Proceedings of the Institute of Acoustics

ASSESSMENT OF ROAD TRAFFIC NOISE IN ENGLAND AND WALES - THE NEXT STEP FORWARD

P Hepworth

Hepworth Acoustics Ltd, Warrington, Cheshire

1. INTRODUCTION

New road developments have over the past couple of years become a focus for considerable environmental protest. Anybody who has been involved with a public inquiry for a new road scheme recently will realise that noise is usually a major factor to be considered at the inquiry and will inevitably take up a large amount of time. For trunk road schemes, local authorities are likely to object and/or put forward alternative routes and noise mitigation measures. New guidance has recently been published on assessing the effects of traffic noise from new road schemes. Over the past few years there have been a number of developments in traffic noise mitigation measures in this country, with further development work under way. These changes indicate that noise is likely to remain an important issue in the consideration of new road schemes, and because of the increasing rate of change, there is likely to be a need for further refinement of the noise assessment method. This paper aims to make a contribution towards the continuing development of the assessment method, based on recent experience of using the current procedures.

2. BACKGROUND

For many years the method of assessment used for new road schemes was that contained in the Department of Transport's Manual of Environmental Appraisal (1). This method was updated with the publication of Volume 11 of the Design Manual for Roads and Bridges in 1993 (2). The document was revised in 1994 (3). The basis of the assessment used in Volume 11 is the same as that used in the Manual of Environmental Appraisal in that the scheme is assessed by predicting noise levels at noise sensitive properties within the study area and presenting the results as a table of noise changes at properties within the study area. The basic method has been added to by the inclusion of data on the change in noise nuisance as a result of the changes in noise levels at the properties, and by some data on vibration nuisance. The assessment method is based on the calculation procedure detailed in Calculation of Road Traffic Noise (4). Reference is also made to the Noise Insulation Regulations (5), and when presenting information on the impact of a road scheme in an Environmental Statement, it would be usual to present an estimate of the number of residential properties which are likely to qualify for noise insulation under the Regulations as a result of the scheme.

Some problems in traffic noise assessments arise from details of the calculation method used, and some from the assessment method. Whilst a number of the problems may appear to be minor details, these are often the areas which take up most time at public inquiries. There is perhaps a more fundamental problem which relates to public perception of the results of the noise assessments carried out. The assessment method obviously needs to contain all the necessary technical detail to enable the best assessment to be carried out. It is important that the results of this assessment can be presented so that the information is understandable by the general public and other non specialists. It is difficult enough to explain the basics of traffic noise to

non specialists, without complicating the situation further with additional analysis which is not understood by the general public.

3. CALCULATION OF ROAD TRAFFIC NOISE

A number of papers (6,7 and 8) have looked at the latest prediction method in some detail, and have presented evidence on particular difficulties with the calculation method. I do not propose to go over all of the difficulties, but merely to pick up on some of the details and highlight particular problems. One problem appears to be the use of a single noise 'source line' 3.5m in from the edge of the nearside carriageway to represent all of the traffic using a double carriageway. This appears to work acceptably where there is a simple situation with no barriers and relatively flat ground. There does appear to be a problem in situations with barriers and where there are differences in ground height between road and receiver. This problem has been compounded by the recent construction of four lanes in each direction on some motorways and proposals for five lanes on some motorways. The change in noise screening between the nearside lane and the farside lane on motorways with four or five lanes can be considerable. The present prediction method can lead to some situations where noise levels at a property are predicted to decrease where an existing road is widened towards the receiver position. This is due to the moving of the source line closer to an existing noise screen, normally the top of a cutting. To the non acoustician, it seems inconceivable that noise levels will decrease when you are bringing traffic nearer to the property, the traffic flows are increasing and no additional barriers are being provided. In situations such as this, the calculation of noise levels from each carriageway separately may lead to a more understandable result. At present, only where the central reservation is greater than 5m wide or where the outer edge of the two carriageways are separated by more than 1m vertically does CRTN allow the road to be treated as two separate carriageways.

