



Roads ACT Noise Management Guidelines

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Contents

1.	Background.....	4
2.	Scope	4
3.	Traffic Noise.....	4
4.	New Developments on Existing Roads.....	5
Table 1.1	Noise Sensitive Land Uses	5
Table 1.2	Maximum external traffic noise level (Target level) at the development, expressed as LAeq dB(A)	6
Schedule 1	Guidelines for new developments on existing roads.....	6
5.	Development of New Roads in New Areas	6
Schedule 2	Guidelines for new roads in new areas.....	7
6.	Development of New Roads in Existing Areas.....	7
7.	Upgrading Existing Roads in Existing Areas.....	8
Table 1.3	Traffic noise levels resulting from upgraded roads in existing areas of noise sensitive land use, expressed as LAeq dB(A) Daytime, Ground Level.....	8
Schedule 3	Guidelines for upgraded roads in existing areas.....	8
8.	Noise Management on Existing Roads in Existing Areas.....	9
9.	Noise Mitigation	10
	The reduction of road traffic noise through the initial fitting of, or the retrofitting of noise mitigation measures may include any one of or a mixture of the following;.....	10
10	Maintenance Issues.....	10
11	Compression braking from heavy vehicles	10
12	Reference.....	10
13	Definitions of terms used to describe traffic noise.....	11
14	Cost-Effectiveness Analysis.....	11

Purpose

This document provides guidance about the management of road traffic noise. It sets out a framework for assessing the impacts of road traffic noise for land uses sensitive to noise intrusion.

1. Background

Roads ACT understands that road traffic noise can be a significant environmental problem, particularly in residential areas adjacent to major collector and arterial roads where traffic volumes and speeds are higher.

Excessive road traffic noise can impact on the health and wellbeing of residents. Everyone has a different perception of noise and has a different threshold of what is an acceptable noise level. This guideline has adopted target and maximum noise levels which aim to be consistent with previous noise management policy in the ACT and nationally recognized acceptable noise levels.

Roads ACT is committed to limiting the impacts of road traffic noise where it is reasonable and practicable to do so, through the use of good planning and design practices, the provision of adequate separation, use of quieter road pavement surfacing and other noise mitigation measures such as noise reduction barriers. The overall level of traffic noise reduction achieved may be impacted by vehicles that produce excessive noise via amplified music, modified engines or other short term traffic noise. Noise from these sources (as they are generally not constant) may still exceed the target noise level after the installation of noise reduction methods.

2. Scope

This guideline addresses four situations that require careful consideration of traffic noise impacts:

- New developments on existing roads
- Development of new roads in new areas
- Upgrading of existing roads or construction of new roads in existing areas.
- Existing roads in established developments

3. Traffic Noise

Roads ACT has adopted a measure of noise referred to as the L_{AeqT} against which to assess traffic noise levels. Traffic noise in itself depends on a number of factors including;

- Traffic volume, speed and the number of heavy vehicles
- Gradient of the road
- Distance from the road
- Structures such as noise barriers or other buildings

Facts relating to traffic noise

- Doubling of the traffic volume increases traffic noise by approximately 3dB if the traffic speed is unchanged.
- Doubling the setback distance from the road reduces traffic noise by 3 to 5dB.
- An increase of 10dB doubles the perceived loudness of noise.
- An increase of 5dB is where most people will start to be aware of a difference.
- Reducing traffic speed from 100km/h to 80km/h reduces noise by approximately 1.5dB if the traffic volume and composition remains unchanged.

4. New Developments on Existing Roads

Proposed noise sensitive developments (refer to Table 1.1) located adjacent to arterial or major collector roads are to be planned, designed and constructed to standards that provide: external noise levels based on the existing conditions at the receiver below the maximum levels set out in Table 1.2, or; internal noise levels that meet the Australian Standard AS 2170.

Proposals for development of potentially noise sensitive land uses (refer to Table 1.1) adjacent to any existing arterial or major collector road will require an assessment against Table 1.2, guidelines contained in the table Schedule 1 provide guidance on achieving this.

In this case "adjacent" refers not only to developments for which the front facade faces these roads but also to situations where these roads pass by the side or rear boundaries of a block.

For dual occupancy developments, the nearest facade to the road which is the main source of traffic noise will be assumed to address that road, irrespective of whether or not the dual occupancy development has direct access to that road. In these cases the side and rear fences should be designed to provide noise reduction.

