

Transport Impact Assessment

Hammond Quarter Structure Plan

CW1200533 / 304900893

Prepared for
Qube Property

29 January 2024



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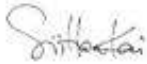
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1 Introduction

1.1 Background

Stantec has been commissioned by Qube Property to prepare a Transport Impact Assessment (TIA) for the proposed Structure Plan (the Site) located in Hammond Park, City of Cockburn. The Structure Plan consists of lots 117, 200, 805, 809, 1000, 1001, 9001, 9002, 9003 Wattleup Road.

Previously, a TIA covering the future developments north and south of Wattleup Road was prepared by Stantec in April 2021 (document reference: CW1143500-TR-RP-002). After lodgement, City of Cockburn has requested a TIA report to cover the LSP which is to include an additional SIDRA analysis scenario for a future Hammond Road/Wattleup Road 3-way roundabout.

1.2 Site Location

The LSP is located within the suburb of Hammond Park, City of Cockburn. The Site is currently majority vacant as shown in **Figure 1-1**.

Figure 1-1 Site Location

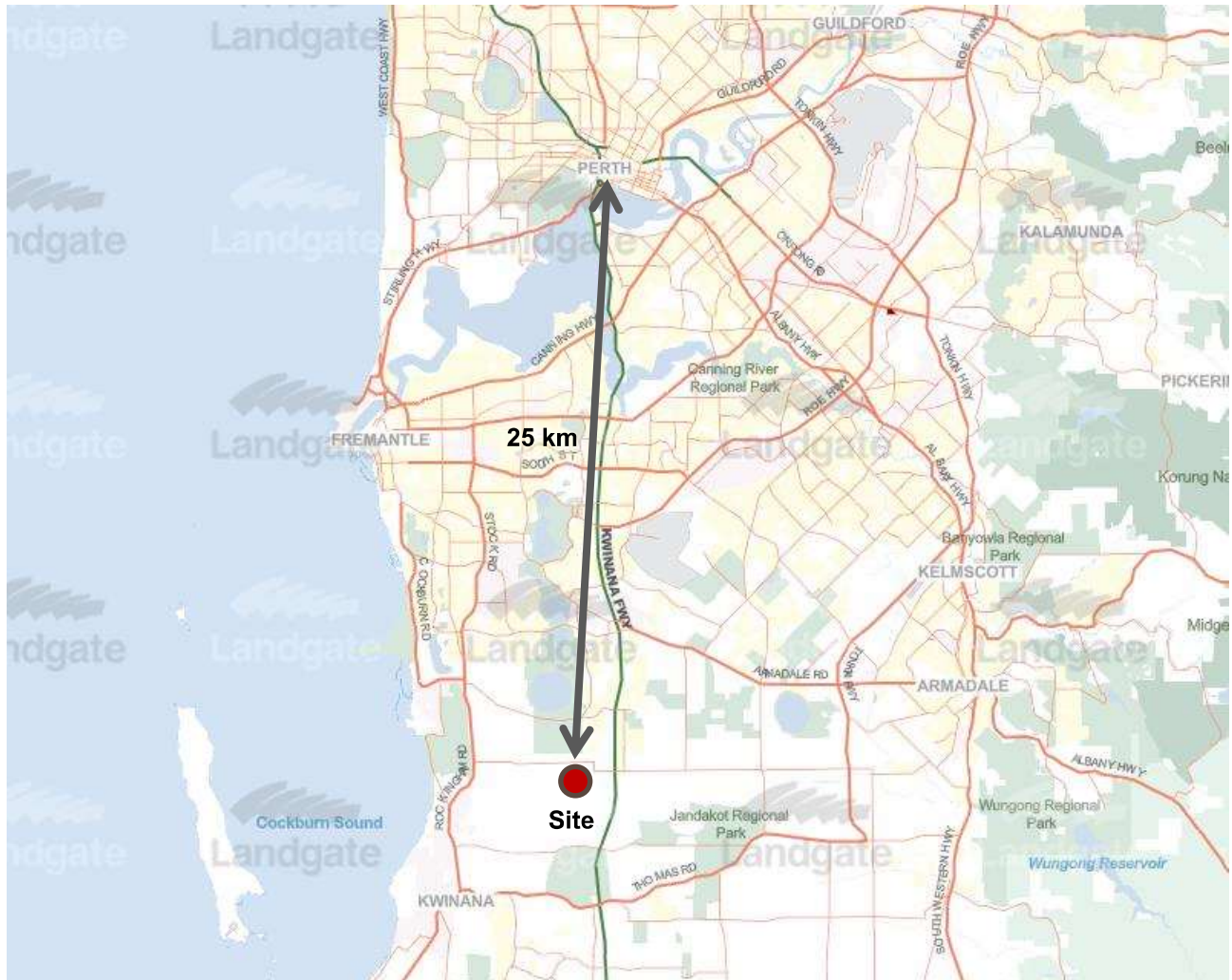


2 Structure Plan Proposal

2.1 Regional Context

The LSP is located approximately 33km from the Perth CBD in the suburb of Hammond Park as shown in **Figure 2-1**. The suburb is predominantly occupied by residential dwellings, with the southern portion of the suburb (where the LSP is located) still under development. The suburb and the LSP is well connected to the Perth CBD via Kwinana Freeway and the Mandurah rail line and to Fremantle / Kwinana industrial strip via Rockingham Road and Stock Road.

Figure 2-1 Regional Location



2.2 Proposed Land Use

The LSP is proposed to be developed into a residential subdivision with yields shown in **Table 2-1**. The LSP layout is shown **Figure 2-2**.

