State Road Noise Strategy

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Department of Infrastructure,
Energy and Resources

Tasmania
Explore the possibilities

BUILD STATUS

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CONTENTS

FOREWORD

Tasmania's road transport network provides extensive benefits to industry and the community. It also generates impacts which can affect the quality of life of individuals and communities, including transport noise.

DIER has developed the State Road Noise Strategy to provide high-level policy and planning guidance on the impacts of road noise and how these impacts can be addressed over time to improve the amenity of adjacent households.

The Strategy focuses on reducing exposure to transport-related noise and excessive noise levels on the State Road network. This network connects major population and industrial centres and carries the majority of freight and passenger traffic in Tasmania. Other road authorities, particularly local government, are encouraged to use the Strategy where it assists in addressing noise issues, provides greater integration between the State and local road networks or supports improved outcomes for the community.

Minimising road noise is a complex, costly and challenging process. Many of our strategic roads are located in built up areas, where both the road network and adjacent land uses are established but largely incompatible. The Strategy identifies a range of measures to address noise issues at the planning, design, infrastructure and operational levels. DIER will continue to pursue measures at all levels to generate long term improvements in the road noise environment, address localised noise issues where reasonable and feasible, and ensure new and upgraded road networks meet best practice noise standards.

The Strategy will provide an effective framework to better understand and reduce community exposure to transport-related noise and excessive noise levels in Tasmania.

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GLOSSARY

Noise Terminology

dB	Refers to the decibel level, the standard measurement for describing the magnitude of sound pressure waves. The dB is a logarithm of the ratio of two powers.
dB(A)	Refers to an A-weighted decibel scale – an adjustment made to sound level measurement to approximate the response of the human ear.
L_{10}	The sound level exceeded for 10% of the nominated averaging period. The L_{10} statistic tends to be a good indicator of traffic-generated noise.
L_{90}	The sound level exceeded for 90% of the nominated averaging period. The L_{90} is indicative of the lower levels of noise occurring during the averaging period. The L_{90} is sometimes referred to as the 'background but this terminology is misleading and is not recommended.
L_{eq}	The equivalent sound pressure level is the steady level which has the same energy as the time-varying level over the same period. For continuous traffic flows the L_{eq} is approximately 3dB less than the corresponding L_{10}. At moderate to high traffic flows this relationship is quite consistent but at low traffic flow it is not reliable and in some cases the L_{eq} can exceed L_{10}.
L_{max}	The peak noise level. Sometimes used as an indicator of the potential for sleep disturbance.
L_{den}	A community noise equivalent level which is 24-hour L_{eq} after adding 5dB to the evening levels (between 7pm and 11pm) and 10 dB to the night time levels (midnight to 7am and 11pm to midnight).
L_{A1} –	The sound level which is exceeded for 1% of the nominated averaging period Potentially used to indicate the impact of individually loud noise events and has the advantage, over L_{max} that it is not controlled by a statistical extreme.
L10(18hour)	The arithmetic average of the 18 hourly L_{10} values from 6am to midnight. The Tasmanian standard refers to the most exposed façade of the dwelling and includes 2.5dB(A) reflection.

Note: The above levels, as applied to traffic noise, are A-weighted. Where it is desirable to differentiate between different frequency weightings then the specific frequency weighting would be included in the subscript.

Abbreviations and Acronyms

ADR	Australian Design Rules
BPEM	Best Practice Environmental Management
DPIPWE	Department of Primary Industry, Parks, Water and Environment
DIER	Department of Infrastructure Energy and Resources
EMPCA	Environmental Management and Pollution Control Act 1994
EPA	Environmental Protection Authority
EPP (Noise)	Environment Protection Policy (Noise)
LUPAA	Land Use Planning and Approvals Act 1993
WHO	World Health Organisation

1. CONTEXT

The road transport network and why we need a noise strategy

While overall traffic volumes remain low in Tasmania relative to other jurisdictions, the passenger and commercial vehicle fleet is growing and both total and average distances travelled are increasing.

Our road transport network is extensive and relatively mature. We have significant transport assets to plan and manage, and a long period of time over which development has increased and consolidated around some of our major corridors.

In this context, as traffic volumes have increased, both the number of individuals potentially affected by transport-related noise and the complexity of addressing transport noise issues have increased.

Some of the characteristics influencing transport-related noise in Tasmania include:

- An extensive, substantially mature road network.
- Historic and continued development of residential areas along key transport corridors.
- Location of major freight routes through urban areas, including the Bass Highway, Brooker Highway, Macquarie-Davey and Wellington-Bathurst couplets.
- Location of industrial areas in or adjacent to urban areas.
- An ageing vehicle fleet – Tasmania has one of the oldest vehicle fleets in Australia – resulting in generally noisier cars.

Vehicle use in Tasmania

Tasmania has around 400,000 registered vehicles with almost 800 vehicles per 1000 people. The growth rate of the fleet is just under 3% pa, and is growing at a faster rate than New South Wales or Victoria (*Source: Motor Vehicle Census, Australia, 31 Mar 2008*).

Freight growth

A growing freight task will see larger volumes of freight moving through Tasmania's ports, intermodal facilities and over the road transport network.

Tasmania's State road network is categorised according to a strategic hierarchy. The hierarchy is based on function and recognises the different roles individual roads play in connecting major cities and towns, industry, major ports and airports, and in supporting local traffic movements. By identifying roads that will take higher volumes of general traffic or higher volumes of freight, the hierarchy indicates roads that are likely to have higher noise levels. A functional hierarchy approach is informed and supported by strategic planning frameworks – for example, the Tasmanian Infrastructure Strategy, regional integrated transport plans and the AusLink Corridor Strategy – and analysis – Tasmanian Freight Strategy and traffic forecasts. Both provide detailed strategies for the development of networks and corridors and support a better understanding of how roads are functioning now and over the long term.

1.1. What are we trying to achieve?

Tasmania *Together* provides an overarching vision for Tasmania that informs all State Government policy and administrative decisions. The State Road Noise Strategy can assist in achieving Goal 1 of Tasmania *Together – A reasonable lifestyle and standard of living for all Tasmanians*.

The State Road Noise Strategy forms part of DIER's strategic transport planning framework. It underpins our core objectives to maintain an efficient, safe and sustainable transport system for the Tasmanian community. The Strategy covers Tasmania's State-owned road network.

Tasmania has around 18 000 km of roads, excluding forestry and private roads. Approximately 80% of these roads are managed by local governments. While many local roads carry low volumes and generally provide local connections, some carry significant passenger and freight volumes. The principles and actions within the Strategy are applicable to any road experiencing a transport-related noise issue, and local governments are encouraged to use this Strategy to manage noise issues on their own networks.

Our vision

To reduce community exposure to transport-related noise and excessive noise levels through effective management of Tasmania's strategic road network.

Our objectives

In planning, designing and managing the State road network, DIER's objectives are to:

- Minimise the number of people exposed to unreasonable levels of transport noise.
- Manage noise levels on new and upgraded transport infrastructure to ensure that future noise levels remain acceptable.
- Reduce amenity conflicts and ensure long-term corridor viability by protecting major transport corridors from incompatible uses (for example, noise sensitive uses such as houses, schools and hospitals) and promoting good building design.

By meeting these objectives DIER aims to fulfil the requirements of the *Environmental Protection Policy (Noise) 2009* as it applies to the road transport network. (Sub clauses 11.1, 11.2 and 11.3 of the Policy provide specific direction for transport noise – see Appendix 2).

Underlying the objectives is the Department of Infrastructure, Energy and Resources' (DIER's) commitment to achieve best practice environmental management in managing transport related impacts.

