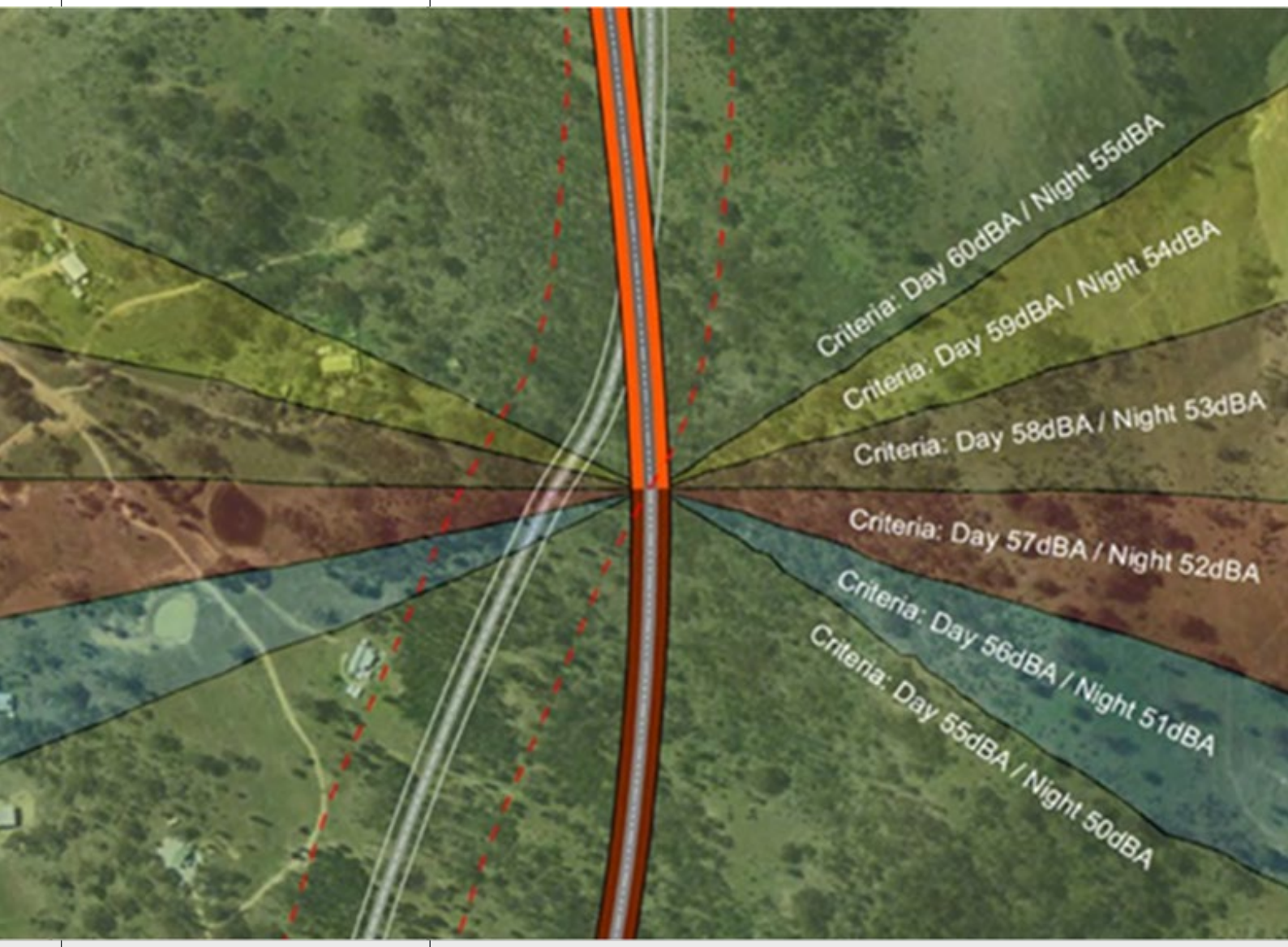
Transport for NSW

Road noise criteria guideline

August 2023



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Acknowledgement of Country

Transport for NSW acknowledges the traditional custodians of the land on which we work and live.

We pay our respects to Elders past and present and celebrate the diversity of Aboriginal people and their ongoing cultures and connections to the lands and waters of NSW.

Many of the transport routes we use today – from rail lines, to roads, to water crossings – follow the traditional Songlines, trade routes and ceremonial paths in Country that our nation's First Peoples followed for tens of thousands of years.

Transport for NSW is committed to honouring Aboriginal peoples' cultural and spiritual connections to the land, waters and seas and their rich contribution to society.

Document control

Document owner	Senior Specialist (Noise)
Approved by	Executive Director, Environment and Sustainability
Branch / division	Environment and Sustainability / Safety, Environment and Regulation
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Superseded documents	Roads and Maritime Environmental Noise Management Manual (2001) Practice Note I and Practice Note III

Versions

Version	Date	Amendment notes
1.0	Undated	Original Roads & Maritime document
1.1	Apr 2022	Rebranded from a Roads & Maritime document to Transport for NSW and included new Appendix A -Assessing maximum road traffic noise level
1.2	Aug 2023	Minor wording updates and updates to flowcharts and images

Related policy and supporting information

- Transport Environment and Sustainability Policy
- Environment & Sustainability Management Framework
- EPA's NSW Road Noise Policy 2011 (RNP)
- EMF-NV-GD-0025-TT1 Application notes for the RNCG
- EMF-NV-GD-0024 Road Noise Mitigation Guideline (RNMG)

Important

This guideline is supported by **EMF-NV-GD-0025-TT1 Application notes for the RNCG.**

Contacts and further information

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Internal users: Environmental planning and assessment (sharepoint.com)

Table of contents

1. Introduction

1.1 Why is this guideline required?

This guideline has been developed to provide a consistent approach to identifying road noise criteria for Transport for NSW (Transport) projects. This guideline establishes criteria for the following project types:

- New.
- Redeveloped.
- Minor works.

Criteria for road projects comprising of new and redeveloped road segments are assigned with reference to the NSW Road Noise Policy (RNP, 2011). This Road Noise Criteria Guideline provides a practical approach in applying the RNP and addresses specific situations relevant to Transport road projects. These approaches meet the intention of the RNP.

This policy should be read in conjunction with the:

- NSW Road Noise Policy 2011 (RNP)
- Project Pack (information provided on a project-specific basis)

Appendix A of this guideline also contains the maximum noise level assessment protocol previously contained within the now superseded Environmental Noise Management Guideline.

1.2 Policy statement

Transport is committed to effectively managing impacts from its activities in an environmentally-responsible manner. For roads and traffic systems under its control, Transport is committed to delivering projects in a manner that minimises, to the extent feasible and reasonable, environmental noise impacts. Determining the appropriate type of road project and its associated noise assessment criteria is essential to delivering such an outcome.

1.3 Context

This guideline supersedes the Roads and Maritime Environmental Noise Management Manual (2001) Practice Note I. It differs from the previous method in that road criteria are now based on the road project near a receiver rather than the existing noise exposure.

For new roads the total noise level from all roads is assessed against the new road criteria. This differs from the 2011 edition of the Road Noise Policy where consideration is only given to the noise levels contributed by the new road. This ensures that noise mitigation provides a benefit by reducing noise levels at a receiver rather than just noise levels coming from the new road. It also ensures that the noise from the new road cannot unreasonably increase noise levels at a receiver without the receiver qualifying for noise mitigation.

Appendix B of this RNCG provides details on the slight differences between the approach of this RNCG and the RNP.

1.4 Scope

This guideline is most relevant for project development managers, environmental staff, project implementation managers, acoustical consultants and regulatory agencies involved in planning, approving and delivering road projects.

This guideline will generally apply:

- In the final stages of project concept design.
- In the environmental impact assessment phase.
- During the project's detailed design.
- To all public roads and classified roads.

2. Policy

This guideline describes the principles to be applied when assigning new and redeveloped road types and transition zones. It also describes procedures to assist in assigning them.

The Road Noise Policy (RNP) sets more stringent criteria for new roads compared to redeveloped roads at-residences. The basis given for this in the RNP is that there are generally more opportunities to minimise noise impacts from new roads and road corridors, especially those in greenfield locations, through judicious road design and land use planning. The scope to reduce noise impacts from existing roads and corridors is generally more limited.

The intention of the approach in this guideline is that new or redeveloped noise criteria may be established by assessing the location of the residence relative to the road.

The intention in all situations is to meet the following principles. The use of the procedures in this guideline does not guarantee that the principles will always be met and in cases where there is doubt then it is the principles rather than the procedures that are paramount. Where the principles are not met the procedures may be varied through consultation with Transport noise specialists.

The principles are:

1. Criteria are based on the road development type a residence is affected by due to the road project.
2. Adjacent and nearby residences should not have significantly different criteria for the same road.
3. Criteria for the surrounding road network are assessed where a road project generates an increase in traffic noise greater than 2dBA on the surrounding road network.
4. Protect existing quiet areas from excessive changes in amenity due to traffic noise.

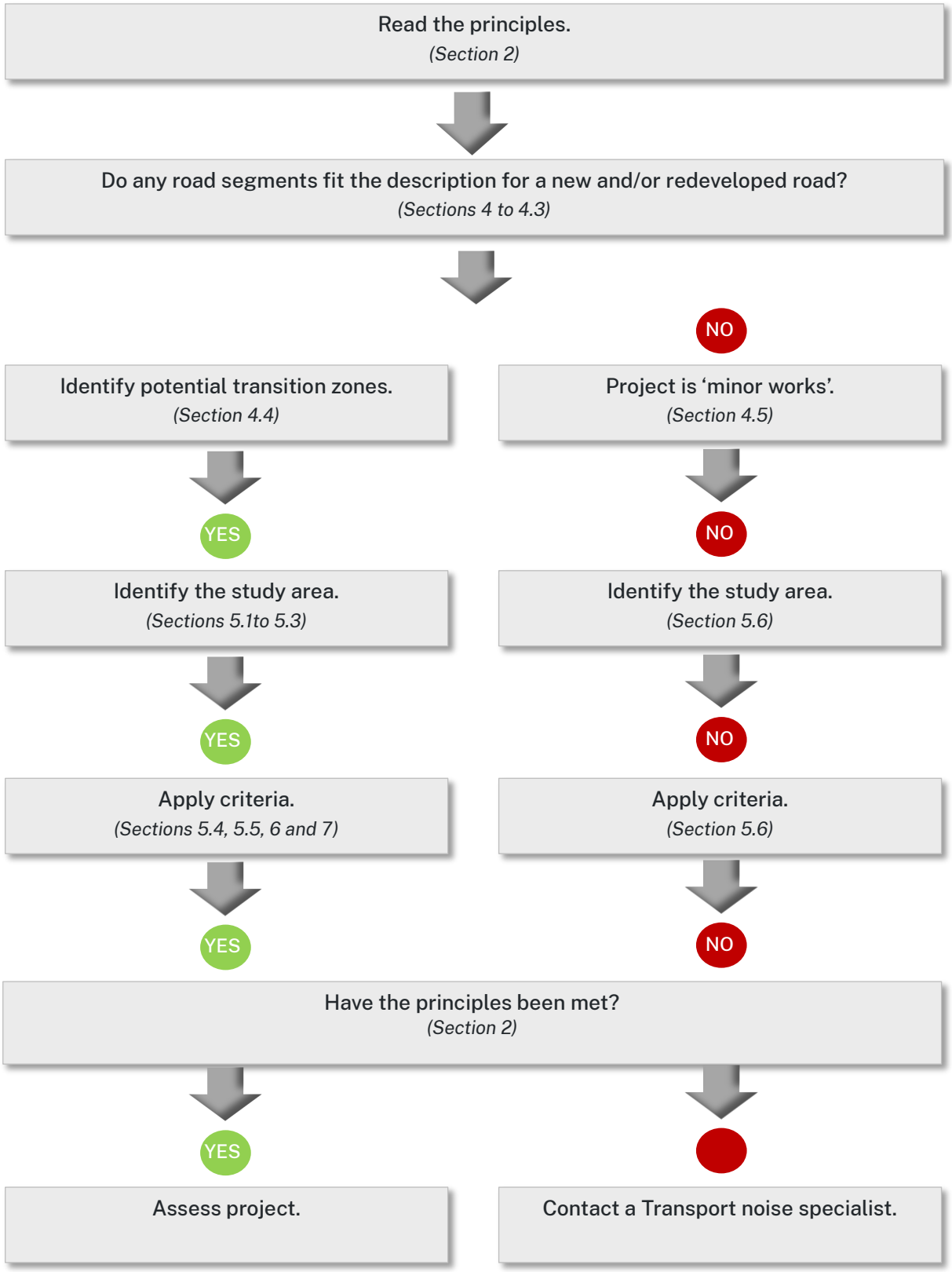
3. How do I use this guideline?

