Towards safer and more liveable urban streets

Discussion Paper

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This report has been developed through Engineers Australia's member-delivered policy and advocacy by the Transport Australia Society

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Executive Summary

The current transport system has become excessively dependent on the use of private cars for urban transport. Increased volume and speed of traffic on the street network has made walking, cycling and other micromobility travel options more difficult and less safe.

In 2023, the Transport Australia Society (TAs) published the Urban Transport Systems – Policy and Planning Advice paper[1] which highlighted the shortcomings of the current policies and proposed an alternative Sustainable Mobility Management approach.

It recommends a move away from the past approach of "predict and provide", based largely on an extrapolation of past trends, to a more forward looking "vision and validate" model.

Whilst the vision should be unique to each city's circumstances, it should support:

- Improved global and local environmental outcomes.
- Improved community health and fitness.
- Safer well-connected streets for all users.
- Improved liveability – more attractive streets, places and neighbourhoods.
- An accessible city with a reduced level of car dependence.
- An affordable city with reduced transport costs for both users and governments.

This paper builds on and discusses practical support for the policy changes proposed in the Urban Transport Systems Policy and Planning Advice paper.

Engineers Australia and TAs support improving the integration of transport and land use planning, use of demand management to reduce traffic volumes on city streets and the implementation of measures specifically designed to improve safety and connectivity for vulnerable streets users.

Designing urban streets in a way that will improve safety for pedestrians and cyclists, without unduly restricting other vehicle movement around the streets, is the focus. Traditional road design has prioritised meeting the needs of cars and large vehicles and has failed to take account of the needs of pedestrians and cyclists early enough in the process. Often it will be too late to include a safe integrated solution for these vulnerable street users at an acceptable cost. Principles for street planning and design should include:

- Reduce street speeds to 'safe speeds', primarily through design, in accordance with the safe system approach; and
- Apply a street user hierarchy that is based on meeting the safety needs of the most vulnerable and making the best use of scarce and valuable street space from both an urban design perspective and the efficient use of resources.

The discussion paper focuses only on the most important and valuable changes to the planning and design of streets that can easily be made. It is not intended to be a complete street design guide, although the principles can easily be applied more widely. TAs considers that the current Austroads Design guide[2] does not meet the needs of a safer, more interconnected transport system. This paper references a number of alternative street design guidelines, from both Australian states and other

[1] Engineers Australia (2023). *Urban Transport Systems - Policy and Planning Advice*. www.engineersaustralia.org.au/sites/default/files/2023-08/Urban-Transport-Systems-Report-%28August2023%29.pdf
[2] AustRoads (2021) *Guide to Road Design* https://austroads.gov.au/safety-and-design/road-design/guide-to-road-design

countries, that can be used in the interim, until a fit-for-purpose Australian street design guide can be prepared.

TAs welcomes discussion with interested stakeholders on the following recommendations:

1. Urban speed regulations should be based on only three speed limits - 30kph, 50kph and 70kph - to enable greater differentiation between streets in terms of appearance and design to provide appropriate visual cues to drivers of the desirable traffic speed.

2. Reduce the default lane width for urban streets from 3.5m to 3.0m, except on major traffic routes, to reduce speed and improve safety, with traffic engineers being required to justify lane widths above or below 3.0m.

3. Convert four laned undivided urban streets to two laned streets, wherever possible, to improve safety and re-allocate space from moving vehicles to higher value uses, such as creation of median crossings, bicycle priority lanes or provision of kerb side parking.

4. Implement a safer, better connected urban street pedestrian crossing program, through installation of zebra crossings, on the 50kph street network. Wombat, raised zebra crossings, are preferred, because of their proven record of reducing traffic to a safe speed of 30kph. This program applies at both mid-block and unsignalised intersections, including roundabouts, where current regulations provide no priority for pedestrians.

5. Provide tighter corner radii at intersections to reduce crossing distance for pedestrians and reduce speed of turning traffic.

6. Provide raised pedestrian refuge islands of adequate width to enable pedestrians to cross one direction of traffic at a time.

These measures when installed, either on their own or in combination, have been successfully used overseas and at some locations in Australia, but they have not yet found their way into routine Australian practice. TAs recommends their use routinely, to improve safety and to encourage people to walk more often, along safer, more attractive and connected urban streets.

Engineers Australia welcome feedback on this discussion paper to help inform future work. To provide feedback please email policy@engineersaustralia.org.au.

1. Introduction

This paper has been developed by Engineers Australia's Transport Australia Society (TAs) to build on and discuss practical support for policy changes proposed in the 'Urban Transport Systems policy and planning advice' paper[3]. The paper aims to improve street design so streets are safer and better connected. It is based largely on the 'Urban Transport Systems' paper, but is consistent with other papers, particularly those on the future of transport[4], road safety[5], universal design[6] and climate change[7]. The basis is consistent with contemporary transport planning including Safe System[8] for road safety and Movement and Place[9], although there are some variations to better take account of human factors, multiple professional disciplines and other important considerations.

1.1. About Engineers Australia

As Australia's national body for engineering, we are the voice and champion of our 130,000-plus members. We provide them with the resources, connections, and growth they need to do ethical, competent and high-value work in our communities.

A mission-based, not-for-profit professional association, Engineers Australia is constituted by Royal Charter to advance the science and practice of engineering for the benefit of the community. We back today's problem-solvers, so they can shape a better tomorrow.

TAs is a technical society for transport professionals in Australia. It focusses on key transport decisions affecting the wellbeing, productivity and sustainability of our cities and regions.

1.2. Objective and scope

Currently, most road design focuses on motorised transport with the needs of pedestrians and cyclists included subsequently. An objective of this paper is to ensure the safety and mobility needs of the most vulnerable urban travellers (pedestrians, cyclists and scooter riders) are prioritised in urban street design.

In the past, traditional road design has been based on a traffic hierarchy with higher order roads carrying larger volumes of traffic at higher speeds and local streets catering for lower traffic volumes at slower speeds, with intermediate roads and streets somewhere in between. The approach has been to design for cars and trucks at speeds that are higher than is desirable on mixed use urban streets, based on the premise that some drivers will always travel faster than the speed limit and the street design should accommodate this behaviour on the grounds it will increase safety for the speeding drivers.