Our focus areas

This Strategy identifies approaches under two focus areas: vehicle and non-vehicle. *Vehicle approaches* to noise mitigation target the source; the point where the sound is generated. *Non-vehicle based approaches* separate the noise generating activity from sensitive land uses using land use and transport planning initiatives or by interfering with the sound waves as they travel through the air, usually through an infrastructure solution.

Vehicle approaches target noise reduction within vehicles through design, technology and driver behaviour. Regulatory frameworks are often used to require or encourage the uptake of new technology and to enforce noise standards for individual noisy vehicles.

On road vehicles (passenger and freight) are the main source of noise emissions in Tasmania. Policies and regulations that control vehicle noise limits and influence behaviour can be used to manage noise levels by reducing noise emissions from a vehicle, encouraging and enforcing compliance, or changing driving behaviour by influencing travel patterns or driving styles.

Non-vehicle approaches target the design and location of transport infrastructure, how infrastructure is used and the type and design of adjacent land uses.

- ***Land use planning*** – the impact of noise from transport corridors is subjective. A key factor is the type of adjacent land use and its proximity to the corridor (e.g.

residential and educational uses are more sensitive to noise than commercial or industrial). Better integration of land use and transport planning is a significant tool in mitigating the impact of transport noise on sensitive uses, such as residential areas, schools and hospitals, while maintaining the function of critical transport infrastructure, particularly higher speed arterial roads.

- ***Infrastructure*** – infrastructure solutions use the space between the source of transport noise (the vehicle) and the receiver (the household or community that is experiencing the impacts) to reduce or interrupt the noise. Alignment, road surface and noise walls and mounds all have an effect in mitigating transport noise.

The Strategy relates the focus areas to the following situations that cover the majority of noise impacts in Tasmania:

- Traffic changes (volume or type) on existing roads;
- Residential and other sensitive use developments potentially affected by traffic noise;
- New land use developments that generate an increase in traffic and volumes;
- Heavy vehicle noise;
- Individually noisy vehicles; and
- New road projects and road upgrades.

Implementation

In planning and managing the strategic road network, DIER will aim to:

1. Plan new and upgraded infrastructure to reduce noise impacts.
2. Ensure that planning for all new and upgraded projects includes processes for measuring and managing the impact on people potentially exposed to higher noise levels.
3. Monitor complaints and identify locations subject to cumulative impacts.
4. Monitor the noise impact of road vehicles in order to reduce the incidence of vehicles making excessive noise.
5. Avoid future problems by anticipating the extent of the future noise 'footprint'.
6. Promote appropriate development adjacent to road networks.

1.2. Where does noise 'fit'?

Management of transport noise on the State road network is undertaken by DIER in compliance with the *Environmental Management and Pollution Control Act 1994* (EMPCA).

Under EMPCA, DIER is required to achieve best practice environmental management (BPEM) in its management of transport infrastructure and operations. BPEM, in relation to road noise is defined in more detail within this Strategy (page 11). Generally, the objective is to minimise any environmental harm associated with transport noise, using practical and cost-effective measures, assessed against applicable international and national standards.

The emission of noise that unreasonably interferes with, or is likely to unreasonably interfere with, a person's enjoyment of the environment is defined in EMPCA as 'environmental nuisance.'

EMPCA provides for Environment Protection Policies (EPP) to address specific pollutants. The objectives of the *EPP (Noise) 2009* are to further the objectives of

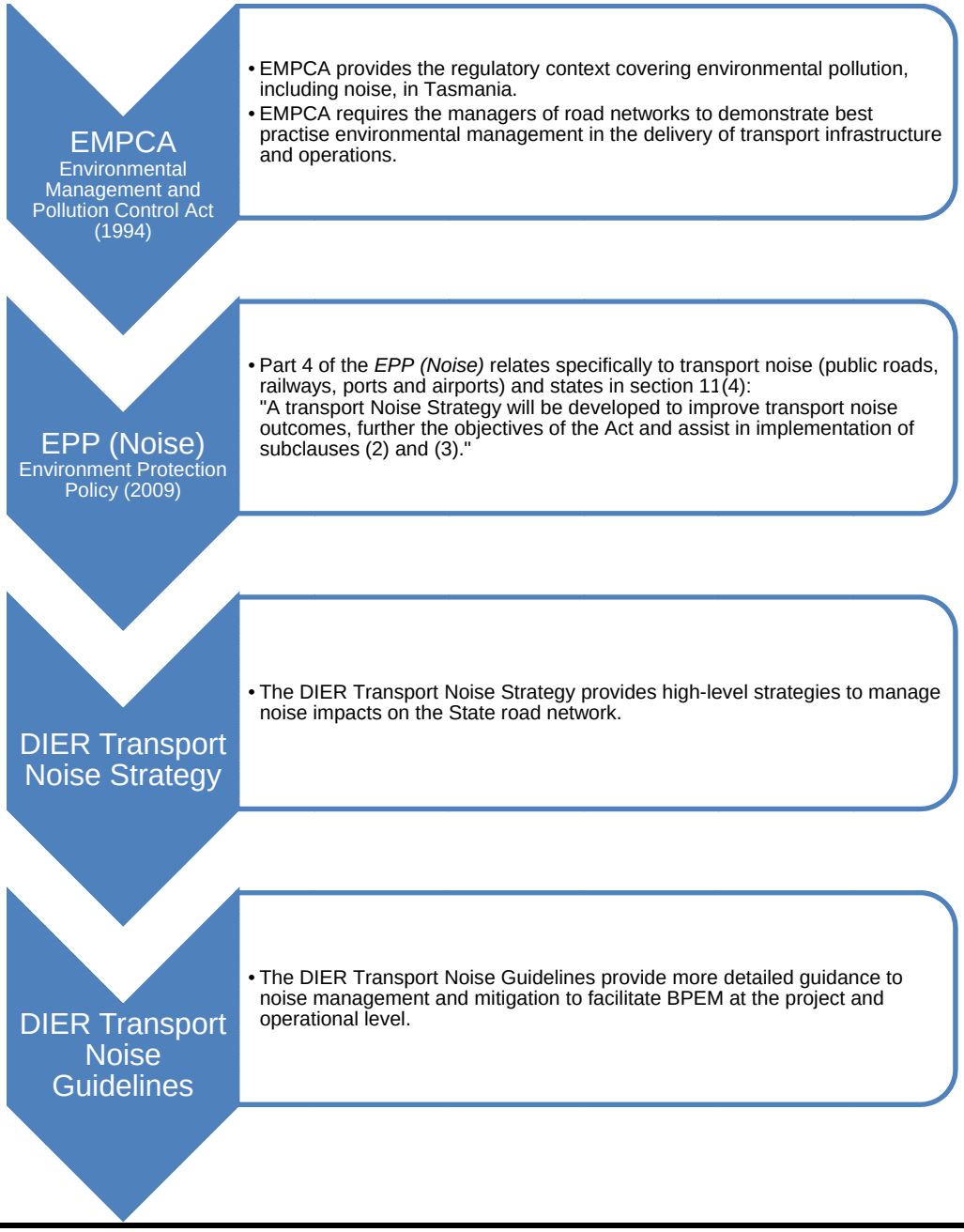
EMPCA as they relate to the acoustic noise environment and to protect the qualities of the acoustic environment that are conducive to the:

- Wellbeing of the community, including social and economic amenity; and
- Wellbeing of the individual, including health, opportunities for work and study, rest and social and recreational activities.

The EPP (Noise) identifies the development of a transport noise strategy, and DIER has developed the State Road Noise Strategy in line with the *EPP (Noise) 2009*. The Strategy gives effect to the principles within the *EPP* but is not a statutory policy.

