Proceedings of the Institute of Acoustics

FROM THE LONDON NOISE SURVEY TO THE CHANNEL TUNNEL RAIL LINK

George Vulkan

Environmental Consultant

INTRODUCTION

As is to be expected, much has changed in over thirty years since the London Noise Survey first put noise on the map in more ways than one. There have been immense improvements in instrumentation and techniques in the measurement of noise, noise has been recognised both as a real environmental problem as well as one that can at least be mitigated, there has also been a great deal of legislation relating to it and from a professional point of view, whereas in 1960 it was very difficult to find any references to previous work on noise, now the difficulty lies in the profusion of Papers, conferences and organisations relating to it!

On the other hand there is also a greater realisation that some aspects have not changed. Most importantly the apparent conflict between adequate noise standards and economic reality remains as great today as in the sixties. Also our understanding of noise and its effect on people is still far from complete. In particular we may need to consider more closely the non-acoustic aspects of the relationship between noise and annoyance and recognise that there are some things a noise meter, however sophisticated, still can not measure!

This Paper tries to give an outline of the development of noise assessment, guidelines and planning since the early sixties, as viewed by the author and mainly relates to London but also refers to some still outstanding issues regarding noise standards, such as those applying to major new railway routes.

THE LONDON NOISE SURVEY

In London noise had long been recognised as a problem but it was not till about 1960 that serious consideration started to be given to means of controlling or reducing noise. The trigger was a proposal by the London County Council, predecessor of the late Greater London Council, that in considering suitable locations nothing was known about the extent and distribution of the existing noise climate in London. Fortunately the Building Research Station was expanding its own noise interest at about

this time and the opportunity was taken to join with them in carrying out the first major noise survey in any city. It was and probably still remains the largest noise survey anywhere (1). It covered an area of 36 square miles with 540 points selected on a grid pattern with points spaced 500 yards apart. At each point noise was measured over 24 hours by LCC staff in mobile laboratories, using tape recordings which were subsequently analysed at BRA. As well as establishing noise levels, expressed for the first time as 10, 50 and 90% levels, the main sources were identified from the recordings. The data was classified into day, rush-hour, evening and night as well as into different types of area and of roads. The survey took over two years to complete, starting in 1961 and it seems highly unlikely that any government or local authority would be happy to fund a similar survey today!

In spite of subsequent doubts about the use of a grid pattern, the data from the survey contributed greatly to an early understanding of urban noise and provided factual material for the Wilson Committee Report on Noise (2). This remained for many years almost a bible on noise and some of its recommendations, especially on aircraft noise still remain to be implemented.

In 1963 the Post Office Tower in central London was nearing completion and the opportunity was taken to measure noise from a height of 115 metres over a period of days. The mean level over 24 hours was later compared with similar data from the average of the 540 ground level sites and the shapes of the curves were very similar, showing that a single measurement taken at a high level can give a good indication of the diurnal variation in noise levels. In later years these single point measurements were repeated to show the changes in noise levels over a period of years. These suggested that while the rush-hour levels scarcely changed, the shallow troughs in the middle of the day were disappearing and the deep night-time troughs were being reduced.

EARLY RESEARCH

At a time when market forces were not as dominating as they are today it was possible to obtain approval from Council Committees for applied research, providing it could be shown that the results could be of value to future planning and design in the capital. After literature searches which provided little information, the Scientific Branch carried out a series of surveys to determine the relative importance of different types of vehicles in setting noise levels. From measurements and traffic counts at 140 sites with smoothly flowing traffic it

could be shown that traffic composition was far more important than traffic volume in determining noise levels (3). In 1965, a survey of 1100 vehicles at Blackheath, classified by type, gave mean noise levels of 71 dB(A) at 7.0m for a car travelling at 25-30 mph and 81 dB(A) for a heavy commercial vehicle; one lorry was thus equivalent to 10 cars in noise energy terms. Motorcycles averaged 77 dB(A) under similar conditions.

