Appendix 5
Transport Assessment (KCTT)

TRANSPORT IMPACT ASSESSMENT

Heritage Park Phase 2

Lots 986 and 993 Baldivis Road, Baldivis

October 2017

Rev H

HISTORY AND STATUS OF THE DOCUMENT

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1. Introduction

1.1 Transport Impact Assessment Layout

KCTT have been requested to provide a Transport Impact Assessment for the Heritage Park Phase 2 project at Lots 986 and 993 Baldivis Road, Baldivis. The purpose of this document is to provide detailed commentary and analysis on the potential traffic and transport impact that the proposed development of this subject site may have on both the surrounding road and transportation networks. The scope of this report therefore is to provide a detailed assessment of the following: -

- Conduct an overview audit of the existing traffic infrastructure adjacent to and within the vicinity of the Structure Plan Area and provide commentary on how these road networks meet their existing functions.
- Make preliminary assessments on how the proposed Structure Plan Area land uses will impact these existing road networks.
- Nominate any improvements required in the local transport network to cater for the needs of the proposed Structure Plan Area land uses and functions.
- Produce a document which meets the requirements of "*Transport Assessment Guidelines for Developments – Volume 2: Structure Plans (August 2006)"* as prepared by the Department of Planning and Infrastructure on behalf of the Western Australian Planning Commission.

This Transport Impact Assessment is presented in the following logical sequence: -

- Section 1 – Introduction

This section provides a brief description on the role of this report in the Structure Planning process, the general layout of the report and a list of the guideline and reference documents used in its composition.

- Section 2 – Transport Impact Assessment

This section provides research and analysis of the key items required for submission of a Transport Impact Assessment for Structure Plans in accordance with the Transport Assessment Guidelines nominated above. In this section, KCTT have examined the following subject areas: -

- Section 2.1 – Structure Plan Outline

We provide a brief description of the Structure Plan Area and its proposed land uses.

- Section 2.2 – Existing Situation and External Traffic Networks

This section provides a description of the existing land uses within the Structure Plan Area and collates all available traffic data from both within, and external to the Structure Plan Area. The transportation networks are examined for a minimum 2km radius from the edge of the Structure Plan Area.

- Section 2.3 – Traffic Modelling for the Proposed Development

This section describes KCTT's 4-step model which is used to determine the future traffic generation / attraction to and from the proposed Structure Plan Area.

- Section 2.4 – Provision for Service Vehicles

This section will provide generic descriptions for service vehicle requirements throughout the Structure Plan Area. Each of the proposed land uses will be required to examine requirements for service vehicles, pending confirmation of the land uses proposed.

- Section 2.5 – Hours of Operation

This section will describe the general operating times for the land uses as they are proposed in the Structure Plan Area. This information will assist in determining the likely timing of the AM and PM peaks, and therefore the peak impact on the existing and surrounding transportation network. The peak vehicle generation is the key for determining intersection capacities within a road network.

- Section 2.6 – Public Transport Access

This section provides a summary of the existing public transportation services available within an 2km radius of the Structure Plan Area's boundaries and provides commentary on whether any services are likely to be extended into the Structure Plan Area.

- Section 2.7 – Pedestrian and Cyclist Access

This section provides a summary of the existing pedestrian and cyclist infrastructure available within an 2km radius of the Structure Plan Area's boundaries and provides commentary on the infrastructure likely to be extended into the Structure Plan Area.

- Section 2.8 – Management of Traffic Generated by the Structure Plan Area

This section summarises the expected traffic generated by the land uses as proposed in the Structure Plan Area and provides an assessment of the cumulative impact of the existing traffic volumes and the proposed traffic volumes as generated by the development.

- Section 3 – Transport Impact Assessment Checklist

This section provides a concise, tabulated summary and review of the detailed information presented in Section 2 of this report. The intention of this checklist is to document the findings of this report, and / or any of the likely transportation / safety issues which should be considered as part of the Heritage Park Phase 2 Project Area Plan submission. This checklist has been developed in accordance with the requirements of the Transport Assessment Guidelines for Developments: Structure Plan Submissions.

1.2 Notes Pertaining to This Report

This report has been provided as one of the key preliminary inputs into the overall documentation required for the MRS / TPS Rezoning and Subsequent Structure Planning approvals. Whilst the final site yields and land-uses are subject to change prior to the finalisation of the Structure Plan, the traffic and transportation requirements discussed in this report are based on the land uses and yields proposed through the Structure Planning process, in accordance with the Estate Structure Plan.

The following key points should be considered when reviewing the existing traffic volumes quoted in this report: -

- We have developed a traffic matrix by dwelling to increase the accuracy of the traffic generation from the Structure Plan Area.
- We have assumed that all landholdings within the Structure Plan Area will be fully developed under this scheme.

1.3 Available Information and Technical Literature

This section provides a brief description of the inputs used in the compilation of this report: -

- WAPC Transport Impact Assessment Guidelines – Volume 2 Structure Plans.
- WAPC Transport Impact Assessment Guidelines – Volume 5 (referenced for PM peak hour and traffic splits).
- RTA NSW Guide to Traffic Generating Developments Version 2.2 October 2002 (referenced to determine trip generation / attraction rates for various land uses).
- Guide to Traffic Management – Part 3: Traffic Studies and Analysis, Austroads, 2008 (referenced to discuss requirements for provision of car parking for various land use types, and how trip attraction / generation rates can be cross-checked in this report to provide a robust and consistent transportation model).
- Guide to Traffic Management – Part 11: Parking, Austroads, 2008 (referenced to discuss requirements for provision of car parking for various land use types, and how trip attraction / generation rates can be cross-checked in this report to provide a robust and consistent transportation model).
- Guide to Traffic Management – Part 12: Traffic Impacts of Developments, Austroads, 2008 (referenced to discuss requirements for provision of car parking for various land use types, and how trip attraction / generation rates can be cross-checked in this report to provide a robust and consistent transportation model).
- Liveable Neighbourhoods Element 2: Movement Network, October 2007 (referenced to discuss road reservation and carriageway requirements for the proposed road network within the structure plan area).
- AS/NZS 2890.1:2004 – Parking Facilities Part1: Off-street Car Parking
- AS 2890.2:2002 – Parking Facilities Part 2: Off-street Commercial Vehicle Facilities
- AS/NZS 2890.6:2009 – Parking Facilities Part 6: Off-street Parking for People with Disabilities
- City of Rockingham Town Planning Scheme No 2
- Baldivis Road Needs Study, Traffic and Infrastructure Report, Worley Parsons, City of Rockingham (6-Jul-05)

Structure Plan Areas in the vicinity of the subject site:

- Lots 569 & 1263 Baldivis Road, and Lot 21 Sixty Eight Road; Prepared for “Alcock Brown-Neaves Group” Prepared by Uloth and Associates, 17 September 2014;
- Lots 1006 & 1007 Baldivis Road, Baldivis; Prepared for ABN Group 131 Hasler Road; Osborne Park WA 6017; Prepared by KCTT (KC00393.000).

1.4 Executive Summary

- KCTT have been requested to provide a Transport Impact Assessment for the proposed development of Heritage Park Phase 2, between Serpentine Road and Furioso Green, approximately 2.5 kilometres south of Safety Bay Road, under jurisdiction of the City of Rockingham. The purpose of this document is to provide detailed commentary and analysis on the potential traffic and transport impact that the proposed development may have on the surrounding existing road network.

- The development proposes to subdivide Lots 986 and 993 Baldivis Road, Baldivis. The proposed development of Heritage Park Phase 2 includes the total of 283 residential lots and accompanying Public Open Space and Drainage Basins areas as shown in Appendix 1 of the report.

- The existing road network surrounding the subject landholdings include Serpentine Road to the south, Baldivis Road to the west, Kwinana Freeway to the east and Furioso Green to the north. The proposed Structure Plan Area does not have access or egress to Kwinana Freeway.

- In recent years the surrounding area has undergone a major transformation from generally rural to sub-urban area. PTA confirmed that it is reasonable to expect an upgrade in the existing bus service through the area given the growth of the population and the increased demand, providing us with information that route 566 will extend to the south to the Sixty Eight Road and Baldivis Road corner. Route 566 is proposed to commence in the North West corner of the intersection and travel to Warnbro Station. However, at the time of writing this report no definite timeframes are known.