When considering noise on a road project the first question that should be asked is whether the project is new, redeveloped or minor works?

The second question should be how to apply criteria at sensitive receivers?

The diagram below shows an overview of how these questions may be answered in most situations. Please always ensure that the overall principles are met (Section 2).

Figure 1: How do I use this guideline?



4. Identifying road types

The RNP describes a number of different types of receivers that are sensitive to noise. Most receiver types have the same criteria for all road types. Criteria for residences however require consideration of the road's functional class and whether the road project is redeveloped or a new road.

Note a 'new road' for the application of this guideline may be a new public, classified road or a new off-road transitway as defined in the RNP.

4.1 Determine the road's functional class

The RNP defines assessment criteria based on the road's function in the road network. Detailed descriptions of function are provided in the RNP. Functional classes include:

- Freeway/arterial.
- Sub-arterial.
- Local road.

The RNP provides two sets of criteria for each functional class, one for new roads and the other for redeveloped roads. Within each functional class the new road criteria are 5dBA lower than redeveloped criteria.

Some projects will consist of both new and redeveloped roads. There may also be a transition zone between these roads. This procedure provides a process to consistently assign criteria to each dwelling based on the road the residence is most exposed to.

The following process should be used to determine whether the road development is assessed as a new or a redeveloped road and the applicable criteria at each residence. An example road project is shown in Appendix C with road development types assigned.

4.2 New road

A road is new for any of the following cases:

- A project proposes road construction in an undeveloped corridor.
- A road project changes the functional class of the road.
- A widening, curve straightening or adjustment of the corridor where the upgrade road pavement has been substantially realigned.
- A duplication where the new lanes have been substantially realigned from the existing corridor in which case the existing lanes are also assessed as a new road development type.
- A bypass where the upgraded road extends beyond the existing road corridor.

Figure 3: Bypass with road construction in an undeveloped corridor

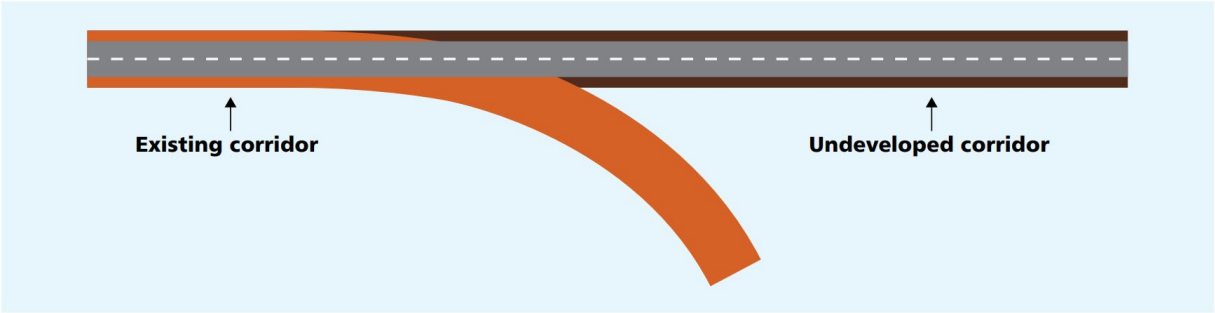
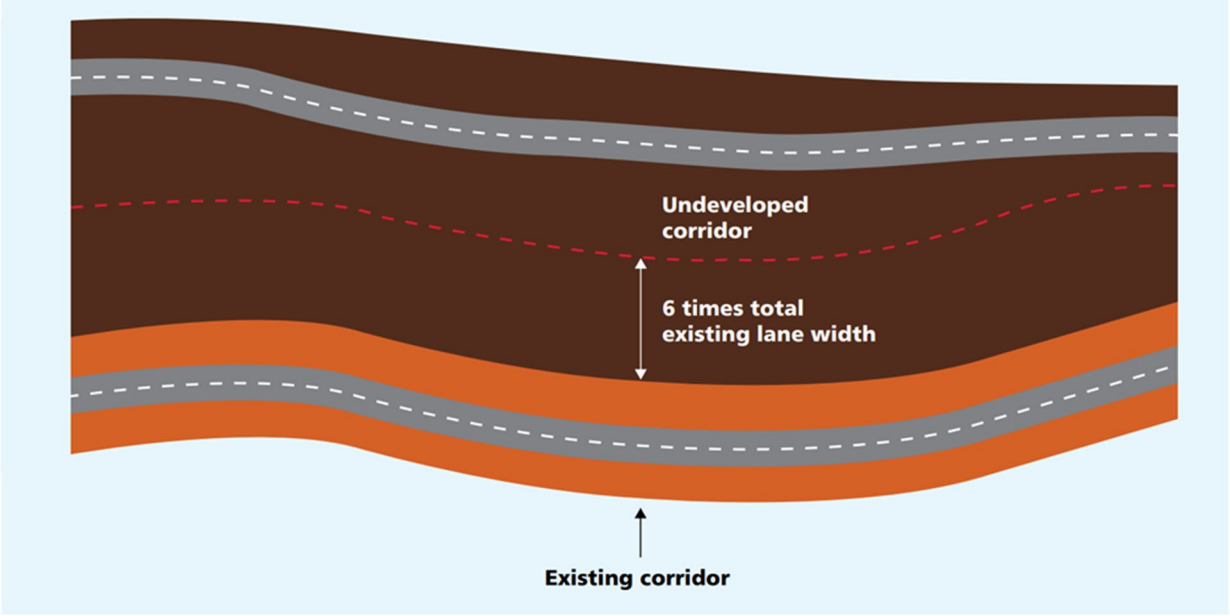


Figure 2: Substantially realigned duplication or upgraded road



4.3 Redeveloped road

A road is redeveloped if the purpose or outcome of the upgrade will result in one or more of the following:

- Increases in the traffic-carrying capacity.
- Increases in the number of heavy vehicles by 50 per cent or more on the road where the physical works are located.

For a road to be considered redeveloped rather than new, the pavement should not be substantially realigned. Typical examples of upgrades designed to increase traffic carrying capacity include:

- Widening/adjustment of the corridor where the road segment (including duplicated carriageway) has not been substantially realigned.
- Duplication of a carriageway adjacent and parallel with the existing road corridor where the widened road has not been substantially realigned.
- Duplication of a carriageway wholly within an existing corridor.
- Introduction of on or off ramps to provide access through an intersection that was previously inaccessible for that direction.

Figure 5: Duplicated carriageway, road widening or curve straightening without substantial realignment of existing road

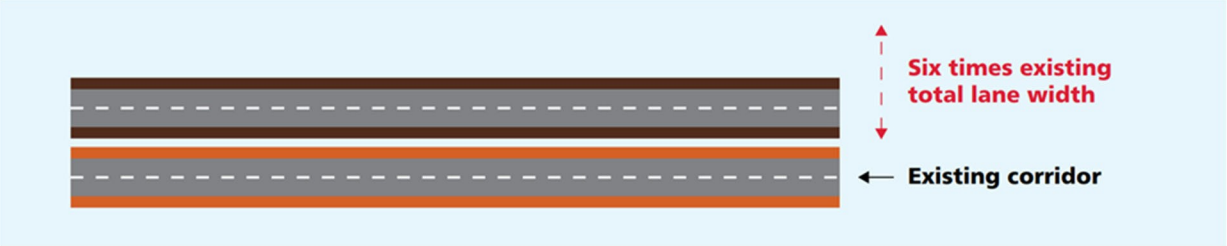
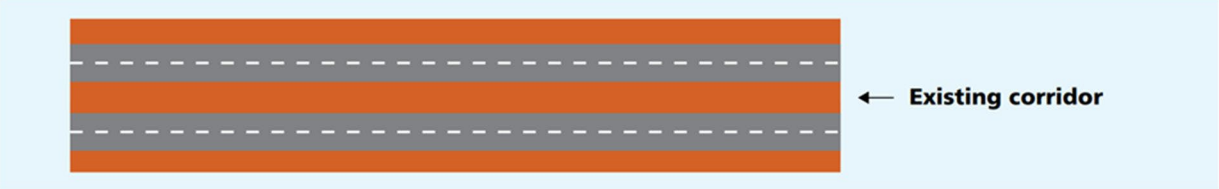


Figure 4: Upgraded road alignment or carriageway duplicated within existing road corridor



4.4 Transition zone

A transition zone is the junction between new and redeveloped roads or different functional classes. The transition zone extends a distance into each road type and provides a smooth change in noise criteria between adjacent residences. Illustrative examples are shown below. The extent and width of transition zones are to be calculated using the approaches in Section 6 of this guideline.

Figure 6: Transition zone between new and redeveloped road segments in a bypass

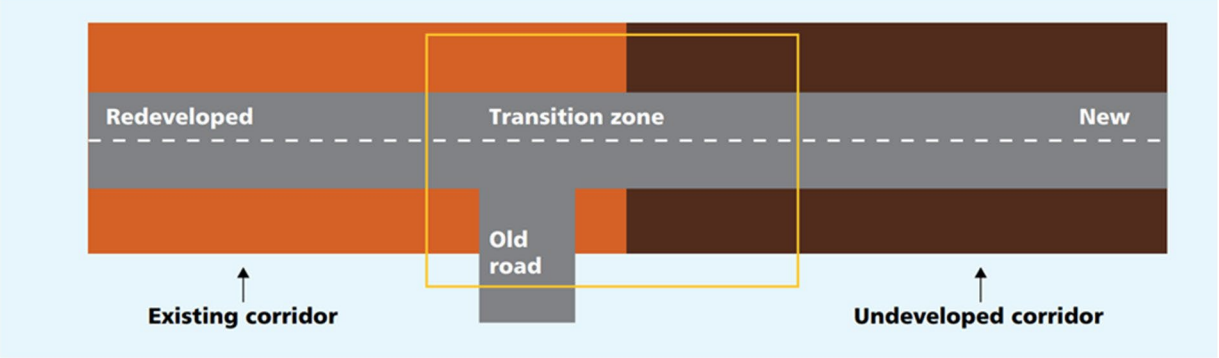
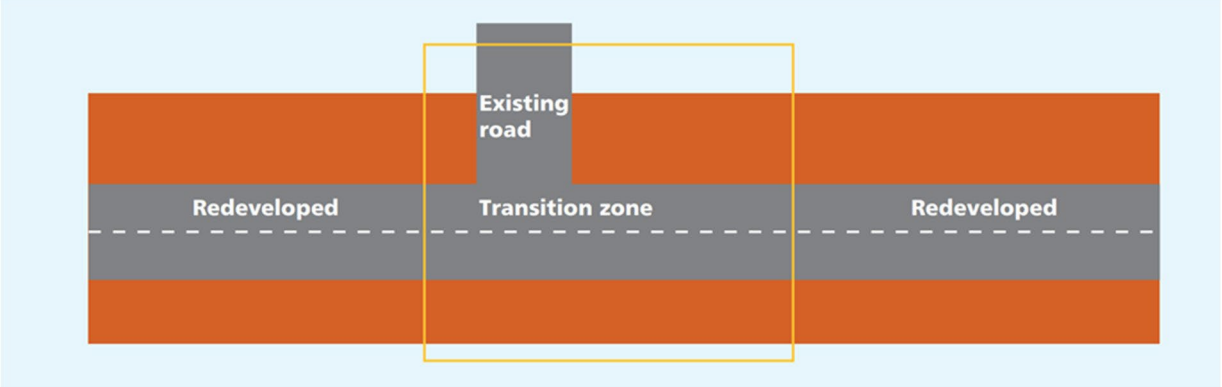


Figure 7: Transition zone between redeveloped project and an existing road



4.5 Minor works

Some works may be primarily to improve safety. This may include minor straightening of curves, installing traffic control devices, intersection widening and turning bay extensions or making minor road realignments.

These works are not considered redeveloped or new as they are not intended to increase the traffic carrying capacity of the overall road or accommodate a significant increase in heavy vehicle traffic.