Table 2-1 LSP Indicative Land Use Yield

Land use	Indicative Yield
Residential Dwelling	294 dwellings

Figure 2-2 Proposed LSP Layout



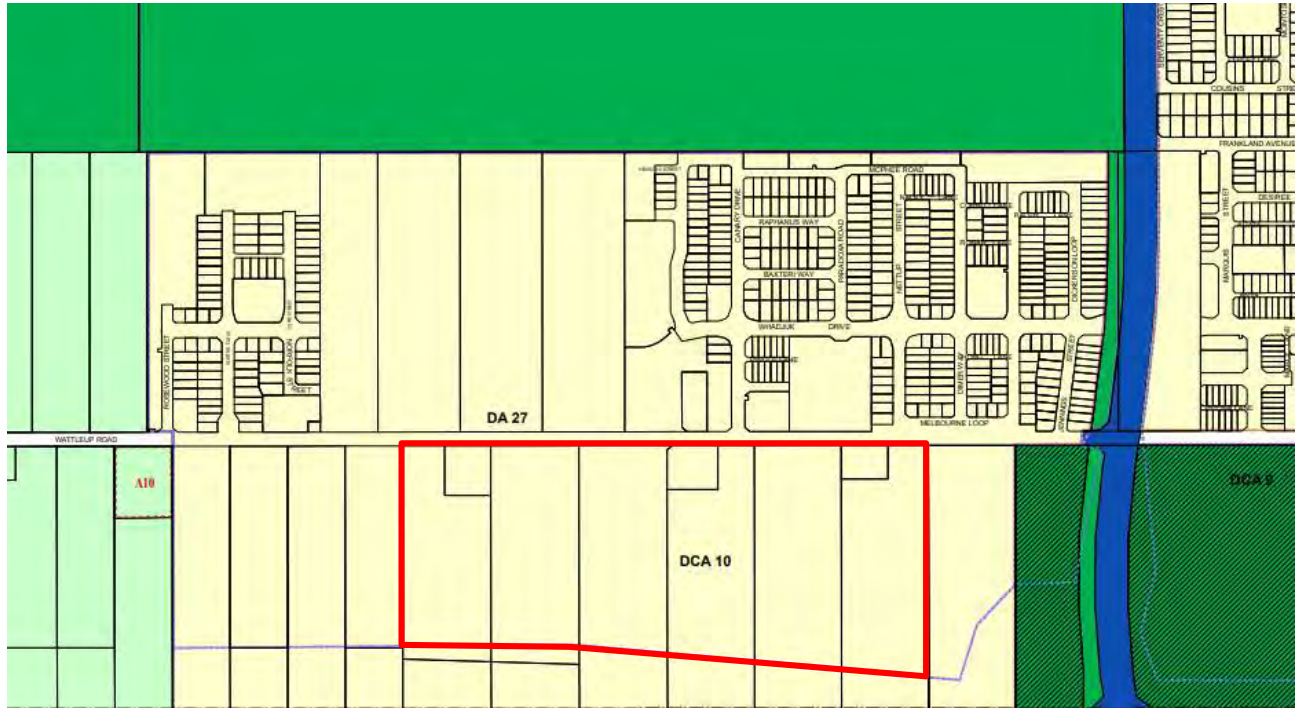
Source: Hatch Roberts Day 2022

3 Existing Situation

3.1 Existing Land Use

As shown in **Figure 3-1** below, the City of Cockburn *Town Planning Scheme No.3*, has zoned the LSP as “Development”. The area north, west, and east of the LSP is also zoned as “Development”, with the area north of Wattleup Road being progressively developed into residential lots / dwellings.

Figure 3-1 Existing Zoning



REGION SCHEME RESERVES (MRS)

Civic and Cultural	Public Purposes
Other Regional Roads	Public Purposes - Car Park
Parks and Recreation	Public Purposes - Commonwealth Government
Parks and Recreation - restricted	Public Purposes - High School
Port Installations	Public Purposes - Hospital
Primary Regional Roads	Public Purposes - Prison
Railways	Public Purposes - Special Uses
State Forests	Public Purposes - State Energy Commission
Waterways	Public Purposes - Technical School
Water Catchments	Public Purposes - University
	Public Purposes - Water Authority of WA

LOCAL SCHEME RESERVES

Lakes and Drainage	Public Purposes : Gas Pipeline
Local Road	Public Purposes : Oil Pipeline
Parks and Recreation	Public Purposes : Pre-School
Public Purposes : Civic	Public Purposes : Primary School
Public Purposes : Dept of Agriculture	Public Purposes : Water Corporation
Public Purposes : Fire Station	Public Purposes : Western Power

LOCAL SCHEME ZONES

Development	Mixed Use
District Centre	Regional Centre
Industry	Residential
Lakes and Drainage	Resource
Light and Service Industry	Rural
Local Centre	Rural Living
Mixed Business	Special Use

The LSP is located within the City of Cockburn's *Southern Suburbs District Structure Plan Stage 3 (SSDSP3)* covering the suburbs of Hammond Park and Wattleup as shown in **Figure 3-2**. SSDSP3 provides the framework for land uses that integrates with the broader area. Under SSDSP3 the Site is marked as 'Subject to Future Structure Planning'.

Figure 3-2 Southern Suburbs District Structure Plan – Stage 3