DIER will also develop internal guidelines to aid the management and implementation of noise mitigation measures for new or upgraded transport projects. These guidelines will be publicly available.

Figure 1.1 State Legislation and Policy



Relationship to other Acts, policies and strategies

State

Environmental Management and Pollution Control Act 1994

The fundamental basis of EMPCA is the prevention, reduction and remediation of environmental harm. Environmental harm is defined in the act as being "…any adverse effect on the environment (of whatever degree or duration) and includes an environmental nuisance". The Act provides for the development of Environmental Protection Policies (EPP) for specific pollutants.

The Secretary of DIER and other senior officers have responsibilities under the Act to ensure the Agency actively manages its activities to prevent or minimise environmental harm or nuisance and operates in accordance with Best Practice Environmental Management.

Environmental Protection Policy (Noise) 2009

The objectives of the *EPP (Noise)* are to further the objectives of EMPCA as they relate to the acoustic noise environment. Part 4 of the *EPP (Noise)* relates specifically to transport noise and refers to the development of a transport noise strategy.

Roads and Jetties Act 1935

The Act gives powers to construct and manage roads and bridges, authorising the relevant Minister to undertake the necessary works to provide public infrastructure for transport.

Vehicle and Traffic (Vehicle Standards) Regulations 2001

The regulations provide that an in-service vehicle must not exceed the ADR standards by a set amount (parameters are specified in the regulations for the type and year of vehicle) if it is to remain legal on public roads.

Land Use Planning Approvals Act 1999

The *Land Use Planning and Approvals Act 1993* (LUPAA) is the principal planning act in Tasmania. LUPAA provides for the preparation and amendment of planning schemes and the development assessment process, including development applications, appeals and enforcements. LUPAA is the framework enabling planning authorities to set and implement development controls relating to noise impacts.

Commonwealth

Motor Vehicle Standards Act 1989

This Act authorises the setting of ADRs governing noise levels for new vehicles. Standards for noise emissions from new vehicles have been lowered regularly in recent times and the achievement of the objectives of this Strategy depends in part upon further improvements being implemented under these standards.

1.3. Understanding Noise

Noise as an impact

There is increased recognition and a growing body of evidence to support noise as an environmental impact that contributes to and can exacerbate human health problems.

International research suggests that community noise, including noise from traffic, can pose a general health risk, including sleep disturbance, hypertension and heart disease. Population groups most exposed to noise (by virtue of where they live, work and socialise) and those most sensitive to its impacts may face even greater risks. These include babies and young children, shift workers, the elderly, the blind, and those suffering existing physical and mental health conditions.

What people hear

Most people have difficulty distinguishing the louder of two sound sources if they differ by less than 1.5-2.0 dB. Research into the human perception of changes in sound level indicates the following:

- 3dB change is just perceptible.
- 5dB change is clearly perceptible.
- 10dB change is perceived as being twice or half as loud.

Ignoring other factors, individual measured noise levels from a point source (e.g. stationary machinery) decrease by 6 dB(A) for every doubling of distance from the noise source. From a line source, such as a road (i.e. a continuous line of traffic), the L_{eq} noise index decreases by 3 dB(A) per doubling of distance from the noise source.

DIER is currently using L_{10} 18hr as the descriptor for transport noise. For the purposes of the State Road Noise Strategy DIER will continue using the L_{10} 18hr descriptor, including approximate conversions to L_{eq}.

In Australia, the use of L_{eq} for various periods is becoming increasingly common and is the key output from newer generation software models. DIER relies upon acoustic consultants for measurements or predictions of L_{eq}. As an interim measure that involves an acceptable degree of accuracy, a standard correction is used to convert from L_{10} 18hr to L_{eq} 24hr.

Night time noise – Some Australian jurisdictions with very high traffic volumes have adopted night time standards based on the L_{eq} for a designated night time period. Generally Tasmanian night time traffic volumes are low enough for this to rarely be of concern. The European Community has initiated community noise mapping based upon L_{den}, the L_{eq} for day, evening and night. This level of sophistication is not necessary in Tasmania where the evening and night disturbance is more dependant on individually loud noise events. In this situation, the L_{Amax} or possibly the L_{A1} might be more appropriate. Alternatively, the number of events at night exceeding a threshold value may be used as a descriptor.

Noise standards and measurement

There are a number of agreed international standards and conventions on noise levels. Many of these identify noise levels that can be demonstrated to cause harm, or provide guidance on levels that appear to have no observable detrimental impact. There is now reasonable agreement on the latter, and these levels are regarded as long term noise

goals. The World Health Organisation (WHO) Environmental Noise Goals are based on such agreements.

The complexity begins once there is an attempt to set levels that can be regarded as acceptable in practice. Standards to be applied by DIER for the State Road Noise Strategy reflect situation and context. Criteria are detailed in the Implementation section of this Strategy.

Methods for measuring and predicting transport noise are generally prescribed by legislation or recommended in professional literature such as Standards Australia publications. Any noise measurements carried out in meeting the requirements of the *EPP (Noise) 2009* must be undertaken in accordance with the *Noise Measurement Procedures Manual (2004).*

Noise amelioration

Noise amelioration measures can manage noise through vehicle and non-vehicle responses.

Vehicle responses target the noise that is generated by a vehicle. These are generally referred to as “source” measures. Non-vehicle measures target the noise between the vehicle and the impacted property or at the property. These are generally referred to as “path” and “receiver” measures.

Individual measures are usually not sufficient in themselves. For example, a highway noise barrier prevents sound from reaching the listener by the direct path, but some sound can still reach the listener and the best that can be expected is a 5 to 10 dB(A) decrease in the noise level. Quieter vehicles, smooth traffic flows and appropriate insulation on the affected building can further decrease the noise levels and in some cases may make a noise wall redundant. Appendix 1 provides information on some available noise amelioration options.

Filling the gaps in understanding

Transport noise has many causal factors and many aspects have a strong subjective element in terms of effect on amenity or environmental quality. Understanding noise issues generally and applying that understanding to specific situations is challenging for land use planners, transport planners and engineers and the communities and individuals that live with the benefits and impacts of transport networks. Data collection, analysis, noise modelling and mapping are integral to improving the level of understanding of transport noise impacts in Tasmania so that outcomes provide the most benefit for the community.

Because transport patterns vary with changes in populations, settlement patterns and travel behaviours, continued refinement of the descriptors and standards used to assess noise impacts is needed. Analysis of network level data allows us to identify potential hot spot areas and to assess the validity of the descriptors and standards applied. At the road project level, modelling and mapping provides a tool to assess the current level of impact and to predict the effect of changes to the road environment on the immediate environment.

DIER has access to a range of information (traffic count data, the Tasmanian Freight Survey, the Greater Hobart Household Travel Survey and ABS statistics) that can provide indicative analyses of the corridor noise environment. More sophisticated modelling is undertaken for individual road projects to determine specific impacts on affected properties and the effect of mitigation measures.

Continued data collection and modelling of transport related noise impacts will provide DIER with the appropriate tools to assess noise impacts in the State and also to judge the effectiveness of the standards and criteria used.

2. STATE ROAD NOISE STRATEGY

2.1. Background

The State Road Noise Strategy details DIERs approach to managing and mitigating noise impacts generated through use of the State road network. Criteria and strategies have been developed specifically for the Tasmanian context, drawing from national and international best practice. The strategies have been developed to address noise impacts on sensitive locations adjacent to existing roads and where new or major upgrades are planned.

