Attachment 4

Transport Impact Assessment

This page has been left blank intentionally

QUBE Property Group

Precinct 8, East Wanneroo

Transport Impact Assessment

October 2023

Project Code: 06784

PJA
Level 27
St Martins Tower
44 St Georges Terrace
Perth
WA 6000
Australia
pja.com.au

Version Control and Approval

Version	Date	Main Contributor	Issued by	Approved by
A – Draft	14 August 2023	LB, RD	RD	TJ
B – Final	31 October 2023	RD	RD	TJ

Prepared for

Rod Gardiner
Director
QUBE Property Group
Suite 3, Level 1
437 Roberts Road
SUBIACO WA 6008

Contents

List of Tables

List of Figures

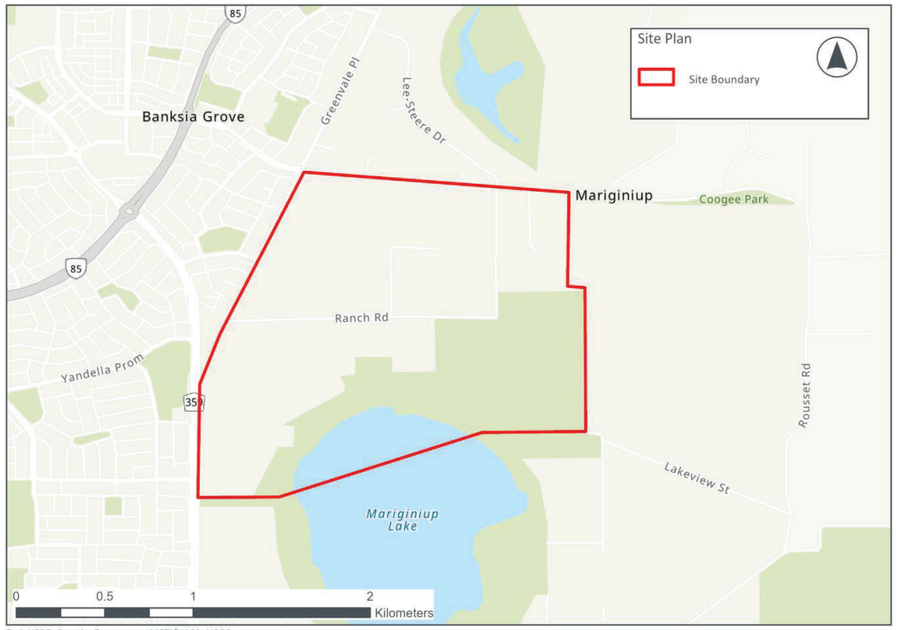
Appendices

1 Introduction

1.1 Introduction and Background

1.1.1 This Transport Impact Assessment (TIA) has been prepared by PJA on behalf of QUBE Property Group in support of a Local Structure Plan for a proposed residential-led development of approximately 2,500 lots and a primary school on land designated as Precinct 8 of the wider District Structure Plan for the proposed Urban Densification of East Wanneroo. Precinct 8 is largely located in the area of Mariginiup, which is a suburb located on the north-western outskirts of Perth.

Figure 1-1: Site Location Plan



1.2 Purpose of this Report

1.2.1 The *Western Australia Planning Commission Transport Assessment Guidelines* (WAPC Guidelines) sets out what level of assessment is necessary, based on the expected traffic impact of a proposed development. This specifies that where a development is forecast to generate more than 100 trips per hour in the peaks, a Transport Impact Assessment is required. Where this is not the case, a Transport Impact Statement (TIS) would suffice. A TIA has a greater focus on the external traffic impact resulting from the development.

1.2.2 Based on the proposed scale of development, the impact would be categorised as 'high' and a TIA would be required.

1.3 Transport Assessment Objectives

1.3.1 In line with the WAPC Guidelines, this TIA seeks to demonstrate that the proposed development would:

- *"provide safe and efficient access for all modes;*
- *be integrated with the surrounding land uses;*
- *not adversely impact the surrounding land uses; and*
- *not adversely impact the surrounding transport networks or the users of those networks."*

1.3.2 This TIA considers all transport modes, including public transport, walking and cycling, as well as private motor vehicles, servicing and delivery vehicles.

1.4 Specific Issues

1.4.1 There are no specific transport issues that have been identified in relation to the proposed development. PJA have, however, ensured the items we feel are most pertinent have been addressed, such as:

- Access of the LSP to Pinjar Road located to minimise the impacts of the drainage system in the location.
- Limiting the East West attractiveness between the LSP and Pinjar Road via Nambi Parkway.
- The local structure plan movement network design uses Safe System thinking to encourage a walkable, ridable and attractive active transport environment with a view to encourage sustainable mobility.

1.5 Layout of this Report

1.5.1 The remaining chapters of this TIA cover the following:

- **Chapter 2** sets out details of the proposed Local Structure Plan.
- **Chapter 3** provides details of the existing situation.
- **Chapter 4** establishes the proposals for the internal transport networks.
- **Chapter 5** sets out changes proposed to external transport networks.
- **Chapter 6** demonstrates how the development will integrate with the surrounding area.
- **Chapter 7** analyses the internal transport networks.
- **Chapter 8** analyses the external transport networks.

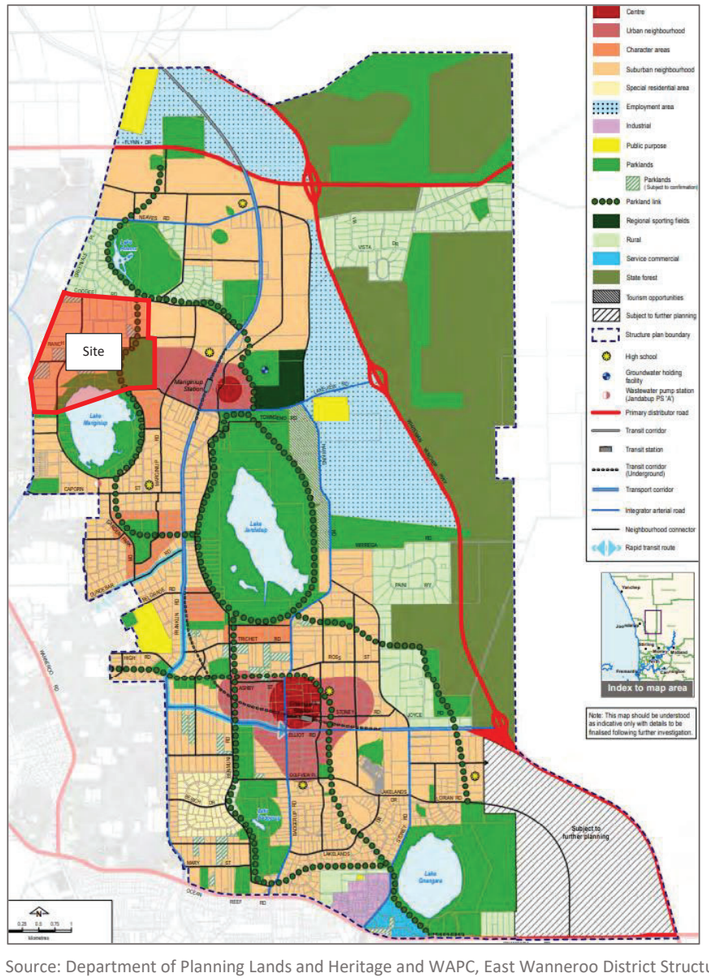
- **Chapter 9** includes a review of safety issues.
- **Chapter 10** concludes the TIA.

2 Local Structure Plan Proposal

2.1 Regional Context

2.1.1 The Local Structure Plan (LSP) covers Precinct 8 of the District Structure Plan (DSP) for East Wanneroo which is zoned as a suburban neighbourhood with some parklands and a parklands link connecting through this parkland. Figure 2-1 and Appendix A shows the layout the DSP, which was approved by the Minister for Planning in August 2021.

Figure 2-1: East Wanneroo District Structure Plan



Source: Department of Planning Lands and Heritage and WAPC, East Wanneroo District Structure Plan

2.1.2 The LSP area is bound by Lake Mariginiup reserves to the south, designated in the City of Wanneroo (CoW) District Planning Scheme No. 2 (DPS2) as an area for Parks and Recreation (under the Metropolitan Region Scheme Reserves), as well as land zoned as 'rural resource' which also currently occupies most of the LSP area. In CoW's DPS2, the site area is zoned as 'urban deferred' for the most part with some allocated as Parks and Recreation (under MRS Reserves). The site sits in the Central East Ward of the City of Wanneroo.

2.1.3 The site is bound to the north by Coogee Road and to the west by Mornington Drive which continues into the site area as it turns and becomes Ranch Road. Mornington Drive does not continue beyond this point along the site boundary. Further south-west of the site, Pinjar Road runs north-south along the boundary to the south-westernmost corner and the suburban area of Tapping is located further west. East of the site is mostly undeveloped agricultural and greenfield land, currently zoned as 'general rural' in the CoW District Planning Scheme.

2.2 Proposed Land Uses

2.2.1 The LSP proposal of 263 hectare area of land within the wider East Wanneroo DSP includes the following;

- Approximately 2,500 residential lots;
- Primary School;
- Public Open Space (POS) and Parkland; and
- Several access points across the site for vehicles and other modes to access the site.

2.2.2 The LSP site forms part of the central western area of the DSP and will directly abut the surrounding local area and existing highway network, particularly as one of the first phases to be built. Additional consideration will therefore be required to understand how this site will effectively tie into the existing local networks.

2.2.3 A plan showing the layout of the proposed LSP is provided at Appendix B.

2.3 Parking and the Medium Density Design Code

2.3.1 The WAPC *State Planning Policy 7.3 Residential Design Codes Volume 1* (R-Codes) refer to parking standards for new residential developments. Paragraph C3.3 states the minimum standards for plot ratio areas in Location A or B. Location A covers developments which are situated in close proximity to high frequency public transport services and Location B is all developments outside of those areas.

2.3.2 Location A – includes all land located within:

- 800m of a train station on a high-frequency rail route, measured in a straight line from the pedestrian entry to the train station platform to any part of a lot;
- 250m of a high-frequency bus route, or multiple bus routes that if combined have timed stops every 15 minutes during weekday peak periods (7–9am and 5–7pm), measured in a straight line from along any part of the bus route to any part of the lot; and/or
- the defined boundaries of an activity centre.

2.3.3 The centre of the LSP is currently located more than 800m from a train station and more than 250m from the nearest existing bus stops, the site would therefore be categorised as Location B. When the DSP is fully delivered, this may change with bus routes but the centre of the LSP will still be beyond the above distances to the future Mariginiup Station, approximately 2km to the east.

2.3.4 For residential dwellings in Location B, all one-bedroom dwellings will be allocated one parking space and all dwellings with 2 or more bedrooms will be allocated two parking spaces.

2.3.5 In Location B, dwellings less than 110sqm are required to have the minimum of at least 1.25 car parking spaces per dwelling. For dwellings equal to or larger than 110sqm, a parking standard of at least 1.5 spaces per dwelling is applied.

2.3.6 Visitor car parking is to be provided at a rate of 0.25 spaces per dwelling, equating to 625 visitor spaces across the LSP.

2.3.7 Based on the above, with 2,500 lots, the LSP could provide anywhere between approximately 625 spaces minimum (visitor only) to approximately 3,750 total. This upper value would be provided for by private garaging.

2.4 Cycling Facilities

2.4.1 Draft SPP 7.3 Medium Density Housing Code notes for single house and grouped dwellings, the minimum number of bicycle spaces is 1 per dwelling, plus 0.1 visitor spaces per dwelling if more than 10 dwellings.

2.4.2 Based on the above, each of the 2,500 lots should provide a space for parking for at least one bicycle in their home garages or store and 250 visitor spaces.

