



## NOISE ELEMENT

### Introduction and Purpose

The Noise Element of the City of Carmel-by-the-Sea's General Plan has been prepared pursuant to Section 65302(g) of the California Government Code. This section requires that each city's or county's General Plan shall contain a Noise Element. In preparing the Noise Element, the "Guidelines for the Preparation and Content of the Noise Element of the General Plan," prepared by the office of Noise Control, California Department of Health, have been closely followed.

The purpose of the Noise Element is to form the basis for the City's efforts in community noise control. The Noise Element is composed of the following parts:

- an evaluation of the present and future noise climate in Carmel;
- a discussion of the major noise sources in Carmel and some suggestions for their control;
- a section discussing the use of the Noise Element as a planning tool; and
- a section summarizing actions which the City can take to reduce existing noise levels and avoid future noise problems.

A major objective of the Noise Element is to provide guidelines to achieve noise compatible land uses. As such, the Noise Element is most closely related to the Land Use, Housing, Circulation, and Open Space Elements. By identifying noise sensitive land uses and establishing compatibility guidelines for land use and noise, the Noise Element influences the general distribution, location, and intensity of future land use.

The circulation system within a city is one of the major sources of continuous noise; therefore, the existing and future circulation system identified in the Circulation Element will greatly influence the noise environment. When proper planning occurs circulation routes such as major streets and highways, along with truck routes, can be located to minimize noise impact upon noise sensitive land use.

Since noise can adversely affect the enjoyment of quiet activities in open space, the Noise Element is also closely related to the Open Space Element. Conversely, open space can be used as a noise buffer between incompatible land uses. This technique can reduce community noise levels and also provide usable open space for recreation.

This element also includes some of the findings gathered through the Community Survey (Survey). The Survey was prepared as part of the public outreach process to gain a broader



response from the community, property owners, and businesses on issues facing Carmel. The complete Survey report can be found in Appendix A.

## Issues of Local Significance

The greatest noise source in Carmel is the large volume of automobile traffic that travels through Carmel. Large buses, trucks and vehicles travel through residential neighborhoods and generate noise that is not in keeping with Carmel's village character. The Survey identified construction, delivery trucks, and garbage trucks as the top three most disturbing noise sources for Carmel's residents. The noise from traffic and buses was in the middle of the scale. While noises generated by animals and the business district were identified as the least disturbing. Other noise sources identified in the Survey included car alarms and leaf blowers as sources of disturbing noise, beyond an occasional, acceptable limit.

## Goals, Objectives and Policies

**G9-1** Preserve Carmel's overall quiet environment; reduce noise in Carmel to levels compatible with the existing and future land uses and prevent the increase of noise levels in areas where noise sensitive uses are located.

**O9-1** Support programs to reduce community noise levels where possible to levels acceptable to the community.

**P9-1** Noise emission levels shall be considered alongside performance and cost, when purchasing City owned vehicles and construction equipment.

**P9-2** Continuously update\_the\_noise ordinance to conform with guidelines established by the Office of Noise Control and the California Department of Health Services.

**P9-3** The noise ordinance shall clearly address all identified sources of noise to simplify enforcement.

**P9-4** Ensure that construction activities are managed to minimize overall noise impacts on surrounding land uses.

**P9-5** Develop a system to monitor construction noise impacts on surrounding land uses.

**P9-6** Develop a noise enforcement program to minimize disturbance of the community tranquility.



- P9-7** Monitor sound levels on a routine basis in order to achieve, through a noise ordinance, reduction of unacceptable noise within Carmel.
- O9-2** Consider the compatibility of proposed land uses with noise environment when preparing community plans or reviewing specific development proposals.

  - P9-8** Apply the noise and land use compatibility standards as shown in Table 9.2: Land Use Compatibility for Community Noise Environments to all new residential, commercial, and mixed-use proposals, including condominium conversions.
  - P9-9** Require acoustical reports and evaluation of noise mitigation measures for projects that would substantially increase noise.
  - P9-10** Develop standard noise mitigation measures that can be incorporated into new developments.
  - P9-11** The standard noise mitigation measures shall not preclude creative solutions addressing unique situations when there are conflicts between noise levels and land use.
- O9-3** Control unnecessary, excessive and annoying noises within the City where not preempted by Federal or State control.

