

## INTRODUCTION

While transport-related environmental issues such as air quality, greenhouse gas emissions and the depletion of natural resources have developed a high profile in recent years, road traffic noise is still widely recognised as “...*the most pervasive source of annoying noise in urban communities.*” (Lawrence 1981). For example, in the Netherlands, the proportion of residential population professing *moderate disturbance* due to neighbourhood noise increased from 40 to 66 percent and *extreme discomfort* rose from 15 to 26 percent over a 10 year period from 1977 to 1987.

In fact, as early as 1963, the European Ministers of Transport met in Paris and found that:

“...*the town traffic noise disturbs the population and may sometimes become a threat to public health, especially in residential quarters and in the neighbourhood of sanatoria, hospitals, schools, etc. And especially at the approaches to crucial traffic points.*” (European Conference of the Ministers of Transport 1963).

Noise has historically been assigned a low priority in terms of environmental policy making due to the following reasons:<sup>1</sup>

- There is *limited knowledge about exposure* to noise, and *limited measurement of its effects*, compared with other pollution problems;
- The *large number of sources of noise and the local character of many noise problems* (neighbourhood noise, in particular) make it difficult to take any coherent action; [and] it may even be felt that action is impossible in some cases;
- *Lack of training and awareness* on the part of decision-makers in regard to noise problems;
- The absence of major accidents due to noise, whereas many advances in environmental policy have been made following serious accidents: *nobody has been killed by noise*;
- The fact that effects on physical and mental health, although today fairly well understood, are generally not yet seen by the authorities as a source of *serious damage*;
- The apparently temporary and fleeting nature of noise: unlike air or water pollution, *noise does not accumulate over time* and its most directly perceivable consequence, discomfort, seems, to most people to disappear once the noise ceases: [and]
- The fact that *some residential districts are fairly well protected* so far as noise is concerned, unlike the situation concerning air pollution, for example.

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<sup>1</sup> Source: OECD 1991

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The issue of the clearly damaging impacts of road traffic noise has reached a critical level in Australia in the 1990's. Numerous studies have been conducted in Australia and around the world over the past several decades in an attempt to not only *understand*, but also to *address* and *redress* the phenomena associated with road traffic noise, particularly in light of the environmental justice mandate which is currently in the spotlight. Brown (1994) demonstrated that nearly *one in ten dwelling units or 19 percent of the population in Australian urban centres with populations greater than 100,000 is exposed to L<sub>10</sub> (18-hours) noise levels of 68 dBA or greater* with traffic noise "black spots", usually located in close proximity to major road transport thoroughfares, as the main sources. A social survey carried out in February 1986 (AEC 1988) assessed the extent of community noise disturbance in Australia based on results of interviews conducted with a broad spectrum of over 2,000 individuals randomly selected from all States and Territories. Overall, 40 percent of the respondents indicated a perceived disturbance to listening activities or to sleep from some form of noise pollution.

### BACKGROUND

Transport infrastructure corridors are significant sources of noise within our community. Road and rail transport operations are responsible for generating noise in infrastructure corridors. Noise may also be generated locally through the transport of materials by means other than road or rail, such as conveyors and pipelines, freight yards, port noise and intermodal terminals. In July, 1998 the Environmental Protection Authority (EPA) issued, for limited public sector review, the draft *EPA Guidance for Road and Rail Transportation Noise (EPA Guidance for the Assessment of Environmental Factors No. 14)* to aid in the assessment of the environmental impact of proposals where road or rail transport may be a factor.

The Infrastructure Co-ordinating Committee (ICC) of the WA Planning Commission, in response to the application of the draft EPA Guidance and its potential impact on service corridors, requested that a Working Group be established in conjunction with the Department of Environmental Protection (DEP). The responsibility of the Working Group is to formulate an investigation and assessment of mobile (linear) and fixed (stationary) sources noise from transport infrastructure corridors.

The regulation of noise from conveyor belts and other stationary and linear transport infrastructure may be governed by the *Environmental Protection (Noise) Regulations 1997*, as these structures fall loosely under the definition of "industrial and utility premises" outlined in Schedule 1: Classification of premises under the *Environmental Protection Act 1986*. The regulation of pipelines, however, is dependant on the influence of the noise on noise sensitive premises, as defined in the *Environmental Protection (Noise) Regulations 1997*. However, there are currently no regulations and/or guidelines used in common practice throughout Western Australia controlling noise associated with road and rail transport. The *Environmental Protection (Noise) Regulations 1997* specifically exclude road and rail transport. As a result, the principal proponents of road and rail infrastructure, Main Roads Western Australia (MRWA) and Westrail, have developed their own guidelines and criteria for managing transport noise.