2.5 Deliveries and Servicing

2.5.1 The Main Roads WA Functional Road Hierarchy designates Mornington Drive and Coogee Road as Local Distributor (Rural, Non Built-Up Area), which is defined as connecting *"…to other Rural Distributors and to Rural Access Roads. Not Regional Distributors, but which are designed for efficient movement of people and goods within regional areas Urban and Rural Local Distributor roads are managed by local government."*

2.5.2 Mornington Drive and Coogee Road connect via a 4-arm roundabout intersection at the north-western corner of the site with Tumbleweed Drive and Greenvale Place. Tumbleweed Drive is also categorised as a Local Distributor, which connects west to Joondalup Drive via a 4-arm roundabout intersection. Although, Tumbleweed Drive may better be defined by the Urban, Built Up Area definition of a Local Distributor due to the residential nature of the surrounding area, which refers to *"…roads that carry traffic within a cell and link District Distributors or Primary Distributors at the boundary, to access roads. The route of Local Distributors should discourage through traffic so that the cell formed by the grid of higher order distributor roads, only carries traffic belonging to, or serving the area. Local Distributors should accommodate buses, but discourage trucks."*

2.5.3 Pinjar Road and Joondalup Drive are designated as District Distributor A, which is defined to *"…carry traffic between industrial, commercial and residential areas and generally connect to Primary Distributors. Much of the traffic will be personal vehicles with a small proportion of heavy vehicles making deliveries to the commercial centre. They are managed by Local Government."*

2.5.4 Access to Pinjar Road and Joondalup Drive for freight movements will be accommodated by the number and proximity of the network of street connections in the design. The anticipated type of servicing vehicles will be the weekly refuse collection vehicle and the occasional heavy rigid for furniture deliveries and semi-trailer during construction of dwellings in the LSP. This level of servicing provision is in line with the expected servicing demand at the site.

2.6 Specific Issues

2.6.1 There are no specific transport issues that have been identified in relation to the proposed LSP but the items in Section 1.4 are noted.

3 Existing Situation

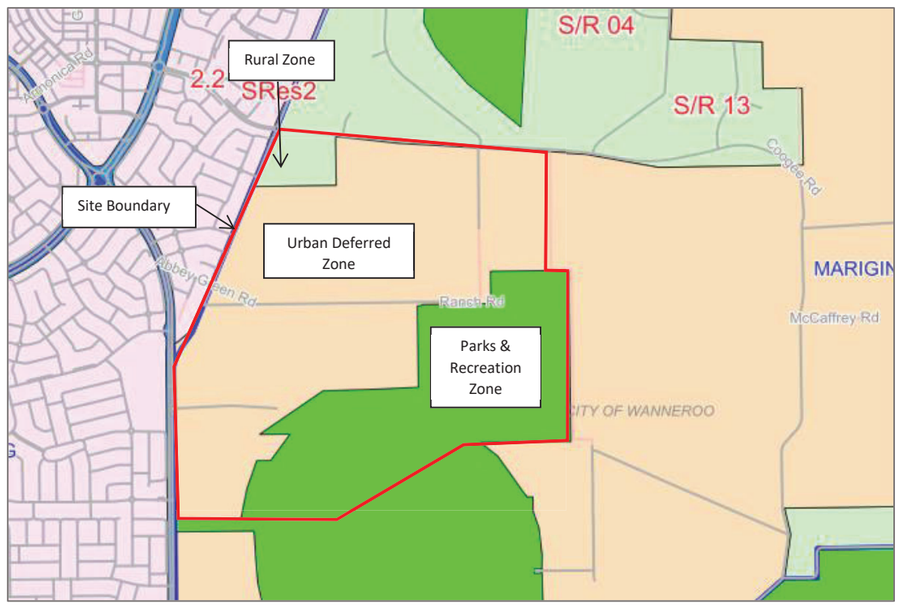
3.1 Existing (2023) Land Uses

3.1.1 The site is currently largely occupied by undeveloped, agricultural or greenfield land, some associated farm buildings, as well as a portion of the Mariginiup Lake at the southern end of the site and the entirety of the seasonal lake of Little Mariginiup Lake in the south-eastern corner. These lakes will be retained within the LSP, as shown in Appendix B.

3.1.2 The existing agricultural uses occupying the site are expected to generate some level of traffic in the existing scenario. All roads surrounding the site are local roads, under the control of the local authority.

3.1.3 The Metropolitan Regional Scheme for City of Wanneroo zones the site for the most part as 'urban deferred', with the area of lakes zoned as 'parks & recreation' and a small area in the north-western corner is zoned as 'rural'. The East Wanneroo DSP refers to the change needed in the rezoning of these areas from 'urban deferred or rural' to 'urban or industrial' in the Metropolitan Regional Scheme, as well as to a 'development zone' under the DPS2. Figure 3-1 shows the context of the site in the City of Wanneroo Planning Map.

Figure 3-1: City of Wanneroo – Metropolitan Regional Scheme – Site Area

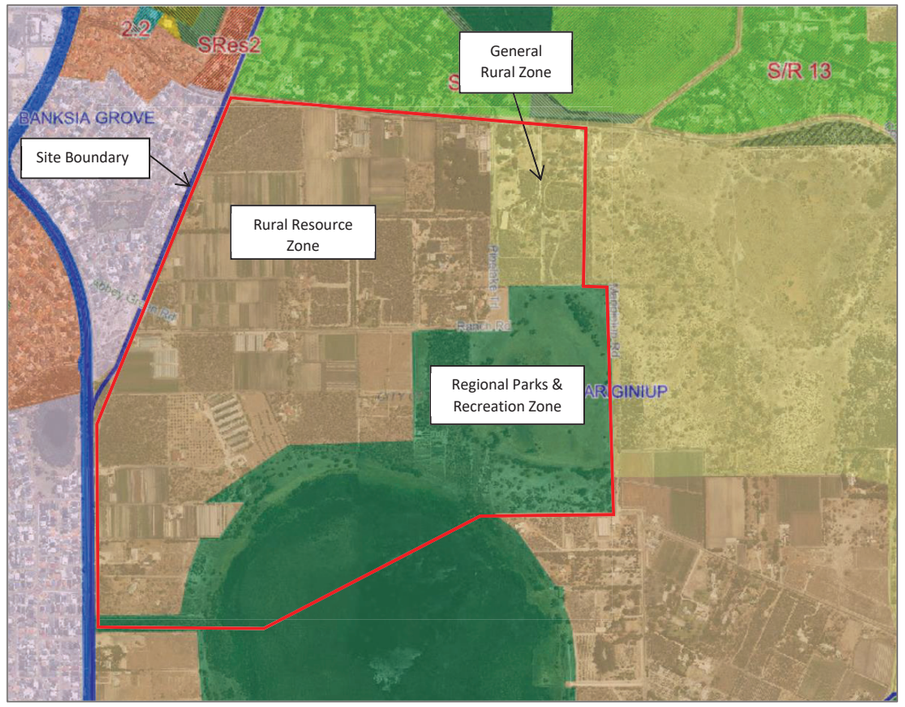


Source: City of Wanneroo, Online Mapping (https://enterprise.mapimage.net/IntraMaps22B/?configId=ab754696-b230-4955-a588-975c4d34312a)

3.1.4 Figure 3-2 shows the site area in the context of the DPS2 for the CoW. In this scheme, the site is zoned as 'rural resource' for the most part, with the lakes zoned as 'regional parks & recreation' and a small area in the north-east of the site zoned as 'general 'rural'.

3.1.5 As mentioned above, the areas zoned as 'rural' in the DPS2 will need to be rezoned to a 'development zone' under the DPS2, to make way for the upcoming East Wanneroo DSP development.

Figure 3-2: City of Wanneroo – District Planning Scheme No.2 – Site Area

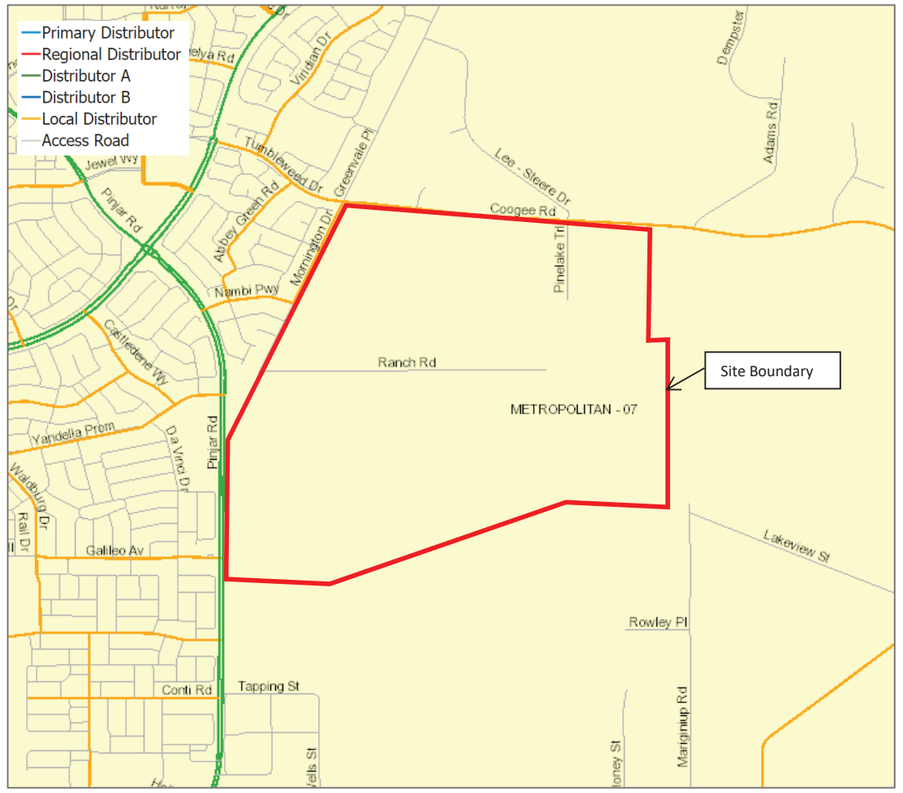


Source: City of Wanneroo, Online Mapping (https://enterprise.mapimage.net/IntraMaps22B/?configId=ab754696-b230-4955-a588-975c4d34312a)

3.2 Existing (2023) Road Network

3.2.1 Figure 3-3 shows the existing road network surrounding the LSP site.

Figure 3-3: Main Roads WA Functional Road Hierarchy



3.2.2 Source: Main Roads WA Road Information Mapping System (https://mrwebapps.mainroads.wa.gov.au/PublicMaps/RoadInformationMapping)

Pinjar Road and Joondalup Drive

3.2.3 Pinjar Road and Joondalup Drive are both Distributor A Roads (Main Roads WA Road Hierarchy) and route broadly north-south past the western boundary of the site. Pinjar Road immediately bounds the western boundary of the site at the south-western corner. Joondalup Drive is somewhat removed from the immediate boundary, accessible via Pinjar Road or Tumbleweed Drive at the north-western corner of the site. Joondalup Drive and Pinjar Road meet at a large 4-arm roundabout intersection which is priority controlled and forms a key strategic route for the area.

3.2.4 Joondalup Drive forms part of State Route 85 which continues north into Neaves Road (Tourist Drive 359) and continues south through the areas of Banksia Grove, Tapping and Joondalup before terminating at Ocean Reef Road (State Road 84) via a signalised intersection.

3.2.5 Both Pinjar Road and Joondalup Drive are subject to a 70km/h speed limit. North of Tumbleweed Drive, Joondalup Drive is a single lane, two-way carriageway with kerbed central islands provided at intervals along this part of the route. South of Tumbleweed Drive, Joondalup Drive widens to a four-lane dual carriageway and features kerbed central islands throughout.

Coogee Road and Mornington Drive

3.2.6 Coogee Road and Mornington Drive are categorised as a Local Distributor Roads (Main Roads WA Road Hierarchy). Both are single lane, two-way carriageways with minimal separation or hatching between the two lanes.

3.2.7 Coogee Road is subject to a 60km/h speed limit with minimal residential or other minor accesses taken directly from the carriageway. While Mornington Drive is subject to a 50km/h speed limit, default for a built-up area, and provides direct access to residences. Coogee Road and Mornington Drive meet at a 4-arm roundabout intersection which is located at the north-western corner of the site, Tumbleweed Drive and Greenvale Place provide the other two approaches to the intersection.

3.2.8 East of the roundabout intersection, Coogee Road continues east adjacent to the northern boundary of the site. A link is provided from the eastern extent of Coogee Road via an informal intersection to Adams Road which eventually connects north to Neaves Road (State Route 85 and Tourist Route 359). Pinelake Trail also leads south from Coogee Road into the site area, via a priority intersection.

