

Operational Instruction

19.8

Trees in Medians and Roadsides in the Urban Environment

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TRAFFIC MANAGEMENT

Operational Instructions

Trees in Medians and Roadsides in the Urban Environment- 19.8

AMENDMENT RECORD

Version	Date	Section/Figure/Table	Amendment Description
1	Mar 1997		Original issue
2	Feb 2001	All	General update
3	Aug 2001	Pages 1, 4, 5, 8	Background, discussion, appendix
4	Aug 2004	All	Scope, Background, Introduction, Community, Environmental and Sight Distance Considerations, Specifications, References, Appendix A
5	May 2008	All	Format and OI number changes (formally OI 2.9)
6	Feb 2010	All	Austroads revision, removal of 1m allowable min
7	Aug 2014	All	Altered to allow trees in any median provided clear zone requirements are met
8	Dec 2017	All	Amended to achieve balance between road users' safety and the community expectations
9	Sep 2022	All	Format and style update; updated references
		Section 3.3, 3.4, 6, 10	Clarification of DIT requirements
9.1	Sep 2022	Appendix B	Update drawing to better define vegetation clearance zones
9.2	Jun 2023	Sections 3.3 & 7	Clarification of DIT requirements

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08/06/2023

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1. Scope

This Operational Instruction has been developed to provide direction to traffic engineering practitioners, landscape architects and planners when considering tree planting in raised medians and roadsides within DIT road corridors.

These guidelines aim to balance the safety risk to road users with the community expectations of enhancement of the public realm through planting of trees and other vegetation.

2. Background

The *National Road Safety Strategy 2021 – 2030* sets a target of at least a 50% reduction in lives lost and at least a 30% reduction in serious injuries. This strategy is founded on the internationally recognised ‘Safe System’ approach formally endorsed by the Organisation for Economic Cooperation and Development (OECD). A Safe System recognises human factors and human frailty and the need to provide forgiving engineered systems as part of a shared responsibility.

South Australia’s *Road Safety Strategy To 2031* adopts the targets of the *National Road Safety Strategy 2021 - 2030* and stresses that those engaged in designing, building and upgrading road infrastructure, and planning maintenance have a responsibility to prioritise safety requirements and safety outcomes, and provide a safe road network.

It is important that any interpretation of this Operational Instruction aligns with the *Road Safety Strategy To 2031*.

Previous versions of this Operational Instruction focussed primarily on the mitigation of hazards within the clear zone as defined in *Austroads Guide to Road Design - Part 6* (2009) Section 4.3.2, which has been superseded.

3. Principle Considerations

This document aims to satisfy the key principles listed below for establishment of trees in road reserves.

To achieve an appropriate balance between road users’ safety and community expectations of providing trees within road reserves, a multi-criteria analysis (MCA) process has been conducted to develop an approach which identifies the appropriate placement of trees in urban road corridors to satisfy these principles.

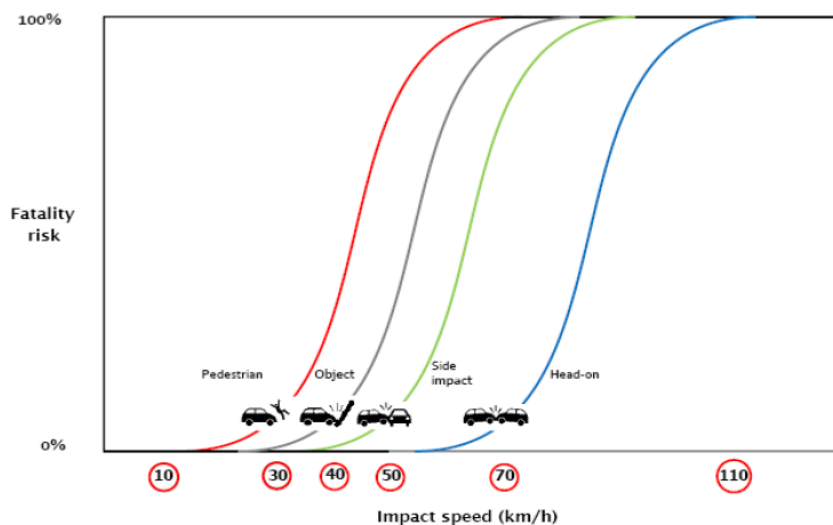
3.1 Safe System Principle

The main objective of the Safe System is to ensure that in the event of a crash, the impact forces are within the boundaries of human tolerance. Figure 3.1 illustrates the estimated crash impact speeds based on the safest vehicles, where the forces are likely to exceed the tolerance of a human body and where chances of survival decrease rapidly beyond this impact speed. Safe System speed threshold for car/pedestrian crash and car/tree are 30 km/h and 40 km/h respectively.

The five year crash history (2011-2015) within the Adelaide Metropolitan area indicates the following:

- Vehicles colliding with fixed objects account for about 10% of total casualty crashes, i.e. approximately 500 casualty crashes per year.
- Compared to all objects hit, hitting trees alone represent about 3-4% of total hitting objects casualty crashes (approximately 170 casualty crashes per year), however it is the most severe crash type compared with other object types (i.e. 35-40% of hitting trees crashes result in a fatality or serious injury).

Decisions regarding the placement of new trees in medians and roadsides should be informed by a risk assessment which takes into consideration road users' exposure, crash likelihood and severity outcomes in the event of a crash; and appropriately weighs up the risk to pedestrians against vehicle occupant safety in various urban road environments.



IMPACT SPEEDS ABOVE WHICH CHANCES OF SURVIVAL DECREASE RAPIDLY		
Crash Type	Impact Speed	Example
Car/Pedestrian or Cyclist	30 km/h	Where there is a mix of vulnerable road users and motor vehicle traffic..
Car/motorcyclist		
Car/Pole or Tree	40 km/h	Where unprotected road hazards exist within defined clear zone.
Car/Car (Side impact)	50 km/h	Where there is a likelihood of side impact crashes (eg, intersections or access points).
Car/Car (Head-on)	70 km/h	Where there is no separation between opposing traffic streams

Source: Fact Sheet, RTA, NSW, 2011

Figure 3.1 Safe System speed thresholds

3.2 Community Values and Expectations

The *30 Year Plan for Greater Adelaide* (2016) outlines key directions to create a greener city through an increase in tree canopy by 20% across metropolitan Adelaide by 2045.