- The *Section 2.3 Traffic Modelling for the Proposed Structure Plan Area* provides detailed description of how traffic volumes are calculated for the development options presented by Creative DP for the Structure Plan Area.

- The Structure Plan Area will generate approximately 2,547 vehicular movements per day with a forecasted impact of around 227 vehicles per hour in the peak hour when Structure Plan is completed; requiring a Transport Impact Assessment in accordance with WAPC Transport Impact Assessment Guidelines.

- Traffic volumes on the surrounding road network were determined based on the projected traffic volumes upon completion of the full proposed Structure Plan Area as well as the future developments of Lots 569 & 1263 Baldivis Road, and Lot 21 Sixty Eight Road, Baldivis prepared for “Alcock Brown-Neaves Group” and prepared by Uloth and Associates, and Lots 1006 & 1007 Baldivis Road, Baldivis; Prepared for ABN Group 131 Hasler Road; Osborne Park WA 6017 and prepared by KCTT (KC00393.000).

- Review of the TIA reports for the surrounding Structure Plan Areas (which were made available by the City of Rockingham) shows that this future development is likely to generate around 4,300 VPD and that the development of Lots 1006 & 1007 Baldivis Road will generate approximately 3,089 vehicular movements per day when Structure Plan Area is developed.

- All roads within the Structure Plan Area will have less than 2,000 VPD and the following classifications:

    - Access Street D1 (6m wide pavement, within 15.0m road reserve, with a standard 2m wide footpath on one side of the road only) - give way street with target speed 30kph; and

- Access Street D2 (6m wide pavement, within 13.0m road reserve, with a 2.5m wide dual use path on one side of the road) - give way street with target speed 30kph; and
- Access Street D3 (6m wide pavement, within 15.0m road reserve, with a 2.0m wide footpath on one side of the road) - give way street with target speed 30kph; and
- Neighbourhood Connector B1 (7.4m wide pavement, within 20m road reserve, with a 2.5m wide dual use path on one side of the road) - wider street with target speed less than 50kph.
- Neighbourhood Connector B2 (7.4m wide pavement, within 18m road reserve, with a 2.5m wide dual use path on one side of the road) - wider street with target speed less than 50kph.

- Access / egress points to the proposed development are as follows:
    - Four accesses / egresses with full movement unsignalised intersections south of the Structure Plan Area onto Serpentine Road;
    - Three accesses / egresses with full movement unsignalised intersections north of the Structure Plan Area onto Furioso Green.

- The proposed streets through the Structure Plan Area are good riding environments due to their low traffic volumes. Pedestrian paths should be provided on all road reservations within the Structure Plan Area, 2.5m wide Shared path should be provided on Serpentine Road and proposed Roads as listed: Road 2, portion of Road 5 adjacent to POS, Road 13 and Road 14.

- The Structure Plan Area has a strong connectivity to major road network including Kwinana Freeway and Safety Bay Road via Baldivis Road.

- The surrounding road network with all committed upgrades has more than sufficient capacity to cater for the proposed development. No adverse impact of the proposed development is expected.

2. Transport Impact Assessment

2.1 Structure Plan Outline

The development proposes to subdivide Lots 986 and 993 Baldivis Road, Baldivis. The landholdings are sized as follows:

- Area of lot 986 = 95,816m^2
- Area of lot 993 = 92,481.5m^2

The proposed development of Heritage Park Phase 2 includes the total of 283 residential lots and accompanying P.O.S. sized as follows-

- Residential lots:
  - 115 lots - varying in size from 320 – 449m^2,
  - 31 lots - varying in size from 450 – 499m^2,
  - 25 lots - varying in size from 500 – 549m^2,
  - 2 lots - varying in size from 550 – 599m^2,
  - 11 lots - varying in size from 600 – 699m^2,
  - 2 lots - varying in size from 3,000 – 3,999m^2.

- Public Open Space & Drainage Basin 1 on 2,2263ha and Drainage Basin 2 on 1,041m^2.

The layout of the proposed development is provided in Appendix 1 of this report.

2.1.1 Development Staging

Works in the proposed Heritage Park Phase 2 development will be undertaken within several stages. The construction is expected to commence in the second half of 2017.

The traffic volumes for this project will be modelled using the ultimate development scenario.

2.2 Existing Situation and External Traffic Networks

The existing road network surrounding the subject landholdings include Serpentine Road to the south, Baldivis Road to the west, Kwinana Freeway to the east and Furioso Green to the north. The proposed Structure Plan Area does not have access or egress to Kwinana Freeway. The sketch of the existing network and distribution of the existing traffic volumes is provided in Appendix 2 (Refer to KC00178.000_S01).

Baldivis Road is a two-way, two-lane undivided road, classified as a Rural Local Road / Distributor B in vicinity of the proposed Structure Plan Area, but increasing to Regional Distributer on the south of Serpentine Road. Legal speed limit is 80kph in the vicinity of the proposed Structure Plan Area, reducing to 70kph to the north approaching existing residential developments. There is no bus service running along this street in the vicinity of the subject site. Baldivis Road provides north-south connections to residential developments south of Safety Bay Road and extends parallel with Kwinana Freeway.

Serpentine Road is a two-way, two-lane road and is classified as a Rural Local Road / Access Road by Main Roads WA. The legal speed limit on Serpentine Road is 50kph. There is no bus service running along this street in the vicinity of the subject site. This road is cul-de-sac to the east.

Furioso Green is classified as an Urban Local Road / Access Road by MRWA. There are two bus services (Route No's 566 and 567) running along this street in the vicinity of the subject site. The legal speed limit on Furioso Green is 50kph.

The following existing traffic volume information has been sourced from Main Roads WA and the City of Rockingham.

Table 1 - Traffic Volumes for Roads Adjacent to the Subject Site

Road Name	Functional Classification / Road Hierarchy	Location of Traffic Count	Vehicles Per Day (VPD)	Vehicles per Peak Hour (VPH)	Heavy Vehicle %	Year	Legal Speed Limit
Baldivis Road	Rural Local Road / Regional Distributer	North of Sixty Eight Road [SLK 2.93]	5,755	AM 08:00 - 553 PM 14:45 - 487	17.9	Sep 2014	80kph
		South of Sixty Eight Road [SLK 2.93]	4,869	AM 07:15 - 382 PM 16:45 - 454	n/a	Apr 2010	
		South of Kwinana Freeway [SLK 6.73]	12,183	AM 06:30 - 950 PM 16:00 -1,063	10.6	Oct 2006	
		200m south of Karnup Road*	4,704	AM 08:00 - 328 PM 16:00 - 386	n/a	Sep 2015	80kph
Safety Bay Road	Significant Urban Local Road / Distributor A	West of Baldivis Road [SLK 14.99]	25,795	AM 06:15 - 2,113 PM 16:00 - 2,200	7.4	Oct 2006	70kph
		West of Kwinana Freeway [SLK 15.70]	25,662	AM 06:15 - 2,297 PM 16:30 - 2,443	9.5	Nov 2014	
Kwinana Freeway	Rural Highway / Primary Distributor	At Safety Bay Road [SLK 41.62]	38,349	AM 06:00 - 2,908 PM 15:45 - 2,970	14.5	Oct 2014	100kph
		North of Karnup Road [SLK 46.69]	51,148	AM 06:30 - 3,494 PM 15:15 - 3,907	10.5	Nov 2014	110kph
		At Karnup Road Bridge [SLK 47.53]	39,454	AM 06:15 - 2,685 PM 15:30 - 3,174	13.6	Oct 2014	
Karnup Road	Rural Local Road / Regional Distributor	East of Kwinana Freeway [SLK 0.97]	2,502	AM 07:30 - 205 PM 15:30 - 242	12.9	Sep 2012	70kph

		East of Baldivis Road [SLK 0.00]	6,051	AM 07:15 - 503 PM 15:30 - 555	20.9	Sep 2014	
Serpentine Road	Rural Local Road / Access Road	East of Young Road*	77	AM 09:00 - 7 PM 15:00 - 8	n/a	Sep 2013	50kph
Sixty Eight Road	Rural Local Road / Local Distributer	West of Eighty Road* [SLK 1.47]	2,537	AM 11:00 - 194 PM 16:00 - 203	n/a	Oct 2013	70kph
Smirk Road	Urban Local Road / Access Road	n/a*	2,636	AM 11:00 - 189 PM 16:00 - 249	n/a	Oct 2014	50kph
Nairn Drive	Significant Urban Local Road / Local Distributor	n/a*	1,622	AM 11:00 - 121 PM 15:00 - 150	n/a	Oct 2014	70kph

*Note * Values have been provided by the City of Rockingham.*

Formal peak hour data has been recorded and is shown in Table 1.