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The draft document *EPA Guidance No. 14 for Road and Rail Transportation Noise* (January 1998 – Draft) outlines proposed criteria which are to be met by proponents of proposals for the following undertakings:

- Noise-sensitive developments near existing road or railway transport routes such as residences and hospitals;
- New transport infrastructure (road and/or railway) near existing noise-sensitive premises; and
- Traffic expansion of existing road and/or railway infrastructure.

This draft Guidance has the potential to impact many stakeholders including road and rail agencies, developers, Local Government, land use planners, planning authorities, industry and the community. It should be noted that the criteria outlined in the draft Guidance only apply to new proposals, leaving existing situations unaffected. It should be noted that following work(s) of a similar nature has (have) already been undertaken in other States:

- Noise model evaluation and validation by VicRoads (1999);
- Initiation of a Road Traffic Noise Taskforce in New South Wales (1992);
- Adoption of new noise impact criteria for assessing transport noise by New South Wales EPA and RTA (1998/99);
- Adoption and enforcement of an Acoustic Design and Assessment Code in the Shire of Hornsby, New South Wales;
- Establishment of a Code of Practice for Road Noise by Main Roads Queensland (1997/98);
- A review of current standards and practices as part of an Austroads project to develop a National Road Traffic Noise Policy (2000); and
- Establishment of draft *Road Traffic Noise Guidelines for Infrastructure Projects* by Transport South Australia (1999).

The ICC Working Group, consisting of representatives from the Department of Transport, Main Roads Western Australia, Ministry for Planning, Department of Environmental Protection and Westrail retained ERM Australia to undertake a project addressing the major issues outlined above. The first stage of the project was completed in December 2000. The second stage of the project which is anticipated to follow in 2001 will involve the review of a series of case studies in and around the Perth Metropolitan Area as well as comprehensive dose/response testing and monitoring to assess the potential impacts of revised guidelines and criteria.

The purpose of this work is outlined as follows:

- Provide recommendations as to the future direction(s) of assessment of transport-related noise (both linear and stationary) in Western Australia in the context of both infrastructure and land development proposals;
- Provide a comparative analysis of best practice, guidance, criteria, processes, etc. in the area of transport infrastructure noise management with a focus on existing practice in Western Australia;
- Provide recommendations as to the potential roles and responsibilities of agency stakeholders and industry in transport noise infrastructure management;
- Provide a series of directions and focus for the development of comprehensive noise management guidance which would be undertaken in a future study; and
- Recommend a process for follow-on case study testing and monitoring which would be undertaken in a future project.

#### **ROAD NOISE – A GLOBAL PERSPECTIVE AND WORLDWIDE CURRENT PRACTICE – A SNAPSHOT**

The World Health Organisation (1980) has provided a definition of health in relation to road traffic noise as follows:<sup>2</sup>

*“Health is a state of complete physical, mental and social well being, and not merely an absence of disease and infirmity.”*

The Organisation for Economic Cooperation and Development (OECD) 1980 Paris Conference was a milestone in the recognition of the importance of noise abatement policy development when OECD Ministers concluded:

*“...the source of noise which currently predominates that is [sic] motor vehicles, will continue in future to be the major noise problem. It is on that source of noise, therefore, that the public authorities should concentrate the main thrust of their policies and actions...”*