3.2 Existing Road Network

The existing road network hierarchy within and surrounding the LSP is shown in **Figure 3-3**. The road classifications are defined in the Main Roads Functional Hierarchy as shown below in **Table 3-1**.

Table 3-1 Main Roads WA Road Hierarchy

Road Hierarchy	Description
Primary Distributor	Form the regional and inter-regional grid of MRWA traffic routes and carry large volumes of fast-moving traffic. Some are strategic freight routes, and all are National or State roads. They are managed by Main Roads.
Regional Distributors	Roads that are not Primary Distributors, but which link significant destinations and are designed for efficient movement of people and goods within and beyond regional areas. They are managed by Local Government.
District Distributor A	These carry traffic between industrial, commercial, and residential areas and connect to Primary Distributors. These are likely to be truck routes and provide only limited access to adjoining property. They are managed by Local Government.
District Distributor B	Perform a similar function to "District Distributor A" but with reduced capacity due to flow restrictions from access to and roadside parking alongside adjoining property. These are often older roads with traffic demand in excess of that originally intended. District Distributor A and B roads run between land-use cells and not through them, forming a grid that would ideally be around 1.5 kilometres apart. They are managed by Local Government.
Local Distributor	Carry traffic within a cell and link District Distributors at the boundary to access roads. The route of the Local Distributor discourages through traffic so that the cell formed by the grid of District Distributors only carries traffic belonging to or serving the area. These roads should accommodate buses but discourage trucks. They are managed by Local government.
Access Road	Provide access to abutting properties with amenity, safety and aesthetic aspects having priority over the vehicle movement function. These roads are bicycle and pedestrian friendly. They are managed by Local government.