An analysis of available traffic data in the vicinity of the proposed Structure Plan Area suggests: -

Baldivis Road (North of Sixty Eight Road):

- AM peak occurs in the period between 08:00-09:00. Traffic volumes in the AM peak are approximately 9.61% of total daily volumes;
- PM peak occurs in the period between 14:45-15:45. Traffic volumes in the PM peak are approximately 8.46% of total daily volumes.

The road geometry for Baldivis Road is undergoing significant change as proposed in the Baldivis Road Needs Studies that have been commissioned by the City of Rockingham since 2005. The proposed cross sectional geometry for Baldivis Road in the future urban context is as follows: -

- 20 to 25 metre road reserve width;
- 3.5 metre wide vehicle lanes with 1.5 metre wide bicycle lanes;
- 2.0 metre wide median.

In this configuration there is enough room for left turn deceleration lanes to be provided within the road reserve. Where right turn deceleration lanes may be required due to larger volumes of right turn movements, some localized adjustments to the horizontal geometry is required.

2.2.1 Crash Data

According to MRWA data base there were no crashes recorded on the existing roads abutting the subject site in period 01.01.2012 – 31.12.2016. The search was completed for following roads (Furioso Green, Serpentine Road, Balddivis Road (between the intersections with Serpentine Road and Palomino Parade).

2.3 Traffic Modelling for the Proposed Structure Plan Area

This section provides a detailed description of how traffic volumes are calculated for the development option presented by Creative DP for the Structure Plan Area. Our traffic model uses a 4-step approach for the estimation of transportation demand into and out of the Structure Plan Area: -

- Step 1 – Confirm the size and quantum of the proposed land uses.
- Step 2 – Confirm how these land uses impact travel patterns and the generation / attraction of transportation trips.
- Step 3 – Confirm where the likely origins of travel external to the development are located and confirm the likely destinations for travel from the subject landholdings.
- Step 4 – Distribute the traffic through the network.

The purpose of the Transport Impact Assessment is to determine the likely impact of the proposed development upon the local road network within an 800 metre radius of the Structure Plan Area.

2.3.1 Step 1 – Quantum of Proposed Land Uses

The Structure Plan proposes homogeneous usage of the landholdings for residential land use purposes. Details and quantities of these areas are laid out in Appendix 1.

Different land uses impact the transportation network in different ways. The purpose of this section is to discuss the land usages as proposed within the Structure Plan Area and to discuss their likely trip generations based on data from trusted guideline sources such as the WAPC Transport Assessment Guidelines and the NSW RTA Guide to Traffic Generating Developments.

The WAPC Transport Assessment Guidelines for Developments offers the following vehicle trip generation rates for the land uses proposed within the development: -

- **Residential** - 0.8 vehicular trips per dwelling for the AM and PM peak hours. An 80% IN/ 20% OUT split has been adopted for the AM peak and a 67% IN / 33% OUT split for the PM peak hour.

Given that the WAPC Transport Assessment Guidelines for Developments does not offer daily vehicle trip generation rates for the land uses proposed within the development, the following rates are provided in the NSW RTA Guide to Traffic Generating Developments:

- **Residential** - from 4 vehicular trips to 9 vehicular trips per dwelling.

The NSW RTA Guide to Traffic Generating Developments suggests developments of this type in Sydney tend to generate between 4 and 5 vehicular trips per dwelling. In Perth, the Department of Planning and Infrastructure conducted a series of studies in the late 1990's / early 2000's which showed that higher density dwellings tended to average closer to 5.5 vehicle movements per day. These studies assumed that anywhere between 50% and 60% of commuters were travelling to the work by car as a driver. Having in mind that there will be no facilities within the structure plan that have a walkable catchment, such as shops, train station and the like, KCTT believe that a rate of 9 vehicular trips per dwelling is suitable for all residential lots within the proposed subdivision area.

The following table outlines the traffic generation of the proposed development based on the above rates.

Table 2 - Proposed Land Uses within the Structure Plan Area and the Projected VPD

Land Use Type	Yield	Daily Trip Generation	Peak Hour Generation	Total VPD	Total VPH (peak)
Residential lots	283	9 vehicle trips per day	0.8 in the peak hour	2,547	227
Total				**2,547**	**227**

2.3.2 Step 2 – Trip Purposes

To understand the likely demand for alternative transportation modes (including public transportation trips, cyclist and pedestrian trips) and the impact of vehicular traffic on the adjacent road network, we need to understand why people are travelling into and out of the Structure Plan Area. These general trip purposes include employment, shopping, social, education and other general purposes. Each land usage will generate a unique matrix of trip purposes. For example, the following table shows the likely percentage share for different trip purposes based on the land usage: -

Table 3 - Trip Purposes by Land Use

Land Use Type	Employment	Shopping	Education / Childcare Purposes	Social / Recreational
Residential lots	40%	25%	17.5%	17.5%

2.3.3 Step 3 – Expected Origin / Destination

The expected origin / destination matrix is important to determine the likely route of vehicular and other travel.

Table 5 below describes the expected trip purposes for trips generated by the proposed land uses within the Structure Plan Area and the likely destinations.

Table 4 - Table of Trip Purposes and Likely Destinations

Trip Purpose	Likely Destination
• Employment	The economic profile of the City of Rockingham shows that according to the latest census 73.5% of the people employed within the LGA of the City of Rockingham reside within the City of Rockingham. Approximately 25% of people employed within the City of Rockingham live outside. Employment locations of residents: o Rockingham - 37 % o Kwinana - 7.8 % o Cockburn - 6.8 % o Perth (Inner) - 3.7 % o Canning - 3.5 % Refer to: http://profile.id.com.au/rockingham/workers It can be expected that the following roads will be predominantly used: - Furioso Green / Baldivis Road / Safety Bay Road - Furioso Green / Baldivis Road / Safety Bay Road / Kwinana Freeway - Serpentine Drive / Baldivis Road / Sixty Eight Road Refer to KC00178.000 S01.
	Journey to work data (City of Rockingham): -

	• Car as Driver - 62.9% • Car as Passenger - 6.1% • Train - 6.5% • Bus - 1.8% • Walking - 1.8% • Bicycle - 0.5%
• Shopping	• Existing Stockland Baldivis Shopping Centre is located approximately 2.5 km to the north of the subject site. • The Avalon (Smirk Road North) LSP to the west of the subject development includes the future commercial and community purpose sites. • Parkland Heights LSP to the west of the subject development includes the future Neighbourhood Centre.
• Education	• Rivergums Primary School is located to the north-east of the subject landholdings (approximately 1000 metres) and will have an impact on all local travel for education purposes at primary school level. • LSP of the proposed development to the west of the subject development (west of Baldivis Road) includes the future primary school. • Baldivis Secondary College is located approximately 1.5km to the north of the subject site, and given its regional stature is likely to be the key attractor of traffic generation through the development from Baldivis Road, Heritage Park Drive and Crinia Drive. • Tranby College is located approximately 3km to the northwest of the subject site. • Additional primary and secondary schools are planned in the surrounding developments.
• Social / Recreational	• It is deemed that a minimum of 90% of the trips for social and recreational purpose will be external.

2.3.4 Step 4 – Destination Matrix and Distribution of Traffic / Transport

This section provides a summary of the likely trip generation by transportation mode from the Structure Plan Area, based on the land uses proposed. Land uses within the proposed Structure Plan Area can be generally classified as trip generators (residential land use). The Structure Plan Area is expected to generate 100% of all trips from internal sources.

