Town of Fairfax General Plan

Noise Element

(We will add an executive summary here)

Introduction

The Noise Element provides the means for managing undesirable levels of sound in the Town. Sources of noise, the effects of noise, and the goals, objectives, policies and programs for controlling noise are included in this Element.

Defining the level and occurrence of sound that becomes unacceptable noise varies from person to person. Sounds that may be acceptable to some may be unacceptable to others.

The Noise Element includes implementation measures and possible solutions that address existing and foreseeable noise problems, if any. The adopted Noise Element is to serve as a guideline for compliance with the State's Noise Insulation Standards.

Noise ordinances are specifically designed to deal with noise issues between land uses. Typical problems in communities include noise from heating, ventilating, and air conditioning equipment, swimming pool pumps, loud parties, barking dogs, and entertainment venues. The Town of Fairfax Noise Ordinance is contained in the *Municipal Code*. The current Noise Ordinance addresses noise-related issues in the community through a combination of quantitative noise limits, prohibition acts and exemptions. Quantitative noise limits are presented in the ordinance to regulate intermittent and continuous sources of noise resulting from residential and commercial mechanical equipment and activities.

State Requirements

The Noise Element requirements are set forth in Government Code Section 65302(f) which provides the following overall guidance:

"A Noise Element shall identify and appraise noise problems in a community. The Noise Element shall recognize the guidelines established by the Office of Noise Control in the State Department of Health Services and shall analyze and quantify, to the extent practicable, as determined by the legislative body, current and projected noise levels for all of the following sources:

(1) Highways and freeways (N/A).

(2) Primary arterials and major local streets.

(3) Passenger and freight online railroad operations and ground rapid transit systems (N/A).

(4) Commercial or general aviation, heliport, helistop, and military airport operations, aircraft overflights, jet engine test cells and all other ground facilities and maintenance functions related to airport operation (N/A).

(5) Local industrial plants, including but not limited to railroad classification yards (N/A).

(6) Other ground stationery sources identified by local agencies as contributing to the community noise environment."

Noise contours shall be shown for all of these sources and stated in terms of Community Noise Equivalent Level (CNEL) or day/night average noise level (L_{dn}). The noise contour shall be prepared on the basis of noise monitoring or following generally accepted noise modeling techniques for various hours identified in paragraphs (1) to (6), inclusive. This Element was prepared utilizing the TNM® traffic noise model, developed by FHWA (Federal Highway Administration), SoundPlan®, and AutoCad®. The SoundPlan model has been used to develop noise contour information for the primary noise sources. This Element includes tables identifying noise exposure levels along transportation routes in the Town based on the gathered noise data and noise modeling.

The noise contours are used as a guide for establishing a pattern of land uses in the Land Use Element that minimizes the exposure of community residents to excessive noise.

Overview of Noise Issues

The primary purpose of this Element is to manage sound that is considered undesirable by the community, particularly the sound level to which neighborhood residents are exposed.

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound could be caused by its *pitch* or its loudness. *Pitch* is the height or depth of a tone or sound, depending on the relative rapidity (frequency) of the vibrations by which it is produced. Higher pitched signals sound louder to humans than sounds with a lower pitch. *Loudness* is intensity of sound waves combined with the reception characteristics of the ear. Intensity may be compared with the height of an ocean wave in that it is a measure of the amplitude of the sound wave.

In addition to the concepts of pitch and loudness, there are several noise measurement scales that are used to describe noise in a particular location. *A decibel (dB)* is a unit of measurement that indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 decibels represents a ten-fold increase in acoustic energy, while 20 decibels is 100 times more

intense, 30 decibels is 1,000 times more intense. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 1.

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level or dBA.* This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This energy-equivalent sound/noise descriptor is called L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends upon the distance the receptor is from the noise source. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

TABLE 1: Definitions of Acoustical Terms Used in this Report

Term	Definitions
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e.g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period. The hourly L_{eq} used for this report is denoted as dBA $L_{eq[h]}$.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 pm to 10:00 pm and after addition of 10 decibels to sound levels in the night between 10:00 pm and 7:00 am.
Day/Night Noise Level, L_{dn}	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 pm and 7:00 am.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.

Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

TABLE 2: Typical Noise Levels in the Environment

Common Outdoor Noise Source	Noise Level (dBA)	Common Indoor Noise Source
	120 dBA	
Jet fly-over at 300 meters		Rock concert
	110 dBA	
Pile driver at 20 meters	100 dBA	
		Night club with live music
	90 dBA	
Large truck pass by at 15 meters		
	80 dBA	Noisy restaurant
		Garbage disposal at 1 meter
Gas lawn mower at 30 meters	70 dBA	Vacuum cleaner at 3 meters

Commercial/Urban area daytime		Normal speech at 1 meter
Suburban expressway at 90 meters	60 dBA	
Suburban daytime		Active office environment
	50 dBA	
Urban area nighttime		Quiet office environment
	40 dBA	
Suburban nighttime		
Quiet rural areas	30 dBA	Library
		Quiet bedroom at night
Wilderness area	20 dBA	
	10 dBA	Quiet recording studio
Threshold of human hearing	0 dBA	Threshold of human hearing

Since the sensitivity to noise increases during the evening and at night — because excessive noise interferes with the ability to sleep — 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level, CNEL*, is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 pm - 10:00 pm) and a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels. The *Day/Night Average Sound Level,* L_{dn}, is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

Effects of Noise

Hearing Loss

While physical damage to the ear from an intense noise impulse is rare, a degradation of auditory acuity can occur even within a community noise environment. Hearing loss occurs mainly due to chronic exposure to excessive noise, but may be due to a single event such as an explosion. Natural hearing loss associated with aging may also be accelerated from chronic exposure to loud noise.

The Occupational Safety and Health Administration (OSHA) have a noise exposure standard that is set at the noise threshold where hearing loss may occur from long-term exposures. The maximum allowable level is 90 dBA averaged over eight hours. If the noise is above 90 dBA, the allowable exposure time is correspondingly shorter.

Sleep and Speech Interference

The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noise of sufficient intensity (above 35 dBA) and fluctuating noise levels above about 45 dBA have been shown to affect sleep. Interior residential standards for multi-family dwellings are set by the State of California at 45 dBA L_{dn}. Typically, the highest steady traffic noise level during the daytime is about equal to the L_{dn} and nighttime levels are 10 dBA lower. The standard is designed for sleep and speech protection and most jurisdictions apply the same criterion for all residential uses. Typical structural attenuation is 12-17 dBA with open windows. With closed windows in good condition, the noise attenuation factor is around 20 dBA for an older structure and 25 dBA for a newer dwelling. Sleep and speech interference is therefore possible when exterior noise levels are about 57-62 dBA L_{dn} with open windows and 65-70 dBA L_{dn} if the windows are closed. Levels of 55-60 dBA are common along collector streets and secondary arterials, while 65-70 dBA is a typical value for a primary/major arterial. Levels of 75-80 dBA are normal noise levels at the first row of development outside a freeway right-of-way. In order to achieve an acceptable interior noise environment, bedrooms facing secondary roadways need to be able to have their windows closed; those facing major roadways and freeways typically need special glass windows.

Annoyance

Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that the causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The L_{dn} as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. When measuring the percentage of the population highly annoyed, the threshold for ground vehicle noise is about 55 dBA L_{dn}. At an L_{dn} of about 60 dBA, approximately 2 percent of the population is highly annoyed. When the L_{dn} increases to 70 dBA, the percentage of the population highly annoyed increases to about 12 percent of the population. There is, therefore, an increase of about 1 percent per dBA between an L_{dn} of 60-70 dBA. Between an L_{dn} of 70-80 dBA, each decibel increase increases by about 2 percent the percentage of the population highly annoyed. People appear to respond more adversely to aircraft noise. When the L_{dn} is 60 dBA, approximately 10 percent of the population is believed to be highly annoyed. Each decibel increase to 70 dBA adds about 2 percentage points to the number of people highly annoyed. Above 70 dBA, each decibel increase results in about a 3 percent increase in the percentage of the population highly annoyed.