**and**

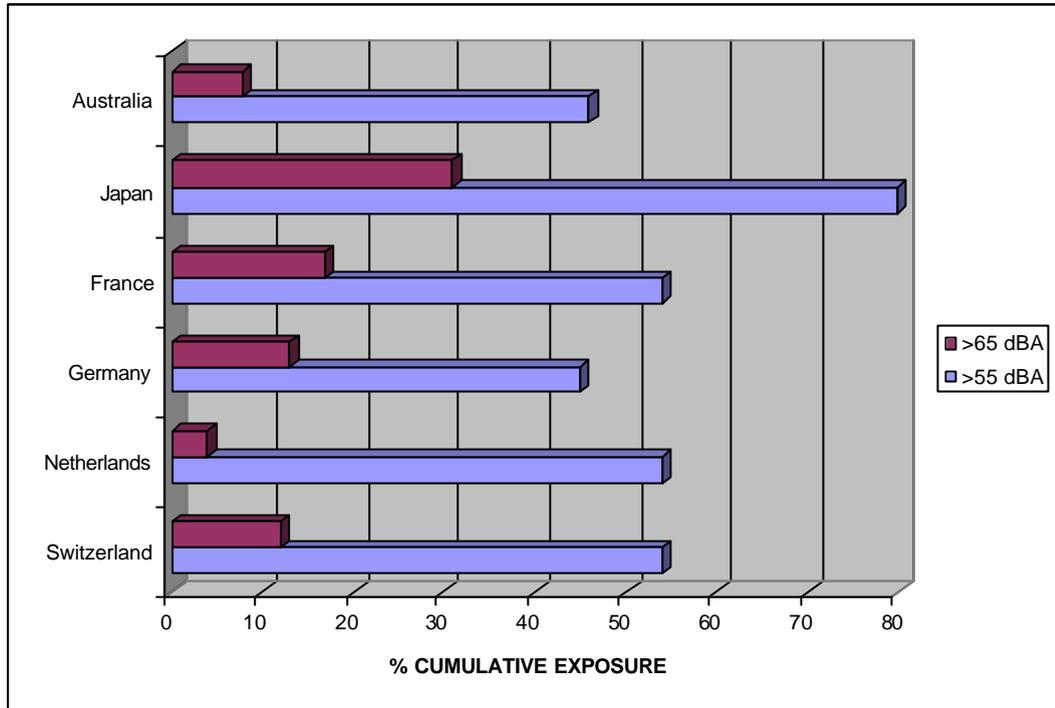
*“...present limits for newly manufactured vehicles are too lenient to provide adequate protection of public health and welfare.”*

Since the 1980 conference, the OECD has continued its work in the area of transport noise and has published two volumes detailing its research in this area - *Fighting Noise* (1986) and *Fighting Noise in the 90's* (1991). **Figure 1** illustrates the proportion of population exposure to benchmark noise levels for each of the six OECD countries studied.

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<sup>2</sup> Source: OECD 1991

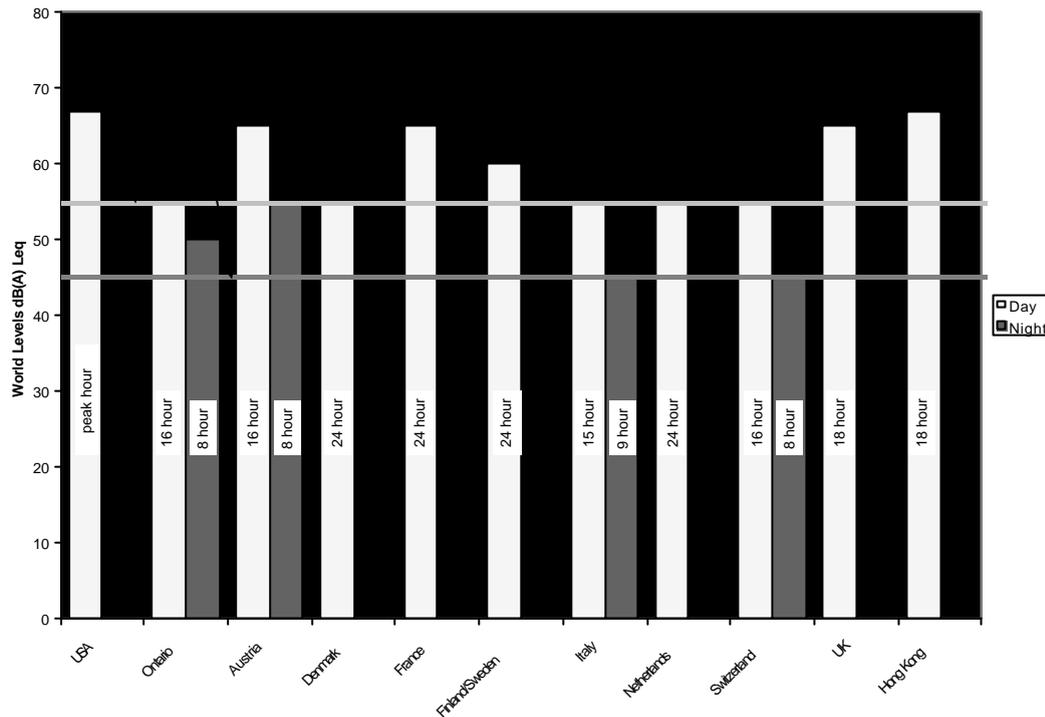
*Figure 1: Noise Level Exposure by Population (Six OECD Member Countries)<sup>3</sup>*



<sup>3</sup> Source: OECD 1991

Figure 2 summarises noise level guidelines applied in Western Europe, North America and Asia.<sup>4</sup>