2.4 Provision for Delivery and Service Vehicles

It is expected that the delivery and service vehicles (such as waste removal vehicles) servicing the residential area will not require designated parking space given that they can operate safely within the road reserve.

2.5 Hours of Operation

The purpose of this section is to discuss the expected hours of operation for the various land uses proposed, such that a theoretical peak hour traffic generation can be determined. The majority of land uses within the Structure Plan Area are residential.

In the short-term it is likely that AM and PM peaks will coincide with journey to / from work times. As such morning and afternoon peaks are likely to be around 7:00am to 9:00am and 4:00pm to 6:00pm during work days.

2.6 Management of Traffic Generated by the Structure Plan Area

Based on an analysis of employment opportunities, location of schools, shopping centres and preferred locations for social and recreational activities KCTT believe the traffic will be distributed from the Structure Plan Area into the adjacent road network as follows: -

- **60%** at Baldivis Road to / from the north of the proposed Structure Plan Area (Baldivis Road / Safety Bay Road and Kwinana Freeway)
- **35%** at Baldivis Road to / from the south of the proposed Structure Plan Area (Baldivis Road / Sixty Eight Road and Karnup Road)
- **5%** at Heritage Park Drive to / from the north of the proposed Structure Plan Area.

The following tables consider the traffic generation from the Structure Plan Area and its impact upon the existing road network and upon the proposed road network within the Structure Plan Area.

Table 5- Forecasted Traffic Volumes on Existing Roads within and Adjacent to the Structure Plan Area

Road Name	Functional Classification / Road Hierarchy	Location of Traffic Count	Vehicles Per Day (VPD)	Estimated traffic growth – 2020 (VPD)	Estimated traffic growth – 2030 (VPD) plus future development in surrounding	Traffic generated / attracted by the Structure Plan Area (VPD)	Total Traffic – 2030 with proposed development
Baldivis Road *	Rural Local Road / Regional Distributer	North of Sixty Eight Road	5,755 [2014]	8,637	18,548	560	19,108
		South of Sixty Eight Road	4,869 [2010]	9,580	20,588	548	21,136
		200m south of Karnup Road	4,704 [2015]	6,597	13,349	127	13,476
Safety Bay Road	Significant Urban Local Road / Distributor A	West of Baldivis Road	25,795 [2006]	39,017	53,055	509	53,564
		West of Kwinana Freeway	25,662 [2014]	30,641	41,241	51	41,292
Kwinana Freeway	Rural Highway / Primary Distributor	At Safety Bay Road	38,349 [2014]	45,791	61,879	280	62,159
		North of Karnup Road	51,148 [2014]	61,073	82,355	229	82,584
		At Karnup Road Bridge	39,454 [2014]	4,7110	63,558	204	63,762
Karnup Road	Rural Local Road /	East of Kwinana Freeway	2,502 [2012]	3,169	4,352	76	4,428

	Regional Distributor	East of Baldivis Road	6,051 [2014]	7,225	11,096	433	11,529
Serpentine Road	Rural Local Road / Access Road	East of Young Road	77 [2013]	94	126	0	126
Sixty Eight Road	Rural Local Road / Local Distributer	West of Eighty Road	2,537 [2013]	3,120	5,116	408	5,524
Smirk Road	Urban Local Road / Access Road	n/a	2,636 [2014]	3,147	4,259	25	4,284
Nairn Drive	Significant Urban Local Road / Local Distributor	n/a	1,622 [2014]	1,937	2,634	25	2,659

Note- rate of 3% traffic growth is used for all analysed roads except Baldivis Road where 7% growth rate is used to meet the forecasted traffic volumes suggested by City of Rockingham.*

As shown in Table 5 (above) total traffic volume for Baldivis Road (in vicinity of the intersection with Serpentine Road) is forecasted as around 20,000 vehicles per day in 2030 (requested as part of the Structure Plan Minor Modifications issued by WAPC).

According to the Table 3 – ''Function and characteristic of arterial routes'' from Liveable Neighbouroods, Integrator B can carry up to 20,000VPD. Therefore the current road reservation of Baldivis Road (30m in vicinity of the intersection with Serpentine Road) is able to accommodate this traffic forecast within an Integrator B type.

Table 6 - Forecasted Traffic Volumes on Proposed Roads within the Structure Plan Area

Road Name	Classification	Cross Section (Liveable Neighbourhoods)	Traffic generated / attracted by the Structure Plan Area (VPD)	Forecast Vehicles per Peak Hour (VPH)
Furioso Green (east of Road 01)	Access Road B	2 x 4.5m lanes, 2m median and 2m wide paths on the both sides in 20.0m road reservation.	1,399	124
Serpentine Road (east of Road 01)	Neighbourhood Connector B	KCTT recommend keeping the existing 20m wide reservation, which consist of a centred 7.4m carriageway (2 x 3.7m lanes) and 2.5m wide Shared path on the northern side	815	73
Road 01	Access Road D3	6m road width in 15m wide reservation	187	17
Road 02	Neighbourhood Connector B	7.4m road width in 20m wide reservation, adjacent to POS in 18m road reservation	954	85

Road 03a	Access Road D1	6m road width in 15m wide reservation	162	14
Road 03b	Access Road D1	6m road width in 15m wide reservation	81	7
Road 04	Access Road D	6m road width in 15m wide reservation (D1), adjacent to POS in 13m road reservation (D2)	328	29
Road 05	Access Road D	6m road width in 15m wide reservation (D1), adjacent to POS in 13m road reservation (D2)	45	4
Road 06	Access Road D1	6m road width in 15m wide reservation	135	12
Road 07	Access Road D1	6m road width in 15m wide reservation	117	10
Road 08	Access Road D1	6m road width in 15m wide reservation	117	10
Road 09	Access Road D1	6m road width in 15m wide reservation	126	11
Road 10	Access Road D1	6m road width in 15m wide reservation	108	10
Road 11	Access Road D1	6m road width in 15m wide reservation	99	9
Road 12	Access Road D1	6m road width in 15m wide reservation	90	8
Road 13	Access Road D2	6m road width in 15m wide reservation	198	18
Road 14	Access Road D	6m road width in 15m wide reservation	54	5

Note - Serpentine Road is expected to carry a total of 2,275 VPD with all development sites included (815 from the proposed development + 1,460 from the development of Lots 1006 & 1007 Baldivis Road, Baldivis).*

Maps showing the proposed road hierarchy and the expected traffic generation by the development are provided in Appendix 2.

The Baldivis Road Needs Study proposes that Baldivis Road should be developed in future as a Local Distributor (Neighbourhood Connector). Further to that, traffic calming devices are proposed to be provided along these roads to manage vehicular speeds to a more appropriate level consistent with an urbanized area. The Study also confirms the intersection of Serpentine Road and Baldivis Road as being suitable for the provision of a roundabout, having in mind that Serpentine Road is expected to carry a total of 2,275 VPD with all development sites included (815 from the proposed development + 1,460 from the development of Lots 1006 & 1007 Baldivis Road, Baldivis).

Therefore, the following intersection controls are proposed as follows:

- Furioso Green / Baldivis Road – channelised sign controlled intersection;
- Furioso Green / Heritage Park Drive / Road 01 – sign controlled intersection, splitter islands recommended;
- Furioso Green / Campolina Avenue / Road 02 – round-about intersection, splitter islands recommended;

- Furioso Green / Road 04 – sign-controlled intersection, splitter islands recommended;
- Serpentine Road / Road 01 – sign-controlled intersection;
- Serpentine Road / Road 02 – sign-controlled intersection;
- Serpentine Road / Road 05 – sign-controlled intersection;
- Serpentine Road / Road 04 – sign-controlled intersection;
- All other intersections internal to the structure plan area can be configured as yield intersections.