  - P9-12** Protect residential areas from excessive noise from traffic, especially trucks and buses.
  - P9-13** Establish noise performance standards for City owned equipment, air circulating and air conditioning equipment.
  - P9-14** Endorse future efforts to reduce noise levels along Highway 1 to acceptable levels.
  - P9-15** Continue to prohibit the use of gas-powered leaf blowers in the City.
  - P9-16** Continue to maintain a truck route to limit noise impacts in the City.
  - P9-17** Continue to enforce state laws regarding un-muffled or improperly muffled motor vehicles.
  - P9-18** Continue to enforce the City's Live Music Ordinance limiting the sound and location of live music in the commercial districts.



## Supporting Information

### Noise Scales and Definitions

Sound is described in terms of the loudness (amplitude) of the sound and frequency (pitch) of the sound. The standard unit of measurement of the loudness of sound is the decibel (dB). Since the human ear is not equally sensitive to sound at all frequencies, a special frequency-dependent rating scale has been devised to relate noise to human sensitivity. The A-weighted decibel scale (dBA) performs this compensation by differentiating among frequencies in a manner approximating the sensitivity of the human ear.

Decibels are based on the logarithmic scale. The logarithmic scale compresses the wide range in sound pressure levels to a more usable range of numbers in a manner similar to the Richter scale used to measure earthquakes. In terms of human response to noise, a sound 10 dBA higher than another is perceived to be twice as loud and 20 dBA higher is perceived to be four times as loud, and so forth. Everyday sounds normally range from 30 dBA (very quiet) to 100 dBA (very loud). Examples of various sound levels in different environments are illustrated on [Figure 9.1: Sound Levels and Human Response](#).

Many methods have been developed for evaluating community noise to account for, among other things:

- The variation of noise levels over time;
- The influence of periodic individual loud events; and
- The community response to changes in the community noise environment.

[Table 9.1: Noise Descriptors](#), provides a listing of methods to measure sound over a period of time. [Table 9.2 Land Use Compatibility for Community Noise Environments](#), provides a description of California noise standards for various land use categories.



**Table 9.1: Noise Descriptors**

Term	Definition
Decibel (dB)	The unit for measuring the volume of sound equal to 10 times the logarithm (base 10) of the ratio of the pressure of a measured sound to a reference pressure (20 micropascals).
A-Weighted Decibel (dBA)	A sound measurement scale that adjusts the pressure of individual frequencies according to human sensitivities. The scale accounts for the fact that the region of highest sensitivity for the human ear is between 2,000 and 4,000 cycles per second (hertz).
Equivalent Sound Level ( $L_{eq}$ )	The sound level containing the same total energy as a time varying signal over a given time period. The $L_{eq}$ is the value that expresses the time averaged total energy of a fluctuating sound level.
Maximum Sound Level ( $L_{max}$ )	The highest individual sound level (dBA) occurring over a given time period.
Minimum Sound Level ( $L_{min}$ )	The lowest individual sound level (dBA) occurring over a given time period.
Community Noise Equivalent Level (CNEL)	A rating of community noise exposure to all sources of sound that differentiates between daytime, evening, and nighttime noise exposure. These adjustments are +5 dBA for the evening, 7:00 PM to 10:00 PM, and +10 dBA for the night, 10:00 PM to 7:00 AM
Day/Night Average ( $L_{dn}$ )	The $L_{dn}$ is a measure of the 24-hour average noise level at a given location. It was adopted by the U.S. Environmental Protection Agency (EPA) for developing criteria for the evaluation of community noise exposure. It is based on a measure of the average noise level over a given time period called the $L_{eq}$ . The $L_{dn}$ is calculated by averaging the $L_{eq}$ 's for each hour of the day at a given location after penalizing the "sleeping hours" (defined as 10:00 PM to 7:00 AM), by 10 dBA to account for the increased sensitivity of people to noises that occur at night.
L01, L10, L50, L90	The fast A-weighted noise levels equaled or exceeded by a fluctuating sound level for 1 percent, 10 percent, 50 percent and 90 percent of a stated time period.
Source: Cyril M. Harris, Handbook of Noise Control, 1979.	