Figure 3-3 Existing Road Network



Table 3-2 below summarises the characteristics of key roads within and surrounding the LSP.

Table 3-2 Key Roads Within and Surrounding the LSP

Road Name	Hierarchy	Jurisdiction	Configuration	Speed Limit (km/h)
Wattleup Road	Regional Distributor	City of Cockburn	- two-lane, two-way undivided carriageway - connects to Rockingham Road to the west and Kwinana Freeway to the east (via Frankland Avenue and Rowley Road). - No footpath on the majority of the road section	70 km/h from Frankland Avenue to 200m west of Canary Drive and increased to 80km/h towards the west.
Frankland Avenue	- Access Road north of Wattleup Road - Regional Distributor south of Wattleup Road	City of Cockburn	- two-lane, two-way undivided carriageway - Frankland Avenue connects to Rowley Road to the south. - Paths are discontinuous and generally only available along built-up area	50 (speed limit is 70 km/h south of Wattleup Road)
Hammond Road	Distributor B	Department of Planning, Land and Heritage (Maintenance is the responsibility of Local Government)	- Two-lane, two-way undivided carriageway. - Path on the east side, which terminates at Gaebler Road	50
Whadjuk Drive	Local Distributor	City of Cockburn	- Two-lane, two-way divided carriageway. - The road has not yet been fully built as the area is still developing - Path on both sides of the road, however it is currently discontinuous as the road is not yet fully constructed	50
Mandogalup Road	Local Distributor	City of Kwinana	- two-lane undivided carriageway - Mandogalup Road connects to Wattleup Road to the north and Anketell Road to the south. - No pedestrian or cycling facility are available along the road	70

3.3 Existing Road Network Volumes

Existing traffic volumes were obtained from Main Roads WA traffic data and tube count data from the City of Cockburn. The data is shown in **Table 3-3** below.

Table 3-3 Existing Mid-Block Traffic Volumes (two-way)

Road Name	Date	Average Two-way Daily Traffic Volume	Vehicles per AM Peak Hour	Vehicles per PM Peak Hour	Heavy Vehicle %	Source
Wattleup Road (East of Frankland Avenue)	2020	5,755	469	527	20%	MRWA Traffic Map Intersection Count
Wattleup Road (800m East of Mandogalup Road)	2019	4,966	481	492	17.9%	City of Cockburn
Frankland Avenue (North of Wattleup Road)	2020	1,841	241	204	4%	MRWA Traffic Map Intersection Count
Frankland Avenue (South of Wattleup Road)	2020	6,508	580	627	18%	MRWA Traffic Map Intersection Count
Hammond Road (310m South of Gaebler Road)	2021	2838	425	391	5.9%	City of Cockburn