DIT's *Functional Hierarchy for South Australia's Land Transport* describes policies to provide safe and attractive streetscapes through tree planting. Providing these improvements along road reserves create a more liveable urban environment that can encourage active travel including walking, cycling and public transport use and have a cooling effect on neighbourhoods and nearby buildings.

Tree plantings within road reserves have often been the result of DIT, local Council, community desires, or a combination of these to improve the aesthetics and environmental quality of the road environment.

There is often a community expectation for large and visually dominant trees to fulfil aesthetic requirements in streetscapes, however, trees with a mature trunk diameter of 100mm or more are considered non-frangible.

Effort should be made to provide the appropriate balance between road user safety, community wellbeing, and environmental benefits and values within the road reserve.

3.3 Sight Distance and Visibility Requirements

The need to maintain clear sight lines for traffic control devices and other road signs is an essential requirement when installing trees on or near roads, particularly in the vicinity of high risk locations such as intersections, curves, pedestrian facilities, and driveways.

The design of streetscapes shall ensure that sight distances to all Traffic Control Devices, or any other approved sign(s), meets legibility distance requirements, as set out in Austroads Guide to Traffic Management - Part 10: Transport Control of Devices, Section 6.3.7 "Letter Size and Legibility".

Clear sight lines shall also be provided along walking and cycling routes.

Trees must also be maintained to achieve sight distances on the approaches of signalised intersections and Pedestrian Actuated Crossings (PACs) to ensure clear visibility of lanterns, refer to *Operational Instruction 14.2 Traffic Signal Faces – Section 4 Vehicle Displays – Aiming Distance Requirements* (<http://www.dit.sa.gov.au/?a=40178>).

Refer to Appendix B for diagram showing the clearances which achieve optimal line of sight to traffic signal lanterns.

Refer to Section 9.3 of *Operational Instruction 20.1 Care, Control and Maintenance of Roads by the Commissioner of Highways* (<http://www.dpti.sa.gov.au/?a=71793>).

Council will be required to provide written advice to DIT that sight distances and visibility requirements are met as part of the design process and at completion of any landscaping project. This includes demonstrated evidence to DIT of how the sight distances were measured.

3.4 Maintenance

Trees must be planted and maintained to minimise any adverse impact on the safe and efficient operation of the road, thereby reducing any potential maintenance costs.

Where trees are planted in close proximity to road infrastructure, tree tanks or root barriers shall be used to minimise the potential impact of tree roots. Formative pruning of young trees must be carried out routinely to ensure that clearance envelopes are achieved, and visibility is maintained.

Refer to *Operational Instruction 20.1 Care, Control and Maintenance of Roads by the Commissioner of Highways* (<http://www.dpti.sa.gov.au/?a=71793>) for maintenance responsibilities.

Council will be required to provide written acceptance of ongoing maintenance to DIT at completion of any landscaping project.

3.5 Environmental Sustainability

Consideration should be given to the environmental benefits that trees can offer, such as restoring ecosystems, improving ambient temperatures, filtering air pollution and dust, storing carbon, reducing storm water run-off and providing wildlife corridors, habitat and food for native fauna species.

4. Tree Offsets

Decisions regarding the placement of new trees should be based on a risk assessment that takes into consideration road users' exposure, crash likelihood and severity outcomes in the event of crash, and appropriately weighs up the risk of pedestrian against vehicle occupant safety in various urban road environments.

Table 4.1 presents the minimum tree offsets adopted by DIT. Lateral offset shall be measured from the face of kerb or the edge line (if there is no kerb) to the expected face of the tree trunk at maturity. If there is both a kerb and an edge line, the lateral offset is the distance measured from the face of kerb. In the absence of an edge line the lateral offset is the distance measured from the edge of road pavement. Refer to Figures 11.1 to 11.4.

In addition, consideration must be given to the following points when determining minimum tree planting offsets along the road reserve:

- offset figures relate to distance to anticipated face of tree trunk at maturity,
- trees must not adversely impact sight distance requirements, and
- measures must be taken to minimise the risk of tree roots damaging road infrastructure. Appendix A is provided as a tree planting offset list to minimise damage to road infrastructure based on DIT field observations. If the minimum lateral offset recommended in Table 4.1 is less than the lateral offset shown in Appendix A, root control measures shall be installed.

Table 4.1 Minimum Tree Offsets in Urban Environments

Speed limit (km/h)	Minimum tree offsets from vertical face of kerb ¹										Minimum tree offsets from edge line or edge of pavement without kerb	
	Verge		Intersection without slip lane ²		Median			Slip/merging lanes		Driveways		
	Lateral		Lateral	Longitudinal	Lateral ³	Longitudinal		Lateral	Longitudinal	Lateral		Longitudinal
	Straight	Curve ⁴				Regular nose (semi-circular or bullet nose)	Tapered nose (shelter lane)					
≤ 50	0.6m		0.6m	10m from the tangent point	1.0m (median width of 2.0m + tree diameter)	10m from the edge of nose	Greater of 10m from edge of nose OR total length of tapered section	0.6m	10m from the hinge point	0.6m	3.0m from tangent point	2.5m
60	0.6m	Gentle 0.8m Sharp 1.1m	0.6m	10m from the tangent point	1.25m (median width of 2.5m + tree diameter)	10m from the edge of nose	Greater of 10m from edge of nose OR total length of tapered section	0.8m	10m from the hinge point	0.6m	5.0m from tangent point	2.5m
≥ 70	Refer Austroads Guide to Road Design - Part 6: Roadside Design, Safety and Barriers											

¹ Refer to Section 11 for figures indicating these offsets² If required sight distance envelope requires greater offsets than listed, sight distance overrides the listed offset distances³ Trees shall be planted at the centre of the median, staggered planting (i.e. varying offsets) along the median is not permitted⁴ Gentle curve ≥ 300m radius and sharp curve < 300m radius

5. Pedestrian Safety

In areas of high pedestrian activity, it is desirable for street trees to be located between the kerb and footpath to provide pedestrians with some protection from vehicle traffic (refer to Figure 11.5).

Areas with high pedestrian activity include shopping precincts, outdoor dining spaces and areas supporting active transportation modes such as walking and cycling where pedestrian safety is paramount. Refer *A Functional Hierarchy for South Australia's Land Transport Network* (<http://www.sa.gov.au/?a=10609>) for locations of pedestrian precincts.