Existing Conditions

Noise Measurement Survey

A noise measurement survey was completed to establish existing noise levels in the Town of Fairfax. There were several purposes for the noise measurements. Long-term measurements made hour by hour over a period of 24 hours or more provide information on how noise levels vary throughout the day and night and may vary from day to day (sunny or cloudy day, calm or windy, various activities). Long-term noise measurements in quiet residential areas provide information on the residual background levels of noise in the community and also are useful in showing the contrast between the quieter noise environments and the noisier environments located near the roadways. Measurements away from major noise sources also provide information on the intrusiveness of individual single-events in the environment, such as aircraft over-flights. A series of attended short-term measurement were also conducted. These measurements are also useful for several purposes. The person attending the measurements can identify the noise sources

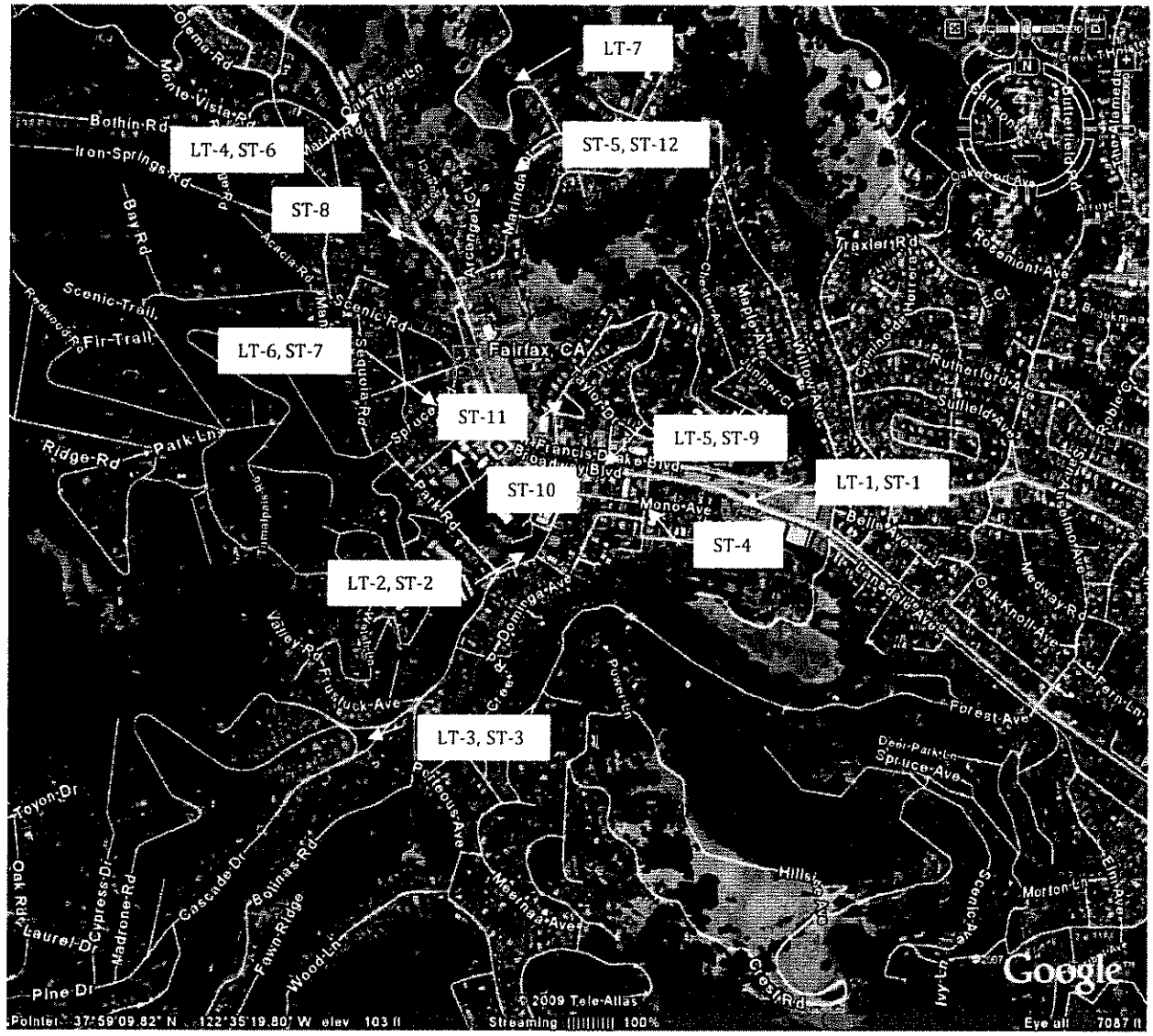
that occur during the measurement and note the level of noise associated with these identifiable events. This assists greatly in quantitatively and qualitatively characterizing the noise environments along the major roadways and also in the quieter areas of the town. Also, along the major roadways, short-term traffic counts are made. These traffic counts are then eventually input into the traffic noise computer models used to produce noise contours along the roadways, and the results checked against the actual measurement that has been made concurrent with the traffic count.

The State Office of Planning and Research Guidelines related to the preparation of the Noise Element of the General Plan mandate that noise exposure levels be prepared in terms of the day/night average sound level (L_{dn}) or the community noise equivalent level (CNEL). Both of these descriptors were described in the previous section and represent the 24-hour average noise level with waiting periods for the daytime (L_{dn}) or the daytime and evening (CNEL). L_{dn} is currently the preferred metric and is used in this report to characterize the 24-hour average noise exposure level. It is also important to know how noise levels vary within each hour of the day and night. For this purpose, standard acoustical descriptors were measured and reported. These standard statistical descriptors are the L_{max}, the L_{10}, the L_{50}, and the L_{90}. The L_{max} noise level is the highest noise levels during the interval and the L_{10}, L_{50}, and L_{90} represent sound levels exceeded 10 percent, 50 percent (the median level), and 90 percent of the time interval (representing the background noise levels). The L_{50} corresponds to the noise limit in the Noise Ordinance. The hourly equivalent sound level (L_{eq}), the basis for the day/night average noise levels, was measured and reported for each hour as well.

The noise survey lasted from the afternoon of Thursday, April 2, 2009 to the afternoon of Friday, April 3, 2009, and from the afternoon of Monday, April 13, 2009 to the afternoon of Thursday, April 16, 2009. Noise measurement locations are shown on Figure 1. During the noise survey, weather conditions were moderate in terms of temperature and wind on Thursday April 2 and Monday April 13, but somewhat windy on Friday April 3 and Tuesday, April 14 through Wednesday, April 15, 2009. The noise survey was conducted with Larson Davis Laboratories precision sound level meters. Larson Davis Type 820 meters were used at long-term locations LT-1 through LT-7 and for the attended short-term noise measurements. Instrumentation was calibrated at the beginning of the noise survey and post calibrated at the end of the survey. No calibration corrections were necessary. During the survey, the microphones were fitted with windscreens.

Measurement LT-1 was on Center Boulevard, one of the busy roads in the Town of Fairfax. The measurement position was at the shopping area of the United States Post Office, Iron Springs Pub & Brewery, and Broadway Video, and about 25 feet from the centerline of the roadway. Vehicular traffic on Center Boulevard was the dominant noise source affecting the noise measurement. The daily trend in noise levels at this location is shown on Figure 2. The measured day/night average noise level at this location was about 68 dBA L_{dn}. Activities in the parking lot such as starting car engine, slamming car doors, talking, etc. may be considered significant intermittent noise sources, but would not affect the overall 24-hour average noise level at the nearest residence located about 50 feet west of the parking lot. The data clearly demonstrate the difference in noise levels between nighttime when noise level drops to 38 dBA L_{90} in the absence of any local traffic and activities in the parking lot and daytime when the noise level reaches 92 dBA L_{max} when a loud vehicle passes by.

Figure 1: Noise Measurement Locations



Measurement LT-2 was on Bolinas Road. This measurement location was also selected to characterize noise levels along a major road. The measurement position was in tree in Fairfax Park about 60 feet from the centerline of Bolinas Road, about 100 feet from the centerline of Elsie Lane, and about 230 feet southeast of the Fairfax Fire Department. The dominant source of noise was vehicular traffic on Bolinas Road. A fire truck siren elevated noise levels at 11:40 AM on Friday. Measured data at Location LT-2 are shown on Figure 3. The measured noise level at this location was 64 dBA L_{dn}.

Noise measurement LT-3 was on the northwest side of Cascade Drive. The measurement position was about 25 feet from the centerline of the roadway. Vehicular traffic along Cascade Drive was the major source of noise. At night, it is likely that light winds in vegetation also contributed to the background noise levels. The day/night average noise level was measured to be about 62 dBA. The measured data are shown on Figure 4. The data show that it is quiet during the night when noise levels drop to about 32 dBA L_{90} in the absence of any local traffic.