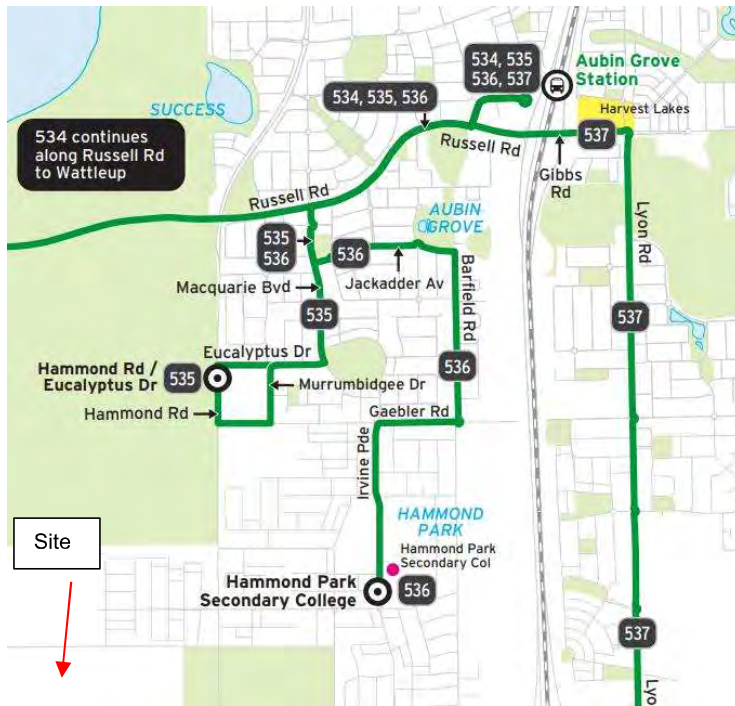
3.4 Existing Pedestrian/Cycle Networks

There are currently no complete pedestrian or cycle networks within the proposed LSP area.

3.5 Existing Public Transport Facilities

There are currently no existing public transport facilities within the vicinity of the LSP. The nearest bus service is the 535 and 536 bus service shown below. These services currently terminate at the nearby schools of Hammond Park Primary School (route 535) and Hammond Park Secondary College (route 536).