6. Maintenance of Clearance Envelopes

Under Section 26A of the *Highways Act 1926*, local Councils are responsible for the maintenance of vegetation on most urban arterial roadsides. The Act requires Councils to coordinate activities to minimise adverse impacts on the safe and efficient operation of the road and the environment.

Operational Instruction 20.1 Care, Control and Maintenance of Roads by the Commissioner of Highways (<http://www.dit.sa.gov.au/?a=71793>) sets out the responsibilities of Councils and DIT in relation to roadside vegetation.

DIT shall not bear any costs associated with the maintenance of any vegetation proposed and installed by Council or a third party within the medians of roads under the care and control of the Commissioner of Highways. Refer to *Operational Instruction 20.1 – Section 9 Vegetation Control* for the maintenance responsibilities of trees in road reserves.

At completion of the project, Council is to acknowledge taking the ongoing maintenance of the clearance envelope for the median trees, including scheduled inspections to ensure the clearance envelope meeting DIT's standard at all times.

7. Other Considerations

The location, height, depth, and extent of underground services should be considered when determining the location and selection of tree species.

The initiator shall assess any other traffic impacts of the proposal, not limited to but including:

- property access,
- traffic control changes,
- pedestrian access,
- traffic redistribution, and
- impacts on street lighting.

Over-dimensional vehicle routes may require wider offsets and greater clearance.

8. Alternative Vegetation Options

In situations where tree planting cannot be achieved in the verge or median, the following landscape options may be considered to improve streetscape amenity:

- frangible small trees or large shrub species with a mature trunk diameter of less than 100 mm;
- low ground covers and frangible shrubs with a mature height of 0.5 m where sight lines are to be preserved;
- native grasses;
- turf grass (e.g. kikuyu); or
- other low maintenance hard surface treatments.

A minimum width of 0.6 m is required between vegetation and the kerb to enable a pedestrian or small child to observe the traffic from the refuge of the verge or median and so that the pedestrian can also be seen by other road users. Pedestrians will also require unobstructed head room around and near any verge or median vegetation for both visibility and injury prevention. The volume of pedestrian activity should be taken into consideration when selecting plant species for verges or medians.

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9. Exceptions

Any variances from offsets listed in Table 4.1 will be subject to assessment and approval on a case-by-case basis. A comprehensive road safety risk assessment would need to be completed taking into consideration the principles outlined in Section 3.

10. Approvals

In accordance with *Operational Instruction 20.1* local Councils are required to seek approval from DIT prior to planting trees along and within DIT road corridors. This applies to both new planting and replacement planting. Approval is generally only withheld on the basis of road safety, or if major works are proposed in the foreseeable future.

Councils may contact DIT's Network Management Services on 08 8226 8222 for further information in relation to approval of tree planting in DIT road corridors.

As part of the design and approval process Council is required to supply the following in writing to DIT with Landscaping Plans:

1. Root barriers have been designed as per Sections 3.4 and 4.
2. Written confirmation from Council's Traffic Engineer that sight distances and clearance requirements in section 3.3 and 3.4 have been checked and are in accordance with this OI, and any other DIT signs impacted has been addressed in the design.
3. Written confirmation that Council will accept the ongoing maintenance of the landscaped median and will ensure that clearance envelopes are maintained. The landscaped median maintenance also includes weeding in the median and any associated components for the landscaped area (e.g., irrigation system) if any.

Upon completion of project, Council is required to supply the following in writing to DIT:

1. Confirmation that root barriers have been installed as per Sections 3.4 and 4.

2. Written confirmation from Council's Traffic Engineer that sight distances have been checked and are in accordance with this OI.

Council are to notify DIT (DIT.MetroRoadMtce@sa.gov.au) upon completion of the landscaping so that DIT can issue a Section 26 notice to Council to formalise the ongoing maintenance responsibility.

A sight inspection by a DIT officer may also be required to verify at notification.

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11. Tree Placement and Offset Scenarios

Figures 11.5 to 11.10 should be read in conjunction with offsets (lateral and longitudinal) described in Table 4.1.