There are three practical methods for reducing traffic noise to acceptable levels. These are:

- adequately separating sensitive receivers from roads (using set-back requirements as per the Territory Plan or buffer strips),
- the construction of noise mounds or other noise attenuation structures either on-site or if supported by Roads ACT as approved off-site works between roads and adjacent buildings, and
- including acoustic features in the building structure (double glazed windows, solid core doors, roof and wall insulation etc) and planning the development to have less noise sensitive rooms on the noisy side.

Table 1.1 Noise Sensitive Land Uses

Development Type	
Residential	Community
apartment	child care centre
attached house	community activity centre (except community halls)
boarding house	educational establishment
caravan park/camping ground	health facility/ hospital
detached house	special dwelling
guest house	
retirement complex	
special care establishment	
special care hostel	

Table 1.2 Maximum external traffic noise level (Target level) at the development, expressed as LAeq dB(A)

Land uses	Target noise level ¹
residential and community facilities (from Table 1.1) daytime LAeq (15 hour) dB(A)	60
Residential Nighttime LAeq (9 hour) dB(A) ¹	55
commercial facilities	72

Notes:

1. The acceptable traffic noise levels incorporate an allowance for reflection from the facade of the building under investigation. Measurements and predictions should be taken at one metre forward of the building facade. In cases where the building is not yet built, measurements should be taken at a distance of one metre in front of the proposed building facade, and 2.5 dB(A) added to the measurement to allow for future facade reflection. Measurements should be taken at a height of 1.2 - 1.5 metres above ground level or the known floor level.

2. Note that, for second and subsequent levels of a building, additional set-back distance is required to achieve the required criterion value in the table owing to the reduction in the sound energy from ground attenuation over soft ground. A combination of set-back distance and other measures (e.g. use of appropriate insulating materials in construction) to meet the guideline requirements.

Schedule 1 Guidelines for new developments on existing roads

Objective	Technique	Criteria
To protect occupants of developments from excessive levels of traffic noise	set-back of the building from the road	} maximum external traffic noise level at the development, as set out in Table 1.2
	AND/OR	
	acoustic barrier between the building and the road (within the lessee land)	} OR internal noise levels as set out in AS 2107 and AS/NZS 3671
	OR building design measures to provide acoustic insulation	

With all new development adjacent to an existing road it is the developers responsibility to meet the requirements of noise mitigation through building design and noise mitigation measures within the lease land and/or as approved off-site works.

5. Development of New Roads in New Areas

Proposed new arterial and major collector roads in greenfield sites must be cognizant of potential land use development on adjacent blocks. These roads are to be planned, designed and constructed to standards that facilitate the development of future land uses to achieve noise levels at the future receiver below the maximum levels set out in Table 1.2.

When planning new roads in greenfield areas, the final land use adjacent to the roads may not be fully known, although land use policy area boundaries may already be determined.

To assist with the compliance of future developments with these noise guidelines, care

should be taken to see that the layout of the roads and blocks ensures the noise levels (as set out in Table 1.2) at the minimum set-back distances required under the Territory Plan building and site controls, can be met. When noise modelling the noise level should be taken as that at one metre forward of the minimum allowable set-back with 2.5dB(A) added to the modeled level to allow for future facade reflection (in the case of buildings). For greenfield developments the obligation to provide noise mitigation rests with the developer. All required measures should be incorporated in the initial design and construction.

Proposals for new roads in greenfield areas are required to meet the planning requirements as set out in the Territory Plan. Developers should work with the planning authority to ensure that the guidelines contained in Schedule 2 are met.

In general, the traffic volumes to be used in determining the likely level of traffic noise at any particular location will be the long-term traffic forecasts produced by the Environment and Planning Directorate (EPD) Major Projects and Transport Unit in the Strategic Planning Division. Forecast traffic models for the arterial and major collector roads are available for the census years 2016, 2021 and 2026 and for the long term 2031 and 2041.

Schedule 2 Guidelines for new roads in new areas

Objective	Technique	Criteria
To protect future occupants of new areas from excessive levels of traffic noise	set-back of buildings from the road AND/OR acoustic barrier between buildings and the road AND/OR building design measures to provide appropriate internal noise levels in accordance with AS 2107	maximum traffic noise levels, as set out in Table 1.2, measured at one metre forward of the minimum setbacks required under the Territory Plan, and based on the predicted traffic volumes* when the area is completely developed.

6. Development of New Roads in Existing Areas

Proposed new arterial and major collector roads in established development areas must be cognizant of existing and potential development on adjacent blocks. These roads are to be planned, designed and constructed to standards to achieve noise levels at the receiver below the maximum levels set out in Table 1.2.