2.6.1 Cross Sections within Structure Plan Area

All roads within the Structure Plan Area will have less than 2,000 VPD and the following classifications:

- Access Street D1 (6m wide pavement, within 15.0m road reserve, with a standard 2m wide footpath on one side of the road only) - give way street with target speed 30kph; and
- Access Street D2 (6m wide pavement, within 13.0m road reserve, with a 2.5m wide dual use path on one side of the road) - give way street with target speed 30kph; and
- Access Street D3 (6m wide pavement, within 15.0m road reserve, with a 2.0m wide footpath on one side of the road) - give way street with target speed 30kph; and
- Neighbourhood Connector B1 (7.4m wide pavement, within 20m road reserve, with a 2.5m wide dual use path on one side of the road) - wider street with target speed less than 50kph.
- Neighbourhood Connector B2 (7.4m wide pavement, within 18m road reserve, with a 2.5m wide dual use path on one side of the road) - wider street with target speed less than 50kph.

The following figures show the typical cross-sections within the proposed development. All roads have been classified in accordance with Liveable Neighbourhoods requirements.

Figure 1 - Access Street D1

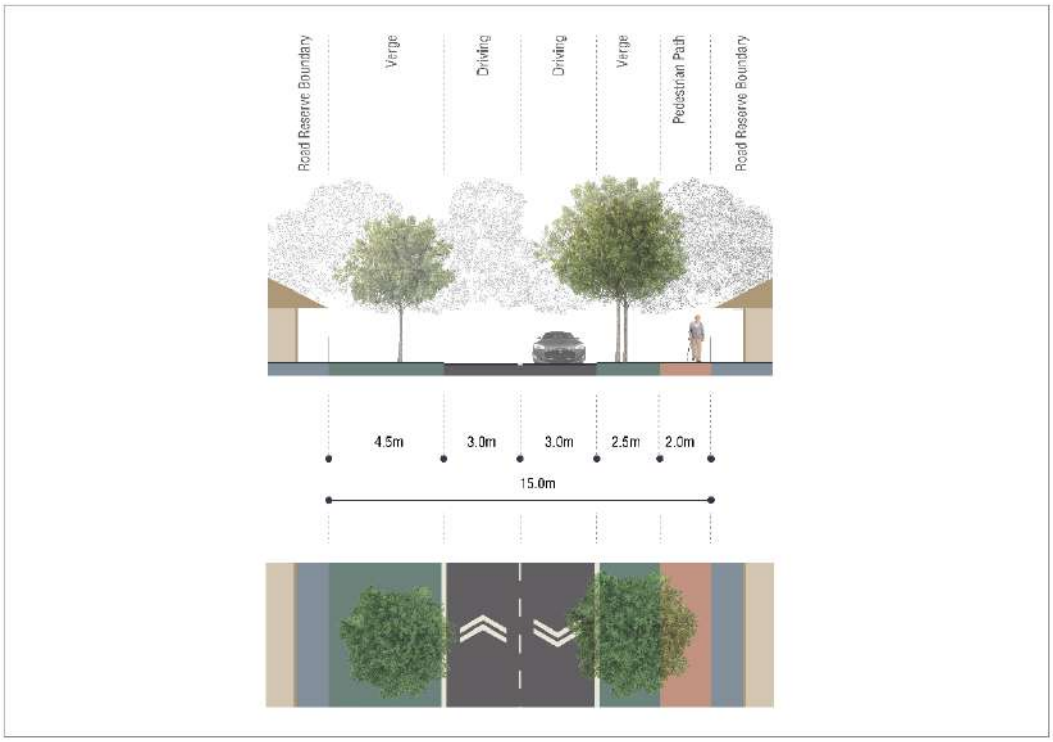


Figure 2 - Access Street D2

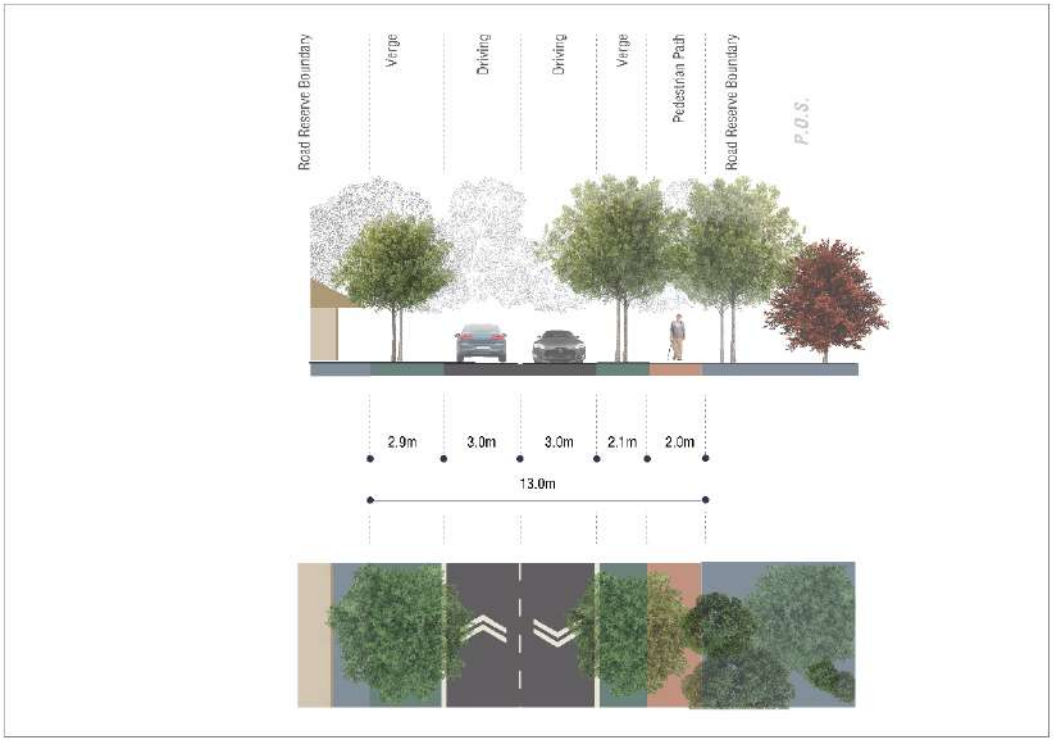


Figure 3 - Access Street D3

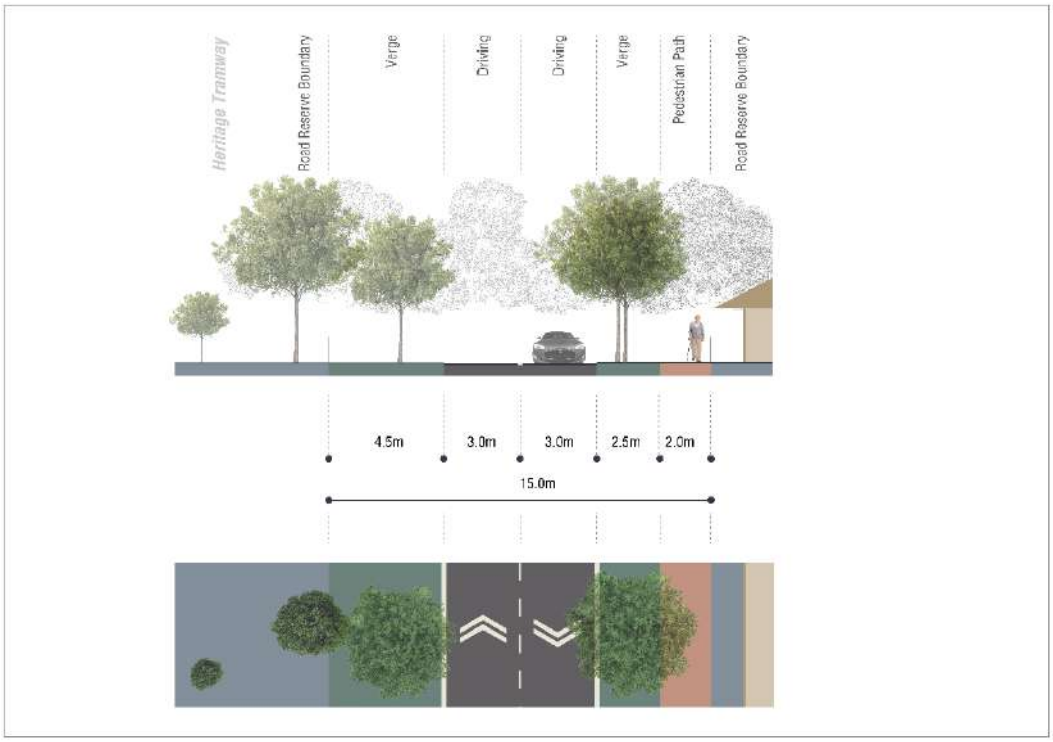


Figure 4 - Neighbourhood Connector B1

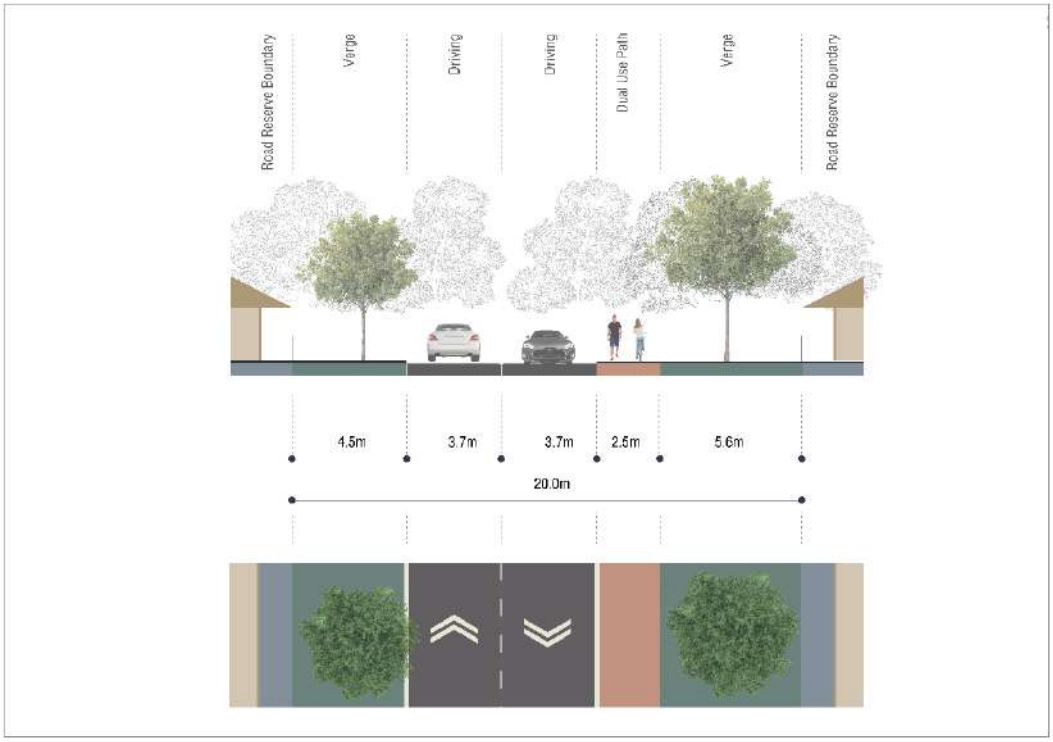
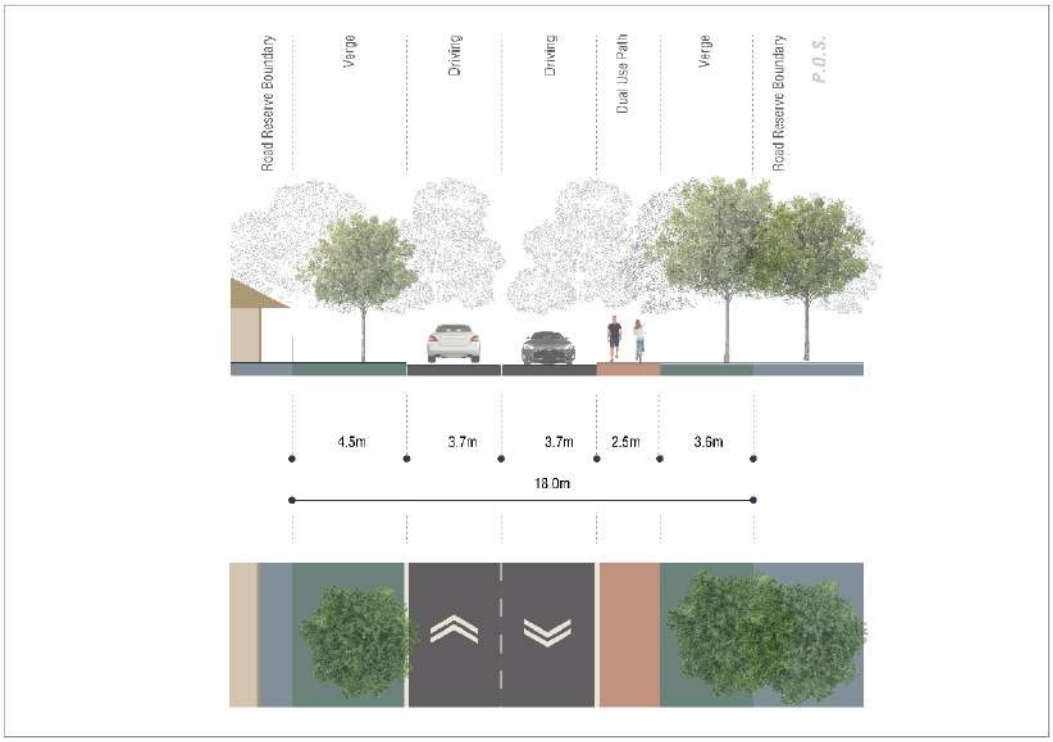


Figure 5 - Neighbourhood Connector B2- variation adjacent to POS



Serpentine Road is an existing road with a 20m road reserve. The future traffic on Serpentine Road is estimated to be 2,275 VPD (815 from the proposed development + 1,460 from the development of Lots 1006 & 1007 Baldivis Road, Baldivis). The target speed limit on Serpentine Road is 40kph. This road is cul-de-sac to the east. The figure 4 - Neighbourhood Connector B1 shows the cross-section of Serpentine Road as KCTT recommended.

2.6.2 Traffic calming

