TRANSPORT IMPACT ASSESSMENT GUIDELINES

VOLUME 2

PLANNING SCHEMES, STRUCTURE PLANS AND ACTIVITY CENTRE PLANS

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1 Introduction

Volume 2 of the guidelines is targeted at land use planners and transport planning professionals. Primarily, it provides advice on the scale and content of the transport assessment that should be undertaken as part of a structure planning exercise. It also provides technical guidance on how to undertake the assessment.

Volume 2 should be read in conjunction with **Volume 1**, which provides general guidance on the transport impact assessment process; **Volume 5** which provides additional technical guidance; *Liveable Neighbourhoods*; and various Western Australian Planning Commission (WAPC) development control policies, which set out the transport-related requirements for structure planning.

2 Planning schemes and amendments

Prior to the structure planning stage, land parcels are normally zoned and/or reserved under a region planning scheme and a local planning scheme. In Western Australia there are three region schemes in operation: the Metropolitan Region Scheme (MRS), the Peel Region Scheme (PRS) and the Greater Bunbury Region Scheme (GBRS). The WAPC prepares these region schemes for the effective planning and coordination of land use and development. The region schemes generally set out broad land use zones or policy areas (for example, Urban, Industrial or Rural) and identify land required for regional purposes.

Local planning schemes, however, are prepared by local governments to set out the way land is to be used and developed. The local planning schemes classify areas for land uses using appropriate planning controls and include provisions to coordinate infrastructure and development in a particular local government area.

Both types of planning schemes (region and local) are often amended and these scheme amendments need to be properly assessed from a transport planning perspective. It is important to know what will be required in transport terms at these early stages, as planning for potential transport impacts at this stage is vital for the more detailed subsequent stages of structure plans, subdivisions and individual developments.

While not requiring a separate volume of these TIA guidelines, there are a number of areas where the approving authority may request transport planning information. Given the wide range of potential amendments in terms of size, content and impact, it is recommended that proponents and/or their appointed traffic engineers should discuss the specific requirements with the approving authority at an early stage, in order to reduce the need for iterations and to ensure that all the required information is supplied in the most efficient manner.

As a general guide, it is recommended that a TIA is prepared for a scheme amendment if that amendment may result in significant impacts or large additional demand on the transport network. An impact may be considered significant when a proposal is expected to generate in excess of 5,000 vehicles per day or 500 vehicles per hour in the peak hour. However, even below these figures, it is recommended that the need for a TIA be discussed with the approving authority at an early stage to facilitate support of the proposal.

The type of transport planning information required for scheme amendments will be very similar to the requirements for structure plans. Some of the more common areas for information to be required are listed below, together with the likely extent of the information that may be requested.

Details of the proposal

If the amendment is for 'Urban' purposes, for example, this should include the potential yield of the land in question, that is, the total number of dwellings, commercial areas, retail, Gross Floor Area (GFA) etc.

Details of the existing situation

The proponent should provide details of the existing situation in the same manner as for a structure plan, for example, existing roads, public transport, cycling and pedestrian networks etc.

Internal networks

This should give a broad description of the networks within the area of the proposal, at least at a strategic level, for example, strategic road network and new roads, road hierarchies, planned public transport routes, planned cycling and pedestrian network.

Proposed changes to the network

This only needs to be at a broad level, for example, new road links, new public transport rotes, new cycling and pedestrian facilities being proposed.

Integration with surrounding area

The level of detail of the amendment will determine how much information can be supplied in this regard, but at least a general description should be supplied.

Trip generation and traffic volumes

A general indication of the likely trip generation and distribution should be supplied, based on the level of detail available. This will vary depending on the specific amendment. Where details are limited, daily traffic flows and increases on external links may be sufficient.

Traffic modelling

Where STEM or ROM traffic modelling may be required, the approving authority may facilitate access to the information if available.

3 The structure plan stage

For the purposes of the TIA guidelines, the term 'structure plan' is also inclusive of activity centre plans. Structure planning forms a critical stage of the land use planning process. It involves planning at a strategic level, often over large areas, and provides the basis for zoning and subdivision of land. Structure plans can be prepared at a district and local level, and for activity centres. The district structure plan generally addresses the 'fatal flaws' for a potential development area and provides for the major structural elements such as major roads, open space, commercial and industrial areas and environmental conditions. A district structure plan may apply to several suburbs or all or part of a town-site, for example, the local structure plan would deal with residential density, subdivisions and the coordination of infrastructure at a neighbourhood level or smaller scale.

It is therefore important that the transport aspects, and in particular the land use/transport integration, are also adequately assessed at this stage in the land use planning process. This assessment should then be used to provide direction in the later, more localised and detailed, planning stages of subdivisions and individual developments.

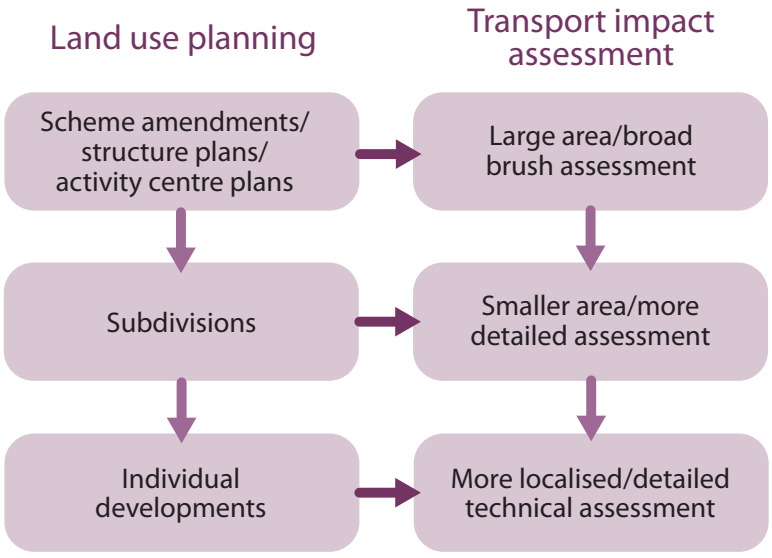
The role of structure planning in the land use/transport planning process is illustrated in **Figure 1**.

4 Policy context

The WAPC's *State Planning Policy No.1* (SPP1 February 2006) sets out the key principles relating to environment, community, economy, infrastructure and regional development, which should guide the way in which future planning decisions are made. The objective of the infrastructure component is to *"facilitate strategic development by making provision for efficient and equitable transport and public utilities"*.

Assessment of the transport infrastructure needed to support proposed land use development is therefore required for all levels of land use planning.

Figure 1: The land use/transport planning process



This requirement is expanded upon in the *Planning and Development (Local Planning Schemes) Regulations* (2015) schedule 2, part 4. Details of the transport related requirements under these regulations can be found within the document, and in appendix 1 of the *Structure Plan Framework*. The regulations state that a structure plan must *"set out…the extent to which the plan provides for the coordination of key transport and other infrastructure"*, while the framework calls for *"a district or local traffic and transport management strategy, including a Transport Impact Assessment"*.

The WAPC's operational policy, *Liveable Neighbourhoods* also requires a transport assessment to be undertaken as part of the structure planning process.

Therefore, **all structure plans** require a supporting transport assessment under current WAPC policy.