Another topic of interest was the variation of noise with height in tall buildings. Measurements were made outside the facades of what were then considered as tall office blocks and even the top of St Pauls Cathedral. The results indicated an appreciable reduction for the first two or three floors, but little thereafter, probably due to the increase in size of the noise 'catchment area'. Measurements were also made to assess the effectiveness of podia in screening noise, such as at New Zealand House, and other surveys related to canyon effects in narrow streets with relatively tall buildings.

The advent of motorways both in and near London was recognised as being of major environmental importance and measurements were made in open fields and in roads at right angles to motorways. To assess the effect of height, tree-lopping vehicles with elevating platforms were brought into use (4). Later, in the seventies, attention turned to noise barriers, and jointly with BRS, experiments were carried out along the M4 in Heston to measure noise at ground and first floor levels in houses along Winchester Avenue. These were made first with an existing wooden fence, then with no barrier at all and finally with a purpose designed 2.7 m. high noise barrier consisting of two leaves of double-skinned hollow vinyl panels (5).

The effect of noise from helicopters and fixed wing aircraft was of continuous concern in London, and a substantial effort was devoted to investigational projects related to this. In connection with proposals for a heliport, and the development of planning conditions for it, a series of tests on different helicopter types was undertaken at Redhill Aerodrome in co-operation with the CAA, BRS and the British Helicopter Advisory Board. Based on these tests lists of 'quieter' helicopters were drawn up and in 1973 this was used in the conditional planning permission for Battersea Heliport. This limited the total number of movements to 12,000of which not more than 1500 could be by helicopters not included in the list.

On fixed wing aircraft the most interesting survey related to the introduction of Concorde at Heathrow when extensive measurements were made of landing and take-off noise (6). Based on these, noise footprints were drawn up for Concorde and other

aircraft under actual operating conditions near Heathrow. Critical concern about the growth of Heathrow also led to extensive surveys and work on predicting future noise climates (7). During the later years of the GLC's existence regular independent noise monitoring of aircraft taking off and landing was also carried out(8). The latter, using permanent monitoring sites at Hounslow Heath and Hounslow Civic Centre was of particular importance as about 70% of landing aircraft approach across London and landing noise was not monitored by the BAA.

NOISE GUIDELINES

In the absence of national noise standards or guidelines a Report was prepared for the GLC in 1966 which set out the Council's Noise Policy, including a range of Guidelines for noise immission levels for housing, offices, schools and parks (9). To a large extent the guidelines were based on the Wilson Report but took into account the special needs and problems of London. The most important guideline was that internal levels in new dwellings must not exceed $50L_{A10}$ by day (0700-1900hrs)and $35L_{A10}$ in the late evening (2200-2400hrs).

The GLC Report also set out policies for controlling and planning against noise. One early result was the publication in 1970 of Urban Design Bulletin No.1 'Traffic Noise - Urban Roads' in which the Architects Department set out their examples of methods for designing against noise. The Bulletin also included methods of calculating noise from road traffic, backed up by a series of transparent overlays for evaluating noise levels at different distances and heights and for various barriers. While not as sophisticated as the 1988 Calculation of Road Traffic Noise from TRRL, it can be considered a worthy predecessor to it! Predictions based on the earlier document do not differ greatly from CRTN.

For railway noise, guidelines were developed in about 1980 and set at 65 $L_{AEQ(24hr)}$ external for new housing near existing lines. For housing newly affected by railway noise sound insulation was proposed for levels in excess of this figure, with offers of acquisition for levels over $80L_{Aeq(24hr)}$. Guidelines were also introduced and widely applied not only by the GLC but also by other local authorities for pop concerts and discotheques (10). These were the subject of considerable discussion and controversy.

