# Alkimos Eglinton District Structure Plan. Appendix 4 Transport and Access.

ALKIMOS EGLINTON

December 2010
Author of Report: SKM

# Alkimos Eglinton Structure Plan
# Transport and Access

- FINAL
- September 2006

# Contents

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# 1. Introduction and background

## 1.1 Purpose of this report

This transport and access report has been prepared by Sinclair Knight Merz for LandCorp, Eglinton Estates and W.R. Carpenter Landholdings Ltd as part of the Alkimos Eglinton Structure Plan.

It addresses the strategic transport aspects of land use/ transport integration for Alkimos Eglinton and, in particular, addresses:

- Traffic volumes and street hierarchy.
- Street cross-sections.
- Traffic management.
- Public transport.
- Pedestrians and cyclists.

The assessment has been prepared in accordance with the Western Australian Planning Commission (WAPC) *Guidelines for Developments, Volume 2 – Structure Plans*, August 2006 (WAPC Guidelines).

## 1.2 Transport assessment objectives

From the WAPC Guidelines, the key objectives of a transport assessment for a structure plan are:

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

## 1.3 Background

Alkimos Eglinton is located in the North West Corridor, as illustrated in **Figure 1.1**.

The Alkimos Eglinton District Structure Plan provides a robust planning framework for the creation of a vibrant, sustainable new coastal community for over 53,000 people, embracing over 2,612 hectares of land with 7.5 kilometres of coastal frontage.

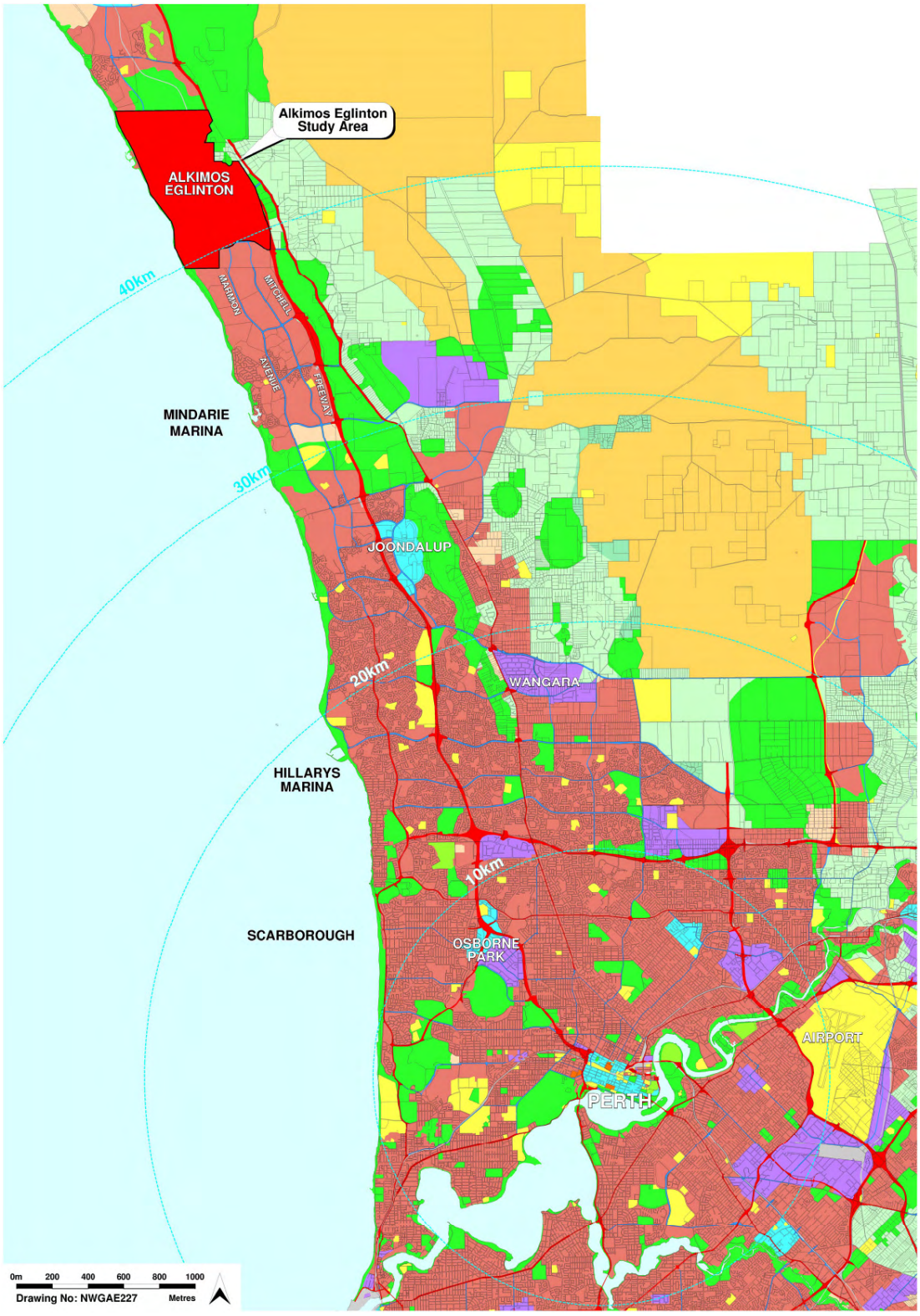
The Alkimos Eglinton Project will:

- Create over 22,000 dwellings which will ultimately house a new, vibrant coastal community of over 53,000 people;
- Preserve over 500 hectares of the coastal dunal system and environmentally significant landform;
- Create extensive east west green linkages, connecting the ocean to the major north-south regional park system extending from Woodvale to Yanchep;
- Create the Alkimos Regional Centre and Eglinton District Centre and incorporate three new coastal villages;
- Address important sustainability criteria;
- Provide seven new primary schools, two high schools and two private schools;
- Provide a wide range of housing diversity and provide for localised employment opportunities;
- Make a significant contribution to satisfying land and housing supply in the City of Wanneroo for the next 15-20 years.

From a transport and access perspective, the key issues are:

- Management of north-south traffic volumes and minimisation of barrier effects. The physical location of the area will result in high volumes of north-south traffic, both internally generated (Alkimos Eglinton) and externally generated. Whilst the Mitchell Freeway is expected to carry the majority of the external to external north-south traffic, Alkimos Eglinton traffic will use district and local north-south roads either to access local/ district destinations or to access the Freeway. District roads may therefore be required to carry high traffic volumes of traffic. A key issue is how the design of these roads, and their integration with surrounding land uses, can minimise potential 'barrier' effects to east-west movement.

## Figure 1.1 Locality Plan



- Integration of a fast, frequent public transport system within the urban environment to create transit orientated development that reduces reliance on private vehicles for local as well as district and regional movements.
- Integration of recreational and commuter walk/ cycle networks within the urban environment to facilitate environmentally sustainable transport modes that are interesting, safe, efficient and effective. Commuter networks include access to work, education and shopping, as well as access to intermediate transit nodes, such as rail stations and transit stops.
- Robustness for staging of transport infrastructure. The main transport infrastructure within Alkimos Eglinton will be developed over a 20+ year timeframe. The integrated land use/ transport network must be capable of achieving a quality living environment at all stage of development of Alkimos Eglinton.

### 1.4 Transport philosophy

The transport philosophy for Alkimos Eglinton was developed in consultation with transport authorities and is consistent with the Metropolitan Transport Strategy (MTS). The MTS has the following vision for Perth and its people:

*"Perth will be a place of vitality and well being. There will be a sharing of spaces for living, work and leisure activities, which can be reached easily and safely by all members of the community".*

The MTS is a strategic document which sets out recommended directions for integrated land use and transport planning through to the year 2029. Transport targets include the reduction of car driver trips from the current 63 percent of all trips to 46 percent. Strategies to implement this include appropriate development and policies which encourage the use of public transport, shared cars, cycling and walking.

Of principal importance is the co-location of land uses and the reduction of major barriers to walking and cycling within residential areas. A major element in the integrated strategy is the provision of quality public transport services to reduce non-essential car driver trips.

Three major themes have been developed by the MTS:

- better coordination of the components of the transport system,
- greater integration between the transport system and the land uses which it supports, and
- improved efficiency in the use of transport infrastructure and services.

The transport philosophy for Alkimos-Eglinton has been developed to follow these three major themes:

*Theme 1: Better coordination of the components of the transport system*

The transport system proposed for Alkimos Eglinton integrates road, rail, bus and cycle access at key nodes within the development. These key nodes include the Alkimos Regional Centre and the Eglinton District Centre. The coordination between road and rail is through both park and ride and bus/ rail interchanges, complimented by cycle to rail coordination through a system of strategic cycle links which connect to the three major rail stations.

*Theme 2: Greater integration between the transport system and the land uses which it supports*

One of the key features of Alkimos Eglinton structure plan area is the proposed location of the three rail stations which will integrate with the Alkimos Regional Centre, Eglinton District Centre and a park and ride/ activity node mid-way between the regional and district centres.

*Theme 3: Improved efficiency in the use of transport infrastructure and services*

The proposed transport infrastructure for the Alkimos Eglinton structure plan area includes a road hierarchy which clearly emphasises the Mitchell Freeway for regional trips, Marmion Avenue, and the east-west roads for district trips, all supported by a local road network. In this way a more efficient use of infrastructure can be achieved particularly since Marmion Avenue is not required to undertake the regional function.

The integrated transport structure plan support two important state initiatives:

- *Liveable Neighbourhoods - Community Design Code,* Western Australian Planning Commission, 2004
- *Better Public Transport - 10 Year Plan,* Transperth.

The *Liveable Neighbourhoods - Community Design Code*, developed by the Western Australian Planning Commission (WAPC), promotes the creation of liveable neighbourhoods that help make the state's suburban areas more sustainable and offer a wider range of housing and employment to support the needs of a changing population. The Alkimos Eglinton structure plan area has adopted the principles of *Liveable Neighbourhoods*, as discussed in subsequent sections of this report.

The *Better Public Transport – 10 Year Plan* incorporates a staged improvement in public transport throughout the metropolitan area. The plan sets the standard for appropriate provision of services within and between residential, employment, retail, entertainment and education land uses. The Alkimos Eglinton structure plan area has adopted the principles of *Better Public Transport*, as discussed in subsequent sections of this report

### 1.5 Layout of this report

This report is divided into eight sections:

- Section 1 Introduction and background (this section)
- Section 2 Structure Plan outline
- Section 3 Existing transport and access
- Section 4 Proposed transport network (overview)
- Section 5 Internal and external road network
- Section 6 Public transport
- Section 7 Cyclists and pedestrians
- Section 8 Conclusions

# 2. Structure Plan outline

## 2.1 Draft Alkimos Eglinton Structure Plan

The draft Alkimos Eglinton Structure Plan is illustrated on **Figure 2.1**.

Alkimos Eglinton is proposed as a sustainable urban community incorporating high, medium and low density residential, schools, Alkimos Regional Centre and Egerton District Centre (encompassing retail, commercial and office activities providing local employment), coastal activity centres and recreational areas, plus light industrial development, also providing employment. Planners Development Planning Strategies (DPS) have included full details about the planning and environmental aspects of Alkimos Eglinton in the document *Alkimos Eglinton Structure Plan*, DPS, August 2006.

## 2.2 Proposed land uses

The proposed land uses are summarised in **Table 2.1** and **Table 2.2**. Further information is contained in *Alkimos Eglinton Structure Plan,* DPS, 2006.

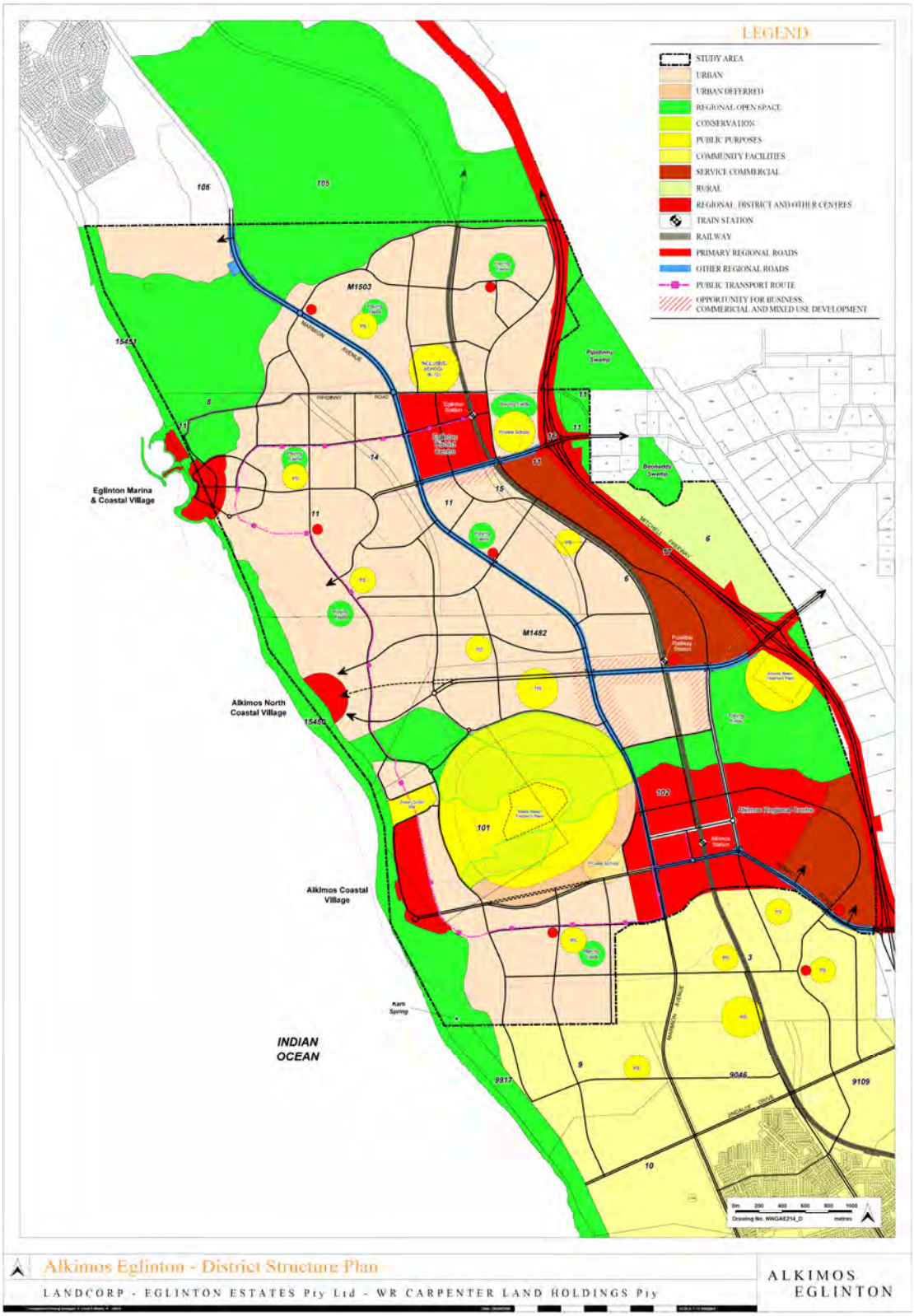
**Table 2.1 Proposed land uses – residential and education**

| | Dwelling units | Population | School enrolments |
|---|---|---|---|
| Residential | 22420 | 53000 | |
| Public primary school | | | 4200 - primary<br>700 – pre-primary and kindergarten |
| Public high school | | | 2800 |
| Private school | | | 4000 |

**Table 2.2 Proposed land uses – retail, commercial, office, service/industrial**

| | Retail ($m^2$) | Office / commercial ($m^2$) | Service / commercial ($m^2$) | Total ($m^2$) |
|---|---|---|---|---|
| Regional centre | 65000 | 92000 | | **157000** |
| District centre | 20000 | 5000 | | **25000** |
| Local centres | 18000 | | | **18000** |
| Marina village | 4000 | 5000 | | **9000** |
| Industrial/service | 2500 | | 297000 | **299500** |
| **Total** | **109500** | **102000** | **297000** | **508500** |

## Figure 2.1 Draft Alkimos Eglinton Structure Plan



# 3. Existing transport and access

## 3.1 Existing land uses

The structure plan area currently has no active uses. Similarly, land within 800m from the boundaries of the structure plan area has no active uses. Residential and related urban development is currently located at Butler, approximately 1.5 km to 2.0 km south of Alkimos, and Yanchep, approximately 1.5 km to 2.0 km north of Eglinton.