5. Study area and criteria

5.1 General

The applicable noise assessment criteria need to be determined for each sensitive receiver within the study area. The RNP defines the study area width as '600 metres from the centre line of the outermost traffic lane on each side of the subject road'. This distance is based on the limit of accuracy of currently approved road traffic noise models.

5.2 Rural areas

Under some circumstances, such as in rural areas, criteria may still be exceeded at 600 metres. Where it can be demonstrated that criteria may be exceeded beyond 600 metres then each residence will need to be assessed on a case-by-case basis. This should be done in consultation with Transport noise specialists.

5.3 Highly urban areas

In highly urban situations a boundary width either side of the project of 600 metres may include other significant roads with noise levels that dominate at nearby receivers. As a guide the boundary width of the study may be reduced to where the noise levels from the project contribute slightly less than half of the total noise level. This is where the project adds no more than 2.0dBA (less than 2.1dBA) to the total noise level. The boundary should then be expanded to include any receivers where the project contribution exceeds 65dBA $L_{Aeq(15hour)}$ and 60dBA $L_{Aeq(9hour)}$ and to meet close-by landmarks to provide a logical boundary.

The extent of the study area is the chainage in which physical works associated with the road project occur and may be extended to close-by landmarks to provide a logical endpoint.

Landmarks defining the project area logical boundary may include items such as blocks of receivers, roads, parks and reserves, power utility corridors and breaks in landscape (For advice and guidance please consult with a Transport noise specialist).

When defining the catchment local roads should be excluded from the modelling. Only sub-arterial and arterial roads should be modelled.

Note the intention is that any noise mitigation applied to a road project under the Road Noise Mitigation Guideline (RNMG) in a highly urbanised area using this modified approach will be the same as when using the 1.2km wide study area. In practice the study area using this approach for redeveloped and most new roads will be bigger than the region where noise levels, due to the project, increase by more than 2dBA. In some situations where there is a new road in a highly urban area with low existing noise levels and it creates more than a 2dBA noise increase, then the study area will be the same as the area eligible for noise mitigation.

5.4 Receiver types

For most types of receivers, the RNP assigns criteria based on the receiver type. For residences it depends on the road.

Under most situations the criteria at a residence may be confirmed by identifying the road type for the upgraded road segment that is 'adjacent to' the sensitive residences location. Where a residence is exposed to more than one road type calculations may need to be completed to assess the contribution from each road.

Under most situations the same criteria are applied at each facade of a residence. The exception may be where the project increases noise contribution by more than 2.0dB (2.1dBA) on an existing road that is not part of the road project.

5.5 How to determine if new or redeveloped criteria apply

Redeveloped and new criteria are assigned by identifying which upgraded road in the project the residence is most exposed to (Principle 1 - refer Section 2). This can be identified by the residence's location or through calculation.

In most instances this may be identified by drawing a line between the residence and the closest point of the road project alignment and identifying the type of the road at that point. Where the sensitive residence location is 'adjacent to' a 'new' or 'redeveloped' road segment, the criteria can be derived from the RNP Tables 3, 4, 5, 6 and 8 (reproduced in Appendix D of this guideline).

Under more complex situations near multiple road types, calculations should be conducted as the residence may be in a transition zone.

5.6 Minor works

Transport applies existing road criteria (RNP Table 8, see Appendix D of this guideline) where the minor works increase noise levels by more than 2.0dBA relative to the existing noise levels at the worst affected receiver (Principles 1, 2, and 3 - refer Section 2).

The noise catchment area should include all receivers where noise levels increase. A 600-metre noise catchment may not be required.

Transition zones are not applicable to minor works.

6. Transition zone

There are two types of transition zones that are most relevant to Transport road projects. These are:

a) A junction between a new road and a redeveloped road.

b) An intersection between the road project and an existing road.

Examples of these transition zones are shown in Appendix E:

- Example 1 shows a bypass or substantially realigned road upgrade with a new road segment that extends and continues beyond the existing road corridor.
- Example 2 shows curve straightening that has resulted in substantial realignment of the road.
- Example 3A to 3D show a road project that abuts an existing road and how this is assessed at each façade.
- Example 4A and 4B show a wholly new road project that meets an existing major road.
- Example 5 shows a situation where there are two types of transition zones at the one location. A redeveloped and new road transition zone is at the crossing point of an existing local road.

6.1 Transition zones between new and redeveloped roads

quieter pavement surface is the preferred form of noise mitigation as it reduces source noise levels. This provides protection to both outside recreational areas and internal noise levels and also has the least visual impact.

A quieter pavement surface should be considered where there are groups of four or more receivers that exceed the criteria and before the use of noise barriers.

Quieter pavements may provide noise benefits to receivers at greater distances than noise barriers. This may occur where receivers at greater distances already have shielding from rows of houses near the road or topography.

In a transition zone between a new and redeveloped road a residence is exposed to noise from the two road types.

Transition zone criteria reflect the degree to which the residence is exposed to each road type. The aim of the transition zone is to ensure noise criteria change smoothly along the road between the two road types. The same criteria are applied at each facade of a residence.

The transition zone criteria are identified from the contribution difference in noise from each road type at the residence's location using Table 1 below. Where the transition zone criteria change across the location of a residence the most stringent of the criteria apply.

Table 1: Assignment of new and redeveloped transition zone criteria

Contribution difference, dBA New minus redeveloped segments			Total noise levels, dBA	
			Daytime criteria	Nighttime criteria
	Contribution difference	≥ +3.0	55	50
+3.0>	Contribution difference	≥ +1.5	56	51
+1.5>	Contribution difference	≥0	57	52
0>	Contribution difference	≥ +3.0	58	53
-1.5>	Contribution difference	≥ +3.0	59	54
-3.0>	Contribution difference		60	55

Note: where traffic volumes on the new road differ by more than 40% relative to the redeveloped road, please consult with Transport noise specialists

Calculation of contribution difference

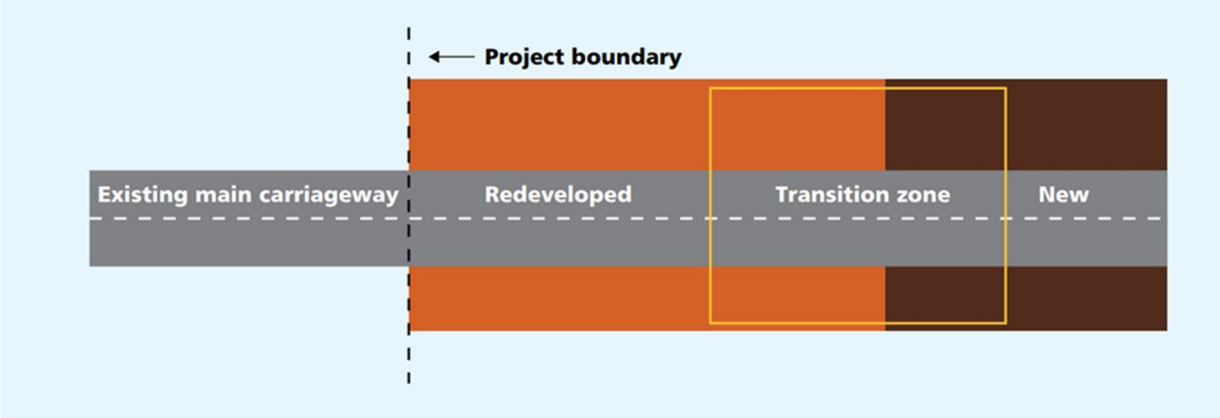
This should be used where the new and redeveloped segments of the road carry the main traffic flows within the project (Example 1 and 2) (Principles 1 and 2 -refer Section 2).

In this transition zone a residence is exposed to noise from a new road and a redeveloped road. The contribution difference is defined as the difference between the new road contribution and the redeveloped road contribution. For example if the level of noise at the receiver coming from the new road is 63dBA and that coming from the redeveloped road is 60dBA then the contribution difference is 3dBA:

New Road Contribution –Redeveloped Road Contribution = Contribution Difference 63-60 = 3dBA

The contribution from the redeveloped road should include any existing segments that remain part of the main carriageway alignment beyond the project boundary (see Figure 8).

Figure 8: Existing main carriageway segment included as redeveloped for calculating contribution difference



Modelling contribution difference

The purpose of transition zones is to provide a smooth change in noise criteria when moving from one road type to a different road type. When modelling contribution difference in the transition zone (as distinct from modelling the actual levels of noise impact) the following applies:

- Noise emission from the road surface must be equivalent to the unmitigated noise in the design year. Propagation modelling should only include road geometry, air and ground absorption and topography
- Noise emission should only be considered from the road project including any existing segments beyond the project boundary that are part of the road alignment being upgraded. Existing segments are counted as redeveloped for the purpose of identifying transition zone criteria. For example, a Pacific Highway upgrade would include the existing parts of the highway beyond the northern and southern project boundaries. Exceptions which should be excluded are existing segments being retained for example as service roads or connectors.
- Buildings and noise mitigation measures such as barriers and low-noise pavement should not be modelled when setting transition zone criteria as their presence in the modelling can prevent the noise criteria being properly calculated.
- All pavement types should use the same base level noise emission for new, redeveloped and existing roads. For example, all surfaces could be modelled as DGA or concrete.

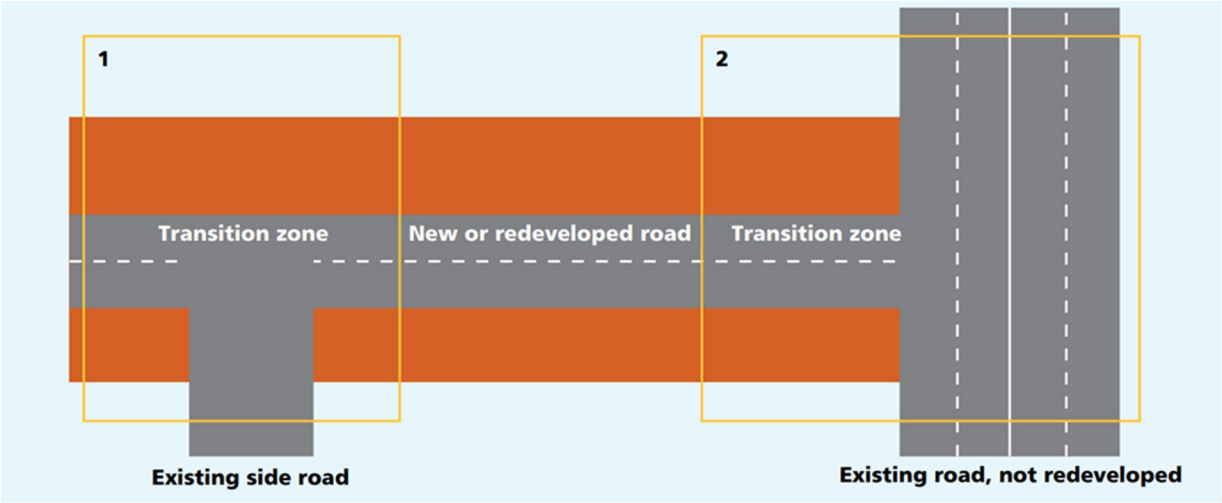
6.2 Transition zones at junctions between a project road and existing road

This approach should be applied at side road junctions between a project's new or redeveloped road and an existing road. There are two situations where this may occur (see Figure 9):

a) The project crosses or abuts an existing side road.

b) The project ends at an existing road and the existing road is not redeveloped.

Figure 9: Locations where a road project should consider side road transition zones



For transition zones with existing roads the road projects noise criteria are applied at all residences and facades. Where certain conditions are met existing road criteria may also be applied at some facades.

Existing road criteria (RNP Table 8 and reproduced in Appendix D of this guideline) are only applied at a facade where both of the following conditions are met:

- The project increases the noise level contribution from the existing road by more than 2dBA (e.g., 2.1dBA or more) following the upgrade and relative to the existing 'no-build' situation.
- The contribution from the existing road is greater than the contribution from the road project (Principles 1, 2 and 3 - refer Section 2).

Figure 10 shows a residence may have a noise contribution increase more than 2dBA from the existing road at the northern facade but negligible noise contribution increase from the existing road at the other facades. This receiver would have new road criteria applied at all facades and may also have the existing road criteria applied at the northern facade. See Examples 3 and 4 in Appendix E for more detail. Table 2 shows an example of the process.

