Introduction to the Revised – Queensland Department of Main Roads Road Traffic Noise Management: Code of Practice

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ABSTRACT

Queensland Department of Main Roads (QDMR) regularly receives complaints about the annoyance of road traffic noise. The purpose of this paper is to provide an overview of the revised Code of Practice (revised CoP) (QDMR.2006) that aims to guide and instruct the user in the assessment, design and management of the impact of road traffic noise.

The CoP was first released in June 1999. Some minor revisions were made and Version 2 was released in January 2000. Due to experience with the use of the CoP over the past six years, it has become necessary to undertake a revision in order to clarify a number of issues and include new issues that have developed. Some of the issues are related road traffic noise assesment, district noise management strategies, development applications, construction noise and vibration, community engagement, managing noise complaints and engine compression braking.

INTRODUCTION

This paper presents a brief overview of the proposed changes and addition included in the revised CoP. Through this revised CoP, QDMR can demonstrate its "General Environmental Duty" by establishing and implementing good environmental management practices as required by the Queenlsand environmental protection legislation ("General Environmental Duty" – a person must not carry out any activity that causes, or is likely to cause environmental harm unless the person takes all reasonable and predictable measures to present or minimise the harm).

HISTORICAL DEVELOPMENT OF THE REVISED COP

QDMR has been active in considering the impact of road traffic noise on the community living contiguously with the State – controlled road reserve.

Due to the increasing concern with respect to environmental issues including road traffic noise, the “Interim Guidelines and Technical Notes for Road Traffic Amelioration” were first prepared in 1991 and were approved by the then government on 16 December 1991.

Following the development of the environmental legislation (Environmental Protection Act) and subordinate legislation (Environmental Protection (Noise) Policy (EPP (Noise)), it became necessary to revise the interim guidelines and technical notes via the development of the current “Road Traffic Noise Management: Code of Practice” which was released in January 2000.

Due to experience with the implementation of the CoP, review of past practices, other emerging issues facing QDMR and industry such as the Integrated Development Assessment System (IDAS) as outlined in the Integrated Planning Act (IPA) and the need for continual improvement, it has necessitated a complete review of the CoP.

LIMITATIONS (NOT APPLICABLE TO PROPOSED NOISE SENSITIVE DEVELOPMENT)

Due to legislative, economic and technical constraints, there are a number of situations where QDMR will not be able to implement the CoP, including the following:

- Provision of treatments for noise attenuation outside the road reserve, unless in exceptional circumstances or where compulsory land acquisition (resumption) occurs and measures for noise attenuation form part of the acquisition agreement.
- Financial compensation to affected members of the community, unless compulsory land acquisition (resumption) is involved.

Exceptional circumstances may include the following:

- In achieving the internal noise criterion level for educational, community and health buildings irrespective of the buildings being State or privately owned.

  Construction of a high noise barrier on the property boundary may not be in the best interests of good environmental design, for example a noise barrier may create a security issue and may not suit the streetscape or built environment.

  Treatments for noise attenuation will be considered on a case-by-case basis, with consideration being given to building construction and use. In each case, it will be necessary to determine an agreed apportionment of costs between QDMR and the institution concerned.

  The treatments may include the closing of windows, the inclusion of a mechanical ventilation system/air - conditioning system for ventilation/comfort requirements and architectural treatment of the building envelope if necessary.

  The apportionment of costs provided by QDMR may be either the equivalent cost of a required noise barrier to

achieve the criterion level or the cost of a mechanical ventilation system/air-conditioning system and / or architectural treatment of the building envelope if necessary, whichever is the lower.

QDMR will not contribute to the running/maintenance costs of the treatments. These will be the responsibility of the institution concerned.

- If the height of a noise fence required to achieve the relevant criterion level for an access controlled road only, exceeds the maximum height stated in the revised CoP or where an isolated dwelling(s) exists within a section of road where consideration is being given to the implementation of an acoustically effective, high noise barrier as a noise attenuation treatment, and this high noise barrier does not suit the streetscape or built environment, it may be more cost effective for QDMR to provide the appropriate ventilation/comfort requirements and architecturally treat the building envelope if necessary. Due consideration shall be given to the achievement of the noise criterion level for private open space within the lot on which the dwelling exists.

  The treatment of the facade of the building envelope will only be considered outside any noise impacted habitable rooms of the dwelling where the external criterion level has been exceeded.