The problem with this approach is that the resulting higher speeds are known to result in an overall increase in severity of road crashes and is inconsistent with a safe system speed for pedestrians and cyclists. The Transport Australia Society considers there is a basic inequity in this approach to street design that favours vehicles over the more vulnerable street users. In any crash between a pedestrian and a moving vehicle it is obvious that the pedestrian will suffer the most serious injury. The design of

[3] Engineers Australia (2023). *Urban Transport Systems - Policy and Planning Advice*. www.engineersaustralia.org.au/sites/default/files/2023-08/Urban-Transport-Systems-Report-%28August2023%29.pdf

[4] Engineers Australia (2023). *The Future of Transport, Discussion Paper*. www.engineersaustralia.org.au/sites/default/files/2023-01/future-transport-discussion-paper-jan-2023.pdf

[5] Engineers Australia (2023). *Road Safety Policy Advice Paper*. www.engineersaustralia.org.au/sites/default/files/2024-05/TAs-Road-Safety-policy-advice-paper.pdf

[6] Engineers Australia (2022). *Universal Design for Transport Discussion Paper*. www.engineersaustralia.org.au/sites/default/files/2022-10/universal-design-for-transport-discussion-paper.pdf

[7] Engineers Australia (2020). *Climate Change and Transport*. www.engineersaustralia.org.au/sites/default/files/2022-06/climate-change-transport-discussion-paper.pdf

[8] Austroads (2021). *Guide to Road Safety Part 1: Introduction and The Safe System*. https://austroads.gov.au/publications/road-safety/agrs01

[9] Austroads, (2020). *Integrating Safe System and Movement and Place for Vulnerable Road Users*. Research Report AP-R611-20. https://austroads.gov.au/publications/road-safety/ap-r611-20#:~:text=The%20integration%20of%20Safe%20System,and%20cyclists%20on%20Australasian%20roads.

the urban street system must ensure that the safety of all street users is equally respected. This paper considers ways in which urban street design can provide more protection for vulnerable street users without unduly restricting other vehicle movement around the system.

The paper focusses only on the most important and valuable changes to the planning and design of streets that can easily be made, both for new streets and for retrofits to existing roads. It is not intended to be a complete street design guide, although the principles can be widely applied.

For many years the safety and mobility needs of pedestrians and other vulnerable street users has been given insufficient emphasis and this has led to a gradual reduction of walking and cycling as a proportion of urban travel. The result is that many people who do not have access to a car, including young people below driving age, those who cannot afford a car, or people who have a disability such as sight impairment, are disadvantaged. For this reason, this paper focusses on transport which is safe, sustainable and equitable.

2. A holistic and integrated approach to planning and design

Transport planning policy or design should not start at the 'drawing board' but should be based on good principles and practice. This discussion paper takes a holistic approach to street planning and design. It is designed to improve transport safety, connectivity and efficiency, both in the short and longer term, by adopting a more sustainable approach to planning and by improving integration of transport and land use. Besides basic transport safety and accessibility, good street planning and design has a multitude of benefits including less energy use and fewer emissions, better community connections, better health outcomes, improved amenity, less noise, improved transport affordability, reduced traffic congestion and benefits to local businesses. A more holistic approach to street planning and street design must prioritise sustainability, equity and systems planning. In many cases, both transport efficiency and accessibility can be improved for many users through an increase in more active and sustainable transport.

2.1. Sustainability

Climate change is the most important environmental crisis of our age[10]. Other environmental issues are also critically important, including fossil fuel use, emissions harmful to health, land degradation, tree cover and cities acting as 'heat sinks'.

Sustainability extends beyond the natural environment to social and economic sustainability. Traditional transport engineering, which focuses on efficiency, or lowest overall cost, does not properly take all sustainability issues into account and underrepresents more sustainable and equitable transport. This is substantially due to reliance on quantified micro-economic analysis, such as benefit-to-cost ratio estimates, that do not account for intangible effects, and overemphasise financial valuations and travel time savings.

2.2. Equity

A large number of Australians are unable to drive themselves, because they are too young to drive, cannot afford a car, are not capable, or have an impairment. In Melbourne, the RACV[11] showed that over one third of people aged 18-24, 17% aged 25-29 and 23% aged 70-90 do not have a driving licence. These people, as well as all those too young to drive, are reliant on others to drive them, or must use

[10] Engineers Australia (2020). *Climate Change and Transport*. www.engineersaustralia.org.au/sites/default/files/2022-06/climate-change-transport-discussion-paper.pdf
[11] RACV (2017) *Young Adult Licensing Trends.* https://www.racv.com.au/content/dam/racv/images/public-policy/reports/2015%20-%20-young-adult-licensing-trends-and-travel-modes-report.pdf

public transport, walk, cycle or use scooters for their main travel needs. The alternatives to driving, or being driven, requires people to walk, cycle or ride scooters for part or all or their journey, using infrastructure that lacks connectivity and safety for many, particularly children, the elderly and people with disabilities that impacts their mobility or sight. It is inequitable that so many of our most vulnerable people do not feel safe travelling on the urban street network. There is a need for a diverse and therefore multimodal transport system to suit the needs of all Australians to access places, experiences, goods and services.

Equity is rarely incorporated explicitly or assessed in transport policy, planning and design. Equity has various interpretations and applications but is generally about providing fair, just, and impartial treatment and distribution of resources, costs, and outcomes for everyone, no matter who they are or their circumstances[12]. Equity needs to go beyond 'universal access', which is restricted to physical and sometimes intellectual limitations, by taking into account background, socio-economic, personal circumstances and other factors [13,14].

Improving equity starts by engaging with and understanding the full range of users and their diverse needs. In most cases this requires careful collection of information and sensitive engagement, particularly with users who do not understand street management or are unable to communicate easily with professionals. In many cases it requires additional information to be collected and designs to be specifically assessed to consider and improve outcomes for different users. There is no single correct way to evaluate transport equity because what is 'fair' is in the eye of the beholder. It is generally best to consider various perspectives. An equitable approach is about continuing to learn about who has what needs, working to meet them and providing accordingly.

2.3. System planning

Streets do not exist in isolation. They are inextricably interconnected with the surrounding land use, but also with the rest of the multimodal transport system serving diverse demands and users. Urban streets should be provided through the careful application of land use planning and transport system management. Streets designed to improve driving conditions for one user group can, and often do, have adverse impact on other user groups. For example, a street designed to improve ease of access for large vehicles will often result in light vehicles travelling higher than desirable speeds for the safe movement of pedestrians or cyclists. For this reason, design standards applied to major truck routes, such as lane width, should not be applied in design of other urban streets. Drivers of the largest vehicles driving on urban streets will need to drive more carefully and at a speed appropriate for the circumstances, as reflected in the street design.