Figure 10: Residence exposed to project noise on opposite sides of the building

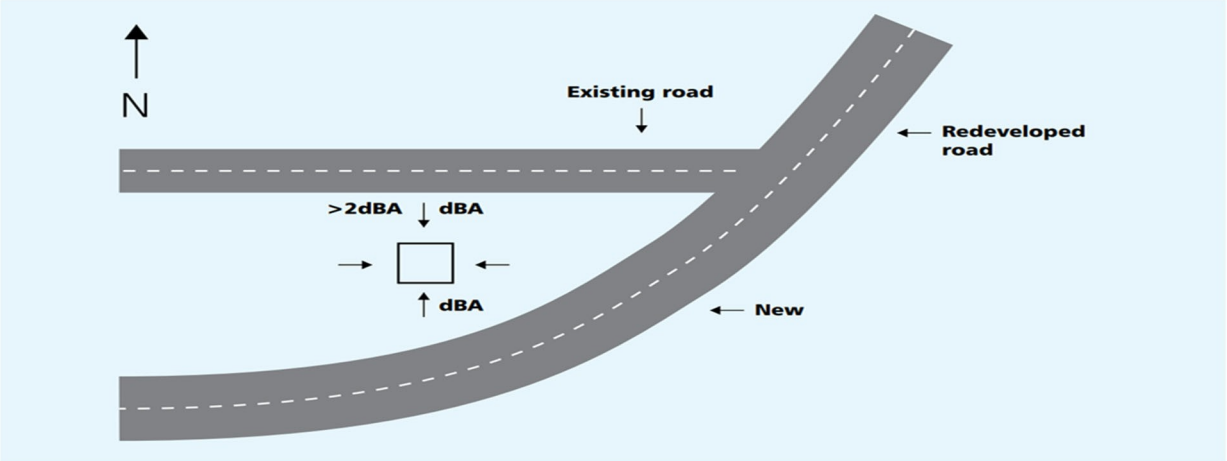


Table 2: Assignment of project and existing road transition zone criteria

Increase test		Existing road criteria	Project road criteria
Does the project cause a greater than 2.0dBA increase in contribution from the existing road relative to the 'no build' situation?	No	–	Applicable
	Yes	Applicable where the existing road contribution is greater than the project road contribution1	Applicable

The criteria time periods will be the same for all roads in the transition zone except where the existing road is a local road. Note where the existing road is a local road and the project has increased the local road noise contribution by more than 2.0dBA (2.1dBA or more) then consideration should be given to whether the existing local road is now a sub-arterial road.

Use the 'no-build and 'build' traffic flows and conditions when assessing contributions at intersections with existing roads. Buildings should be included in the noise model.

6.3 Multiple transition zones

At some road junctions there may be more than one type of transition zone at the same location (Example 5). This may occur where a road development has both new and redeveloped road segments and also increases noise level contribution by more than 2.0dBA (2.1dBA) on the surrounding road network.

The first step is to identify the relevant road project transition-zone criteria at each residence using the contribution difference approach for junctions between new and redeveloped roads. This is followed by assessing if the existing road transition zone criteria also apply. This meets Principles 1, 2 and 3 (refer Section 2).

6.4 Notes on implementation

Junction between new and redeveloped roads

The aim for junctions with new roads is to create a smooth transition zone that relates to road geometry and unmitigated exposure to noise.

The intention is that criteria for redeveloped, new and transition zones may be established using the same noise model. This can be achieved by setting up the new and redeveloped road segments on different layers and calculating their noise contributions separately. The results for the redeveloped layer may then be subtracted from the results obtained with the new layer.

The sound power level assigned per metre of road chainage should reflect noise emission in the design year without noise mitigation. The results showing the transition zone could be presented as contribution difference noise contours or the assigned criteria.

Note - noise level contributions from algorithms such as CoRTN that use an angle of view correction to adjust between an infinite line source and a finite-length line source may be inaccurate where receivers are end-on to road segments. Adjustments or alternative approaches may be required.

Please review the modelling parameters in the modelling contribution difference in Section 6.1.

Junctions with existing roads

It is intended that the requirement for transitions with existing roads may first be checked using desktop methods to evaluate the difference in traffic flows between the 'no-build' and 'build' scenarios. Where an increase of more than 2dBA (2.1dBA or more) on an existing road is identified then the existing roads could be modelled on different layers to assist in identifying facades that are also eligible for existing road criteria.

Note - also review the modelling parameters in the Section 6.2 for junctions with existing roads.

7. Relative increase criterion

A large increase in the existing level of noise can cause a major change in the acoustic environment of a location. Under the RNP this is assessed using the Relative Increase Criterion (RIC). The purpose of the RIC is to recognise the potential for such a change and provide a means to assess and mitigate for this type of noise impact (Principles 1, 2, 3 and 4 -refer Section 2).

The RIC also functions as a transition zone between areas with low existing traffic noise and higher traffic noise. The RIC criteria become less stringent at receivers that are closer to existing sources of traffic noise.

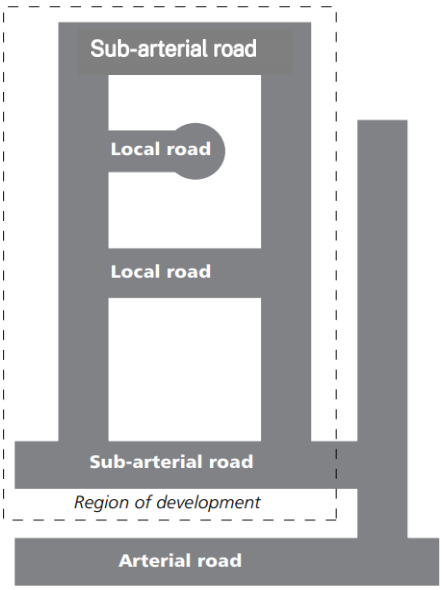
Where applicable the RIC should be assessed at each facade.

When determining the RIC criterion at each residence, limit the existing traffic noise to exclude contributions from local roads. The basis for this is that a freeway or sub-arterial road represents a significantly different noise source than a local road with low intermittent traffic flows.

The RIC should be applied to receivers where it is more stringent than the new or redeveloped criteria. In this instance, only the RIC needs to be applied to the receiver. Which criteria are most stringent should be checked for both the daytime and night time periods.

8. Definitions

Term	Definition
A–frequency weighting	A frequency based adjustment made to sound level measurement, by means of an electronic filter, in line with international standards. This approximates the frequency response of the human ear and accounts for reduced sensitivity at low frequency.
Adjacent to	To determine the type of road that a residence is 'adjacent to' draw a straight line between the residence and closest point on the project road alignment
Administrative class	Administrative class defines the responsibility for operating and maintaining a road (e.g. between Transport for NSW or a local council). The administrative class is not used to determine noise criteria.
Arterial	Supports major regional and inter-regional traffic movement and carry traffic directly from one region to another. For noise assessment this term also includesfreeways and motorways.
Classified road	Classified under the Roads Act 1993 and includes private toll roads.
CoRTN	UK Department of Transport's Calculation of Road Traffic Noise (CoRTN) algorithm
Decibel (dB)	A measure of sound level. The decibel is a logarithmic way of describing a ratio. The ratio may be power, sound pressure, voltage, intensity or other parameters. In the case of sound pressure, it is equivalent to 10 times the logarithm (to base 10) of theratio of a given sound pressure squared to a reference sound pressure squared.
Decibel (A-weighted; dBA)	Unit used to measure 'A-weighted' sound pressure levels. A-weighting is a frequency based adjustment made to sound-level measurement to approximate the response of the human ear.
ECRTN	Environmental Criteria for Road Traffic Noise
Existing road corridor	A corridor of land that is zoned for road purposes in relevant environmental planning instruments such as LEPs and contains an existing formed and dedicatedpublic or classified road within the road reserve. Note that lots subsequently purchased and owned by Transport for NSW that are adjacent to the existing road reserve do not form part of the existing corridor.
Frequency	The number of times that a vibration or periodic function occurs or repeats itself in one second, measured in Hertz (Hz).

Functional class	Austroads and Transport for NSW categorise roads based on how they function in the road network. The EPA uses the term 'road category' in the Road Noise Policy (RNP) which is analogous to 'functional class' in the context of the RNP. Functional class is based on usage and provides a basis for policy relatedto noise impacts. For the purpose of evaluating noise impacts, only the functional class is relevant. 
L_{Aeq}	Energy average A-weighted sound level –the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
$L_{Aeq(15hour)}$	The L_{Aeq} noise level between the period of 7am.–10pm.
$L_{Aeq(1hour)}$	The energy average noise level representing the 'average maximum' one-hour noise level within the appropriate day or night-time period. As referred to in the EPA's Road Noise Policy.
$L_{Aeq(9hour)}$	The L_{Aeq} noise level between the period of 10pm–7am.
L_{Amax}	The "Maximum Noise Level" for an event, used in the assessment of potential sleep disturbance during night-time periods. The subscript "A" indicates that the noise levels are filtered to match normal human hearing characteristics (i.e. A-weighted). "Fast" time constant is used for this measurement.
New road	See Section 4.2 of this guideline.
Receiver	A noise sensitive receiver includes the following: residences, schools, child care centres, places of worship, health care institutions. Note, a proposed noise-sensitive development is assessed as an existing noise sensitive receiver for the purpose of noise impact assessment, where the proposed noise-sensitive development has an approved development consent, or a complying development certificate for the erection of a building on vacant, that has been issued before a road development proposal has been approved.
Redeveloped road	See Section 4.3 of this guideline.
RIC	Relative Increase Criterion
RNP	NSW Road Noise Policy 2011 (RNP)

Road Category	Refer functional class
Road reserve	Property cadastral for the road.
Road segment	A continuous extent of road that is all either new or redeveloped and is the same functional class. A road project may have multiple alternating new and redeveloped segments along the road corridor. Some segments that meet the project may also be existing roads.
Substantially realigned	A road will be substantially realigned when the new carriageway in the road project is more than approximately six times the total existing lane width from the edge of the existing road corridor (refer Appendix C). For example with an existing two lane road this would be 42 metres from the existing road corridor. And for a four lane road this would be 84 metres from the existing road corridor. Consideration can be given to whether a road has been substantially realigned for distances less than six times the existing lane width using local context for guidance.
Total existing lane width	3.5 metres per formed traffic lane excluding cycle and pedestrian lanes.
Transition zone	The 'transition zone' is the area either side of the physical transition point between road functional classes (e.g. arterial versus local) or road development types (e.g. new versus redeveloped road project). See Section 4.4 of this guideline.
Undeveloped road corridor	A corridor of land that is zoned for road purposes in relevant environmental planning instruments or draft environmental planning instruments such as LEPs and does not have an existing dedicated public or classified road.

Appendix A: Assessing maximum road traffic noise levels

Introduction

Although sleep assessment goals are not defined within the EPA's Road Noise Policy (RNP) as there was determined to be insufficient evidence to set new indicators for potential traffic noise sleep disturbance, the RNP recommends that an assessment of maximum noise levels should be undertaken, where impacts may occur during the night.

For continuous traffic flow, the RNP notes that the L_{Aeq} appears to be acceptably correlated with sleep disturbance, since under these conditions there are few emergent noise events above the main hum of the traffic. For intermittent traffic flow which may occur at night, the RNP notes that other measure that consider the emergence of the maximum noise level above the ambient level may be needed, for example L_{AFmax}–L_{Aeq}, the maximum noise level and the number of events.

This maximum noise assessment may be used to help prioritise and rank mitigation strategies but is not intended to be applied as a decisive criterion in itself as there is no definitive criterion.

A substantial portion of the RNP is a review of international sleep disturbance research indicating that:

Maximum internal noise levels below 50-55dBA are unlikely to cause awakening reactions, and

One or two noise events per night with maximum internal noise levels of 65–70dBA are not likely to significantly affect health and well-being.

At locations where road traffic is continuous rather than intermittent, the $L_{Aeq(9hour)}$ target noise levels should sufficiently account for sleep disturbance impacts.

However, where the emergence of L_{Amax} over the ambient L_{Aeq} is equal to or greater than 15dBA, the $L_{Aeq(9hour)}$ criteria may not sufficiently account for sleep disturbance impacts.

A 'maximum noise event' can therefore be defined as any pass-by for which L_{Amax} -$L_{Aeq(1hour)}$ $\geq$ 15dBA.

Assessment protocol

This assessment may be used to help rank and prioritise design options and noise-mitigation strategies.