Figure 2

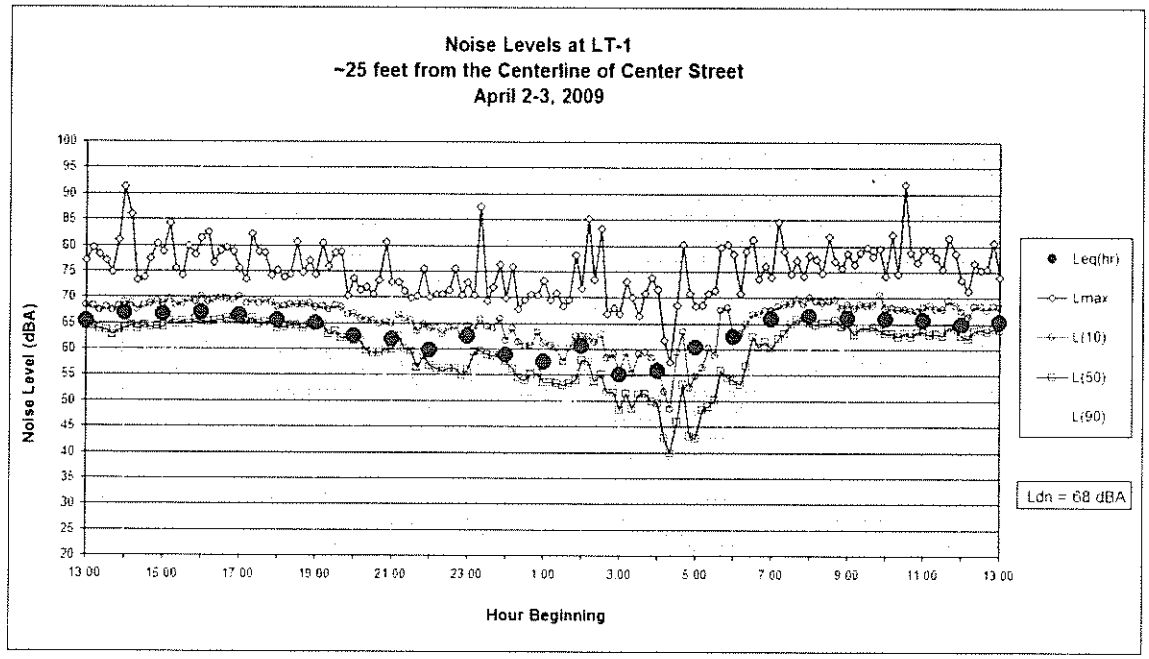
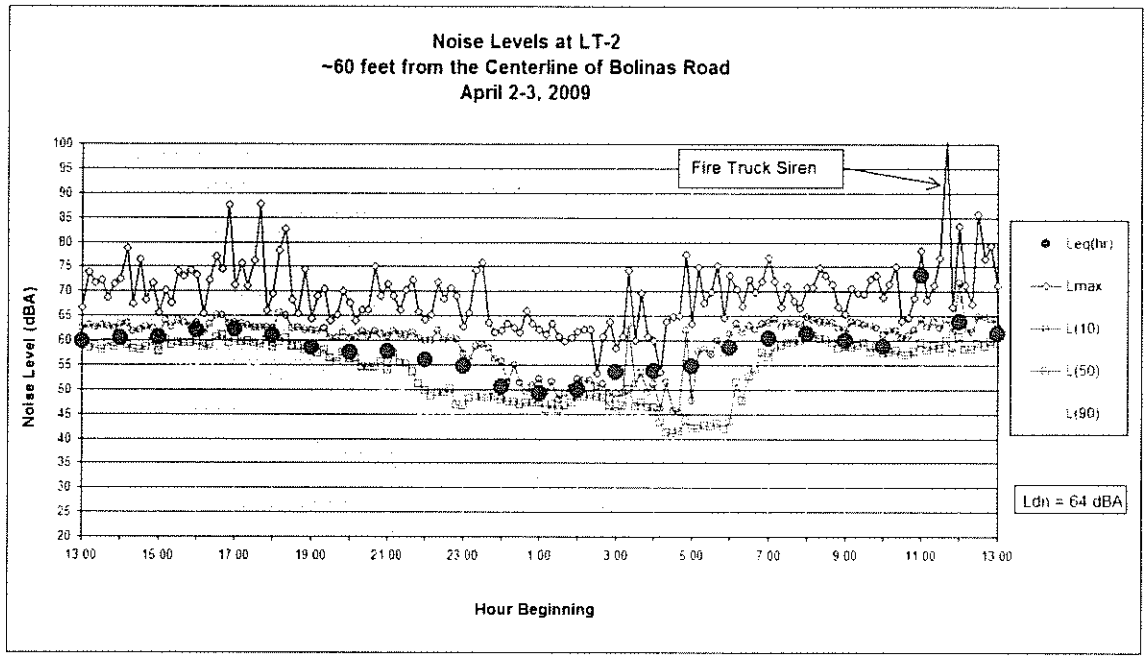


Figure 3



Measurement Location LT-4 was on Sir Francis Drake Boulevard just south of Oak Tree Lane. The measurement position was about 45 feet from the centerline of Sir Francis Drake Boulevard. Vehicular traffic along Sir Francis Drake Boulevard was the major source of noise at this location. This is the noisiest road in the Town. Vehicular traffic on this segment of Sir Francis Drake Boulevard travels at about 40 miles per hour, a higher speed than other local roadways. The day/night average noise level at this site was measured to be about 70 dBA L_{dn}. Noise levels at this portion of the road varied from as low as 41 dBA L_{90} when there is little local traffic at night to as high as 87 dBA L_{max} during daytime hours when there are bus and truck pass-bys and high engine vehicle noise. The measurement data are summarized on Figure 5.

Figure 4

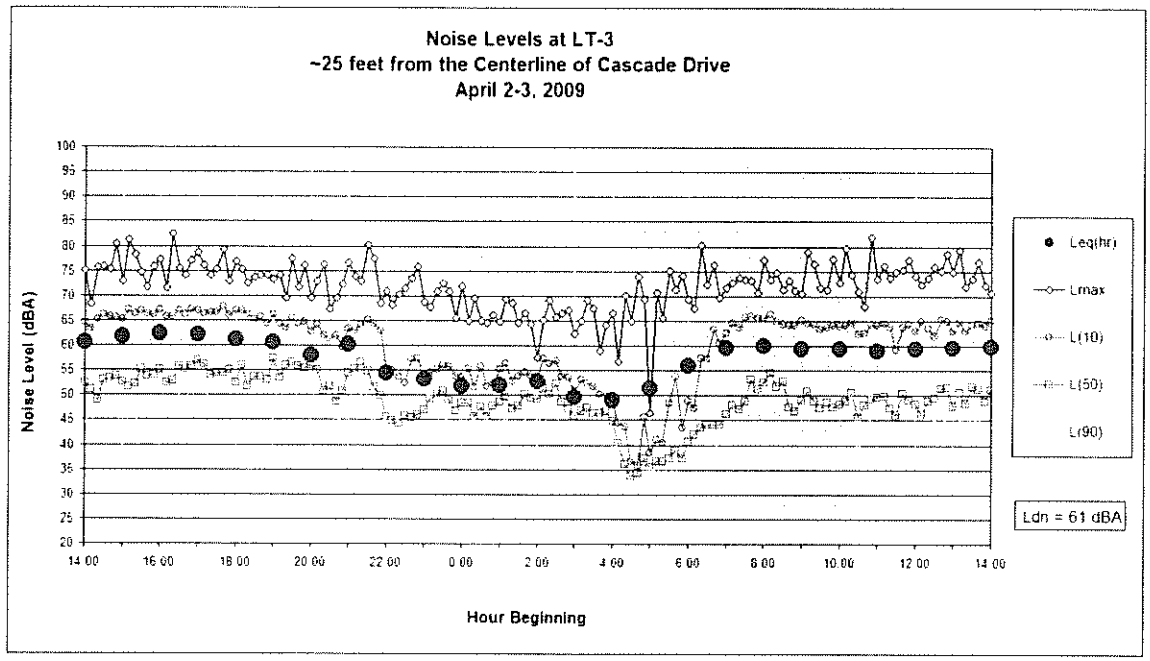
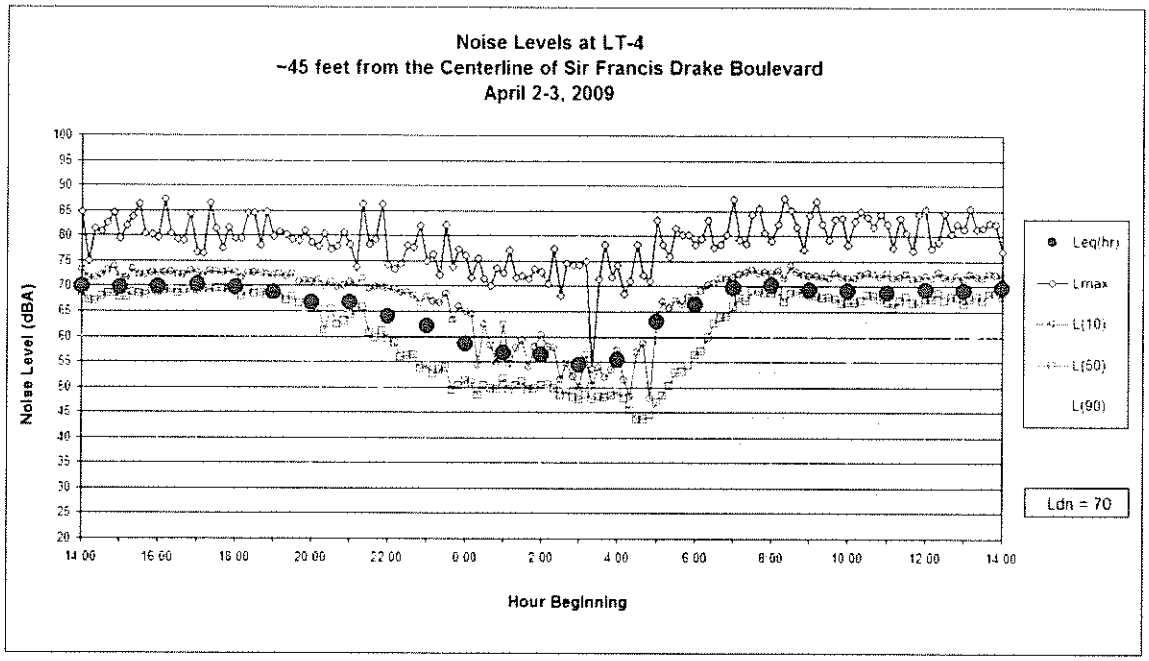
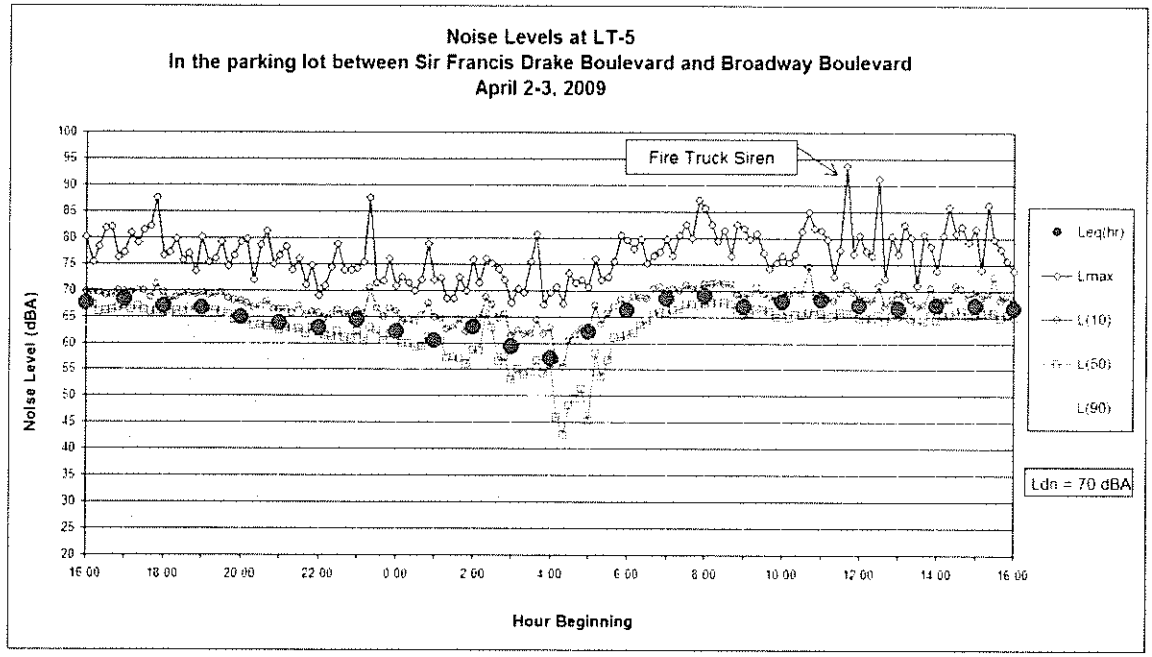