3.2.9 South of the roundabout, Mornington Drive provides access to residential dwellings and eventually becomes Ranch Road as the route turns into the site area.

Ranch Road and Pinelake Trail

3.2.10 Ranch Road and Pinelake Trail, both located within the site boundary, are classified as Access Roads in the Main Roads WA Functional Road Hierarchy. Both are subject to a 50km/h speed limit, default for a built-up area. Both carriageways are single lane, two-way carriageways with no markings or separation and are subject to the 'default' speed limit, 110km/h outside of built-up areas.

3.3 Existing Traffic Flows

3.3.1 Traffic count data has been obtained from Main Roads WA Traffic Map, where available and supplied by the City. The nearest available Main Roads count points are found at the Joondalup Drive / Pinjar Road roundabout intersection, SCATS data has also been sourced for this intersection between 21st-27th February 2022.

3.3.2 This count recorded that the Monday-Friday, two-way 5-day average (2020/2021) of vehicles moving through this intersection was 6,692 in the AM peak (08:00-09:00) and 6,825 in the PM peak, which was found to be 15:00-16:00 in this area. During the weekend period, the flows through this intersection were slightly less with 2,736 vehicles on the Saturday and 2,538 on the Sunday, both with a peak hour of 11:00-12:00. Table 3-1 shows the directional splits for each approach to the roundabout intersection, the two-way flows and the roundabout total across all approaches. Although the traffic experienced on this major route is likely to be higher than that found in the site area, this shows a representation of the baseline flows in the area.

Table 3-1: Current Traffic Flows (2020/2021) – Joondalup Drive / Pinjar Road Roundabout Intersection

Road	Direction	Weekday AM (08:00-09:00)	Weekday PM (15:00-16:00)
Joondalup Drive (North of Intersection)	NB	660	919
	SB	782	686
	Two-Way	**1442**	**1,605**
Joondalup Drive (South of Intersection)	NB	861	889
	SB	729	791
	Two-Way	**1590**	**1680**
Pinjar Road (East of Intersection)	EB	1346	1024
	WB	776	1041
	Two-Way	**8186**	**8,635**
Pinjar Road (West of Intersection)	EB	825	732
	WB	713	743
	Two-Way	**17910**	**18,745**
Roundabout Total		**6692**	**6825**

3.3.3 Mid-block data received from the City and obtained from the Main Roads traffic map are shown below summarised in Table 3-2.

Table 3-2: Current Mid-Block Traffic Flows

Road	Direction	Weekday AM (08:00-09:00)	Weekday PM (15:00-16:00)
Pinjar Road South of Joondalup Drive	NB	775	1,040
	SB	1,345	1,025
	Two-Way	**2,120**	**2,065**
	Daily Two-Way	22,587	
Nambi Parkway East of Abbey Green	**Two-Way**	145	145
	Daily Two-Way	1,605	
Mornington Drive North of Nambi Parkway	**Two-Way**	100	95
	Daily Two-Way	970	
Yandella Promenade east of Waldberg Drive	**Two-Way**	280	215
	Daily Two-Way	2,030	

3.4 Existing Pedestrian and Cycle Provision

3.4.1 The nearest dedicated pedestrian infrastructure to the site is along the western side of Mornington Drive (opposite the western site boundary), providing pedestrian access to the residential dwellings directly accessed from Mornington Drive. At the roundabout intersection between Mornington Drive, Coogee Road, Greenvale Place, Tumbleweed Drive, a single informal pedestrian crossing is provided across the Mornington Drive approach. Dropped kerbs are provided on both sides to access the crossing point, but no tactile paving or surfacing change separates pedestrians from the carriageway as the road surface continues into the crossing area. Additionally, the dropped kerb on the eastern side of the carriageway does not appear to connect into any formal footway provision, potentially creating a point of severance for pedestrians leaving the crossing. It would be recommended to tie this into the proposed pedestrian network for the site.

3.4.2 Pinjar Road at the south-western corner of the site has a good level of pedestrian and cycle infrastructure, which appears to have been provided in approximately the last three years, based on a desktop review. A bi-directional, segregated shared path is provided along the western side of Pinjar Road, commencing at the Joondalup Drive / Pinjar Road roundabout intersection and ending at the Pinjar Road / Tapping Street priority intersection. Although, at times this route does not cater to the pedestrian and cycle desire line taking them far from the most convenient route at intersections and navigating around large highway infrastructure such as large U-turn spaces.

3.4.3 Some informal pedestrian crossing points are provided with tactile paving and pedestrian refuges at intervals along the route. The tactile paving on these crossings is located in the centre of the pedestrian waiting area and does not cover the entire area which would increase safety for those with mobility impairments. However, these crossings are quite infrequent and do not offer protection for pedestrians crossing the carriageway which is known to experience high volumes of vehicular traffic, as shown in Table 3-1. Connections directly into this route from the site would be advised.

3.4.4 Other routes immediately surrounding the site such as Coogee Road, Pinelake Trail and Ranch Road do not cater for pedestrian and cycle movements separately from the carriageway. However, bridal ways north of Coogee Road provide potential attractive walking routs to Banksia Grove Primary School and Lake Adams.

3.5 Existing Public Transport Provision

Bus

3.5.1 Bus stops are located west of the site on Pinjar Road, approximately 180-200m from the western extent of Ranch Road. These stops are served by the Route 390 service only. Stops on both sides of the carriageway are provided with a raised kerb to assist with boarding, seating and a post to identify the stop.

3.5.2 Route 390 provides a one-way route to Joondalup Station, operating approximately every 20-30 minutes, varying throughout the day with increased service at peak times. On weekends, the service is hourly.

3.5.3 In the other direction, Route 391 provides a service back towards the site, but this service takes a different route with the nearest stop to the site being in the Banskia Grove retail area on Jewel Way with a subsequent 30 minute walk to the LSP area.

Rail

3.5.4 Currambine (7.2km) and Joondalup Stations (8.6km) are the closest railway stations to the site, measured from the centre of the site. While Currambine Station is the closest station to the site by distance, the provision of large car parks and lack of access by bus, promotes the use of the private car to access this station from the site.

3.5.5 However, Joondalup Station is served by 19 bus services including Route 390 which accommodates access in close proximity to the site area. Thereby offering more sustainable transport opportunities to the station, in addition to the large Lakeside Joondalup Shopping City, university campus and employment destinations within walking distance of the station.

3.5.6 Both stations are on the Joondalup Railway Line and offer services in the direction of Elizabeth Quay Train Station in Central Perth and Butler Station, at the northern extent of Perth, as the two terminating stations. Services towards both terminating stations are provided approximately every 10 minutes. Currambine Station is located in Zone 4 and Joondalup is located in Zone 3, being closer to Central Perth.

4 Proposed Internal Transport Networks

4.1 Proposed Road Network

4.1.1 Several access points are proposed to allow the site to be permeable via all modes and well-integrated to the existing surrounding area, as well as to the future DSP. Each access will accommodate vehicular traffic, as well as pedestrian and cycle movements. These are as follows:

- Five vehicular accesses on the eastern side of Mornington Drive/Pinjar Road, along the western boundary, including the upgrades to Ranch Road;
- Two vehicular accesses on the southern side of Coogee Road, along the northern boundary, including the upgrades to Pinelake Trail;
- One vehicular accesses along the eastern boundary with an extension/formalisation of the existing Mariginiup Road;
- One vehicular access along the southern boundary with an onward connection to Pinjar Road and possible connections to the wider DSP south of the site; and
- A strong public open space green area and link in the south of the LSP area for pedestrians of all types on foot, on wheels or cycling.

4.1.2 The proposed road network within the LSP can be seen on the plan included as Appendix B, with a summary of the proposed roads set out in Table 4-1.

Table 4-1: Proposed Roads

Road	Road Reserve	Location Description	Liveable Streets Road Base Type
Pinelake Trail	22m	Form a NS connection between Ranch Road and Coogee Road	Neighbourhood Connector B
Ranch Road/EW NC	20-22m	Connects from the NS NC roadway through to the eastern boundary of the LSP and provides connectivity to other development to the east. The 20m road reserve is located north of Little Mariginiup Lake / South of the POS, near the eastern boundary of the LSP.	Neighbourhood Connector B
NS NC	22m	Connects from Coogee Road in the north through to the southern boundary of the LSP between Pinjar Road and Lake Mariginiup	Neighbourhood Connector B
EW NC to Pinjar Road	24m	Provides the main connection of the LSP from Pinjar Road to the NS NC	Neighbourhood Connector A
Local Streets	15m	These streets are form the typical residential streets within the LSP	Access Street C or D

4.1.3 Appendix A and B, respectively, show the planned road network within the East Wanneroo DSP and the LSP area between Pinjar Road, Mornington Drive and Coogee Road. At this stage, the DSP and LSP do not provide a detailed breakdown of the road types and designs that would be implemented but does recommend the layout of the routes. In the DSP, these are primarily linear routes leading north-south and will navigate through the key centres of the DSP at Mariginiup and Gnangara.

4.1.4 The street types have been reviewed based on the *WA Liveable Neighbourhoods Update 02*, dated January 2009. Table 4-2 specifies the following for Access Streets and Laneways.

Table 4-2: Liveable Streets Road Specifications

Street Type	Max. Design Speed / Target Operating Speed (km/hr)	Indicative Volume (vehicles per day)	Indicative Street Reserve Width (metres)	Indicative Road Pavement Width (metres)
Access Street C – Wider Street	50/40	3,000	15.4	7.2
Access Street D – Narrow Yield or Give Way Street	50/30	1,000	14.2	6

** Lesser reserve widths and pavement widths may be applied over limited lengths where performance can be justified.

4.1.5 The Access Street D roads (Narrow Yield or Give Way Streets) are proposed with a 6m to 7.2m wide carriageway, as well as *at least* one footpath of 1.5m minimum width (but we should aim for 1.8m). In the few locations where the Road Reserve width is restricted to 12m, narrower verges will be provided. This road type has an indicative upper volume of 1,000 vehicles per day for 6m and up to 3,000vpd for the wider 7.2m wide pavement, and is effective in constraining vehicle speeds.

4.2 Intersection Controls

4.2.1 Due to the low volume and speed, residential nature of the LSP, access street intersections within the LSP are intended to be constructed as priority-controlled intersections. At intersections of the neighbourhood connectors in the LSPO, these are proposed to be controlled by single lane roundabouts.

4.2.2 The main entrances to the LSP area will be in the vicinity of Pinjar Road to Ranch Road and the route proposed to the south of Ranch Road, as well as the first access taken south of Coogee Road. This is given the proximity of these connections to the wider local road network and connections to key distributor roads such as Joondalup Drive and Pinjar Road. The design of these, and other connections across the site, will be considered in line the level of traffic forecast to use each access to ensure they are constructed as appropriate. Depending on the staging of delivery of the LSP, the final details of intersection control will be determined and may change from one stage to the next as traffic flows and intersection priorities changes.

4.3 Pedestrian and Cycle Network

4.3.1 Pedestrian and cycle connections will be provided throughout the site to connect internally and externally to create a good level of permeability to the wider area. Traffic free routes will also be accommodated within the site area, particularly in the public open space areas adjacent to Mariginiup Lake in the south of the site and other areas throughout the rest of the site. Dropped kerb crossings will be provided as appropriate, including at intersections.

4.3.2 Cyclists can either use the footpaths, or cycle on the quiet streets within the LSP if the speed of vehicles can be limited to 30km/h). Taking a Safe System approach, off-road shared paths or protected on-road cycle routes are proposed to be the provided to encourage riding and not mixing with traffic, this for the neighbourhood connector road across the site.

4.4 Public Transport Routes

4.4.1 Dedicated bus transit routes will not be provided within the LSP area, but within the wider DSP where key bus transit routes will be operating such as in other precincts of the DSP, notably east of the lakes. The provision of neighbourhood connector streets through the LSP will allow the use of these streets by bus serves if they just so happen to be routed through the LSP.

4.4.2 The DSP refers to bus services linking "…through neighbourhoods to transit stations and other key destinations in the surrounding locality. A rapid bus service route has been identified on the DSP map and on the Movement Network linking Wanneroo town centre with the Gnangara district centre using Dundebar, Franklin, Elliott and Badgerup roads."