Road 01 and Road 04 appear to be Access Streets that exceed 500 metres in length. In order to keep the operating speeds to a desired level (40kph – 50kph), traffic calming measures are welcome therefore appropriate 'slow points' should be installed as required along above noted roads.

KCTT have reviewed Guide to Traffic Management Part 8 and AS1743.13 regarding the possible traffic calming treatments. Below are some suggestions that can be considered: -

- Road humps (curved or flat) – Vertical deflection devices that reduce speeds, traffic volume and crash risk;
- Road cushions – Vertical deflection devices that reduce speeds, traffic volume and crash risk concurrently increasing bicycle safety;
- Paved intersections (change of tactile surface) – visual and tactile cue to change of the environment;
- Raised intersections – physical obstacles that force vehicles to slow down, commonly used for pedestrian crossings;
- Blister islands / horizontal delineation slow points – physical obstacles forcing vehicles to slow down, commonly used in conjunction with vegetation retention plans;

- Provision of on-street parking.

Road humps and blister islands should be applied only mid-block. Although there are intersections along these roads, they will be yield intersections. The type of calming devices can be combined to create pleasing urban setting, also the combination of different types of paving materials will give a strong visual and audio cue on change of the environment sending clear message to reduce operative speed.

The exact design of the device and traffic management plan are subject to detail design.

2.7 Public Transport Access

This section describes the accessibility to public and alternative modes of transportation. KCTT have reviewed Transperth and Walk Score for the information found below.

2.7.1 Transperth Bus Routes

The following public transport routes are within proximity of the subject site. The key information provided below includes: -

- Bus route number;
- Description of the bus route; and
- Their indicative peak and off-peak frequencies.

These bus routes are available within a 2km radius vicinity:

- To the west: Bus route No's 564 and 565;
- To the north: Bus route No's 566 and 567.