  The noise attenuation treatment may also include a low noise fence, for example 1.8 metres high on the property boundary.

  QDMR will not contribute to the running/maintenance costs of the treatments. These will be the responsibility of the dwelling owner concerned.

While it would be highly desirable for the revised CoP to be fully implemented, its application will be subject to the individual funding levels of QDMR districts and their works program.

As well, while QDMR is required to embrace the concept of General Environmental Duty from a road traffic noise perspective, there will be instances where noise attenuation treatments may not be implemented within the road reserve due to one or more of the following issues:

- Technical feasibility (an engineering consideration; what can be practically constructed – minimum height of a noise fence shall be 1.8 metres and/or a minimum of 3dB(A) noise reduction shall be achieved at the most exposed noise impacted receptor). Feasibility may be restricted by topography, access requirements, presence of local area streets, other noise sources in the area and safety considerations etc.
- Reasonableness (implies a common sense and good judgement approach to arriving at a decision). The reasonableness criteria includes the following:
  - Cost effectiveness of attenuation treatments.
  - Absolute noise level.
  - Change in noise level.
  - Noise attenuation benefits.
  - Life cycle of attenuation treatments.
  - Environmental impacts of noise attenuation treatment construction.
  - Opinions of affected residents (community engagement).
  - Input from local and public agencies.
  - Social, economic, environmental, legal and technical factors.
  - Scenic/visual amenity impacts.
  - Date of development beside the road.
    Within a ten-year period following completion of a new noise sensitive development under the IDAS framework, QDMR will not consider the impact of road traffic noise upon that particular development. A new noise sensitive development becomes an existing development 10 years after the development's completion and final sign off by the assessment manager.
  - Length of occupancy
    QDMR will not consider any complaint with respect to the impact of road traffic noise from a resident(s) / occupant(s) who has lived in / owned a particular noise sensitive development (contiguous with a State-controlled road) for less than 10 years unless it can be shown that there has been a substantial increase in road traffic noise level ie. equal to or greater than 3dB(A) in a shorter time frame. In general this would equate to a doubling in the traffic volume.

DEPARTMENTAL MANAGEMENT FRAMEWORK

Community amenity may be improved through appropriate planning and management of new and existing State-controlled roads and land use planning.

There are three alternative approaches to the management of the impact of road traffic noise:

- District Road Traffic Noise Management Strategy for existing roads.
- Project Environmental Assessment for proposed new and upgraded existing roads.
- Private Development Assessment.

These approaches provide guidelines for the management of the impact of road traffic noise.

District Road Traffic Noise Management Strategy

The District Road Traffic Noise Management Strategy identifies the priorities in the assessment of the impact of road traffic noise on existing roads with no road works. A district may choose to cover all roads, or only those roads with high traffic volumes or a high proportion of noise-sensitive receptors. The approach provides districts with a method to manage and plan for the impact of road traffic noise both now and in the future.

In order to determine a priority rating for the provision of noise attenuation treatments in noise affected areas, the following parameters shall be considered as a minimum:

- The duration of exposure and level of exposure to road traffic noise levels above the departmental criterion level at existing noise sensitive development;
- The provision of existing noise barriers;
- The number of residences affected by road traffic noise levels above the departmental criterion level;
- The cost-effective, equitable and practical provision of noise attenuation treatments.

Project Environmental Assessment (PEA)

The purpose of a PEA is to identify, describe and assess the environmental advantages, disadvantages and constraints associated with new and upgraded road projects. This process identifies noise-affected communities and may recommend a Road Traffic Noise Assessment be undertaken. The reporting of a PEA would be via a Review of Environmental Factors (REF).

Private Development Assessment

As a concurrence agency pursuant to the Integrated Planning Act, QDMR will review the likely primary impacts of road traffic noise on proposed developments and set appropriate conditions of development for the developer to comply with.

CONSTRUCTION NOISE AND VIBRATION

This chapter provides guidance applicable to the management of noise and vibration associated with construction and maintenance of road works conducted by, or on behalf of QDMR.

CATEGORIES AND CRITERIA

Introduction

The purpose of this section is to specify the QDMR road traffic noise performance criteria. For the consideration of noise attenuation treatments, the actual measured, calculated and/or predicted levels shall be assessed against the criteria.

Criteria can be advisory, flexible or fixed as defined in Table 1 which compares the advantages and disadvantages of these three approaches.

QDMR chooses to use fixed criteria when considering the implementation of noise attenuation treatments although it may not always be possible to achieve the criteria in all circumstances.