## 3.2 Existing road network

The existing road network is described in the following sections and illustrated in **Figure 3.1**.

### 3.2.1 Wanneroo Road

Wanneroo Road is located 200 m to 300 m to the east of the Alkimos Eglinton structure plan area. It is classified as a District Distributor (A) under the Metropolitan Functional Road Hierarchy. Over this section, Wanneroo Road is currently constructed as a two lane single carriageway, under the care and control of the City of Wanneroo.

### 3.2.2 Pipidinny Road and Romeo Road

Pipidinny Road and Romeo Road are classified as access roads. They each have a two lane single carriageway and are under the care and control of the City of Wanneroo. Pipidinny Road and Romeo Road connect with Wanneroo Road with priority T-intersections.

## 3.3 Existing traffic volumes

Existing traffic volumes are summarised in **Table 3.1**.

**Table 3.1 Existing traffic volumes**

| Location | Traffic volume, vpd | Year of count |
|---|---|---|
| Wanneroo Road, north of Nowergup Road (representative of volume near Alkimos Eglinton) | 6570<br>7400 (e) | 1998/9<br>2005 |
| Wanneroo Road, south of Yanchep Beach Road | 6600<br>5800 | 2005<br>1998/9 |
| Pipidinny Road, west of Wanneroo Road | 100 | 2002 |

Source: Main Roads and City of Wanneroo

(e) Estimated from available data about traffic volumes at Yanchep Beach Road.

## Figure 3.1 Existing road network

## 3.4 Existing public transport

There are no public transport services operating through the structure plan area. In the surrounding area, route 490 operates six/ seven journeys per weekday between Two Rocks and Clarkson Train Station, as illustrated on **Figure 3.2**. The route operates along Wanneroo Road, Hester Avenue and Marmion Avenue, as illustrated in **Figure 3.3**.

- **Figure 3.2 Existing route 490**

**To Clarkson *timetable*** **490**

**Weekdays**

| Route No: | Two Rocks Shop Ctr | Saint Andrews Dr / Troon Ct | Clarkson Train Stn | Train to Perth: Clarkson Train Stn | Train to Perth: Perth Train Stn |
|---|---|---|---|---|---|
| 490 am | 6:32 | 6:51 | 7:21 | 7:26 | 7:58 |
| 490 S | 6:46 | 7:07 | 7:39 | 7:44 C | 8:14 |
| 490 | 9:24 | 9:45 | 10:17 | 10:22 | 10:54 |
| 490 | 11:29 | 11:45 | 12:17 | 12:22 | 12:54 |
| 490 pm | 1:29 | 1:45 | 2:17 | 2:22 | 2:54 |
| 490 | 3:51 | 4:07 | 4:39 | 4:44 C | 5:14 |

LEGEND
490 S - Operates on school days only.
Train C - All stops to Warwick, then express to Perth.

**Saturdays**

| Route No: | Two Rocks Shop Ctr | Saint Andrews Dr / Troon Ct | Clarkson Train Stn | Train to Perth: Clarkson Train Stn | Train to Perth: Perth Train Stn |
|---|---|---|---|---|---|
| 490 am | 7:14 | 7:30 | 8:02 | 8:07 | 8:39 |
| 490 | 9:14 | 9:30 | 10:02 | 10:07 | 10:39 |
| 490 pm | 1:29 | 1:45 | 2:17 | 2:22 | 2:54 |

**Sundays and Public Holidays**

| Route No: | Two Rocks Shop Ctr | Saint Andrews Dr / Troon Ct | Clarkson Train Stn | Train to Perth: Clarkson Train Stn | Train to Perth: Perth Train Stn |
|---|---|---|---|---|---|
| 490 am | 9:14 | 9:30 | 10:02 | 10:07 | 10:39 |

**To Two Rocks *timetable*** **490**

**Weekdays**

| Train from Perth: Perth Train Stn | Train from Perth: Clarkson Train Stn | Route No: | Clarkson Train Stn | Saint Andrews Dr / Troon Ct | Two Rocks Shop Ctr |
|---|---|---|---|---|---|
| 7:54 C | 8:24 | 490 am | 8:29 | 8:52 | 9:15 |
| 10:00 | 10:32 | 490 | 10:37 | 11:00 | 11:25 |
| 12:00 | 12:32 | 490 pm | 12:37 | 1:00 | 1:25 |
| 2:00 | 2:32 | 490 A | 2:37 | 3:00 | 3:35 |
| 3:00 | 3:32 | 490 S | 3:37 | 4:00 | 4:32 |
| 4:00 C | 4:30 | 490 M | 4:35 | 5:02 | 5:29 |
| 5:45 C | 6:15 | 490 | 6:20 | 6:43 | 7:10 |

LEGEND
Train C - Express to Warwick then all stops to Clarkson.
490 A - Deviates via Yanchep High School and Damepattie Dr Two Rocks, on school days only.
490 M - Deviates via Mindarie Senior College on Tuesday and Thursday school days only.
490 S - Operates on school days only.

**Saturdays**

| Train from Perth: Perth Train Stn | Train from Perth: Clarkson Train Stn | Route No: | Clarkson Train Stn | Saint Andrews Dr / Troon Ct | Two Rocks Shop Ctr |
|---|---|---|---|---|---|
| 12:00 | 12:32 | 490 pm | 12:37 | 1:00 | 1:25 |
| 2:30 | 3:02 | 490 | 3:07 | 3:30 | 3:55 |
| 5:00 | 5:32 | 490 | 5:37 | 6:00 | 6:25 |

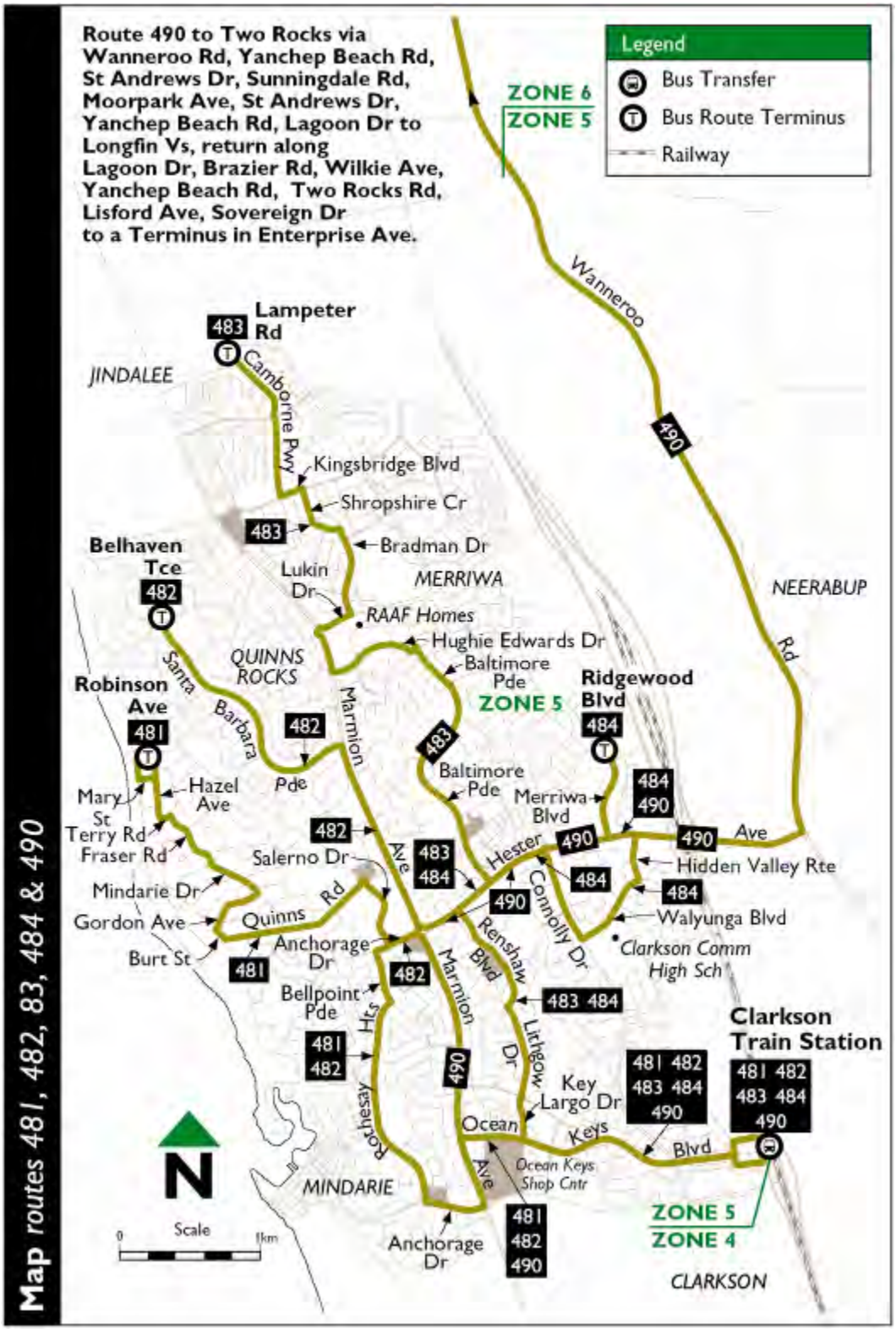
**Sundays and Public Holidays**

| Train from Perth: Perth Train Stn | Train from Perth: Clarkson Train Stn | Route No: | Clarkson Train Stn | Saint Andrews Dr / Troon Ct | Two Rocks Shop Ctr |
|---|---|---|---|---|---|
| 5:00 | 5:32 | 490 pm | 5:37 | 6:00 | 6:25 |

## 3.5 Existing pedestrian/ cycle routes

This area currently has no special facilities for pedestrians and cyclists.

- **Figure 3.3 Existing public transport network**



# 4. Proposed transport network – overview

This section of the report incorporates an overview of the proposed transport network, including roads, public transport walking and cycling. Further sections of this report provide more detailed information about each component of the transport network.

## 4.1 Proposed ultimate road network

The proposed ultimate road network is illustrated in **Figure 4.1**. The road network incorporates the transport framework included in the MRS amendment 1029/33. The key features of the ultimate road network are described below.

**External to the structure plan area**

- The Mitchell Freeway will form the eastern boundary of the Alkimos Eglinton project area. It is planned as a Primary Regional Road ('red road') in the Metropolitan Region Scheme (MRS) under the care and control of Main Roads. Alkimos Eglinton will have grade separated interchange connections at Romeo Road, Alkimos Drive and Eglinton Avenue.

**Internal to the structure plan area**

- Marmion Avenue is proposed as a north-south integrator arterial (A), providing for movement between the south and the Alkimos Regional Centre, between Alkimos and Eglinton, and between Yanchep and the Alkimos Eglinton project area. It is designated as an Other Regional Road ('blue road') in the MRS, under the care and control of the City of Wanneroo.
- Romeo Road is proposed as an integrator arterial (A), connecting Marmion Avenue to the Mitchell Freeway, through Alkimos Regional Centre. It is proposed as an Other Regional Road in the MRS, under the care and control of the City of Wanneroo
- Alkimos EW Coastal Village Connector is proposed as an integrator arterial (B), connecting the Alkimos Coastal Village to Alkimos Regional Centre. From an alignment perspective, it is planned to connect with Marmion Avenue at the same location as Romeo Road, providing a continuous link between the coast and the Mitchell Freeway.
- Alkimos Drive is proposed as an integrator arterial (A), connecting Marmion Avenue to the Mitchell Freeway. West of Marmion Avenue, Alkimos Drive is proposed as an integrator arterial (B). The section of Alkimos Drive between Marmion Avenue and the Mitchell Freeway is proposed as an Other Regional Road in the MRS, under the care and control of the City of Wanneroo.

- Eglinton Avenue is proposed as an integrator arterial (A), connecting Marmion Avenue to the Mitchell Freeway. West of Marmion Avenue, Eglinton Avenue is proposed as an integrator arterial (B). The section of Eglinton Avenue between Marmion Avenue and the Mitchell Freeway is proposed as an Other Regional Road in the MRS, under the care and control of the City of Wanneroo.
- Neighbourhood connectors throughout Alkimos and Eglinton will form the local road linkages to the district roads. These are described in more detail in **Section 5**.

### 4.2 Proposed ultimate public transport network

The proposed ultimate public transport network is illustrated in **Figure 4.2**. It is proposed to include three components:

- Northern suburbs railway for line-haul movements to district and regional destinations.
- AE-CAT (Alkimos Eglinton Connector Area Transit), also acting as an internal distribution system in its own right.
- General Transperth bus routes.