**Table 9.2: Land Use Compatibility for Community Noise Environments**

Land Use Category	Community Noise Exposure (CNEL)			
	Normally Acceptable	Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable
Residential - Low Density, Single-Family, Duplex, Mobile Homes	50 – 60	55 - 70	70-75	75-85
Residential - Multiple Family	50 – 65	60 - 70	70 - 75	70 – 85
Transient Lodging - Motel, Hotels	50 – 65	60 - 70	70 - 80	80 – 85
Schools, Libraries, Churches, Hospitals, Nursing Homes	50 – 70	60 - 70	70 - 80	80 – 85
Auditoriums, Concert Halls, Amphitheatres	NA	50 - 70	NA	65 – 85
Sports Arenas, Outdoor Spectator Sports	NA	50 - 75	NA	70 – 85
Playgrounds, Neighborhood Parks	50 – 70	NA	67.5 - 75	72.5 - 85
Golf Courses, Riding Stables, Water Recreation, Cemeteries	50 – 70	NA	70 - 80	80 – 85
Office Buildings, Business Commercial, and Professional	50 – 70	67.5 - 77.5	75 - 85	NA
Industrial, Manufacturing, Utilities, Agriculture	50 – 75	70 - 80	75 - 85	NA
CNEL = community noise equivalent level				
Source: General Plan Guidelines, Office of Planning and Research, California, October 2003.				
Notes: 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 included in the design. Conventional construction, but, but with closed windows and fresh air supply systems or air conditioning will normally suffice. NORMALLY UNACCEPTABLE - New Construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design. CLEARLY UNACCEPTABLE - New construction or development should generally not be undertaken. NA: Not Applicable				

**Ambient Noise Measurements**

To quantify existing ambient noise levels in Carmel, 11 noise measurements were conducted throughout the City on June 12, 2007. Locations of noise measurement sites were representative of typical existing noise exposure within the City of Carmel. [Figure 9.2: Noise Measurement Locations](#), shows the locations of each site. As shown in [Table 9.3: Noise Measurements](#), measured noise levels ranged from 41.4 dBA to 65.4 dBA.



Table 9.3: Noise Measurements

Site No.*	Location	Leq (dBA)	Time
1	Open space area at the end of Martin Road	45.1	11:13 AM
2	Guadalupe Street between 4th and 5th Avenue	41.4	11:53 AM
3	Junipero Avenue at the Police Station	44.3	12:14 PM
4a	Lincoln Avenue and Ocean Avenue at the Library	57.2	12:48 PM
4b	Lincoln Avenue and Ocean Avenue at the Library	53.6	8:40 PM
5	Scenic Drive between 8th and 9th Avenue	65.4	2:30 PM
6a	Dolores Street and 13th Avenue	45.5	2:44 PM
6b	Dolores Street and 13th Avenue	41.4	9:40 PM
7	Monte Verde Street between 11th and 12th Avenue	43.1	3:03 PM
8	Cassanova Street between 9th and 10 Avenue	58.5	3:42 PM
9	Carmelo Street between 2nd and 4th Avenue	46.2	4:08 PM
10a	Dolores and 2nd Avenue	41.6	4:48 PM
10b	Dolores and 2nd Avenue	46.3	9:20 PM
11	Construction Activity along Scenic Drive	64.6	2:00 PM
Note: * Noise levels were also taken during the evening per the City's requests. Site with both daytime and nighttime measurements are denoted by "a" and "b".			
Source: Noise Monitoring Survey conducted by RBF Consulting, June 12, 2007.			

The majority of the City consists of residential homes. The commercial areas within the City are concentrated along major thoroughfares such as Ocean Avenue. As indicated in the noise measurement level provided in Table 9.3: Noise Measurements, noise levels within the residential areas of the City are well below 60 dBA. The noise levels within the residential portions of the City are considered “Normally Acceptable” based upon California Standards. The highest noise levels were recorded along Scenic Drive. However, this noise also takes into account the noise generated from the Pacific Ocean in addition to traffic traveling along Scenic Drive. Based upon the noise measurements, the noise levels at the commercial areas (site 3 and 4) were well below 65 dBA, which would be considered “Normally Acceptable” for commercial and public areas.

### Major Noise Sources

Control or abatement of a noise problem can typically be accomplished in any one or a combination of three ways: reduce or remove completely the noise source; protect the receiver



of the noise; or block the path between the source of the noise and the receiver to reduce the noise level. All of these options can be used to reduce the noise exposure in Carmel.

### State Highway 1

The greatest generator of continuous high noise levels, Highway 1, is located east of Carmel, outside of the city limits. The noise generated by motor vehicles on Highway 1 is caused by a relatively large number of automobiles and trucks traveling at high speed. This high noise level coupled with the fact that residences are located close to the roadway results in a noise problem. The noise levels along Highway 1 in the yards of the nearest residents make conversation and normal vocal levels difficult. Even inside these homes with the windows and doors closed, highway noise is constantly audible as background level noise.