Categories set are initially based on whether the road project is:

- a new road (Category 1).
- an upgrade of an existing road (Category 2).
- an existing road with no roadworks (Category 3).

The criteria are listed in Figure 1.

Limitation on Use of Categories and Criteria

There are a number of situations where the ability to meet the criteria for the applicable category may be limited, including:

- attenuating the impact of road traffic noise on non-access controlled roads.
- attenuating the impact of road traffic noise on roads with speed limits less than 80 km/h; and
- attenuating the impact of road traffic noise by the provision of treatments outside the road reserve unless in cases of exceptional circumstances or compulsory land acquisition (resumption).

Criteria and Treatments: Exceptional Circumstances

When exceptional circumstances prevail, treatments for noise attenuation may be considered outside the road reserve for individual buildings at the discretion of the District Director.

The range of possible building treatments will be determined by the predicted noise level outside the façade(s) of a habitable room(s) within a ten year horizon and based on sustainable development principles such as equity, energy efficiency and economics. Refer to Table 2

Table.2 Treatments

External Noise Level	Treatment
< Criterion Level	NIL
1 to < 3dB(A) > Criterion Level	Mechanical ventilation
3 to < 10dB(A) > Criterion Level	Mechanical ventilation and air – conditioning
≥10dB(A) > Criterion Level	Mechanical ventilation, air – conditioning and architectural treatment if necessary

ROAD TRAFFIC NOISE ASSESSMENT

The purpose of a Road Traffic Noise Assessment is to:

- determine the existing acoustic and landscape environment.
- predict the impact of the proposal.
- recommend a range or combination of possible noise attenuation strategies.
- provide advice on the integration of noise attenuation treatments and amenity (including aesthetics).
- integrate the above issues to produce a design that conforms with good environmental management practice.

When designing treatments for noise attenuation, it is important to note that there are a number of additional issues to consider apart from acoustic effectiveness and integration with the road landscape. These include issues such as safety, aesthetics, maintenance and public amenity.

Table 1. Comparison of approaches

Approach	Comment	Disadvantages	Advantages
Advisory	Exceeding the criteria is tolerated on a case-by-case basis whenever compliance is undesirable, impractical, not feasible or not cost effective.	• Relatively ineffective • Low level of control by relevant authorities.	• No need to check compliance, as exceeding the criteria is tolerated • Low impact on infrastructure budgets when policy implemented • Low costs for management, as exceeding the criteria is tolerated.
Flexible	Criteria are set relatively low, but can be adjusted upwards on a case-by case basis if compliance with base criteria is undesirable or impractical.	• Relatively complex to implement and manage policy.	• Ensures that noise control must be considered in all situations involving significant noise impact • Allows costs to be managed • Allows negative impacts of noise control measures to be managed.
Fixed	Criteria must be complied with wherever possible.	• Pressure to set high criteria • May lead to high costs • May lead to excessively high noise barriers with associated negative visual and overshadowing impacts	• Relatively simple to monitor compliance • Maintains consistency of standards • Establishes criteria up front in order to manage expectations.