Just as streets do not exist in isolation, neither does street planning or design. System changes are required in order to deal with the full range of issues and outcomes such as different modes of transport, and a wider variety of users and outcomes. These include:

- collecting and using more diverse data and information
- improving professional skills, knowledge and experience
- updating guidelines to take account of the full range of issues and alternatives, and
- demonstrating better practice by trials and examples.

Questions for consideration

[12] Exec. Order No. 13,985 (2023). *Advancing Racial Equity and Support for Underserved Communities Through the Federal Government.* President of the USA. www.govinfo.gov/content/pkg/DCPD-202100054/pdf/DCPD-202100054.pdf
[13] Martens, K. (2016). *Transport justice: Designing fair transportation systems.*
[14] Littman, T. (2024). *Evaluating Transportation Equity Guidance for Incorporating Distributional Impacts in Transport Planning.* Victoria Transport Policy Institute. https://www.vtpi.org/equity.pdf

1. What factors should be considered in a holistic approach to planning and design of urban streets?

2. How can we better integrate sustainability into the design and planning of urban streets?

3. Street planning and design principles

As with all transport management, any design process must be holistic and thorough[15]. All designs should have a clear purpose, a range of viable options should be considered, and all the outcomes must be assessed and described clearly. To do so requires contributions from many different specialist professional disciplines and good base information. Traditional road design has focused mainly on meeting the needs of cars and trucks, but has failed to sufficiently incorporate the needs of other street users, such as pedestrians, cyclists and micromobility users. Principles for urban street design have been described in various research publications and reports. However, they still have some way to go to be comprehensive and have not been routinely applied in Australia.

This paper recommends the following key principles for planning and design of urban streets:

- Place more emphasis on the design of streets as public places to ensure they can fulfill their role as attractive meeting places for the community and maximise value for adjacent business, retail and commercial premises.

- Move away from the "predict and provide" approach based largely on an extrapolation of past trends to ensuring that the selected design takes due account of and supports a forward-looking vision at both precinct and city levels, that has been developed by the community, business representatives, professional groups, and different levels of government. Ensure option assessment takes due account of the full range of proposed improvements, not just measures to increase road capacity for cars and trucks.

- Ensure connections are legible, safe, efficient, comfortable and easy to use by all potential travellers.

- Reduce street speeds to 'safe speeds', primarily through design, in accordance with the Safe System approach.

- Ensure all users are provided for (which extends beyond 'universal design').

- Apply a street user hierarchy that is based on meeting the safety needs of the most vulnerable and makes the best use of scarce and valuable street space from both an urban design perspective and the efficient use of resources.

- Plant more trees to increase shade for active street users and to lower surface and air temperatures at street level to improve both comfort and community health.

- Recognise that street design is only one part of the land use and transport system which needs to integrate with other parts, such as bus services and information for users.

- Undertake improvements to street design in a comprehensive and timely manner commencing immediately.

- Integrate street design with other aspects of the urban transport system. While good design of one component may be valuable, integration with others will provide even better outcomes.

[15] Austroads (2021). *Guide to Road Design Part 1: Objectives of Road Design.* https://austroads.gov.au/publications/road-design/agrd01

Questions for consideration

1. Are these principles adequate for urban street design to meet the needs of all street users? What other principles should be considered in planning and design of urban streets?

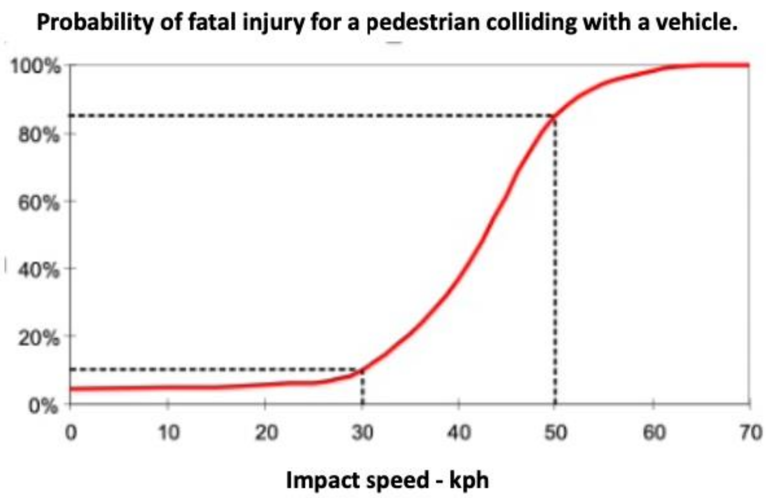
4. Urban speed management framework

4.1. Reducing speed reduces crashes, injuries and deaths

For many years, studies have identified speeding as a major road safety problem in most countries around the world (refer to OECD/ECMT Transport Research Centre[16] for a comprehensive discussion at an international level and to Monash University Accident Research Centre[17] for a discussion in the Australian context of the impact of lower speeds in urban areas). It has been found that a reduction in vehicle speed results in a proportionally greater reduction in people Killed or Seriously Injured (KSI).

There are two major reasons why speed has such a big impact on serious injuries and deaths.

- Firstly, the severity of an injury is highly dependent on the impact speed at a collision. For example, the probability of death for a pedestrian hit by a vehicle at an impact speed below 30kph is fairly low but increases rapidly to 85% at an impact speed of 50kph.



Source: OECD/ECMST Transport Research Centre (2006), based on research by Interdisciplinary Working Group for Accident Mechanics (1986); Walz *et al* (1983) and Swedish Ministry of Transport (2002)

- Secondly, crashes occur when mistakes are made and are inevitable given the number of interactions that happen in traffic, but drivers travelling at lower speeds can stop quicker and either avoid crashing altogether or reduce the severity of the crash. The mechanics of stopping a vehicle

[16] OECD/ECMT (2006) *Speed management*. www.itf-oecd.org/sites/default/files/docs/06speed.pdf
[17] Archer, J. et al., (2008) *The impact of lowered speed limits in urban and metropolitan areas.*
Monash University Accident Research Centre - Report #276 www.monash.edu/data/assets/pdf_file/0007/216736/The-impact-of-lowered-speed-limits-in-urban-and-metropolitan-areas.pdf

includes a reaction time before the brakes are applied, followed by the braking itself. The reaction time has been observed to vary between 0.7 and 2.5 seconds. Some drivers have naturally quicker reactions than others, but the most important variable is driver expectation. In the following example, a commonly used average driver reaction time of 1.5 seconds has been used.

  - If a child in a local street were to step out in front of a car, travelling at 30kph, that was 18 to 20 metres away, the average driver would be able to stop before reaching the child. The average total stopping distance at 30kph is estimated at 17m.