### Truck and Bus Routes

Delivery trucks to the central business area of Carmel mainly use the following route: Carpenter Street, Second Avenue, Santa Fe Street, Third Avenue, Junipero Avenue, Fourth Avenue, San Carlos Street, Thirteenth Avenue and Rio road. As is shown in [Figure 9.2: Noise Measurement Locations](#) and [Table 9.3: Noise Measurements](#), noise levels along these streets ranged between 44.3 dBA (Junipero Avenue at 4<sup>th</sup> Avenue) to 45.5 dBA (Dolores Street at 13<sup>th</sup> Avenue). These noise levels are considered very low and are “Normally Acceptable” for all types of land uses, including residential uses (see [Table 9.2: Land Use Compatibility for Community Noise Environments](#)). A heavy truck can generate noises as high as 88 dBA (TRBNA 2009), however, the noise measuring equipment averages noise levels recorded, resulting in a lower reading.

Tour buses traveling through Carmel have also been identified by residents as a source of noise. Tour buses are directed in a loop pattern through Carmel on Carpenter street, Second Avenue, Santa Fe Street, Third Avenue, Junipero Avenue, Eighth Avenue, San Carlos Street, Thirteenth Avenue, and Rio Road. The tour bus route is similar to the designated truck route. The main problem with trucks and buses is that in a quiet residential area the noise emitted by these vehicles contrasts sharply against the low-level background noise.

### Ocean Avenue

Ocean Avenue is one of the major access arterials of Carmel. Ocean Avenue presently carries an average daily traffic of 11,322 automobiles (more during seasonal periods and weekends) with a decreasing number of motor vehicles west of the business area. Truck traffic is prohibited on Ocean Avenue from Highway 1; therefore, the section of Ocean Avenue from Highway 1 to east of the central business area is used by automobiles only. Within the business area, trucks have destinations on Ocean, Junipero, Fifth, Sixth, Seventh and Eighth Avenues, and San Carlos, Lincoln, Mission, Dolores and Monte Verde Streets have to travel and unload throughout the business district. Residents living adjacent to Ocean Avenue are occasionally exposed to temporary, traffic generated, high noise levels. Noise measurements recorded along Ocean



Avenue ranged from 53.6 dBA (evening) and 57.2 dBA (mid day) (see [Figure 9.2: Noise Measurement Locations](#) and [Table 9.3: Noise Measurements](#)). These noise levels are considered very low and are “Normally Acceptable” for all types of land uses, including residential uses (see [Table 9.2 Land Use Compatibility for Community Noise Environments](#)).

### Individual Vehicles

One of the most annoying and illegal sources of noise in any community, including Carmel, is un-muffled or improperly muffled motor vehicles. Section 27150 of the California Motor Vehicle Code requires that all vehicles be equipped with a properly maintained muffler. Section 27151 makes it illegal to modify the exhaust system of any vehicle. Enforcement of these sections of the vehicle code does not require the use of a sound level meter to prove a violation. In addition to the muffler regulations, Section 23130.5 of the Vehicle Code sets quantitative noise emission limits for different vehicle classes. Enforcement of this section requires noise monitoring equipment and trained personnel. Since almost all the vehicles that violate the quantitative limits have faulty or modified exhaust systems, it is generally more cost effective for a city to cite vehicles under sections 27150 and 27151.

### Trash Pick-Up

Noise from trash pickup and compacting results from the use of hydraulic equipment which raises and lowers the metal trash bins, as well as compacts the contents. Typical noise levels range from 80 to 85 dBA at 50 feet during the raising, lowering and compacting operations. A typical trash pickup takes approximately three minutes. The higher noise levels occur during approximately one-half of the operation. The City experiences this type of noise level from existing trash pick-operation, and while this service emits much higher noise levels than its surroundings, the impact of trash pick up service would be short-term and periodic.

### Street Sweepers

Because of the slow speed of the sweepers and the need to sometimes sweep opposite to the traffic flow, it is imperative that the sweepers operate when traffic is at its lowest. The nominal operating speed for a street sweeper is 5 miles per hour. This ensures a thorough pickup of debris, but can provide frustrating traffic delays during busy traffic hours. Most cities find it nearly impossible to sweep busy arterial streets or commercial areas after 7:00 AM. In residential areas the opposite is true as streets tend to have less on-street parking during normal work hours. [Table 9.4: Street Sweeper Noise Levels](#), provides representative noise levels for two types of street sweepers. As indicated in [Table 9.5: Street Sweeper Noise Levels](#), noise levels can vary between product type and operation. The noise generated by street sweepers may cause annoyance to surrounding sensitive uses. Although the sweepers result in noise levels above 60 dBA it is not a sustained noise level. The operation of street sweepers would vary and is not anticipated to significantly increase the ambient noise levels within the City.



