Noise Control in Sacramento County, California

HARRY SEN AND MAS HATANO

In 1976 the Sacramento County Board of Supervisors recognized the need for a noise-control program by approving local ordinances and providing funds for two persons to implement a noise-control program. This team spent most of their time in enforcement (60 percent) and land use (40 percent) activities.

Details of the ordinances and the noise standards are presented. The major noise problems in the county involve transportation (highways, airports, trains, and waterways) and general complaints about loud noises (neighbors, radios, dogs, fixed mechanical sources, and so forth). Each transportation problem and the various state and federal laws that are involved are discussed. A case study is presented along with a solution to a problem of using a football stadium for rock concerts to satisfy the audience, adjacent residents, and promoters.

An overview of the noise-control activities in Sacramento County, California, is presented. These activities can provide a guide to other local agencies. The section of SCC254 that supplements an existing noise-control program. The need for a noise program was recognized by the county long before any federal or state laws were enacted. Complaints about noise from such sources as barking dogs, loud radios, transformers, swimming pool pumps, air-conditioning units, and noisy neighbors were common. Usually the Sheriff or Health Department responded to the complaints with mixed results. Noise from highway traffic, aircrafts, trains, and boats generally went unabated.

In 1970 the Board of Supervisors (BOS) of Sacramento County adopted the first noise ordinance for fixed mechanical sources, which (a) provided personnel to respond to noise problems from mechanical equipment and (b) authorized the purchase of a sound-level meter. This work was assigned to the Health Department.

The California Environmental Quality Act (CEQA) was passed by the state in 1970. It was comparable to the federal National Environmental Protection Act (NEPA) passed in 1969. CEQA required that an environmental impact report (EIR) be written for all major construction projects in California that involved private or public funds. Noise was one of the many issues to be addressed.

CEQA was followed by Section 65302(g) of the state code, which required each county to adopt a noise element as part of their general plan. Interim studies were performed, which resulted in the Noise Element for the Sacramento County General Plan (NESCGP) being approved by the BOS in September 1975. This was followed by Sacramento County Code (SCC) 254 titled "Noise Control", which was approved by the BOS in June 1976. A supplement to SCC254 (numbered SCC490) was approved by the BOS in December 1981. The provisions of these documents provide the authority for responding to most noise problems in the county.

GEOGRAPHIC AND DEMOGRAPHIC DATA

Sacramento County is located in northern California (Figure 1). It covers an area of 930 miles² and has a population of 809,700. The climate is generally mild, with a mean annual temperature of 62°F. However, the summers are hot and dry with temperatures exceeding 100°F on occasion, and the winter temperatures are cold but usually greater than 32°F. Rainfall averages 18 in. per year. The terrain is generally flat and is about 35 ft above sea level.

About 35 percent of the work force in Sacramento County are public employees; 22 percent are employed in trades, 18 percent are employed in services, and the balance are employed in other categories. The percentage of public employees is high because the capitol of California is located in the city of Sacramento, which is the largest city in the county.

CURRENT PROGRAM

The goal of the county noise program, as stated in the NESCGP, is "to provide the residents of Sacramento County an environment as free as possible from unnecessary noise and to reduce the level of necessary noise in order to improve the overall quality of life in the county."

The functions of the NESCGP are to identify noise problems in the community from transportation facilities and fixed noise sources and make recommendations for land use. A chart of land use compatibility for community noise is shown in Figure 2. It is used as a tool to evaluate the noise impact, but it is not used as a standard.

In SCC490 (Declaration of Policy) the following provisions are stated:

It is hereby declared to be the policy and purpose of this chapter of the SCC to assess complaints of noises alleged to exceed the ambient noise levels. Further, it is declared to be the policy to contain sound levels in the County of Sacramento at their present levels with the ultimate goal of reducing such levels, when and where feasible and without causing undue burdens, to meet the noise standards set forth in this chapter.

The principal element of SCC254 is the noise standards given in Table 1. Exceptions are made for noise sources such as sirens, school activities, and other events conducted under permit. The standards for mechanical equipment, pumps, fans, air-conditioning apparatus, stationary pumps, stationary cooling towers, and stationary compressors are given in Table 2.

SCC490 (supplement) specifically addresses the loud playing of radios, tape recorders, record players, or televisions outdoors on public property. It does not specifically set a noise-level standard, but it does provide for fines ranging from $50 to $250 for people who are cited.

The adoption of the NESCGP resulted in the creation of a Noise Section as part of the Environmental Health Branch of the County Health Department. The section is staffed by an industrial hygienist and a noise specialist who use four sound-level meters, three calibrators, one graphic level recorder, and one octave band analyzer. Enforcement (60 percent) and land use (40 percent) are the two primary areas of emphasis.