5 Role of the guidelines

The above policy documents provide broad advice on designing the transport components of structure plans and indicate the supporting transport planning information that should be provided. **Volume 2** of these TIA guidelines has been prepared to provide greater clarity and further guidance on how the TIA should be undertaken and what information should be provided in support of a structure plan proposal.

It should be noted that the guidelines are not intended to specifically address policy issues such as the appropriateness of the proposed land uses.

TIAs are therefore a means of assessing the transport implications of a structure plan proposal, rather than necessarily dictating or changing the proposal. They will assist transport and land use planners in determining whether the proposal is consistent with policy and if the implications are acceptable.

If not, changes may be required to either the proposed land uses, (including the distribution and densities/plot ratios) and/or to the proposed transport system, (for example, better public transport services) in order to achieve a more desirable integrated land use/transport outcome.

6 Sustainability and travel demand management (TDM) issues

The main issues worth considering in the preparation of a structure plan, in order to achieve a more sustainable transport outcome, are generally covered within the revised *Liveable Neighbourhoods* document.

In keeping with current Government policy, developers, and proponents of larger developments in particular, should give due consideration to the issues of travel demand management (TDM) and modal splits at an early stage of the planning process, in order to ensure that the relevant objectives of the various policies referenced within these guidelines are followed.

While it would be impossible to lay down specific modal split targets or travel demand criteria applicable to all developments, TDM strategies for mobility management generally fall into the broad categories of

improved transport options, incentives, land use management, and policies and programs. These categories cover measures such as improvements to public transport and alternative transport modes, improvements to accessibility through the integration of transport and land use planning, workplace travel plans, travel behaviour change programs and parking management. There are various sources of information which provide further guidance for planning and implementation of these TDM measures. The use of these measures will contribute towards more sustainable transport outcomes. PATREC's *Congestion Abatement Through Travel Demand Management Report A* (2014) and the Victoria Transport Policy Institute's *Online TDM Encyclopaedia* (2014) are useful resources.

While TDM measures are encouraged, if the proponent seeks to reduce the impact of a development below the levels set out in these guidelines these measures must be clearly identified and the claimed reductions shown must be genuine and achievable. For example, any significant reduction in trip generation rates attributed to the proximity of a development to a public bus service is generally only acceptable if the service meets PTA's definition of a *'high frequency'* service.

A high frequency bus service[1] is defined by PTA as:

- 10 minutes in peak periods;
- 15 minutes during inter-peak, early evening and peak weekend periods; and
- 30 minutes at other times.

[1] *Bus Planning and Design for Efficient People Movement, 2015.*

Currently, the majority of local government authorities are limited in their ability to encourage the successful implementation of TDM measures, due in part to policies that stipulate a minimum level of parking provision for developments. However, it is expected that this situation will change over time, with authorities stipulating maximum rather than minimum rates, for example, in order to encourage alternative modes of travel.

Some local governments may have existing Integrated Transport Plans (ITPs) which address overarching transport outcomes in their local government area. Further information about ITPs can be found in the WAPC's *Guidelines for Preparation of Integrated Transport Plans* (2012).

7 Transport impact assessment objectives

The key objectives of a TIA for a structure plan are to:

- assess the proposed internal transport networks with respect to accessibility, circulation and safety for all modes, that is, vehicles, public transport, pedestrians and cyclists;
- assess the level of transport integration between the structure plan area and the surrounding land uses;
- determine the impacts of the traffic generated by the structure plan area on the surrounding land uses; and
- determine the impacts of the traffic generated by the structure plan area on the surrounding transport networks.

8 Activity centres

For developments that include or consist of an *activity centre*, proponents are urged to begin consultation with the relevant authorities at an early stage, and refer to Department of Transport's (DoT's) *Transport Modelling Guidelines for Development in Activity Centres*.

9 Format of assessment report

9.1 Introduction

This section provides advice on the general content and format of a TIA for a structure plan. It is recommended that the assessment follows this general format as it will simplify the processing of the proposal by the assessing officers and reduce the time required for approval.

9.2 Scale of assessment

Structure planning can range from the large scale, less detailed level of regional plans and district structure plans, through to the smaller scale, more detailed local structure plans and activity centre plans. These are expanded upon in the *Planning and Development (Local Planning Schemes) Regulations* (2015) and the *Structure Plan Framework. Liveable Neighbourhoods* further defines district structure plans as applying to areas of land generally greater than 300 hectares, with local structure plans covering areas of land between 20–300 hectares and/or three neighbourhoods or less.

All structure plan TIAs should cover the items in **Section 9.3**, as detailed below. The level of detail will, however, depend upon the level of detail within the structure plan itself.

For example, if the road network only goes down to the neighbourhood collector level (the requirement for larger structure plans), then the assessment of the road, public transport and pedestrian/cycle networks can only go down to this level.

In these cases, the additional level of detail required should be provided at the next level of planning, that is, at the local structure plan or subdivision stage. This should draw on the earlier assessment made at the higher level planning stage.

9.3 Assessment report

For example, there is scope for some flexibility in preparing a TIA report for a structure plan, the recommended general structure is along the lines of the following:

- Summary
- Introduction and background
- Structure plan outline
- Existing situation
- Internal transport networks
- External transport networks
- Integration with surrounding area
- Analysis of internal transport networks
- Analysis of external transport networks
- Conclusions

More detailed guidance on the content of each of the above is provided in **Section 10**.

The assessment report should also adhere to the following general principles:

- The assessment report should be written in a clear and simple style as some of the people reading it may not be familiar with technical terms. Where appropriate, technical details should be provided in appendices with the main findings and conclusions summarised in the body of the report;
- ***Maps, plans and diagrams should be used wherever possible*** for clarity of presentation and to avoid the need for lengthy descriptions;
- All analysis should be fully explained to allow the reviewer to trace the steps followed in the process. Conclusions should follow logically in the order in which issues were addressed so that they can be reviewed easily, based on the information provided;
- All data sources used should be referenced to allow for retrieval of relevant information if required at a later date;
- Results of data collection and related detailed analysis should be attached as technical appendices. Electronic copies of data and/or analysis should be provided as part of the report where appropriate.

9.4 Checklist

A checklist of the typical information required is provided in **Appendix A** of this volume. This checklist may be used by the proponent and/or the person undertaking the TIA as a method of ensuring that all items have been addressed and submitted with the transport information. In the event that a revision to a TIA is required a checklist is included to ensure all further requests have been included.

While it is not mandatory for the checklist to be submitted with the application/TIA report, this may assist the assessors in identifying any further information required to process the application.

10 Details of content

10.1 Introduction

This section details what should be provided in each of the items in Section 9.2. The key information to be provided is shown initially, followed by further guidance on what should be provided and how to undertake the assessment, as appropriate.

Where appropriate, references are given to additional information and guidance which can be found in **Volume 5 – Technical guidance**.

10.2 Summary

- Provide a summary of the TIA including a brief description of the structure plan proposal, the key transport issues, potential transport impacts and any proposed modifications to the surrounding transport networks.

10.3 Introduction and background

- Provide a brief description of the structure plan and the purpose and contents of the transport report including any appropriate background information.

The introduction should include the following information:

  - the name of the applicant/agent/ proponent for the structure plan and the consultant who prepared the transport impact assessment;
  - a description of the structure plan location and a location map showing the site area in context;
  - a brief description of the land use proposal;
  - a summary of key issues to be addressed; and
  - background information, for example, previous reports or earlier planning proposals for the site.