**Table 9.4: Street Sweeper Noise Levels**

Vehicle	Idling at 10 feet	Operating at 10 feet	Idling at 75 feet	Operating at 75 feet
Schwartz Sweeper	76.7 dBA	91.2 dBA	66.1 dBA	76.7 dBA
Johnston Sweeper	66.2 dBA	88.9 dBA	55.4 dBA	73.0 dBA

Source: City of Ashland, <http://www.ashland.or.us/Page.asp?NavID=9565>, July 17, 2007.

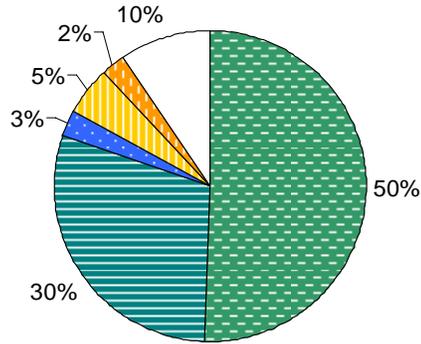
### Community Perceptions About Noise

The Survey prepared as part of the General Plan update included a series of questions related to establishing community noise perception. A great majority of respondents (80 percent) perceived Carmel as a tranquil, quiet place with only occasional noise problems (64 percent). A small percentage of respondents (22 percent) believed that Carmel has an increasing noise problem. Similarly, a small percentage of respondents (22 percent) thought that the City should do more to control noise. **Graph 9.1: Noise Perception**, provides detail related to Carmel residents perception of noise.