The objective assessment of transport noise impacts requires criteria to ensure equity and consistency in assessment, on individual projects and on a state-wide basis.

What are noise sensitive locations?

The DIER Road Noise Strategy is primarily concerned with noise sensitive locations adjacent to State road corridors. Typically, all land uses other than retail, commercial and industrial can be considered noise sensitive. For particular situations, sensitivity will depend on site specific details as well as people's expectations and perceptions. Places where transport noise may disturb sleep or disrupt communication need to be given careful consideration and include hospitals and care facilities, residential areas and schools. The sensitivity of some environments can be dependant on time (for example, residential areas are more sensitive on weekends and during the evening and night where as schools are only sensitive to noise impacts during school hours).

2.2. New roads and major upgrades

What are the issues

New roads and major upgrades benefit the community by providing links that facilitate social and economic activity. However, adding to or changing traffic volumes or characteristics requires management of the associated impacts on adjacent uses. This includes changes to the noise environment. The following table provides a summary of noise issues relating to new roads and major upgrades.

Issues for new roads and major projects on existing roads

	Issue / impact / cause	Description
New Roads and major upgrades	New roads (e.g. Alignment, design, expected use, current and future adjacent uses)	The geometry of a proposed road, the terrain it passes through, surface type, expected traffic volumes and mix and adjacent land uses will influence sensitivity issues.
	Major upgrades (e.g. Capacity increase, alignment, design, adjacent uses)	Changes to width, alignment or surface and alterations to traffic management can influence the noise environment. Increasing capacity on corridors can lead to increased volumes and changes in the vehicle mix.

New road projects, especially those in greenfield areas, generally offer more opportunities to minimise noise impacts. Road location, layout and design specifications are more readily adjusted for new roads in greenfield areas and subsequent adjacent development can be planned with regard to their sensitivity.

For major road projects on existing roads, adjacent land uses may limit the available mitigation options; due to factors such as engineering constraints, amenity impacts or cost. In such situations it is important that appropriate tests of feasibility and reasonableness are applied to ensure fair and equitable outcomes.

Criteria

DIER has adopted the following target criterion for new roads and major upgrades:

CRITERIA

	Status	Noise level	Application	Comment
New roads and major upgrades	**Target criterion**	**63dB(A)L_{10} 18hr**	DIER will aim to meet a façade level of 63 dB(A) L10 18hr or below for noise sensitive land uses, subject to tests of feasibility and reasonableness.	A road noise level of 63 dB(A) or less is considered to be generally acceptable for most adjacent uses for most people. While an increase of 3dB(A) or less is not likely to be perceived by most people, as levels increase above 63dB(A) impacts become less acceptable to more people.

What does this mean

DIER has adopted a target criterion of 63 dB(A) L_{10} 18hr. Where new roads or major upgrades are expected to exceed this level, DIER will assess the noise impact and evaluate the effectiveness of available management and mitigation measures. DIER will implement measures where they are considered feasible and reasonable.

For planning new and upgraded projects, noise levels are calculated for the expected volume of traffic 10 years after opening. Estimated future noise levels that will not exceed the level of 63 dB(A) L_{10} 18 hr are not normally considered to require noise attenuation measures and would not usually trigger acoustic investigation. Noise levels of 63 dB(A) L_{10} 18hr and above will trigger investigation of the acoustic impact of new and upgrade projects. As increases of less than 3 dB(A) are difficult to reliably identify in fluctuating noise environments, an exceedance of 63 dB(A) by 3 dB(A) or less at a small number of noise sensitive locations would not automatically lead to a presumption that noise levels are generally unacceptable.

Exceeding the target may be tolerated on a case-by-case basis where compliance is undesirable, impractical, not feasible or not cost effective. In the section on Management and Mitigation a range of strategies are described that DIER can employ to manage future noise impacts on new roads or where major upgrades are planned. Strategies range through transport and land-use planning to road design and maintenance.

2.3. Existing roads (where no development is planned)

What are the issues

Noise impacts on existing roads are often the result of incremental increases in traffic volumes or changes in vehicle mix as land use and travel patterns in the vicinity, and the wider community, change over time. Many of these impacts could have been avoided or reduced if better integrated transport and land use planning had been undertaken at the time of construction and during the intervening period. The following table provides a summary of noise issues pertaining to existing roads.

Issues for existing roads where no major projects are planned

	Issue / impact / cause	Description
Existing Roads	Incremental increase in noise	Slow increase in traffic volumes over time can produce higher noise impacts than historic levels. <u>Changes to adjacent land use:</u> • A change in land use to more sensitive uses which do not consider existing or expected noise levels along adjacent corridors can lead to future noise impact issues. <u>New development:</u> • New developments can increase noise levels by increasing traffic or changing traffic conditions • New developments that do not consider existing or expected noise levels along adjacent corridors can lead to future noise impact issues.
	Heavy vehicle noise and individually noisy vehicles	Traffic streams with a higher proportion of heavy vehicles (particularly freight) generally have a greater impact on the noise environment. Noise from a single vehicle that is significantly higher than background noise levels can create disturbance.
	Infrastructure condition	Deterioration of or changes to surface condition or noise amelioration infrastructure can exacerbate noise issues. Different seal types influence the generated noise levels.

Past decisions and actions have resulted in the existing urban form (including transport infrastructure) and shaped the prevalent travel patterns. Retrofitting engineered measures (such as noise walls) around existing land use and infrastructure can be technically difficult and at a high cost for limited perceivable reductions in noise levels. In established residential areas such solutions can impact amenity by being visually intrusive or may present safety and security concerns.

Providing cost-effective noise solutions to these issues will often require a long term strategic approach by road management authorities, planning authorities and land owners and developers

What is generally considered acceptable

For existing roads where no development is planned, DIER considers that a façade noise level of 63 dB(A) L_{10} 18hr provides an appropriate benchmark position. Noise at or

below this level is generally considered acceptable for most adjacent uses. This is consistent with the criterion DIER has adopted for new roads and major upgrades.

A façade noise level of 68dB(A) L_{10} 18hr indicates a point above which noise levels would generally be considered unacceptable for most people for sensitive uses (where design or architectural mitigation measures within property boundaries have not been implemented). Therefore, noise levels above 63 dB(A) and below 68 dB(A) are not necessarily considered as being unacceptable. In any event, in a fluctuating noise environment it is generally difficult to perceive differences of 3 dB(A) or less.

What does this mean

Incremental noise increases

Incremental noise increases along transport corridors are generally driven by growth and development at local and regional levels. Limited options are available to mitigate this type of impact. The preferred approach is through long-term strategies that engage DIER and the State Government, local government, industry and developers and land owners.

Where appropriate, reductions may be achievable through improved planning, design and construction of adjoining land use developments; reducing vehicle emission levels through new vehicle standards; regulation of in service vehicles; greater use of public transport and alternative modes of freight haulage such as rail. Achieving significant reductions in noise levels on existing roads will likely require action from all stakeholders.

DIER does not consider ad hoc provision of noise walls (and similar engineering measures) to be a reasonable approach to managing incremental increases in noise. Where major upgrades are not planned, noise walls are a high cost solution and any potential benefits are only likely to be perceived by a small section of the community. The negative impacts of these measures on adjacent uses can also make them undesirable to the local community.

The section on Management and Mitigation describes a range of strategies that can be employed to manage noise impacts on existing roads.

Heavy vehicle noise and individually noisy vehicles

Heavy vehicles perform an essential function in moving goods around Tasmania. They facilitate the economic life of the State by providing vital links to markets for Tasmanian businesses and making sure that goods reach the industries and communities that rely on them. Managing heavy vehicle noise requires reaching an appropriate balance that allows the provision of essential services while minimising adverse impacts.