Figure 5



Measurement LT-5 was in another noisy location Downtown Fairfax in the parking lot between Sir Francis Drake Boulevard and Broadway. The measurement was closer to Broadway than to Sir Francis Drake Boulevard. Vehicular traffic along Sir Francis Drake Boulevard and Broadway are the dominant noise sources at this location. This portion of Sir Francis Drake Boulevard and Broadway has bars, restaurants, a movie theatre, clothing shops, coffee shops, and grocery stores. These stores and shops would elevate noise levels at the measurement position. High traffic volumes also elevate noise level to as high as 91 dBA L_{max} during the day. Activities in the vicinity of the noise measurement location would increase noise levels as well. Noise levels at night dropped to 39 dBA L_{90} when there is light traffic or minimal activities. Typical average daytime noise levels ranged from 64 dBA L_{eq} to 68 dBA L_{eq} and background noise levels at night and through the early morning commute period were between 39-63 dBA. The measured day/night average noise level was 70 dBA L_{dn}. The measurement data are summarized on Figure 6.

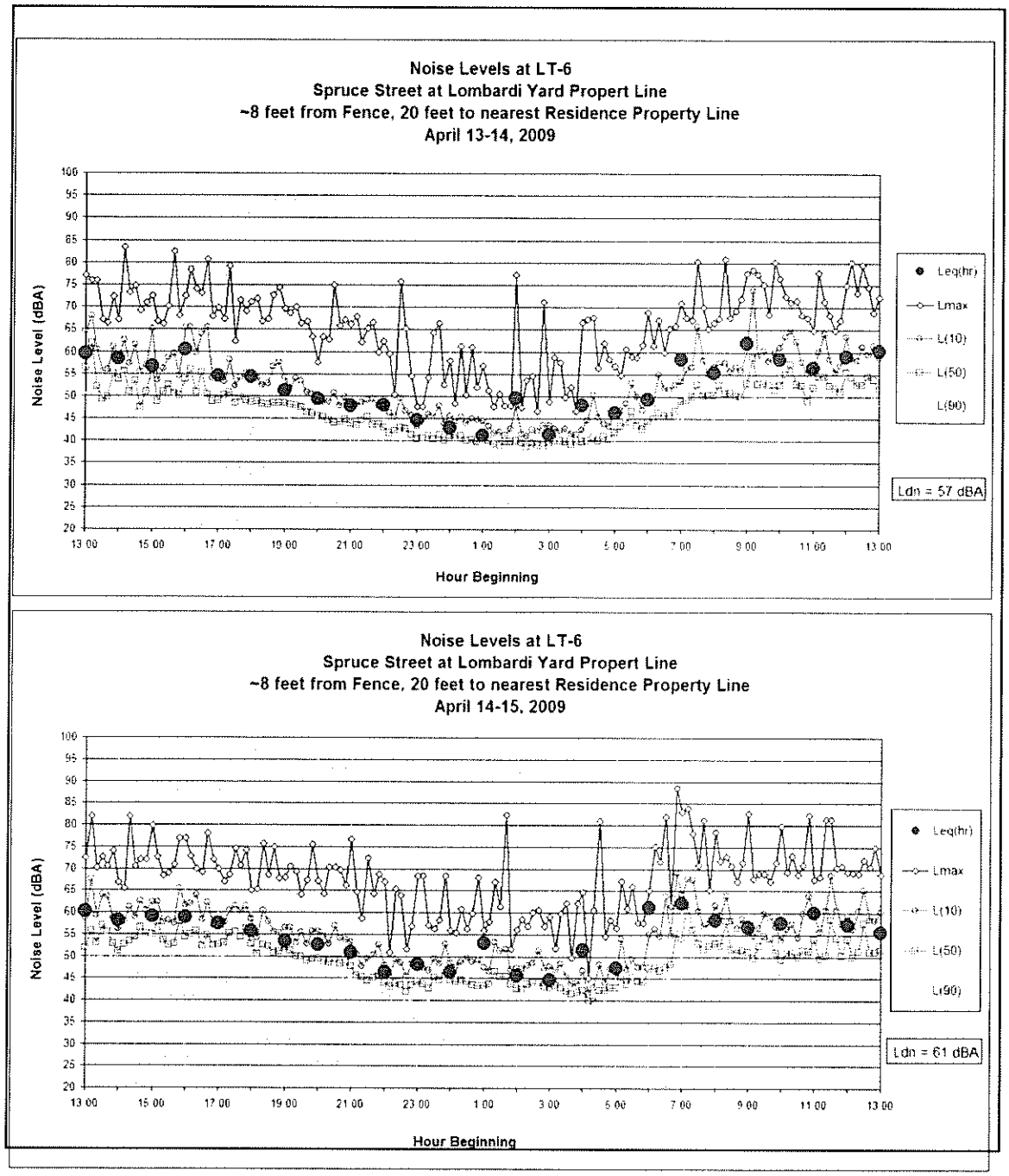
Figure 6



Measurement LT-6 was made on Spruce Avenue west of the Lumber & Hardware Fairfax Yard located on Broadway. Major sources of noise at this location are distant traffic on Broadway and Sir Francis Drake Boulevard, traffic on Spruce Avenue, and intermittent noises from the activities on the yard. The data clearly shows the difference in noise levels between moderate windy days (5 to 10 mph) and windy days (more than 20 mph). When winds were moderate, background noise levels during nighttime hours did not fluctuate as much. Whereas background noise levels at night fluctuated more when winds were high.