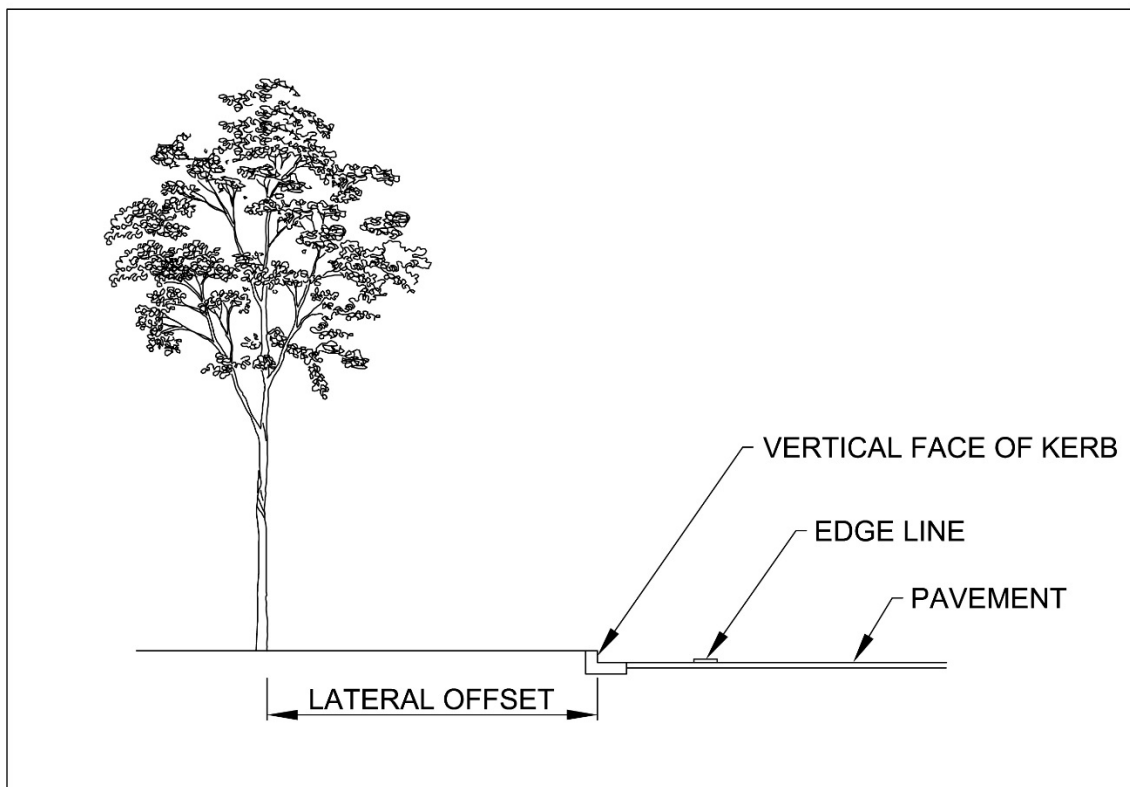
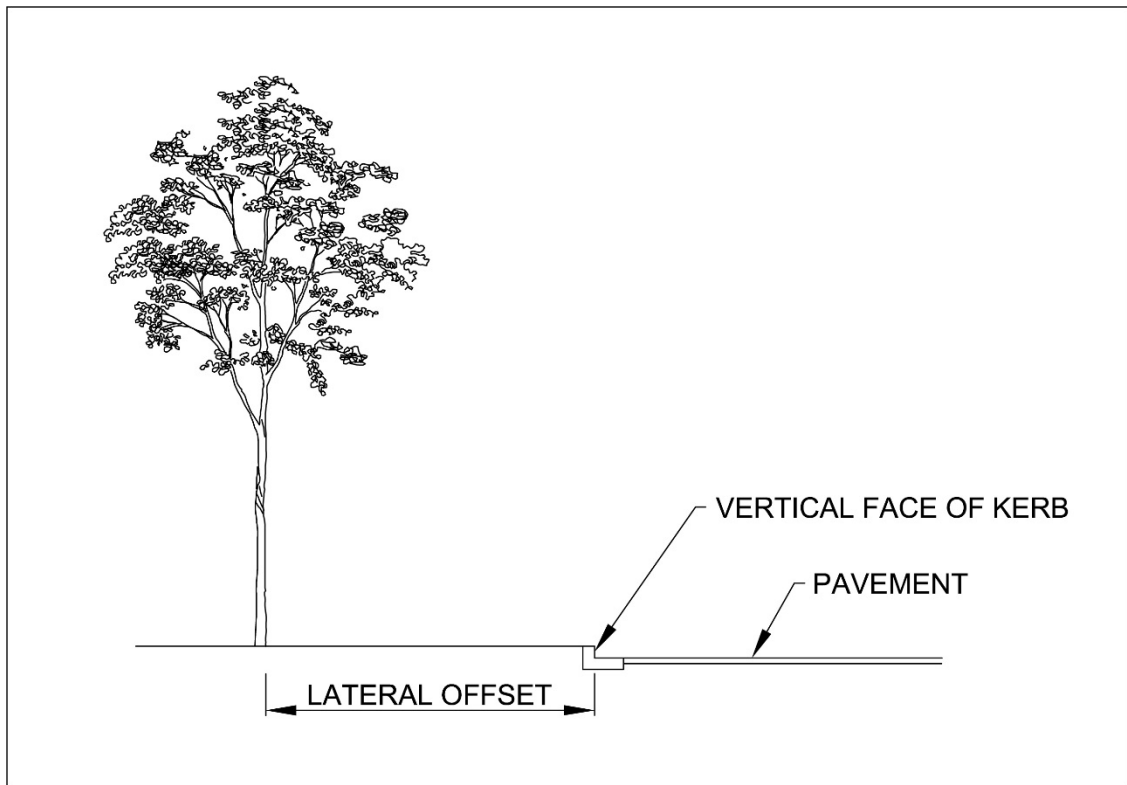
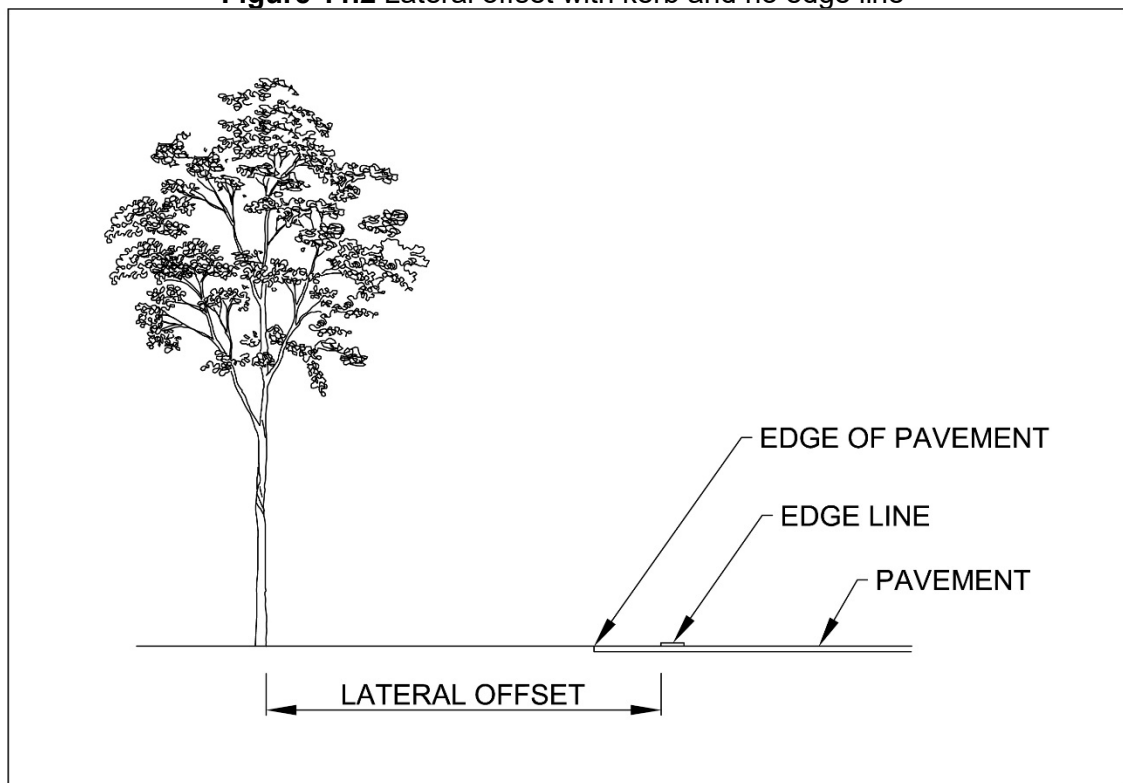