Some recent developments in noise mitigation techniques in this country are raising questions which are difficult to fully answer using the existing CRTN. New barrier materials and the combination of both absorbent and reflective materials within the same barrier or retained cut are areas where at present assumptions need to be made that a surface is either totally absorbent or totally reflective. The effect on reflections of an inclined barrier is not covered within CRTN. Future changes such as new barrier formats (such as the 'Trident' barrier) and quieter road surfaces may provide significant noise benefits. At present, the absence of detailed guidance on these areas in CRTN may lead to some reluctance to use new noise control measures. There would appear to be a requirement for implementing a system of regular reviews of CRTN, perhaps every 5 years, to ensue that the calculation method stays up to date. This would certainly be an improvement over the existing situation where there was a 13 year gap before the last review, and it is now 7 years since that review.

4. VOLUME 11 OF THE DESIGN MANUAL FOR ROADS AND BRIDGES

This document was the long awaited replacement for the Manual of Environmental Appraisal. As mentioned previously, Volume 11 works on the same basis for assessing noise impacts by looking at the change in noise levels at noise sensitive properties. In Volume 11 the minimum perceptible change is taken as being 1 dB(A) rather than the 3 dB(A) used in the Manual of Environmental Appraisal. Much of the increased amount of information within Volume 11 relates to noise nuisance and subjective response to noise. Despite the graphs and equations within the document showing how to calculate the percentage of residents bothered 'very much' or 'quite a lot' from a particular noise level or change in noise level, this area has proved to be the most difficult to present to the public and other objectors at public inquiries into road schemes. Although the

information can be summarised in a table, from experience of presenting noise evidence for the Highway Authority at two public inquiries since Volume 11 was published, this has been the area which is least understood by objectors. Whilst people can cope with assessing the impact of a particular change in noise level, they appear largely unable to grasp the concept that a particular increase in noise level would lead to a certain percentage increase in the population being bothered very much or quite a lot. The general response appears to be that if the figures for the noise change at their property indicate that there will be a 40% increase in the population being bothered very much or quite a lot, does that mean that they personally will be bothered very much or quite a lot in the future? What happens if they are already bothered by traffic noise? Despite this apparent confusion over the value to the public of this information, the main effort in the updating of the noise section of Volume 11 appears to have been devoted to the noise nuisance section by incorporating the findings of additional research work and deriving new formulae for the response curves. The areas which users of Volume 11 have identified as possibly benefitting from further work have largely been left unchanged. This possibly demonstrates a lack of consultation with the users of Volume 11 in the recent updating.

There are a number of areas where it is considered that further guidance/research would be worthwhile. As mentioned earlier, it is considered that there should be more regular updates to CRTN to take on board the latest developments and feedback from users. One item related to this is that at present CRTN is quoted as valid for distances of up to 300m from the edge of carriageway. It appears that based on this, the study area recommended in Volume 11 is also specified as 300m. With the increase in traffic flows on roads and greater public awareness of traffic noise, many questions are raised regarding noise levels at noise sensitive properties greater than 300m from the scheme. At present, Volume 11 directs the user to the method set out in TRRL Supplementary Report 425 "Rural Traffic Noise Prediction - An Approximation" (9). This report dates from 1978 and is based on data from a study carried out of a road improvement scheme in the Lake District. The report warns against using the method for predicting traffic noise at specific points. It is considered that this prediction method is not acceptable for the majority of situations where information is needed regarding the effects of a road scheme on locations greater than 300m from the road. It is accepted that there are difficulties in predicting noise levels at these distances, but it is considered that it should be possible (particularly with the widespread use of computers for noise predictions) to derive a prediction method valid beyond 300m.

One other area which is covered very briefly in Volume 11 is night time noise. In the past road schemes have been assessed solely on the $L_{A10,18hr}$ index, as this had been found to correspond most closely to human response to noise. Volume 11 devotes two sentences to the subject, and puts forward a rudimentary method of carrying out an assessment of changes in sleep disturbance due to traffic growth. This involves identifying properties with a noise level increasing above 68 $dBL_{A10,18hr}$ and where the average weekday flow between 10pm and 6am is likely to exceed 10% of the total. Despite the detailed assessment guidance provided elsewhere in the document, there is no information on how to assess night time noise other than saying that an estimate of possible sleep disturbance may be based on research described in another Chapter. Night time noise is certainly an area of concern to the general public. At present the guidance in Volume 11 is so brief that it raises more questions than it answers. It would certainly appear that if a worthwhile and practical assessment method for night time noise is to be produced, further research is required.