In situations where there may be impacts attributable to maximum noise events, there may be traffic management or other long-term noise management opportunities which could be investigated even if the $L_{Aeq(9hour)}$ noise level is less than the target.

The RNP does not include a requirement to evaluate maximum noise level impacts for road upgrades that are not 'redevelopments'. Even so, an evaluation of maximum noise levels may prove beneficial in managing the concerns of surrounding residents if interruptions to traffic flows are proposed (such as would occur with the installation of roundabouts or traffic lights).

A maximum noise level assessment can also be beneficial in prioritising treatments identified as necessary for 'new road' or 'redeveloped road' works in order to satisfy the project criteria.

If a road upgrade is expected to involve interruptions to traffic flows and a maximum noise level assessment is proposed, the protocols for undertaking this type of assessment are set out below.

Maximum noise level monitoring

The objectives of this monitoring are to identify individual maximum noise impacts for the existing noise environment and to use the recorded data as a basis for predicting future impacts.

Monitoring of maximum noise levels needs to be undertaken for all projects other than minor road upgrades. (The maximum noise impacts associated with minor upgrades involving interruptions to traffic flows may be

evaluated by applying a prediction method which does not require maximum noise level monitoring, as described below.)

The instrumentation used may be a chart recorder or an integrated sound level meter capable of electronic storage of instantaneous sound pressure levels at intervals of about ¼ second.

The storage of noise levels over longer intervals, such as 1-second L_{Aeq} levels, may be appropriate but should be justified.

The monitoring period should be sufficient to be representative of prevailing traffic flows and must be conducted over a minimum of one night. The monitoring period used should be justified.

For projects (other than minor upgrades) involving interruptions to the traffic flow or changes to the traffic mix, classified traffic counts need to be taken simultaneously with the maximum noise level monitoring at representative locations exposed to road traffic noise from the existing alignment (see below).

Evaluation of the existing environment

Collate from the monitored and/or predicted existing noise levels (as appropriate for the size and potential impact of the project) the external L_{Amax} and L_{Aeq} noise levels for each hour between 10pm and 7am.

For minor road upgrade projects involving interruptions to traffic flow

While there are no criteria for this type of project, changes in maximum noise impacts are likely to result. For these projects, calculate the L_{Amax} noise levels from the prevailing vehicle types and distributions, using:

Classified hourly traffic counts (where available) and AADT data for the existing situation; and

Representative pass-by noise levels for each of the prevailing vehicle types.

Monitored or predicted L_{Aeq} noise levels for each hour during the night should also be reported

For 'new roads' and 'redevelopments' that are free-flowing and do not involve interruptions to the traffic flow

Changes in maximum noise impacts associated with this type of project will usually be proportional to traffic growth.

For these projects, the L_{Amax} and L_{Aeq} noise levels for the existing environment should be collated from the monitored data.

For other 'new roads' and 'redevelopments'

The maximum noise impacts may not be proportional to traffic growth, as changes in traffic mix and any interrupted traffic flows are likely to cause changes in the magnitude and frequency of maximum noise levels and L_{Amax} -L_{Aeq} maximum noise events.

This means any assessment of maximum noise impacts for the design year needs to evaluate both the expected increases in traffic growth and the expected increases in L_{Amax} noise levels from vehicle pass-bys.

As already indicated, this necessitates classified traffic counts simultaneously with the maximum noise level monitoring at representative locations exposed to road traffic noise from the existing alignment.

For projects that will cause interruptions to traffic flow, consider conducting this simultaneous monitoring of classified traffic counts and L_{Amax}/L_{Aeq} noise levels for the existing alignment at both a section of free-flowing traffic and at a section of interrupted traffic flow, where practical. A comparison of these data will allow the differences in maximum noise impacts for the different types of traffic flows to be characterised when predicting impacts for the design year of the road project.

Reporting requirements

Report the following aspects for the existing noise environment:

The L_{Amax} noise levels greater than 65dBA where L_{Amax} -L_{Aeq} maximum noise events.

- This means any assessment of maximum noise $\geq$ 15dBA.

- The number and distribution of the L_{Amax} - L_{Aeq} maximum noise events from road traffic on an hourly basis between 10pm and 7am.

The report should discuss the likelihood and extent of maximum noise impacts on the basis of these parameters.

Evaluation of the prediction noise environment for the design year

For minor road upgrade projects involving interruptions to traffic flow

Refer to the AADT traffic data for the design year, likely vehicle-type distributions and representative maximum noise levels for each of the prevailing vehicle types.

Calculate the likely number and distribution of L_{Amax} -L_{Aeq} maximum noise events occurring during the night.

For 'new roads' and 'redevelopments' that are free-flowing and do not involve interruptions to the traffic flow or changes to the traffic mix

Refer to the AADT traffic data for the existing environment and the design year.

Calculate the L_{Amax} -L_{Aeq} maximum noise events for the design year using the monitored existing L_{Amax} -L_{Aeq} noise levels and the projected traffic growth.

For other 'new roads' and 'redevelopments'

If the project will not involve changes in the traffic mix but will cause interruptions to traffic flow:

- Refer to the noise levels and classified traffic counts recorded at the free-flowing and interrupted sections of the existing alignment, if available.
- Refer to the predicted traffic growth for the design year.
- Calculate the maximum noise levels and the frequency of L_{Amax} - L_{Aeq} maximum noise events for the design year by applying the percentage increase in traffic to monitored noise data representative of the traffic flow type under consideration.
- If it was not possible to monitor existing interrupted traffic flows, apply a correction to the monitored L_{Amax} noise levels for free-flowing traffic, representative of the increase in pass-by noise levels that will occur for each of the vehicle types being considered.

If the project will involve changes to the traffic mix:

- Refer to the L_{Amax} and L_{Aeq} noise levels and classified traffic counts recorded for the existing alignment.
- Calculate the L_{Amax} and L_{Aeq} noise levels from the AADT data for the existing alignment, the data obtained from the classified hourly traffic counts of vehicle types and distributions and representative pass-by noise levels for each of the vehicle types being considered.
- Compare the monitored and predicted L_{Amax} and L_{Aeq} noise levels for the existing alignment and calculate any differences in terms of both magnitude and frequency.
- Calculate the L_{Amax} - L_{Aeq} maximum noise events for the design year from the predicted traffic volume and mix for the design year, representative pass-by noise levels for each of the vehicle types being considered, and the reported differences between monitored and predicted data for the existing alignment.

Reporting requirements

Report the following aspects:

- Differences between monitored and predicted noise levels for the existing alignment and how they were accounted for in predicting maximum noise impacts, if applicable.
- L_{Amax} noise levels greater than 65dBA where L_{Amax} - $L_{Aeq} \geq$ 15dBA.
- The number and distribution of the L_{Amax} - L_{Aeq} maximum noise events from road traffic on an hourly basis between 10pm and 7am.

- Evaluate whether maximum noise impacts will reduce or increase for the design year.
- On the basis of this evaluation, take account of maximum noise levels when prioritising, selecting and designing noise control measures.

Appendix B: Consistency between this Road Noise Criteria Guideline and the Road Noise Policy

This Appendix B describes how this Guideline meets the intentions in the RNP (Environment Protection Authority, 2011).

- Outlines the subtle differences in how Transport assigns road assessment criteria for potential mitigation using the RNCG as compared with the RNP.

It is intended to outline the subtle differences in how Transport assigns road criteria using the RNCG compared with the RNP.

Overview

Transport's RNCG has been developed to provide a consistent approach to identifying road noise criteria for Transport's projects and practical implementation of the RNP intent. The RNCG uses the same values for noise criteria as the RNP. and is driven by common underlying principles (See Section 2 of this RNCG).

An overview is provided in Section 3 of this RNCG on the steps taken to assign criteria to sensitive receivers.

Identifying road type

This RNCG is used to identify the road development type by whether the:

- Volume or composition of traffic flows would change substantially.
- Road project is in a new or existing road corridor.
- Road project involves the construction of a new road or substantial changes to the alignment or function of an existing road.

The road development type can be new, redeveloped or a combination of both. Each development type has different criteria.

The approach to identifying road development types is consistent with that given in Sections 1.1 to 1.3 of the RNP.

Note that the definition of substantial realignment is not given in the RNP. Transport interpretation of substantial realignment is defined in this RNCG. Transport's definition aims to relate to community perception of substantial realignment and also gives some tolerance to allow for minor curve straightening of an existing road without it being considered substantially realigned.

Not all road development types are covered by the RNP. For example some works completed by Transport that are either minor works or required to improve safety use the RNP criteria for redeveloped roads as guidance. This procedure is defined in the RNCG in Sections 4.5 and 5.6.

Study area

The study area used by Transport is described in Section 5 of this RNCG. In general, the study area width where criteria apply for a new or redeveloped road would be 600 metres from the subject road, consistent with Section 3.4 of the RNP. The RNCG also allows the study area to be reduced in highly urban situations as a boundary of 600 metres may include areas where noise levels are dominated by other significant roads, not relevant to the project.

In highly urban areas reducing the study area produces the same mitigation outcome as if a 600m boundary had been used. The benefit is that the noise modelling and reporting requirements have been reduced to only include sensitive receivers affected by the project. Approaches to determine feasible and reasonable noise mitigation are described in the RNP under Section 3.3 of the RNP and Transport's RNMG. The RNCG uses the

highly urban situation as an initial check at the start of the assessment process to reduce processing and reporting requirements by excluding receivers that would not be mitigated as part of the project with noise levels dominated by other roads.

Assigning criteria to receivers

Criteria are assigned to receivers using this RNCG. For residences, the RNCG defines criteria based on the road types the receiver will be affected by in the 'build' year post opening. For example, if a receiver is most affected by a new road it gets new road criteria and similarly for redeveloped road.

Transition zone

Some residences will be in regions affected by new and redeveloped road types within the same project or roads within the project and another existing road. These regions are called transition zones. The challenge is to assign noise criteria to receivers in these regions and provide a smooth change between the different criteria associated with each road type based on what the receivers is affected by.

The concept of transition zones are explored in both the RNP (Section 3.6) and RNCG (Section 6), but with different implementation approaches. If receivers are affected by both a new and redeveloped road then the RNCG evaluates the proportion of noise contribution from each road type at the residences location to identify the transition zone criteria. This can be visualised as a sliding scale in 1dBA increments between the new and redeveloped criteria (see Figure 2) depending on the proportion of noise at the receiver that comes each road type before mitigation has been applied. This approach ensures that the transition zone is located at the physical junction between the two road categories.

On the other hand, the RNP (see Figure 3) takes existing noise levels into consideration when setting transition zone criteria. This can result in new road criteria not being assigned for 150m to 900m from the physical junction between the two road types on Transport projects. This is because existing noise levels near State and Federal roads are often much higher than new road criteria or often the road project alignment is significantly different to the existing road and associated noise pattern.

Under Transport's approach in the RNGG the existing noise level has no effect on setting new and redeveloped criteria. The approach documented in the RNCG is easier to explain to the community as the transition aligns with the physical junction between the new and redeveloped road and follows the project road geometry. It also treats people more fairly as it ensures that criteria and opportunities to reduce noise relate to the project road design rather than what they had before.

Existing noise levels are only considered in setting more stringent criteria in very low traffic noise environments (RNCG adopts RNP's relative increase criteria) where achieving the new and redeveloped criteria would still create a large impact and where a road project generates significant additional traffic near receivers on the surrounding and road network.