  - If a child in a local street were to step out in front of a car, travelling at 50kph, that was 18 to 20 metres away, the car would still be travelling 50kph when it hit the child. For a reaction time of 1.5 seconds, the vehicle would travel an estimated 21 metres before the driver applied the brakes.

Also, the cone of a driver's vision narrows as speed increases, reducing the peripheral vision of the driver. This means that a slower driver would see a pedestrian moving into a potential conflict zone earlier, than would a faster driver.

Reducing driver speeds reduces crashes, injuries (and the severity of injuries) and deaths on the urban street system. Reliance on legislation and signing to reduce speed can have a small impact but, on its own, it does not achieve the speed reduction required. The physical environment of a street must be changed, in conjunction with a reduced speed limit, to maximise both speed and crash reduction. The design speed of a street should be reduced to or below the speed limit, and/or traffic management devices installed to provide visual cues to the driver on appropriate speed. This is sometimes referred to as self-enforcing streets. This position is supported by the Australasian College of Road Safety[18].

4.2. Benefits of a 3-tier urban speed limit regime

In the last decade, targets to reduce injuries and fatalities across Australia have not been met. Part of the reason is that there are too many different speed limits in Australia. In urban areas speed limits vary between 30kph and 80kph, in 10kph increments. This results in too many changes in speed limits, often without any perceptible change in the street or road environment. An effective speed management system requires drivers to be given fair warning of speed limit changes through changes in the street environment or design. This is not practical with the current system of six different urban speed limits where drivers are mostly dependant on speed limit signs placed infrequently along the roadside. It is not surprising that instances of speeding are commonplace.

The general speed limit for urban roads and streets in most European countries is 50 kph. In the UK the general urban speed is 30 mph (48 kph).

Many European countries have introduced (or support) a 3-tier urban speed regime[19]:

- **30 kph** streets with moderate to high conflicts between pedestrians, cyclists and cars. It provides a potential safe system speed for pedestrians and cyclists.

- **50 kph** general urban speed limit. It provides a potential safe system speed for vehicle-to-vehicle collisions at intersections. To improve safety for pedestrians it may be desirable to separate pedestrians and cyclists from vehicles and/or reduce speed to 30kph at major crossing points.

[18] Australasian College of Road Safety (2023). *Policy Position statement: Speed Management*. https://acrs.org.au/wp-content/uploads/ACRS-Speed-Management-PPS-2023.pdf
[19] Florence School of Regulation, European University Institute (2020). *Speed and Speed Management in Road Safety*. Input paper for executive seminar organised by the European Commission on road safety. https://fsr.eui.eu/wp-content/uploads/2020/12/2020-10-08-speed_input_paper.pdf

- **70 kph.** This limit applies to only a limited number of major traffic routes. It provides a potential safe system speed for car-to-car head on collisions. Roads of this nature should desirably be dual carriageways. Controlled traffic signal pedestrian crossings are required.

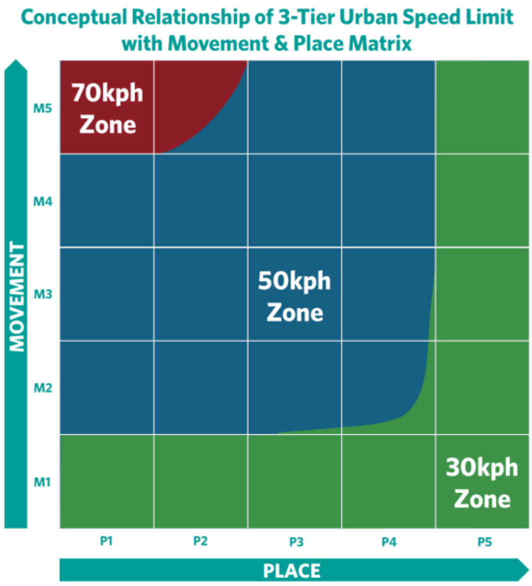
A similar 3-tier urban speed regime operates in the UK with speeds of 20mph, 30mph and 40 mph.

This system offers a compromise between the safety and connectivity needs of walkers and cyclists and the mobility needs of drivers, but it does result in slower traffic and safer streets than the current Australian system. TAs supports a change of this nature should be given serious consideration in Australia. It is operating, at least partially successfully, in European countries that have better road safety outcomes than in Australia. It provides a basis to differentiate between the different street types by design in a way that will make sense to both drivers and active transport users. This will assist in gaining much needed support from these groups for speed management reform that results in reduced speed and safer streets.

4.3. Relationship with movement and place

Many transport and urban planners now support the adoption of the principles of movement and place in urban street planning and design[20].

The Movement and Place approach features a categorisation for all streets in terms of the respective level of movement within the street or road corridor paired with the level of adjoining place activity. This categorisation is often presented in matrix form with levels one to five of 'movement' on the vertical axis (low movement levels rated '1' and high movement levels rated '5') and 'place' on the horizontal axis (low place activity rated '1' and high place activity rated '5'). A conceptual relationship of the 3-tier urban speed management regime overlayed on the movement and place matrix is presented in the figure below.



Conceptually there is consistency with the major urban roads with a speed of 70kph being favoured in high movement low place locations. On the other hand, streets with a 30kph speed are favoured in locations where place is of greater importance than movement. In some locations, most notably city /town centres there is both high movement and high place activity. Many streets in these areas have low to moderate levels of car traffic with higher levels of pedestrian traffic. The most appropriate speed limit in this high movement high place is 30kph, as shown in the diagram above.

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[20] See for example Jones, P.M., Boujenko, N. and Marshall, S. (2007). *Link and Place: A Guide to Street Planning and Design*. https://australasiantransportresearchforum.org.au/wp-content/uploads/2022/03/2009_Jones_Boujenko.pdf
Landor Publishing, London; and Transport for NSW (2022). *Design of Roads and Streets*.
https://standards.transport.nsw.gov.au/_entity/annotation/c5bf520d-ad91-ef11-8a6a-000d3a6b1b0b

It is recommended this diagram is considered for street corridor upgrade projects that apply the Movement and Place approach when determining the appropriate speed limit of the upgraded street environment.

4.4. Proposed urban street management framework for Australia

Excluding freeways, urban speed regulations be based on only three speed limits:

- **Safe Active Streets (SAS) - 30kph.** This limit is proposed on all streets with high volumes of pedestrians, cyclists or micromobility users, such as city, town and activity centres, school zones, bicycle boulevards and busy strip shopping centres with high numbers of crossing pedestrians. This limit is also proposed within local street and neighbourhood precincts, where majority resident and local government support exists to improve safety through lowering traffic speed. Low-cost design changes would be introduced to complement the design changes and to provide appropriate visual cues to drivers to encourage them to slow down and respect the safety of the local community, especially children.