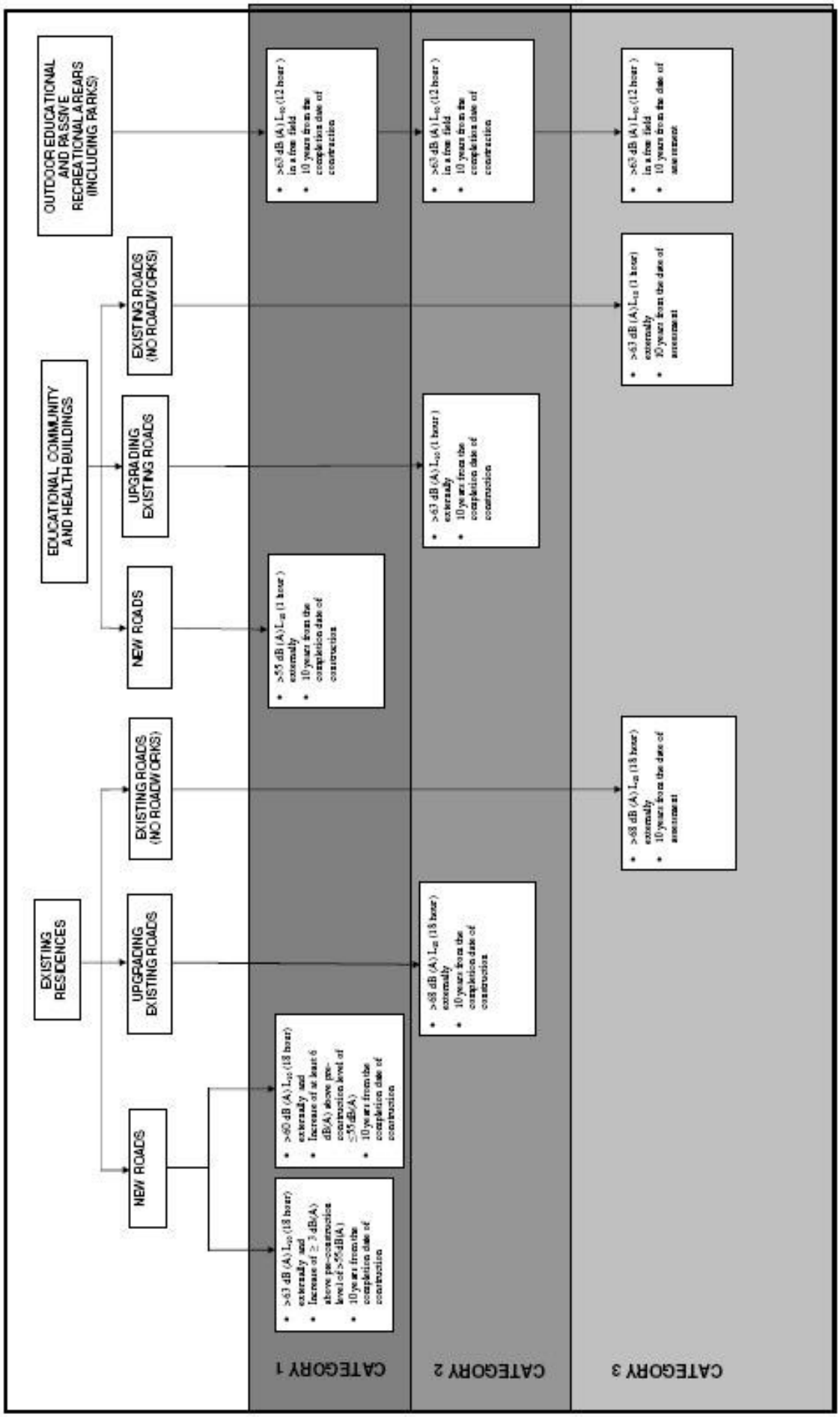

Figure 1 Description of Categories and Criteria

Acoustical Assessment

For New, Upgraded or Existing Roads, there are a number of requirements for an acoustical assessment. These include Measurement, Calculation and Prediction, Impact Assessment and Management of the Impact.

Measurement

Typically, road traffic noise is measured outdoors in either a free field situation or at the façade of a potentially affected building. It is always important when measuring road traffic noise to ensure that the conditions under which the measurements are conducted are as favourable as possible. Here the term conditions refers to factors such as the weather (e.g. wind, temperature, rain, humidity) and the operation of other sources of noise that are not related to the road traffic noise being investigated. The latter can include a multitude of sources like rustling foliage, animals, insects, plant and equipment. Further, it is critical that all relevant conditions and factors that could potentially affect the measurements are both monitored and recorded. While this may at first appear to be an intuitively obvious requirement, it is often both difficult and time consuming to achieve. One key reason for this is that it is often not clear just what conditions and factors are relevant and could affect the measurements.

Well-proven and documented techniques for the measurement of road traffic noise are set out in comprehensive detail in various documents such as Standards Australia and Austroads.

Calculation and Prediction

For the purposes of the revised CoP, the terms "calculation" and "prediction" of road traffic noise are defined as follows:

- *Calculation* of road traffic noise involves the use of a road traffic noise calculation model to estimate the existing noise levels at or near to a road facility.
- *Prediction* of road traffic noise involves the use of a road traffic noise calculation model to estimate the future noise levels at or near to a road facility.

Any given road traffic noise calculation and prediction model usually involves a series of algorithms that describe and quantify the manner in which noise is generated, propagated and attenuated. Generally road traffic noise is calculated and predicted (and measured) utilising the appropriate noise descriptors. There are many road traffic noise calculation and prediction models and associated computer software packages available around the world. Two road traffic noise calculation and prediction models commonly used in Australia are the Calculation of Road Traffic Noise (CoRTN) and the Traffic Noise Model (TNM).