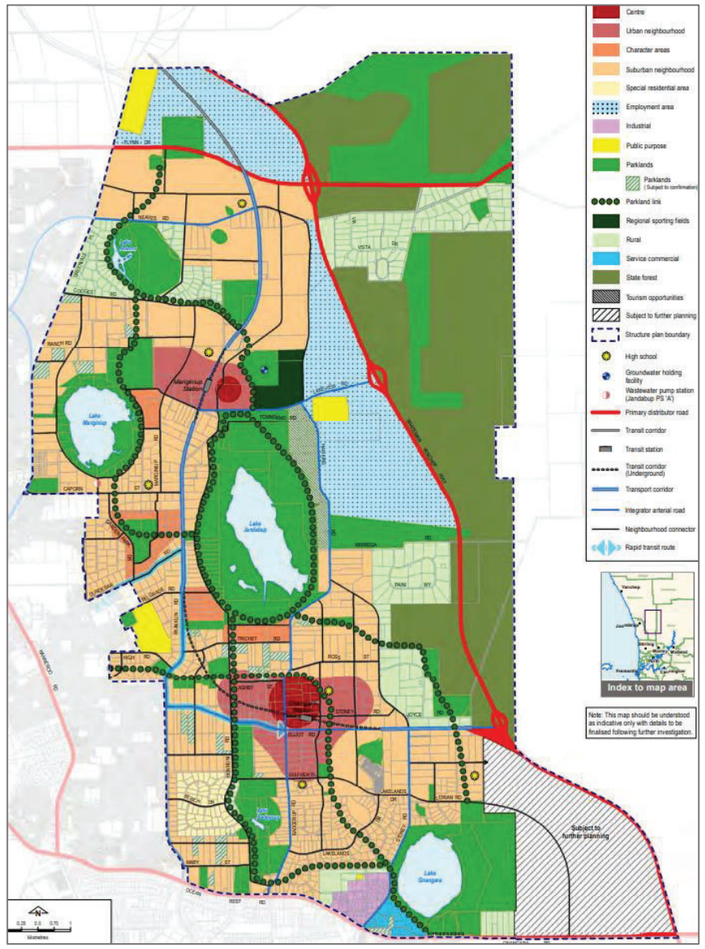
4.4.3 New rail services will be provided at two new stations within the DSP at the new urban centres of Mariginiup and Gnangara. Mariginiup will be the closest station to the LSP offering genuine opportunities for future residents to travel by rail to key destinations for leisure, employment and other destinations.

5 Changes to External Transport Networks

5.1.1 Given the agricultural and greenfield nature of the site, the addition of the new intersections accessing the site along each boundary will create change to the local environment and as most of these access points are not currently present on the network.

5.1.2 As the East Wanneroo DSP develops around the LSP further road connections and transport infrastructure is expected to be delivered. As noted below in Figure 5-1 below, these elements are to be limited to eastern areas of the East Wanneroo DSP.

Figure 5-1: East Wanneroo DSP Transport Network



These are expected to include:

- Whiteman-Yanchep Highway
- Franklin Road Integrator Arterial
- Mariginiup Station
- Mariginiup Road Neighbourhood Connector

Nearer the LSP, Coogee Road to the north of the site is expected to be upgraded to a neighbourhood connector street in the future as development intensifies in the wider DSP. This road will provide an east to west link between the Franklin Road Integrator Arterial and Joondalup Drive.

Ranch Road through the LSP is expected to connect with the future Mariginiup Road neighbourhood connector as a T-junction and thus the Ranch Road route through the LSP is not expected to be highly attractive for non-local traffic.

6 Integration with Surrounding Area

6.1 Local Attractors / Generators

6.1.1 Given the proposed residential uses on the site, it is expected that the majority of the trips to / from the site will be generated towards places of education, employment, retail and leisure uses. Several retail and leisure destinations are available surrounding the site such as at Banksia Grove and Joondalup, as well as some wider employment uses in these areas.

6.1.2 For education trips, it is anticipated that a primary school will be provided within the LSP and several high schools will be provided within the wider DSP area. Externally from the LSP and DSP areas, Banksia Grove Primary School is located next to Peridot Park and just north of Tumbleweed Drive, within approximate 20-minute walk (1.6km) from the centre of the LSP. No internal commercial area is proposed, such as in the form of a neighbourhood centre.

6.1.3 In the wider DSP, urban centres are proposed surrounding the two rail stations at Mariginiup and Gnangara which will provide a range of facilities for retail, leisure and other. It is also anticipated that other local centres will be provided throughout the DSP. At the eastern extent of the DSP, large areas of employment uses are also proposed, providing potential employment opportunities for residents in future.

6.2 Travel Desire Lines

Pedestrian / Cycling

6.2.1 To access the existing retail and employment area at Banksia Grove, pedestrians will be able to follow the footpaths provided in the residential area of Banksia Grove to the west of the LSP. These will offer quiet routes for pedestrians and cyclists to cycle on-carriageway. After leaving the residential area, pedestrians and cyclists will be able to cross Joondalup Drive using the dropped kerb and pedestrian refuge crossing. A short walk will then be required on a footpath to the Banksia Grove retail area. From the centre of the site, this will take circa 30 minutes. No dedicated infrastructure is provided for cyclists on this route and are therefore required to cycle on carriageway, however, quiet routes through the residential area are available.

6.2.2 For the Banksia Grove Primary School located north-west of the LSP, residents will be able to walk across Mornington Drive at the roundabout and continue on the footpath on the southern side of Tumbleweed Drive. Although, this use is expected to be minimal, given that a primary school is proposed to be provided within the LSP. Along Tumbleweed Drive, a dropped kerb and tactile paving crossing is provided to reach the northern side of the carriageway. From here, the footpath continues to the intersection with Viridian Drive, where pedestrians will follow the footpath north to the primary school. The school is also accessible via the bridal ways north of Coogee Road.

6.2.3 It is noted that the pedestrian and cycle links proposed with the East Wanneroo DSP are yet to be constructed and will provide improved connections to nearby destinations. For this LSP, the internal planned pedestrian and cycle provision is deemed acceptable.

Motor Vehicle

6.2.4 The site is located near Pinjar Road and Joondalup Drive which provide strategic distributor roads towards key destinations such as Joondalup and Central Perth. The construction of the LSP routes will provide connections to these routes for onward travel.

6.2.5 The strategic road network for the East Wanneroo DSP is yet to be constructed and will provide improved connections to nearby destinations when complete.

Public Transport

6.2.6 As discussed above, bus services are accessible on Pinjar Road and can be accessed via footpaths to be provided on Ranch Road and existing pedestrian infrastructure on Pinjar Road, including a bi-directional route and dropped kerb pedestrian crossings with tactile paving between the two bus stops.

6.2.7 The DSP is proposed to provide a Rapid Transit Route in the southern extent the area. The route will follow Dundebar Road from Wanneroo Centre, along Franklin Road and Elliot Road towards the new Gnangara Station and urban centre.

7 Analysis of Internal Transport Networks

7.1 Internal Road Network and Traffic Impact

7.1.1 Two-way, two-lane roads are proposed within the LSP to accommodate the anticipated traffic flows, as detailed previously in Section 4.1. The expected daily traffic flows, on the main neighbourhood connectors and other key streets are noted below in

Figure 7-1: Key Street Expected Traffic Flows

7.1.2 The internal streets main network should typically be Neighbourhood Connector B type streets with the exception of the higher volume sections from Pinjar Roar to past the school site. This section should be a Neighbourhood Connector A street as traffic volumes are expected to exceed 3,000vpd. The short section of street near Pinjar Road has an expected traffic flow exceeding the upper 7,000vpd limit of a neighbourhood connector, but it is recommended that the side streets on this section be limited to left-in/left-out intersections, so as to minimise interruption of through traffic on the neighbourhood connector and reduce exposure to right angle crashes. As there is no direct fronting properties on this same section of street then there the on-street parking could be omitted, to further reduce the side friction and improve traffic flow.

7.1.3 Adequate sight distance is to be checked and provided at each intersection in subsequent stages of the project.

7.1.4 As detailed in Section 4.1, all intersections will take the form of priority intersections which can adequately accommodate the anticipated traffic flows. At key intersections, namely on the neighbourhood connectors, these intersections are recommended to be roundabouts.

7.1.5 This is especially important around the proposed school site. This will enable good traffic circulation around the school block in both directions. It will allow parent and carers to undertake U-turns safely to assist access and exit from the school and also reduce traffic circulating around the school.

7.2 Internal Pedestrian/Cycle Network

7.2.1 As the internal roads within the LSP are anticipated to have low volumes of traffic, with up to 147 two-way vehicle trips in both peak periods, it is considered that none of the proposed roads within the LSP would be difficult for pedestrians and cyclists to cross.

7.2.2 This is in line with Table 2 of the *WAPC Transport Impact Assessment Guidelines Volume 2*. This states that for a two-lane undivided road, which is what is proposed for the internal road network within the LSP, the ability of pedestrians to cross would only be affected if there are more than 1,100 vph.

7.3 Safe Walk/Cycle to School Assessment

7.3.1 As discussed above, there is proposed to be a primary school included within the LSP, and this will be within an 800m catchment of the entire LSP.

7.3.2 The walk and cycle routes to and from this school will be able to be provided by the local street network, using the footpaths to reach the primary school.

7.4 Pedestrian Permeability and Efficiency

7.4.1 The guidance set out within *Liveable Neighbourhoods* within Appendix 2, is not considered to be appropriate for the proposed LSP. While the site is located within a 5-minute walk of some amenities, the site is not located within a 5-minute walk of a local centre or a 10-minute walk of a train station. Therefore, the guidelines set out within the *Liveable Neighbourhoods* are not considered to be appropriate.

7.4.2 Although, the LSP is considered to be accessible for pedestrians with the Banksia Grove convenience facilities located closer to the LSP within a 10-minute walk including a store, health centre, food retail and community centre.

7.4.3 Overall, it is considered that the LSP is located within an accessible location, as some services are available within a less than 10-minute walk of key amenities and public transport services on Pinjar Road and a wider variety of facilities is available within a 30-minute walk at Banksia Grove.

8 Analysis of External Transport Networks

8.1 Scope of Assessment

8.1.1 Traffic surveys were undertaken at the following intersections in July 2023, provided at Appendix C, and these form the basis of this traffic impact assessment:

8.1.2 Based on an estimated delivery of 250 lots per annum and with an estimated 2,500 lots, the LSP is expected to be fully built out with dwellings constructed over an approximate 12 year period from commencement. With an estimated start date of 2024/25 it is expected that the LSP would be fully developed by approximately 2036. On this basis, the effect of the development traffic on the road network has been assessed as 2036. On that basis the following assessment period was examined:

- 2036 Future case (i.e. "with development") operation of the subject intersections in SIDRA for equivalent design horizons for the purposes of comparison.

8.2 Proposed Residential Trip Rates and Generation

8.2.1 For the proposed residential use, PJA has adopted the following trip rates and generation based on the *WAPC Transport Impact Assessment Planning Guidelines (Volume 2: Planning Schemes, Structure Plans and Activity Centre Plans, , August 2016)*.

8.2.2 summarises the adopted trip rates and the resultant trip generation for the proposed LSP for the 2,500 proposed lots for the weekday AM peak (between 07:00-09:00) and PM peak (16:00-18:00) periods. In addition is the primary school in the LSP. This is expected to generate approximately 1,000 vehicle trips per day (based on a 650 student primary school with 1.5 trips per day per student) and all of these are expected to be trips to and from dwellings within the LSP, but these trips form part of the trips per dwelling and thus discount the LSP external trips.

Table 8-1: Weekday AM and PM Residential Peak Hour Trip Rates and Generation (WAPC Guidelines)

Time Period	Weekday AM Peak			Weekday PM Peak		
	In	Out	Two-way	In	Out	Two-way
Trip Rate (Residential, per dwelling)	0.2	0.6	0.8	0.5	0.3	0.8
Primary School	0.225	0.225	0.45	0.14	0.14	0.28
Trip Generation (vph)	350	1,350	1,700	1,160	660	1,820

8.2.3 From Table 8-1, in the AM peak hour 1,700 two-way trips (350 inbound, 1,350 outbound) predicted to be generated by the LSP and in the PM peak hour 1,820 two-way trips (1,160 inbound, 660 outbound) are forecast to be generated.