Figure 11.1 Lateral offset with kerb and edge line

**Figure 11.2** Lateral offset with kerb and no edge line**Figure 11.3** Lateral offset with no kerb and edge line

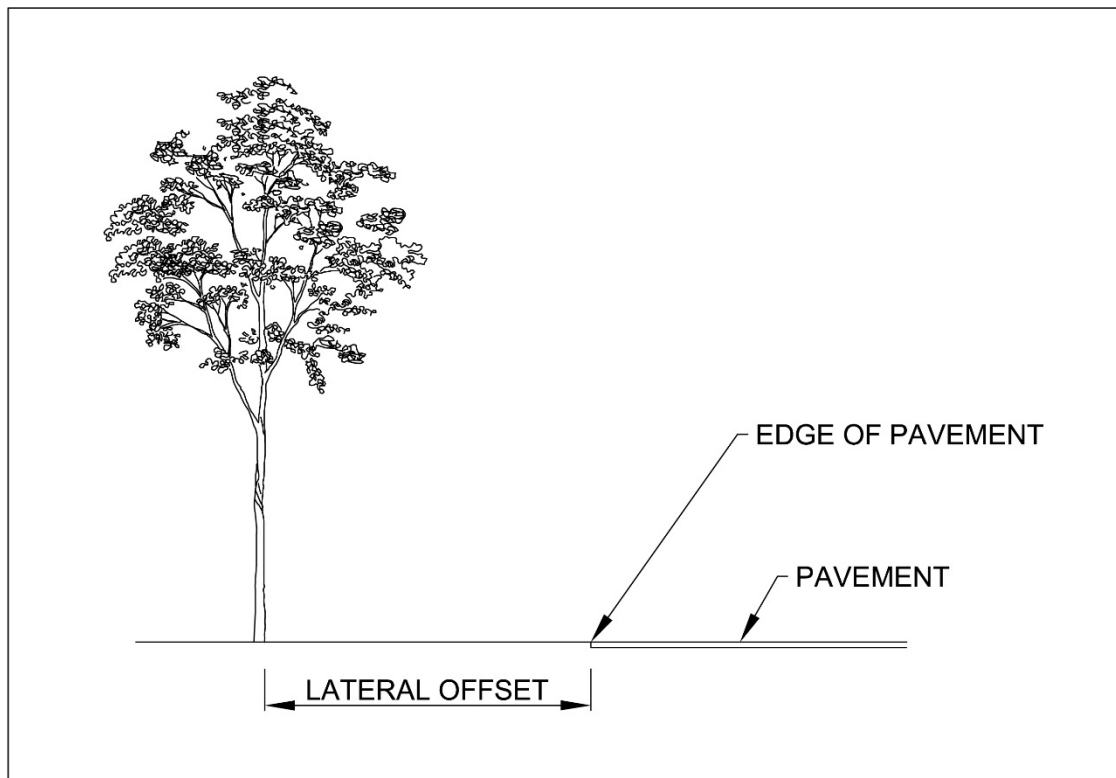


Figure 11.4 Lateral offset with no kerb and no edge line

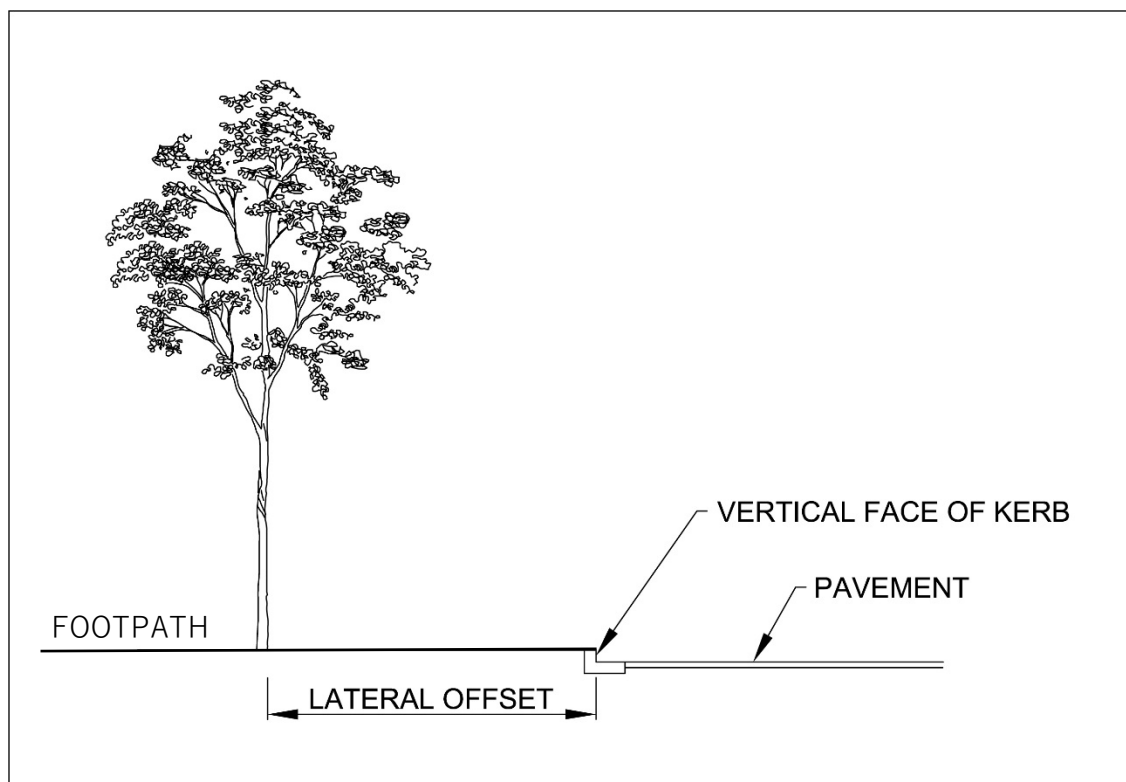


Figure 11.5 Minimum lateral offset on roads with a speed limit ≤ 60 km/h and desirable tree placement in areas of high pedestrian activity