In order for both QDMR and the community to have confidence in the results of noise calculations and predictions using models such as CoRTN and TNM, it has been necessary firstly to undertake careful, scientifically based studies of the models themselves. The process of determining the performance of a model in the calculation of road traffic noise involves a series of scientifically based procedures known as evaluation, calibration and validation.

Impact Assessment

The process of road traffic noise impact assessment is in fact a subset of the general process of an environmental assessment undertaken during the development of a road infrastructure proposal. As road traffic noise is one of many environmental elements that are considered in the environmental assessment, it is desirable for the road traffic noise impact assessment process to be comparable to the processes adopted for the other environmental elements. In this way the impacts of each of the elements may be assessed in a consistent and fair manner and subsequent comparisons facilitated between these impacts.

Assessment of road traffic noise impacts does not only occur within the ambit of the environmental assessment process. There may be many other situations where such assessments are conducted such as the situation of the potential road traffic noise impacts from an existing road on a development proposed on land adjacent to the road.

Management of the Impact of Road Traffic Noise

There are several ways in which the impact of road traffic noise can be managed.

- At the source (ie. controlling the noise emitted by the vehicle).
- At the reception point, by means of building location and design to minimise noise transmission into the interior of a building.
- Along the propagation path (ie. attenuating the noise as it travels between the source and reception point by means of noise barriers or buffer zones).

Control at the Source

In the long term, the most equitable method of reducing road traffic noise is through control at the source. This is being accomplished by means of Australian Design Rules (ADRs), which stipulate maximum noise emission levels of new vehicles.

Queensland Transport has been involved in the formulation and administration of these rules and their enforcement is covered under the Transport Operation (Road Use Management) Act 1995. Queensland Transport and QDMR encourage and support related research and development for quieter vehicles.

The selection of pavement surface type can have a noticeable effect on road traffic noise levels. Refer to Table 3

Table.3 Changes in Road Traffic Noise Due to Pavement Surface Type (All speeds ≥ 60km/h).

Pavement Surface Type	Change in Noise Level[3] (dB(A))
Portland Cement Concrete (PCC)	Increase by 5
16-20mm Bituminous Seal[1] (BS)	Increase by 4-5
5-14mm Bituminous Seal[1] (BS)	Increase by 2-4
Dense Graded Asphalt (DGA)	0
Stone Mastic Asphalt (SMA)	Decrease by 1
Low Noise Stone Mastic Asphalt (LNSMA)[2]	Decrease by 2
Open Graded Asphalt (OGA)	Decrease by 2

Notes 1: For a two coat bituminous seal, the size of the aggregate in the second cost shall be used to determine the pavement surface correction factor from this table.
2: Proprietry product not covered by QDMR Specification
3: These correction factors are nominally based on the average life of the pavement surface type.

Control at the Reception Point

QDMR will consider treatments at the reception point where there are:

- alterations to an existing road which impact on a partially acquired property (forms part of a land acquisition agreement;
- a change in land use or proposed development contiguous to an existing State-controlled road (developer's responsibility); or
- exceptional circumstances.

It is desirable to examine noise issues at the road concept, planning and preliminary design phase. Planned future land development should also be considered in all road traffic noise investigations.

Effective land use planning and design play an important role in abating noise nuisance. The sitting of less sensitive land uses in areas likely to be adversely affected can minimise noise impact.

Proper planning and design at the land use development approval stage should remove the need to attenuate impacts at a later date. Where dwellings are built after construction of the road, appropriate architectural design can limit the intrusion of road traffic noise.

Measures such as acoustic seals, thickened glass and double glazing of windows, and ceiling insulation can be effective means of treatment. These should be applied where effective indoor communication, sleeping and other noise-sensitive activities are required and where other alternatives are not appropriate.

To achieve the internal criterion levels specified in AS2107-2000, architectural treatment shall be designed in accordance with AS3671-1989 for new developments beside State - controlled roads.

When exceptional circumstances prevail, the assessment of the impact of road traffic noise will include the prediction of noise levels at the façade of every dwelling where the criterion level is likely to be exceeded for a 10 year horizon. This will provide a short list of dwellings which may be eligible for treatment.

Once the confirmation has been made that the dwelling qualifies for treatment, and the owner(s) agrees in writing to proceed, a process shall be put in place in order to comply with the treatments described in Table 2.