Background noise level at night ranged from about 38 dBA L_{90} to about 44 dBA L_{90} when it was not windy. When it was windy, background noise level ranged from about 38 dBA L_{90} to about 50 dBA L_{90}. Hourly average noise levels in moderate windy night ranged from about 42-50 dBA L_{eq}. When it was windy, hourly average noise level ranged from 45-62 dBA L_{eq} during nighttime hours. During daytime hours, hourly average noise levels did not differ much between a windy day and a moderate windy day because vehicular traffic and intermittent noises at the yard were the dominant noise sources at this site. The measured day/night average noise level ranged from 57-61 dBA L_{dn}. Heavy wind caused the L_{dn} to increase from 57 to 61 dBA. The measurement data are summarized on Figure 7.

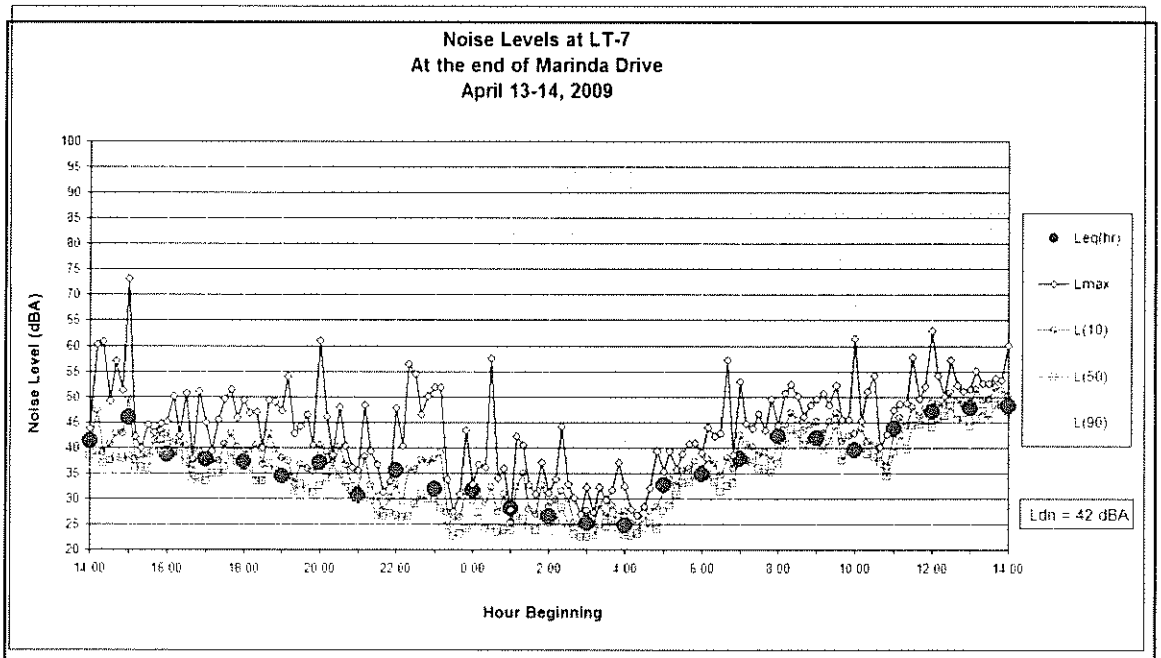
Figure 7

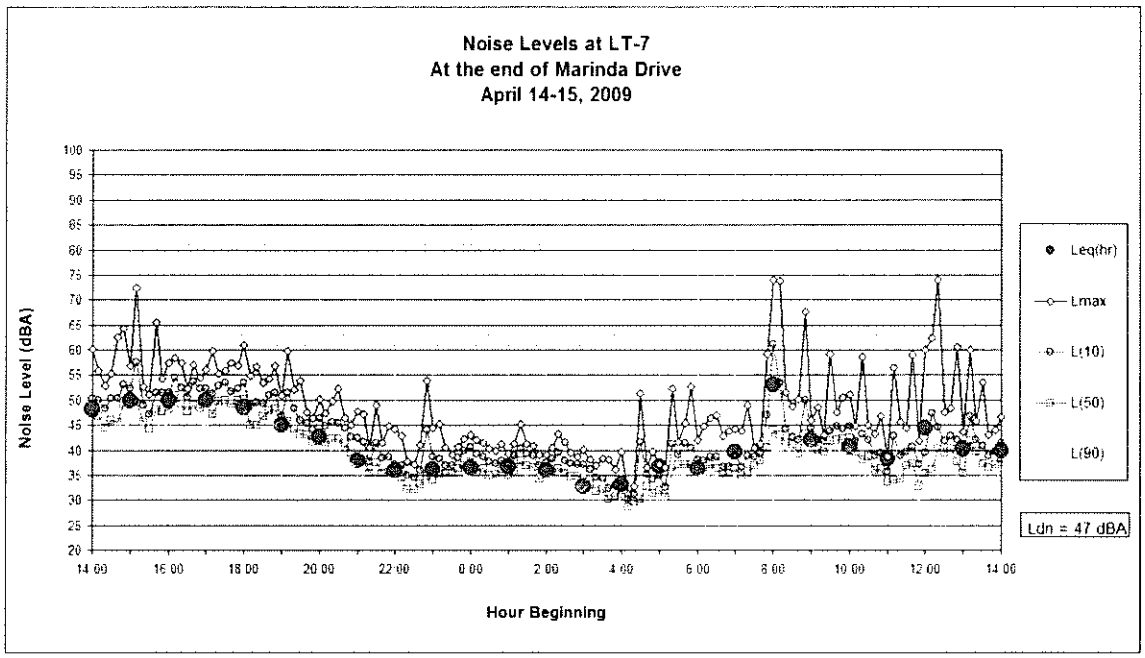


Measurement LT-7 was made at the end of Marinda Drive in a very quiet residential area. The acoustical environment at LT-7 resulted primarily from the occasional plane and

natural sounds such as birds and wind. The data clearly shows the difference in noise levels between moderate windy days (5 to 10 mph) and windy days (more than 20 mph). When it was moderately windy, hourly average noise levels at this location ranged from about 31-46 dBA L_{eq} during the daytime and from about 25-36 dBA L_{eq} at night. When the winds were high, hourly average noise levels at this location ranged from about 41-50 dBA L_{eq} during the daytime and from about 32-37 dBA L_{eq} at night. The measured day/night average noise level ranged from 42-47 dBA L_{dn}. High wind caused the L_{dn} to increase from 42 to 47 dBA. The measurement data are summarized on Figure 8.

Figure 8





Short-term noise measurements were conducted during the day on April 3, 2009 at each of the long-term locations, and during the day on April 13, 2009. The measured data are summarized in Table 3. At Location ST-1 on Center Boulevard, automobile, truck, and bus traffic on the roadway and on Sir Francis Drake Boulevard were the only significant contributors to measured noise levels. At Location ST-2, vehicular traffic on Bolinas Road was the dominant source of noise at this measurement location. At Location ST-3, vehicular traffic on Cascade Drive was the only significant contributor to measured noise level. A loud car pass-by on Cascade Drive generated a maximum instantaneous noise level of 76 dBA. At Location ST-4, distant vehicular traffic along Broadway and Sir Francis Drake Boulevard and local traffic along Mono Avenue and Pacheco Avenue were the dominant source of noise. At Location ST-5, winds in Vegetation contributed significantly to the background noise levels. During the 10-minute measurement only one car drove by and elevated noise level to 62 dBA L_{max}. Distant traffic along Sir Francis Drake Boulevard generated a noise level of about 45 dBA. ST-12 was made at the same location as ST-5. At location ST-6 on Sir Francis Drake Boulevard, automobile, truck, bus, and motorcycle traffic contributed significantly to measured noise levels. Measurement location ST-7 was on Spruce Road northwest of Fairfax Lumber and Hardware Yard. Vehicular traffic on the Spruce Road and distant traffic along Broadway and Sir Francis Drake Boulevard dominated the noise measurements. At location ST-9 on Broadway, vehicular traffic along Broadway and Sir Francis Drake Boulevard was the dominant noise source. A bus along Broadway generated a noise level of about 76 dBA L_{max}.

Short-term measurements were made at three additional locations in the Town of Fairfax. Noise measurement ST-8 was located on Olema Drive about 120 feet to the edge of Sir Francis Drake Boulevard. Vehicular traffic on Olema Drive and Sir Francis Drake Boulevard were the only significant sources of noise during the measurements. A loud car along Olema Drive generated a maximum noise level of 77 dBA, and a bus pass-by along Sir Francis Drake Boulevard generated an instantaneous noise level of 68 dBA. At ST-10, vehicular traffic along Merwin Avenue, distant traffic along Sir Francis Drake Boulevard and Broadway, and activities at the yard were the dominant noise sources at this location. Measurement ST-11 was located about 25 feet from the center of Claus Drive, and about 290 feet from the edge of Sir Francis Drake Boulevard. Traffic along Claus Drive and distant traffic along Sir Francis Drake Boulevard was the dominant noise source at this location.