Proposals for new roads in existing areas will be treated in the same way as proposals for new roads in new areas (i.e. the criteria in Table 1.2 apply in respect of noise-sensitive land uses listed in Table 1.1 which will be affected by such a new road).

Note: A new road is a road placed into an area that was designed or planned to have a road that presently is without one, such as the proposed Nudurr Drive extension. A new road does not comprise of new road lane/s to an existing road such as the Gundaroo Drive duplication, this is a road upgrade.

7. Upgrading Existing Roads in Existing Areas

Proposed upgrades of arterial and major collector roads in established development areas must consider noise impacts on adjacent blocks. Road upgrades should be planned, designed and constructed to achieve noise levels at the receiver below the maximum levels set out in Table 1.3.

Proposals for upgraded roads in existing noise sensitive developed areas will require an assessment against the guidelines contained in Schedule 3.

Future traffic forecasts from the Environment and Planning Directorate's Major Projects and Transport Unit should be obtained before an estimate of future traffic noise levels is made (see Section 3.2 above).

Table 1.3 Traffic noise levels resulting from upgraded roads in existing areas of noise sensitive land use, expressed as L_{Aeq} dB(A) Daytime, Ground Level.

Existing traffic noise level at adjacent buildings ¹	Traffic noise level at adjacent buildings after road works completed
> 60	equal to existing level (Not greater than 65)
55 - 60	60
< 55	not more than 5 dB(A) above existing level

Notes:

1. The traffic noise levels incorporate an allowance for reflection from the facade of the building under investigation. Measurements should be taken at one metre forward of the building facade. In cases where the building is not yet constructed, measurements should be taken at a distance of one metre in front of the proposed building facade, or one metre forward of the minimum set-backs required under the Territory Plan, and 2.5 dB(A) added to the measurement to allow for future facade reflection. Measurements should be taken at a height of 1.2 - 1.5 metres above ground level.

Schedule 3 Guidelines for upgraded roads in existing areas

Objective	Technique	Criteria
To protect residents of existing areas from excessive increases in levels of traffic noise	acoustic barrier between buildings and the road AND/OR acoustic treatment of existing buildings	traffic noise levels as set out in Table 1.3 measured at adjacent noise- sensitive land uses and based on the predicted maximum traffic flow* on the new or upgraded road.

* Long-term traffic forecasts are available from EPD's Major Projects and Transport Unit.

8. Noise Management on Exiting Roads in Existing Areas

Roads ACT will investigate complaints from the public regarding traffic related noise issues. Existing roads and estates will be assumed to have been planned, designed and constructed to achieve noise levels at the receiver below the maximum levels set out in Table 1.4.

However, Roads ACT will investigate what strategies can be adopted to assist in noise mitigation if traffic noise is 5dB or greater than the residential target noise level set out in Table 1.4

Table 1.4 Target traffic noise levels for noise sensitive land use in existing areas, expressed as L_{Aeq} dB(A).

Situation	Traffic noise level at adjacent buildings
Target level $L_{Aeq(15 \text{ hour})}$ dB(A) estates established prior to 1996	63
Target level $L_{Aeq(15 \text{ hour})}$ dB(A) estates established after 1996	60
Nighttime $L_{Aeq(9 \text{ hour})}$ dB(A) Target level – estates established prior 1996	58
Nighttime $L_{Aeq(9 \text{ hour})}$ dB(A) Target level – estates established after to 1996	55
Target level $L_{Aeq(15 \text{ hour})}$ dB(A) commercial facilities	72

Noise complaint investigations will usually include the following steps:

1. **Identifying relevant target noise level.**
2. **Review of previous traffic noise studies:-** If noise levels from previous studies on the same road section (i.e. sections having similar traffic volumes, speeds and composition) demonstrates that traffic noise is 3dB or less above the *target level* (refer to Table 1.4) then no further action will be taken. Customer should be advised to seek the services of an acoustics engineering specialist for measures they can apply to their home to reduce traffic noise intrusion.
3. **Desktop assessment:-** if there are no traffic noise studies, then a desk study should be undertaken. If the estimated noise level is greater than 5dB above the target noise level then noise monitoring should be considered.
4. **Noise monitoring:-** if required noise monitoring should be undertaken by a competent and experienced contractor. The site for noise monitoring should be selected on the basis that it represents the location of noise sensitive rooms within the house such as bedrooms and whether the property frontage on the road section likely to be experiencing the highest levels of traffic noise. Traffic volumes and speeds may also need to be collected.