- **General Urban Streets (GUS) - 50kph.** This speed limit is proposed for the remainder of the urban street system that is not designated a major urban road and designed accordingly. It is deemed appropriate on one lane each way streets, with direct property access. The 60kph limit would be discontinued. The design speed on these streets would be reduced to 50kph. On streets with higher design speeds where speeding is problematic, traffic calming or minor design changes would be introduced as soon as practical.

- **Major Traffic Routes (MTR) - 70kph.** This speed limit is proposed on roads that form part of the major urban road network. They would mostly be multilane dual carriageway roads, with limited direct access to properties and a design speed of 70kph. Where four lane undivided roads with a design speed of less than 70kph exist as part of the major urban road system, they should be upgraded to dual carriageway standard as soon as feasible. Until this occurs, a 50kph speed limit should apply. Alternatively, it may be desirable to reclassify these roads as urban streets and redesign them as one lane in each direction streets. The 80kph limit would be discontinued.

The reduction to three speed categories in urban areas will result in fewer speed limit changes. However, there will be times when a higher speed street route passes through an urban centre where localised speed reductions are warranted. When this occurs, it should be accompanied by physical changes to the lower speed section, such as reduced lane widths and modified cross sections.

TAs considers that this policy framework for urban speed management will assist in reducing speeds and will reduce fatalities and injuries. It will also provide drivers with appropriate cues on desired travel speed, reduce reliance on signs alone for speed control and should go some way to neutralise the argument, advanced by some drivers, that they are being given insufficient information on desirable and permitted speed to make rational decisions.

Questions for consideration

1. Do you support that reduction in speed on urban streets is necessary to make a sustained reduction of crashes, injuries and deaths?

2. How can the physical environment and design speed of streets best reflect the posted speed limit?

3. How can a 3-tier urban speed limit regime be successfully implemented across Australia?

5. Street design treatments for improved practice

Both planning and design have a role to play in improving the safety and liveability of urban streets. The best results will be delivered when street planning and design is integrated and coordinated, because attempting to plan and design urban streets in isolation is simplistic and likely to fail. A number of different professional disciplines should be involved in the planning and design process, including community engagement officers, land use and transport planners, engineers and landscape architects, which together contribute to placemaking as well as the safety and movement capability of streets. The planning and design process should be holistic and take account of multiple objectives, including but not restricted to:

- Ensuring the needs of all street users are considered, with the needs of the most vulnerable being given priority, particularly in respect to safety and connectivity.
- Applying a framework to manage vehicle speed that is consistent with the safe system approach and maximises the potential to reduce deaths and serious injuries to all street users, particularly pedestrians, cyclists and micromobility users that are the most exposed to harm when crashes occur.
- Maximising travel efficiency of different street users in terms of space per person utilised and the priority given to different user types.
- Ensuring that engagement occurs with street users of all types, characteristics, circumstances and abilities.
- Ensuring the application of higher order road design standards are not strictly applied to the design and assessment of neighbourhood streets. This includes the abolishment of some state or jurisdictional standards that require a street to be designed for 10kph higher than the posted speed limit.
- Ensuring measures and devices that improve safety and regulate safe speeds are given priority over services separation requirements in the street verges at the detailed design and implementation stages. For example, physical measures to reduce speed and improve safety should not be omitted because they result in reduced separation distances to trees or street lighting, which can logically be reduced because of a lower operating speed.

For many decades the planning and design of urban streets has been guided by Austroads design manuals that are based on the movement of cars and trucks. Little or no advice is provided on how street design could be used to lower speed as a means of improving safety. Over the last 10 to 15 years, a number of design guides began advocating for more of a balance between movement and place and street designs to affect lower speeds to improve safety. The UK's *Manual for Streets*[21] and *Manual for Streets 2*[22] are examples of a more holistic approach to street planning and design that has been successfully employed in the UK for over a decade. Similar street design practice has been employed in many other Western European countries. Change has been slower to come in the USA and Australia, but this has started to change. Over the last 10 years or so, street design guides based on movement and place principles that advocate lower design speeds to improve safety for everyone, but especially vulnerable road users, have started to emerge. TAs recommends that these design guides (referenced below) be considered by practitioners to guide the design of most urban streets, until such time as an Austroads guide to the design of urban streets can be approved for use in Australia:

[21] UK Department of Transport (2007) *Manual for Streets*. www.gov.uk/government/publications/manual-for-streets
[22] UK Chartered Institution of Highways and Transportation (2010) *Manual for Streets 2*. www.ciht.org.uk/media/9351/manual-for-streets-2.pdf

- National Association of City Transportation Officials (NACTO, 2016). *US Urban Street Design Guide*, New York[23].
- Transport for NSW *Network Planning in Precincts Guide* (2022)[24] and *Design of Roads and Streets* (2023)[25].
- Institute of Public Works Engineering, Queensland (2020). *Street Design Manual: Walkable Neighbourhoods*[26].
- Department of Infrastructure and Transport, South Australia (2024). *South Australia's Active Travel Design Guide*[27].

The planning and design practices described in this paper are by no means new. They surface regularly in various research and reports and are well proven. Many of them have been successfully trialled and implemented overseas but have not yet found their way into routine practice in Australia. While there are many initiatives and programs that can be used to improve the safety and liveability of urban streets, this paper focuses on a limited number of measures that have been found to be effective and should be used routinely. Many of the measures recommended below achieve similar overall outcomes, which means they are complementary and produce better results when applied together.

5.1. Narrower traffic lanes are safer

Austroads and most state road authorities' standard lane width (and default position) for urban roads and streets in Australia is 3.5 metres. Where site constraints preclude the use of the standard width, consideration may be given to reducing a traffic lane to 3.3 metres. The reason given by road authorities has been that wider lanes are safer, but no research has been provided to support this position. European countries have constructed streets with narrower lanes for many years. The UK Department of Transport's *Manual for Streets* used for the design of more lightly trafficked urban streets, which noted that "*research carried out in the preparation of Manual for Streets indicated that many of the criteria routinely applied in street design are based on questionable or outdated practice.*" In 2010, 'Manual for Streets 2' expanded these principles for application in the design of busier streets and roads. One of the many recommendations contained in 'Manual for Streets 2' is "*lanes wider than 3m are not necessary in most urban streets carrying mixed traffic*", *effectively creating a default width of 3m for urban streets.*

In a major national study in the United States, in 2023 the John Hopkins Bloomberg School of Public Health undertook research to provide evidence on whether or not wider traffic lanes are safer than narrower ones on urban streets[28]. Based on a sample of 1,117 street sections in seven cities they found no evidence that wider lanes are safer in terms of non-intersection crashes.