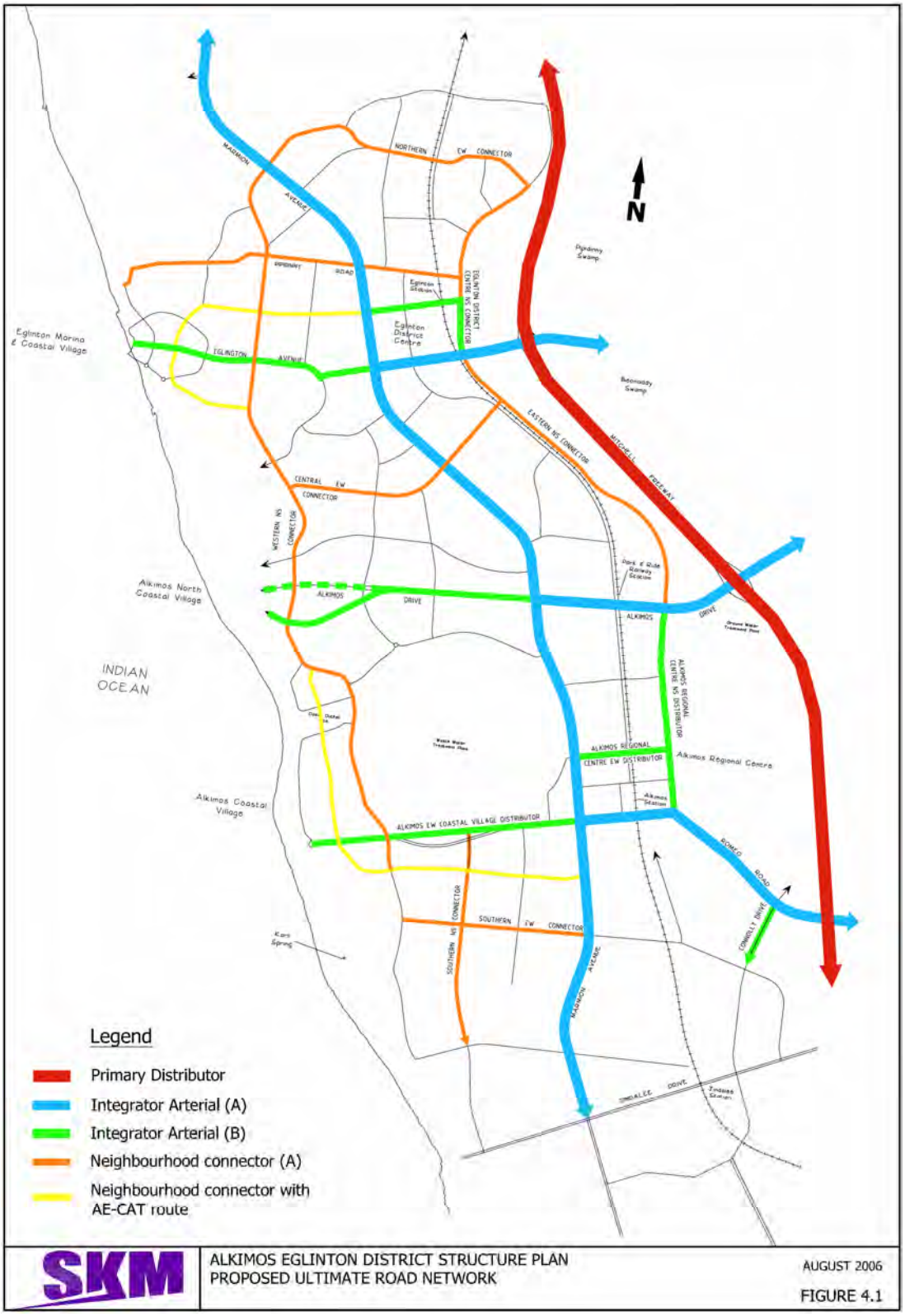
The proposed public transport network is described in detail in **Section 6**.

### 4.3 Proposed ultimate walk/cycle network

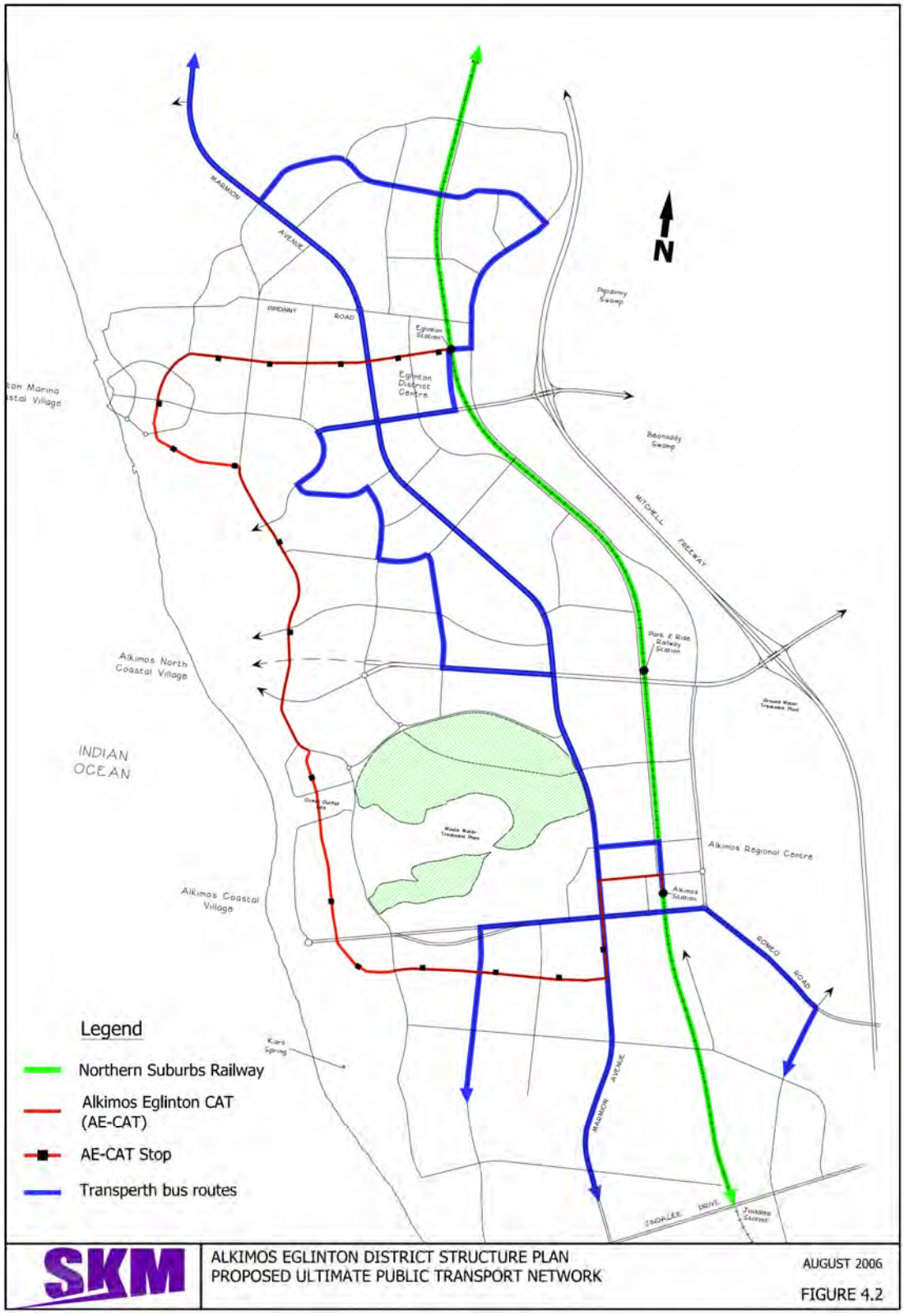
The Alkimos Eglinton Structure Plan aims to maximise pedestrian and cyclist connections to the local and regional pedestrian/ cycle network, as described in **Section 7**. The plan includes the proposed strategic cycle/ pedestrian network; the detailed local cycle network will be provided at the Development Plan stage.

The pedestrian/ cycle network will provide for efficient access to activity nodes such as the Regional Centre, District Centre, three Coastal Villages, schools, as well as public open space and public transport nodes (including stations). It is proposed to accommodate on-street cycle lanes and off-street shared paths on all neighbourhood connectors and district distributors.

- **Figure 4.1 Proposed ultimate road network**



- **Figure 4.2 Proposed ultimate public transport network**




**SINCLAIR KNIGHT MERZ**

# 5. Internal and external road network

## 5.1 Overview

This section of the report provides details about the analysis process, the forecast traffic volumes and the proposed road types and cross sections for both the ultimate and interim road networks.

## 5.2 Analysis process

Analysis of the proposed road network was undertaken as an iterative process in which the desired integrated land use/ transport plan was subjected to traffic modelling to understand the estimated future traffic volumes on each link. Where there was a conflict between the desired urban environment and the estimated traffic volumes, options were developed to change the transport network so that traffic volumes and land uses were compatible.

The transport modelling package Emme/2 was used to estimate future traffic volumes on the road network. Details of the traffic model, the model inputs, trip rates, distribution split and assignment assumptions are detailed in **Appendix A**.

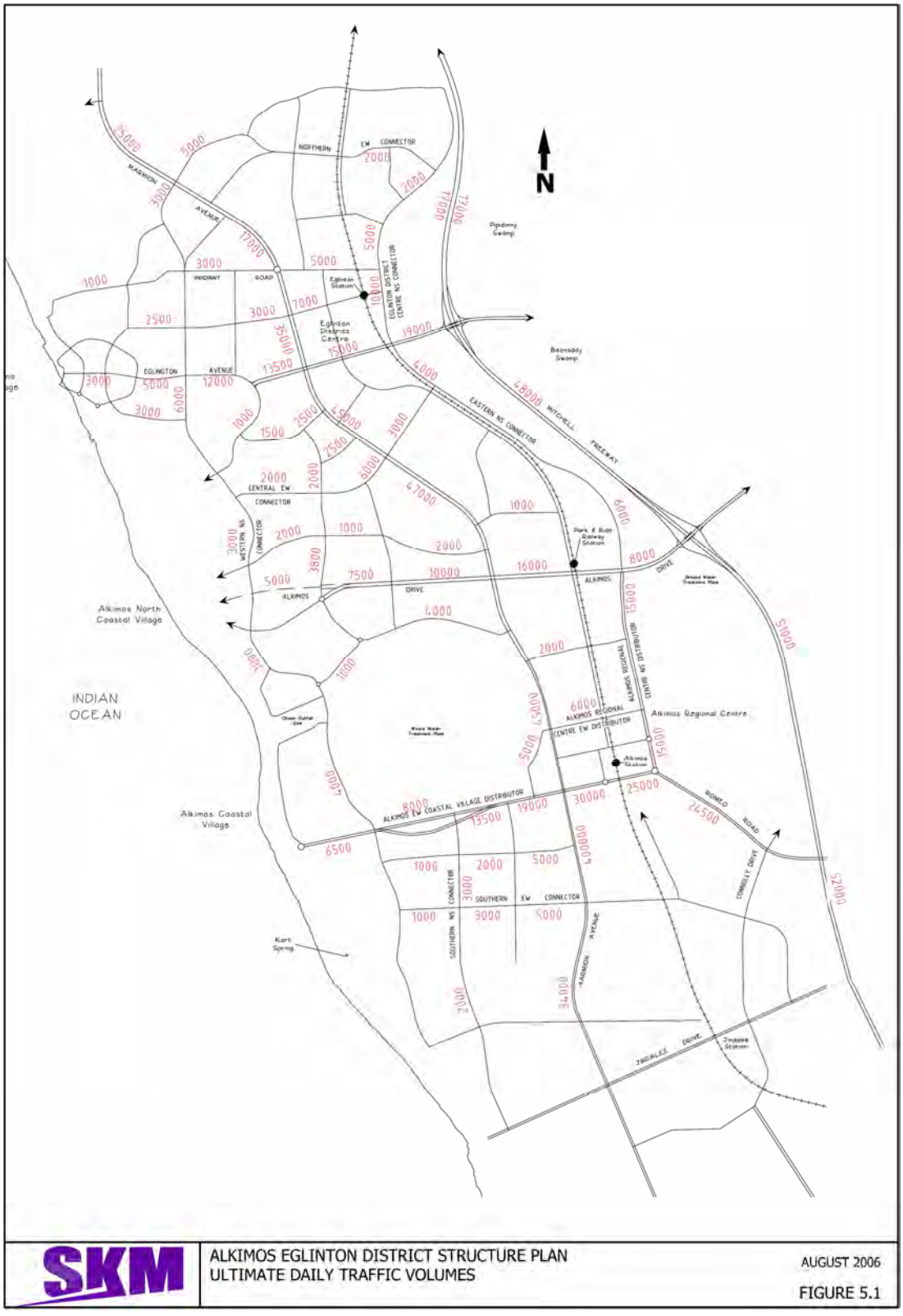
The assessment year for ultimate development was taken as 2031. The external traffic volumes, that is, traffic volumes having neither an origin nor a destination in the Alkimos Eglinton structure plan area, were provided by Main Roads from their 2031 Regional Operations Model (ROM).

All estimated traffic volumes were average 24-hour weekday traffic volumes.

## 5.3 Estimated traffic volumes

The estimated traffic volumes for the proposed Alkimos Eglinton road network are shown in **Figure 5.1**.

- **Figure 5.1 Ultimate daily traffic volumes**

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## 5.4 Functional road hierarchy

The functional hierarchy, based on *Liveable Neighbourhoods Ed 3* (2004), is shown in **Figure 4.1**, and includes:

- Mitchell Freeway - Primary Distributor
- Marmion Avenue - Integrator Arterial (A)
- Romeo Road - Integrator Arterial (A)
- Alkimos Drive - Integrator Arterial (A)/ Integrator Arterial (B)
- Eglinton Avenue - Integrator Arterial (A)/ Integrator Arterial (B)
- Alkimos regional centre NS distributor - Integrator Arterial (B)
- Alkimos regional centre EW distributor - Integrator Arterial (B)
- Eglinton district centre EW distributor - Integrator Arterial (B)
- Eglinton district centre NS connector - Integrator Arterial (B) – south section only
- Southern NS connector - Neighbourhood connector (A)
- Southern EW connector - Neighbourhood connector (A)
- Western NS connector - Neighbourhood connector (A)
- Eastern NS connector - Neighbourhood connector (A)
- Central EW connector - Neighbourhood connector (A)
- Park and Ride connector - Neighbourhood connector (A)
- Pipidinny Road - Neighbourhood connector (A)
- Eglinton district centre NS connector - Neighbourhood connector (A) -north section
- Northern EW connector - Neighbourhood connector (A)

All other subdivision roads within the development would be classified as access streets and neighbourhood connectors (B).

## 5.5 Mitchell Freeway

The Mitchell Freeway is estimated to carry about 35,000 to 52,000 vpd (alongside Alkimos Eglinton) and has been planned to accommodate this traffic volume.

