPlan/CCCGeneralPlan.pdf.

County of Marin. 2013. Marin County Code of Ordinances, Title 6 – Public Peace, Safety, and Morals, Chapter 6.70 – Loud and Unnecessary Noises. Available online at: http://library.municode.com/index.aspx?clientId=16476

County of Monterey. 2013. Monterey County Code of Ordinances, Title 10 – Health and Safety, Chapter 10.60 Noise Control. Available online at: http://library.municode.com/index.aspx?clientId=16111

County of Napa. 1994. Napa County Code, Title 8 Health and Safety, Chapter 8.16 Noise Control Regulations. Available online at: http://www.co.napa.ca.us/FileFrame.asp?Title=Document&Section=gov&ExtURL=/code2000/_DATA/TITLE08/index.html.

County of San Mateo. 2013. San Mateo County Code of Ordinances, Title 4 Sanitation and Health, Chapter 4.88 – Noise Control. Available online at: http://library.municode.com/index.aspx?clientId=16476

County of Santa Clara. 1994. Santa Clara County General Plan, Health and Safety Chapter, Noise. Available online at: http://www.sccgov.org/SCC/docs/Planning,%20Office%20of%20(DEP)/attachments/General%20Plan/GP_Book_A.pdf.

County of Santa Clara. 2013. Santa Clara County Code of Ordinances, Title B – Regulations, Division B11-Environmental Health, Chapter VIII – Control of Noise and Vibration. Available online at: http://library.municode.com/index.aspx?clientId=13790

County of Solano. 2008. County of Solano General Plan, Health and Safety Element. Available online at: http://www.co.solano.ca.us/civicax/filebank/blobdload.aspx?blobid=7793.

Department of Defense, U.S. Army Center for Health Promotion and Preventive Medicine, Operational Noise Program. 2005. Operational Noise Manual. November.

Glegg, S., O. Masory, and R. Coulson. 2005. Sound Generated by Airboats. College of Engineering, Florida Atlantic University. September.

Governor's Office of Planning and Research. 1990. State of California. General Plan Guidelines. June.

Governor's Office of Planning and Research. 1998. State of California. General Plan Guidelines. November.

Hubbard, H. 1995. Acoustical Society of America. Aeroacoustics of Flight Vehicles: Theory and Practice', Volume One and Two, Edited.

Industrial Acoustics Company. 1979. Noise Control Reference Handbook.

Pater. 1976. Noise Abatement Program for Explosive Operations at the NSWC/DL. Presented at the 17th Explosives Safety Seminar of DoD Explosives Safety Board.

Redwood City. 2010. Redwood City New General Plan, Section 4.10 Noise and Vibration. Available online at: www.redwoodcity.org/phed/planning/eir/pdf/gp/4.10_Noise.pdf.

State of California. 1977. Department of Transportation (Caltrans) Noise. Technical Analysis Note.

State of California. 1984. Department of Parks and Recreation (DPR). General Plan. June.

State of California. 2004. Caltrans, Traffic and Vehicle Data Systems Unit. Annual Average Daily Truck Traffic on the California State Highway System for 2002. February.

State of California. 2005a. California Health and Safety Code Sections 46000–46080). Noise Control Act.

State of California. 2005b. California Offroad Vehicales Noise Report, WR-04-31. September. Conducted by Wyle Laboratories, Inc.

State of California. 2011. Caltrans, http://www.dot.ca.gov/hq/env/noise/pub/ca_tnap_may2011.pdf.

State of Florida. 2007. Use of Nondestructive Techniques to Estimate the Allowable Vibratory Compaction Level During Construction. March 31. Available online at: http://www.dot.state.fl.us/research-center/Completed_Proj/Summary_SMO/FDOT_BDB11rpt.pdf.

Town of Fairfax. 2006. Municipal Code of Ordinances, Title 8: Health And Safety, Chapter 8.20: Noise Control 8.20.050. Available online at: http://www.amlegal.com/nxt/gateway.dll/California/fairfax_ca/townoffairfaxcaliforniamunicipalcodefor?f=templates$fn=default.htm$3.0$vid=amlegal:fairfax_ca.

Town of Woodside. 2012. Town of Woodside General Plan 2012, Noise Element. Available online at: http://www.woodsidetown.org/sites/default/files/fileattachments/9_noise_element_2.pdf.

U.S. Department of Transportation (DOT), Urban Mass Transportation Administration. 1990. Guidance Manual for Transportation, Noise and Vibration Impact Assessment.

U.S. Department of Transportation, Urban Mass Transportation Administration. 1990. Guidance Manual for Transportation, Noise and Vibration Impact Assessment.

U.S. Environmental Protection Agency (USEPA). 1974. U.S. Environmental Protection Agency. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. March.

U.S. Environmental Protection Agency (USEPA). 1979. Protective Noise Levels. [document is condensed version of the EPA's 1974 Document, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.

This Page Intentionally Left Blank