- For low speeds in the 20-25 mph range (32-40 kph) they found no significant difference in the number of non-intersection crashes between 9, 10, 11, 12 and 13 foot lanes (2.75 to 4m)
- For higher speed urban streets for speeds between 30 and 35 mph (48 to 56 kph), sections of street with 10, 11 and 12 foot lanes (3.05 to 3.65m) have significantly higher numbers of crashes than streets with nine foot lane width (2.75m).

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[23] National Association of City Transportation Officials (NACTO, 2016). US Urban Street Design Guide, https://nacto.org/publication/urban-street-design-guide/

[24] Transport for NSW (2022) *Network Planning in Precincts Guide.* www.movementandplace.nsw.gov.au/place-and-network/guides/network-planning-precincts-guide

[25] Transport for NSW (2023) *Design and Roads and Streets* www.movementandplace.nsw.gov.au/design-principles/design-roads-and-streets

[26] Institute of Public Works Engineering, Queensland (2020). *Street Design Manual: Walkable Neighbourhoods* https://ipweaq.intersearch.com.au/ipweaqjspui/handle/1/7095

[27] Department of Infrastructure and Transport, South Australia (2024). *South Australia's Active Travel Design Guide* www.dit.sa.gov.au/standards/active-travel-design-guide

[28] John Hopkins Bloomberg School of Public Health (2023) *Narrower Traffic Lanes in Cities Could Help Lower Risk of Traffic-Related Collisions.* https://publichealth.jhu.edu/2023/narrower-traffic-lanes-in-cities-could-help-lower-risk-of-traffic-related-collisions

This evidence suggests the main reason wider lanes are not safer, is that wider lanes provide a greater feeling of comfort for drivers, which encourages them to drive faster. Put another way, narrower lanes will act in a similar way to traffic calming by encouraging slower driving and improving safety. The Bloomberg research supports adopting a default lane width of 3.0m, similar to current UK practice.

Reducing lane widths can assist in providing additional space for a variety of other purposes, including landscaping, wider footpaths, off-street bicycle or shared lanes, or provision of central refuges to assist pedestrians crossing. Decisions on how this additional space could be used will depend largely on local circumstances.

Recommended practice - Reduce lane widths in urban streets

On the basis of the Bloomberg research and the 'UK Manual for Streets' guidance, the default width for urban streets with a speed limit of 50kph or below should be set at 3.0m with traffic engineers being required to justify lane widths above or below 3.0m. Slightly wider lane widths are favoured by some bus operators along major bus routes, although there are many bus routes in Australian cities that have operated satisfactorily along 3.0 metre lanes for many years. For example, Perth's busiest bus route along St George's Terrace has operated for over 3 decades on 3.0 metre lanes. TAs considers it should be left to bus operators to argue the case for wider lanes on a case-by-case basis, as an exemption to the default lane width of 3.0 metres, taking account of issues related to bus operations and a range of other matters. On the major traffic and truck routes, with 70kph speed limits, a lane width of between 3.3 and 3.5 metres is recommended where space permits.

5.2. Four-lane undivided streets are a barrier to pedestrian connectivity and are comparatively unsafe

Over the years a number of streets have been widened from two lanes to four-lane undivided roads, often within a 20 metre road reserve. The purpose of the widening was almost always solely to increase capacity, with insufficient attention being given to safety. Four-lane undivided roads are a barrier to connectivity and are comparatively unsafe for crossing pedestrians. They are also typically subject to speeding with drivers passing each other on either the left or the right. This "lane hopping", at excessive speed, results in sideswipe or rear-end collisions when fast moving vehicles are required to slow down, stop or swerve out of their lane.

Four-lane undivided road

Two-lane street with protected bicycle lane

Daily traffic volumes along many of these streets have remained relatively low, often below 20,000 vehicles per day, because the traffic flow is constrained by intersection capacity along the route. The opportunity exists to convert many of these streets back to one lane each way, which is more in keeping with an urban street, without much or any loss of capacity. In a few cases, where high traffic volumes exist, it may be considered desirable to re-classify the street as a major traffic route and upgrade it to dual carriageway standard with a 70kph speed limit. In the interim period, until this occurs, safer pedestrian crossing facilities and a speed limit of 50kph should be considered to improve safety.

The photos above, show a four-lane undivided road with narrow verges and a two-lane street with a protected bicycle lane and a median area to assist pedestrians crossing. The saving in road space from reducing from four to two lanes can be used for a variety of purposes, including:

- Provision of a median, either continuous or not
- Tree planting in verge or median
- Provision of kerbside parking
- Safer pedestrian crossing areas, and
- Bicycle priority lanes.

The example shown below relates to a busy Brooklyn street in New York City. It is one of a number of New York streets, where street space for drivers has been reduced and where there has been an improvement in economic performance following the reallocation of street space. The outcomes have been:

- Improved pedestrian connections and safety
- Safer cycling – 80% increase in cycling
- Major growth in retail sales compared to neighbouring streets
- No change in traffic movement, and
- Reduced traffic speed and improved safety.

Source: NYC Dept of Transportation (2013), *The Economic Benefits of Sustainable Streets*.[29]
– Vanderbilt Avenue, Brooklyn

Recommended practice - Implement a program to convert four-lane undivided streets to one lane each way

Streets with one lane in each direction and a design speed and speed limit of 50kph as proposed will result in lower speeds and improve travel safety for all road users. Speeding will be limited because of the reduced opportunity to pass slower vehicles. These streets will be safer for pedestrians and cyclists moving around and across the street network, including passengers boarding and alighting from buses.

[29] Department of Transportation, New York City (2013). *The Economic Benefits of Sustainable Streets.* https://a860-gpp.nyc.gov/concern/nyc_government_publications/h415pb28s

5.3. Additional safe pedestrian crossings are needed

High and sometimes increasing traffic on many city streets have made it increasingly difficult for pedestrians, particularly children, the elderly and people with disabilities, to move around their neighbourhood or access public transport. For many of these cohorts, walking is the major option for independent travel. The percentage of school children who walk or cycle to school in Australia is the lowest ever recorded. The WA Department of Transport[30] has reported that:

"***Over the past 40 years the national rate of active travel to school has declined from 75 to 25 per cent. In Perth, the rate is as low as 20 per cent and one half of children travel to school by car despite living less than one kilometre away***."