## 5.6 Marmion Avenue

Marmion Avenue is proposed as a district distributor integrator (A) with a maximum traffic speed of 60 kph. It is estimated to carry 34,000 to 47,000 vpd within the Alkimos Eglinton structure plan area. Marmion Avenue would not have frontage access to individual developments.

Marmion Avenue would have different cross sections for: (a) for town centre environments (within Alkimos Regional Centre and Eglinton District Centre), (b) urban environments, and (c) non-urban environments.

**Figure 5.2** illustrates the proposed cross section of Marmion Avenue as a 4-lane dual carriageway in a town centre environment. The minimum road reserve would be 37 m, comprising 6.0 m median, two 8.5 m traffic lanes (including cycle lanes) and two 6.5 m verges. This minimum width assumes that earthworks are incorporated into the surrounding land forms and not required to be accommodated within the road reserve.

- **Figure 5.2 Indicative cross section for Marmion Avenue in a town centre environment**

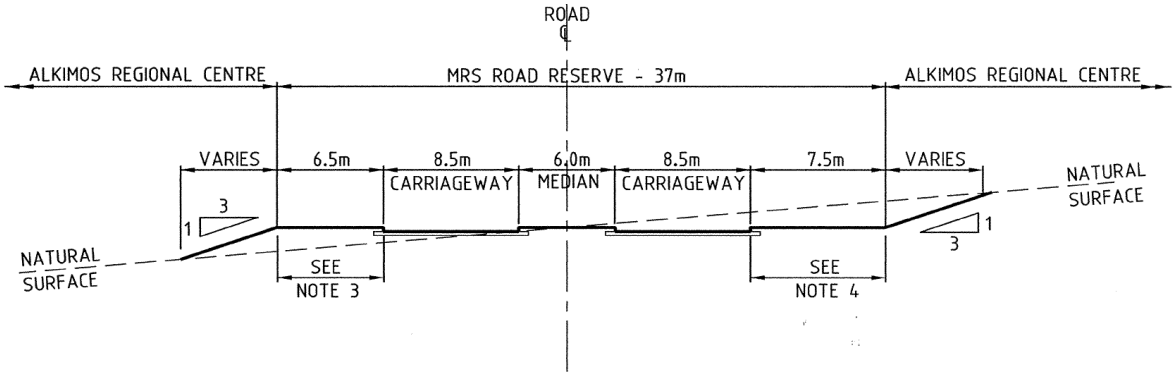



**Figure 5.3** illustrates the cross section of Marmion Avenue as a 4-lane dual carriageway in an urban environment. The minimum road reserve would be 53 m, comprising 6.0 m median, two 8.5 m carriageways (including cycle lanes), plus service roads and verges as shown. The minimum width assumes that earthworks are incorporated into the road reserve.

- **Figure 5.3 Indicative cross section for Marmion Avenue, urban environment**

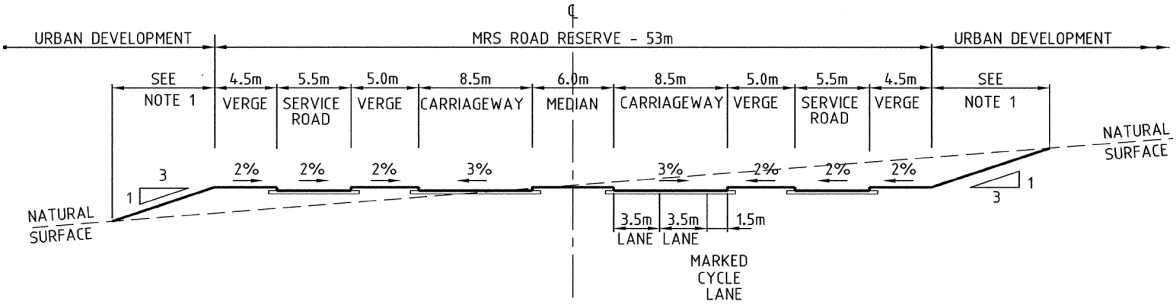
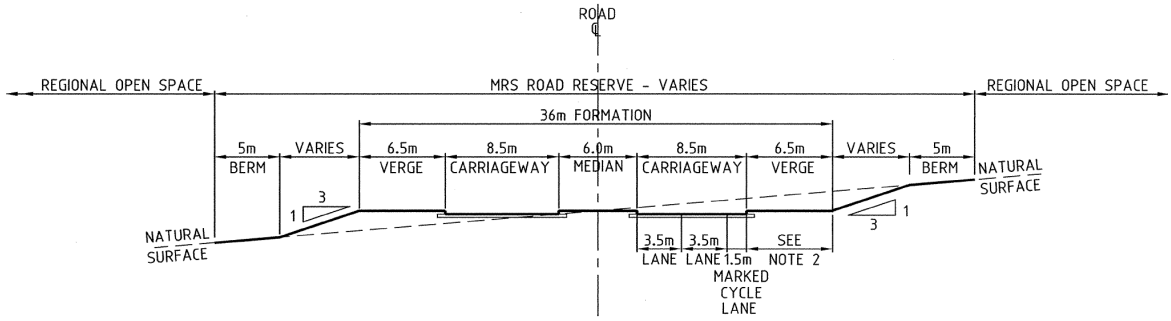


**Figure 5.4** illustrates the cross section of Marmion Avenue as a 4-lane dual carriageway within regional open space. The minimum road formation would be 36 m, comprising 6.0 m median, two 8.5 m carriageways (including cycle lanes), plus two 6.5 m verges as shown. The minimum road reserve would depend on the surrounding environment and land form.

- **Figure 5.4 Indicative cross section for Marmion Avenue in regional open space**




Environments that have regional open space on one side and an urban environment of the other would have a road formation partly comprising urban environment cross section (Figure 5.3) and partly comprising regional open space formation (Figure 5.4).

## 5.7 Romeo Road

Romeo Road is proposed as a district distributor integrator arterial (A) with an indicative maximum traffic speed of 60 kph. It is estimated to carry 25,000 to 30,000vpd.

Romeo Road would have two different cross sections: one for the section within Alkimos Regional Centre and the other for the section between the regional centre and the Mitchell Freeway.

**Figure 5.5** illustrates the proposed cross section of Romeo Road as a 4-lane dual carriageway within Alkimos Regional Centre. The minimum road reserve would be 37 m, comprising 6.0m median, two 8.5 m traffic lanes (including cycle lanes) and two 6.5 m verges. This minimum width assumes that earthworks are incorporated into the surrounding land forms and not required to be accommodated within the road reserve.

- **Figure 5.5 Indicative cross section for Romeo Road within Alkimos Regional Centre**

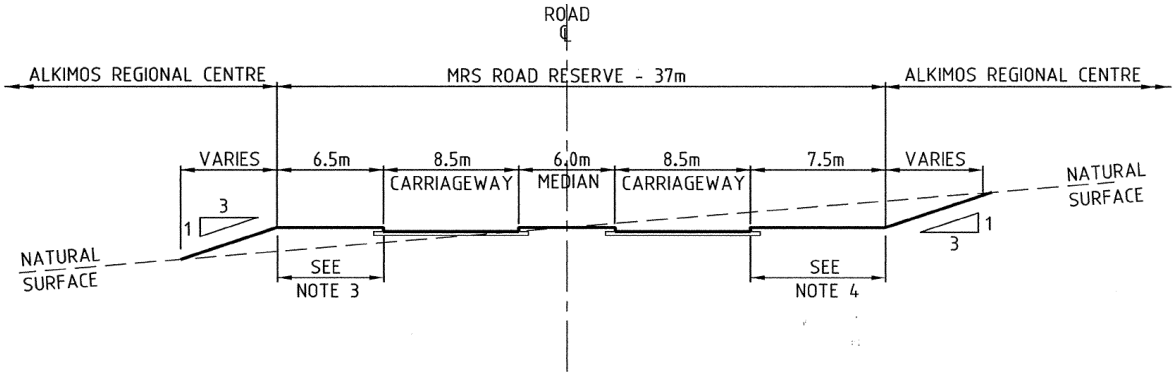
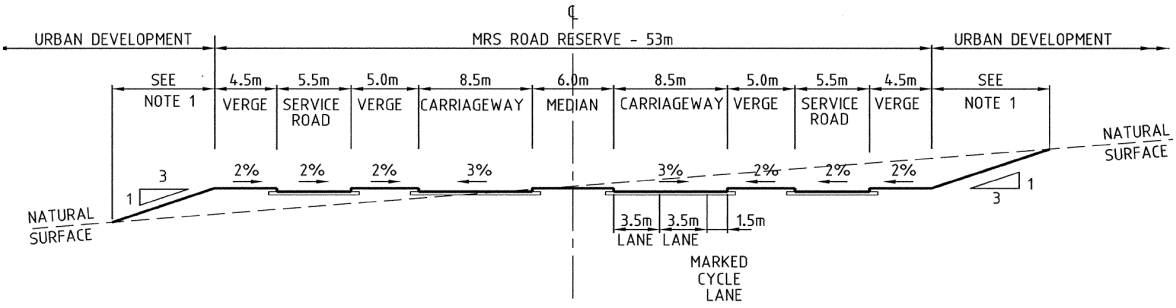



**Figure 5.6** illustrates the cross section of Romeo Road as a 4-lane dual carriageway between Alkimos Regional Centre and the Mitchell Freeway. The minimum road reserve would be 53 m, comprising 6.0 m median, two 8.5 m carriageways (including cycle lanes), plus service roads and verges as shown. This minimum width assumes that earthworks are incorporated into the road reserve.

The illustrated cross section is based on service roads fronting Romeo Road. If the detailed design of the urban environment either side of Romeo Road does not require service roads, then the road reserve would be correspondingly reduced.

- **Figure 5.6 Indicative cross section for Romeo Road between Alkimos Regional Centre and the Mitchell Freeway**



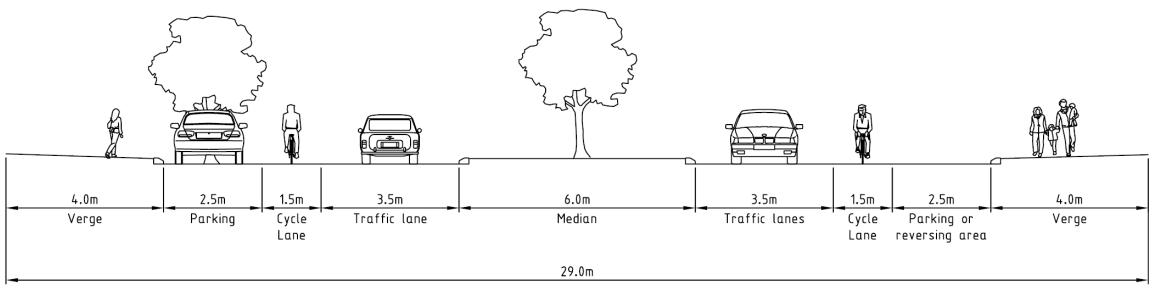
## 5.8 Alkimos Drive

Alkimos Drive, east of Marmion Avenue, is proposed as a district distributor integrator arterial (A) with an indicative maximum traffic speed of 60 kph. It is estimated to carry 8,000 to 16,000vpd.

The proposed cross sections for Alkimos Drive, east of Marmion Avenue, are similar to those proposed for Romeo Road, and illustrated in **Figure 5.5** and **Figure 5.6**.

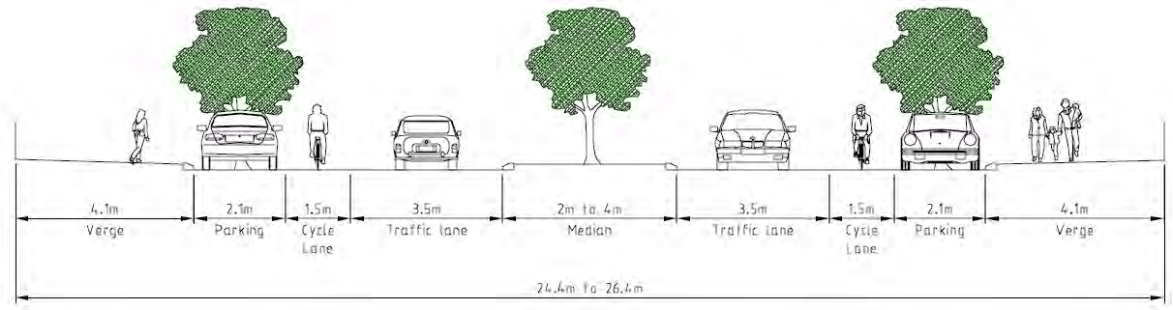
West of Marmion Avenue, Alkimos Drive is proposed as a district distributor integrator arterial (B) and estimated to carry 5,000 vpd to 10,000 vpd at full development. Immediately west of Marmion Avenue, Alkimos Drive is proposed as a boulevard with one traffic lane in each direction, a central median and kerbside parking lanes (as appropriate), as illustrated in **Figure 5.7a**. The minimum road reserve would be 29 m, comprising 6.0 m median, two 7.5 m carriageways including 1.5 m cycle lanes and 2.5 m parking lanes, and two 4.0 m verges. Parking lanes could be deleted near intersections to provide for additional traffic/ turning lanes, as required.

- **Figure 5.7a Indicative cross section for Alkimos Drive, immediately west of Marmion Avenue**




Further to the west, Alkimos Drive is proposed as a single carriageway with median zones, cycle lanes and parking lanes, as illustrated in **Figure 5.7b**. The road reserve would vary, depending on the width of the median and whether or not parking was provided.

- **Figure 5.7b Indicative cross section for Alkimos Drive, western section**




## 5.9 Eglinton Avenue

Eglinton Avenue, east of Marmion Avenue is proposed as a district distributor integrator arterial (A) with an indicative maximum traffic speed of 60 kph. It is estimated to carry 15,000 to 19,000vpd.

The proposed cross sections for Eglinton Avenue are similar to those proposed for Romeo Road, and illustrated in **Figure 5.5** and **Figure 5.6**.