A review of the measured data, both long term and short term, portrays a quiet noise environment; the exceptions are the major roadways (Sir Francis Drake Boulevard, Broadway, Center Boulevard, and Bolinas Road).

Table 3: Noise Measurement Summary

		A-Weighted Noise Level (dBA)					
Location	Start Time	L_{eq}	L_{01}	L_{10}	L_{50}	L_{90}	L_{dn}
Short-term noise measurement summary (Measurements made for 10 minutes)							
ST-1: Center Boulevard. ~25 feet to the center of the roadway. (4/3/2009).	12:00 pm	63	70	67	62	55	68
ST-2: Bolinas Road. ~60 feet to the center of the roadway. (4/3/2009).	12:20 pm	59	65	61	58	52	64
ST-3: Cascade Drive. ~25 to the center of the roadway. (4/3/2009).	1:00 pm	59	70	64	49	41	61
ST-4: At the corner of Mono Avenue and Pacheco Avenue. ~30 feet from the edge of Pacheco Avenue. (4/3/2009).	1:30 pm	53	61	57	51	47	58[1]
ST-5: In front of 220 Marinda Drive. (4/3/2009).	2:20 pm	48	57	50	46	43	N/A[2]

ST-6: On Oak Tree Lane. ~50 feet from the center of the roadway. (4/3/2009).	2:50 pm	68	77	70	67	59	70
ST-7: On Spruce Road behind the Fairfax Lombardi Hardware Yard. (4/3/2009).	3:30 pm	54	63	56	51	48	N/A
ST-8: On Olema Drive. ~120 feet from the center of Sir Francis Drake Boulevard. (4/3/2009).	4:00 pm	61	71	64	57	53	65[1]
ST-9: In the parking lot between Sir Francis Drake Boulevard and Broadway.	4:50 pm	69	74	73	66	61	70
ST-10: On Merwin Avenue. ~50 feet from the edge of the property line of the Yard. (4/13/2009)	1:40 pm	50	63	53	45	41	54[1]
ST-11: ~25 feet from the centerline of Claus Drive. ~290 feet from the edge of Sir Francis Drake Boulevard. (4/13/2009).	2:20 pm	53	62	57	51	48	N/A
ST-12: ~25 feet from the center of Marinda Drive. (4/13/2009).	2:40 pm	48	61	48	41	37	42-47

Long-term noise measurement summary (Measurements were made for at least 24 hours)	
	L_{dn}, dBA
LT-1: Center Boulevard. ~25 feet to the center of the roadway. (4/2/2009 to 4/3/2009).	68
LT-2: Bolinas Road. ~60 feet to the center of the roadway. (4/2/2009 to 4/3/2009).	64
LT-3: Cascade Drive. ~25 feet to the center of the nearest lane of the roadway. (4/2/2009 to 4/3/2009).	61
LT-4: Sir Francis Drake Boulevard. ~45 feet to the center of the roadway just south of Oak Tree Lane. (4/2/2009 to 4/3/2009).	70
LT-5: Between Sir Francis Drake Boulevard and Broadway. ~40 feet to center of Broadway. (4/2/2009 to 4/3/2009).	70

LT-6: On Spruce Road at Lombardi Yard property line. ~8 feet from fence ~20 feet to nearest residential property line. (4/13/09 to 4/15/2009).	57-61
LT-7: At the end of Marinda Drive. (4/13/2009 to 4/15/2009).	42-47

Day/Night Noise Level, L_{dn}: The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 pm and 7:00 am.

Equivalent Noise Level, L_{eq}: The average A-weighted noise level during the measurement period.

L_{01}, L_{10}, L_{50}, L_{90} The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.

[1]Ldn estimated based on concurrent long-term data.

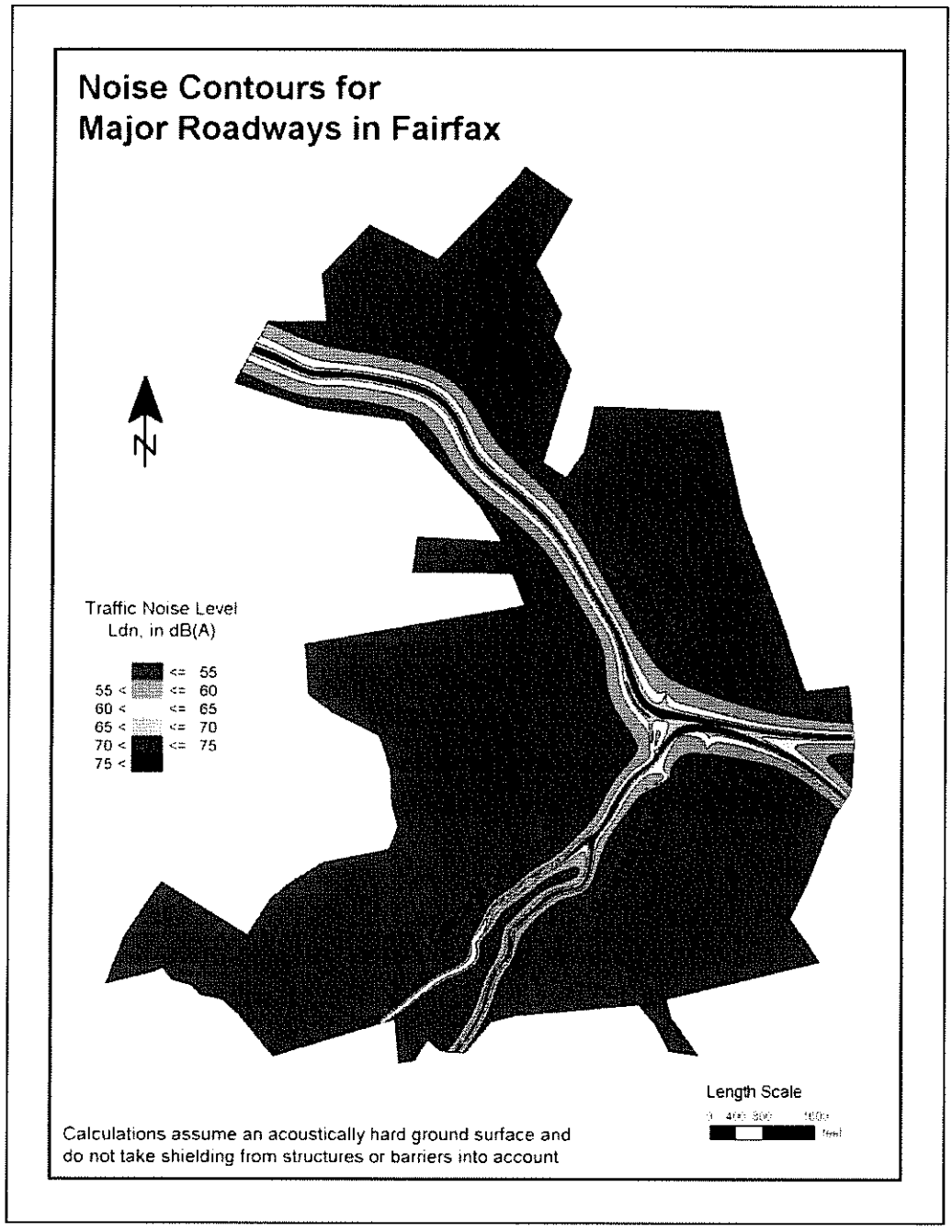
[2]N/A, Not Available, only short-term measurements were made so the L_{dn} cannot be directly calculated from the data.

Solving the Noise Challenge

The definition of noise compatible land use planning is the second major component of the Noise Element. While this may not be a major issue in Fairfax because it is largely built out, it is a requirement for the Noise Element. Noise exposure in the community is defined in terms of the 24-hour day/night average noise level (L_{dn}). The noise levels were measured throughout the community. Noise contours were prepared for the major roadways utilizing a combination of the measured noise levels and traffic data.

The noise exposure in the community is depicted in the form of noise exposure contours along the major roadways. The noise exposure contours are lines of equal loudness, similar to elevation contours that are lines of equal elevation. Noise exposure contours were calculated using a traffic noise model developed by the Federal Highway Administration and the California Department of Transportation that is incorporated into the SoundPlan computer model. The traffic noise model was calibrated using the actual measured noise levels in Fairfax. Noise exposure is presented in terms of the L_{dn} noise metric. The results of the traffic noise modeling are shown in Table 4 and the noise exposure contour map is shown in Figure 9.