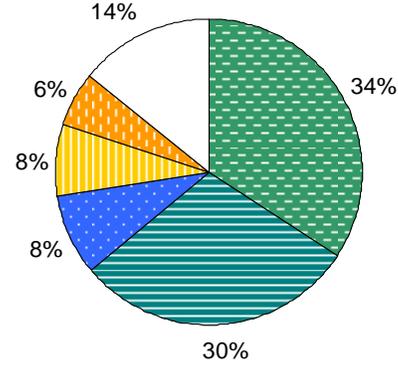


Graph 9.1: Noise Perceptions

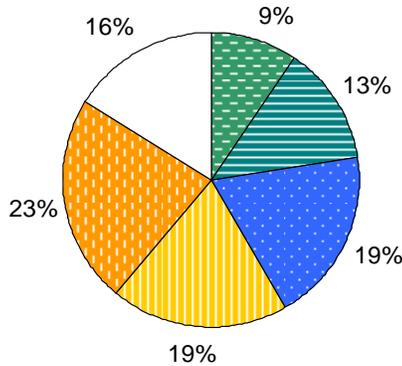
*Tranquil, Quiet Place*



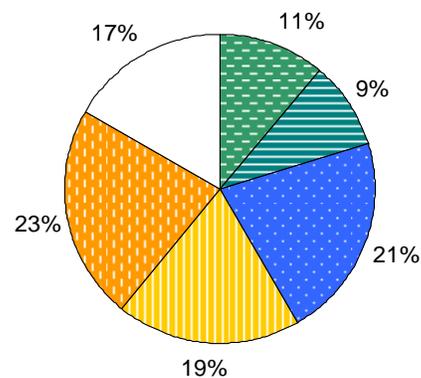
*Occasional Noise Problems*



*Increasing Noise Problems*



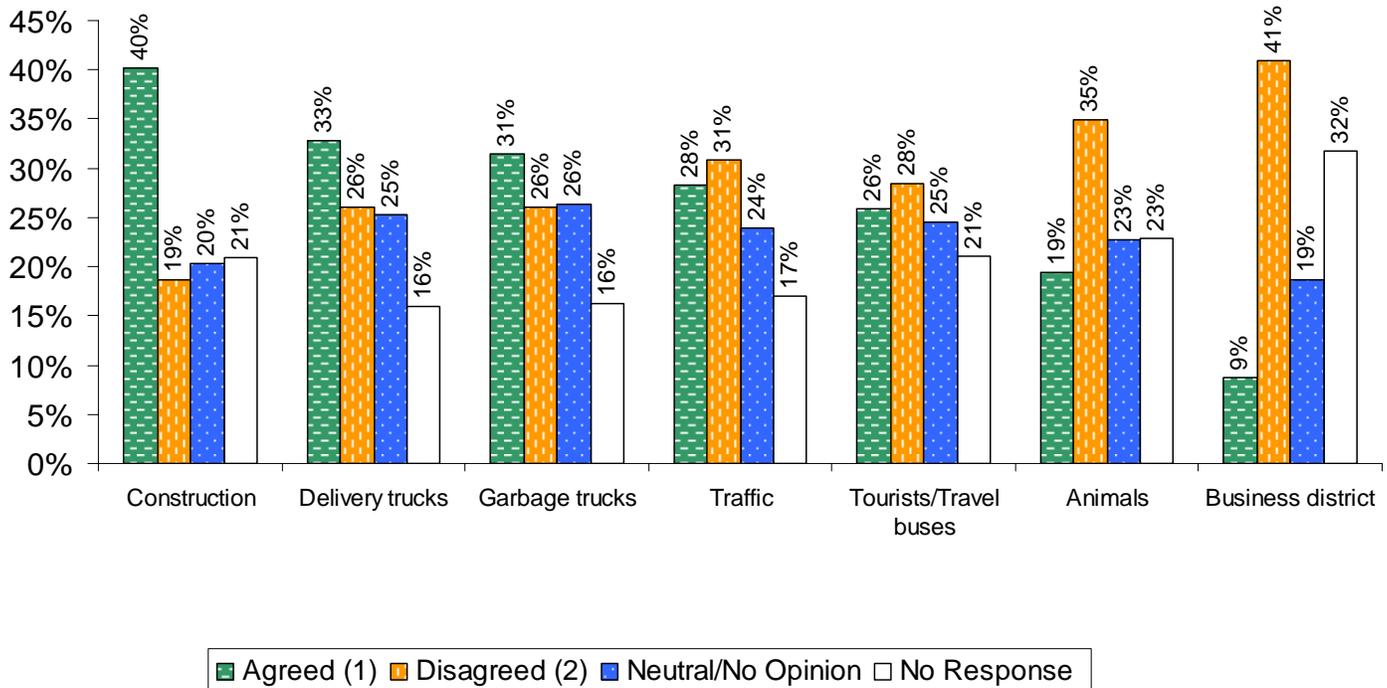
*Increase Noise Control*



Construction, delivery trucks, and garbage trucks were identified as the top three most disturbing noise sources in Carmel. The noise from traffic and buses was in the middle of the scale, while noises generated by animals and the business district were identified as the least disturbing (see [Graph 9.2: Disturbing Noise Sources](#)). In addition, the narrative portion of responses also identified car alarms and leaf blowers as sources of disturbing noise, beyond an occasional, acceptable limit.



**Graph 9.2: Disturbing Noise Sources**



Notes:

- (1) Agreed category for this graph combines the results of the strongly agreed and somewhat agreed categories. For a detailed breakdown of these categories, please refer to Appendix A.
- (2) Disagreed category for this graph combines the results of the strongly disagreed and somewhat disagreed categories. For a detailed breakdown of these categories, please refer to Appendix A.

A lot of the miscellaneous noises above were identified as common problem in Carmel. Power saws, leaf blowers and other assorted power tools (such as branch shredders and street sweepers operated by the City) are often annoying to neighbors. The variety of power tools in use and because some are used exclusively outdoors, makes enforcement of fixed noise emission limits difficult. The hours during which these tools are used, however, can be regulated. Other activities which generate noise, and which may cause annoyance, include amplified music, public address systems, and refuse collection and are best controlled through the adoption of a quantitative community noise ordinance.

**The Noise Element as a Planning Tool**

The noise measurements for Carmel provide baseline information that will be very useful in the City's planning efforts. Some of the more important uses follow.



### Exterior Noise Levels and Land Use Compatibility

Over the years many studies have been performed to determine how much noise is acceptable for different land uses. [Table 9.2: Land Use Compatibility for Community Noise Environments](#) summarizes this information. The table indicates that there is often a large range of exterior noise levels for which a land use could be made compatible if the necessary noise reduction features are included in the design of the project. The land use compatibility table used in conjunction with the noise measurements will, therefore, provide additional input into the decision making process. Proposals to rezone parcels, for example, can be quickly evaluated for any potential conflicts with the existing noise environment.

### Noise Ordinance

Section 8.56 of the City's Municipal Code includes a Noise Ordinance. The purpose of this ordinance is to prohibit unnecessary, excessive and annoying noises from all sources in the City and provide guidance as to what uses fall within this group. The standards used in determining if a noise is a nuisance include, but are not limited to:

- The volume, intensity, and duration of the noise;
- The number of persons affected by the noise;
- The use and zoning of the area within which the noise emanates;
- The time of day or night the noise occurs;
- Whether the origin of the noise is natural or unnatural;
- Whether the noise is recurrent, intermittent, or constant; and
- Whether the noise is produced by a commercial or a noncommercial activity.

### The Noise Exposure Contours and the California Noise Insulation Standards

The California Noise Insulation Standard for Multi-Family Dwellings (Title 25 of the California Government Code) requires an acoustical report for dwellings proposed in areas where the CNEL exceeds 60 dBA. The purpose of the acoustical report is to demonstrate the manner by which the development will meet the standards for interior noise levels.