Control along Propagation Path

QDMR, local government and land developers have the greatest scope for control between the source and the reception point. The selection of alignment, grading, and provision of earth mounds and noise fences, are some of the design features requiring early consideration in the planning and preliminary design phases. The CoP provides guidance for road planners and designers on how to integrate such features into the road landscape.

To achieve the external criterion level, the preferred strategy will involve building setback, reduced building heights, landscaped earth mounds and/or landscaped noise fences. Noise fences placed on the property boundary of the State-controlled road reserve shall be landscaped to permit dense screen plantings. For proposed developments, new landscaped areas within the road reserve may be permitted and any costs associated with the construction of earth mounds and/or noise fences and landscape works described above shall be at the developer's expense.

Land used outside of the road reserve (including buffer strips) for the purpose of noise fences and landscaped earth mounds shall be owned and maintained by the land owners (private or local government). All noise barriers and landscaping shall be to the satisfaction of QDMR.

Effective reductions in road traffic noise levels can be achieved through distance alone. However, in an urban environment, applying this method is expensive over greater distances from the source due to the cost of land acquisition and maximum lot yield.

PREFERRED ATTENUATION STRATEGIES

The correct siting of noise barriers is a critical determinant in the appearance of roadside areas and the degree of "tunnelling effect" perceived by the motorists. Poor practice includes the creation of monotonous 'tunnels' lacking visual interest or balance.

The preferred option on new and existing roads is landscaped earthmounds. Where this is not practical, the following options should be observed wherever possible.

It may be possible to combine a concrete safety barrier, retaining wall, earth mound and noise fence (or various combinations of these) to achieve an acceptable outcome with respect to acoustics issues (noise barrier as close as possible to the source), land acquisition (resumption), engineering or environmental issues (reduction in the footprint width of a mound).

New Roads

- the maximum preferred height of a noise fence above the proposed natural ground or earth mound level shall be 4.0 metres (absolute maximum 6.0 metres depending on visual amenity/road landscape issues);
- the minimum offset from the noise fence to the back of any guard rail posts shall be 2.5 metres; and
- the combination of a noise fence on top of a concrete safety barrier is **not** preferred. However, it may be possible to combine these elements if there are savings to be made with respect to land acquisition (resumption), engineering or environmental issues etc.

Existing Roads

- the maximum preferred height of a noise fence above the existing or proposed ground level shall be 6.0 metres;
- the minimum offset from the noise fence to the back of any guard rail posts shall be generally 1.5metres;
- the maximum preferred height of noise fence combined with a concrete safety barrier shall be 6.0 metres.

Combination of a Noise Fence and Concrete Safety Barrier

In the determination of the most suitable cross section for the combination of safety barriers and noise fences, it is necessary to refer to the QDMR Road Planning and Design Manual (QDMR 2002). If there is a likehood that a truck may impact a noise fence due to the pavement surface crossfall (with or without a shoulder), then the decision as to whether a noise fence can be located on top of a concrete safety barrier or behind the concrete safety barrier, is based on a risk assessment with respect to the possibility of the noise fence falling onto a pedestrian or specific sensitive object, for example, light pole, electrical switchboard etc.

If the risk is low, it is considered that the noise fence could be located on top of or behind the concrete safety barrier.

Bridges

Being raised above ground level, bridges often present an opportunity for outward views from the road. Transparent noise barriers should be considered where there are significant views.

Noise barriers should be offset from the outer edge of the bridge to reduce the tunnelling effect.

Where bridges are located on horizontal curvature, noise barriers should be offset from the outer edge of the inside of the curve to reduce obstruction of sight lines. Where structurally practicable, the minimum offset from the outer edge should be determined according to sight line requirements.

Horizontal alignment of the noise barrier should continue in line with the alignment of the noise barrier approaching the bridge (where possible). Generally, elements fixing the noise barrier to the bridge should not dominate the design, but should create an integrated appearance.

It is important to note that these recommendations and preferred noise barrier options are based only on acoustic and visual considerations. There are other important design considerations for noise barriers, including:

- safety requirements;
- flooding /hydraulic requirements (especially for higher flood levels than the "design" flood where a noise barrier may cut off storm water drainage paths).
- public amenity; and
- maintenance requirements.