10.4 Structure plan proposal

- Provide details of the proposed structure plan, including:
  - its regional context;
  - the proposed land uses;
  - a table of the quantum of each land use type proposed (for example, number of dwellings, hectares of industrial etc.);
  - any major non-residential attractors and generators of traffic (for example, shopping centres, schools, hospitals);
  - any specific issues.

10.5 Existing situation

- Describe, and show on a plan where appropriate, the existing situation, including:
  - existing land uses within the structure plan area;
  - existing land uses within a minimum of 800metres from the boundaries of
  - the structure plan area;
  - existing transport networks within the structure plan area for:
    - road (including Restricted Access Vehicles (RAV) networks);
    - pedestrian/cyclist;
    - public transport;
  - existing road network within a minimum of 5 kilometres (for large structure plans, that is, generally >=300 Ha) and 2 kilometres (for smaller

structure plans, that is, <300 Ha) from the boundaries of the structure plan area (See explanatory note 1);

- available traffic counts on existing roads in, and within 5km or 2km of, the structure plan area, based on the above structure plan areas. (See explanatory note 2);
- existing pedestrian/cyclist and public transport networks within a minimum of 800metres from the boundaries of the structure plan area. (See explanatory note 3).

Explanatory Note 1

The 5km or 2km distances for the road network and traffic flows are arbitrary. The intent is to provide road information for the full area likely to be materially affected by the traffic generated by the structure plan land uses.

The process to determine this is an iterative one. Both the existing traffic flow and the structure plan traffic need to be known for a section of road to decide whether or not the structure plan traffic would have a material impact on operation or safety.

As a general guide, an increase in traffic of less than 10 per cent would not normally be likely to have a material impact, but increases over 10 per cent may and further assessment may be warranted.

Section 10.11 provides further guidance on this and there may be a need to expand the area covered here based on the detailed assessment of the extent of impact.

Explanatory Note 2

The traffic counts should be for at least the PM peak hour, (and preferably both the AM and PM peak hours), and by direction, where available. (See section 10.9.3 for further guidance).

Explanatory Note 3

The 800 metre distance for external land uses and external pedestrians/cyclists and public transport networks equates to a 10 minute walk time from the edge of the structure plan area. This is somewhat arbitrary and it may be appropriate to vary this, up or down, depending upon the nature and size of the structure plan and the nature and form of the surrounding land uses and transport networks.

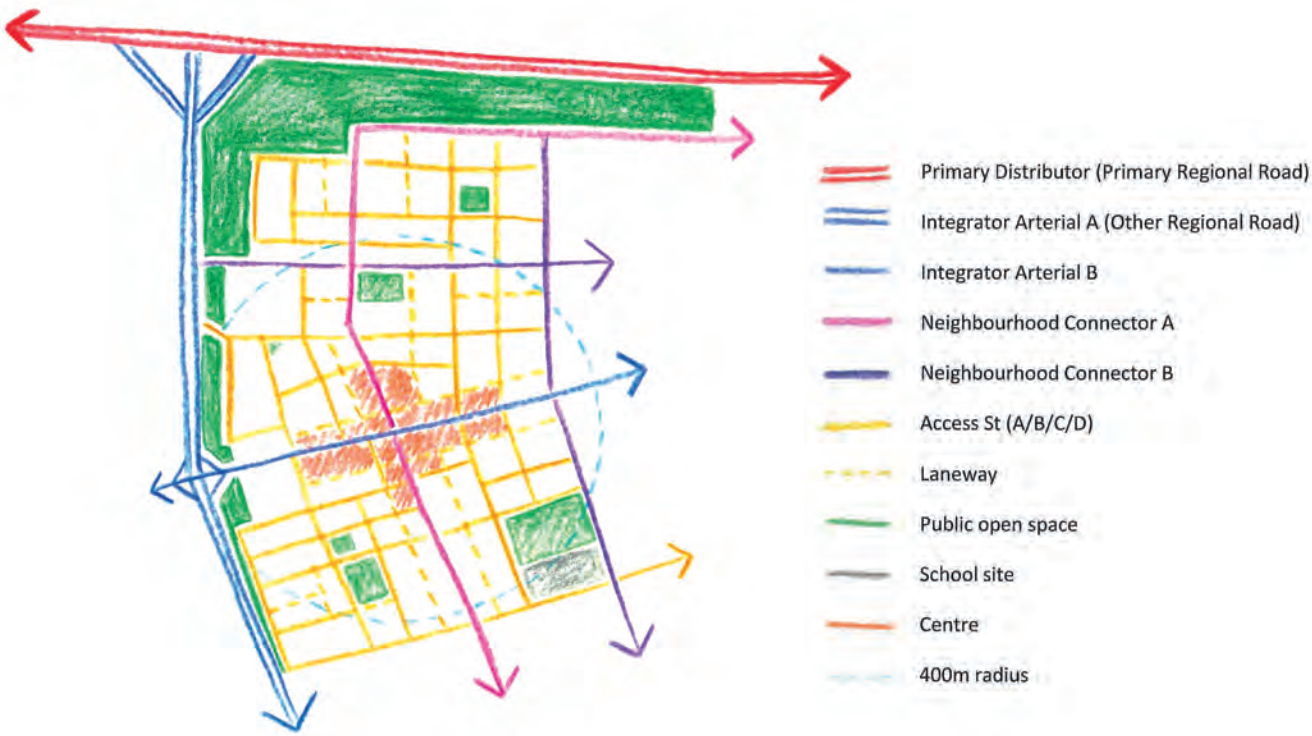
10.6 Proposed internal transport networks

- Describe, and show on a plan where appropriate, the proposed internal transport networks including:
  - changes/additions to the existing road network;
  - proposed road hierarchy and speed limits;
  - road reservation widths;
  - road cross-sections (for example, two lane or four lane, but also showing pedestrian, cycling and/or PT facilities);
  - intersection controls;
  - pedestrian/cycle networks and crossing facilities, for example, signalised pedestrian crossings;
  - public transport routes;
  - modal priority; and
  - proposed road access strategies.
- The details of any discussions/agreements with the local authority, Main Roads Western Australia (MRWA) or the Public Transit Authority (PTA) with respect to the above proposals should also be provided.

This includes any discussions/agreements with:

- the local authority over local road networks and pedestrian and cycle facilities;
- MRWA regarding intersections with, or direct access onto, roads under their jurisdiction; and
- PTA/Transperth on new bus services or extensions/alterations to existing bus services to serve the structure plan area, and ensure alignment with Transperth's Service Development Plan.

Figure 2: Example of Liveable Neighbourhoods road heirarchy



10.7 Changes to external transport networks

- Describe, and show on a plan where appropriate, any committed or proposed changes or additions to the external transport networks including:
  - the road network;
  - the road hierarchy as per *Liveable Neighbourhoods* Movement Network;
  - intersection controls;
  - pedestrian/cycle networks and crossing facilities;
  - public transport services; and
  - modal priority

These changes could be those committed to, or proposed, by others, for example, by MRWA or the local authority, or by the proponent as part of the structure plan.

Discussions are likely to be required with the affected local authority(ies), MRWA and PTA to determine whether or not they are proposing, or considering, any potential changes.