Figure 3-4 Existing Public Transport

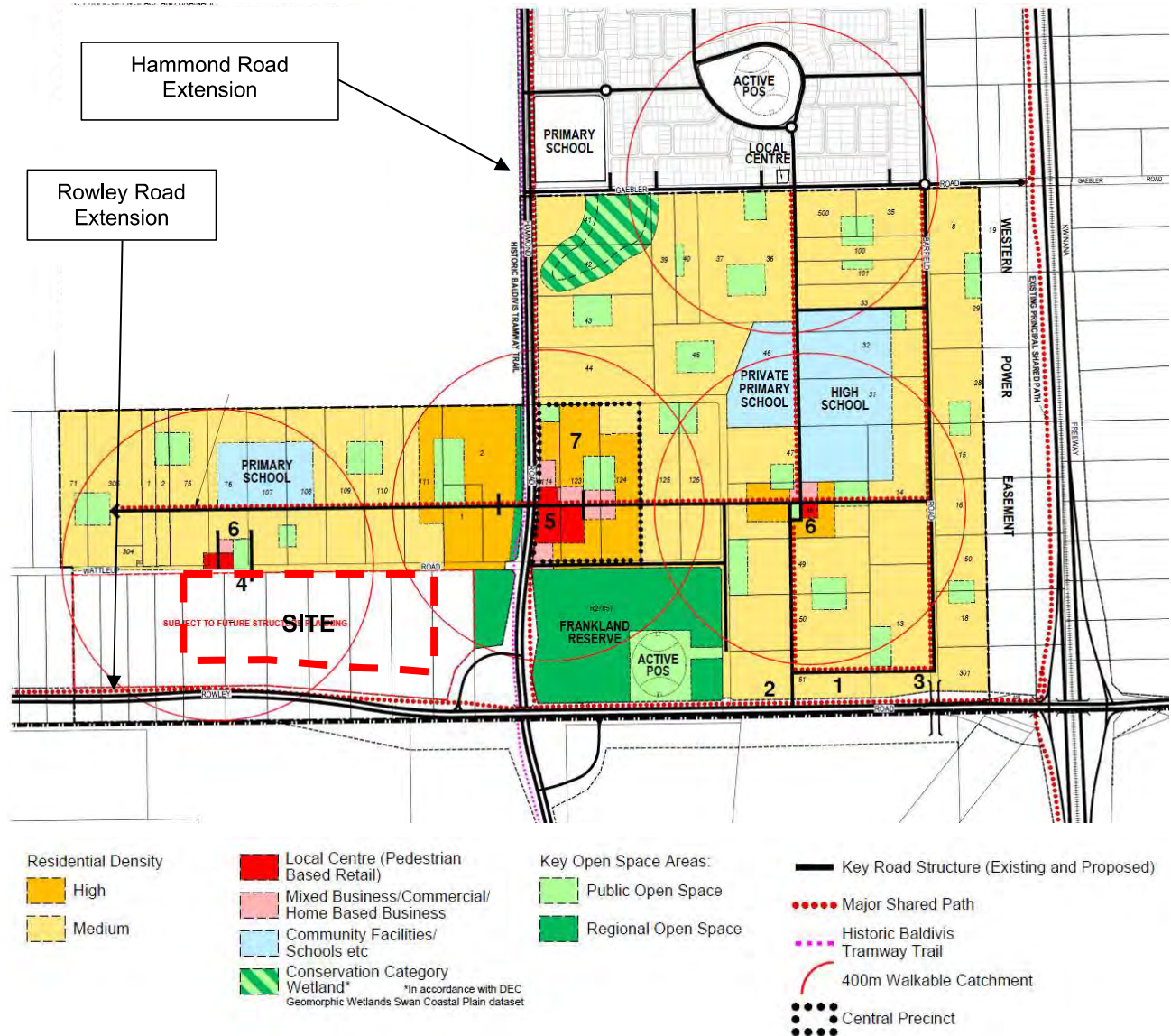


4 Proposed Changes to Transport Networks

4.1 Planned Road Network Upgrades

Figure 4-1 shows the proposed road alignments as detailed in the Southern Suburbs District Structure Plan (SSDSP) 2012. The Plan also details the proposed land uses and pedestrian/cycling network. The following sections will discuss future road upgrades/extension within the SSDSP.

Figure 4-1 Road Network in SSDSP



Source: Southern Suburbs District Structure Plan (SSDSP) (2012)

4.1.2 Rowley Road

The Department of Planning, Lands and Heritage (DPLH) has identified the need to upgrade and extend Rowley Road westwards as a dual carriageway, which would potentially provide the main link from the Kwinana Freeway to the Latitude 32 industrial area and the proposed future outer harbour. The extension will run parallel to Wattleup Road and will reduce the freight traffic demand along Wattleup Road.

This extension has been detailed in the SSDSP, Section 5.3.1.