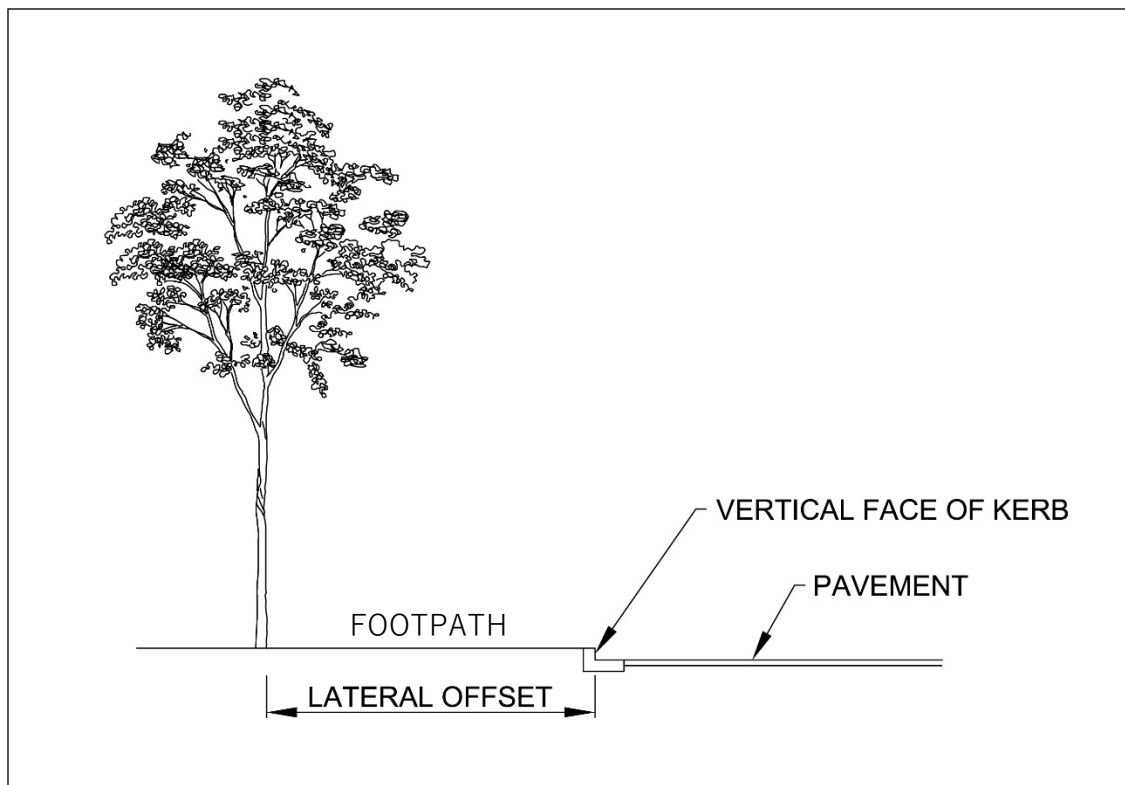


Figure 11.6 Desirable tree placement on roads with a speed limit $\leq 60\text{km/h}$ and minimal pedestrian activity

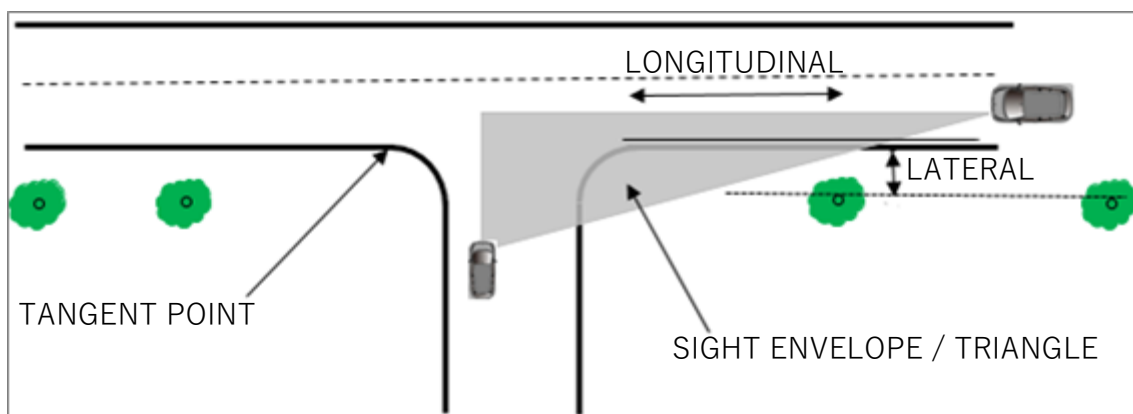


Figure 11.7 Minimum offsets (lateral and longitudinal) at an intersection without slip lane