Noise impacts can occur on routes that receive larger amounts of heavy vehicle traffic; either through incremental increase over time or generated by new or relocated industry. As in general incremental increases in noise (see above), long term strategies are generally preferred, and it is important that all stakeholders are involved in developing solutions. Integrated transport and land use planning that considers current impacts can effect change over time and priority freight routes can be used to inform future land use decisions. New technology is leading to the production of quieter heavy vehicles and DIER will continue working within the review process for the Australian Design Rules to ensure that these technologies are incorporated.

Individually noisy vehicles often penetrate significantly above ambient levels and can create considerable annoyance, especially at night. Where this disturbance is created by compliant heavy vehicles (often caused by exhaust brakes) DIER actively works with industry to promote considerate driving practices. Exhaust brake regulations and corresponding compliance/enforcement methods have recently been introduced in other

states. DIER will monitor the effectiveness of these programs and consider their future application in Tasmania.

Where individually noisy vehicles are non-compliant, issues are managed through the *Vehicle and Traffic (Vehicle Standards) Regulations 2001.*

Maintenance

Some noise issues can be exacerbated by deterioration in the road surface and can be managed through normal road maintenance programs. For specific issues, consideration of alternative seal types may be appropriate as part of the reseal program.

2.4. Applying the criteria

Assessing noise impacts

Noise measurement and assessment methods are an integral part of implementing any set of noise criteria. Road Transport Noise Guidelines are being developed by DIER to provide assistance and direction relating to the principles, standards and recommendations associated with performance based objectives and desired outcomes. Any noise measurement carried out for the purpose of identifying transport impacts should be made in accordance with the *Noise Measurement Procedures Manual* developed by DPIPWE.

Assessment approach: Determining what is reasonable and feasible

The *EPP (Noise) 2009* recognises that transport systems can affect amenity and environmental quality, but also perform a critical social and economic function (*EPP (Noise) 2009* Part 4 Section 11.1 – see Appendix 2). The Strategy seeks to balance the role our road networks play in supporting industry, business and personal travel needs, with the environmental and social impacts. In this context, the *EPP* requires a focus on "minimising the number of people exposed to noise levels"; and, where noise impacts are acute, reducing impact "by the greatest extent that is reasonably practical" (*EPP (Noise) 2009* Part 4 Section 11.2 – see Appendix 2).

As such, the above criteria represent target standards; it will not be possible to achieve these standards in all situations. Different situations will require different responses depending on the scale and severity of the noise disturbance, and DIER will assess the feasibility and reasonableness of a response on a project by project basis. In determining what is feasible and reasonable, DIER will consider the following.

Feasibility

Feasibility describes how practical, achievable or 'doable' a response is. It considers both individual circumstances, such as the noise source, type of land use affected, role and function of the transport network, and any physical constraints, with broader considerations such as cost and administrative or regulatory frameworks.

The factors that should be considered include:

- The extent to which a measure is effective against the specific kind of transport noise causing the disturbance.
- The cost or scale of the response relative to the severity of the noise (in terms of both noise levels and geographical spread of disturbance).
- Whether the technology is practically available (e.g. machinery to lay open graded asphalt is not always present in Tasmania).

- Whether the legislative and regulatory frameworks provide DIER with the power to act (e.g. DIER is limited in its capacity to address noise impacts of infrastructure projects at locations outside the physical boundaries of a project).

Reasonableness

Reasonableness considers the level of benefit gained proportional to investment and includes an assessment of the social, economic and environmental impacts of an action.

The factors that should be considered include:

- Whether a proposed measure is compatible with the proposed infrastructure or with safety, environmental and other regulations.
- Will people have reasonable protection against future noise increases?
- Will the proposed measures protect the majority of those affected?
- Are the mitigation measures cost-effective relative to the overall project costs and the level of impact?

Best practice environmental management

Under EMPCA, DIER is required to achieve BPEM in its management of road transport noise. In the context of noise, DIER has identified BPEM as being based on the following:

- DIER clearly demonstrates its commitment to achieving the highest possible community and environmental outcomes, while providing the infrastructure that meets industry and community needs.
- There is no significant departure from relevant DIER, state, national or international standards as applied in practice.
- Measures to address noise are informed by and support broader strategic planning frameworks and considerations.
- DIER actively works with stakeholders, including local government and developers, to promote good land use decisions and design adjacent to major transport corridors
- Impacts are minimised through design and mitigation measures that are both feasible and reasonable in the Tasmanian context.
- DIER actively promotes a better understanding and application of BPEM as it relates to transport-related noise across its activities.
- Impacted stakeholders are consulted throughout the process of measuring and addressing noise impacts. Where the impact is significant for individual households, there is close consultation on final design and implementation of any mitigation measures.

2.5. Management and Mitigation – Strategies for minimising road noise impacts

The approaches to transport noise management under this Strategy are covered by the two focus areas – Vehicle and Non-vehicle. Each focus area covers a range of measures.

Targeting one aspect will not be as effective as combined action that targets vehicle and non-vehicle approaches. Direct action can be effective for specific projects; long-term strategies that involve all stakeholders will deliver more significant benefits to more people, over time.

Vehicle approaches

Road based passenger and freight vehicles are the main source of transport noise in Tasmania. Noise from a vehicle's engine, transmission, exhaust, chassis and road/tyre interaction are all factors that influence the acoustic environment. Other factors influencing sound generation and impact are overall traffic volumes, the mix of vehicle types and individually noisy vehicles.

Vehicle noise is influenced by the design parameters of the vehicle, the age and general repair of the vehicle and the way it is driven. Design and technology innovations are making quieter vehicles. Regulatory frameworks and standards encourage the uptake of new technologies and influence behaviour to reduce noise. Because road/tyre interaction is also a factor of noise generation, pavement type and general maintenance need to be considered.

Traffic volumes in Tasmania are comparatively light when compared to similar environments in other states. However, passenger and freight traffic has been increasing on many roads, with a corresponding increase in noise impacts in some urban areas. Traffic management and travel demand management can be used to influence travel patterns and driving behaviour with potential benefits to the noise environment.

Vehicle mix within a stream of traffic also has an impact on the noise environment and how this impacts on people. Corridors that experience higher levels of heavy freight will often have higher noise levels than corridors that cater predominantly to passenger traffic. Heavy vehicles will have increased engine noise, more noise coming from movement in the chassis and rig and noise from engine brakes. The Tasmanian State Road Hierarchy and priority freight routes provide avenues for promoting routes that will create less noise issues.

Isolated verses general traffic noise. With comparatively low traffic volumes in Tasmania, the background noise level created by transport movements is well below acceptable maximum levels in many areas. However, many instances of noise disturbance in Tasmania are caused not by general traffic conditions, but by individually noisy vehicles that create a noise significantly above background levels. Design rules on new vehicles and regulations for in-service vehicles provide avenues for managing this type of noise issue. In these situations, the disturbance can be related more to how loud the intrusion is above background levels rather than the specific noise level of the intrusion. Noisy vehicle detection programs have been used to target specific issues and locations in Tasmania and specific exhaust brake standards and regulations are being introduced in other states.

Desired Outcomes

- Noise levels generated by vehicles in urban areas are managed to minimise impacts on adjacent sensitive land uses.
- Regulatory frameworks are continually updated to reflect new technology, planning and enforcement measures.
- Analysis and data are used to inform the planning and management of strategic freight corridors.