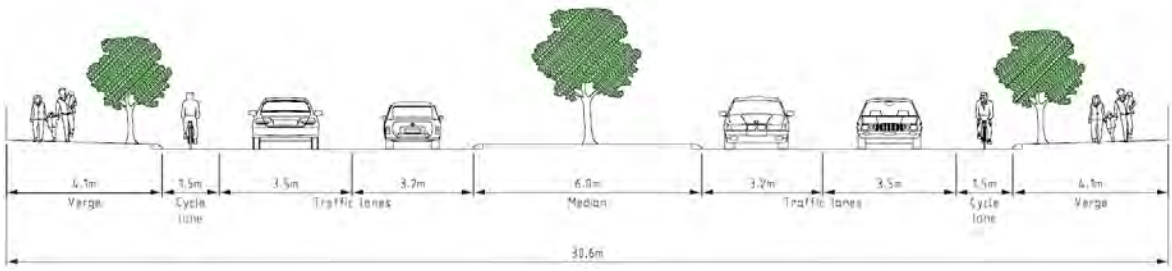
West of Marmion Avenue, Eglinton Avenue is proposed as a district distributor integrator arterial (B) and estimated to carry 5,000 vpd to 13,500 vpd at full development. The proposed cross sections are similar to Alkimos Drive, as illustrated in **Figure 5.7a** and **Figure 5.7b**. The minimum road reserve in the areas with higher traffic volumes would be 29 m, comprising 6.0 m median, two 7.5 m carriageways including 1.5 m cycle lanes and 2.5 m parking lanes. Parking lanes can be deleted near intersections to provide an additional traffic/ turning lane, as required. In the low traffic volume sections, the road reserve would be 24.4 m to 26.4 m, depending on the width of the median and whether or not parking was provided.

## 5.10 Alkimos EW Coastal Village Distributor

The Alkimos EW Coastal Village Distributor (between Marmion Avenue and the Alkimos Coastal Village) is proposed as a district distributor integrator arterial (B) with an indicative maximum traffic speed of 60 kph. It is estimated to carry 6,500 to 19,000vpd.

The eastern section of this road is likely to require four traffic lanes, as illustrated in **Figure 5.8**. The minimum road reserve would be 30.6 m, comprising 6.0 m median, two 8.5 m carriageways including 1.5 m cycle lanes and two traffic lanes (3.5 m and 3.2 m).

- **Figure 5.8 Indicative cross section for Alkimos EW Coastal Village Distributor**

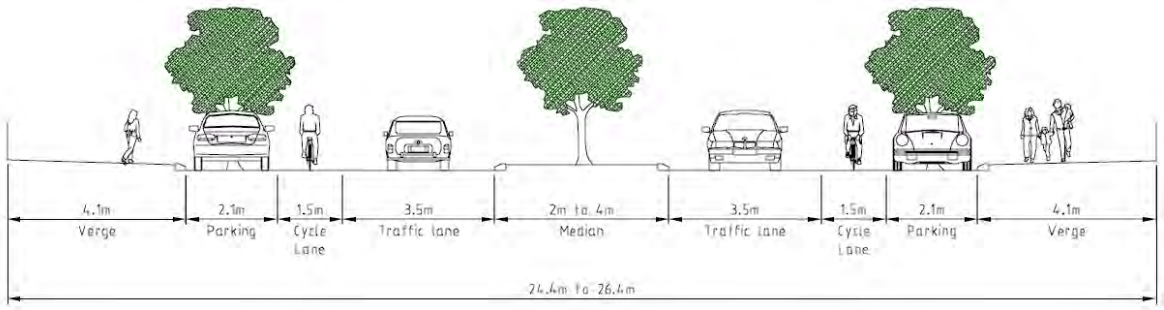



On the western section, the proposed cross section is similar to Alkimos Drive, as illustrated in **Figure 5.7**. The minimum road reserve would be 29 m, comprising 6.0 m median, two 7.5 m carriageways including 1.5 m cycle lanes and 2.5 m parking lanes. Parking lanes can be deleted near intersections to provide an additional traffic/ turning lane, as required.

## 5.11 Neighbourhood connector (A)

**Figure 5-9** illustrates an indicative cross section for neighbourhood connectors (A), up to 7,000 vpd. The road reserve would be 24.4 to 26.4 m, comprising 2.0m to 4.0 m median (depending on the tree species selected), two 7.5 m carriageways (including cycle lanes and parking lanes) and two 4.1 m verges.

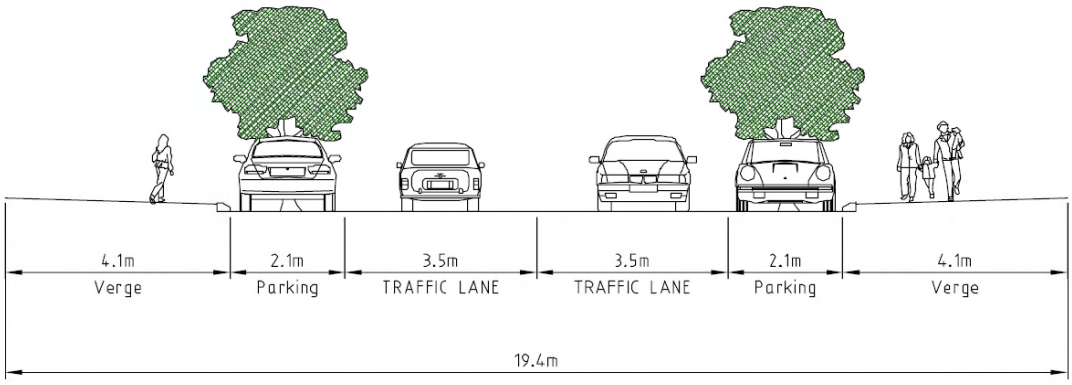
- **Figure 5-9 Indicative cross section, neighbourhood connector (A)**




## 5.12 Neighbourhood connector (B)

**Figure 5-9** illustrates an indicative cross section for neighbourhood connectors (B), up to 3,000 vpd. The minimum road reserve would be 19.4 m, comprising two 3.5 m traffic lanes, tow 2.1 m parking lanes and two 4.1 m verges. This minimum width assumes that earthworks are incorporated into the surrounding land forms and not required to be accommodated within the road reserve.

- **Figure 5.9 Indicative cross section, neighbourhood connector (B)**




## 5.13 Access Streets

Access Street would have an indicative maximum traffic speed of 50 kph and expect to carry less than 3,000 vpd. *Liveable Neighbourhoods* includes four indicative cross sections for different local street environments. Access streets have not been specified at this structure plan level.

## 5.14 Controls at major intersections

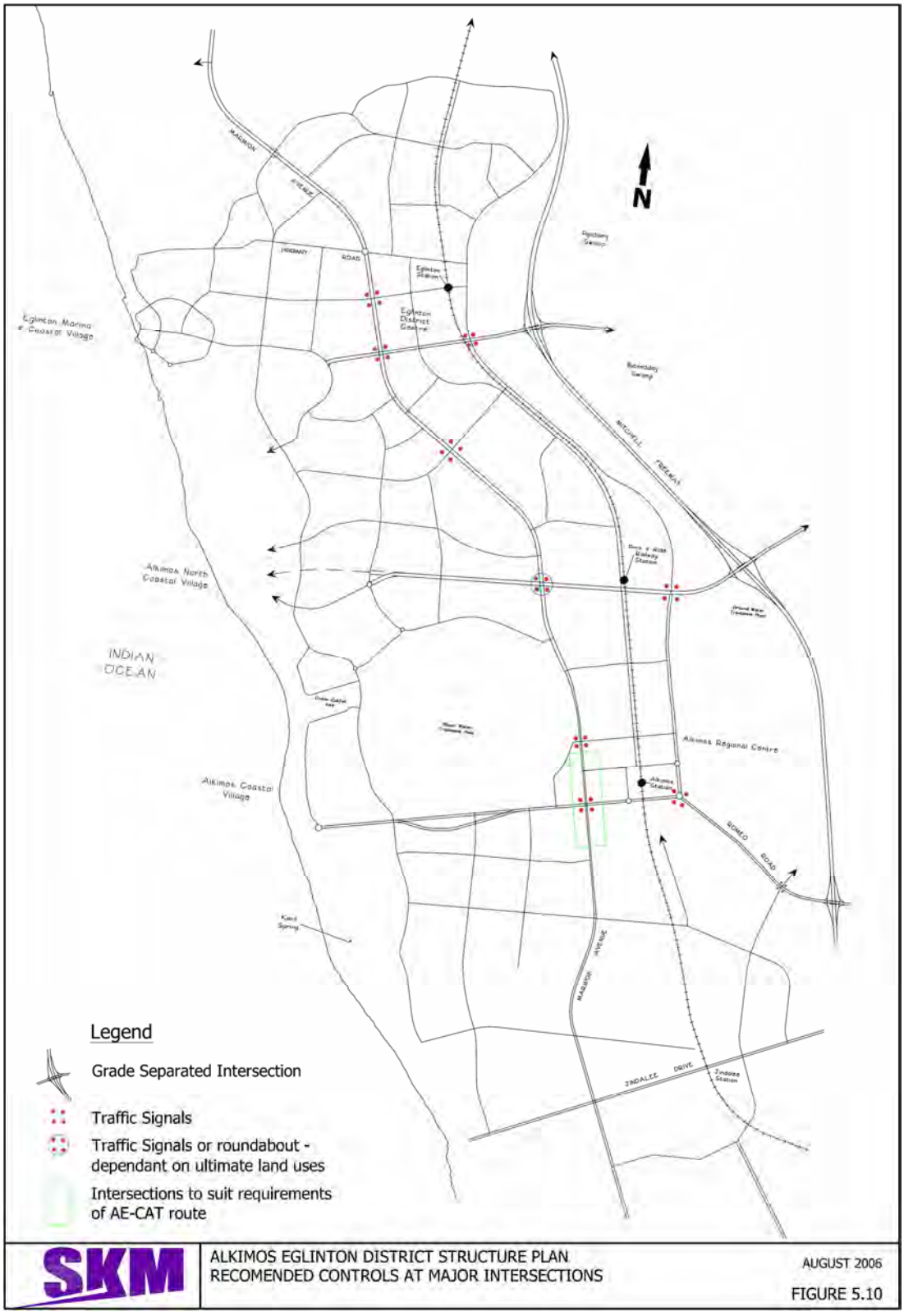
The recommended controls at major intersections are illustrated in **Figure 5.10**.

### 5.14.1 Mitchell Freeway interchanges

The intersections of Romeo Road, Alkimos Drive and Eglinton Avenue with the Mitchell Freeway are each planned to be conventional grade-separated diamond interchanges.

To the south of Romeo Road, the interchange of the Mitchell Freeway and Jindalee Boulevard is planned as an unconventional grade separated interchange with frontage roads such that northbound traffic from Jindalee Boulevard to the Mitchell Freeway would pass through the Romeo Road interchange. Similarly, southbound traffic to Jindalee Boulevard would exit the freeway via the Romeo Road exit and use the frontage road to Jindalee Boulevard.

- **Figure 5.10 Recommended controls at major intersections**

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### 5.14.2 Marmion Avenue/ Romeo Road

The four-way intersection at Marmion Avenue and Romeo Road is proposed as a signalised intersection. This location is expected to attract a high number of pedestrians and cyclists moving to and from the Alkimos Regional Centre. Traffic signals offer a greater level of amenity for crossing Marmion Avenue, compared with a roundabout.

In addition, this intersection will have a high percentage of turning traffic and signals are operationally more efficient for managing turning movements.

### 5.14.3 Marmion Avenue/ Alkimos regional centre EW distributor

The (potential) four-way intersection at Marmion Avenue and the Alkimos regional centre EW distributor is proposed as a signalised intersection. This location is expected to attract a high number of pedestrians and cyclists moving to and from the Alkimos Regional Centre. Traffic signals offer a greater level of amenity for crossing Marmion Avenue, compared with a roundabout.

In addition, this intersection will have a high percentage of turning traffic and signals are operationally more efficient for managing turning movements.

### 5.14.4 Marmion Avenue/ Alkimos Drive

The four way intersection at Marmion Avenue and Alkimos Drive could either be constructed as a signalised intersection or a roundabout, depending on the surrounding land uses. The north-east quadrant of the intersection would incorporate the proposed park and ride station plus associated car parking. If the remaining quadrants were to have high intensity land uses expected to generate high pedestrian movements, then a signalised intersection would be preferred. If on the other hand, the remaining quadrants have standard urban density, then a roundabout could be considered.

The road reserve requirements for roundabouts and traffic signals are similar. Hence the decision about which form of intersection to develop can be made at the detailed development planning stage rather than at the structure plan stage.

### 5.14.5 Marmion Avenue/ Central EW connector

The (potential) four way intersection at Marmion Avenue and the Central EW Connector is proposed to be constructed as a signalised intersection. This intersection would provide access to the development on the eastern side of the rail line. It is also anticipated that this intersection would become the location for a neighbourhood centre.

### 5.14.6 Marmion Avenue/ Eglinton Avenue

The four-way intersection at Marmion Avenue and Eglinton Avenue needs to be developed within the context of access to the Eglinton District Centre. It is proposed that this intersection should be planned for traffic signals to facilitate pedestrian movements to and from the district centre and the Eglinton train station.

### 5.14.7 Marmion Avenue/ Eglinton district centre

The four-way intersection at Marmion Avenue and Eglinton district centre is proposed as traffic signals to facilitate pedestrian movements and the AE-CAT to and from the district centre and the Eglinton train station.

### 5.14.8 Marmion Avenue/ Northern EW Connector

The four-way intersection at Marmion Avenue and the northern EW connector could be planned as a roundabout intersection since pedestrian movements in this area is likely to be low.

### 5.14.9 Romeo Road/ Alkimos Regional Centre NS distributor

The intersection of Romeo Road and the Alkimos Regional Centre NS distributor is proposed as a signalised intersection. This location is expected to attract a high number of pedestrians and cyclists moving within the Alkimos Regional Centre, particularly given the proximity to the proposed rail station. Traffic signals offer a greater level of amenity for pedestrians crossing Romeo Road, compared with a roundabout. Signals are also operationally more effective at managing regional centre turning movements.

Depending on the detailed planning for the regional centre, this signalised intersection could be developed as a four-way intersection, providing access to development to the south.

### 5.14.10 Alkimos Drive/ Alkimos Regional Centre NS distributor

The intersection of Alkimos Drive and the Alkimos Regional Centre NS distributor is proposed as a signalised intersection. This location is expected to attract a high number of turning movements to and from the proposed park and ride station as well as to and from the regional centre (to the south).

### 5.14.11 Eglinton Avenue/ Eastern NS connector/ Eastern District Centre NS Connector

The intersection of Eglinton Avenue and the Eastern NS connector/ Eastern District Centre NS Connector is proposed as a signalised intersection. This location is expected to attract a high number of turning movements to and from the district centre and the proposed commercial/ industrial area, east of the rail line (to the south).

### 5.14.12 Minor intersections within Alkimos Eglinton

Minor intersections within the development would be appropriately controlled with priority intersections. The treatment of four-way intersections would be consistent with the guidelines in *Liveable Neighbourhoods*.