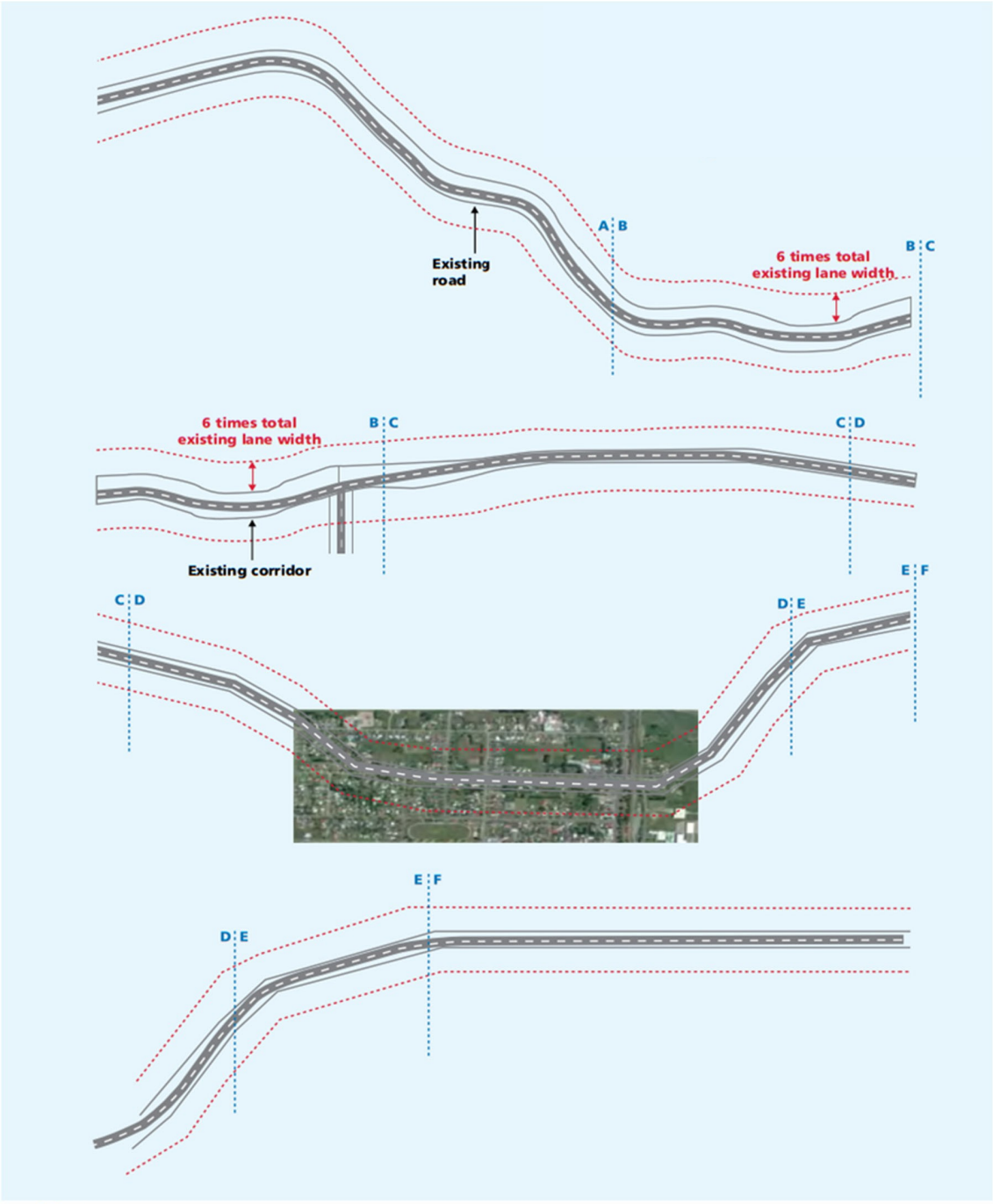
Note that for receivers with new road criteria Transport assesses the total noise level from all roads against the new road criteria. This differs from the RNP where consideration is only given to the noise levels contributed by the new road. This is an important difference and Transport's approach ensures that noise mitigation reduces road traffic noise levels at the receiver rather than just the noise level coming from the new road. This approach also ensures that noise from the new road, even if it complies with criteria under the RNP approach, cannot unreasonably add to existing noise levels without the receiver qualifying for mitigation.

All in all, the principles behind the RNCG are consistent with the RNP. Criteria are based on the road development type a residence is affected by due to the road project. Residences may be assigned new, redeveloped or transition zone noise criteria depending on what part of the project they are affected by and assigned relative increase criteria for the project or existing noise criteria on the surrounding road network depending on how the built project will change noise levels.

Appendix C1: New and redeveloped zones - existing road and boundaries

This appendix shows:

- The existing road.
- Current Transport road boundary.
- Six times total existing lane width.
- For between road segments A to F.



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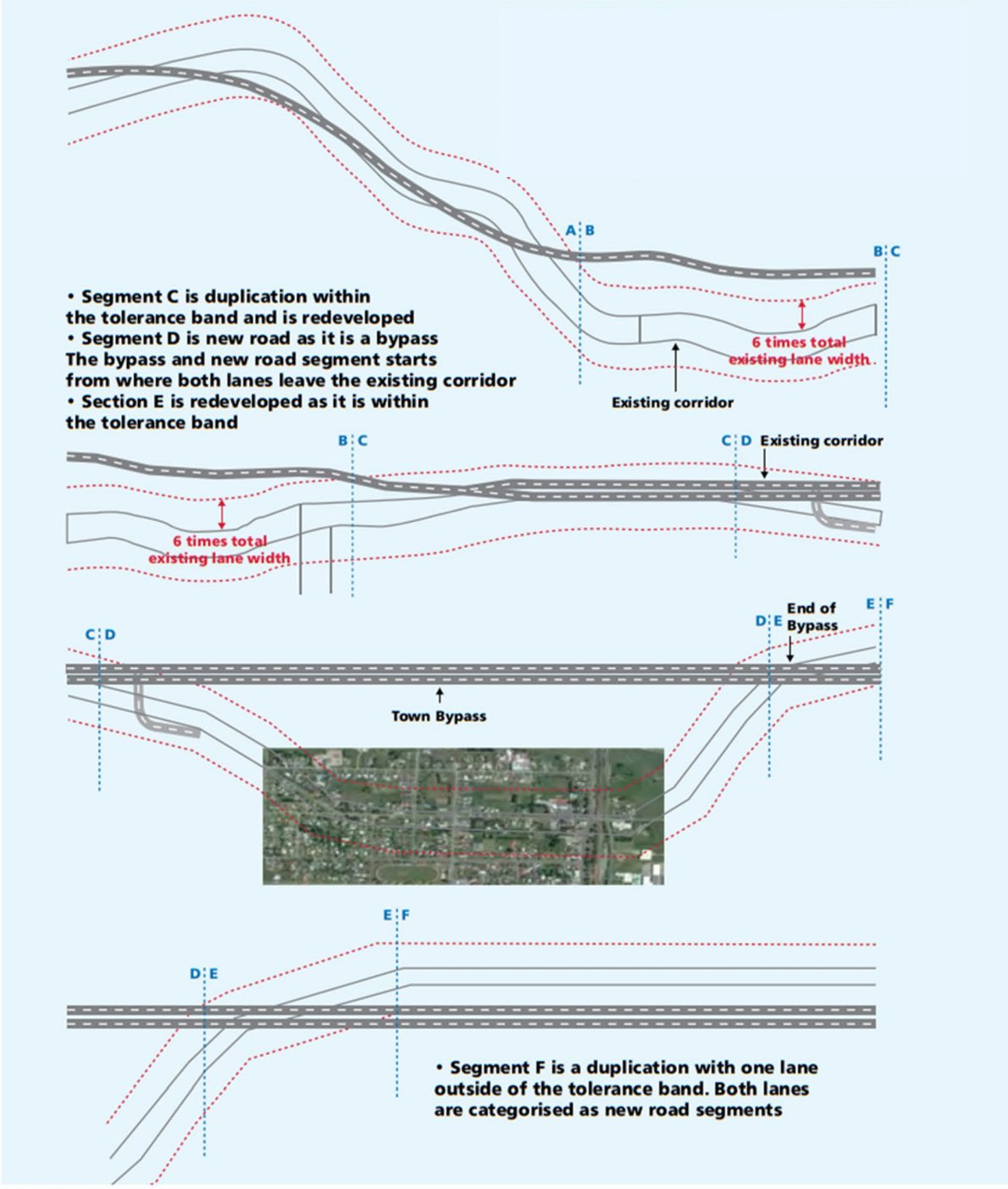
Appendix C2: New and redeveloped zones

This appendix shows the road project overlaid on the existing road boundary and six times lane width tolerance.



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Appendix D: Road Noise Policy criteria

The following tables have been reproduced from the Environmental Protection Authority's NSW Road Noise Policy 2011 (RNP) (March 2011).

Note that:

- Austroad and Transport documentation uses the term functional class rather than road category. For the purposes of noise assessment in NSW the two terms are interchangeable.

RNP Table 3: Road traffic noise assessment criteria for residential land uses

Road category	Type of project / land use	Assessment criteria – dBA	
		Day (7am–10pm)	Night (10pm–7am)
Freeway/ arterial/ sub-arterial roads	1. Existing residences affected by noise from new freeway/arterial/sub-arterial road corridors	$L_{Aeq(15hour)}$ 55 (external)	$L_{Aeq(9hour)}$ 50 (external)
	2. Existing residences affected by noise from redevelopment of existing freeway/arterial/sub-arterial roads 3. Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq(15hour)}$ 60 (external)	$L_{Aeq(9hour)}$ 55 (external)
Local roads	4. Existing residences affected by noise from new local road corridors 5. Existing residences affected by noise from redevelopment of existing local roads 6. Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq(1hour)}$ 55 (external)	$L_{Aeq(1hour)}$50 (external)

RNP Table 4: Road traffic noise assessment criteria for non-residential land uses affected by proposed road projects and traffic generating developments

Existing sensitive land use	Assessment criteria – dBA		Additional considerations
	Day (7am–10pm)	Night (10pm–7am)	
1. School classrooms	$L_{Aeq(1hour)}$ 40 (internal)	-	In the case of buildings used for education or health care,noise level criteria for spaces other than classrooms andwards may be obtained by interpolation from the'maximum' levels shown in Australian Standard 2107:2000 (Standards Australia 2000).
2. Hospital wards	$L_{Aeq(1hour)}$ 35 (internal)	$L_{Aeq(1hour)}$ 35 (internal)	
3. Places of worship	$L_{Aeq(1hour)}$ 40 (internal)	$L_{Aeq(1hour)}$ 40 (internal)	The criteria are internal, i.e. the inside of a church. Areas outside the place of worship, such as a churchyard or cemetery, may also be a place of worship. Therefore, in determining appropriate criteria for such external areas,it should be established what is in these areas that may be affected by road traffic noise. For example, if there is a church car park between a church and the road, compliance with the internal criteriainside the church may be sufficient. If, however, betweenthe church and the road are areas where outdoor services may take place such as weddings and funerals, external criteria for these areas are appropriate. As issues such as speech intelligibility may be a consideration in these cases, the passive recreation criteria (see point 5) may be applied.
4. Open space (active use)	$L_{Aeq(15hour)}$ 60 (external) when in use	-	Active recreation is characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion. Passive recreation is characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, e.g. playing chess, reading. In determining whether areas are used for active or passive recreation, the type of activity that occurs in thatarea and its sensitivity to noise intrusion should be established. For areas where there may be a mix of passive and active recreation, e.g., school playgrounds, the more stringent criteria apply. Open space may also be used as a buffer zone for more sensitive land uses.
5. Open space (passive use)	$L_{Aeq(15hour)}$ 55 (external) when in use	-	

6. Isolated residences in commercial or industrial zones	–	–	For isolated residences in industrial or commercial zones, the external ambient noise levels can be higher than those in residential areas. Internal noise levels in such residences are likely to be more appropriate in assessing any road traffic noise impacts, and the proponent should determine suitable internal noise level targets, taking guidance from Australian Standard 2107:2000 (Standards Australia 2000).
7. Mixed use development	–	–	Each component of use in a mixed-use development shouldbe considered separately.
8. Mixed use development	Sleeping rooms $L_{Aeq(1hour)}$ 35 (internal) Indoor play areas $L_{Aeq(1hour)}$ 40(internal) Outdoor play areas L_{Aeq}(1hour) 55 (external)	–	For example, in a mixed-use development containing residences and a child care facility, the residential component should be assessed against the appropriate criteria for residences and the child care component shouldbe assessed against the appropriate criteria for child care facilities.
9. Aged care facilities	–	–	Multipurpose spaces, e.g., shared indoor play / sleepingrooms should meet the lower of the respective criteria.

RNP Table 5: Transitway noise assessment criteria for existing residential land uses

Transitway type	Assessment criteria – dBA		Additional considerations
	Day (7am–10pm)	Night (10pm–7am)	
Off-road transitway	$L_{Aeq(15hour)}$ 60 (external)	$L_{Aeq(9hour)}$ 55 (external)	The total noise level from the transitway is to be assessed against the criteria.
On-road transitway	The noise assessment criteria in Table 3 apply as appropriate to the existing road classification, e.g., freeway/ arterial/ sub-arterial or local road classification.		The total combined noise level from the road, including the transitway and other traffic, is to be assessed against the criteria.