INTEGRATED DESIGN

Introduction

Integrated design is a process whereby social, economic, environmental and technical issues are considered equally. There are a number of other issues that will influence the design of noise barriers. These issues include:

- Safety Requirements;
- Maintenance Requirements;
- Public Amenity;
- Horizontal and Vertical Alignment;
- Fauna Movements;
- Visual Considerations; and
- Community Art.

Integrated design is an iterative process whereby these issues influencing the siting of noise barriers can alter the recommendation in the Road Traffic Noise Assessment. Consequently if the site is changed, the acoustic effectiveness of treatments for noise attenuation and their integration into the contextual road setting will need to be reviewed.

Community Engagement

The provision of noise barriers can often lead to trade-offs between acoustic and public amenity for the community. These trade-offs are highly subjective. To ensure that the most acceptable design is compatible with the desires of the community, a program of community engagement shall be undertaken. This program of community engagement shall be carried out in accordance with QDMR Community Engagement Policy, Principles, Standards and Guidelines (QDMR 2004).

Engagement may be carried out in the form of one-on-one discussions with affected property owners, public workshops or letter-drops. The aim of this engagement will be to obtain the opinions of the affected community on such issues.

From a road traffic noise perspective the following shall apply:

- An appropriate consultation protocol must be implemented to ensure that the community is provided with realistic appraisals of what the post construction noise environment will be like for those living near and in the environs of the roadway. It is important to ensure that the expectations of the community are not raised above what can reasonably be delivered.
- Where post construction complaints arise in relation to road traffic noise impacts, these complaints should be addressed in accordance with the principles and requirements set out in the revised CoP. Note that these principles and requirements are based on robust, scientific theories and practices.

MANAGING NOISE COMPLAINTS

Managing Community Expectations

A brochure *Living With Road Traffic Noise* (included in the revised CoP) has been prepared for general issue to the public in order to briefly inform them of what they (in addition to QDMR) can do with respect to minimizing the impact of road traffic noise.

While the department recognizes that people have varying sensitivities to road traffic noise and its impact on their lifestyle, it is difficult to assess each individual's needs. In order to comply with government requirements, it has been necessary to undertake a monitoring and reporting process for road traffic noise issues. As such, a document has been prepared to provide an overview of the process including issues and proposed outcomes (included in the revised CoP).

A set of appropriate responses to public complaints and enquires is provided in the revised CoP.

Recording and Management of Noise Complaints and Responses

A system for the registration of environmental complaints has been developed with specific reference to road traffic noise. It is envisaged that the system will also be linked to a MapInfo database in the future.

Engine Compression Brake Noise

Engine compression brake noise is a source of community complaint against the heavy vehicle industry. It may be addressed through improved vehicle maintenance and the use of signage. The major cause of excessive engine compression brake noise is inadequate muffles that do not provide attenuation of the noise.

The National Transport Commission (NTC) has investigated a number of ways to control engine compression brake noise without introducing unfair restrictions on industry or creating a safety issue. Engine compression brakes are an important safety device and the reporting of the investigations proposes a method of testing noisy engine compression brakes, rather than placing arbitrary restrictions on their use. Trucks failing the test may simply need to replace their mufflers in order to pass.

A departmental strategy has been developed in an effort to address the issue. The department, with the support of the

heavy vehicle industry, relies on an education and awareness campaign. This is aimed at reaching a larger percentage of truck drivers and raising community awareness in an effort to reduce engine compression brake noise in urban areas.

The strategy combines two aspects as follows:

- An educational brochure addressing this issue has been produced and is distributed to the trucking industry.
- Signs asking truck drivers to limit using their engine compression brakes may be installed at key locations for vehicles entering a town or city. Reference should be made to the QDMR Traffic and Road Use Management Manual (TRUM) (2002b), for guidelines for the use of signs to reduce heavy vehicle noise.

Research on the effectiveness of signs has provided mixed outcomes. Some trials have indicated that the use of the signs has shown no improvement in limiting engine compression brake noise in the immediate vicinity of the signs. There is evidence however, that the appropriate placement of these signs in accordance with TRUM on approaches to country towns has had a positive response from truck drivers and therefore adjacent residents.

Examples of a typical community engagement response with repect to the issue are provided in the revised CoP.

CONCLUSION

Road Traffic Noise is recognized as being a concern for many people living contiguous with motorways and arterial roads that have high traffic volumes and/or individual noisy vehicles. The revised CoP represents a compromise between the need to improve acoustic amenity, visual amenity and the technical/cost constraints in providing treatments for noise attenuation

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