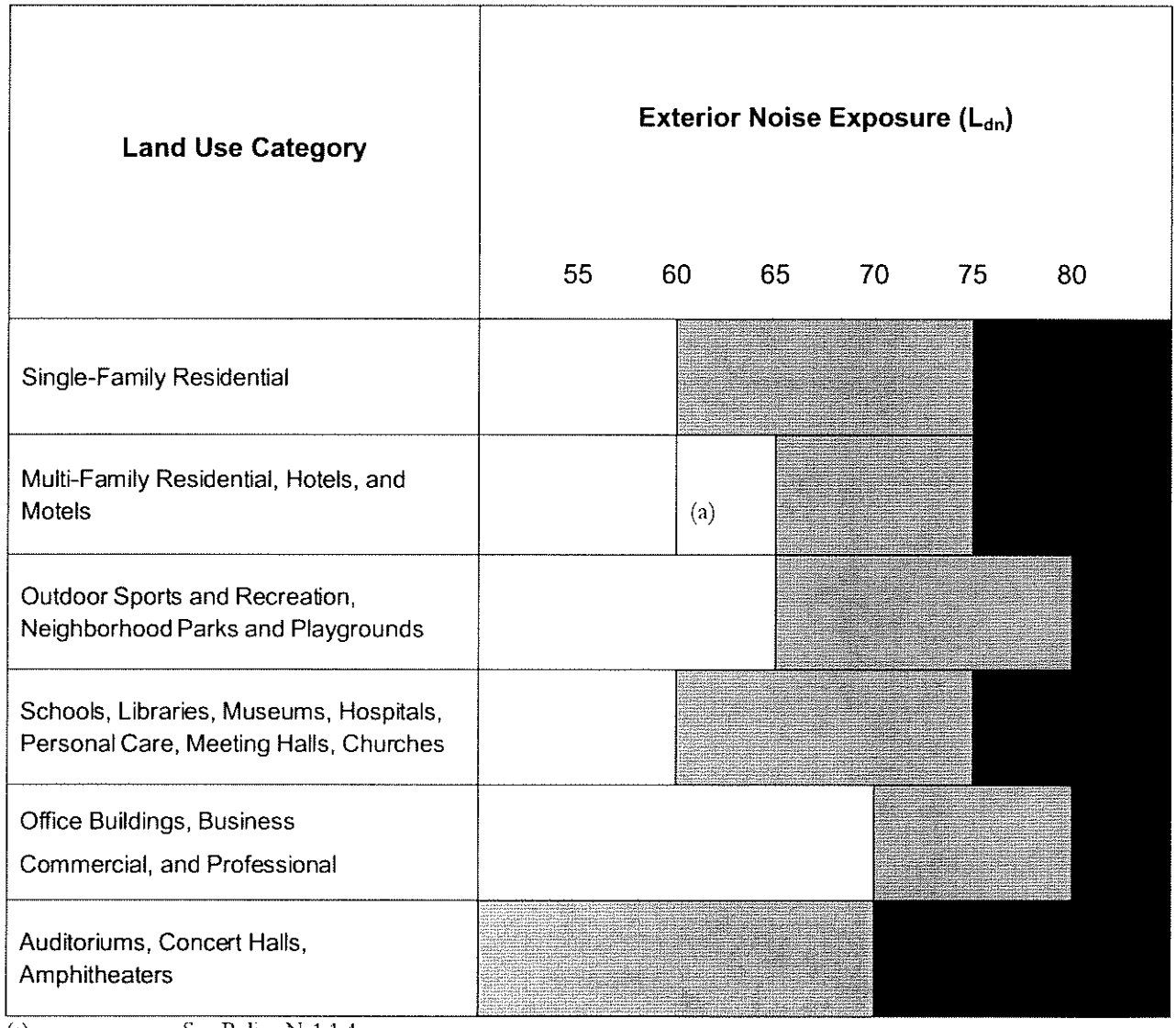
Figure 9



Paraphrasing from the State's Noise Element Guidelines, given the definition of the existing and forecasted noise environment, the Town must now approach the problem of defining how much noise is too much. The State guidelines include an example that can be used to address this issue. Figure 10 shows the recommended noise and land use compatibility

guidelines. This chart simplifies the land uses and reduces the acceptability categories to three: normally acceptable, conditionally acceptable, and normally unacceptable. These categories translate to a noise environment for a particular use that would be acceptable without additional mitigation measures, an intermediate category where the application of available mitigation measures would normally result in an acceptable noise environment, and a noise environment that could potentially be unacceptable even after the application of available mitigation measures. In the CEQA context, this would translate to a less-than-significant impact, a less-than-significant impact after mitigation, and a significant and unavoidable impact.

Figure 10 - Land Use Compatibility for Transportation Noise



(a) See Policy N-1.1.4

	Acceptable. Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special insulation requirements

	Conditionally Acceptable. Specified land use may be permitted only after detailed analysis of the noise reduction requirements and needed noise insulation features included in the design.
	Unacceptable. New construction or development should generally not be undertaken because mitigation is usually not feasible to comply with noise element policies.

One of the requirements of the noise element is to facilitate the Noise Insulation Standards contained in the State Building Code that are applicable to new multi-family housing. This code section states that where the exterior noise exposure level is 60 dBA L_{dn} or greater, the building must attenuate the interior noise level to 45 dBA L_{dn} or less. The noise and land use compatibility chart is used to screen for this and a policy is normally included to explain how this is accomplished.

Much research has resulted in the development of a correlation of exterior community noise levels and their acceptability for different land uses. In the mid-1970s the Environmental Protection Agency made a finding that an L_{dn} of 55 dBA (including a 5 dBA margin of safety) would have "no impact" on a residence. Following this, the State of California established guidelines and suggested 60 dBA L_{dn} as an upper limit for environmental noise in a residential setting. Furthermore, typical California construction with windows open provides about 15 dBA of noise reduction when going from outside to inside, so if the exterior L_{dn} is 60 dBA or less, the interior L_{dn} will typically be 45 dBA or less. An L_{dn} of 45 dBA is considered the upper limit of acceptability for residential development in California (as defined in the State Building Code). Based on the existing conditions in Fairfax an exterior noise goal of 60 dBA L_{dn} and an interior goal of 45 dBA L_{dn} has been proposed for new residences.

Commercial and retail establishments generate a different kind of noise referred to as non-transportation noise. The noise results from sources such as heating, ventilating, and refrigeration equipment, loading dock activities, parking lot traffic and maintenance, and special events with music. If a residence is planned near such a source of noise, the noise limits in the Noise Ordinance are used to address noise during any hour of the day and night are used to evaluate the suitability of the environment.

Roadway - Segment	Peak-Hour Traffic	Speed	Ldn @ 50 feet
Sir Francis Drake Blvd. near Oak Manor Drive	1480	35	68

Table 4: Traffic Noise Levels in the Town of Fairfax

Sir Francis Drake Blvd. near Oak Tree Lane	1490	25	66
Sir Francis Drake Blvd. west of Claus Drive	1490	25	69
Sir Francis Drake Blvd. east of Claus Drive	1230	25	67
Sir Francis Drake Blvd. east of Pacheco Avenue	1440	25	64
Broadway west of Bolinas Road	700	25	64
Broadway east of Bolinas Road	1080	30	65
Center Blvd. east of Pacheco	1008	25	64
Bolinas Road south of Broadway	909	25	64
Bolinas Road north of Cascade Drive	914	25	64
Bolinas Road south of Cascade Drive	458	25	60
Cascade Drive south of Bolinas Road	444	25	60
Cascade Drive south of Laurel Drive	228	25	56

Goals, Objectives, Policies and Programs

The three goals of this element are:

- Make Land Uses Compatible with the Noise Environment
- Reduce Noise from Traffic
- Maintain the Current Quality of the Acoustical Environment

The Noise Element shall include measures and possible solutions that address existing and foreseeable noise problems. Traffic noise is the most significant source of community noise in Fairfax. The noise generated by individual vehicles is pre-empted by the state, so noise limits cannot be set for individual vehicles. Noise generated by tire-pavement interaction is the predominant source of noise and can be affected by local actions. During the last seven years, extensive research has been completed related to tire-pavement noise. Quieter pavements have been identified. These include pavements commonly used in California, such as open-grade asphalt concrete and rubberized asphalt.

The other irritating noise sources associated with traffic are poorly muffled vehicles and loud stereo systems. Both of these are regulated by the Motor Vehicle Code and enforced by local Police.

Goal N-1: Make Land Uses Compatible with the Noise Environment

Objective N-1.1: Establish traffic-related noise standards for the Town

Policy N-1.1.1: All new development must include an analysis of potential noise impacts.

> Program N-1.1.1.1: Utilize the noise contours in Figure 9 and noise/land use compatibility standards in Figure 10 to update the Town Code.
>
> > Responsibility: Planning and Building Services
> > Schedule: 2011

Policy N-1.1.2: The Town will maintain a pattern of land uses that separates noise-sensitive land uses from major traffic noises, to the extent feasible.