Strategies

FOCUS	CONTEXT	NOISE MANAGEMENT OPTIONS	DIER
National policy	A National Transport Policy Framework is being	Participation in relevant national	DIER will continue its involvement in national noise

FOCUS	CONTEXT	NOISE MANAGEMENT OPTIONS	DIER
	proposed by states to provide a consistent and co-ordinated approach to major national transport policy issues. The Framework will inform State policy development, including in relation to the environmental impacts of transport. The Commonwealth is responsible for developing Australian Design Rules (ADRs), which include rules to limit vehicle noise. Research into other noise issues is on-going between the Commonwealth and states.	policy initiatives Involvement in the development of regulations that target specific issues Lower vehicle noise limits Lower tyre noise limits	initiatives, focusing on the development of common policy frameworks for noise, initiatives to better plan transport networks and national standards and regulations governing vehicle noise.
Regulations and standards Compliance and enforcement	Where standards and regulations exist, processes to encourage and enforce compliance are required. National standards are currently in place to provide maximum allowable noise levels (ADRs). Standards and model laws that target exhaust brake noise on in-service vehicles have been developed by the National Transport Commission and are currently being implemented in NSW and Victoria	Industry and community consultation Noisy vehicle detection programs Noise cameras	DIER will continue to liaise with industry to promote voluntary compliance to reduce impacts from individual noisy freight vehicles. DIER will continue current enforcement programs as resourcing allows. DIER will monitor programs being implemented in other states and consider their application in Tasmania where appropriate.
Managing travel demand: the Tasmanian Urban Passenger Transport Framework	The Tasmanian Urban Passenger Transport Framework identifies a wide range of measures to better manage travel demand and influence travel choice. Initiatives include high frequency bus corridors, park and ride facilities and improved walking and cycling infrastructure. Providing people with alternative options to car trips is an important part	High frequency bus corridors Park and ride facilities Walking and cycling infrastructure General travel behaviour initiatives Regional integrated transport plans Integrated land use and transport planning	DIER will progressively implement strategies in the Tasmanian Urban Passenger Transport Framework that aim to better manage travel demand, provide modal alternatives and influence mode choice. DIER will continue to work with local government to better integrate land use and transport planning, including the development and review of regional integrated transport plans.

FOCUS	CONTEXT	NOISE MANAGEMENT OPTIONS	DIER
	of managing urban traffic volumes.		
Managing freight transport: transport and corridor planning	How, where and when trucks access the road network can influence noise impacts. Maintaining a hierarchy and employing mechanisms to promote particular routes can reduce impacts in other areas.	Tasmanian Freight Strategy Regional integrated transport plans Regular reviews of the Tasmanian State Road Hierarchy Priority Freight Routes High Productivity Vehicle (HPV) and Higher Mass Limit (HML) routes	DIER is developing a Tasmanian Freight Strategy, which will provide direction for planning of the freight system and of major freight supply chains, over the long term. DIER will continue to periodically review its regional integrated transport plans and the Tasmanian State Road Hierarchy.
Traffic management	Reducing noise through traffic management covers a range of measures, from controlling vehicle speeds to maintaining steady traffic flows. Implementation covers both infrastructure and non-infrastructure initiatives.	Physical infrastructure • Traffic signals • Roundabouts • Chicanes • Signage	In managing specific noise issues, DIER will consider the use of traffic management options and implement where effective, feasible and reasonable. DIER will consider noise issues during all aspects of infrastructure development.
Infrastructure provision and maintenance	Interaction between vehicle and road surface adds to generated noise. In higher speed environments this is the prevailing noise. Maintenance programs can target sections of road where noise impacts are caused by deterioration of the road surface. Road seal also affects noise generation. Quieter seal types can be considered when resealing.	Planning and design for new roads and major upgrades Maintenance program Reseal program	DIER will develop and implement processes to ensure that potential vehicle noise impacts and current issues are considered during maintenance and reseal programs. DIER will develop guidelines to promote best practice management of noise issues in the planning, design and delivery of transport infrastructure and the ongoing maintenance.

Applying the strategies:

	Issue / impact / cause	Application
Existing Roads	Incremental noise increase	All strategies that aim to reduce noise emissions at the source will aid management of the noise environment on existing roads. On strategic freight and high-volume passenger routes, the progressive

		improvement of the road to minimise noise issues, is appropriate. National and State policies will provide the framework in which to apply regulatory mechanisms that can be used to restrict noise at the source and enforce compliance.
	Heavy vehicle noise and Individually noisy vehicles	Strategies that reduce noise emission levels from vehicles or provide regulatory frameworks to target individually noisy vehicles will significantly reduce the incidence of individually noisy vehicles. The *Vehicle and Traffic (Vehicle Standards) Regulations 2001* provide powers to deal with individually noisy vehicles that exceed ADR levels by a specific level.
	Infrastructure condition	Maintenance programs will need to consider the effects of infrastructure condition and reseal type on the generation of vehicle noise.
New roads and upgrade works	New roads	All strategies that aim to reduce noise emissions at the source will aid management of the noise environment on new roads or where major upgrades are undertaken that increase capacity and volumes. Design parameters that directly influence noise generation, including aspects of traffic management and seal selection, need to be considered early in the planning and design phase of new projects.
	Major upgrades	As tyre/road interaction is a major component of noise generation, the choice of surface can significantly reduce or increase noise impacts. Seal selection needs to be considered in the planning and design phases of any new project or upgrade work. Traffic management changes have the potential to either reduce or increase noise impacts. The impact of traffic flow and speed needs to be considered in the planning and design process for new road projects and upgrade works.

Non-vehicle approaches

Non-vehicle approaches to noise mitigation are interventions that either separate the noise generating activity from sensitive land uses (using land use transport planning initiatives) or by interfering with the sound waves as they travel through the air (usually through an infrastructure solution).

Land use and transport planning – how individuals and communities are affected by transport noise depends on how land adjacent to transport corridors is used. By better integrating land use and transport planning we can mitigate the impact of transport noise on sensitive uses, such as residential areas, schools and hospitals, while maintaining the function of critical transport infrastructure. Improved integrated transport and land-use planning can be used to avoid transport noise issues and can also provide solutions to existing issues by changing land-uses over time.

Building siting and design – Dwellings with narrow setbacks from busy roads, poorly insulated buildings or sleeping areas on the road side of a house can all exacerbate noise impacts. Appropriate siting and design of buildings adjacent to transport corridors can minimise or reduce noise levels significantly. Architectural treatments and landscaping can provide relief from transport noise for dwellings where an issue currently exists and new structures can incorporate noise smart concepts into the design from the beginning.

Infrastructure – Infrastructure solutions provide a more immediate solution to noise issues where cost and feasibility allow. However, on established roads they can be difficult due to the technical and financial constraints associated with retrofitting and the potential adverse effects on other values.

Consideration of design parameters for the alignment and construction (including the construction of specific noise amelioration measures) of new roads or for planned improvements to existing roads provide avenues to minimise or reduce noise levels. Externalities such as noise impacts need to be factored into the construction and life cycle costs of infrastructure. Design and surface treatments need to be considered in road planning and construction.

Desired Outcomes

- Planned and future land use and developments are matched to existing or planned transport infrastructure and services to avoid the development of sensitive uses on adjacent land or with inappropriate setbacks from major road infrastructure.
- Development controls are used to enable appropriate development to take place adjacent to high volume corridors and freight routes.
- Key transport sites and corridors are identified and protected to avoid encroachment from sensitive uses.
- Infrastructure measures to mitigate noise issues are used where they offer the most appropriate solution and provide the maximum benefit.