The majority of the "lost" active transport trips to school have been replaced with car trips. In some cases, one walking trip each way has been replaced by two car trips – one each way. In others, the journey to work car trip becomes longer because of an added detour via the school. The result is substantial local congestion around schools, and in areas with a cluster of schools there is significant subregional congestion during school days and times. This increase of traffic increases parents' concern about the safety of walking and cycling to school and has contributed to the reduction in active travel to school.

A network of safe, convenient walking routes is needed in the same way as vehicle routes need to be safe and connected. In most Australian cities the pedestrian network is fractured in many places, and pedestrians suffer longer routes than necessary and find it difficult to safely cross streets carrying significant volumes of traffic at speeds that are well above the safe system speed for pedestrians – 30kph.

On major traffic routes with two or more lanes in each direction, traffic signals will be required to stop traffic while pedestrians cross, or a grade separated crossing provided. On low volume low speed streets, central islands may provide some benefit, but they are not suitable for certain user groups, including young children and the visually impaired. At the majority of locations, zebra crossings are likely to be the preferred solution.

5.3.1. The case for zebra crossings

On most urban streets with a speed limit of 50kph or less, zebra crossings will best meet the needs of pedestrians, in terms of both safety and connectivity. By giving priority to pedestrians when they arrive at the crossing point, zebras reduce delay and make walking safer and more attractive. At zebras, the onus is on drivers to give way to pedestrians, rather than the other way round. This is particularly important for certain user groups, such as the visually impaired and groups whose cognitive processes, for whatever reason, are less developed to process information on the speed of approaching traffic and to decide how and when it is safe to cross the street. In any civilised society, it is a basic human right for the most vulnerable people to be able to walk around their neighbourhood safely to go to school, to the shops, to meet friends or for other reasons.

It is also incumbent on urban designers and engineers to ensure a high level of safety is incorporated in zebra crossing placement and design. In the past, some argued that not all drivers will stop and that, as a consequence, zebra crossings are unsafe. About 30 years ago, this led to some zebras being removed and others not being installed. As with any type of traffic control measure, injuries will and do occur. The appropriate response is to determine the reason for the collision and the severity of the collision and to take appropriate remedial action. Had this occurred with the collisions at zebras it would have been found that zebras were not inherently unsafe, but rather some were located inappropriately on high-

[30] WA Department of Transport (2021). *The declining rate of walking and cycling to school in Perth*. www.transport.wa.gov.au/mediaFiles/active-transport/AT_P_Declining_Rate_walking_cycling_to_school_in_Perth.pdf

speed roads with two traffic lanes approaching the crossing. The South Australia Active Travel Design Guide (2024)[31] commented:

"In South Australia, historical restrictions on zebra crossings have led to a decline in driver awareness and comprehension of these crossings, as exposure has mainly been limited to wombat-type crossings. Reintroducing zebra crossings presents an opportunity to foster broader acceptance and understanding among drivers, thereby cultivating a culture of heightened driver awareness to enhance safety for all road users."

Like roundabouts, zebra crossings are safest and most effective when traffic speeds at the crossing point are around 30kph. Zebra crossings are safer and more appropriate on streets with one lane each way, where pedestrians crossing are not hidden from drivers by another vehicle travelling in the same direction. Zebras are most appropriate on city streets with a speed limit of up to 50kph. Where approach speed is too high, safety is enhanced when measures are put in place to reduce speed to about 30kph at the crossing. There are many ways to reduce speed, including but not limited to horizontal traffic management or road humps on approach to the crossing, or a flat-topped raised area can be provided as part of the zebra crossing itself. This latter option is referred to as a wombat crossing. The recommendation on speed management made earlier in this report, which would eliminate the 60kph speed limit and replace it with 50kph is compatible with this approach.

The Queensland Government's Street Design Manual: Walkable Neighbourhoods (IPWEA, 2020)[32] provides useful advice on planning and design of pedestrian crossings, including zebras and wombats, as well as more general advice to make walking safer, better connected, more convenient, comfortable and attractive.

5.3.2. Zebra crossings at roundabouts

The law in respect to priority at roundabouts was changed several years ago, so that, unlike at other non-signalised intersections, drivers turning at a roundabout do not have to give way to pedestrians unless there is a pedestrian crossing. TAs considers this loss of priority for pedestrians at roundabouts is inequitable and unsafe, given:

- Intersections controlled by roundabouts are often on major pedestrian routes
- Intersections controlled by roundabouts often have moderate to large traffic volumes
- Some roundabouts have sweeping curves that enable speeds of 40kph or greater

Under these circumstances it is difficult for fit adult pedestrians to gain safe passage through the intersection. For people with sight disabilities, the elderly and young children, safe crossing at intersections controlled by the roundabouts is often impossible. This introduces a major inequity and bias in favour of vehicle drivers over pedestrians.

One way to address this problem is to install zebra crossings on all legs of the roundabout. This has been done at a number of roundabout sites in Australian cities, but they are still in the minority. TAs supports zebra crossings being installed at all one lane roundabouts, unless there are particular circumstances relating to design that prohibit this. Zebra crossings, like roundabouts, are safest at traffic speeds of no more than 30kph. Traffic speed should be controlled through the roundabout design by installation of a wombat crossing, by humps or horizontal traffic calming devices on approach to the roundabout, or by a combination of these measures.

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[31] Department of Infrastructure and Transport, South Australia (2024). *South Australia's Active Travel Design Guide* www.dit.sa.gov.au/standards/active-travel-design-guide
[32] Institute of Public Works Engineering, Queensland (2020). *Street Design Manual: Walkable Neighbourhoods* https://ipweaq.intersearch.com.au/ipweaqjspui/handle/1/7095


Wombat crossing at Scarborough Beach roundabout

Recommended practice – Implement a program to implement zebra crossings on a network basis

Zebra crossings are proposed as the principal means of providing pedestrian crossing facilities on urban streets with speed limits of 50kph or less. They have a proven safety record, will reduce pedestrian delay and barriers to movement along major desire lines and are relatively inexpensive to install, compared to signalised crossings. This proposal is considered fundamental to the provision of a safe connected pedestrian network.

Zebras are suitable for implementation at all "one-lane in each direction" streets and at non-signalised intersections, including most roundabouts with single lane entries and moderate to high traffic volumes. Under current regulations in Australia, vehicles have priority over pedestrians at roundabouts and without the provision of zebras, pedestrians would have no safe means of crossing at these intersections. Wombat crossings are preferred at busier, higher speed locations, because they effectively slow traffic at the crossing point and because vehicles and not pedestrians need to change level at the crossings. However, non-wombat zebras still have their place at lower volume crossings or where design aspects such as drainage make wombats prohibitively expensive.