## 5.15 Summary

The proposed ultimate road network incorporates the transport framework included in the MRS amendment 1029/33. The key features of the ultimate road network include:

- The Mitchell Freeway, forming the eastern boundary of the Alkimos Eglinton structure plan area;
- Marmion Avenue as the main north-south integrator arterial (A), providing for movement between the south and the Alkimos Regional Centre, between Alkimos and Eglinton, and between Yanchep and the Alkimos Eglinton area.
- Romeo Road connecting Marmion Avenue to the Mitchell Freeway, through Alkimos Regional Centre;
- Alkimos EW Coastal Village Connector, connecting the Alkimos coastal village to Alkimos Regional Centre.
- Alkimos Drive and Eglinton Avenue connecting Marmion Avenue to the Mitchell Freeway and to the coastal suburbs;
- Neighbourhood connectors and other lower order integrator arterial roads throughout Alkimos and Eglinton to form the local road linkages to the district roads.

# 6. Public transport

## 6.1 Overview

The proposed ultimate public transport network, illustrated in **Figure 4-2,** is proposed to include three components:

- Northern suburbs railway for line-haul movements to district and regional destinations.
- AE-CAT (Alkimos Eglinton Connector Area Transit), also acting as an internal distribution system in its own right.
- General Transperth bus routes.

At this structure plan stage, the route alignments are indicative and subject to refinement as detailed planning progresses for each of the development areas. This section of the report discusses the objectives of each of the components of the public transport network.

## 6.2 Northern suburbs railway

The alignment for the northern suburbs railway is set out in the following report: *Northern Suburbs Railway Alignment Definition – Alkimos to Yanchep, Alignment Definition Report*, GHD, 2005 (prepared for the DPI).

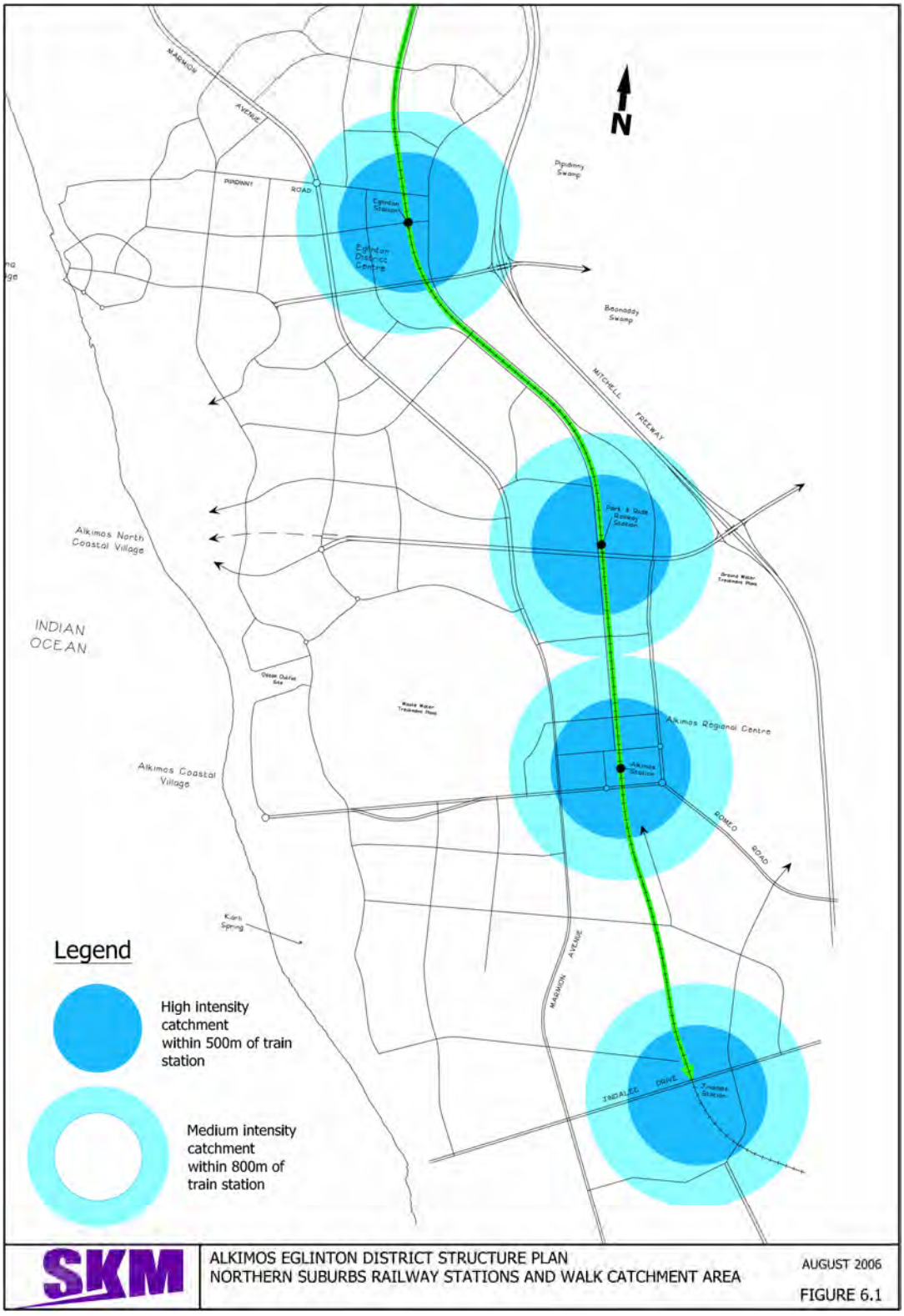
The northern suburbs railway is ultimately planned to include three stations, as illustrated on **Figure 6.1**:

- Alkimos Regional Centre - Major bus-rail interchange with high pedestrian (walk-on) patronage and nominal kiss and ride provided through on-street parking. This would not be a park and ride station.
- Eglinton District Centre – Minor bus-rail interchange with pedestrian (walk-on) patronage and nominal kiss and ride provided through on-street parking. The report suggests that a park and ride facility for 480 parking bays be provided on the east side.
- Park and Ride at Alkimos Drive – Major park and ride station with 1000 parking spaces.

The location of the rail stations has been incorporated into the overall public transport structure plan.

The three stations would provide a high quality public transport service within 400 m of approximately 1300 households (6% of total households), and within 800 m of approximately 4000 households (18% of total households).

- **Figure 6.1 Northern suburbs railway station and walk catchment area**



## 6.3 AE-CAT

### 6.3.1 Principles

The Alkimos Eglinton CAT route has been developed along the following principles:

- The AE-CAT would not only link the main demand centres within the area, but would also form a collector service to stations on the northern suburbs railway.
- The AE-CAT service would operate (at least) every 10 minutes in each direction.
- The AE-CAT stops would be approximately every 500 m. Each stop would be developed as a transit oriented development (TOD) with high intensity activity within a catchment zone of 500 m, and medium intensity activity within a catchment zone of 800 m. High intensity activities include high density residential (R30/R40), employment and retail activity. Low intensity activity or public open space would not be adjacent to the stops. School buildings could be within walking distance of each stop, although playing fields etc should be located outside the high intensity catchment areas.
- The AE-CAT system would have significant priority over general traffic, including designated AE-CAT lanes on district distributor roads, dedicated traffic signals (where required) and priority at general traffic signals.
- The AE-CAT would initially be operated with high quality tyre-based vehicles with an on-board propulsion system. The vehicles would need to be low floor and fully accessible. The current Perth City CAT buses and the Zuidtangent "High Quality Bus Service" between Haarlem and Schiphol Airport (**Figure 6.2**) are examples of the types of vehicle that could be used. In the longer term, the route could be capable of being upgraded to a rail based system with an off-board propulsion system, if required.

- **Figure 6.2 Examples of high quality transit vehicles**


### 6.3.2 Indicative alignment

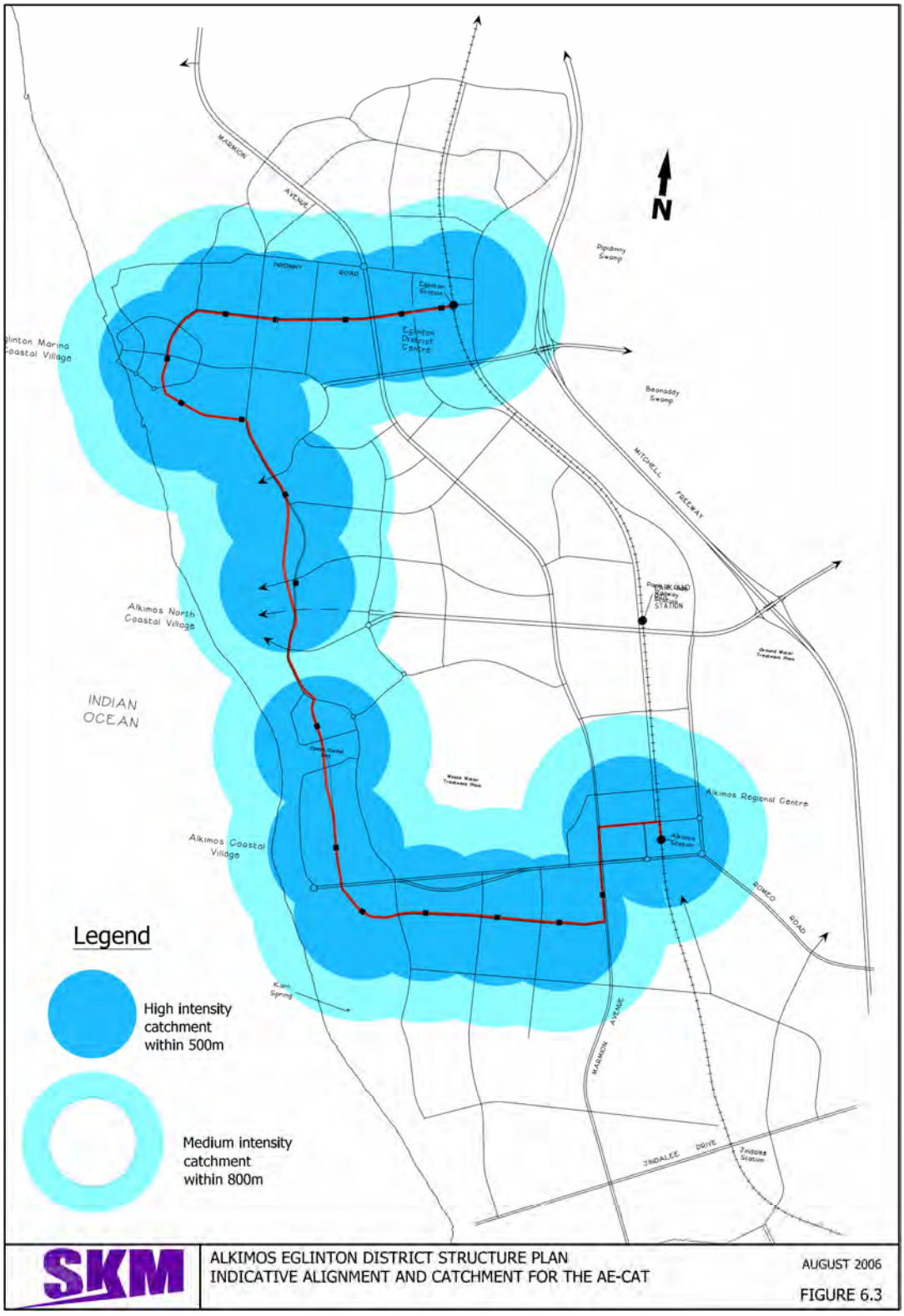
An indicative alignment for the AE-CAT is illustrated in **Figure 6-3**. The indicative alignment has the following features:

- In Alkimos Regional Centre, the alignment would terminate at the Alkimos train station (stop 1). An additional stop within the regional centre (stop 2) would provide access to expected employment and retail opportunities.
- Access to Marmion Avenue may require priority signals, depending on the final alignment selected. Provision should be made for a stop on Marmion Avenue (stop 3).
- West of Marmion Avenue, the alignment would preferably be offset by about 500m from the edge of the buffer to the wastewater treatment plant to create a full 360$^{o}$ catchment to each transit stop (stops 4, 5 and 6).
- A major AE-CAT stop would be located at the Alkimos coastal village (stop 7).
- The alignment and number of stops along the coastal area between the Alkimos coastal village and Eglinton marina and coastal village would depend on the detailed planning for the area. This section of route could potentially have five stops (stops 7 to 12).
- The AE-CAT would preferably have a major stop within walking distance of the Eglinton marina and coastal village (stop 13).
- The east-west alignment could potentially incorporate two stops west of Marmion Avenue (stops 14 and 15).
- Within the Eglinton District Centre there could potentially be two stops, one integrated with high intensity employment/ retail activity (stop 16) and one at the Eglinton train station (stop 17).

The total length of this indicative alignment is 10 km.

The indicative AE-CAT alignment and stopping pattern would provide a high quality public transport service within 500 m of approximately 14 000 households (62% of total households).

- **Figure 6.3 Indicative alignment and catchment for the AE-CAT**

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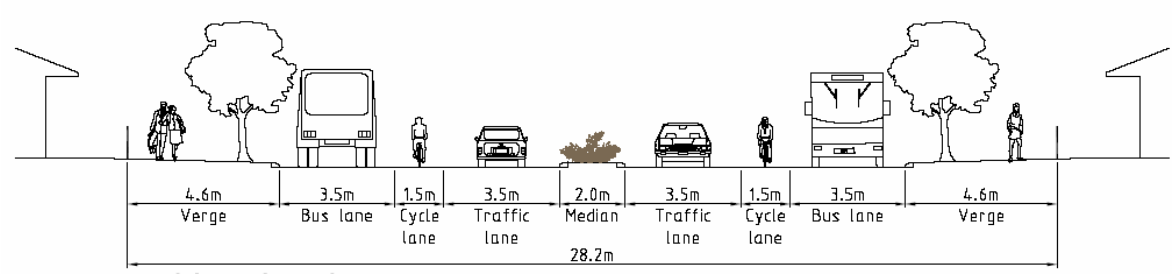
### 6.3.3 Road cross sections and priority AE-CAT lanes

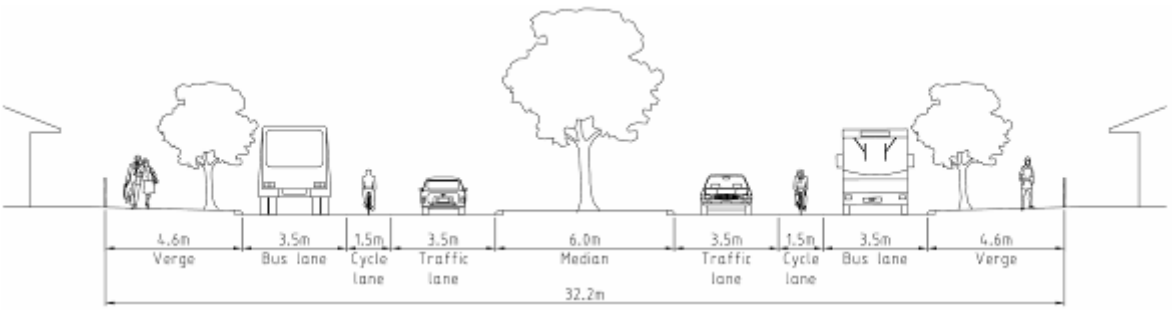
Many of the roads on which the AE-CAT would operate would be designed to accommodate AE-CAT lanes (bus lanes) to ensure that the service could operate without encountering traffic delays.