Strategies

FOCUS	CONTEXT	NOISE MANAGEMENT OPTIONS	DIER
Strategic land use and transport planning	Improved integration of land use and transport planning can promote appropriate uses adjacent to major freight and passenger corridors. Over the long term land use planning can reduce conflict by supporting a change in land uses over time.	Regional integrated transport and land use plans Appropriate zoning adjacent to transport corridors Strategic corridor planning	DIER will continue to work with local government to develop, implement and revise regional integrated transport plans. DIER will work with local government to prepare corridor plans for strategic corridors, as required. DIER is working with local government and regional authorities to develop regional land use frameworks and new planning schemes. DIER will work with local government and developers to implement the principles of integrated land use and transport planning as these relate to noise.
Planning schemes and development controls	Zoning provides a site specific opportunity to influence adjacent land use, assisting to mitigate the effects of transport systems on sensitive uses. Via planning schemes, local government can apply appropriate zoning and/or setbacks adjacent to	Promote appropriate zoning adjacent to major transport corridors Set backs Quiet house design Landscaping	DIER is developing a Road and Rail Asset Schedule for planning schemes, which includes appropriate setbacks from high volume freight routes. In assessing and providing advice on developments, DIER will promote the use of noise-smart design that

FOCUS	CONTEXT	NOISE MANAGEMENT OPTIONS	DIER
	noisier, high use corridors. Development controls can ensure appropriate siting and design to avoid potential noise issues.		considers siting, layout, design and materials to minimise noise impacts for occupants.
Planning and design phases of new projects and upgrade works	The physical characteristics of a road have the potential to influence the speed profile of vehicles. Judicious use of topographical features within the design can provide opportunities to deflect or shield sensitive use areas from traffic noise. Traditionally, noise mounds and fences have been the usual means of achieving noise attenuation. They are at their most effective when they can be located close to the source or close to the receiver. Noise walls have the potential to provide a 5-20 dB(A) reduction in noise levels. However, in most cases they give only a 5-10 dB(A) reduction. This may be insufficient in some cases to prevent disturbance.	Route selection Road alignment Pavement design Cuttings / embankments Design speed Gradient Noise barriers / mounds	DIER will evaluate potential noise issues during the planning and design phases of new projects and upgrade works, and implement infrastructure solutions when appropriate. For existing roads: • Where complaints and investigations indicate the problem is at a level that can be regarded as acute and unacceptable, DIER will investigate the severity of the noise issue and identify possible solutions commensurate with the scale of the problem. For new roads and upgrade projects: • DIER will model the projected noise levels for all major works (new roads and significant upgrades). • Where noise levels are expected to be above 63 dB(A) L_{10} 18 hr within 10 years of construction DIER will evaluate the reasonableness and feasibility of infrastructure solutions and implement these where appropriate. DIER will develop guidelines to promote best practice management of noise issues in the planning, design and delivery of transport infrastructure and the ongoing maintenance.

Applying the strategies:

	Issue / impact / cause	Application
Existing Roads	Incremental increase	Managing transport noise along major road corridors needs to consider adjacent land uses. Some land uses (e.g. residential housing or educational facilities) are generally not appropriate along busier corridors or freight routes and should be discouraged to avoid future conflicts. While a long-term action, land use planning can promote a change in use over time to provide a more compatible land use-transport relationship along key corridors. Local government, developers and land owners should encourage and implement good noise mitigation measures in their planning and design.
	New developments	Protecting the efficiency and safety of major road corridors carrying high traffic volumes is essential. It requires an integrated approach to transport and land use planning to ensure strategic and statutory processes support protection of the corridor and promote appropriate adjacent land uses. Local government can actively support the safe and efficient corridors through planning schemes, zoning and specific development controls that prescribe minimum set backs and encourage noise-smart design, siting and layout. With suitable siting, layout and building design, proponents should be able to demonstrate an ability to achieve interior and external living noise levels consistent with WHO guidelines and Australian Standards. Measures may include: • Earthworks. • Building orientation. • Noise absorbent/reflective building materials. • Noise barriers.
	Heavy vehicle noise and individually noisy vehicles	Where noise is generated through high traffic volumes or significant freight movements, corridor planning and zoning can provide solutions.
New Roads and upgrade works	New roads	Where new roads are planned, it is important to consider current land uses and the impact that any changes will have. This should include a measure of the noise impact and the proposed mitigation measures.
	Major upgrades	As for new roads, with major upgrades it is important to consider current land uses and the impact that any changes will have. Where significant upgrade works increase capacity there is potential for increased noise impacts. Noise modelling can provide an indication of likely impacts and mitigation measures can be considered based on projected noise levels.

2.6. Noise monitoring and measurement

Monitoring

The *EPP (Noise) 2009* requires monitoring and impact studies to be undertaken where possible and appropriate, to ensure noise emissions are being managed in accordance with relevant legislation or approvals. The *EPP* provides broad guidelines for noise monitoring and measurement:

- Noise Monitoring – in cases where transport infrastructure is a significant source of sound; and
- Noise Impact Study – if there are reasonable grounds to consider that existing or proposed noise emissions might prejudice the protection of environmental values.

Where a noise impact study is carried out, it should consider –

- Noise levels at appropriate locations compared with noise limits applicable to the activity in any legislation, approval or proposed approval;
- Compliance with any other relevant legislative requirements or approvals;
- The potential for reducing the impact of the activity's noise emissions or proposed emissions on the acoustic environment; and
- The cumulative effect of the noise emissions or proposed emissions from the activity.

DIER will measure, model and monitor noise impacts for new roads and major upgrades where the target criterion is expected to be exceeded if no mitigation measures are implemented. DIER will not generally monitor noise impacts on existing roads.

Complaints

Complaints about noise impacts provide information about the location and extent of issues. DIER will evaluate current complaints processes and develop new processes (where required) that will help to define the extent of impacts, ensure appropriate consideration of issues and inform prioritisation of monitoring and management.

2.7. Strategy implementation and review

Following endorsement by the Secretary of the Department of Infrastructure Energy and Resources, the State Road Noise Strategy is to be implemented through the appropriate operational business units within the department.

The Strategy will be reviewed after five years to determine its effectiveness in meeting the objectives. The review will consider the effectiveness of the Strategy and the Guidelines and the suitability of new interstate and international developments in the area of road noise management

Appendix 1 – Noise management options: how do they work?

The Noise Strategy targets vehicle and non-vehicle responses to manage noise impacts. Vehicle responses target noise at the source, where as non-vehicle responses function either between the source and the receiver or at the receiver.

1. At the source:
    - Limiting noise through quieter vehicles
    - Driver behaviour, road design, road management
    - Road surfaces
2. Between source and receiver:
    - Absorbent/reflective barriers
    - Increased distance between source and receiver; or
3. At the receiver:
    - Barriers
    - Quiet design
    - Insulation

None of these measures alone are as effective as action on all three. For example, noise standards for new vehicles have been improved periodically over the past thirty years but the number of people exposed to disturbing noise levels appears to have remained high through increases in traffic volumes. No single measure alone can solve transport noise problems. Co-ordinated action by everyone concerned is the best option to minimise the impact.

Source Measures

Standards and regulations

- *ADRs*

  The *Motor Vehicle Standards Act 1989* authorises the setting of national standards for road vehicles called Australian Design Rules (ADRs).

  Design requirements controlling noise outputs from new vehicles are specified through the Australian Design Rules (ADR). The ADR relating specifically to noise is ADR83/00 External Noise.

  The development of the ADRs continues as part of a normal program of review and revision by the Commonwealth Government. The program includes monitoring international developments and involves regular consultation with key stakeholders.

  Standards for noise emissions from new vehicles have been lowered regularly in recent times and the achievement of the objectives of this Strategy depends in part upon further improvements being implemented.