The details of any discussions/agreements with the above agencies regarding any proposals by the proponent should also be provided.

10.8 Integration with surrounding area

- Describe the level of integration with the surrounding area by:
  - identifying the major attractors and generators within 800 metres of the boundaries of the structure plan area (See explanatory note 4);
  - identifying any proposals for major changes to the land uses within 800 metres of the boundaries of the structure plan area;
  - determining the main desire lines between the structure plan land uses and these external attractors and generators;
  - assessing whether the existing transport networks, plus any proposed changes, would adequately match these desire lines, particularly for pedestrians, cyclists and public transport users (See explanatory note 5);
  - identifying any deficiencies in the surrounding transport networks and/or areas where improvements could be made (See explanatory note 5);
  - identifying potential remedial measures to address these deficiencies.

The intent of this section is to identify how well the proposed structure plan integrates with the surrounding land uses with respect to transport links and accessibility. This is to be a qualitative assessment of the level of accessibility and integration between the structure plan area and the surrounding land uses. A quantitative analysis of the external transport networks is to be undertaken later, in Section 10.11.

Consideration may also be required of the impact of **traffic noise** on both the structure plan area itself and the surrounding area. Further advice on this requirement is provided in *State Planning Policy 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning*, and in **Volume 5 – Technical guidance**.

Explanatory Note 4

Major generators would be those external land uses, primarily residential, from which people would be attracted to land uses such as schools, shopping centres or sports facilities, lying within the structure plan area.

Major attractors would be those external land uses (such as schools, shopping centres or sports facilities) that would attract people from the residential areas within the structure plan area.

Explanatory Note 5

The assessment should consider the directness of the route(s) and the quality of the connecting pedestrian and cycle networks. It should identify whether there are any existing public transport services or whether any are proposed.

Potential deficiencies, or areas for improvement, could include missing sections of footpath and/or cycle path, the absence of safe crossing facilities where major roads need to be crossed and the absence of public transport links.

10.9 Analysis of transport networks – General advice

The assessment to date has provided a description and an inventory of the structure plan proposal and surrounding area with respect to land uses and transport networks. The next two sub-sections (10.10 and 10.11) require a more detailed quantitative analysis of the proposed internal and external transport networks to demonstrate that they will provide a high level of accessibility and safety for all modes.

Much of this analysis should already have been undertaken as part of the process of determining and designing the required transport networks. It should therefore be more a matter of presenting this design assessment than undertaking a new assessment.

10.9.1 Assessment year(s)

Structure planning is usually a longer-term process, with the development of the structure plan area occurring over a number of years, often 15 or 20 years or more into the future. The analysis of the transport networks should therefore be undertaken for the (assumed) year of full development.

It is recommended that, for analysis purposes, the assessment year matches one of the years modelled in the State's transport models, that is, **2016, 2021, 2026 or 2031**. This would allow, where appropriate, future year volumes on the surrounding road network to be extracted from either the ROM or the STEM transport models, or indeed for the structure plan land uses to be assessed using the transport models.

For large structure plans and/or structure plans likely to be staged over a longer time period, it may be appropriate to also

undertake assessments at key stages of development. This would provide information on the timing and level of transport infrastructure required to support the various stages of development.

10.9.2 Daily versus peak hour traffic

It has been normal practice to assess the road network requirements for a structure plan based on projected daily, that is, 24-hour, traffic flows. These guidelines recommend that peak hour traffic flows be used for two reasons.

The first is that the structure plan assessment is intended to provide the basis for the design of the traffic components of the later, more detailed land use planning stages, that is, the subdivision and then individual development stage.

A peak hour operational analysis of the road network will be required at the individual development stage and preferably also at the subdivision stage. It therefore makes more sense to undertake a broad brush peak hour assessment at the structure plan stage that can then be refined and revised as required at the subdivision and development stages.

The second reason is that road networks should be, and generally are, designed to provide a certain level of service during the peak hour, rather than to accommodate daily flows. This is because two roads carrying the same daily flow can have significantly different peak hour flows, as illustrated below for two roads carrying 20,000 vehicles per day.

Example of differing peak hour volumes for same daily volume

Assume two roads are both carrying 20,000 vehicles per day.

For a road serving an industrial area, the traffic is usually concentrated in the AM and PM peak periods and is very tidal, that is, a lot more vehicles arrive in the AM peak than depart, and vice versa for the PM peak.

Assuming the PM peak hour is 12 per cent of the daily flow equates to 2,400 vehicles (two-way) in the PM peak hour. Assuming an in:out directional split of 20:80 in the PM peak hour results in 1,920 vehicles departing in the PM peak hour.

BUT

For a road serving a shopping centre, the traffic is spread more evenly over the day and is usually more evenly balanced between vehicles heading to the shopping centre and vehicles leaving the shopping centre.

Assuming the PM peak hour is 8 per cent of the daily flow equates to 1,600 vehicles (two-way) in the PM peak hour. Assuming an in:out directional split of 40:60 results in 960 vehicles departing the shopping centre in the PM peak hour [2]:

The example illustrates that the percentage of daily flow occurring in the peak hour and the directional split can vary significantly, depending on a road's function and location. In the example, this results in the industrial road having peak hour directional flows more than double those on the road serving a shopping centre.

[2] *The ratios and percentages used above are for illustrative purposes only and should not be assumed to be correct for an actual transport assessment.*

Designing the road based on daily flows could therefore result in an over-provision of road space, for example, four lanes when only two are required, in the case of the road to the shopping centre, or conversely, an under provision for the road serving the industrial area.

10.9.3 Design traffic hour

The choice of peak hour(s) will depend to some degree on the land uses within the structure plan and its location. In most cases, for the structure plan area as a whole, the busiest hours are likely to be the normal AM and PM peak hours on the surrounding highway network.

There may be parts of the structure plan area with land uses generating significant volumes of traffic outside these peaks. These should be noted at the structure plan stage and then addressed at the subdivision and/or individual development stages that concentrate on smaller areas in more detail.

For structure plan assessments a single design hour would normally be sufficient for the broad brush transport network assessment. For structure plans with a significant retail component, the PM peak is suggested rather than the AM peak as shopping areas generate more traffic in the PM than in the AM.

For structure plans that are primarily residential and contain schools, the AM peak hour may be more appropriate as the commuter and school peaks tend to overlap more in the AM than the PM. Professional judgement should therefore be used to determine the more appropriate peak for assessment purposes.

For large scale structure plans, and in particular for activity centres, both AM and PM peaks may require analysis as each period could place pressure on different parts of the transport network.

In addition, at the later more detailed planning stages, particularly at the individual development stage, it is likely that both AM and PM peak hour assessments will be required. It is therefore recommended that both AM and PM peak hour volumes, where available, be obtained at the structure planning stage, to assist in the later planning stages.

Note that the PM (and/or AM) peak hour assessment is to take the place of the traditional daily traffic assessment, that is, a daily traffic assessment is NOT required for structure plans under these guidelines.

10.10 Analysis of internal transport networks

10.10.1 Introduction

This section presents the steps recommended to undertake and present the analysis of the proposed internal transport networks.

10.10.2 Assessment parameters

– Determine the year(s) for assessment and the time period(s) for the traffic flow analysis.

The assessment year(s) and the time period(s) for analysis should be determined in accordance with the advice provided in **Section 10.9** above.