One fundamental problem with the overall assessment method for noise is that there are no design criteria provided to assist the acoustician in determining what should be the goal for the noise mitigation scheme. Without a goal to aim for, there is likely to be a wide interpretation of what is a reasonable provision of noise mitigation measures. The adoption of a noise goal is not helped at present by the fact that the primary

assessment of traffic noise impact compares the existing situation before the road is built with the situation 15 years after the road is opened to traffic. Therefore, not only does the assessment take into account the effects of the change as a result of the new road, but also the impact of 15 years growth in traffic. Built into the assessment is usually an increase in noise levels of between 1 and 2 dB(A) as a result of traffic growth. I do not argue that future noise levels are unimportant, their importance is shown by the fact that they are taken into account in determining which properties receive noise insulation. However, the current assessment practice does make it difficult to derive a sensible noise goal because of the in built affect of traffic growth.

The adoption of a noise goal would provide a clear target for the design agency to aim for and would reduce the variation in the provision of noise attenuation measures on different schemes. It is accepted that there would be some difficulties in producing a realistic noise goal, but it is considered that the adoption of a goal would bring noticeable benefits and would also stimulate the development and adoption of new forms of noise attenuation.

5. NOISE INSULATION REGULATIONS

There is no doubt that the provision of noise attenuation measures for new road schemes has increased over the past decade. There is evidence that during this time fewer dwellings have been provided with noise insulation (10). Therefore, the increased use of noise screening measures appears to have led to a reduction in the number of properties receiving the benefits from noise insulation. The qualifying level of 68 $dBL_{A10,18hr}$ for noise insulation was set in the Regulations first published in 1973. One of the recommendations of the Batho Report (11) was that research should be carried out to determine whether the 68 $dBL_{A10,18hr}$ level was still appropriate. Although the insulation package will not solve all noise problems, it does provide a significant improvement to the internal environment of the dwelling, and it is considered that it's use should not be allowed to decline because of the effectiveness of other noise attenuation measures reducing the highest noise levels. Should the qualification level be reviewed, the opportunity should be taken to review other matters such as the specification of the noise insulation works, to ensure that the works which are installed are used in an appropriate manner.

6. CONCLUSIONS

The publication of the Design Manual for Roads and Bridges and its recent update are welcome steps forward in the assessment of road traffic noise. It is particularly encouraging after the 20 year wait for the document that further information has been incorporated within the document within a short time of it being published. It is considered that there are subjects within the document which need further information and guidance on how they should be assessed. This would cover subjects such as calculations for positions greater than 300m from a road and night time noise. There is a concern that some of the information contained within the document, in particular the assessment of noise nuisance from road traffic noise, is not in a format that is readily understandable by the public and other participants at public inquiries into road schemes. This limits the usefulness of some of the information required for a noise assessment of a road scheme. It is considered that the usefulness of the document could be improved by instigating a feedback mechanism such that the views of users of the document can be taken into account in future revisions. This would particularly be of benefit in considering a noise goal.

Consideration should also be given to a more regular review of the prediction method contained in CRTN, and a change in the qualifying level for noise insulation should be considered.

REFERENCES

(1) Department of Transport. Manual of Environmental Appraisal, 1973.
(2) Department of Transport. Design Manual for Roads and Bridges Volume 11, 1993.
(3) Department of Transport. Design Manual for Roads and Bridges Volume 11, 1994.
(4) Department of Transport, Welsh Office. Calculation of Road Traffic Noise, 1988.
(5) The Noise Insulation (Amendment) Regulations 1988. Statutory Instrument No. 2000
(6) R C Hill and K R Tompsett. Experiences in Implementing CRTN 1988. Proceedings of the Institute of Acoustics, 1988, 10(8) pp 225-232
(7) H S Sagoo. Assessment of Noise from Traffic on a Dual Carriageway, Proceedings of Euronoise, 1992, pp 841-848
(8) I W K Ng, S W H Wong, C C Chiut. Prediction and Field Validation of Road Traffic Noise, Proceedings of the Institute of Acoustics, 1993, 15(8) pp 29-34
(9) D G Harland. Rural Traffic Noise Prediction - an Approximation, Department of the Environment, TRRL Supplementary Report 425, 1978.
(10) K D Mason. The UK Environmental Foresight Project Volume 3 - The Future Road Traffic Noise Agenda in the UK, 1993, HMSO.
(11) Department of the Environment. Report of the Noise Review Working Party 1990.