Table 7 - Bus Routes and Frequencies

Bus Route	Description	Peak and Off-Peak Frequencies		
		Monday to Friday	Saturday	Sunday
564	Warnbro Station - Baldivis via Arpenteur Drive	10 minutes	60 minutes	60 minutes
565	Warnbro Station - Baldivis via Nairn Drive	20 minutes	60 minutes	60 minutes
566	Warnbro Station - Baldivis via Makybe Drive	20 minutes	60 minutes	120 minutes
567	Warnbro Station - Baldivis via Rivergums Boulevard	20 minutes	60 minutes	60 minutes

2.7.2 Accessibility to Public Transportation

The following table highlights the proximity of the various bus routes to the subject site and highlights the "walkability" to alternative transport modes. This information has been sourced from "Walk Score" at http://www.walkscore.com

Table 8 - Bus Route Description and Walkable Distance to / from the Subject Site

Bus Route	Description	Distance from Subject Site
564	Warnbro Station – Baldivis via Arpenteur Drive	2.0 km
565	Warnbro Station – Baldivis via Nairn Drive	1.4 km
566	Warnbro Station – Baldivis via Makybe Drive	0.0 km

567	Warnbro Station – Baldivis via Rivergums Boulevard	0.0 km

The nearest railway station is currently not in walking distance of the subject landholdings.

The existing bus routes service the existing established areas of Baldivis to the north of the Structure Plan area, namely the Settlers Hill development, the existing Stockland Shopping Centre and the local schools in the area. It is expected that as urban development continues south of these areas that local bus services will be extended.

In recent years the surrounding area has undergone a major transformation from generally rural to sub-urban area. PTA confirmed that it is reasonable to expect an upgrade in the existing bus service through the area given the growth of the population and the increased demand, providing us with information that route 566 will extend to the south to the Sixty Eight Road and Baldivis Road corner. Route 566 is proposed to commence in the North West corner of the intersection and travel to Warnbro Station. However, at the time of writing this report no definite timeframes are known.

The map of existing public transportation routes is provided in Appendix 2.

2.8 Pedestrian and Cyclist Access

There are no separate pedestrian and cyclist paths provided along the roads adjacent to the proposed development. Given the location and the proposed land use within the subject site, we believe that there would be requirement for pedestrian and cyclist paths in the future, but for now the traffic is predominantly vehicular.

There are no footpaths adjacent to the Structure Plan Area. The footpaths are provided in the residential area north of the proposed development.

The proposed streets through the Structure Plan Area are good riding environments due to their low traffic volumes. Pedestrian paths should be provided on all road reservations within the Structure Plan Area.

2.8.1 Pedestrian and cyclist provision

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 developments, having regard for the need to service schools, shops, recreation and other land uses as well as public transport access points.

The Access Streets should provide footpaths or shared paths, in accordance with Liveable Neighbourhoods, as KCTT recommended in Section 2.8.1. Cross Section.

The following is a list of the major bicycle infrastructure within a 2km radius of the subject site: -

- Baldivis Road is classified as PBN "Good Road Riding Environment" route.
- Principal Shared Path along Kwinana Freeway.
- Bridal Trail (2m) in the Baldivis Road Tramway Reserve.

As the Structure Plan Area is further developed pedestrian / cycle networks would be required along: -

- Heritage Park Drive
- Furioso Green
- Serpentine Road

All internal roads classified as Access Street D within structure Plan Area would have 2m wide footpath on one side of the road only. Alternation of Access Street D is made for roads adjacent to P.O.S. which would have 2.5m wide dual use path on one side of the road reserve.

According to *'Baldivis Road Needs Study'* Baldivis Road is proposed to have Cycle Lanes and a Pedestrian Shared Path. The same study states: - *The town centre will be planned in a pedestrian friendly manner and should benefit from good pedestrian / cyclist and public transport connections to surrounding residential area.* The proposed development is situated approximately 2.5 km to the south from the Baldivis Town Centre mentioned above, which equates to a 15 minute bicycle ride.

Pedestrian / cyclist networks that are to be provided should be tied into the regional and district path network. Linkages along Heritage Park Drive and Road 01, Serpentine Road and Furioso Green within the Structure Plan Area will provide direct connection to Makybe Rise Primary School to the northwest of the Structure Plan Area and to Baldivis Secondary College to the north of the Structure Plan Area. Standard 2.0m wide paths along specified streets are suitable as pedestrian linkages. Heritage Park Avenue, Campolina Avenue and Furioso Green (boulevard section) have larger carriageways which can safely accommodate local cycling traffic.

Pedestrian / Cyclist Networks should be interconnected also with the adjacent Heritage Park Estate to the north and the Highbury Park Development to the northwest. It is also considered desirable to extend the Bridal Trail that is being gradually constructed within the Tramway Reservation past the proposed development. Serpentine Road should provide a connection for the proposed Shared Path along Baldivis Road and the existing Principal Shared Path along Kwinana Freeway. Therefore, KCTT recommend 2.5m wide Shared path on Serpentine Road and proposed Roads as listed: Road 2, portion of Road 5 adjacent to POS, Road 13 and Road 14.

Pedestrian and cyclist routes in the area are shown in detail on Plan S10 in Appendix 2 for clarity.

3. Transport Impact Assessment Checklist for a Structure Plan

The following is the summary / checklist for a Transport Impact Assessment as shown in the Department for Planning and Infrastructure's Transport Assessment Guidelines – Part 2: Structure Plans.

Item	Status	Comments / Proposals
Summary	Y	The development proposes to subdivide Lots 986 and 993 Baldivis Road, Baldivis into the total of 283 residential lots and Public Open Space with drainage basins areas as shown on Appendix 1 for clarity.
Introduction / Background	Y	KCTT have completed a Transport Impact Assessment using the data from the Structure Plan Area. We have completed this report and all supporting graphics in accordance with the full requirements of the WAPC Guidelines for the preparation of a Transport Impact Assessment – Part 2 (Structure Plans).
Structure Plan Proposal	Y	The Structure Plan Area proposal area includes land uses as shown in Section 2.1 of this report.
Regional Context	Y	Heritage Park Phase 2 is immediately adjacent to a new residential settlement (Heritage Park). The proposed development land-uses fit within the context of the region. Karnup and Port Kennedy are located approximately 6km to the west and southwest of the subject site, Warnbro is located approximately 5km to the northwest, and Rockingham is located approximately 10 km to the northwest.
Proposed Land Uses	Y	Proposed land uses are described in Structure Plan Area Proposal, noted above.
Table of Land Uses and Quantities	Y	Refer Structure Plan Area Proposal noted above.
Major Attractors / Generators	Y	The major trip generators in this locality will be: - • Residential – likely peaks around 7:00am to 9:00am and 4:00pm to 6:00pm Mondays to Fridays on Baldivis Road, Furioso Green and Serpentine Road. No trip attractors – residential land uses only.
Specific Issues	N	No specific issues.
Existing Situation		
Existing Land Uses Within the Structure Plan Area	Y	The existing site is vacant land.

Existing Land Uses Within 800 metres of the Structure Plan Area	Y	Existing residential development immediately to the north (Heritage Park) and the existing residential development (Highbury Park Estate) to the north - west. Land uses clearly detailed on plan KC00178 .000_S01.
Existing Road Network Within the Structure Plan Area	Y	The Structure Plan Area includes the following existing road network immediately adjacent to the Structure Plan Area: - • Baldivis Road • Serpentine Road • Furioso Green
Existing Pedestrian / Cyclist Network Within the Structure Plan Area	Y	The following is a list of the major infrastructure within an 2km radius of the subject site: - • Baldivis Road is classified as PBN "Good Road Riding Environment" route. • Principal Shared Path along Kwinana Freeway. • Bridal Trail (2m) in Tramway Reserve. Refer Appendix 2.
Existing Public Transport Services Within the Structure Plan Area	N	None
Existing Road Network Within 800 metres of the Structure Plan Area	Y	The existing road network surrounding the subject landholdings include Serpentine Road to the south, Baldivis Road to the west, Kwinana Freeway to the east and Furioso Green to the north. The sketch of the existing network within 2km of the Structure Plan Area is provided in Appendix 2 (Refer to KC00178.000_S01).
Traffic Flows on Roads Within the Structure Plan Area (including AM / PM peak flows)	Y	Refer Section 2.2
Traffic Flows On Roads Within 800 metres of the Structure Plan Area	Y	Refer Section 2.2
Existing Pedestrian / Cycle Paths Within 800 metres of the	Y	The following is a list of the major bicycle infrastructure within an 2km radius of the subject site: - • Baldivis Road is classified as PBN "Good Road Riding Environment" route.