10.10.3 Structure plan generated traffic

Project the peak hour traffic volumes that would be generated by the structure plan land uses, onto the internal roads. A suggested approach is to:

- divide the structure plan area into a number of smaller zones;
- determine the quantum of each land use in each zone;
- determine peak hour vehicle trip generation rates for each land use type. (See explanatory note 6);
- apply the trip rates to the land uses in each zone to obtain inbound and outbound trips for each zone;
- determine the internal/external split of vehicle trips for each zone. (See explanatory note 7);
- distribute trips onto the internal and external road networks.

It is recommended that peak hour volumes be determined for both the AM and PM peak hours and distributed on the surrounding road networks, to assist the later planning stages as discussed above.

Explanatory Note 6 – Trip rates

Vehicle trip generation rates are to be based on surveys of comparable land uses or extracted from recognised land use traffic generation databases such as:

- *Guide to Traffic Generating Developments Version 2.2, October 2002 – Roads and Traffic Authority, New South Wales and 2013/04a Updated Traffic Surveys; and*
- *Trip Generation Manual – Institute of Transportation Engineers, Washington, USA.*

Table 1: Typical land use vehicle trip rates

LAND USE	UNIT	AM peak hour trip rate			PM peak hour trip rate		
		In	Out	Total	In	Out	Total
Residential	Dwellings	0.2	0.6	0.8	0.5	0.3	0.8
School	Pupils	0.5	0.5	1.0	0.5	0.5	1.0
Commercial	100m² GFA	1.6	0.4	2.0	0.4	1.6	2.0
Retail (Food) [ab]	100m² GFA	2.0	0.5	2.5	5.0	5.0	10.0
Retail (Non-food) [b]	100m² GFA	1.0	0.25	1.25	2.0	2.0	4.0
Industrial	100m² GFA	0.8	0.2	1.0	0.2	0.8	1.0

GFA = gross floor area

a – These rates should be applied to retail developments/ shopping centres that have a significant food retail component.

b – The trip rates for both food and non-food retail stores can vary significantly depending upon a number of issues including type of goods sold, location and size. Caution should be used in applying these rates arbitrarily.

In the absence of more accurate data, the typical (average) trip rates shown in ***Table 1***, (which have been extracted from the currently available data bases), should be considered as default values for the main land use types. Thus, any variation to these values should be recorded and justified.

The table shows typical (average) vehicle trip rates for the various land uses. While rates can vary significantly, especially for retail developments, these variations tend to be balanced out over the larger areas contained in a structure plan. For example, it is unlikely that all of the individual developments in an industrial area would generate at a low rate, or alternatively at a high rate.

At the later, more detailed planning stages, (that is, subdivision and individual development), when the specific uses are better defined, the variations in trip generation within a particular land use may be more significant and should be assessed on an individual basis.

The rates in the above table are based on number of dwellings or square metres of gross floor area (GFA). Structure plans usually define land uses in terms of residential densities or hectares for non-residential uses. These will therefore need to be converted into either dwellings, based on the residential density, or m2 GFA based on the relevant plot ratios in the appropriate town planning scheme.

Further advice on determining the trip generation of the structure plan land uses is provided in ***Volume 5 – Technical guidance***.

Explanatory Note 7 – Internal vehicle trips

A proportion of the vehicle trips generated by the structure plan uses are likely to be attracted to other uses within the structure plan area, for example, trips from a residential area to the local shops or school. These would only appear on the internal road network and can be described as internal trips. The

remaining trips would be attracted to land uses outside the structure plan area, for example, to the Perth CBD or a regional shopping centre. These can be considered as external trips.

This split of internal to external trips is likely to be different for each structure plan and is dependent upon a number of factors including the size of the structure plan, the range of land uses and facilities within it and the land uses in the surrounding areas.

For example, a smaller structure plan that is predominantly residential would have a very high proportion of external trips. A larger structure plan with a wide range of land uses and facilities, for example, schools, medical facilities, shops, employment and recreation, as well as residential, would have a high proportion of internal trips.

Structure plans based on Liveable Neighbourhoods principles would therefore be likely to have a higher proportion of internal trips than a structure plan based on more conventional design principles.

It is not possible within these guidelines to provide firm guidance on what proportions to use for internal/external trips, as each structure plan will be different. The transport assessor should therefore use professional judgement when determining an appropriate internal/external split backed up with supporting information, data, surveys etc. where available.

In some cases, where the potential adverse impacts on the surrounding land uses and transport networks may be significant, sensitivity testing of a range of possible internal/external splits may be appropriate.

10.10.4 Non structure plan traffic

– Assess the potential for extraneous (that is, through) traffic to use the roads within the structure plan area.

Depending upon the structure plan layout, there may be existing traffic passing through the site on existing roads and/or the new road layout may attract traffic from surrounding roads. This potential for extraneous traffic should be assessed for the structure plan assessment year(s).

It is again recommended that this be done for both the AM and PM peaks (to assist later planning stages) although it is only required for one peak at the structure plan stage.

10.10.5 Design traffic flows

– Determine the traffic flows to use for the design of the internal road network by adding the extraneous traffic (Section 10.10.4) to the structure plan generated traffic (Section 10.10.3).

10.10.6 Roads and intersections

– Determine the road cross-sections required, for example, two lane or four lane, to accommodate the above design traffic flows.

– Determine the intersection controls required, for example, priority, roundabout or traffic signals, to accommodate the above design traffic flows.

The road cross-sections should be in accordance with *Liveable Neighbourhoods* and Austroads design guidelines, in particular the *Guide to Road Design (GRD)*, *Guide to Road Safety (GRS)* and *Guide to Traffic Management (GTM)* series.

The intersection assessment should be undertaken in accordance with Austroads *GTM* series, using parts on intersections, traffic signals and roundabouts (Parts 4, 6, 9 and 10). It should be sufficient to demonstrate that the proposed methods of control are appropriate and would satisfy operational and safety requirements.

Note that this is to be a broad brush assessment that should be reviewed and revised as required at the later subdivision and individual development transport assessment stages. At this structure plan level an assessment for a single design period (generally the PM peak hour) would be adequate.

Any proposed signalised intersections should include an analysis of an alternative intersection treatment, such as a roundabout. This is to ensure that the appropriate intersection treatment is adopted at each stage of the planning process.

10.10.7 Access to frontage properties

- Develop strategies to provide access to properties fronting all roads carrying more than 500 vehicles per hour. Strategies to be considered include:
  - individual direct access;
  - shared access (between two properties);
  - service lanes;
  - no frontage access.

The 500 vehicles per hour threshold is based on the Liveable Neighbourhoods Element 2 advice that vehicles reversing directly out of driveways should be avoided on roads carrying more than 5,000 vehicles per day.

It is important that an overall access strategy is developed as early as possible in the land use planning process. The access strategy should determine the principles upon which individual lots should be accessed, for example, one access per lot, shared access, service road or no frontage access.

This should be based on the function of the road and its projected traffic volumes. This strategy then forms the basis for the individual lot access arrangements at the subdivision stage and then for individual developments.

Developing the access strategy at the structure planning stage, and getting the appropriate local and/or State Government approval, should have the added benefit of streamlining the later stages, particularly the development application stage as the major issues will have already been addressed and agreed upon.