9. Noise Mitigation

The reduction of road traffic noise through the initial fitting of, or the retrofitting of noise mitigation measures may include any one of or a mixture of the following;

- Quieter road pavement surfacing,
- Reduced speed limits,
- Noise barriers constructed of earth, concrete, wood, metal or plastic,
- No change from existing.

The following issues are taken into account when selecting noise mitigation measures;

- Technical feasibility,
- Visual Impact,
- Community preference and
- Cost
- Effectiveness

The trigger for considering retrofitting noise abatement measures will be when the existing estimates or measured traffic noise exceeds the target level by more than 5dB.

Any retrofit of noise abatement measures should aim to reduce the noise level to the target noise level (refer to Table 1.4) and achieve a reduction of the existing noise level by a minimum of 3dB(A).

Roads ACT will consult with the affected community with regard to the available options prior to the installation of noise mitigation measures which may include no change.

10 Maintenance Issues

Noise issues arising after road maintenance activities such as chip seals can result in higher than expected noise levels in the short term. These levels can exceed 65dB(A) upon completion of the works, it is however expected that the level will reduce to a target level of 63dB(A) or less over time as the wearing surface beds in. No action will be taken unless after 12 months, the noise level is demonstrated to be above the maximum level in Table 1.4.

11 Compression braking from heavy vehicles

Compression braking by large and heavy vehicles can create very loud noises for a short duration. This type of traffic noise can be disturbing for residents but is seldom reflected in the recorded noise levels which tend to average out such short duration peak sounds. Roads ACT will consider installing information signs telling drivers not to use compression braking following the criteria set out in the Practice Note XI Engine Brake Signs "*RTA Environmental Noise Management Manual*"

12 Reference

AS 3671-1989 : Acoustics - Road traffic noise intrusion - Building siting and construction.

AS/NZS 2107:2016 : Acoustics - Recommended design sound levels and reverberation times for building interiors.

ACT Government: The Territory Plan 2008;

Residential Zones Development Code,

Single Dwelling Housing Development Code,

Multi Unit Housing Development Code.

NSW Roads and Maritime Service: RTA Environmental Noise Management Manual, Practice

13 Definitions of terms used to describe traffic noise

Due to its nature traffic noise varies over both the short and long term. Metrics for expressing the sound level over time have been developed based on the equal energy approach.

dB: This is the abbreviation used for decibel which is the measure of sound pressure level.

dB(A): The (A) denotes that the sound pressure level has been "A" weighted so that the scale approximates the response of the human ear. The ear is less sensitive to high and low frequency sounds than it is to sounds in the midrange. Most community noise is measured in "A" weighted decibels.

LAeq,T: Equivalent sound pressure level – The steady sound level that, over a specific period of time, T , would produce the same energy as the fluctuating sound level actually occurring.

LAeq(15hr): The noise level in terms of LAeq over the 15 hour period from 7 am to 10 pm.

LAeq(9hr): The noise level in terms of LAeq over the 9 hour period from 10 pm to 7 am.

LDen : The average sound level over a 24 hour period, with a penalty of 5 dB added for the evening hours of 19:00 to 22:00, and a penalty of 10 dB added for the nighttime hours of 22:00 to 07:00.

Noise Level (Target): A noise level that should be adopted for planning purposes as the acceptable noise level for the specific area, land use and time of day.

14 Cost-Effectiveness Analysis

$$\text{Cost-Effectiveness Ratio} = \frac{\text{Total Cost}}{\text{Units of Effectiveness (achievable Reduction in Db)}}$$

Recommended procedure

1. Engage with the affected land user/s (including other affected residence that may not have complained) to determine the number of affected dwellings (ground floor units and townhouses shall be viewed as individual residences^{note1}).
2. Calculate for each alternative noise reduction method the total costs of the noise reduction measure(s).
3. Calculate for each alternative the number of dwellings exposed to noise levels before and after the intervention.
4. Calculate for each alternative the number of highly affected dwellings by multiplying the percentage of highly affected at different Lden levels before and after the intervention.
5. Calculate for each alternative the shift in the total number of highly affected dwellings before and after intervention = Δ total highly affected dwellings.
6. Calculate for each alternative the cost-effectiveness ratio: total costs / Δ total highly affected dwellings.

Note 1: Noise reduction measures are generally ineffective in reducing noise issues related to multi story buildings above the ground floor, in these cases the methods implemented may not achieve a significant noise reduction for those residences above the ground floor. It should be noted that building design should have the appropriate noise reduction measures implemented in the design and construction stage.