RNP Table 6: Relative increase criteria for residential land uses

Road category	Type of project/development	Assessment criteria – dBA	
		Day (7am–10pm)	Night (10pm–7am)
Freeway /arterial/ sub-arterial roadsand transitways	New road corridor/ redevelopment ofexisting road/land use development with the potential to generate additional traffic on existing road.	Existing traffic $L_{Aeq(15hour)}$ + 12 dB(external)	Existing traffic $L_{Aeq(9hour)}$ + 12 dB(external)

RNP Table 8: Target noise abatement levels for existing roads not subject to development

Existing road category	Assessment criteria – dBA	
	Day (7am–10pm)	Night (10pm–7am)
Freeway/arterial/sub-arterial road	$L_{Aeq(15hour)}$ 60 (external)	$L_{Aeq(9hour)}$ 55 (external)
Local road	$L_{Aeq(1hour)}$ 55 (external)	$L_{Aeq(1hour)}$ 50 (external)

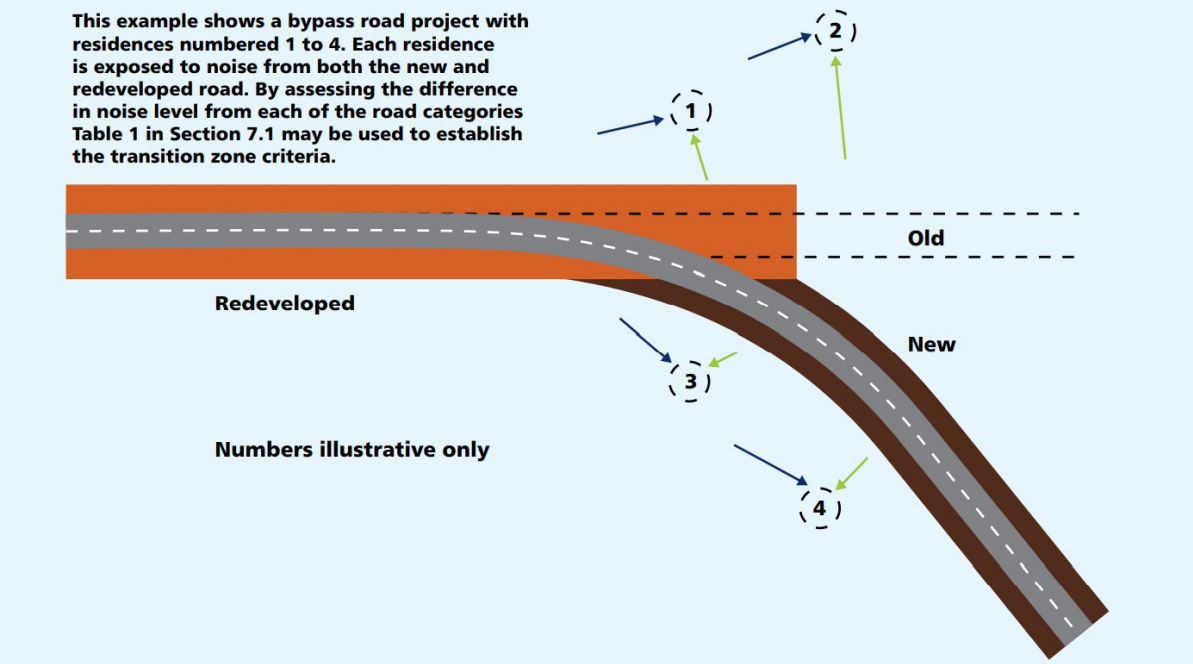
Appendix E: Transition zone examples

The following examples show how the approaches in Section 6 may be applied for a number of junctions between road types and functional classes.

- Example 1 shows a bypass or substantially realigned road upgrade with a new road segment that extends and continues beyond the existing road corridor.
- Example 2 shows curve straightening that has resulted in substantial realignment of the road.
- Examples 3A to 3D show a road project that abuts an existing local road and how this is assessed at each facade.
- Examples 4A and 4B show a wholly new road project that meets an existing major road.
- Example 5 shows a situation where there are two types of transition zones at the one location. A redeveloped and new road transition zone is at the crossing point of an existing local road.

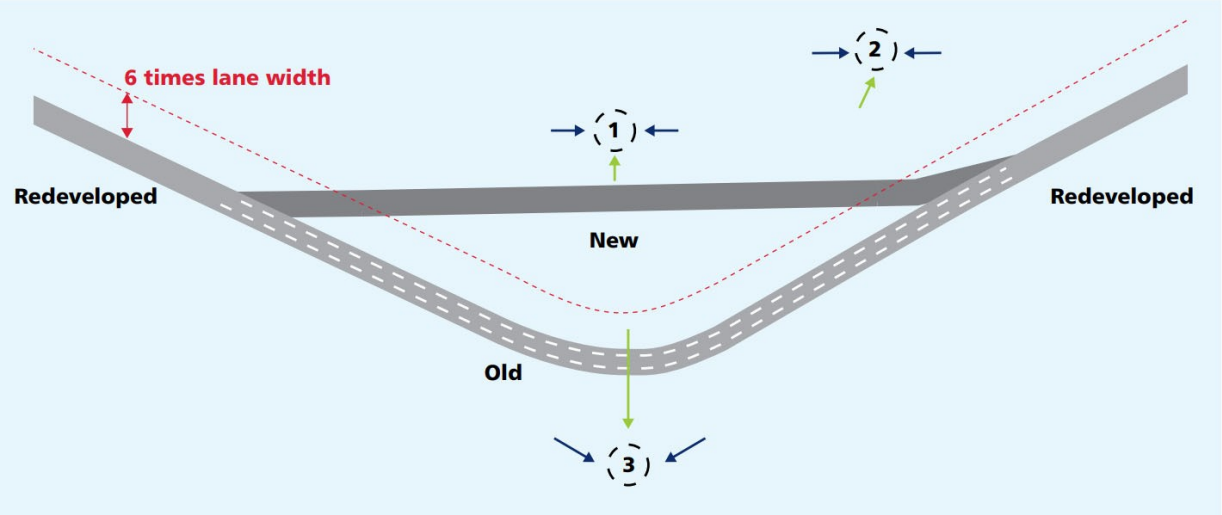
Example 1: Transition zone between redeveloped and new road (contribution difference)

Residence no.	New road contribution	Redeveloped contribution	Contribution Difference	Daytime criteria
1	61	65	-4	**60**
2	59	61	-2	**59**
3	63	63	0	**57**
4	65	56	9	**55**



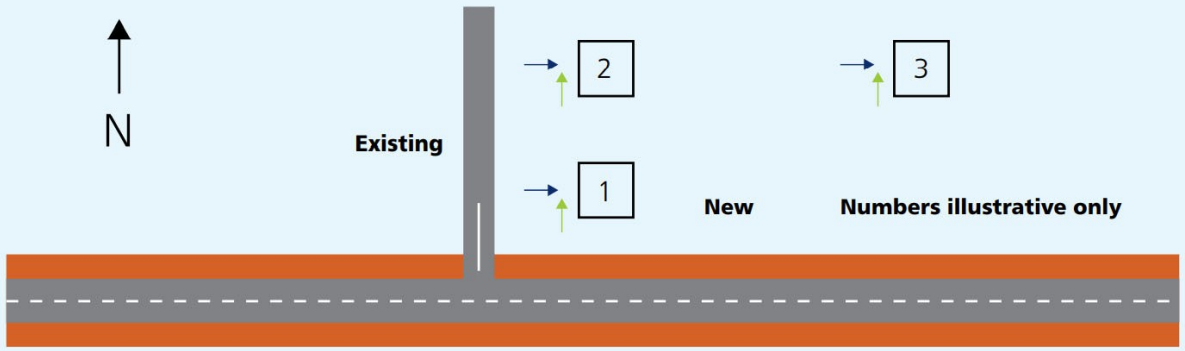
Example 2: Substantial realignment of road, transition zone between redeveloped and new road segments (contribution difference

Residence no.	New road contribution	Redeveloped contribution	Contribution difference	Daytime criteria
1	70	59	11	**55**
2	64	64	0	**57**
3	63	61	2	**56**



Example 3A: Transition zone between a new road and an existing local road – Western façade (road traffic noise levels)

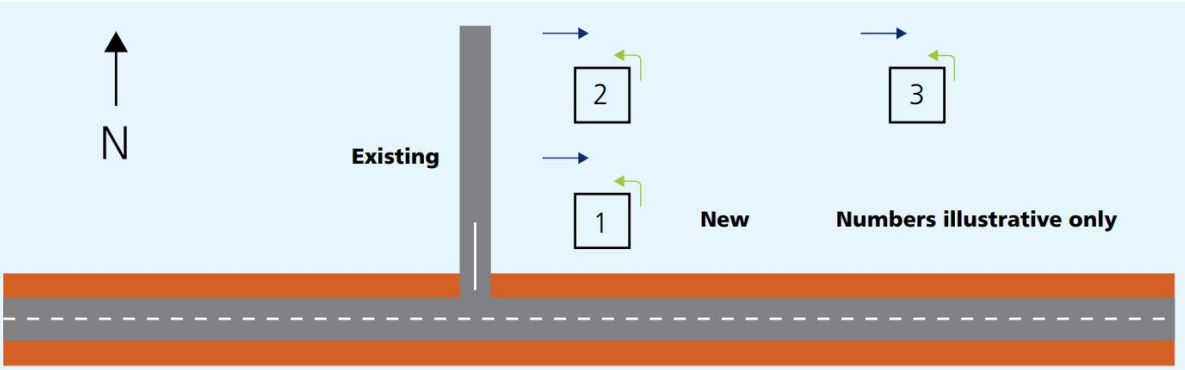
Residence no.	Facade	Project daytime criteria	"Build" existing side road contribution	"No build" existing side road contribution	>2dB change?	"Build" project road contribution	Existing side road contribution *greater than Project* road contribution	Existing road daytime criteria
1	West	55 15hr	62 1hr	59 1hr	Y	63 15 hr	N	NA
2	West	55 15hr	62 1hr	59 1hr	Y	57 15 hr	Y	55 1hr
3	West	55 15hr	56 1hr	53 1hr	Y	57 15 hr	N	NA



This example shows a new road which abuts an existing local road with residences numbered 1 to 3. Each residence is exposed to noise from both roads and is assessed at each facade. At each residence the change in noise level from the existing road is assessed to see if a transition zone needs to be considered. Where the change in noise level from the existing road is greater than 2dBA and the noise from the existing local road is greater than the new road, both the existing local and new road criteria apply. Table 2 from Section 7.2 is completed for each residence.

Example 3B: Transition zone between a new major road and an existing local road – Northern façade (road traffic noise levels)

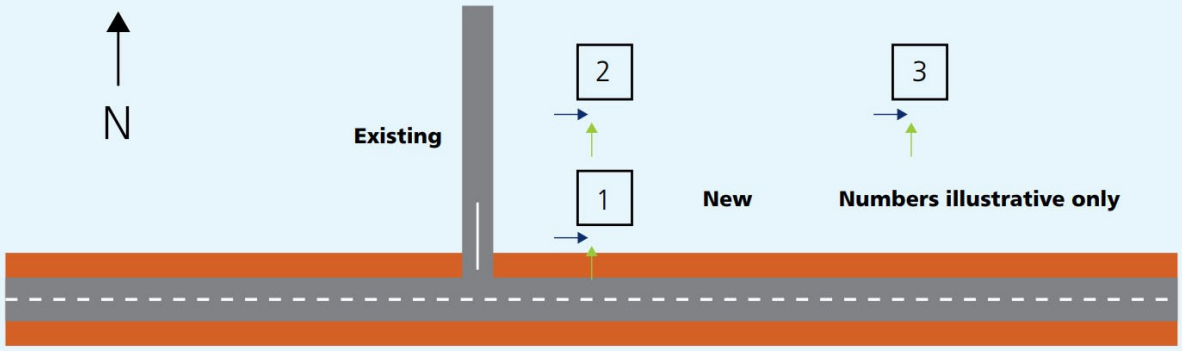
Residence no.	Facade	Project daytime criteria	"Build" existing side road contribution	"No build" existing side road contribution	>2dB change?	"Build" project road contribution	Existing side road contribution *greater than* Project road contribution	Existing road daytime criteria
1	North	55 15hr	59 1hr	56 1hr	Y	55 15 hr	Y	55 1hr
2	North	55 15hr	59 1hr	56 1hr	Y	54 15 hr	Y	55 1hr
3	North	55 15hr	53 1hr	50 1hr	Y	54 15 hr	N	NA



This example shows a new road which abuts an existing local road with residences numbered 1 to 3. Each residence is exposed to noise from both roads and is assessed at each facade. At each residence the change in noise level from the existing road is assessed to see if a transition zone needs to be considered. Where the change in noise level from the existing road is greater than 2dBA and the noise from the existing local road is greater than the new road both the existing local and new road criteria apply. Table 2 from Section 7.2 is completed for each residence.