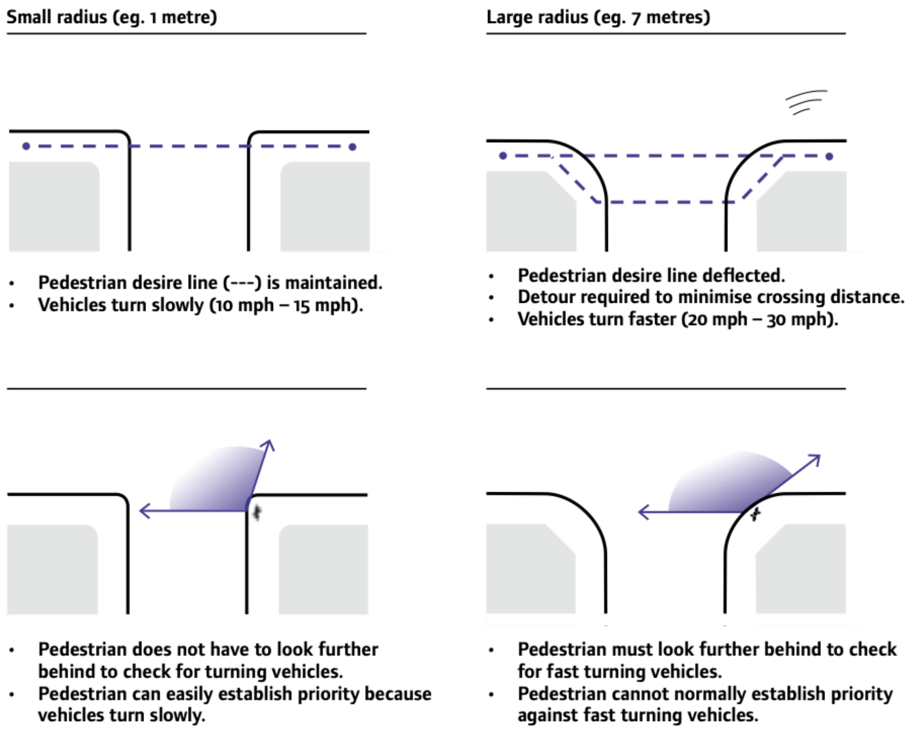
TAs has stopped short of proposing zebra crossing at two-lane roundabouts at this stage, because of potential safety and operational concerns, although there are instances where this occurs in the UK. The problem for pedestrians crossing at these locations remains and is much greater than at one-lane roundabouts. Options to consider, in addition to zebra crossings, include signalisation at the roundabout, either in its current format, or as a more traditional intersection format, or provision of a grade-separated pedestrian crossing. Doing nothing is inequitable to pedestrians and is not considered acceptable. TAs considers that councils and other road authorities have an obligation to develop and implement a safe and reasonably convenient means of crossing for pedestrians, as they must accept responsibility for creation of the current problem.

5.4. Tighter corner radii at intersections

The radius of corners at intersections has traditionally been dictated by the turning path of large vehicles and allowance to turn from the left lane (or side) when approaching into the left lane (or side) of the road into which they are turning. In most urban residential streets, this generous path is unnecessary and has adverse consequences.

Tighter corner radii have been promoted in many street guides over several years, such as the 'UK Manual for Streets'[33].

[33] UK Department of Transport (2007) *Manual for Streets*. www.gov.uk/government/publications/manual-for-streets



Source: UK Dept of Transport (2007), *Manual for Streets*.

Tighter corner radii offer several advantages for vulnerable street users, particularly:

- Reducing the length of the crossing and allowing a straighter path
- Reducing the speed of the traffic turning the corner
- Improving sightlines and visibility with potential conflicting vehicles, and
- Making the crossing path and conflict area clearer.

They may also have other complementary benefits such as lower construction cost, or more space for verge facilities or landscaping. They can be used in conjunction with other treatments such as local areas traffic management schemes. Tighter corner radii are particularly useful in older urban areas where the additional verge space created can improve safety for vulnerable street users.

“As of right” vehicles need to be considered in the design process, but the size of the intersection can be substantially reduced when the low traffic volumes and speeds in urban streets mean that large vehicles can use part of the opposing lanes without undue conflict to other road users. There are many streets in older areas of our cities where this occurs, and results in minimum disruption.

Recommended practice – Implement a program to reduce turning radii at urban intersections

5.5. Raised pedestrian refuges and median islands

Median or pedestrian refuges have been used on urban streets for decades as a means of improving connectivity and safety for pedestrians at a relatively low cost. The US Federal Highway Administration[34] summarises some of the benefits and opportunities of this approach, which can include reducing crashes, decreasing delays for pedestrians and reducing vehicle speeds. Median islands reduce

[34] Federal Highway Administration (2013) *Safety Benefits of Raised Medians and Pedestrian Refuge Areas*. https://highways.dot.gov/safety/pedestrian-bicyclist/safety-countermeasures/state-best-practice-policy-medians

the complexity of crossing two-way streets by allowing the pedestrian to assess and cross one direction of traffic at a time, thus improving pedestrian safety. Crossing two lanes of traffic travelling in different directions is considerably more difficult that crossing one direction of traffic. It requires judgement in finding a coincident gap in traffic approaching from two different directions at the same time. In particular, this will benefit young people with limited experience in estimating the speed of approaching traffic and the elderly whose reaction times have slowed.

Photo Credit: Bruce Landis, Angled cut-through in Bainbridge, WA

Source: US Federal Highway Administration, *Safety Benefits of Raised Medians and Pedestrian Refuge Areas.*

Median refuges, when combined with traffic management or calming treatments, have the potential to reduce speed and further improve safety. Wider central islands can be used to deflect traffic and suitable landscaping in the central median can be used to interrupt the straight line of sight along the street. They can also be used to locate road signs and street lighting. Median refuges are particularly beneficial at intersections, where turning traffic makes pedestrian crossing even more difficult to negotiate safely.

Traffic Calming South Perth Using Central Medians

Pedestrian refuges should not a be considered as a substitute for zebra or wombat crossings, discussed in section 5.3, which offer priority to pedestrians of all ages and abilities. However, central median treatments can be an integral building block of other treatments, including pedestrian crossing treatments.

Recommended practice – Implement raised pedestrian refuges and median islands as part of an integrated program to manage traffic speed and provide a better connected and safer pedestrian network

Questions for consideration

1. Which of the proposed treatments are most important? Why?
2. What other treatments would complement the recommended treatments?
3. How can these recommended treatments be implemented?