From the standpoint of enforcement, the section responds to all noise complaints, which range from noisy roosters in rural parts of the county to fixed mechanical sources and noisy aggregate plants. All problems to date have been resolved without taking legal action.

Surveys conducted by the Sacramento City Police and County Sheriff's Department indicate that the majority of complaints reported by citizens concern barking dogs or loud parties. These do not generate.
Figure 1. Sacramento County.

Figure 2. Land use compatibility for community noise.

<table>
<thead>
<tr>
<th>LAND USE</th>
<th>NOISE LEVELS AND LAND USE IMPLICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGRICULTURAL-RESIDENTIAL, RESIDENTIAL CATEGORIES &amp; MOBILE HOME PARKS</td>
<td><img src="table.png" alt="Noise Level and Land Use Implications Table" /></td>
</tr>
<tr>
<td>TRANSIENT LODGING - MOTELS, HOTELS</td>
<td><img src="table.png" alt="Noise Level and Land Use Implications Table" /></td>
</tr>
<tr>
<td>SCHOOLS, LIBRARIES, CHURCHES, HOSPITALS, NURSING &amp; CONVALESCENT HOMES</td>
<td><img src="table.png" alt="Noise Level and Land Use Implications Table" /></td>
</tr>
<tr>
<td>ASSEMBLY AND MEETING HALLS, ENTERTAINMENT CENTERS, COMMUNITY &amp; CULTURAL CEN</td>
<td><img src="table.png" alt="Noise Level and Land Use Implications Table" /></td>
</tr>
<tr>
<td>OPEN SPACE PARKS, WATER AREAS, CEMETERIES &amp; AGRICULTURE</td>
<td><img src="table.png" alt="Noise Level and Land Use Implications Table" /></td>
</tr>
<tr>
<td>RECREATION AREAS, PLAYGROUNDS, GOLF COURSES</td>
<td><img src="table.png" alt="Noise Level and Land Use Implications Table" /></td>
</tr>
<tr>
<td>SPORTS ARENAS, AMPHITHEATERS &amp; AMUSEMENT CENTERS</td>
<td><img src="table.png" alt="Noise Level and Land Use Implications Table" /></td>
</tr>
<tr>
<td>OFFICE BUILDINGS - PERSONAL, BUSINESS, PROFESSIONAL SERVICES</td>
<td><img src="table.png" alt="Noise Level and Land Use Implications Table" /></td>
</tr>
<tr>
<td>COMMERCIAL-RETAIL, MOVIE THEATERS, RESTAURANTS</td>
<td><img src="table.png" alt="Noise Level and Land Use Implications Table" /></td>
</tr>
<tr>
<td>COMMERCIAL-WHOLESALE &amp; SOME RETAIL</td>
<td><img src="table.png" alt="Noise Level and Land Use Implications Table" /></td>
</tr>
<tr>
<td>INDUSTRIAL, TRANSPORTATION, UTILITIES, COMMUNICATION</td>
<td><img src="table.png" alt="Noise Level and Land Use Implications Table" /></td>
</tr>
</tbody>
</table>

**Legend:**
- **S**: Satisfactory; no special requirements.
- **U**: Use should be permitted only after careful study & inclusion of protective measures if needed.
- **D**: Use should be discouraged; if permitted, noise reduction measures must be taken.

**Note:** Noise insulation features for new construction should be such that an interior $L_{eq}$ of 45 dB will be achieved in areas where people sleep.
Transportation Research Record 937

Table 1. Exterior and interior noise standards.

<table>
<thead>
<tr>
<th>Noise Level [dB(A)]</th>
<th>Not To Be Exceeded Between</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7:00 a.m. and 10:00 p.m.</td>
</tr>
<tr>
<td>Exterior noise standard</td>
<td>10:00 a.m. and 7:00 a.m.</td>
</tr>
<tr>
<td>30</td>
<td>55</td>
</tr>
<tr>
<td>15</td>
<td>60</td>
</tr>
<tr>
<td>5</td>
<td>65</td>
</tr>
<tr>
<td>1</td>
<td>70</td>
</tr>
<tr>
<td>0</td>
<td>75</td>
</tr>
<tr>
<td>Interior noise standard</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>45</td>
</tr>
<tr>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>0</td>
<td>55</td>
</tr>
</tbody>
</table>

\*Includes apartment, condominium, town house, duplex, and multiple dwelling unit.

Table 2. Standards for stationary equipment.