### Noise Mitigation Measures

In some situations it is necessary to construct noise sensitive developments (e.g. residential, schools, hospitals) in noisy areas. In those cases noise control engineering can be used to help mitigate noise impacts in a way that does not interfere with structural, architectural, or building code requirements. The measures or combinations of measures used to mitigate noise fall into four major categories: site planning, architectural layout, noise barriers, and construction modifications. Noise mitigation measures should also be assessed against other community values such as open space, aesthetics, maintenance problems, etc. Each project has its own special problems, and mitigation measures, which are cost effective for one project, may not be



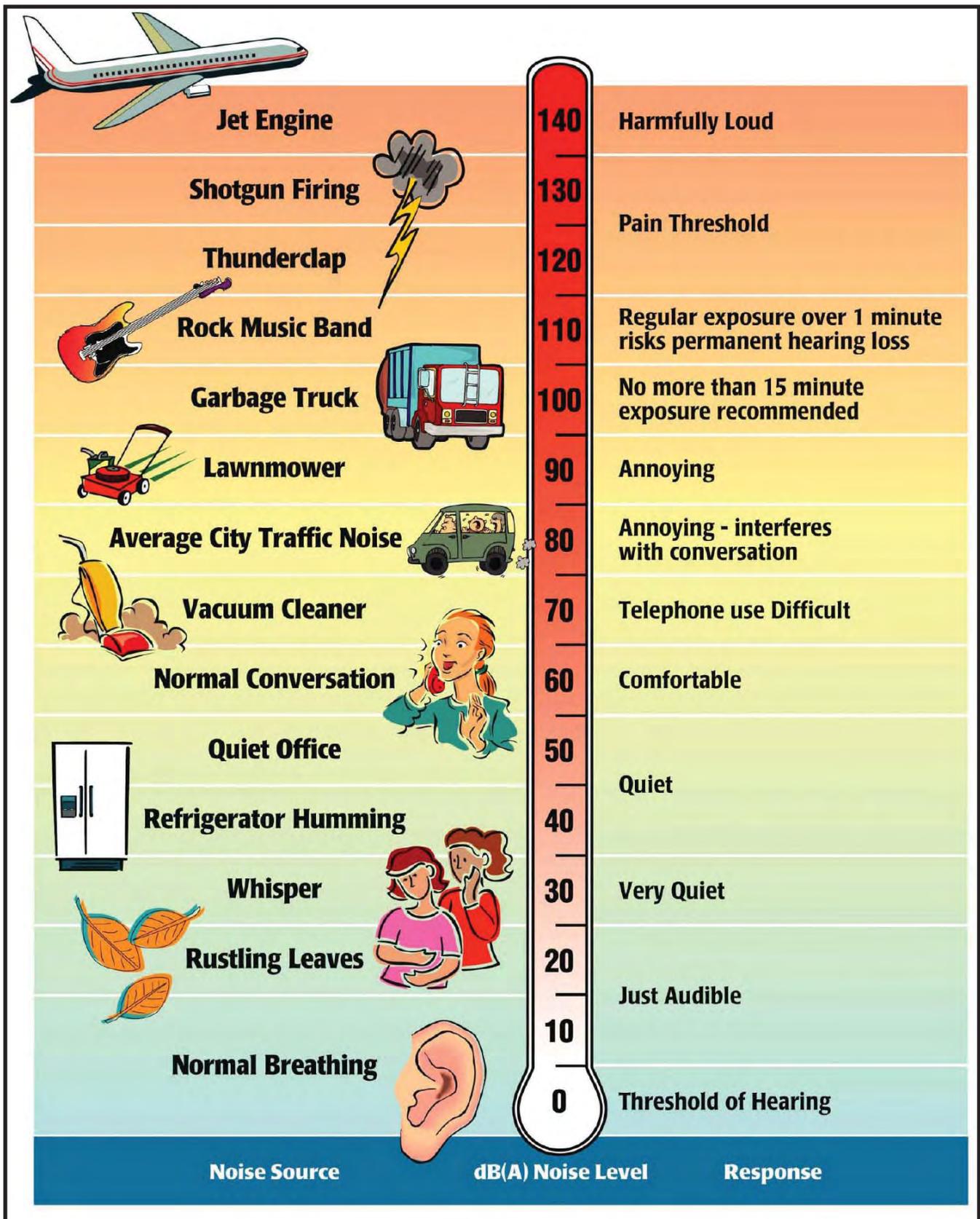
for another. Regardless of the measures employed for a project, mitigation is generally cheaper and more effective if it is addressed during the design phase.