> Program N-1.1.2.1: Incorporate a noise analysis in the Town Center Plan.

Responsibility: Planning and Building Services, Planning Commission
Schedule: Per the schedule for the Town Center Plan

Policy N-1.1.3: New development of residential or other noise sensitive land uses should not be allowed in noise impacted areas unless effective mitigation measures are incorporated into the project design to reduce noise levels in outdoor activity areas to 60 dBA L_{dn} or less.

Program N-1.1.3.1: Incorporate noise reduction guidelines in the Green Building Ordinance, when adopted.

Responsibility: Planning and Building Services, Planning Commission
Schedule: 2011

Policy N-1.1.4: Interior noise levels shall not exceed 45 L_{dn} in all new residential units (single- and multi-family).

Program N-1.1.4.1: Residential development sites exposed to noise levels exceeding 60 L_{dn} shall be analyzed following the protocols in the 2007 California Building Code (Chapter 12, Appendix Section 1207.11.12) or the most recent revision.

Responsibility: Planning and Building Services
Schedule: On-going

Policy N-1.1.5: New development of noise-sensitive land uses shall not be allowed where the noise level due to non-transportation noise sources will exceed the standards in the noise ordinance.

Program N-1.1.5.1: Identify and map non-transportation noise sources.

Responsibility: Planning and Building Services
Schedule: 2011

Policy N-1.1.6: Where noise sensitive land uses are proposed in areas exposed to existing or projected exterior non-transportation noise levels exceeding the Noise Ordinance limits, an acoustical analysis shall be submitted by the applicant so that noise mitigation may be included in the design of new development.

Program N-1.1.6.1: Revise the project application to require a noise analysis if the proposed development would be exposed to sound levels exceeding the Noise Ordinance levels.

Responsibility: Planning and Building Services, Planning Commission
Schedule: 2011

Goal N-2: Reduce Noise from Traffic

Objective N-2.1: Establish noise limits for public areas.

Policy N-2.1.1: The Town will employ innovative techniques and materials to reduce noise.

Program N-2.1.1.1: Utilizing currently available information, select a "quieter" pavement that also meets other criteria established by the Town for pavements, and use the quieter pavement when resurfacing roads.

Responsibility: Public Works
Schedule: 2011

Program N-2.1.1.2: Control the sound of vehicle amplification systems (e.g., loud stereos) by encouraging the enforcement of Section 27007 of the California Motor Vehicle Code. This section prohibits amplified sound that can be heard 50 or more feet from a vehicle.

Responsibility: Police
Schedule: On-going

Program N-2.1.1.3: Control excessive exhaust noise by enforcing Section 27150 of the California Motor Vehicle Code.

Responsibility: Police
Schedule: On-going

Goal N-3: Maintain the Current Quality of the Acoustical Environment

The fundamental principle of the California Environmental Quality Act as it relates to community noise is to keep new projects from causing a substantial increase in noise that would impact residents and other sensitive receivers. This can be accomplished if impacts are identified as a part of normal project review or through the CEQA process and mitigation measures are incorporated into projects.

Noise from construction activities, and particularly activities associated with the construction of new residences, remodeling or demolition and reconstruction of residential properties, has an adverse effect on the peace and quiet in the Town of Fairfax.

The term "construction" covers a large range of projects ranging from new construction or the demolition and construction of a large residence that could include demolition, site grading, foundation work, framing, roofing, exterior sheeting, and site improvements and landscaping, a project that may last up to two years, to someone repairing a deck on a Saturday afternoon.

The primary method for communicating construction noise management methods to the community could be through a guidance manual and/or design guide. If a major project is expected to take less than 18 months and work would be done following all of the standard controls that would be established, including limiting the work to a certain schedule of allowable days and hours, then the project would be found to cause a less-than-significant impact under CEQA. Alternatively, if the project is going to necessitate construction activities that would last beyond 18 months, or occur outside of allowable time periods, then the project would be found to cause a potentially significant impact and would be subject to environmental review under CEQA. The assessment could result in additional mitigation measures, a finding of overriding considerations, or project denial.

The following is a representative list of standard controls:

a) Limit construction to the hours of 8:00 AM to 5:00 PM on weekdays, and 9:00 AM to 5:00 PM on Saturdays, with no noise-generating construction on Sundays or holidays.

b) Control noise from construction workers' radios to the point where they are not audible at existing residences that border the Project site.

c) Equip all internal combustion engine-driven equipment with mufflers which are in good condition and appropriate for the equipment.

d) Utilize quiet models of air compressors and other stationary noise sources where technology exists.

e) Locate stationary noise-generating equipment as far as possible from sensitive receptors when sensitive receptors adjoin or are near a construction project area.

f) Prohibit unnecessary idling of internal combustion engines.

g) Notify residents adjacent to the Project site of the construction schedule in writing.

h) Designate a noise disturbance coordinator who would be responsible for responding to any local complaints about construction noise. The disturbance coordinator would determine the cause of the noise complaints (e.g., starting too early, bad muffler) and institute reasonable measures warranted to correct the problem. Conspicuously post a telephone number for the disturbance coordinator at the construction site.

Other sources of noise that contribute to the noise environment in Fairfax include aircraft flights, and various neighborhood sources including barking dogs, yard maintenance, garbage trucks, noise generated by other home equipment such as swimming pool pumps and air-conditioners, early morning deliveries, and parties. The Town has little direct control of aircraft operations that may constitute a noise burden to its residents. Hence, most aircraft noise abatement measures must necessarily be affected by seeking cooperation from other government agencies. The Town can manage noise generated within its boundaries.

Objective N-3.1: Establish a noise abatement program that preserves the existing acoustical character of the Town.

Policy N-3.1.1: The Town will periodically analyze the acoustical environment of the community.

Program N-3.1.1.1: Require an acoustical analysis to evaluate mitigation measures for noise-generating projects that would cause the following criteria to be exceeded or would cause a significant adverse community response:

- Cause the L_{dn} at noise-sensitive uses to increase by 3 dBA or more and exceed the "normally acceptable" level.
- Cause the L_{dn} at noise-sensitive uses to increase 5 dBA or more and remain "normally acceptable"

Note: Locations where there is greater sensitivity to excess noise, including but not limited to, residences, hospitals, nursing homes, theaters, auditoriums, churches, meeting halls, schools, libraries, museums, and parks.

Responsibility: Planning and Building Services, Planning Commission
Schedule: On-going

Policy N-3.1.2: Noise created by new non-transportation noise sources shall be mitigated so as not to exceed the noise level standards of the noise ordinance. Where proposed non-transportation noise sources are likely to produce noise levels exceeding the standards, an acoustical analysis shall be required as a part of project review or as part of the environmental review process so that noise mitigation may be included in the project design.

Program N-3.1.2.1: Revise the Town Code to require noise analyses.

Responsibility: Planning and Building Services, Town Attorney, Town Council
Schedule: 2011

Policy N-3.1.3: All acoustical analyses shall:

- Be the responsibility of the applicant
- Be prepared by a qualified person experienced in the fields of environmental noise assessment and architectural acoustics
- Include representative noise level measurements with sufficient sampling periods and locations to adequately describe local conditions
- Estimate existing and projected (20 years) noise levels in terms of L_{dn} and/or the standards of the noise ordinance, and compare those levels to the policies of this Element
- Recommend appropriate mitigation to achieve compliance with the adopted policies and standards of this Element. Where the noise source in question consists of intermittent single events, the report must address the effects of maximum noise levels in sleeping rooms in terms of possible sleep disturbance
- Describe a post-project assessment program which could be used to evaluate the effectiveness of the proposed mitigation measures

Program N-3.1.3.1: Identify acoustical analyses as a project application requirement, where appropriate.

Responsibility: Planning and Building Services
Schedule: 2011

Policy N-3.1.4: Implement appropriate standard controls (e.g., some or all of a-h above) for all construction projects.

Program N-3.1.4.1: Develop a guidance manual to provide information to public regarding construction noise control.

Responsibility: Planning and Building Services, Public Works
Schedule: 2012

Policy N-3.1.5: Consider CEQA review for construction projects lasting more than 18 months, and submittal of detailed construction noise management plans.

Program N-3.1.5.1: Develop a guidance manual to provide information to public regarding construction noise control.

Responsibility: Planning and Building Services, Public Works
Schedule: 2012

Policy N-3.1.6: Work with local airports to promote a "fly neighborly" program to minimize noise resulting from low altitude aircraft operations and unnecessary general aviation aircraft over Fairfax.

Program N-3.1.6.1: Apply the noise ordinance to address ongoing noise issues by using the quantitative noise limits and other prohibitions where appropriate and establishing comprehensive noise control measures.

Responsibility: Town Council
Schedule: 2011