Figure 2: Summary of International Transport Noise Level Guidelines and Objectives<sup>5</sup>



As part of its conclusions in *Fighting Noise in the 90's* (1991), the OECD reinforced the need for member countries to commit themselves to noise abatement policies on the basis of the six following objectives:

- Development of a *real* national strategy coordinated at both the local and regional levels;
- Provision of the resources needed for effective implementation of policies and regulations;

<sup>4</sup> In comparing the limits, the variation in averaging time must be noted. In the United States, the Federal Highway Administration applies a criterion of 67 dB  $L_{eq}$  peak hour. European averaging periods include 24 hour, 18 hour and separate day/night criteria. Most European countries apply the  $L_{eq}$  unit, with limits in accordance with the World health Organisation (WHO) and OECD recommendations of 55 dB during the day and 45 dB at night. Australian noise guidelines have historically been aligned with those employed in the UK, including the use of the  $L_{10}$  descriptor.

<sup>5</sup> Source: Lansdell & Cameron (1998), as documented in ARRB Transport Research (2000)

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- Provision of the resources and tools to effectively assess policy implementation;
- Generalisation of the use of economic incentive/disincentive policies;
- Initiation of vigorous action to modify the behaviour of the public and that of decision-makers; and
- Tightening of noise emission standards for vehicles.

The *Polluter Pays Principle*<sup>6</sup> was adopted by the OECD for use in the design and enforcement of pollution control, including noise control (e.g. levies on car buyers and manufacturers).

### WESTERN AUSTRALIA – NOW AND IN THE FUTURE

In order to set a context for the project, the consultant undertook the following tasks, bearing in mind past and current international initiatives, standards, guidelines, criteria and direction, as well as the trend towards to national consistency across Australia and New Zealand:

- A review of the existing legislative framework.
- Community and societal attitudes towards noise.
- A review of objectives of a transport noise policy.
- A ‘best practice’ review of national and international trends in noise control management.
- Stakeholder liaison.
- An assessment of the roles of community response to noise and sleep disturbance.
- A review of fixed noise source policy.
- A critical review of WA noise policies.
- A review of the role cost/benefit analysis and land use planning as part of transport noise management.

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<sup>6</sup> In 1974, the OECD adopted the *Polluter-Pays Principle* whereby the *Polluter* bears the expense of carrying out pollution prevention and control measures to ensure that the environment is maintained in an acceptable state, with these measures reflected in the costs of goods and services which cause pollution in production and/or consumption. The uniform application of this principle encourages the rational use and better allocation of environmental resources. (Source: in *International Environmental Agreements Compendium*, compiled by the Pollution Prevention and Pesticide Management Branch, Ministry of Environment, Lands and Parks, British Columbia, Canada, 1995. <http://www.sedac.ciesin.org/pidb/texts/oecd/OECD-4.09.html>)

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In brief, it should be noted that there are currently three policies/guidances relating to transport noise in Western Australia:

- EPA Preliminary Draft Guidance for the Assessment of Environmental factors, No. 14, Road and Rail Transportation;
- Main Roads WA *Standard Brief-Noise Study 1998*; and
- Westrail Railway *Noise Standards, 1995*.

**Table 1** illustrates a comparison of these existing policies.

Once the review of the existing policy framework and stakeholder consultation was completed, a critical review of the policy framework, existing guidelines, indicators, criteria, jurisdictional issues and the role of transport noise management in the context of land use planning was undertaken. The key recommendations and future directions presented to the ICC Working Group have incorporated policies and standards currently used in Western Australian practice as well as current national and international trends in transport noise management and control, and stakeholder comments received during the consultative process. The key issue which should be noted is that planning for the environmental sustainability of the transport system and the health and well-being of community are major themes which have been addressed throughout the project. In the follow-on stage, a detailed review of potential cost-benefit analysis techniques will be undertaken with respect to mitigation and the funding responsibility for noise control.