8.2.4 It should be noted that this flat rate has been applied to all dwelling types across the site for robustness and given alternative rates are not currently entertained in the WAPC Guidelines (we understand this is under review). Realistically, the vehicular trip rate per dwelling would be lower for medium density and vary from approximately 0.4/0.5 trips per dwelling for grouped dwellings (noting that no grouped dwellings are proposed nor likely to be developed) up to 0.8 for single detached residential dwellings, where more cars would be owned per household due to larger garages and proximity to on-street and driveway parking for the latter.

8.2.5 Given the scale of the LSP and that it is largely residential, it is expected that the majority of vehicle trips would be external. It is thus noted that the trip rate adopted will lead to a generation of double the expected trips and thus the assessment represents a very robust assessment. The effect of local trips to and from the primary school has been included above.

Directional Distribution

8.2.6 PJA has assumed that the site generated traffic will be distributed in similar proportions to that adopted from previous work undertaken by Uloth & Associates on this site in 2013. These proportions were:

- To/from SE 10%
- To/from NE 5%
- To/from Banksia Grove 15%
- To/from Joondalup Drive West 30%
- To/from Pinjar Road South 40%.

8.2.7 It is anticipated that through-traffic within the LSP would be limited, as the LSP is located along the edge of a residential area and does not provide a route between any key destinations. The eastern connectivity of Ranch Road to Mariginiup Road lies outside the future proposed DSP centre and train station. In discussion with DPLH, there was no DSP traffic modelling available to assess what impact the connection might have on traffic flows through the LSP. As a conservative estimate, it was assumed that in the order of 2,000vpd would be external though traffic across the site, entering from Pinjar Road and then using Ranch Road to access the eastern parts of the DSP, and vice versa.

8.3 SIDRA Analysis

8.3.1 The operation of each intersection has been analysed using SIDRA Intersection (Version 9). The key outputs of SIDRA are summarised below:

- **Degree of Saturation (DOS)** is the ratio of the volume of traffic observed making a particular movement compared to the maximum capacity for that movement.
- The **95th Percentile (95th %ile) Queue** represents the maximum queue length that can be expected in 95% of observed queue lengths in the peak hour.
- **Average Delay** is the delay time that can be expected over all vehicles making a particular movement in the peak hour.

8.3.2 The SIDRA results for the intersections for the estimated future volumes is presented in the tables below. The main connection of the LSP to the external road network is to be via Pinjar Road to the west and via Coogee Road to the north.

8.3.3 The geometry of the intersection with Pinjar Road included the following elements:

- 120m long Left turn slip lane under Give Way control on the Neighbourhood Connector
- Left turn slip lane under Give Way control on the Pinjar Road north approach designed to a High Entry Angle, slow speed approach.
- Right turn pocket on the Pinjar Road southern approach

8.3.4 Other options for this intersection were tested including Give Way controlled T-junction and a roundabout. These options were found to fail at various times and were not considered. The T-junction would fail soon after the opening of the LSP, whilst the roundabout option was found to fail by approximately 2041. This due to the heavy left turn movement from the LSP onto Pinjar Road. The traffic signals were stress tested and this option was found to be able to operate until approximately 2045 where traffic flows on Pinjar Road exceed the capacity of the traffic signals.

Table 8-2: New Pinjar Road Intersection Performance Summary

Lane	Performance Measure			
	Degree of Saturation (DoS)	Average Delay (s)	Level of Service (LoS)	95th %ile Queue (m)
Pinjar Road/NCA Street – AM Peak (85s Cycle Time)				
Pinjar Rd S				
Th	0.42	3		63
RT	0.45	51		19
NCA Street				
LT	0.74	36		100
RT	0.74	52		32
Pinjar Rd N				
LT	0.01	19		1
Th	0.88	22		336
Intersection	**0.88**	**20**	**C**	**336**
Pinjar Road/NCA Street – PM Peak (70s Cycle Time)				
Pinjar Rd S				
Th	0.66	5		122
RT	0.87	46		89
NCA Street				
LT	0.17	14		20
RT	0.20	39		8
Pinjar Rd N				
LT	0.06	16		5
Th	0.88	29		233
Intersection	**0.88**	**19**	**B**	**233**

Access to the LSP is also expected to be gained via Nambi Parkway where it intersects with Pinjar Road south of Joondalup Drive. Approximately 10% of the LSP traffic was expected to use Nambi Parkway in an initial layout of the LSP with multiple accesses onto Mornington Drive. Current traffic flows provided by the City from 2022 indicates that approximately 1600vpd use Nambi Parkway. The LSP demand to use Nambi Parkway was estimated at approximately 1,900vpd, thus there was expected to be a total of approximately 3,500vpd using Nambi Parkway. In its present format Nambi Parkway is estimated to have a traffic carrying capacity of approximately 4,000 to 5,000vpd. The assessment of the performance of the intersection of Nambi Parkway and Pinjar Road for this scenario is summarised below in Table 7-2.

Table 8-3: Nambi Parkway Intersection Performance Summary (AM Peaks)

Lane	Performance Measure			
	Degree of Saturation (DoS)	Average Delay (s)	Level of Service (LoS)	95th %ile Queue (m)
Pinjar Road/Nambi Parkway – AM Peak (Current 2023 Flows)				
Nambi Parkway				
LT	0.15	8		4
RT	0.26	14		6
Pinjar Rd N				
LT	0.02	7		1
Th	0.43	0		0
Pinjar Rd S				
Th	0.26	0		0
RT	0.11	20		2
Intersection	**0.43**	**2**	**NA**	**6**
Pinjar Road/Nambi Parkway – AM Peak (2036 Flows with no LSP)				
Nambi Parkway				
LT	0.21	11		6
RT	0.51	31		12
Pinjar Rd N				
LT	0.02	7		1
Th	0.56	0		0
Pinjar Rd S				
Th	0.34	0		0
RT	0.23	34		5
Intersection	**0.56**	**3**	**NA**	**12**
Pinjar Road/Nambi Parkway – AM Peak (2036 Flows with LSP)				
Nambi Parkway				
LT	0.33	12		10
RT	0.84	52		29
Pinjar Rd N				
LT	0.02	7		1
Th	0.56	0		0
Pinjar Rd S				
Th	0.34	0		0
RT	0.29	35		6
Intersection	**0.84**	**6**	**NA**	**29**

From the above assessment summary, it can be seen that the critical right turn from Nambi Parkway is close to capacity in 2036 when the LSP traffic flows are considered. Delays for this movement are expected to be approximately 52s. This is slightly higher than the WAPC threshold of 45s for an individual movement, but the approach has delays of approximately 30s, this less than the 35s threshold. Beyond 2036, these delays are expected to worsen as traffic flows for the right turn begin to exceed its capacity (this being a practical degree of saturation of 0.80 for sign control).

Based on the above findings, the initial LSP layout was then modified so that street connections of the LSP to Mornington Drive were limited, this to also limit the amount of LSP traffic on Nambi Parkway. On this basis a resultant 50% drop in LSP traffic on Nambi Parkway will result in delays to right turn traffic of approximately 37s with a DoS of 0.68, these now below WAPC thresholds.

Road Safety

8.3.5 The low level of traffic generated by the proposed LSP and the expected acceptable levels of delays exiting or accessing the site directly from the frontage roads is not anticipated to worsen the existing relatively low-level crash history. The adoption of traffic signals for the Pinjar Road entry will make this access relatively safe, compared to an uncontrolled T-junction.

8.4 Analysis of Pedestrian / Cycle Networks

8.4.1 Table 2 of the WAPC Guidelines Volume 2 has been reproduced below.

Table 8-4: Traffic Volumes Affecting Pedestrian Crossing Amenity

Road Cross-Section	Traffic Volume Affecting Ability of Pedestrians to Cross (vehicles per hour – two-way)
2 lane undivided	1,100 vph
2 lane divided (or with pedestrian refuse islands)	2,800 vph
4 lane undivided (without pedestrian refuge islands)	700 vph
4 lane divided (or with pedestrian refuge islands)	1,600 vph

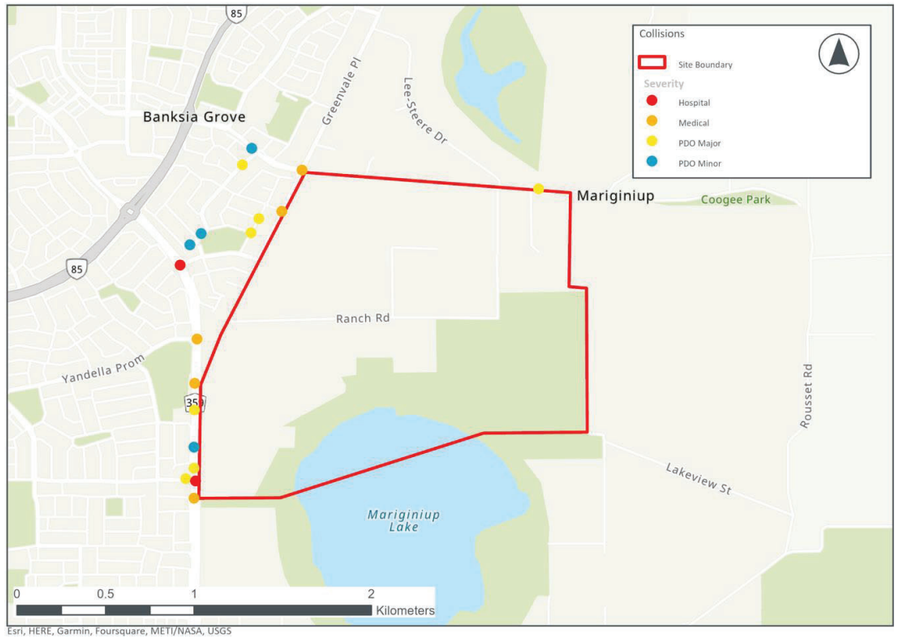
8.4.2 This states that for a two-lane divided road, as is the case for the proposed neighbourhood connector connecting to Pinjar Road, the ability of pedestrians to cross would only be affected if there are more than 2,800 vph. This section of road is expected to carry approximately 760vph.

8.4.3 Other streets within the LSP are expected to have traffic flows generally less than this and expected to be significantly less than the 1,100vph threshold for a 2-lane undivided street. Thus, all streets within the LSP will not require to have treatments installed to assist pedestrians crossing the streets picking gaps in traffic.

9 Safety Issues

9.1.1 Crash history has been reviewed from the Main Roads WA Crash Information map on streets in the vicinity of the development site. Crashes in the vicinity of the site were identified and the locations of which are shown in Figure 9-1.