Bus lanes are not new and design standards for lane widths and road markings are well established. The typical cross sections included in **Figures 6.4** to **Figure 6.8** are indicative only. Final road configurations will be prepared at the more detailed development planning stages.

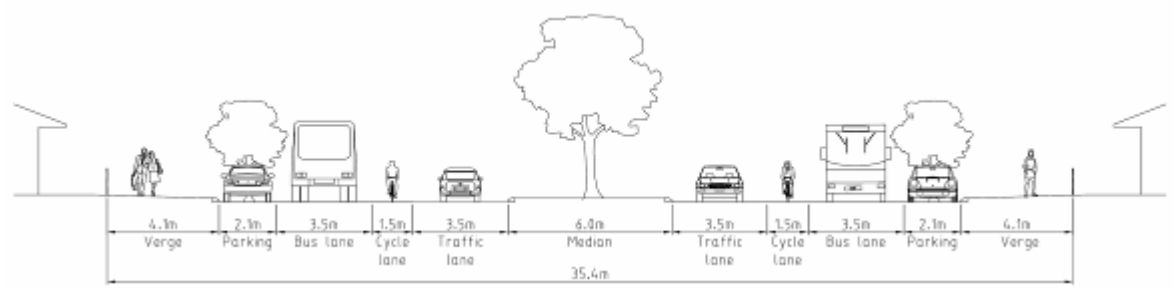
- **Figure 6.4 Indicative cross section for neighbourhood connector**



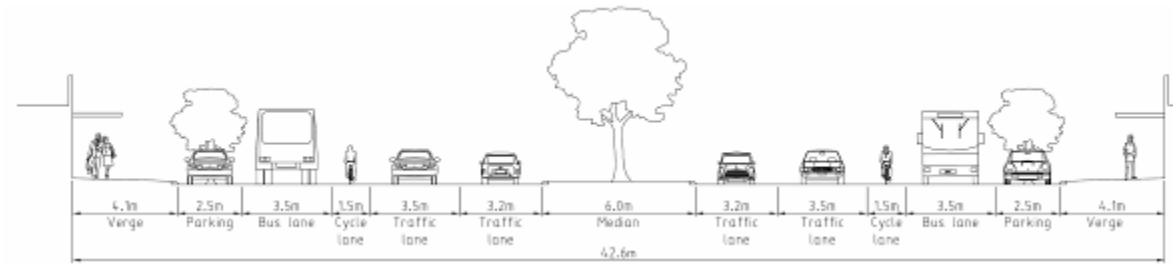

- **Figure 6.5 Indicative cross section for district distributor (B), without kerbside parking**



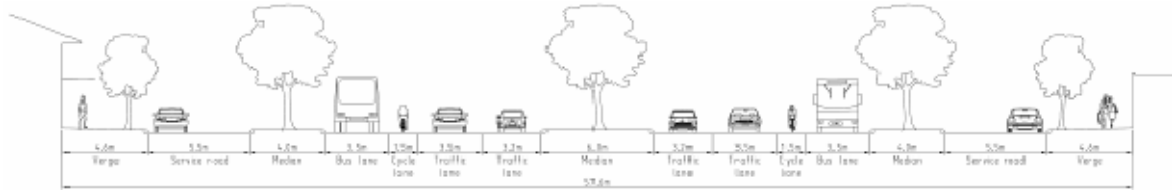
- **Figure 6.6 Indicative cross section for district distributor (B), with kerbside parking**




- **Figure 6.7 Indicative cross section for district distributor (A), in centres with kerbside parking**




- **Figure 6.8 Indicative cross section for district distributor (A), with service roads**



### 6.3.4 AE-CAT stops

AE-Cat stops would include full mobility access and wayfinding, modern shelter arrangements, passenger information systems, lighting, emergency help phones and security systems. Each stop would be an important activity node and would be integrated within its urban environment.

## 6.4 Transperth services

Conventional Transperth bus services would provide public transport to the areas that are outside the catchment of the AE-CAT. The primary catchment areas are illustrated on **Figure 6.9**.

## 6.5 Estimated patronage

The transit demand to/from Alkimos Eglinton is estimated to be about 26,900 passenger trips per day at full development, comprising approximately 12% of total trips. The maximum passenger demand for the AE-CAT is estimated to be about 2900 passengers per day, between the Alkimos Regional Centre and Alkimos Coastal Village.

The indicative service frequencies that will be needed to meet the estimated passenger demand are summarised in **Table 6.1**.

**Table 6.1 Estimated passengers demand and service frequency**

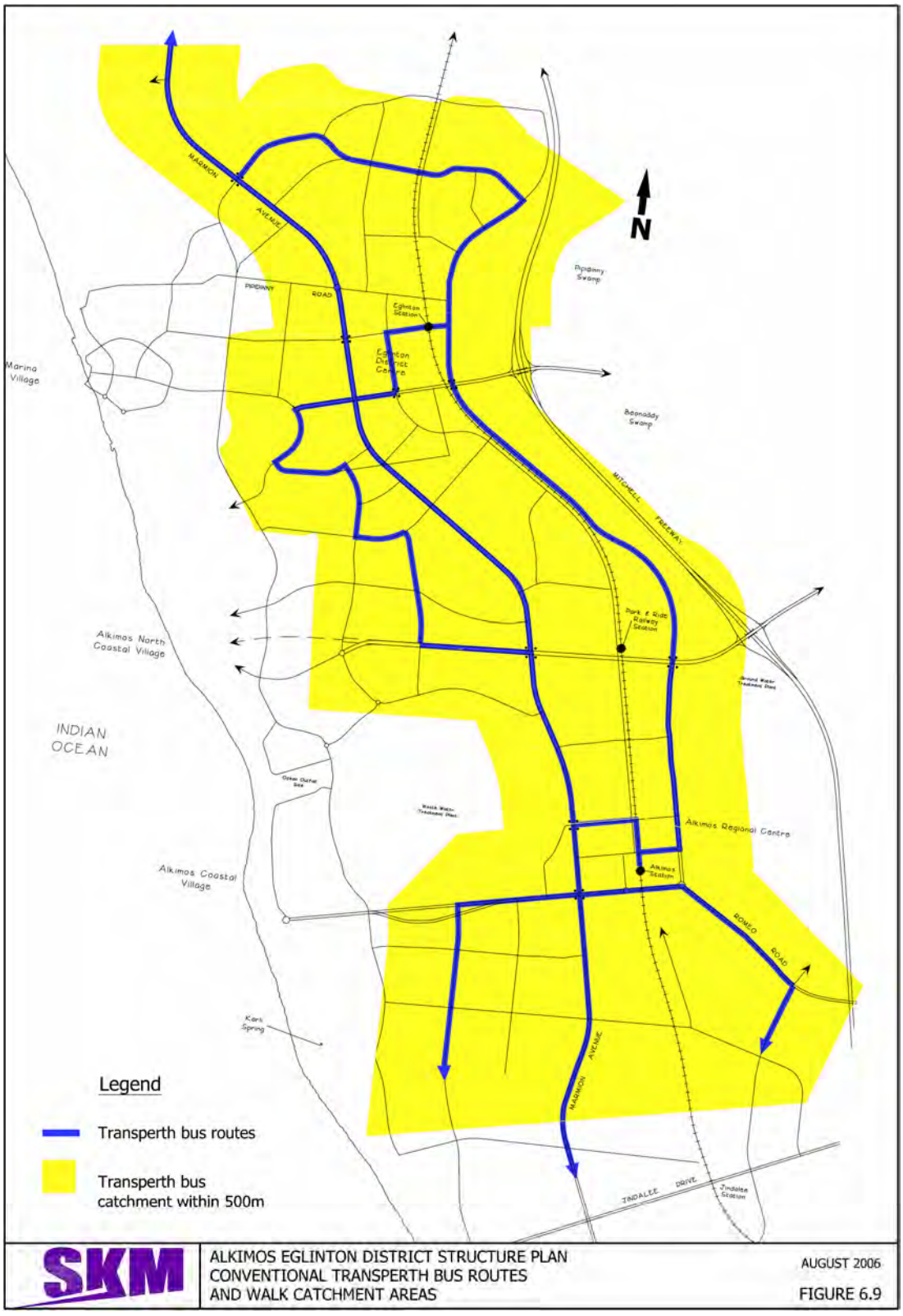
| | Estimated passenger demand at busiest sections of routes | | Indicative headway (min) | |
|---|---|---|---|---|
| | Passengers/ day | Passengers/ peak hour | Peak hours | Outside peak hours |
| AE-CAT | 2900 | 500 to 600 | 5 mins | 15 mins |
| Northern suburbs railway | 3200 | 500 to 600 | 10 to 15 mins (a) | 15 mins |
| Transperth services, including school services | 2300 | 400 to 500 | Depends on number of services offered | Depends on number of services offered |

(a) Headway would depend on demand from other suburbs, and number of carriages per train.

## 6.6 Summary

The public transport network would provide a service within 500 m of approximately 20,500 households (92% of total households), and within 800 m of approximately 22,200 households (99% of total households).

- **Figure 6.9 Indicative Transperth bus routes and walk catchment**

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# 7. Cyclists and pedestrians

## 7.1 Objective

Walking and cycling have an important role within the overall transportation system of an urban area. When integrated with compatible land uses, a strong walk/cycle network can:

- reduce private car dependency for residents;
- increase accessibility to employment and other urban activities for residents;
- reduce the adverse environmental impacts of vehicular and motorised transport;
- increase resource efficiency in a multi-modal transport system; and,
- reduce transport-related crashes or injuries.

The objective of a pedestrian and cycle network is to provide for the convenient and safe movement of pedestrians and cyclists through and between urban cells, having regard for the need to service schools, shops, recreation and other land uses as well as public transport access points.

## 7.2 Pedestrian and cyclist provision

The Alkimos Eglinton Structure Plan aims to maximise pedestrian and cyclist connections to the local and regional pedestrian/ cycle network.

The proposed strategic cycle/ pedestrian network is shown in **Figure 7.1.** The detailed local cycle network will be developed in conjunction with detailed planning for each development cell.

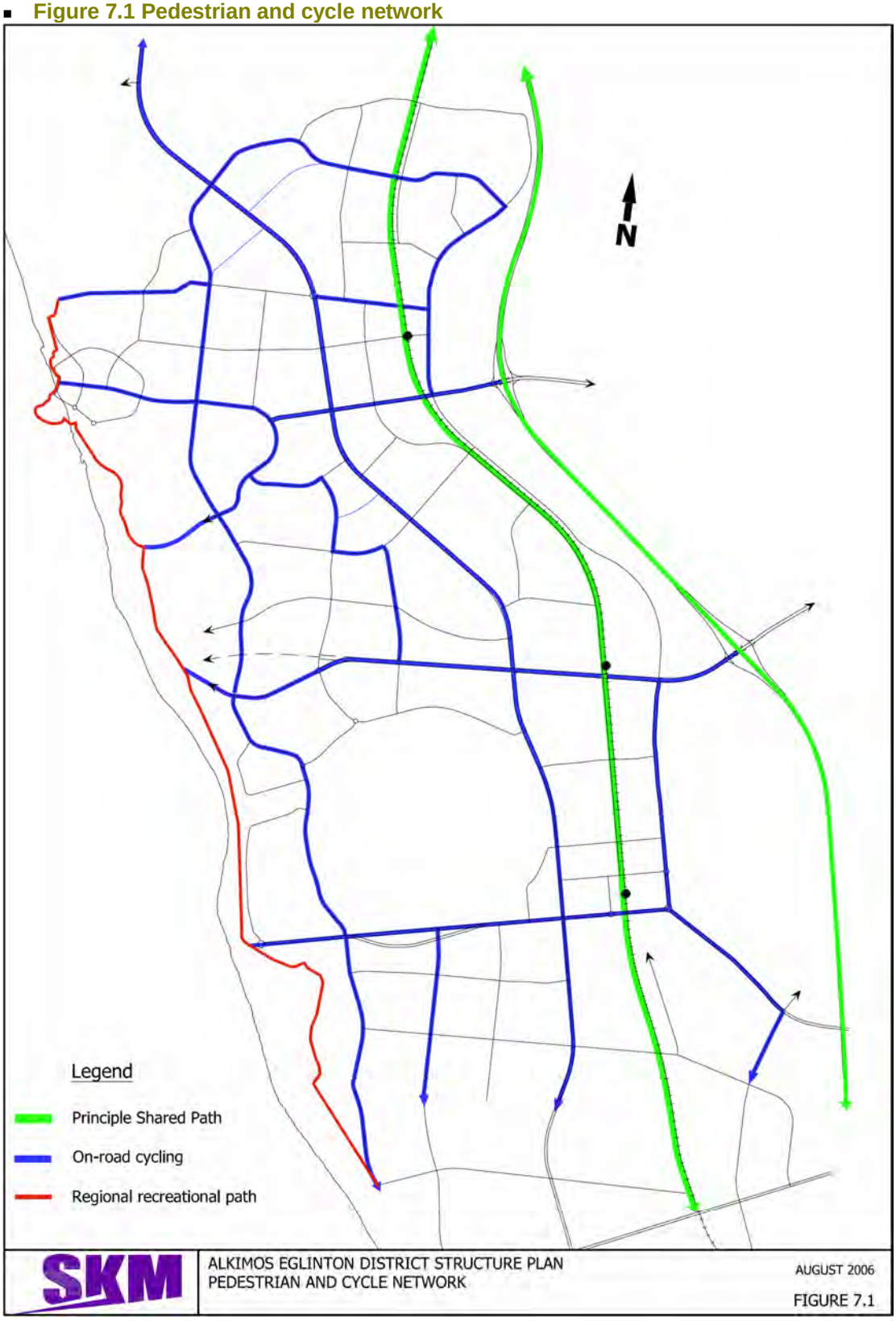
The neighbourhood centres and primary schools would be easily accessed on foot from most of the development cells within the Alkimos Eglinton structure plan area. Pedestrian/cyclist movements between the cells will be along the neighbourhood connectors and district distributors.

It is proposed to accommodate on-street cycle lanes and off-street shared paths on all neighbourhood connectors and district distributors, as discussed in Section 4.