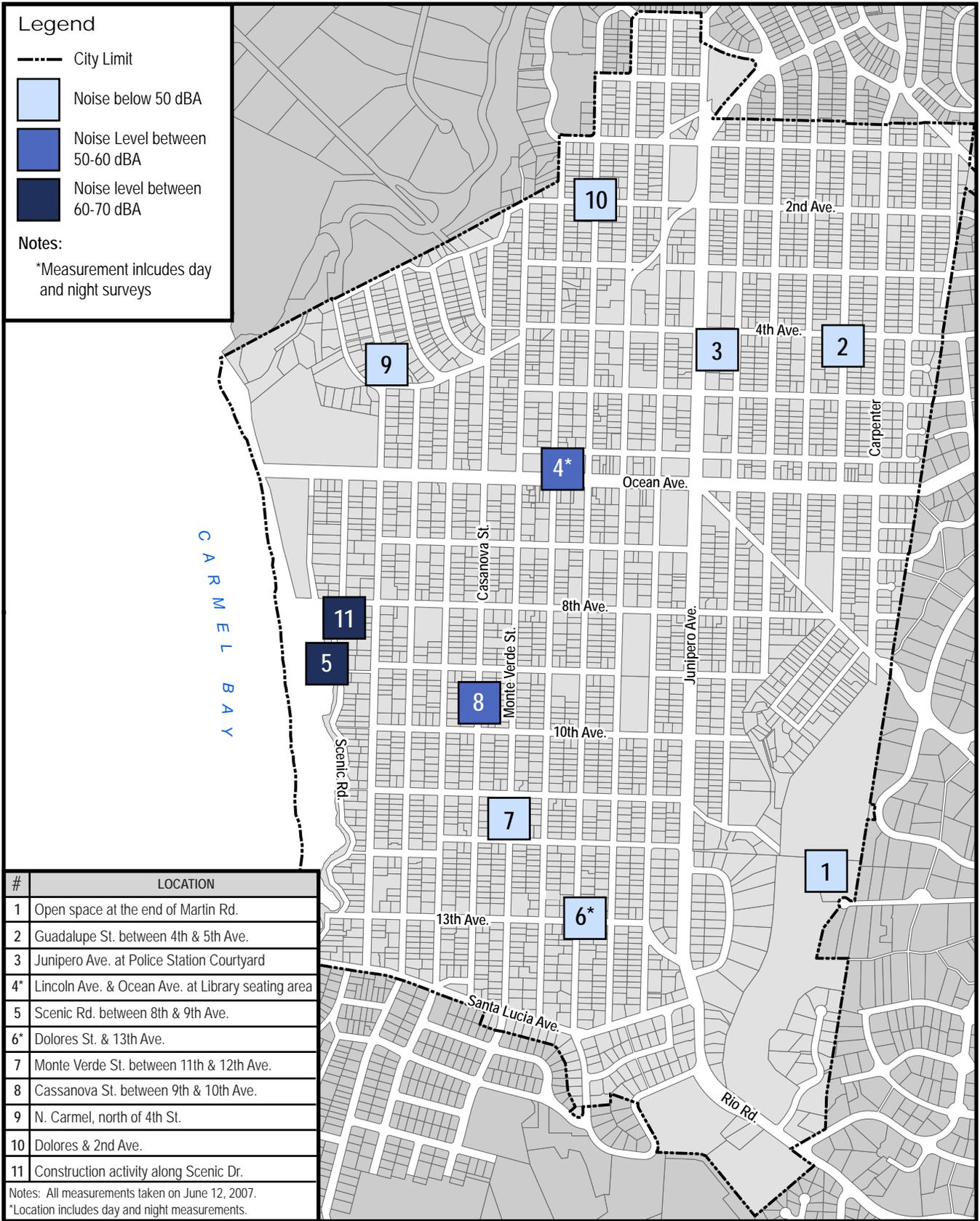
## Noise Element References

RBF Consulting, City of Carmel-by-the-Sea Noise Measurements, July 2007. (RBF 2007)

Transportation Research Board of the National Academies, *Vehicle Noise Sources and Noise-Suppression* <<http://pubsindex.trb.org/document/view/default.asp?lbid=40119>>. Accessed April 15<sup>th</sup>, 2009. (TRBNA 2009)



Source: Melville C. Branch & R. Dale Beland (1970), Environmental Protection Agency (1974)



Source: RBF Consulting (2007)



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CARMEL-BY-THE-SEA GENERAL PLAN UPDATE  
**Noise Measurement Locations**

**Figure 9.2**