Figure 9-1: Location of Crashes (worst rated collisions in each location shown where more than one collision recorded)



9.1.2 The crashes in Figure 9-1, are summarised in Table 9-1.

Table 9-1: Crash Summary

Location	Date, Time	Severity	Accident Type	Event Type	Other Involvements
Coogee Road	07/03/2021, 15:15	PDO Major	Sideswipe same direction	Involving overtaking	2 x cars
Coogee Road, Tumbleweed Drive, Mornington Drive & Greenvale Place	07/06/2019, 08:45	PDO Major	Right angle	N/A	2 x cars
	23/08/2021, 16:15	Medical	Right angle	N/A	N/A
Sundowner Meander & Mornington Drive	18/07/2019, 13:20	Medical	Right angle	N/A	2 x cars
Tumbleweed Drive	12/07/2018, 18:50	PDO Minor	Hit object	N/A	N/A
Abbey Green Road & Tussock Elbow	13/07/2019, n/a	PDO Major	Hit object	N/A	1 x car
Kandalee Gate & Cyandra Loop	26/01/2019, 23:56	PDO Major	Hit Object	N/A	1 x car
	26/01/2019, n/a	PDO Major	Hit object	Entering / leaving driveway	1 x car
Kandalee Gate & Winona Link	14/04/2021, 17:35	PDO Major	Rear end	N/A	1 x car
Abbey Green Road	03/06/2017, n/a	PDO Minor	Hit object	N/A	N/A
Sundowner Meander	08/02/2017, 20:00	PDO Minor	N/A	Involving parking	1 x car
Pinjar Road & Nambi Parkway	13/08/2017, 19:15	PDO Major	Rear end	Involving overtaking	1 x car
	26/02/2018, 19:00	PDO Minor	Rear end	N/A	2 x car
	04/09/2019, 17:30	PDO Major	Hit object	N/A	1 x motorcycle, 1 x car
	26/08/2021, 15:00	PDO Minor	Right angle	N/A	2 x car
	26/02/2021, 21:10	Hospital	Right turn thru	N/A	3 x car
Pinjar Road & Yandella Promenade	22/03/2018, 08:20	PDO Major	Right turn thru	N/A	1 x motorcycle, 1 x car
	01/06/2018, 16:00	Medical	Rear end	N/A	1 x car
	10/08/2018, 05:50	Medical	Right angle	N/A	1 x car
	06/08/2019, 16:20	Medical	Rear end	N/A	2 x car
Pinjar Road	23/03/2017, 05:50	PDO Major	Rear end	Entering / leaving driveway	2 x car
	02/07/2019, 18:00	PDO Minor	Sideswipe same direction	Involving overtaking	2 x car
	19/09/2019, 08:50	Medical	Rear end	N/A	2 x car
	29/11/2019, 14:45	Medical	Rear end	N/A	3 x car
	29/04/2020, 15:30	PDO Major	Sideswipe same direction	Involving overtaking	1 x car
Pinjar Road & Galileo Avenue	31/03/2017, 19:30	Hospital	Rear end	N/A	1 x truck, 1 x car
	08/05/2019, 09:00	Medical	Rear end	N/A	2 x car
	07/04/2021, 07:00	PDO Major	Rear end	N/A	2 x car
Galileo Avenue	10/03/2018, 18:30	PDO Major	N/A	Involving parking	2 x car

***Source:** https://portal-mainroads.opendata.arcgis.com/

9.1.3 Across the study are there were 29 crashes recorded across the last five years to December 2021 of which two were Hospital, eight were Medical, 13 were Major Property Damage and six were Minor Property Damage. There were no crashes involving pedestrians or cyclists; one crash involved a truck; and two crashes involved a motorcycle. The most commonly crash type was 'rear end' (11) followed by 'right angle' crashes and 'hit object' (five each).

9.1.4 There are three intersections with Pinjar Road where there were three or more crashes over the last five years: with Nambi Parkway (5), with Yandella Promenade (4) and Galileo Avenue (3).

9.1.5 At the intersection of Pinjar Road and Nambi Parkway, one crash was Medical, two were Major Property Damage, and two were Minor Property Damage. At the intersection of Pinjar Road and Yandella Promenade, three crashes were Medical, and one was Major Property Damage; all crashes took place in 2018 and 2019, involving rear end or right turn crashes. Three rear-end crashes occurred at the intersection with Galileo Avenue (one Hospital, one Medical and one Major Property Damage.

9.1.6 Pinjar Road was upgraded to a four-lane dual carriageway between Blackberry Drive and Joondalup Drive in 2018/2019. The 2.5km stretch of road covers five intersections (including the three mentioned above), with improved provision for right turn vehicles and through moving traffic using separate lanes. This has shown to have improved the capacity and safety of Pinjar Road, where the number of crashes has decreased.

10 Summary and Conclusion

10.1.1 This TIA has been prepared by PJA on behalf of QUBE Property Group in relation to a proposed residential Local Structure Plan within the wider East Wanneroo DSP The LSP proposals include the following;

- Approximately 2,500 residential lots;
- Primary School;
- Public Open Space (POS); and
- Several access points across the site for vehicles and other modes to access the site.

10.1.2 The proposals are forecast to generate 2,000 two-way residential vehicle trips in both the weekday AM and PM peak periods, based on WAPC trip rates. Modelling has shown that the additional traffic expected to be generated by the LSP will be able to use the adjacent road network with the introduction of traffic signals at the main access on Pinjar Road.

10.1.3 The site will connect well to surrounding pedestrian and cycling provision via the strong links provided through the site north-south and east-west. Residents and visitors to the site will benefit from frequent bus services on Pinjar Road and from the future bus services and rail stations to be provided in the DSP.

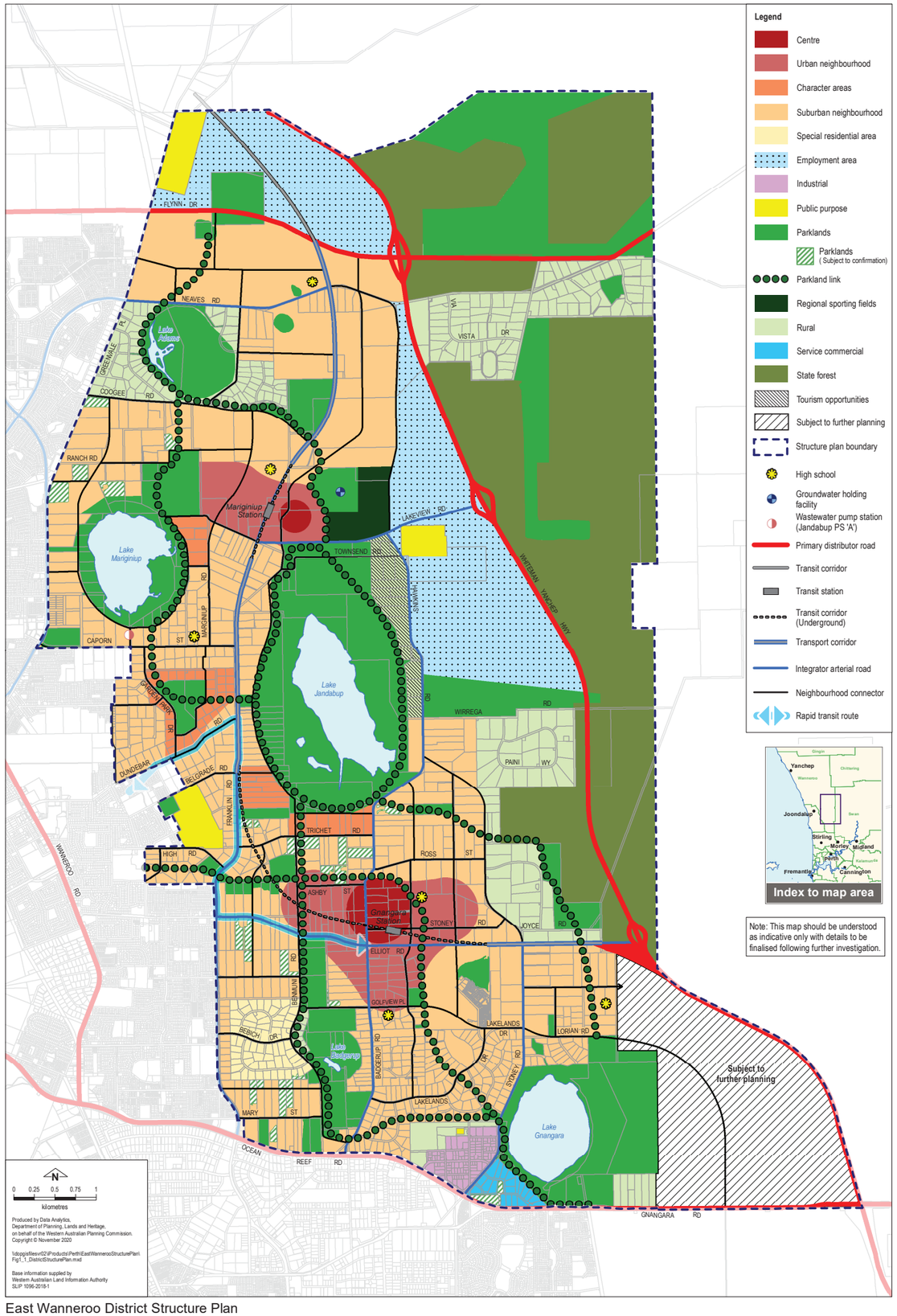
10.1.4 Based on the Medium Density Design Codes, the LSP could provide a minimum of 625 car parking spaces for visitors. The new codes respect that if there are good public transport provisions nearby, there is no need for car ownership. Similarly, each of the 2,500 lots should provide a space for parking for at least one bicycle in their home garages/store plus 250 visitor spaces.

10.1.5 The site provides a sustainable opportunity for development, providing residential dwellings in close proximity to high frequency bus services to/from rail transport opportunities, reducing the demand for private vehicle usage and increasing patronage to local amenities.

10.1.6 This Transport Impact Assessment has been prepared in accordance with the *WAPC Transport Impact Assessment Guidelines Volume 2*, the completed checklist is provided at Appendix D.

Appendix A East Wanneroo District Structure Plan Masterplan

Figure 1.1 East Wanneroo District Structure Plan

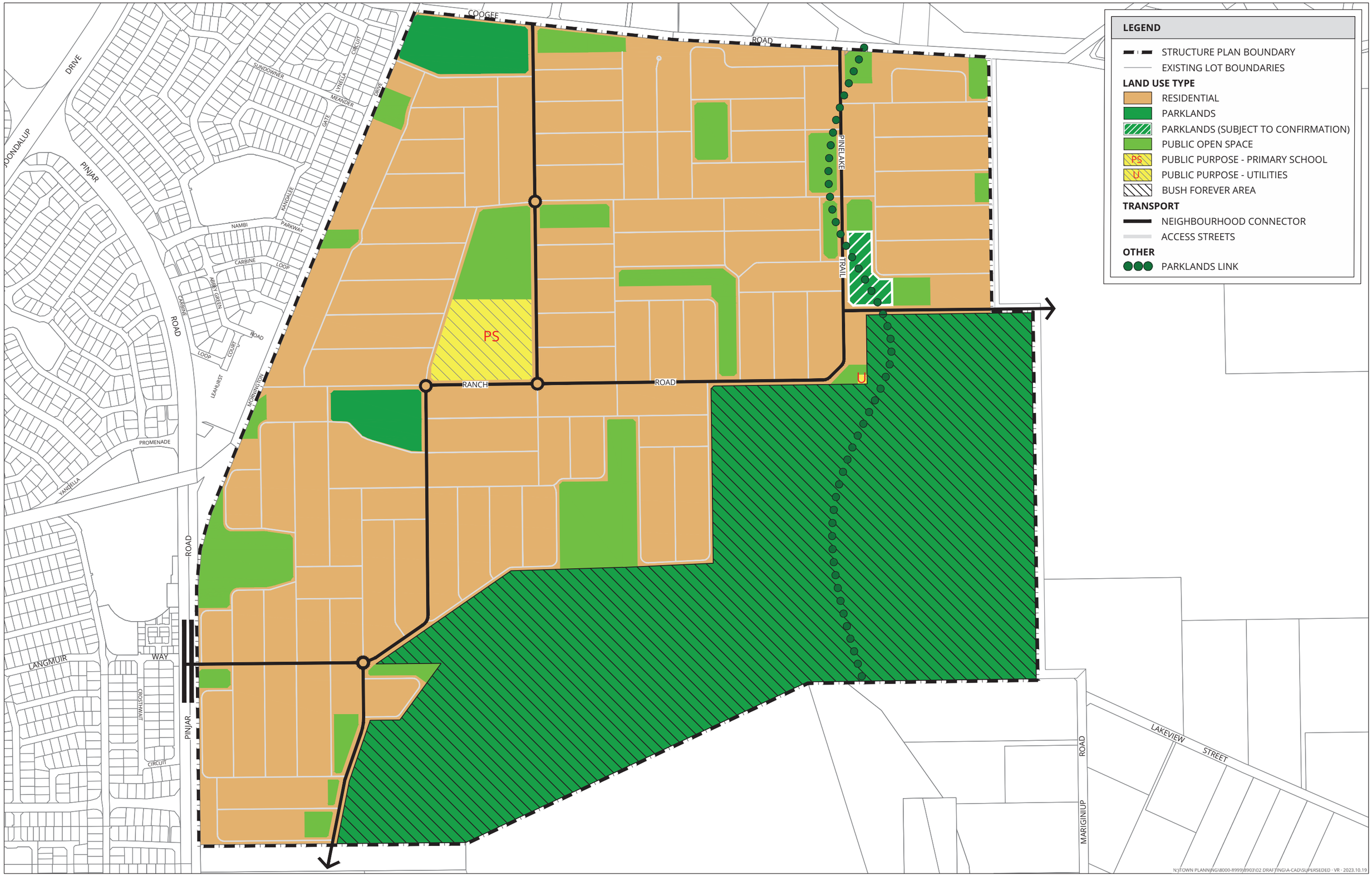


East Wanneroo District Structure Plan

Appendix B Proposed Local Structure Plan Masterplan

This page has been left blank intentionally

This page has been left blank intentionally



PLAN 1 - LOCAL STRUCTURE PLAN

PRECINCT 8 - RANCH ROAD

EAST WANNEROO

DRAFT

N

0 180 m

SCALE @ A3: 1:7500

8903-LSP-01-B

DRAWN: VR
DATE CREATED: 2023.10.19
PROJECTION: MGA50 GDA2020
CADASTRE: LANDGATE

ROWE GROUP DESIGN

This page has been left blank intentionally

Appendix C Traffic Survey Results

mainroads WESTERN AUSTRALIA

SITE 51846

Hourly Volume

Pinjar Rd (1100250)