FROM THE LONDON NOISE SURVEY TO THE CHANNEL TUNNEL RAIL LINK

THE LONDON LORRY BAN

In spite of the appreciable reduction in noise emission from heavy commercial vehicles since the sixties, mostly encouraged by increasingly effective E.C. legislation, lorries remain the most significant source of urban traffic noise (11). In 1983 the GLC set up an Inquiry headed by Derek Woods QC to examine the problem and make recommendations (12). As a result the Council, just before its abolition in 1986, introduced a partial lorry ban across Greater London. The ban covers lorries over 16.5 tonnes and operates from 2100 to 0700hrs each night and from 1300 on Saturdays to 0700hrs on Mondays. The ban does not apply to specified trunk and access roads and many vehicles are exempt either because they carry essential goods or meet specified noise reduction criteria. As well as actually reducing the number of lorries in London during sensitive periods the ban has been useful in encouraging both manufacturers and operators to develop the use of quieter engines and air brakes. Vehicles permitted to enter London during restricted periods other than on specified roads must carry exemption plates and Permit discs. There have been a considerable number of successful prosecutions under the scheme. The ban is at present administered by the London Boroughs Transport Scheme which is supported by most but not all London Boroughs. It is however under threat as part of the government's policy on deregulation and its removal would in the author's view be a very retrograde step in the protection of London's environment.

THE CHANNEL TUNNEL RAIL LINK

Having considered some aspects of noise over the past 30 or more years, a brief look at the the year 2002 and beyond may be relevant. It is a very long time since a major new railway line was last built in Britain and the introduction of such a line, especially as it will carry trains at up to 225km/h, suggests that there are still potential new environmental noise problems to be considered. The proposed line from Folkestone to St Pancras in London passes through mainly rural parts of Kent, before crossing under the Thames into Essex and the heavily built up area of east London. Using experience gained from continental high-speed trains it has been possible to build up prediction models for noise emission and propagation and these have been applied to indicate future noise levels outside properties along the route when the line becomes fully operational, in the first few years of the next century. In the London area the line will be in tunnel for long stretches and while this almost eliminates airborne noise problems (portals and ventilation shafts remain), there is some concern about the

effect of ground-transmitted noise into properties above the route. Serious consideration was given to potential environmental problems from the earliest stages of route selection and design, and well-informed and articulate action groups made their feelings known as to why the route should be elsewhere. The final route has now been selected but the main issue of compensation and or sound insulation remains. Union Railways is working to design aims to ensure as far as possible that no dwelling is exposed to external peak levels exceeding $85L_{Amax}$ from individual trains and that the increase in noise exposure should be not greater than $3L_{Aeq(24hr)}$ when the line is fully operational compared to a predicted base-line level for the year 2000.

To achieve this noise bunds and barriers, including absorptive barriers up to 2.5m high are proposed. Sound insulation will be provided under proposed Noise Insulation (Railways and Other Guided Transport Systems) Regulations currently in draft and designed to provide similar protection as for noise from highways under the 1975 Regulations. Discussions on the design aims and the appropriate method of establishing base-line levels are continuing, and relate to areas such the inclusion of week-end data, the use of short-term 'satellite' stations to determine 24 hour levels, and whether L_{A90} or L_{Aeq} is more appropriate in defining pre-railway levels. There will be plenty of material for future technical papers on this topic!

REFERENCES

1. London Noise Survey HMSO 1968
2. Wilson Committee Report on Noise HMSO 1963
3. Stephenson and Vulkan Traffic Noise J.Sound Vib. 2(2) 1968
4. Stephenson and Vulkan Noise from Elevated Trunk Roads Town Planning Review 34 (2) pp146-152
5. Scholes et al. Performance of a Motorway Noise Barrier at Heston Applied Acoustics 7 1974
6. Concorde - Noise Effect on London. Research Memorandum GLC 1975
7. Vulkan Environmental Implications of a Fourth Terminal at Heathrow Inter-Noise Proceedings 1981
8. Vulkan and Hyde A Local Authority Aircraft Noise Monitoring System - Noise Control Engineering 16 (3) 1981
9. Traffic Noise Report GLC Minutes 22 February 1966
10. Code of Practice for Pop Concerts (3rd Edn) GLC March 1985
11. Vulkan Traffic Noise Control in Cities J. Highways and Transportation 35 (8-9) pp27-33 1988
12. Heavy Lorries in London - Report of Panel of Inquiry headed by D. Wood QC June 1983