Structure Plan Area		• Principal Shared Path along Kwinana Freeway. • Bridal Trail (2m) in the Baldivis Road Tramway Reserve.
Existing Public Transport Routes Within 800 metres of the Structure Plan Area	Y	Existing public transportation services are available north of the Structure Plan Area including: - • Route 566 - Warnbro Station – Baldivis via Makybe Drive, with peak frequencies 20 minutes. • Route 567 – Warnbro Station to Baldivis via Rivergums Boulevard, with peak frequencies 20 minutes.
Proposed Internal Transport Networks		
Changes / Additions to existing road network or proposed road network	Y	All internal roads in accordance with Liveable Neighbourhoods.
Road reservation widths	Y	All internal roads will be between 13metre and 20 metre road reserve width with varying pavement widths.
Road cross sections and speed limits	Y	All speed limits to be between 30kph and 50kph.
Intersection controls	Y	All intersections will allow full turning movements.
Pedestrian / cycle networks and crossing facilities	Y	Pedestrian / cyclist networks that are to be provided should be tied into the regional and district path network. Refer Section 2.7 for more details.
Public transport routes	Y	In recent years the surrounding area has undergone a major transformation from generally rural to sub-urban area. PTA confirmed that it is reasonable to expect an upgrade in the existing bus service through the area given the growth of the population and the increased demand, providing us with information that route 566 will extend to the south to the Sixty Eight Road and Baldivis Road corner. Route 566 is proposed to commence in the North West corner of the intersection and travel to Warnbro Station. However, at the time of writing this report no definite timeframes are known.
Changes to External Transport Networks		
Road Networks	N	No change proposed.

Intersection Controls	Y	The road geometry for Baldivis Road is undergoing significant change as proposed in the Baldivis Road Needs Studies that have been commissioned by the City of Rockingham since 2005. The proposed cross sectional geometry for Baldivis Road in the future urban context is as follows: - • 20 to 25 metre road reserve width; • 3.5 metre wide vehicle lanes with 1.5 metre wide bicycle lanes; • 2.0 metre wide median. In this configuration there is enough room for left turn deceleration lanes to be provided within the road reserve. Where right turn deceleration lanes may be required due to larger volumes of right turn movements, some localised adjustments to the horizontal geometry is required.
Pedestrian Cycle Networks and Crossing Facilities	Y	Existing cycle networks have been noted. As the Structure Plan Area is further developed internal pedestrian / cycle networks would be required along: - • Heritage Park Drive • Road 02 • Furioso Green • Serpentine Road Pedestrian / cyclist networks that are to be provided should be tied into the regional and district path network. Linkages along Heritage Park Drive and Road 02, Serpentine Road and Furioso Green within the Structure Plan Area will provide direct connection to Makybe Rise Primary School to the northwest of the Structure Plan Area and to Baldivis Secondary College to the north of the Structure Plan Area. Standard 2.0m wide paths along specified streets are suitable as pedestrian linkages. Heritage Park Avenue, Campolina Avenue and Furioso Green (boulevard section) have larger carriageways which can safely accommodate local cycling traffic. Pedestrian / Cyclist Networks should be interconnected also with the adjacent Heritage Park Estate to the north and the Highbury Park Development to the northwest. It is also considered desirable to extend the Bridal Trail that is being gradually constructed within the Tramway Reservation past the proposed development. Serpentine Road should provide a connection for the proposed Shared Path along Baldivis Road and the existing Principal Shared Path along Kwinana Freeway. KCTT recommend 2.5m wide Shared path on Serpentine Road and proposed Roads as listed: Road 2, portion of Road 5 adjacent to POS, Road 13 and Road 14.
Public Transport Services	Y	Existing and proposed bus services nominated. Refer KC00178.000_S03 and Section 2.6.
Integration with Surrounding Area		
Trip Attractors / Generators	Y	Trip Generators: -

Within 800 metres of the Structure Plan Area		• Residential Land Uses directly to the north in Heritage Park and Highbury Park Trip Attractors: - • Makybe Rise Primary School • Baldivis District / Secondary Activity Centre (located 2.5km north along Baldivis Road / Safety Bay Road intersection) Refer KC00178.000_S01 for more details
Proposed Changes to Land Uses Within 800 metres of the Structure Plan Area	Y	Proposed development west of the subject development (west of Baldivis Road) includes the future Neighbourhood Centre, primary school and a large residential Estate.
Travel Desire Lines from the Structure Plan Area to Trip Attractors / Generators Within 800 metres of the Structure Plan Area	Y	We believe up to 65% of all traffic from this development will exit / access the site via Furioso Green and 35% will exit / access the site via Serpentine Road. The general desire lines from the Structure Plan Area include: - Furioso Green / Baldivis Road / Safety Bay Road - Furioso Green / Baldivis Road / Safety Bay Road / Kwinana Freeway - Serpentine Drive / Baldivis Road / Sixty Eight Road
Adequacy of External Transport Networks	Y	External road network is adequate to accommodate the traffic that is expected to be generated by the proposed development and is well connected to the local and regional road network.
Deficiencies in External Transport Networks	N / A	To be confirmed during the planning process.
Remedial Measures to Address These Deficiencies	N / A	To be confirmed during the planning process.
Analysis of Internal Transport Networks		
Assessment Year(s) and Time Period(s)	Y	Traffic assessed as a base case, based on traffic volumes from MRWA. Works in the proposed Heritage Park Phase 2 development will be undertaken within several stages. The construction is expected to commence in the second half of 2017.

Structure Plan Generated Traffic	Y	Refer Table 8
Extraneous (Through) Traffic	Y	Refer Table 8
Design Traffic Flows (i.e. Total Traffic)	Y	Refer Table 8
Road Cross-Sections	Y	Refer Figures 1 and 2.
Intersection Controls	Y	Access / egress points to the proposed development are as follows: • Four accesses / egresses with full movement unsignalised intersections south of the Structure Plan Area onto Serpentine Road; • Three accesses / egresses with full movement unsignalised intersections north of the Structure Plan Area onto Furioso Green.
Access Strategy	Y	The general access strategy is as follows: -. • Furioso Green / Baldivis Road • Serpentine Road / Baldivis Road
Pedestrian / Cycle Networks	Y	Major internal pedestrian / cycle networks required in: - • Heritage Park Drive • Road 01 • Furioso Green • Serpentine Road
Safe Routes to Schools	Y	Pedestrian / cyclist networks that are to be provided should be tied into the regional and district path network. Linkages along Heritage Park Drive and Road 01, Serpentine Road and Furioso Green within the Structure Plan Area will provide direct connection to Makybe Rise Primary School to the northwest of the Structure Plan Area and to Baldivis Secondary College to the north of the Structure Plan Area. Standard 2.0m wide paths along specified streets are suitable as pedestrian linkages. Heritage Park Avenue, Campolina Avenue and Furioso Green (boulevard section) have larger carriageways which can safely accommodate local cycling traffic.
Pedestrian Permeability and Efficiency	Y	The development is laid out with a high level of internal permeability and efficiency for pedestrian and bicycle connectivity.
Access to Public Transport	Y	Existing Public Transport network shown in KC00178.000 S03 for clarity. PTA confirmed that it is reasonable to expect an upgrade in the existing bus service through the area given the growth of the population and the increased demand, providing us with information that route 566 will extend to the south to the Sixty Eight Road and Baldivis Road corner. Route 566 is proposed to commence in the North West corner of the intersection and travel to Warnbro Station. However, at the time of writing this report no definite timeframes are known.

Analysis of External Transport Networks	Y	Review of road and transportation networks undertaken within a 2km radius of the Structure Plan Area.

This checklist and summary has been reviewed and is an accurate reflection of the transportation requirements for development of the structure plan area in accordance with the development yields and land uses which are nominated in this report.