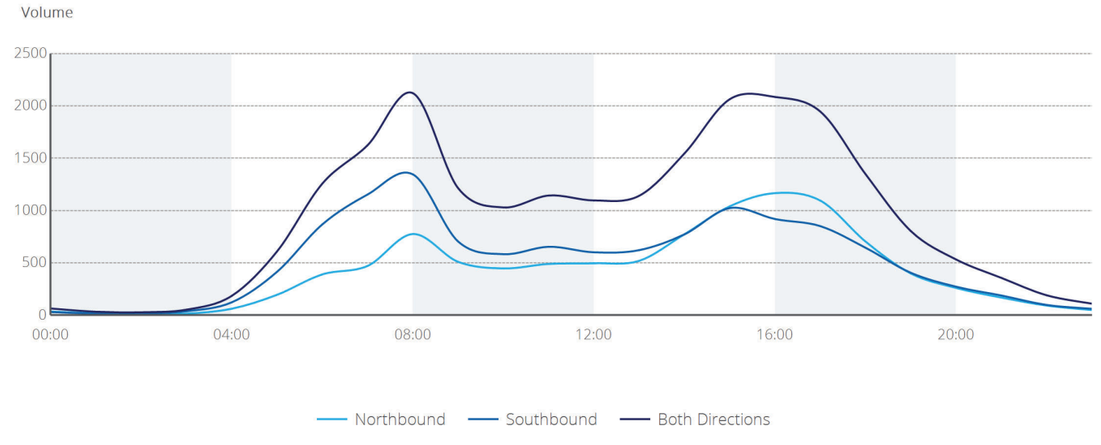
South of Joondalup Dr (SLK 3.85)

2020/21
Monday to Friday

	All Vehicles			Heavy Vehicles			
	NB	SB	Both	NB	SB	Both	%
00:00	34	30	64	3	5	8	12.5
01:00	18	15	33	3	2	5	15.2
02:00	14	14	28	2	0	2	7.1
03:00	15	38	53	5	5	10	18.9
04:00	62	123	185	8	8	16	8.6
05:00	195	415	610	34	58	92	15.1
06:00	390	868	1258	81	132	213	16.9
07:00	471	1154	1625	70	113	183	11.3
08:00	776	1346	2122	86	99	185	8.7
09:00	510	704	1214	74	98	172	14.2
10:00	447	583	1030	77	91	168	16.3
11:00	490	654	1144	81	92	173	15.1
12:00	496	601	1097	77	96	173	15.8
13:00	520	622	1142	83	102	185	16.2
14:00	774	773	1547	82	109	191	12.3
15:00	1041	1024	2065	101	109	210	10.2
16:00	1167	919	2086	104	82	186	8.9
17:00	1095	851	1946	90	59	149	7.7
18:00	703	644	1347	60	46	106	7.9
19:00	398	405	803	28	29	57	7.1
20:00	260	272	532	16	13	29	5.5
21:00	168	188	356	4	16	20	5.6
22:00	92	98	190	6	4	10	5.3
23:00	49	61	110	2	4	6	5.5
TOTAL	10185	12402	22587	1177	1372	2549	11.3

Peak Statistics

AM	TIME	08:00	08:00	08:00	08:15	06:00	06:15
	VOL	776	1346	2122	93	132	223
PM	TIME	16:00	15:00	15:45	16:30	14:30	14:45
	VOL	1167	1024	2090	104	115	214



mainroads WESTERN AUSTRALIA

Hourly Volume

Pinjar Rd (1100250)

South of Joondalup Dr (SLK 3.85)

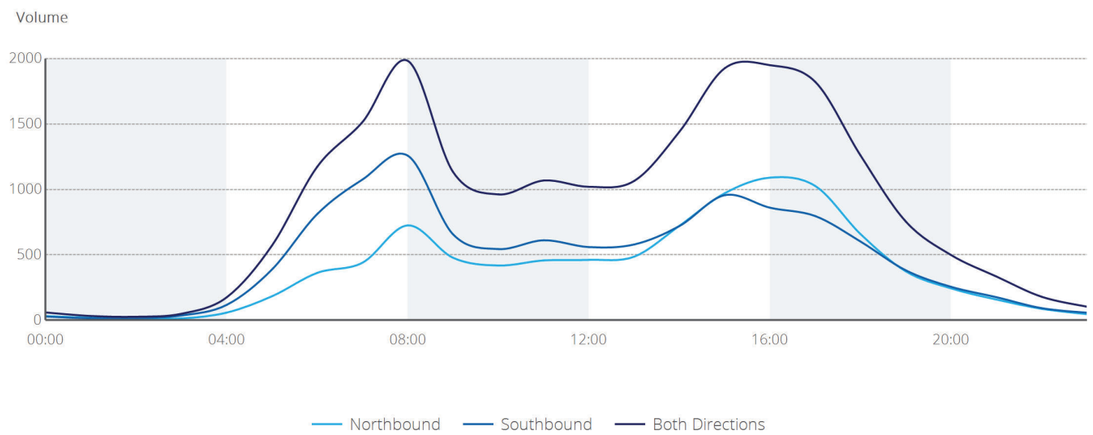
SITE 51846

2020/21
Monday to Sunday

	All Vehicles			Heavy Vehicles			
	NB	SB	Both	NB	SB	Both	%
00:00	31	28	59	2	5	7	11.9
01:00	18	14	32	4	2	6	18.8
02:00	12	14	26	1	1	2	7.7
03:00	13	36	49	4	5	9	18.4
04:00	58	117	175	8	9	17	9.7
05:00	183	388	571	32	54	86	15.1
06:00	362	812	1174	74	125	199	17.0
07:00	440	1076	1516	65	103	168	11.1
08:00	725	1258	1983	81	93	174	8.8
09:00	477	656	1133	69	90	159	14.0
10:00	418	544	962	72	85	157	16.3
11:00	457	611	1068	75	86	161	15.1
12:00	461	559	1020	70	88	158	15.5
13:00	486	579	1065	78	93	171	16.1
14:00	722	720	1442	76	100	176	12.2
15:00	971	956	1927	93	101	194	10.1
16:00	1090	860	1950	97	78	175	9.0
17:00	1026	796	1822	87	57	144	7.9
18:00	658	601	1259	57	43	100	7.9
19:00	373	381	754	27	28	55	7.3
20:00	243	255	498	15	13	28	5.6
21:00	158	176	334	4	15	19	5.7
22:00	87	92	179	7	4	11	6.1
23:00	46	57	103	2	4	6	5.8
TOTAL	9515	11586	21101	1100	1282	2382	11.3

Peak Statistics

AM	TIME	08:00	08:00	08:00	08:15	06:00	06:15
	VOL	725	1258	1983	87	125	205
PM	TIME	16:15	15:00	15:45	16:30	14:30	15:15
	VOL	1091	956	1951	100	106	196



City of Wanneroo

City of Wanneroo
23 Dundebar Road,
Wanneroo, WA 6065
Tel: 9405 5000

Traffic Survey

Location: Nambi Parkway, East of Abbey Green Banksia Grove <50>
Site name: --M18--TC03078 Location: [-31.710233, 115.806890]
Survey duration: 8:00 Tuesday, 6 September 2022 to 8:00 Tuesday, 13 September 2022 (7 days, 1 weeks)
Profile: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16),
Speed limit: 50 km/h **Sensor Balance:** % **Class scheme** = *AustRoads94*

Summary

AWDT (VPD)	**1604**
Commercial	**5.8%**
Mean Speed	**45.9kp/h**
Speed 85%	**52.7kp/h**
30kp/h Above	**0.019%**
Direction	**East, West (bound)**

Average Daily Volume

Hours	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
0000-0100	1	3	4	4	2	13	13	3	13	**6**
0100-0200	3	2	1	2	2	6	10	2	8	**4**
0200-0300	1	0	2	2	2	3	4	1	4	**2**
0300-0400	2	2	2	3	3	9	5	2	7	**4**
0400-0500	12	7	12	10	8	6	3	10	5	**8**
0500-0600	46	45	42	40	41	8	4	43	6	**32**
0600-0700	101	86	100	96	100	35	20	97	28	**77**
0700-0800	122	22	110	102	103	44	29	92	37	**76**
0800-0900	138	140	145	157	137	58	42	143	50	**117**
0900-1000	74	80	79	95	78	103	68	81	86	**82**
1000-1100	90	76	85	76	68	78	93	79	86	**81**
1100-1200	60	70	82	62	78	117	85	70	101	**79**
1200-1300	93	78	61	81	84	112	110	79	111	**88**
1300-1400	77	82	79	86	91	99	99	83	99	**88**
1400-1500	108	121	114	108	108	101	109	112	105	**110**
1500-1600	149	136	155	139	150	104	89	146	97	**132**
1600-1700	155	156	181	168	147	98	81	161	90	**141**
1700-1800	145	156	138	136	148	115	125	145	120	**138**
1800-1900	77	81	122	96	112	84	83	98	84	**94**
1900-2000	58	49	63	65	56	43	56	58	50	**56**
2000-2100	32	36	55	41	50	45	27	43	36	**41**
2100-2200	20	36	28	29	22	41	26	27	34	**29**
2200-2300	12	10	13	30	37	21	16	20	19	**20**
2300-2400	1	8	8	10	15	22	9	8	16	**10**
Total	**1577**	**1482**	**1681**	**1638**	**1642**	**1365**	**1206**	**1604**	**1286**	**1513**
AM peak	138 (0800)	140 (0800)	145 (0800)	157 (0800)	137 (0800)	117 (1100)	93 (1000)	143 (0800)	101 (1100)	**117 (0800)**
PM peak	155 (1600)	156 (1600)	181 (1600)	168 (1600)	150 (1500)	115 (1700)	125 (1700)	161 (1600)	120 (1700)	**141 (1600)**
Day peak	155 (1600)	156 (1600)	181 (1600)	168 (1600)	150 (1500)	117 (1100)	125 (1700)	161 (1600)	120 (1700)	**141 (1600)**

Speed Data kp/h

	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
Mean kp/h	46.1	46.4	46.3	46.2	45.6	45.2	45.1	46.1	45.1	**45.9**
Speed 85% kp/h	52.9	53.3	53.1	52.7	52.5	52.0	52.2	52.9	52.2	**52.7**
Mean Exceeding kp/h	54.3	54.3	54.5	54.3	54.5	54.4	54.3	54.4	54.3	**54.4**
Vol Exceeding	449	435	464	434	425	312	281	441	297	**400**
% Exceeding	28.47	29.35	27.60	26.50	25.88	22.86	23.30	27.52	23.06	**26.44**

Vehicles 30kph Above	2	0.019%

Class Data

Commercial	5.82%

Class (*AustRoads94*)	Number of Vehicles	%	
1 - SV	9774	92.29%	L
2 - SVT	200	1.888%	L
3 - TB2	484	4.570%	M
4 - TB3	86	0.812%	M
5 - T4	16	0.151%	M
6 - ART3	3	0.028%	H
7 - ART4	18	0.170%	H
8 - ART5	9	0.085%	H
9 - ART6	0	0.000%	H
10 - BD	1	0.009%	H
11 - DRT	0	0.000%	H
12 - TRT	0	0.000%	H

Class (*AustRoads94*)	%
Light Vehicle	94.18%
Medium Vehicle	5.53%
Heavy Vehicle	0.29%