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### ***Linear Noise Sources***

1. A policy on transport infrastructure noise management should be adopted by the whole of government and integrated into environmental management and land use strategies.
2. For the impact assessment of road or rail noise, an  $L_{eq}$  (daytime) and  $L_{eq}$  (nighttime) noise level descriptor should be used.
3. Daytime period should be 6:00 a.m. to 10:00 p.m. and nighttime period to be 10:00 p.m. to 6:00 a.m.
4. Transport noise criteria should be applied using a 15 to 20 year time horizon.
5. Policy should distinguish between the development of new transport infrastructure near existing noise sensitive receivers and noise sensitive development near existing or gazetted transport corridors.
6. Chosen external daytime criteria for new transport infrastructure near existing residential development should be within the range of  $L_{Aeq}$  50 dBA to 60 dBA.
7. Chosen external nighttime criteria for new transport infrastructure near existing residential development should be within the range of  $L_{Aeq}$  45 dBA to 55 dBA.
8. Noise impact from new transport infrastructure near existing residential development should be assessed at ground floor level.
9. Adoption of a 5 dBA allowance/tolerance level over the chosen criteria, where it can be proven that achieving the criteria is not economically feasible or socially desirable.
10. Adoption of the principles of Section 5.1 of the Draft EPA Guidance (Version 3) for new developments near an existing transport corridor.
11. Criteria for increases to existing transport noise levels due to upgraded roads or railways should be developed on a sliding scale.
12. Development of a set of guidelines to assist developers and planning authorities in specifying appropriate techniques for developments near existing and planning transport infrastructure.
13. The capacity of Western Australian transport infrastructure providers to allocate funds for noise attenuation work outside the road/rail transport reserves should be determined.

### ***Fixed Sources***

1. Fixed noise sources should be addressed through the Environmental Protection (Noise) Regulations 1997, and not through a transport infrastructure noise policy.
2. Safety warning devices should remain exempt from the regulations but should be assessed informally to identify quieter alternatives.

### ***Further Research and Development***

It was further recommended that the ICC Working Group pursue an approach of additional research and development to address several key issues which are detailed below.

1. Should rail criteria be higher than road criteria to promote the use of rail on environmental grounds e.g. greenhouse gas emission and air quality?

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2. The outdoor lifestyle synonymous with living in Australia may lend itself to consideration of the ‘railway bonus’, especially considering the strong links to air quality benefits.
3. Should legislation be changed to allow Main Roads to operate outside of the road reserve to provide flexibility in noise mitigation? This would be especially relevant for control to individual premises in rural situations.
4. Should the adopted criteria be extended to include existing residential developments near existing infrastructure to address inequity issues for extended roads such as the Mitchell Freeway?
5. How is responsibility for noise mitigation assigned in mixed use transport corridors?
6. Should separate criteria be developed for rural settings with low background noise levels and, if so, should this criteria be included in a general transport policy document? A possible solution would be to apply a  $-5$  dB(A) adjustment to the criteria for ‘greenfield’ sites, particularly where a road was not expected.

The ICC Working Group, under the leadership of Transport, will be pursuing the second stage of the project which will review case studies in the context of the recommendations and undertake an assessment of dose/response testing and monitoring within the Perth Metropolitan area. Following this work, a ‘whole of government’ transport noise policy will be developed and presented for adoption by the Western Australian government to be consistent with both national and interstate objectives and guidelines as well as international standards and criteria.

### GLOSSARY

- **dB(A)**– The noise level in decibels measured with a frequency weighting network, corresponding to the A-scale (the range of frequency perceptible to the human ear) on a standard sound level meter.
- **Existing or Ambient Noise Level** - The surrounding or background noise of a given area or location, including all representative natural and man-made noises from adjacent transport facilities (i.e. road, rail). Measured in dB(A), it provides a reference based for determining the relative noise impacts when transport improvements or new residential communities are being considered.
- **Indicator** – A defined probabilistic measure of noise level (i.e.  $L_{eq}$ ,  $L_{10}$ )
- **$L_{10}$**  – The sound level which is exceeded 10 percent of the time for the period under consideration (i.e. at present typically 18 hours in Australia and the United Kingdom). This value is an indicator of both magnitude and frequency of the loudest noise events.
- **$L_{eq}$** – The equivalent steady-state sound level (“equal energy”) which in a specified time period contains the same acoustic energy as the time-varying level during the same period.
- **Night-time noise level** - The noise level experienced by individuals over the sensitive nighttime sleeping period, generally an interval between 10 p.m. and 7 a.m.

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- **Noise** – Excessive sound, which is considered to be a “contaminant” (as defined in Canadian Environmental Protection legislation) or a “nuisance”.
- **Noise Sensitive Area** - An area where the usage is impaired or restricted when subjected to excessive sound levels. Otherwise, known as “critical receiver location” (i.e. outdoor living space during the daytime, bedrooms at nighttime).
- **Sleep Disturbance** – The interruption of normal sleeping patterns and deterioration of sleep quality by intermittent peak noise events.
- **Sound Pressure Level** - The root-mean square sound pressure related in decibels to a reference pressure. Generally, measured or defined in terms of a

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