On access streets, it is envisaged that on-road cyclists will share the roadway with motorists due to the low traffic volumes (less than 3,000 vpd) and small speed differential assisted by the introduction of 50 km/hr speed limits in built up areas. Shared paths/ footpaths would also be provided for child cyclists.

The pedestrian/ cycle network would provide for efficient access to activity nodes such as the town centre, schools, as well as public open space and public transport stops.

- **Figure 7.1 Pedestrian and cycle network**



## 7.3 Pedestrian crossings

The draft WAPC Guidelines require an analysis of the operation and safety of the pedestrian/ cycle networks including identification of which roads could potentially be difficult for pedestrians and cyclists to cross, where safe crossing should be provided, and where safe crossings are proposed.

Traffic volumes which adversely impact on the ability of pedestrians to cross safely are:

- 2-lane undivided road – 1,000 vehicles per hour (two-way), equivalent to 10,000 vpd
- 4-lane divided road – 1,500 vehicles per hour (two-way), equivalent to 15,000 vpd.

Subsequent development planning stages will identify where additional pedestrian crossings will be required, and the format of those crossings.

## 7.4 Safe routes to school

The draft WAPC Guidelines require an assessment of safe routes to school by identifying the catchment of each school, identifying the most likely walk and cycle routes, determining any potential deficiencies and proposing measures to address those difficulties.

Subsequent development planning stages will identify if additional pedestrian crossings will be required to provide safe routes to school, and the format of those crossings.

# 8. Summary

This transport and access report has addressed the strategic transport aspects of land use/ transport integration for Alkimos Eglinton. The key objectives of the transport assessment for the Alkimos Eglinton Structure Plan have been:

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

Alkimos Eglinton is proposed as a sustainable urban community incorporating high, medium and low density residential, schools, regional and a district centres encompassing retail and commercial activities providing local employment. It is proposed to have a population of 58,450 people, nine primary schools (plus pre-primary), two high schools, private school plus a regional centre, district centre and additional commercial areas with about 508,500 sq m retail and commercial development.

The proposed ultimate road network incorporates the transport framework included in the MRS amendment 1029/33 with the following features:

- The Mitchell Freeway will form the eastern boundary of the Alkimos Eglinton structure plan area. It is planned as a Primary Regional Road (‘red road’) in the Metropolitan Region Scheme (MRS) under the care and control of Main Roads. Alkimos Eglinton will have grade separated interchange connections at Romeo Road, Alkimos Drive and Eglinton Avenue.
- Marmion Avenue is proposed as a north-south integrator arterial (A), providing for movement between the south and the Alkimos Regional Centre, between Alkimos and Eglinton, and between Yanchep and the Alkimos Eglinton area. It is designated as an Other Regional Road (‘blue road’) in the MRS, under the care and control of the City of Wanneroo.
- Romeo Road is proposed as an integrator arterial (A), connecting Marmion Avenue to the Mitchell Freeway, through Alkimos Regional Centre. It is proposed as an Other Regional Road in the MRS, under the care and control of the City of Wanneroo

- Alkimos EW Coastal Village Connector is proposed as an integrator arterial (B), connecting the Alkimos coastal village to Alkimos Regional Centre. From an alignment perspective, it is planned to connect with Marmion Avenue at the same location as Romeo Road, providing a continuous link between the coast and the Mitchell Freeway.
- Alkimos Drive is proposed as an integrator arterial (A), connecting Marmion Avenue to the Mitchell Freeway. West of Marmion Avenue, Alkimos Drive is proposed as an integrator arterial (B). The section of Alkimos Drive between Marmion Avenue and the Mitchell Freeway is proposed as an Other Regional Road in the MRS, under the care and control of the City of Wanneroo.
- Eglinton Avenue is proposed as an integrator arterial (A), connecting Marmion Avenue to the Mitchell Freeway. West of Marmion Avenue, Eglinton Avenue is proposed as an integrator arterial (B). The section of Eglinton Avenue between Marmion Avenue and the Mitchell Freeway is proposed as an Other Regional Road in the MRS, under the care and control of the City of Wanneroo.
- Neighbourhood connectors throughout Alkimos and Eglinton will form the local road linkages to the district roads. These are described in more detail in section 5.

The proposed ultimate public transport network is proposed to include three components: (a) the northern suburbs railway for line-haul movements to district and regional destinations; (b) the AE-CAT (Alkimos Eglinton Connector Area Transit), also acting as an internal distribution system in its own right; and (c) general Transperth bus routes.

The Alkimos Eglinton Structure Plan aims to maximise pedestrian and cyclist connections to the local and regional pedestrian/ cycle network. The pedestrian/ cycle network will provide for efficient access to activity nodes such as the town centre, schools, as well as public open space and public transport stops. The plan proposes to accommodate on-street cycle lanes and off-street shared paths on all neighbourhood connectors, district distributors and along the coast.

# Appendix A Traffic model

Sinclair Knight Merz has previously developed a traffic model for Alkimos Eglinton using the internationally recognised EMME/2 software platform. EMME/2 is used by the DPI for its Strategic Transport Model (STEM) which has provided forecasts for *Future Perth*, and for the Perth to Mandurah rail link.

## A.1 Transport modelling package

EMME/2 represents a road network as a series of links (roads) and nodes (intersections). The traffic generating land uses are represented as a number of zones connected to the network.

For this application, a 24-hour average weekday model was developed. The average weekday was selected as it represents the typical activity on the roads in the area and is suitable for structure planning purposes.

## A.2 Modelled road network

The modelled road network comprises all the key routes proposed within the area including important local roads, neighbourhood connectors, district distributors and primary distributors. The road network is shown in **Figure 4-1**.

The road network coding was based on an estimate of the road hierarchy. Each category of road hierarchy was assigned an appropriate traffic capacity in the form of a volume-delay function. These functions change the travel time based on the volume of traffic uses that particular section of road. Higher-order roads with more traffic lanes have higher capacities and hence vehicle travel times are less affected large traffic volume increases compared with local roads. The EMME/2 model attempts to minimise the journey time and hence tends to concentrate traffic on roads with higher traffic capacities.

## A.3 Model structure

A traditional four-step model includes the following processes:

- Trip generation;
- Mode split;
- Trip distribution; and
- Trip assignment.

For Alkimos Eglinton, ‘trip generation’ considers private vehicle motorised trips and transit trips separately; therefore the mode split process is not required. However the influence of

mode split was incorporated in the assumptions adopted for the vehicle trip production rate per household and the percentage of transit trips, as discussed in the following section.

## A.4 Model share

For various development densities i.e. R20/R40/R60, the average household size and transport modes used are often different. At higher development densities, the number of trips per household reduces (due to generally lower numbers of persons per dwelling). In addition, high density residential developments close to major activities and public transport corridors generate proportionately higher walk/cycle trips and higher public transport usage (depending on the quality of service offered).

The model assumptions for car trips and transit mode share for various densities within the study area are shown in **Table A.1**.

**Table A.1 Car driver and transit mode share assumptions**

| Density | R60/R100 | R40 | R25/R20 |
|---|---|---|---|
| Car driver | 39% | 48% | 60% |
| Transit | 15% | 12% | 4% |

## A.5 Modelling of motorised traffic

The purpose of the trip generation model is to produce 24-hour trip productions and attractions for input into the trip distribution procedure. These trips include:

- Trips originating in the study area to any destination;
- Trips terminating in the study area from any origin;
- Through trips originating and terminating outside the study area but using roads within and around the study area.

### A.5.1 Trip production

The 24-hour trip production rates were based on the most recent traffic generation and mode split data, confirmed with the DPI transport modelling section. The trip production rates incorporate the following assumptions for the design year:

- In Perth about 3.5 trips per person per day are generated per head of population
- Car driver trips are 60% of total trips.

Hence, based on an average household size of 2.88 persons per household, the vehicle trip generation rate is approximately 6.0 car driver trips per household.

In Alkimos Structure Plan, residential developments are designed in various densities. As discussed in **Section A.4**, different car driver trip generation rates should apply to different housing densities. The adopted car driver trip rates for various development densities are summarised in **Table A-2.**

- **Table A-2 Daily car driver trip production rates**

| Trip purpose | Average vehicle trips/dwelling | | | |
|---|---|---|---|---|
| | Average trip rates (Perth) | Assumed trip rates in Alkimos – Eglinton | | |
| | | R20/25 | R40 | R60/100 |
| Work | 2.01 | 2.4 | 1.5 | 0.6 |
| Education | 0.54 | 0.6 | 0.4 | 0.2 |
| Other | 3.45 | 4.0 | 2.5 | 1.1 |
| **Total** | **6.0** | **7.0** | **4.4** | **1.9** |

### A.5.2 Trip attractions

While trip productions represent the number of trips associated with each household, trip attractions represent the number of trips to the various destinations within the study area.

Trips are attracted to work places, education facilities, shopping facilities, community facilities and residential areas. The trip attraction rates input to the model are summarised in **Table A.3**.

- **Table A.3 Daily car driver trips attraction rates**

| | | | |
|---|---|---|---|
| Work Attractions | = | | 1.365 trips per job |
| Education Attractions | = | | 0.8 trips per primary/secondary enrolment |
| | | + | 0.897 trips per private school enrolment |
| Other Attractions | = | | 0.5 trips per dwelling unit |
| | | + | 0.7 trips per $m^2$ GFA retail floor area |
| | | + | 0.2 trips per school enrolment |
| | | + | 1.5 trips per 100sqm office/commercial |
| | | + | 0.1 trips per 100sqm services/commercial |
| | | + | 1.006 trips per tourism job |

### A.5.3 Trip generation of Alkimos-Eglinton study region

The total motorised trips generated within the Alkimos Eglinton areas are summarised in **Table A.4**.

**Table A.4 Total vehicle trips generated by Alkimos Eglinton**

| Trip purpose | Generation | | Internal trips | External trips |
|---|---|---|---|---|
| | Production | Attraction | | |
| Work | 36040 | 15760 | 11030 | 29740 |
| Education | 9650 | 9670 | 9200 | 950 |
| Other | 61510 | 78790 | 43060 | 54190 |
| **Total** | **107240** | **104220** | **63290** | **84880** |

### A.5.4 External and through trips

External and through trips were obtained from a sub-area cordon of the MRWA Regional Operations Model version Oct 05. This is a sub area matrix from the 2031 regional traffic model for the extent of the Alkimos Eglinton modelled area. The year 2031 was selected as appropriate for this development. The sub area matrix from MRWA was used to determine:

- the distribution and percentages of traffic travelling to and from the model area to the various external roads; and
- the volume of 'through trips' (i.e. trips originating and terminating outside the model area but using roads within and around the model area).

The percentage of Alkimos Eglinton traffic travelling to and from the external roads is shown in **Table A.5**. The external – external matrix from MRWA Regional model is shown in **Table A.6**.

**Table A.5 External traffic proportion to and from Alkimos Eglinton**

| External gateway | Proportion |
|---|---|
| Marmion Avenue north | 19.1% |
| Mitchell Freeway north | 0.9% |
| Marmion Avenue south | 44.0% |
| Mitchell Freeway south | 23.4% |
| Wanneroo Road south | 8.5% |
| East of Mitchell Freeway | 4.1% |
| **Total** | **100%** |

- **Table A-6 2031, external – external trip matrix, 24-hour (rounded)**

| External gateway | | 1 | 2 | 3 | 4 | 5 | 6 | Total |
|---|---|---|---|---|---|---|---|---|
| Marmion Avenue north | 1 | 0 | 4247 | 120 | 8019 | 1024 | 1880 | **15290** |
| Marmion Avenue south | 2 | 4165 | 0 | 374 | 9179 | 896 | 5358 | **19970** |
| Mitchell Freeway north | 3 | 116 | 350 | 0 | 3798 | 135 | 367 | **4770** |
| Mitchell Freeway south | 4 | 7773 | 8400 | 3971 | 0 | 588 | 115 | **20850** |
| East of Mitchell Freeway | 5 | 885 | 862 | 173 | 545 | 0 | 853 | **3320** |
| Wanneroo Road south | 6 | 1995 | 5309 | 446 | 112 | 1025 | 0 | **8890** |
| | **Total** | **14930** | **19170** | **5080** | **21650** | **3670** | **8570** | **73080** |

### A.5.5 Trip distribution

Trip distribution is the process whereby two-dimensional matrices of trips are produced from the one-dimensional production and attraction matrices. Internal trips within the study area have been distributed based on the following formula:

$$T_{ij} = f(u_{ij}) * P_i * A_j$$

Where:

$P_i$: trip production from zone *i*,

$A_j$: trip attraction to zone *j*,

$f(u_{ij})$: deterrence function of trips from zone *i* to zone *j*,

The deterrence is determined by the following *gamma* function formula:

$$f(u_{ij}) = u_{ij}^{-\alpha} \qquad u_{ij} <= 7 \text{ min}$$

$$= u_{ij}^{-\lambda} e^{-\theta u_{ij}} \qquad u_{ij} > 7 \text{ min}$$

Where:

$u_{ij}$ is travel time from zone *i* to zone *j*,

$\alpha, \lambda, \theta$ are model parameters, calibrated to match desired average travel time,

Internal trips and external trips were distributed separately based on the proportions obtained from the MRWA Regional Operations Model.

### A.5.6 Assignment

The EMME/2 assignment model uses a linear approximation algorithm to solve the capacity restrained highway assignment.

The trips are distributed around the network by EMME/2 in such a way that their total travel time is minimised. The shortest travel time calculations for the road network take into consideration the road type, average speed and number of lanes along each route. This is done in several iterations to allow the congestion to be included in the travel time calculations.

## A.6 Transit modelling

### A.6.1 Transit demand

The transit mode share assumptions for various densities of residential developments are summarised in **Table A.1**.

For transit attractions (mainly to retail/commercial centres), it is assumed that an average of 1.2 transit trips per employment would be generated within Alkimos – Eglinton area. However, if located outside the transit corridor, i.e. walking distance >1000m, no transit demand would be generated.

The estimated transit demand generated by the Alkimos Eglinton area is shown in **Table A-7**.

- **Table A-7 Estimated transit demand**

| | Internal | External | Total |
|---|---|---|---|
| Internal | 10900 | 8000 | 18900 |
| External | 8000 | 0 | 8000 |
| **Total** | 18900 | 8000 | 26900 |

### A.6.2 Transit provision

Three transit routes have been proposed within the Alkimos Eglinton area (as discussed in **Section 6** of this report):

- Northern suburbs railway for line-haul movements to district and regional destinations.
- AE-CAT (Alkimos Eglinton Connector Area Transit), also acting as an internal distribution system in its own right.
- General Transperth bus routes.

The forecast transit trips were assigned to the various routes and estimates made of the total demand on each route.