<table>
<thead>
<tr>
<th>Noise Level [dB(A)]</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>One foot inside the property line of the affected residence and 3 to 5 ft above the ground; this will be lowered to 55 dB(A) for new equipment installed 5 years later</td>
</tr>
<tr>
<td>55</td>
<td>Center of neighboring patio 3 to 5 ft above the ground level</td>
</tr>
<tr>
<td>55</td>
<td>Three feet outside living area window of closest residence</td>
</tr>
</tbody>
</table>

the most noise, but they appear to generate the most complaints.

Land use activities involve assistance given to subdividers, contractors, acoustical consultants, planners, and building officials. Environmental documents, plans, and other documents related to noise are reviewed. Sometimes limited studies and noise monitoring tests are performed.

The land use process in Sacramento County is as follows. The developer submits plans to the Department of Public Works. Then the plans follow one of two proposals as to the course of action taken: ministerial or discretionary.

Proposal 1: Ministerial

If the architectural plans and use conform to initial zoning, a building permit is issued without any further approval from the Zoning Administrator, Subdivision Review Committee, Planning Commission, and BOS. The noise standard is Title 25 (California Noise and Insulation Act), which specifies an interior standard of 45 dB community noise equivalent level (CNEL) for multiple housing.

Proposal 2: Discretionary

If the architectural plans and use do not conform to the initial zoning, the procedures are as follows. All projects are reviewed from the CEQA enacted in 1970 as to the type of discretionary proposal to use: (a) rezone (the BIR section of the Planning Department screens all noise-impacted projects for review by the Noise Section), (b) variance, (c) use permit, (d) development permit, (e) subdivision (all parcel map split and subdivision proposals are reviewed with input by the Noise Section), and (f) parcel map division of land in more than four lots (30 percent of the projects reviewed are affected by transportation noise sources (highway, railway, airport, and waterway)).

Recommendations made by the Noise Section have resulted in denials, extensive modifications of plans, and mitigative measures imposed on the developer. These have been generally well received by the subdivision Review Committee, Planning Commission, City Council, and BOS. The final approval on noise-impacted projects is provided by the Noise Section.

Unresolved noise problems between the county and any violator are first referred to a nine-person Hearing Board. Four members are appointed by the mayor of the city of Sacramento, subject to city council approval. Four members are appointed by the BOS, and the ninth member is appointed by the BOS and the mayor, subject to city council approval. The members are further broken down to represent the legal (1), medical (1), acoustical (1), engineering (1), contractor (2), public (2), and business (1) sectors.

If the problem cannot be resolved by the Hearing Board, it is then referred to the BOS, and finally to the courts if necessary. To date only one case has gone as far as the Hearing Board. The accomplishments of the professionals in the Noise Section testify to their ability to solve noise problems by appealing to people's sense of responsibility through persuasion and helpful advice.

HIGHWAYS

Five major freeways cross Sacramento County (Figure 1): I-5, I-80, I-880, US-50, and SR-99. In addition, there are a number of expressways, major arterials, and local streets. Traffic noise from these highways affects more people on a continuous basis than any other noise source.

The county has no direct control over the noise from vehicles, which are under the jurisdiction of the federal and state governments. Law enforcement officers can cite drivers of vehicles that exceed state vehicle noise laws, but this is seldom done.

Section 65302(g) of the Government Code requires the California Department of Transportation (Caltrans) to provide noise contour maps next to all state highways in the county. The county uses these maps to control land uses next to highways under state jurisdiction.

The state has a community noise program to retrofit noise barriers along existing freeways when traffic noise exceeds an Leq of 67 dB(A). However, because of a shortage of funds, many areas that exceed the standards will not receive barriers for some time. Barriers are required on new or major highway construction projects that are federally funded.

Section 215.5 of the Streets and Highways Code allows any city or county to construct noise barriers on state rights-of-way to state standards. It also provides for reimbursement of the costs of the barriers when the project reaches the priority level for state funds. The county has not participated in this program because of a lack of funds.

Developers have constructed noise barriers in many cases to meet the state standard of 65 dB CNEL (equivalent). In other cases techniques such as orientation of the houses, thicker glass, and double pane windows are other alternatives considered.

AIRPORTS

Sacramento Executive Airport

Executive Airport was built in 1930 and is located in and owned by the city of Sacramento (Figure 1). It serves as a general aviation airport for the residents of the area. Sacramento County leases and operates the airport. At one time it served interstate commercial airlines, but those aircraft now
use Metro Airport (constructed in 1967), which is located in the northwest part of the county.