Access strategies should also consider the type of land uses proposed such as industrial areas which will generate many heavy vehicle movements and may call for special access arrangements for heavy vehicles.

10.10.8 Pedestrian/cycle networks

- Undertake an analysis of the operation and safety of the pedestrian/cycle networks including:
  - identifying which roads could potentially be difficult for pedestrians and cyclists to cross;
  - identifying where safe crossing facilities should be provided;
  - indicating where safe crossing facilities are proposed.

The key component of the analysis is the ability of pedestrians/cyclists to cross major roads and at intersections. This includes the ability of public transport users to cross major roads to access bus stops and train stations.

The analysis should identify which roads are likely to have traffic volumes that would adversely impact on the efficiency and safety of pedestrians trying to cross. This depends upon the road cross-section as shown in **Table 2**.

Table 2: Traffic volumes affecting pedestrian crossing amenity

Road cross-section	Traffic volume affecting ability of pedestrians to cross * (vehicles per hour – two-way)
2 lane undivided	1,100 vph
2 lane divided (or with pedestrian refuge islands)	2,800 vph
4 lane undivided (without pedestrian refuge islands)	700 vph
4 lane divided (or with pedestrian refuge islands)	1,600 vph

* See the Pedestrian assessment section of **Volume 5** for details on how the above volume thresholds were determined.

Note that four lane undivided roads without pedestrian refuge islands are the most difficult to cross, the difficulties occurring at lower volumes than for a two lane road. This is due to the longer time required to cross the road, requiring a longer gap in the traffic. For this, and other safety reasons, four lane undivided roads should not be considered in any new road network planning.

The analysis should also identify where safe crossing facilities should be provided and indicate where they are proposed, concentrating on:

- key locations on the pedestrian network (that is, along major pedestrian desire lines and routes identified in Sections 10.4 and 10.6);
- proposed bus stop locations, if known, or potential bus stop locations.

In addition, to ensure an efficient and safe pedestrian/cyclist network, safe crossing facilities should be considered at intervals no greater than shown in **Table 3** for the roads identified above as posing difficulties for pedestrians.

Safe crossing facilities are:

- pedestrian refuge islands (up to the volumes shown in Table 2);
- zebra crossings;
- signalised pedestrian crossings (mid-block);
- crossing facilities at signalised intersections;
- overpasses/underpasses (where appropriate).

Note that for undivided roads carrying greater volumes than those in Table 2, the provision of pedestrian refuge islands may not provide an acceptable level of service to pedestrians and one of the other facilities above may need to be considered.

10.10.9 Safe walk/cycle to school assessment

– Undertake a safe walk/cycle to school assessment by:
  – identifying all schools within the structure plan area and those within 800 metres of the structure plan area;

Table 3: Maximum desirable spacings for safe pedestrian crossings

Road type	Maximum spacing of safe pedestrian crossing facilities*
Arterial – minimal frontage activity	400 metres
Arterial – significant frontage activity	200 metres
Local distributor/Neighbourhood connector	100 metres

* See the Pedestrian assessment section of **Volume 5** for for the rationale behind these spacings.

- identifying the potential catchment for each school;
- identifying the most likely walk and cycle routes to each school from the catchment areas;
- determining any potential deficiencies, or areas where improvements could be made, along these routes;
- proposing measures to address these deficiencies.

As an extension to the general pedestrian/cycle network analysis, an analysis of the accessibility by foot/cycle of the schools within the structure plan area and those within 800 metres (10 minutes' walk) of its boundaries should be undertaken.

The assessment should consider the directness of the route(s) and the quality of the connecting pedestrian and cycle networks. Potential deficiencies, or areas for improvement, could include missing sections of footpath and/or cycle path and the absence of safe crossing facilities where major roads need to be crossed.

The intent of the assessment is to develop preliminary safe routes to schools for pedestrians and cyclists that will form the basis for more detailed assessment at the later planning stages. This process may identify major deficiencies such as the need for primary school children to cross major roads. There may be opportunities to address this at the structure planning stage by relocating the proposed schools and/or revising the road layout.

Indeed, a safe walk/cycle to school assessment should be an integral component of any decision on where to locate a school.

10.10.10 Pedestrian permeability and efficiency

- For those structure plans where sufficient road network detail is provided, that is, down to the local road level, undertake a walkable catchment analysis in accordance with *Liveable Neighbourhoods* Appendix 2 for all:
  - neighbourhood or town centres within the structure plan;
  - existing or proposed bus stops within the structure plan; and
  - existing or proposed train stations within the structure plan.

Note that while this is a requirement for those structure plans designed and submitted in accordance with *Liveable Neighbourhoods,* it is suggested that such analyses also be undertaken for those structure plans designed in accordance with DC policy.

The walkable catchment analysis, as described in *Liveable Neighbourhoods* Appendix 2, is a good way of assessing the permeability and efficiency of the proposed pedestrian network.

Walkable catchment calculations are expressed as the *actual* area within a five-minute walking distance as a percentage of the *theoretical* area within a five-minute walking distance. The theoretical five-minute walking distance is shown as a circle, with a radius of 400m, drawn around any particular centre. This is an area of about 50ha. When calculating a 10-minute walking distance, the radius used is 800m, resulting in a circle with an area of around 200ha.

For any urban area, the higher the percentage, the better its walkability (and hence the likely energy efficiency). A good target for a walkable catchment is to have

60 per cent of the area within five-minutes walking distance, or ten minutes in the case of stations.

To undertake a walkable catchment analysis at this scale, a detailed road network is required, that is, down to the local street level. Most of the larger, and many smaller, local structure plans are unlikely to provide this level of detail.

In these cases, the walkable catchment analysis will need to be deferred until either the local structure plan or subdivision stage, that is, at the first stage where details of the local road network are provided. The walkable catchment analysis should then be undertaken in accordance with *Liveable Neighbourhoods* Appendix 2.

10.10.11 Access to public transport

One of the ongoing KPIs PTA has in its Annual Report measures "the proportion of street addresses within the Perth public transport area which are within 500m of a Transperth stop providing an acceptable level of service." It is recommended that a figure of at least 90 per cent be achieved at the structure plan stage to ensure the above requirements would be able to be satisfied at the local structure plan or subdivision stages, that is, when the local road network and bus stop locations are known.

At the structure plan stage, bus stop locations and the local road networks are unlikely to be well defined. The assessment above is therefore based on a straight line distance to a bus route. The proponent must consult with the PTA and gain confirmation prior to the location and design of bus stop facilities being determined.

10.11 Analysis of external transport networks

10.11.1 Introduction

This section presents the steps recommended to undertake and present the analysis of the transport networks surrounding the structure plan area.

10.11.2 Extent of analysis

The area to be analysed for the road network is generally to be all those sections of road where the structure plan traffic would be likely to increase traffic on any lane by more than 100 vehicles per hour. This threshold equates to around 10 per cent of the mid-block capacity of an urban arterial lane *(*Austroads *GTM Part 3)*, that is, the level at which the traffic increase may have a material impact.

For the pedestrian/cyclist and public transport networks, it will be 800 metres (10 minutes' walk) from the boundaries of the structure plan area.

Most structure plans, being of a large size and generating significant volumes of traffic, could potentially have an impact over a wide area.