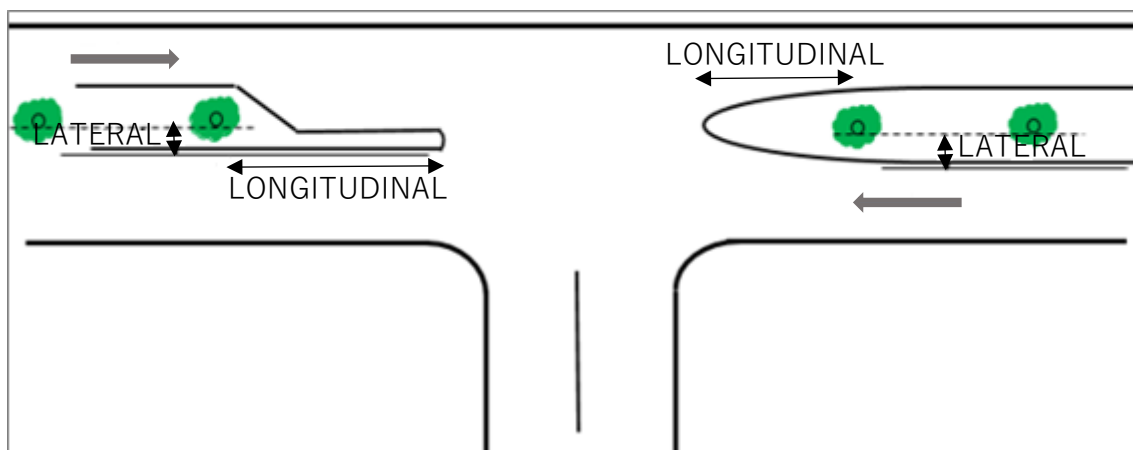
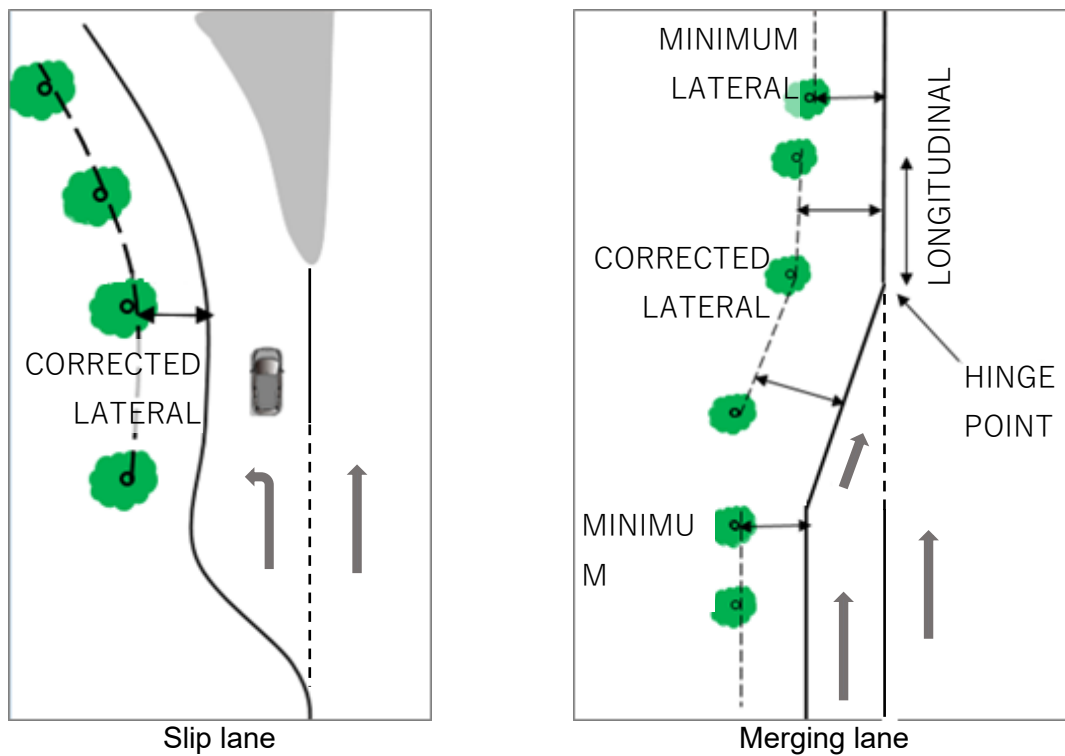
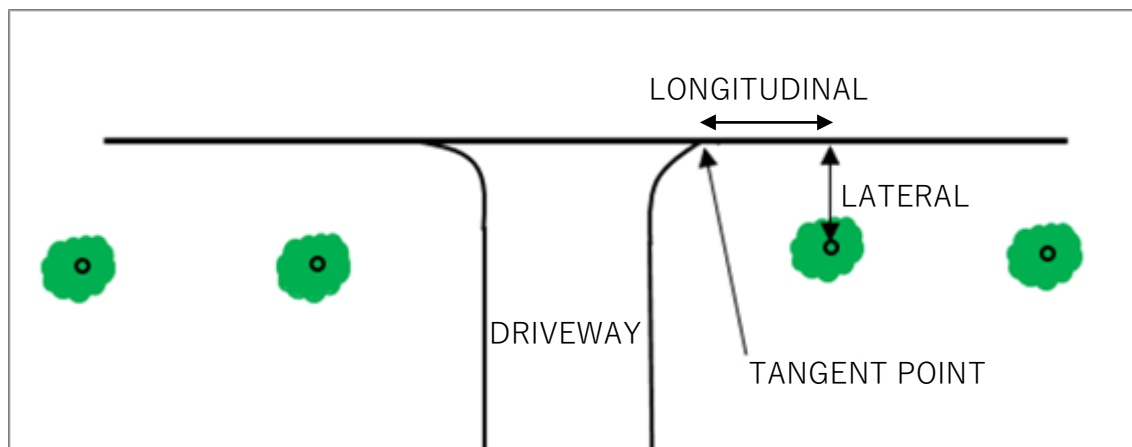


Figure 11.8 Minimum offsets (lateral and longitudinal) in medians with median opening**Figure 11.9** Minimum lateral offsets at slip lane and merging lane**Figure 11.10** Minimum offsets (lateral and longitudinal) at driveway