- *Vehicle and Traffic (Vehicle Standards) Regulations 2001*

  The *Vehicle and Traffic (Vehicle Standards) Regulations 2001* provides that a road vehicle must either:

  a) For vehicles prior to 2004 – not exceed the levels specified in the regulations for the type and year of vehicle; or

b) For vehicles certified to ADR83/00 – not exceed the noise level specified in the ADR, for the type and year of vehicle, by more than 5dB.

- Other regulatory options
  - *Exhaust brake regulation and compliance*

    Standards and model laws that target exhaust brake noise on in-service vehicles have been developed by the National Transport Commission and are currently being implemented in New South Wales and Victoria.

  - *Truck Curfews*

    May be possible if alternatives routes exist that are not noise sensitive, but may otherwise be regarded as 'anti-competitive' and is generally considered to be an undesirable approach to traffic management.

Surface management

The three major sources of road traffic noise for passenger cars travelling at moderate speeds are the engine and drive train, the exhaust system and the tyre/ road interaction. The tyre/road noise interaction becomes increasingly dominant at higher speeds. Tyre/road noise is considered the dominant factor above the following speeds:

- 50 km/h for passenger vehicles;
- 80 km/h for trucks.

Key noise factors are summarised in the text box (right).

Noise Factor	Comment
Vehicle speed	Noise level is proportional to speed. A doubling in speed equates to a 9-12 dB(A) noise increase depending on tyre and road characteristics.
Road surface texture	Road surface type is the major influence on tyre/road noise with variation in the range of –4 to +4 dB(A) relative to dense graded asphalt.
Tyre type	Noise level differences up to 10 dB(A) have been identified depending on tyre type. Key parameters are: o rim dimension (increased diameter decreases noise) o tyre section width (increased width increases noise) o tread pattern, width and depth

The quietest road surface available is open graded asphalt and is typically used for urban freeways and arterial roads. The construction quality and age will affect noise performance over time. While the choice of surface type effects noise levels, decisions require analysis of other factors including safety issues and financial constraints.

Behavioural

Driver behaviour influences noise generation. Speed reduction, traffic calming and signage are three key avenues for effecting noise control through behaviour change.

- *Reducing traffic speed*

  A reduction of 10-20km/h can reduce L_{eq} levels by 1-2 dB(A). As part of a suite of measures this can provide a significant component while having only a small impact on overall travel times.

- *Traffic calming devices and smooth traffic flows*

  Traffic calming is a measure appropriate for local and collector roads. Arterial roads and freeways are intended for faster speeds and calming devices should not be used to impede this function.

  Physical traffic calming techniques, for example roundabouts, chicanes and speed humps, can effectively be used to reduce speeds and hence noise levels. However,

contributing factors that may interfere with efforts at noise reduction should be taken into account. For example:

- Increased noise through braking/swerving/acceleration.
- Vehicle body noise over humps (particularly larger vehicles – a 30mm increase can produce an equivalent noise increase to being 40m closer to the source).
- Contrasting pavement textures can increase road/tyre noise.

- *Signage*

  There are currently no regulations controlling the use of engine brakes in particular areas or at specific times. Driver education and signage targeting specific areas can impact on driver behaviour to reduce single incident noise issues.

- *Industry Self Regulation*

  In Tasmania, noise complaints associated with road freight are a significant proportion of all complaints received. This is due, in part, to individual noisy events 'emergent' above the background noise levels.

  Peak industry bodies are well placed to work with their members to develop and adopt codes of practice for considerate behaviour and to promote industry management of complaints.

  DIER will liaise with and encourage the freight transport industries to adopt codes of practice for considerate driver behaviour and industry management of complaints.

Measures between source and receiver

Noise Barriers

Traditionally noise mounds and fences have the usual means of achieving noise attenuation. They are at their most effective when they can be located close to the source or close to the receiver. Noise walls have the potential to provide 5-20 dB(A) reductions in noise levels, however in most cases only give 5-10 dB(A) reduction. This may be insufficient in some cases to prevent disturbance.

Noise barriers may offer part of the solution for high traffic routes but should not be considered in isolation. Planning, behavioural and design solutions may prove more salient for specific sites or work in conjunction with noise barriers to achieve better results than barriers alone. Considering other options has the potential to reduce project costs.

Measures at Receiver

When considering new developments, effective planning and building design can provide significant screening from traffic noise and provide appropriate noise levels for a healthy living environment.

Site planning

- Set backs

Set backs reduce the level of noise at the receiver by enforcing a minimum distance between source and receiver. A doubling of distance from a line noise source can reduce the noise level by around 3 dB(A).

- Use of built form

A combination of good urban design and appropriate building design can be used to good effect in greenfield and brownfield developments. Appropriately designed buildings (see below) can be used as a noise barrier for other sections of the development.

- Use of natural features

The topography may offer natural features that, with appropriate siting may offer significant noise level reductions.

- Noise mounds or walls

Judicious use of cut and fill to create mounds and/or installing walls may offer opportunities for landscaping that provides a sufficient barrier to traffic noise. As the use of noise walls and mounds is not always feasible in the road reserve, works within the property boundary may provide a cost effective solution. On site landscaping also provides an option for developers required to meet specific noise requirements by local authorities.

Acoustic treatments – Quiet House Design

Improved protection from disturbance by transport noise inside the house can be achieved by the application of "Quiet House" design guidelines to new buildings. Many of the measures are cost effective because they will also significantly reduce heating and cooling costs. Examples of Quiet House design:

- Locate bedrooms on the side of the house away from the noise source;
- Locate noise insensitive rooms closest to the noise source;
- Consider locating ancillary structures such as garages, sheds, enclosed courtyards, air locks and clerestory rooms as buffers to the noise source
- Use noise-insulating construction for external walls. Walls with significant thermal mass would normally be preferred;
- Use solid core external doors with seals;
- Provide generous roof and ceiling insulation;
- Seal and insulate eaves and floor walls to subfloor areas;
- Use thicker glass than normal, or laminated glass or double glazing in windows facing the noise source;
- For opening windows, it is recommended that casement sashes be designed to use compressible acoustic seals;
- In extreme cases, ventilation should be ducted from the quiet side of the house.
- Use walls and garden structures to reduce noise levels in outdoor areas.

Appendix 2 – Environmental Protection Policy (Noise) 2009

The following excerpt is taken from the *Environmental Protection policy (Noise) 2009* (EPP) and provides the basis and direction for the DIER State Road Noise Strategy

PART 4 – TRANSPORT INFRASTRUCTURE

Public roads, railways, ports and airports

11. **(1)** It is recognised that although the operation or use of public roads, railways, ports or airports may prejudice protection of the environmental values, the function the transport network serves is necessary for the community's economic, environmental and social wellbeing.

(2) Notwithstanding sub-clause (1), it is intended that –

(a) transport planning initiatives for freight and passenger movement and new transport infrastructure be developed in a systematic way to achieve an optimal balance of economic, environmental and social benefits and costs with a major criterion of minimising the number of people exposed to noise levels that would prejudice protection of the environmental values; and

(b) where environmental values are acutely prejudiced, existing transport infrastructure noise should be reduced to the greatest extent that is reasonably practical, consistent with achieving an optimal balance of economic, environmental and social benefits and costs.

(3) The allocation of any public resources to minimise noise impacts resulting from public roads, railways, ports or airports shall aim to achieve the most benefit for the greatest number of people exposed to those impacts.

(4) A transport noise strategy will be developed to improve transport noise outcomes, further the objectives of the Act and assist in implementation of subclauses (2) and (3).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