The nature of the surrounding road network could also affect the extent of impact. For example, a dense road network would be likely to quickly disperse traffic and therefore dilute its impact, whereas a limited road network would provide fewer opportunities for the traffic to disperse, increasing the area materially affected.

It is important that the analysis covers a sufficiently wide area to ensure that this potential impact is adequately assessed. It is not possible to specify a set area for all structure plans within these guidelines as this will vary from one structure plan to another.

In Section 10.5 information on the existing road network was to be provided for a distance of 5 kilometres from the structure plan boundary for large (over 300 Ha) structure plans and 2 kilometres for smaller (300 Ha or less) structure plans.

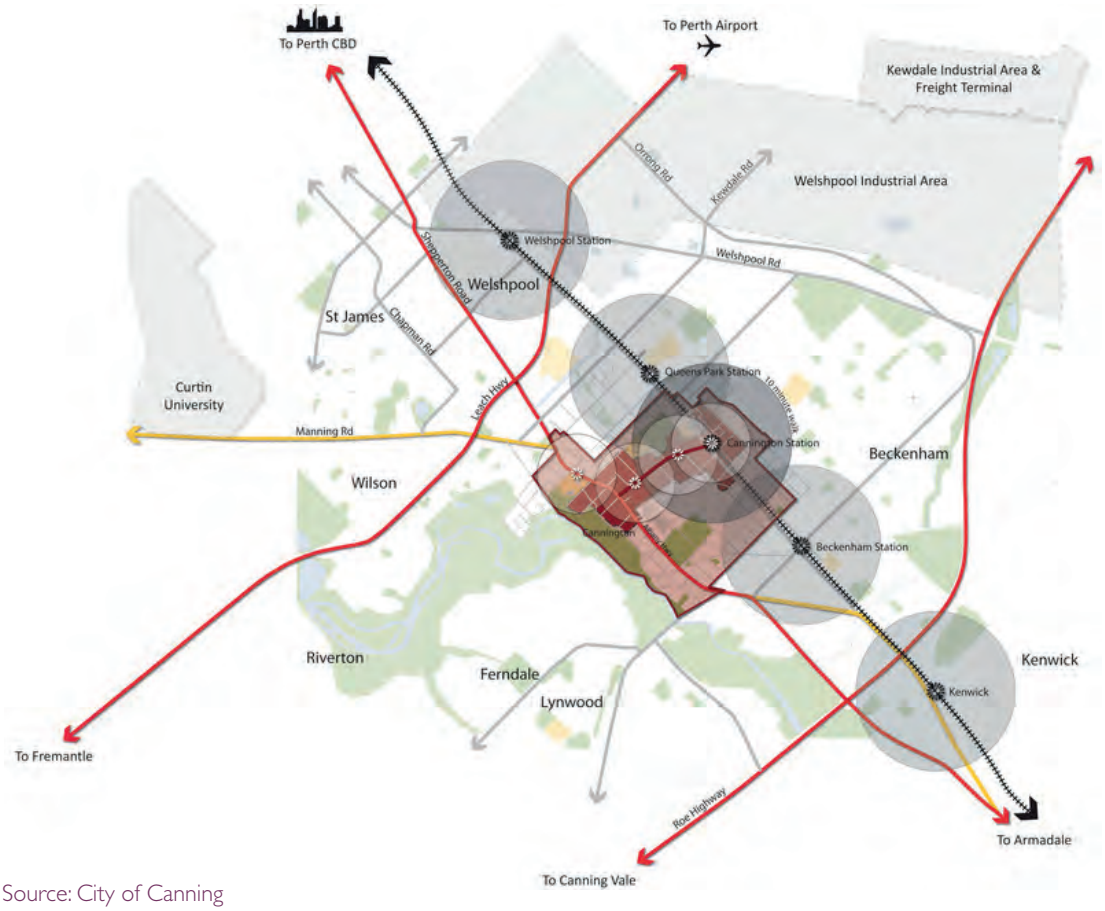
These are arbitrary distances and should be considered as "starting points" for determining the area for analysis, adjusted as required based on the likely impact of the structure plan being assessed.

As a general guide, an increase in traffic of less than 10 per cent of capacity would not normally be likely to have a material impact on any particular section of road, but increases over 10 per cent may. All sections of road with an increase greater than 10 per cent of capacity should therefore be included in the analysis.

For ease of assessment, an increase of 100 vehicles per hour for any lane can be considered as equating to around 10 per cent of capacity. Therefore any section of road where the structure plan traffic would increase flows by more than 100 vehicles per hour for any lane should be included in the analysis.

The 800 metre distance for external pedestrians/cyclists and public transport networks equates to a 10-minute walk time from the edge of the structure plan area. This is somewhat arbitrary and it may

Figure 3: Example of structure plan transport network



Source: City of Canning

be appropriate to vary this, up or down, depending upon the nature and size of the structure plan and the nature and form of the surrounding land uses and transport networks.

For example, if there is a major attractor such as a train station or major shopping centre, say, 1 kilometre away, it should be included, or for an isolated site with only one attractor/generator within 800 metres the analysis could be limited to the route between the structure plan area and that one attractor/generator.

Note that the public transport network assessment relates to access to public transport rather than the bus/train services themselves, that is, walk/cycle access to bus stops and train stations. (The adequacy of the public transport services has already been considered in Section 10.8).

It should be noted that inclusion of a particular road, intersection or other feature in the study area does not necessarily imply that the proponent will be responsible for all improvements that the assessment might recommend at that location.

Such decisions are beyond the scope of the guidelines. They are subject to other policies and current practice and may require detailed negotiation with the approval authority. For further information see *WAPC Policy DC1.7 General Road Planning and State Planning Policy 3.6 Developers Contributions for Infrastructure*.

10.11.3 Surrounding network base flows

– Determine the base flows, that is, without structure plan, on the surrounding road network.

The existing traffic flows on the roads around the structure plan area were obtained in Section 9.4 of this assessment.

These are to be factored up to the structure plan assessment year(s) by:

- obtaining future year volumes from the State transport models, if available; or
- applying a growth factor, agreed with the approving authority, to existing traffic volumes; or
- using a recognised traffic engineering technique, as agreed with the approving authority.

Note that traffic projections from the MRWA model, if available, are daily flows and need to be converted to peak hour flows.

This section should also take into consideration the proposed or possible changes to the external road network identified in Section 10.7. Where these changes may or may not occur, scenarios for both situations may need to be considered.

It is again recommended that this be done for both the AM and PM peaks (to assist later planning stages) although it may only be required for one peak at the structure plan stage.

10.11.4 Total flows on external road network

– Determine the total traffic flows on the external road network by adding the structure plan generated traffic (Section 9.10.3) to the above base flows.

It is again recommended that this be done for both the AM and PM peaks (to assist later planning stages) although it is only required for one peak at the structure plan stage.

Where increased traffic volumes will impede the efficient flow of a current or proposed bus route, consideration should be given to the provision of bus priority infrastructure and/or measures such as dedicated bus lanes and queue jumps.

10.11.5 Roads and intersections

- Assess whether the existing road cross-sections, for example, two lanes or four lanes, would be adequate to accommodate the above design traffic flows. If not, indicate what improvements would be required.

Assess whether the existing intersection controls, (for example, priority, roundabout or traffic signals), would be able to accommodate the above design traffic flows. If not, indicate what improvements would be required.