12. References

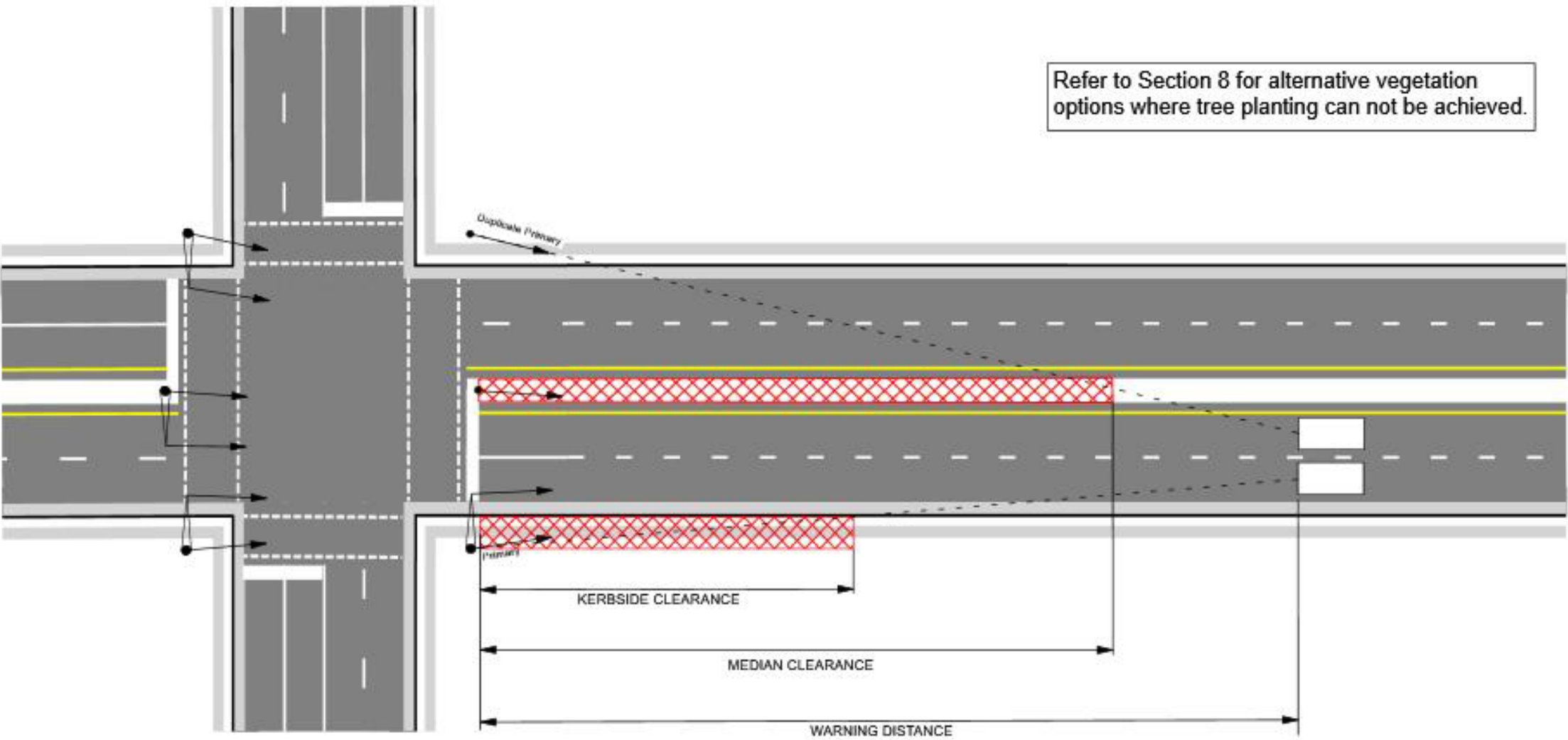
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Appendix A Street Tree Species Suitable for Adelaide Streetscapes


Scientific Name	Common Name	Lateral offset from face of tree trunk to vertical face of kerb to minimise damage (metres)	Trunk Diameter (metres)	Height (metres)	Canopy Span (metres)	Spacing (metres)
Large Trees (Height 12+ metres)						
Angophora costata	Smooth-barked Apple	1.0	0.5	20	10	10
Celtis australis	Southern Hackberry	1.0	0.5	11	10	12
Corymbia maculata	Spotted Gum	1.0	0.5	20	10	12
Eucalyptus leucoxylon	SA Blue Gum	1.0	0.5	20	10	10
Fraxinus angustifolia 'Raywood'	Claret Ash	1.0	0.5	12	9	12
Ginkgo biloba	Maidenhair Tree	0.8	0.4	15	8	10
Hymenosperum flavum	Native Frangipani	0.6	0.3	15	6	8
Jacaranda mimosifolia	Jacaranda	1.0	0.5	14	8	12
Platanus X acerifolia 'Liberty'	Plane Tree	1.0	0.4	14	10	12
Platanus orientalis	Oriental Plane Tree	1.0	0.5	15	10	15
Quercus palustris	Pin Oak	1.0	0.5	15	8	12
Quercus palustris 'Green Pillar'	Green Pillar Pin Oak	0.6	0.35	14	3	8
Zelkova serrata 'Green Vase'	Japanese Elm	0.6	0.3	14	10	8
Zelkova serrata 'Mushashino'	Japanese Elm	0.6	0.3	14	10	8
Medium Trees (Height 8 to 12 metres)						
Cupaniopsis anacardioides	Tuckeroo	0.8	0.3	8	6	10
Fraxinus ornus	Manna Ash	0.8	0.2	10	7	10
Fraxinus pennsylvanica 'Urbanite'	Urbanite Ash	0.8	0.3	11	8	10
Koelreuteria bipinnata	Chinese Flame Tree	0.8	0.4	10	5	10
Koelreuteria paniculata	Golden Rain Tree	0.8	0.4	7	5	10
Melia azedarach 'Elite'	White Cedar	1.0	0.35	8	9	12


Scientific Name	Common Name	Lateral offset from face of tree trunk to vertical face of kerb to minimise damage (metres)	Trunk Diameter (metres)	Height (metres)	Canopy Span (metres)	Spacing (metres)
<i>Pistacia chinensis</i>	Chinese Pistachio	0.6	0.35	8	6	10
<i>Pyrus calleryana</i> 'Capital'	Ornamental Pear	0.6	0.3	11	3	6
<i>Pyrus calleryana</i> 'Chanticleer'	Ornamental Pear	0.6	0.35	11	6	10
<i>Pyrus ussuriensis</i>	Manchurian Pear	0.8	0.4	12	10	12
<i>Sapium sebiferum</i>	Chinese Tallow	0.6	0.3	8	8	8
<i>Sophora japonica</i>	Japanese Pagoda Tree	0.8	0.3	9	6	10
<i>Quercus rubra</i>	Red Oak	1.0	0.3	10	9	10
Small Trees (Height 5 to 8 metres)						
<i>Callistemon</i> 'Harkness'	Gawler Hybrid	0.6	0.2	6	4	4
<i>Callistemon viminalis</i>	Weeping Bottlebrush	0.6	0.3	6	4	4
<i>Cercis siliquastrum</i>	Judas Tree	0.6	0.2	6	4	8
<i>Eucalyptus leucoxylon</i> 'Euky Dwarf'	S.A. Blue Gum - Dwarf variety	0.6	0.2	6	5	8
<i>Eucalyptus torquata</i>	Coral Gum	0.6	0.2	8	4	8
<i>Fraxinus griffithii</i>	Ash	0.6	0.2	7	4	8
<i>Lagerstroemia indica</i>	Crepe Myrtle	0.6	0.2	8	6	8
<i>Prunus x blireana</i>	Flowering Plum / Purple Leafed Plum	0.6	0.2	5	3	10


Appendix B Clearance Zones for optimal line of sight to traffic signal lanterns



LEGEND

 Traffic Signal Lanterns and poles

 Clearance zone

 Line of sight

Speed	Warning Distance* (from Dwg S-4538)	Median Clearance*	Kerbside Clearance*
(km/h)	(m)	(m)	(m)
50 (or less)	100	85	40
60	130	110	55

* - distances are measured from the stop line

NOT TO SCALE