Example 3C: Transition zone between a new major road and existing local road – Southern façade (road traffic noise levels)

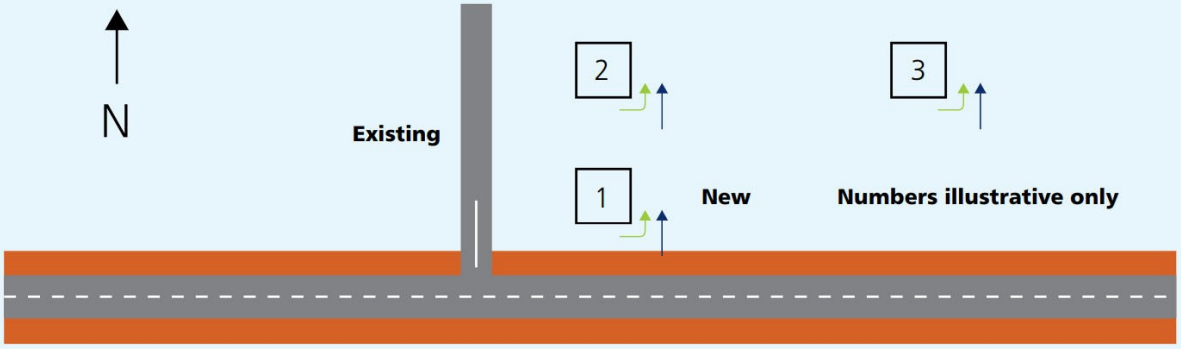
Residence no.	Facade	Project daytime criteria	"Build" existing side road contribution	"No build" existing side road contribution	>2dB change?	"Build" project road contribution	Existing side road contribution *greater than* Project road contribution	Existing road daytime criteria
1	South	55 15hr	59 1hr	56 1hr	Y	63 15 hr	N	NA
2	South	55 15hr	59 1hr	56 1hr	Y	57 15 hr	Y	55 1hr
3	South	55 15hr	54 1hr	51 1hr	Y	57 15 hr	N	NA



This example shows a new road which abuts an existing local road with residences numbered 1 to 3. Each residence is exposed to noise from both roads and is assessed at each facade. At each residence the change in noise level from the existing road is assessed to see if a transition zone needs to be considered. Where the change in noise level from the existing road is greater than 2dBA and the noise from the existing local road is greater than the new road both the existing local and new road criteria apply. Table 2 from Section 7.2 is completed for each residence.

Example 3D: Transition zone between a new road and an existing local road – Eastern façade (road traffic noise levels)

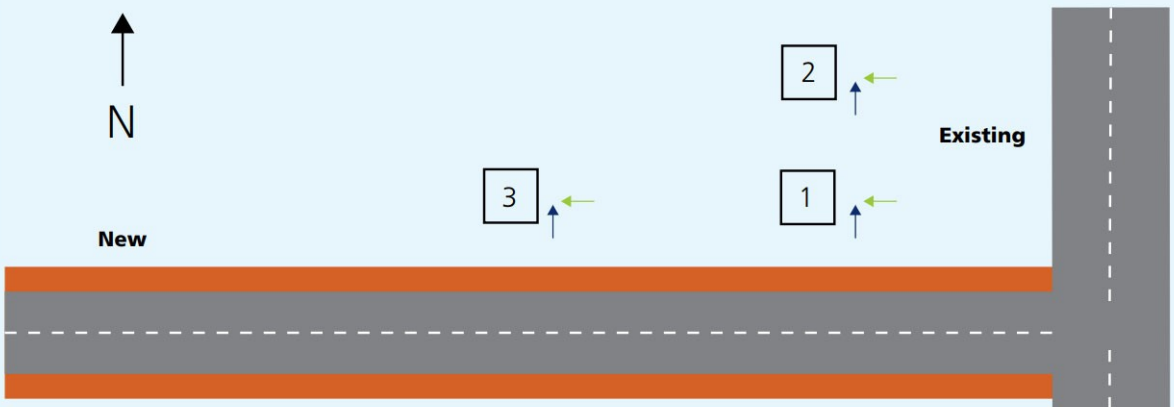
Residence no.	Facade	Project daytime criteria	"Build" existing side road contribution	"No build" existing side road contribution	>2dB change?	"Build" project road contribution	Existing side road contribution *greater than* Project road contribution	Existing road daytime criteria
1	East	55 15hr	54 1hr	51 1hr	Y	63 15 hr	N	NA
2	East	55 15hr	54 1hr	51 1hr	Y	57 15 hr	N	NA
3	East	55 15hr	48 1hr	45 1hr	Y	57 15 hr	N	NA



This example shows a new road which abuts an existing local road with residences numbered 1 to 3. Each residence is exposed to noise from both roads and is assessed at each facade. At each residence the change in noise level from the existing road is assessed to see if a transition zone needs to be considered. Where the change in noise level from the existing road is greater than 2dBA and the noise from the existing local road is greater than the new road both the existing local and new road criteria apply. Table 2 from Section 7.2 is completed for each residence.

Example 4A: Transition zone between a new road and an existing road; the existing road has a 3dBA increase in noise contribution – Eastern facades

Residence no.	Facade	Project daytime criteria	"Build" existing side road contribution	"No build" existing side road contribution	>2dB change?	"Build" project road contribution	Existing side road contribution *greater than* Project road contribution	Existing road daytime criteria
1	East	55 15hr	58 15hr	55 15hr	Y	57 15 hr	Y	60 15hr
2	East	55 15hr	58 15hr	55 15hr	Y	51 15 hr	Y	60 15hr
3	East	55 15hr	55 15hr	52 15hr	Y	57 15 hr	N	NA



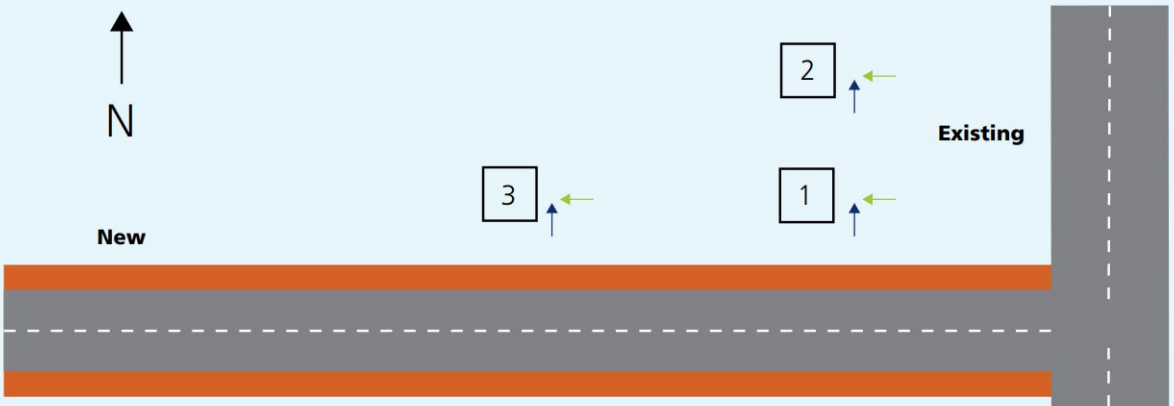
This example shows a transition between a new road which ends at an existing road with residences numbered 1 to 3. Each residence is exposed to noise from both the new and existing road. By assessing the difference in noise level from each of the road categories Table 2 in Section 7.2 may be used to establish the transition zone criteria. The change in noise level contribution on the eastern facade from the existing road is greater than 2dBA. At receivers 1 and 2 the existing road contribution is greater than the project road so the receiver gets both the project and existing road criteria. At receiver 3 the project road contribution is greater than the existing road so it gets the project criteria.

Note 1: Redeveloped contribution includes both redeveloped road segments

Numbers illustrative only

Example 4B: Transition zone between a new road and an existing road; the existing road has 1dBA increase in noise contribution – Eastern facades

Residence no.	Facade	Project daytime criteria	"Build" existing side road contribution	"No build" existing side road contribution	>2dB change?	"Build" project road contribution	Existing side road contribution *greater than* Project road contribution	Existing road daytime criteria
1	East	55 15hr	55 15hr	54 15hr	N	58 15 hr	N	NA
2	East	55 15hr	55 15hr	54 15hr	N	52 15 hr	Y	NA
3	East	55 15hr	52 15hr	51 15hr	N	58 15 hr	N	NA



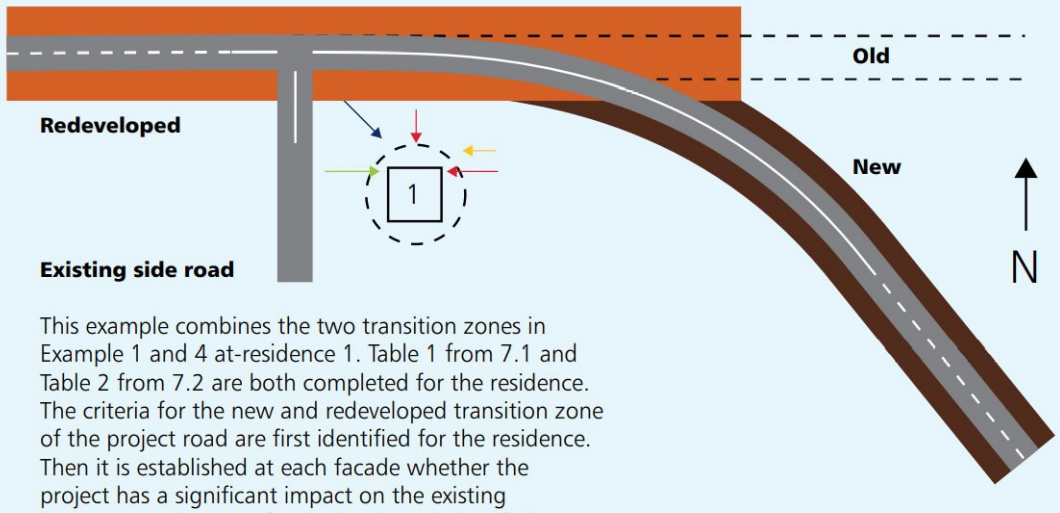
This example shows a transition between a new road and an existing road with residences numbered 1 to 3. Each residence is exposed to noise from both the new and existing road. By assessing the difference in noise level from each of the road categories Table 2 in Section 7.2 may be used to establish the transition zone criteria. The change in noise level contribution on the eastern facade from the existing road is less than 2dBA. Since the eastern facade is most affected by the existing road it can be assumed that criteria for the existing road are not applied at any facades. Only the new road criteria are applied at each residence.

Note 1: Redeveloped contribution includes both redeveloped road segments

Numbers illustrative only

Example 5: Transition zone between new and redeveloped roads and existing local road (both contribution difference and road traffic noise levels

Residence no.	New road contri.	Redeveloped road contri.	Contri. difference	Project road daytime criteria	Facade	"Build" existing side road contri.	"No build" existing side road contri.	>2dB?	"Build" project road contri.	Existing road contri. greater than project road contri.	Existing road daytime criteria
1	62	62	0	**57 15hr**	North	60 1hr	56 1hr	Y	65 15hr	N	**NA**
					South	60 1hr	56 1hr	Y	59 15hr	Y	**55 1hr**
					East	52 1hr	48 1hr	Y	65 15hr	N	**NA**
					West	63 1hr	59 1hr	Y	59 15hr	Y	**55 1hr**



This example combines the two transition zones in Example 1 and 4 at-residence 1. Table 1 from 7.1 and Table 2 from 7.2 are both completed for the residence. The criteria for the new and redeveloped transition zone of the project road are first identified for the residence. Then it is established at each facade whether the project has a significant impact on the existing local road and criteria for the local road identified.

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