Urban growth (primarily residential) has surrounded the airport and created environmental, operational, development, and safety problems. Estimates indicate that existing facilities will be inadequate to handle operational demand (275,000 annual takeoffs and landings) until 1985 and based aircraft demand (575) until the early 1990s. The various alternatives for the airport included no growth, controlled growth, or relocation.

The county adopted the controlled-growth master plan and land use plan for Executive Airport in April 1979. It involved items such as improved airport runways, buildings, acquisition of property, and land use.

Airport operational and noise-abatement procedures were part of the plan:

1. Operation of aircraft shall not exceed 80 dB (the effective perceived noise level (EPNL));
2. Restrict touch-and-go operations and practice instrument approaches on weekends and between 6:00 p.m. and 7:00 a.m. on weekdays; helicopter touch-and-go operations are prohibited;
3. Keep traffic pattern altitude at 1,000 ft, and at 1,500 ft for turbine-powered or large aircraft;
4. All departing aircraft shall climb on runway heading to an altitude of 600 ft before turning; and
5. Formation landings and departures are prohibited.

Sacramento Executive Airport regularly monitors noise levels to determine changes in noise contours, trends, and compliance with regulations. Executive Airport essentially complies with the California Division of Aeronautics noise standards, which are currently 70 dB CNEL, and which will drop to 65 dB CNEL in 1995.

Sacramento Metro Airport

Metro Airport was constructed in 1967 and is located in the northwest part of Sacramento County (Figure 1). It is the largest commercial airport in northern California (not including the San Francisco Bay Area) that serves major interstate airlines for passengers (3.7 million annual passengers in 1982), freight, and pilot training. A number of intrastate commuter airlines also use the airport.

The airport is generally surrounded by agricultural land. About 86 percent of the 7,800 acres owned by the airport is leased for farming. There are also gas-producing wells located on airport property that provide revenue for airport operations.

Projected growth of air travel will result in noncompliance with the California Division of Aeronautics noise standard of 70 dB CNEL, which will be reduced to 65 CNEL in 1995. Nevertheless, the noise impact will be small because of the small population involved in farming and the nearby land owned by the airport.

McClellan and Mather Air Force Bases

McClellan Air Force Base was constructed in 1938 and is located in the northern part of Sacramento County (Figure 1). It was a rural area in 1938, but by 1985 it will be completely surrounded by development. The base covers 2,593 acres and employs about 18,000 people (civilian and military).

Its mission is to provide worldwide logistic management, firefighting and support, equipment, and commodity items. It also performs an industrial-type mission in providing maintenance, supply, and procurement-type services essential to U.S. Air Force logistics.

Mather Air Force Base was constructed in 1918 and is located in the northern part of Sacramento County. Most of the area is undeveloped or farmland, but urban growth is beginning to approach the base. It covers 5,800 acres and employs about 7,000 people. The base mission is to train navigators, and it is part of the Strategic Air Command (SAC).

The Air Force recognized the critical nature of urban growth near airports and developed an air-installation compatible use zone (AICUZ). This was the refinement of the green belt concept (1971), which specified an area of 2.5 miles from the runway ends and 1 mile on each side. The AICUZ consists of accident potential zones (APZ) and noise zones (NZ), and uses a 24-hr noise descriptor [L_{eq}]. The APZ and NZ are overlaid to create compatible use districts (CUDs), which are the basic planning units of the AICUZ program.

Noise contours are drawn around the base to provide a planning and control process to restrict adjacent land to agriculture, industrial, or residential use. The role of the Air Force is to minimize the impact of its operation by planning flights to reduce noise, acquire properties adjacent to the base, and work cooperatively with the county by exchange of information. The role of the local communities is to ensure that proper land use planning is practiced.

RAILROADS

The Southern Pacific, Western Pacific, and Central Pacific railroads and the National Railroad Passenger Corporation (Amtrak) provide rail service to Sacramento. Railroad tracks cross all parts of the county (Figure 1), and trains use some tracks day and night. Most of these tracks have been in place longer than any of the freeways or airports in Sacramento County.

Railroad maintenance shops and switching yards are located within the city limits of Sacramento. The Southern Pacific (SP) shops and yard are located near the confluence of the Sacramento and American rivers. SP train noise is not a problem because of the small number of residences and businesses located nearby. In contrast, the Western Pacific shop and yards have a number of residences on both sides of the facility.

Urban growth has resulted in many developments along the railroad right-of-way and subsequent complaints about the noisy trains. The U.S. Environmental Protection Agency (EPA) has made some effort to require quieting of locomotives manufactured in future years and is looking at noise standards for yard operations.