The road cross-sections should be in accordance with Austroads design guidelines - in particular the *Guide to Road Design (GRD)* series and, where appropriate, with *Liveable Neighbourhoods*.

The intersection assessment should be undertaken in accordance with *GRD parts 4 – Intersections and Crossings - General, 4a – Traffic Signals and 4b – Roundabouts*. It should be sufficient to demonstrate that the proposed methods of control are appropriate and would satisfy operational and safety requirements.

Note that this is to be a broad brush assessment that should be reviewed and revised as required at the later subdivision and individual development transport assessment stages. At this structure plan level an assessment for a single design period (generally the PM peak hour) would normally be adequate.

Any proposal for a signalised intersection should also be accompanied by an analysis of an alternative intersection treatment, such as a roundabout. This is to ensure that the analysis is rigorous and the recommended treatment is fully justified. It will also ensure that the appropriate intersection treatment is adopted at each stage of the planning process.

10.11.6 Pedestrian/cycle networks

- Undertake an analysis of the operation and safety of the external pedestrian/cycle networks including:
  - identifying which roads could potentially be difficult for pedestrians and cyclists to cross;
  - identifying where safe crossing facilities should be provided;
  - indicating where safe crossing facilities are proposed.

This analysis is comparable to that undertaken in Section 10.10.8 for the internal transport networks but is to concentrate on the pedestrian and cycle networks within 800 metres, or 10 minutes' walk, of the boundaries of the structure plan area.

The key component of the analysis is again the ability of pedestrians/cyclists to cross major roads and at intersections. This includes the ability of public transport users to cross the road to access bus stops. It should consider both the pedestrians and cyclists generated by the structure plan land uses and the impact of the structure plan traffic on existing pedestrians and cyclists.

The analysis should identify which roads are likely to have traffic volumes that would potentially have an adverse impact on the efficiency and safety of pedestrians trying to cross, as per **Table 2** *(see page 23)*. The traffic volumes are to be as determined in Section 10.11.4.

For example, the analysis should concentrate on the network within 800 metres of the site, there may be roads further afield where flows have increased to above those in Table 10.4 due to the structure plan traffic. The potential need for safe crossings on these roads should also be identified.

The analysis should also identify where adequate safe crossing facilities are already provided, where they may be required and indicate where any new facilities are proposed. The analysis should concentrate on:

- key locations on the pedestrian network (that is, along major pedestrian desire lines identified in Section 10.7);
- existing bus stop locations;
- proposed or potential bus stop locations.

In addition, to ensure an efficient and safe pedestrian/cyclist network safe crossing facilities should be considered at intervals no greater than shown in **Table 3** for the roads identified above as posing difficulties for pedestrians (*see page 24*).

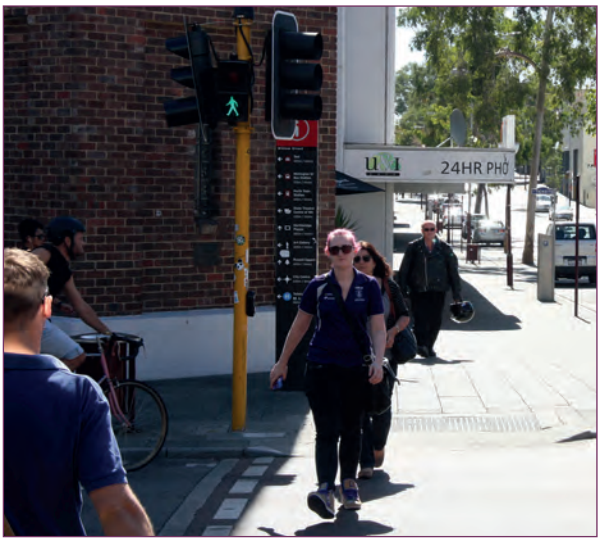
Safe crossing facilities are:

- pedestrian refuge islands (up to the volumes shown in **Table 2**);
- zebra crossings;
- signalised pedestrian crossings (mid-block);
- crossing facilities at signalised intersection;
- overpasses/underpasses (where appropriate).

Note that for undivided roads carrying greater volumes than those in **Table 2**, the provision of pedestrian refuge islands may not provide an acceptable level of service to pedestrians and one of the other facilities above may need to be considered.

10.12 Conclusions

– Provide a summary of the findings and conclusions of the TIA.



Appendix A:

Checklists for planning scheme, structure plan and activity centre plan transport impact assessments

Checklist for a transport impact assessment of a planning scheme, structure plan or activity centre plan

- Tick the 'provided' column for items for which information is provided.
- Enter N/A in the 'provided' column if the item is not appropriate and enter the reason in the comments column.
- Provide brief comments on any relevant issues.
- Provide brief description of any proposed transport improvements, for example, new bus routes or new traffic signals or extending existing footpath to the site.

ITEM	PROVIDED	COMMENTS
Summary		
Introduction/Background		
Structure plan proposal		
regional context		
proposed land uses		
table of land uses and quantities		
major attractors/generators		
specific issues		
Existing situation		
existing land uses within structure plan		
existing land uses within 800 metres of structure plan area		
existing road network within structure plan area		
existing pedestrian/cycle networks within structure plan area		
existing public transport services within structure plan area		
existing road network within 2 (or 5) km of structure plan area		
traffic flows on roads within structure plan area (PM and/or AM peak hours)		
traffic flows on roads within 2 (or 5) km of structure plan area (AM and/ or PM peak hours)		
existing pedestrian/cycle networks within 800m of structure plan area		
existing public transport services within 800m of structure plan area		

ITEM	PROVIDED	COMMENTS
Proposed internal transport networks		
changes/additions to existing road network or proposed new road network		
road reservation widths		
road cross-sections & speed limits		
intersection controls		
pedestrian/cycle networks and crossing facilities		
public transport routes		
Changes to external transport networks		
road network		
intersection controls		
pedestrian/cycle networks and crossing facilities		
public transport services		
Integration with surrounding area		
trip attractors/generators within 800 metres		
proposed changes to land uses within 800 metres		
travel desire lines from structure plan to these attractors/generators		
adequacy of external transport networks		
deficiencies in external transport networks		
remedial measures to address deficiencies		
Analysis of internal transport networks		
assessment year(s) and time period(s)		
structure plan generated traffic		
extraneous (through) traffic		
design traffic flows (that is, total traffic)		
road cross-sections		
intersection controls		
access strategy		

ITEM	PROVIDED	COMMENTS
Analysis of internal transport networks (cont.)		
pedestrian/cycle networks		
safe routes to schools		
pedestrian permeability & efficiency		
access to public transport		
Analysis of external transport networks		
extent of analysis		
base flows for assessment year(s)		
total traffic flows		
road cross-sections		
intersection layouts & controls		
pedestrian/cycle networks		
Conclusions		

Proponent's name .....

Company ..... **Date** .....

Transport assessor's name .....

Company ..... **Date** .....

Transport impact assessment revision checklist

Please include this checklist when providing revisions to transport impact assessments (TIAs) to the Department of Planning, to identify changes made.

Name of planning application: .....

Date/revision no. of previous TIA: .....

Date/revision no. of revised TIA: .....

ITEM No.	INFORMATION/CHANGE REQUESTED	COMPLETE ✓	PAGE No.

If information/changes not provided, please attach explanatory notes, using item no. to identify information/change request.