City of Wanneroo
23 Dundebar Road,
Wanneroo, WA 6065
Tel: 9405 5000

Traffic Survey

Location: Mornington Drive, North of Nambi Pwkwy, Banksia Grove <50>
Site name: M20--TC02816 Location: [-31.708986, 115.809327]
Survey duration: 8:00 Tuesday, 6 September 2022 to 8:00 Tuesday, 13 September 2022 (7 days, 1 weeks)
Profile: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16),
Speed limit: 50 km/h **Sensor Balance:** % **Class scheme** = *AustRoads94*

Summary

AWDT (VPD)	972
Commercial	4.9%
Mean Speed	51.1kp/h
Speed 85%	60.1kp/h
30kp/h Above	0.286%
Direction	North, South (bound)

Average Daily Volume

Hours	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
0000-0100	0	3	4	1	1	10	6	2	8	**4**
0100-0200	2	1	1	2	0	3	2	1	3	**2**
0200-0300	0	0	1	1	1	1	3	1	2	**1**
0300-0400	0	0	1	1	1	5	2	1	4	**1**
0400-0500	5	4	4	3	2	0	0	4	0	**3**
0500-0600	22	16	24	24	18	6	6	21	6	**17**
0600-0700	62	48	69	50	53	19	8	56	14	**44**
0700-0800	89	22	72	63	67	25	16	63	21	**51**
0800-0900	94	90	102	108	96	34	17	98	26	**77**
0900-1000	47	48	56	57	56	60	48	53	54	**53**
1000-1100	64	54	46	53	44	48	60	52	54	**53**
1100-1200	56	39	48	36	51	68	61	46	65	**51**
1200-1300	59	41	30	52	52	46	66	47	56	**49**
1300-1400	45	52	50	51	54	57	60	50	59	**53**
1400-1500	56	70	69	74	65	58	58	67	58	**64**
1500-1600	93	88	105	94	100	48	51	96	50	**83**
1600-1700	106	95	105	102	96	63	49	101	56	**88**
1700-1800	78	94	92	85	94	64	64	89	64	**82**
1800-1900	45	49	70	48	49	43	41	52	42	**49**
1900-2000	33	28	34	34	21	25	25	30	25	**29**
2000-2100	12	19	26	14	15	42	14	17	28	**20**
2100-2200	8	22	17	14	10	17	9	14	13	**14**
2200-2300	4	6	9	13	8	10	9	8	10	**8**
2300-2400	1	4	5	7	5	9	4	4	7	**5**
Total	**981**	**893**	**1040**	**987**	**959**	**761**	**679**	**972**	**720**	**900**
AM peak	94 (0800)	90 (0800)	102 (0800)	108 (0800)	96 (0800)	68 (1100)	61 (1100)	98 (0800)	65 (1100)	**77 (0800)**
PM peak	106 (1600)	95 (1600)	105 (1500)	102 (1600)	100 (1500)	64 (1700)	66 (1200)	101 (1600)	64 (1700)	**88 (1600)**
Day peak	106 (1600)	95 (1600)	105 (1500)	108 (0800)	100 (1500)	68 (1100)	66 (1200)	101 (1600)	65 (1100)	**88 (1600)**

Speed Data kp/h

	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
Mean kp/h	51.3	51.4	50.6	50.9	51.4	50.6	51.7	51.1	51.1	**51.1**
Speed 85% kp/h	60.1	59.8	59.9	60.1	61.2	59.6	60.1	60.3	59.9	**60.1**
Mean Exceeding kp/h	57.1	57.1	57.3	57.5	57.8	57.1	57.3	57.4	57.2	**57.3**
Vol Exceeding	585	537	584	532	562	432	406	560	419	**520**
% Exceeding	59.63	60.13	56.15	53.90	58.60	56.77	59.79	57.61	58.19	**57.75**

Vehicles 30kph Above	18	0.286%

Class Data

Commercial	**4.92%**

Class (*AustRoads94*)	Number of Vehicles	%	
1 - SV	5839	92.68%	L
2 - SVT	151	2.397%	L
3 - TB2	216	3.429%	M
4 - TB3	56	0.889%	M
5 - T4	10	0.159%	M
6 - ART3	4	0.063%	H
7 - ART4	13	0.206%	H
8 - ART5	8	0.127%	H
9 - ART6	2	0.032%	H
10 - BD	0	0.000%	H
11 - DRT	1	0.016%	H
12 - TRT	0	0.000%	H

Class (*AustRoads94*)	%
Light Vehicle	95.08%
Medium Vehicle	4.48%
Heavy Vehicle	0.44%

City of Wanneroo
23 Dundebar Road,
Wanneroo, WA 6065
Tel: 9405 5000

Traffic Survey

Location: Yandella Prom, east of Waldburg Dr, Tapping <50>
Site name: --M8--TC00585 Location: -31.716953, 115.796416]
Survey duration: 8:00 Wednesday, 4 August 2021 to 8:00 Wednesday, 11 August 2021 (7 days, 1 weeks)
Profile: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16),
Speed limit: 50 km/h **Sensor Balance:** % **Class scheme** = *AustRoads94*

Summary

AWDT (VPD)	**2029**
Commercial	**4.9%**
Mean Speed	**49.1kp/h**
Speed 85%	**55.8kp/h**
30kp/h Above	**0.046%**
Direction	**East, West (bound)**

Average Daily Volume

Hours	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
0000-0100	2	4	1	6	3	15	18	3	17	**7**
0100-0200	4	4	4	3	1	6	7	3	7	**4**
0200-0300	2	2	1	1	3	3	11	2	7	**3**
0300-0400	1	4	2	3	5	4	3	3	4	**3**
0400-0500	6	8	12	8	9	5	5	9	5	**8**
0500-0600	31	36	32	37	34	13	10	34	12	**28**
0600-0700	55	57	65	60	46	23	12	57	18	**45**
0700-0800	127	130	126	131	137	48	21	130	35	**103**
0800-0900	284	290	273	278	284	78	41	282	60	**218**
0900-1000	85	84	96	75	94	116	84	87	100	**91**
1000-1100	83	63	81	87	81	114	117	79	116	**89**
1100-1200	94	76	71	89	97	134	119	85	127	**97**
1200-1300	76	67	85	74	98	156	111	80	134	**95**
1300-1400	93	87	95	103	97	126	114	95	120	**102**
1400-1500	205	202	195	193	176	126	118	194	122	**174**
1500-1600	232	218	217	194	221	123	110	216	117	**188**
1600-1700	185	191	213	198	185	135	113	194	124	**174**
1700-1800	155	153	184	166	175	126	108	167	117	**152**
1800-1900	89	115	114	144	134	96	93	119	95	**112**
1900-2000	49	86	67	86	102	64	59	78	62	**73**
2000-2100	45	33	51	65	69	39	49	53	44	**50**
2100-2200	25	29	35	24	37	34	34	30	34	**31**
2200-2300	19	12	21	22	26	22	10	20	16	**19**
2300-2400	5	6	4	10	19	24	4	9	14	**10**
Total	**1952**	**1957**	**2045**	**2057**	**2133**	**1630**	**1371**	**2029**	**1501**	**1878**
AM peak	284 (0800)	290 (0800)	273 (0800)	278 (0800)	284 (0800)	134 (1100)	119 (1100)	282 (0800)	127 (1100)	**218 (0800)**
PM peak	232 (1500)	218 (1500)	217 (1500)	198 (1600)	221 (1500)	156 (1200)	118 (1400)	216 (1500)	134 (1200)	**188 (1500)**
Day peak	284 (0800)	290 (0800)	273 (0800)	278 (0800)	284 (0800)	156 (1200)	119 (1100)	282 (0800)	134 (1200)	**218 (0800)**

Speed Data kp/h

	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
Mean kp/h	48.7	48.9	49.0	48.8	49.2	49.5	49.4	48.9	49.5	**49.1**
Speed 85% kp/h	55.3	55.4	55.8	56.0	56.0	56.7	55.6	55.6	56.2	**55.8**
Mean Exceeding kp/h	54.7	54.9	55.2	55.0	55.1	55.2	55.0	55.0	55.1	**55.0**
Vol Exceeding	842	851	879	911	961	798	640	889	719	**840**
% Exceeding	43.14	43.48	42.98	44.29	45.05	48.96	46.68	43.81	47.92	**44.75**

Vehicles 30kph Above	6	0.046%

Class Data

Commercial	**4.90%**

Class (*AustRoads94*)	Number of Vehicles	%	
1 - SV	12401	94.34%	L
2 - SVT	100	0.761%	L
3 - TB2	620	4.717%	M
4 - TB3	8	0.061%	M
5 - T4	7	0.053%	M
6 - ART3	2	0.015%	H
7 - ART4	6	0.046%	H
8 - ART5	1	0.008%	H
9 - ART6	0	0.000%	H
10 - BD	0	0.000%	H
11 - DRT	0	0.000%	H
12 - TRT	0	0.000%	H

Class (*AustRoads94*)	%
Light Vehicle	95.10%
Medium Vehicle	4.83%
Heavy Vehicle	0.07%

Appendix D WAPC Guidelines Checklist

Item	Provided	Comments / Proposals
Summary		
Introduction / Background		
name of applicant and consultant	Y	
local structure plan location and context	Y	
brief description of local structure plan	Y	
key issues	Y	No key issues identified
background information	Y	
Local structure plan Proposal		
regional context	Y	
proposed land uses	Y	
table of land uses and quantities	Y	
major attractors/generators	Y	Site to be residential-led but will feature some generators including a primary school
any specific issues	Y	
Existing Situation		
existing land uses within structure plan	Y	
existing land uses surrounding the local structure plan	Y	
existing road network within local structure plan	N/A	No road network within LSP at present
existing road network surrounding the local structure plan	Y	
traffic flows on roads within local structure plan (AM and PM peak hours)	N/A	No road network within LSP at present
traffic flows on roads surrounding the local structure plan (AM and PM peak hours)	Y	
existing pedestrian/cycle networks within the local structure plan	N/A	No pedestrian / cycle network within LSP at present
existing pedestrian/cycle networks surrounding the local structure plan	Y	
existing public transport services within the local structure plan	N/A	No public transport services within LSP at present
existing public transport services surrounding the local structure plan	Y	
Proposed Internal Transport Networks		
changes/additions to existing road network	Y	
road reservation widths	Y	
road cross-sections & speed limits	Y	
intersection controls	Y	
pedestrian/cycle networks and crossing facilities	Y	
public transport routes	Y	
Changes to external transport networks		
road network	N/A	No changes to the external transport networks are proposed, excepting proposed TCS on Pinjar Road

Item	Provided	Comments / Proposals
intersection controls	N/A	No changes to the external transport networks are proposed
pedestrian/cycle networks and crossing facilities	N/A	No changes to the external transport networks are proposed
public transport services	N/A	No changes to the external transport networks are proposed
Integration with surrounding area		
surrounding attractors/generators	Y	
proposed changes to surrounding land uses	Y	
travel desire lines from local structure plan to these attractors/generators	Y	
adequacy of existing transport networks	Y	
deficiencies in existing transport networks	N/A	Possibly issues with Nambi Parkway intersection with Pinjar Road
remedial measures to address deficiencies	N/A	Consider modifications to Mornington Drive accesses
Analysis of internal transport networks		
assessment years and time periods	N/A	2036 at full buildout with AM/PM peaks assessed
local structure plan generated traffic	Y	
extraneous (through) traffic	Y	
design traffic flows	Y	Details provided in Chapter 4
road cross-sections	Y	Details provided in Chapter 4
intersection sight distances	Y	
intersection operation and method of control	Y	Details provided in Chapter 4
frontage access strategy	Y	
pedestrian/cycle networks	Y	
safe walk/cycle to school assessment (residential local structure plans only)	Y	
pedestrian permeability & efficiency	Y	
access to public transport	N/A	No public transport provision proposed within the LSP
Analysis of external transport networks		
base flows for assessment years	Y	
total traffic flows	Y	
road cross-sections	N/A	No changes to external road networks proposed
intersection operation	N/A	Low traffic volumes forecast to be generated
pedestrian/cycle networks	Y	
Safety issues		
identify issues	Y	
remedial measures	N/A	No need for remedial measures
Conclusions		