Section 65302, which was previously mentioned for highways, requires the railroads to provide noise contour maps to the county for land use planning purposes. There have been several developments who have constructed or plan to construct noise barriers in order to develop their property. The railroads have made some efforts to control noise by scheduling train and work activities in their yards.

WATERWAYS

The western boundary of the county is the Sacramento River. It is a navigable river that flows to San Francisco Bay and is used by commercial and pleasure boats. The American River bisects the county and flows east to west and joins the Sacramento River. The river is used by small private boats and by rafters. There are other rivers that are generally used by fishermen or for other recreation.
Noise from boats is a problem. Noise regulations of the California Department of Boating and Waterways are used by the County Sheriff's Department to control noise. They have four sound-level meters to assist them in their work.

State regulations require mufflers on all combustion engines, and noise levels from engines cannot exceed 86, 84, and 82 dB(A) before 1976, before 1978, and after 1978. Testing is performed by using SAE test J34, which requires measurements at 50 ft with the boats traveling at full throttle.

CASE HISTORY

Hughes Stadium, which has a seating capacity of more than 20,000, is located next to the campus of the Sacramento City College and is owned by the Los Rios Community College District (Figure 3). The stadium is located within the city of Sacramento in a noise-sensitized residential area, and problems have arisen because of various athletic events, rock concerts, and other activities held at Hughes Stadium. Contributing to the noise problem is the proximity of the Western Pacific railroad yards and Executive Airport.

A rock band played at Hughes Stadium on Labor Day in 1976. Noise levels at this concert were monitored at the request of the City Police Department because of previous complaints. Loudbreakers were located at the south (open) end of the stadium, and a strong prevailing wind from the south carried the noise into the residential areas north of the stadium.

Noise measurements were taken at locations about 900, 1,500, and 2,600 ft from the stadium (Figure 3). Measurement periods varied from 20 min to 2 hr during the 5-hr concert. A summary of the data and the corresponding noise standards are given in the following table:

<table>
<thead>
<tr>
<th>Time (min/hr)</th>
<th>Standard [dB(A)] at 200 ft</th>
<th>Measured Noise Levels [dB(A)] at 900 ft</th>
<th>Measured Noise Levels [dB(A)] at 1,500 ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>&lt;65</td>
<td>63-71</td>
<td>62-65</td>
</tr>
<tr>
<td>15</td>
<td>&lt;60</td>
<td>66-76</td>
<td>67-69</td>
</tr>
<tr>
<td>5</td>
<td>&lt;65</td>
<td>79-82</td>
<td>69-71</td>
</tr>
<tr>
<td>1</td>
<td>&lt;70</td>
<td>&lt;83</td>
<td>&lt;72</td>
</tr>
</tbody>
</table>

Additional measurements taken at 2,600 ft indicated ambient levels of 45 dB(A), after each performance (applause and cheers) levels of 60 dB(A), and amplified sound and music levels of 75 dB(A).

The noise data indicated that the levels may potentially be intrusive within 0.75 mile north of the stadium. Such factors as shielding, wind, ambient levels, distances, and proximity to the railroad yard or arterial streets affected the noise levels. However, the noise levels measured clearly revealed that the standards were exceeded and were a legitimate community concern. Many complaints were received by the police, stadium officials, and the Health Department. These complaints were primarily from residents north of the stadium.

There was a dilemma because stadium officials needed the revenue, rock band enthusiasts wanted loud music, and the residents wanted quiet. The county Noise Section performed a study with a local sound company. Measurements were made at peripheral sites around the stadium while the speakers were moved around the inside of the stadium. Noise levels were set at 102 dB(A) and were measured at 120 ft in front of the speakers.

The study indicated that the noise standards could be met if the speakers were placed at the north (closed) end of the stadium, directly downward, and faced the southwest. Arterial traffic noise at the south end of the stadium tended to mask some of the band noise, and the overcrossing helped to block the noise. The first row of buildings across the arterial street were businesses, which also helped minimize the noise impact.

A permit issued for the next concert stipulated that one person from the county Noise Section be stationed at the amplifier and have full control of the volume. He received instructions from a second person who had a sound-level meter and was placed near a sensitive residence. Communications between the two was by walkie-talkie.

This proved to be a workable solution for all parties, and no complaints were registered. The sound level of 102 dB(A) at 120 ft with loudspeakers placed at the north end of the stadium and facing south was a satisfactory criterion.

SUMMARY

Sacramento County has implemented a successful ongoing noise-control program that can serve as a model for city or county government. Transportation noise affects the most people and is controlled by land use planning. Noise complaints from such sources as barking dogs, loud radios, and noisy neighbors are the most common. These complaints have always been resolved by helpful advice rather than by issuing citations.