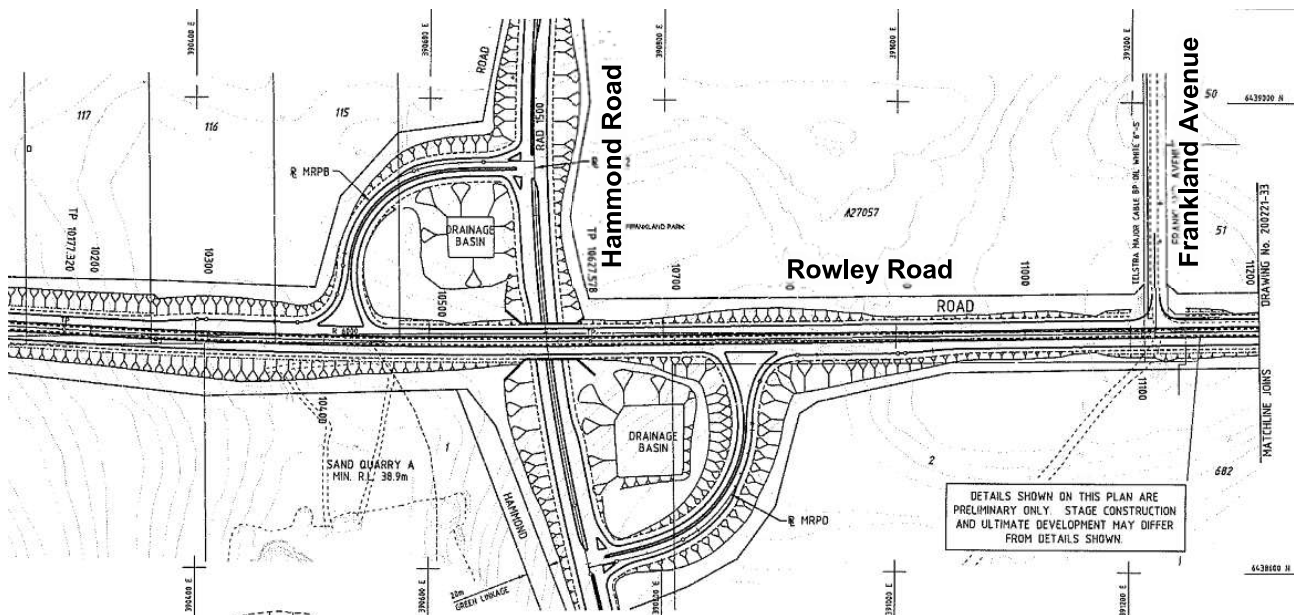
4.1.3 Hammond Road

Hammond Road (currently named Frankland Avenue south of Russell Road) is planned to be extended southwards from Gaebler Road to Rowley Road and continue further south.

The SSDSP defines the long-term intentions for the intersection of Hammond and Rowley Roads as a grade-separated interchange as shown in the preliminary concept proposed by Main Roads WA in **Figure 4-2**. Prior to grade separation, it is proposed that the intersection be signalised or roundabout controlled.

As part of this TIA, the City of Cockburn is considering an interim scenario where Hammond Road is only extended to Wattleup Road. In this scenario, Hammond Road and Wattleup Road form a 3-way roundabout. Refer to **Section 6.7.2** for detail of the SIDRA analysis of this roundabout.

Figure 4-2 Rowley Road/Hammond Road Proposed Ultimate Layout



Source: Main Roads (2015)

4.1.4 Wattleup Road

Wattleup Road will continue to be a significant freight route until the construction of the Rowley Road extension. Following this upgrade to the transport network, the function of Wattleup Road will shift more towards local traffic uses.

4.1.4.1 Speed Limit

Speed limit on Wattleup Road has recently been reduced to 70km/h from Frankland Avenue to 200m west of Canary Drive. The speed limit change excludes half of the LSP study area, however Main Roads WA has stated that section west of Canary Drive will be reviewed in the future when further changes are made along Wattleup Road.

In the medium term following the opening of the LSP, Wattleup Road speed limit is proposed to be reduced to 60km/h along the section that is abutting developed urban residential areas (between Frankland Avenue and Mandogalup Road). This would provide a safer road environment more suitable to an urban area and

would help reduce road safety risk along Wattleup Road related to its undulating vertical alignment that results in potential sight line limitations at some future intersecting roads.

In the long term, when Rowley Road is extended, Wattleup Road will no longer be the primary regional route and heavy vehicles traffic would use Rowley Road instead. At this point, Wattleup Road should be downgraded into a local road with a 50km/h speed limit.

4.1.4.2 Road Upgrades

Wattleup Road is proposed to be upgraded to support the additional residential area on both the north and south side of the road. The upgrades will include road pavement widening which will allow the installation of right turn lanes at residential access road. The traffic lanes will be 3.5m wide, while the turn lanes will be 3m wide.

Figure 4-3, Figure 4-4, and Figure 4-5 below shows the proposed design for Access Road 1 (western access road), Access Road 2 (central access road), and Access Road 3 (eastern access road) respectively. These designs were updated from the preliminary designs previously discussed with the City of Cockburn in March 2021 with inputs from Stantec. Right turn lanes are provided for Access Road 1 and 2, while Access Road 3 is left in and left out only with a left turn pocket. A traffic lane separator will be provided along Wattleup Road to prevent right turns into and out of Access Road 3.

Figure 4-3 Wattleup Road / Access Road 1 Intersection Concept

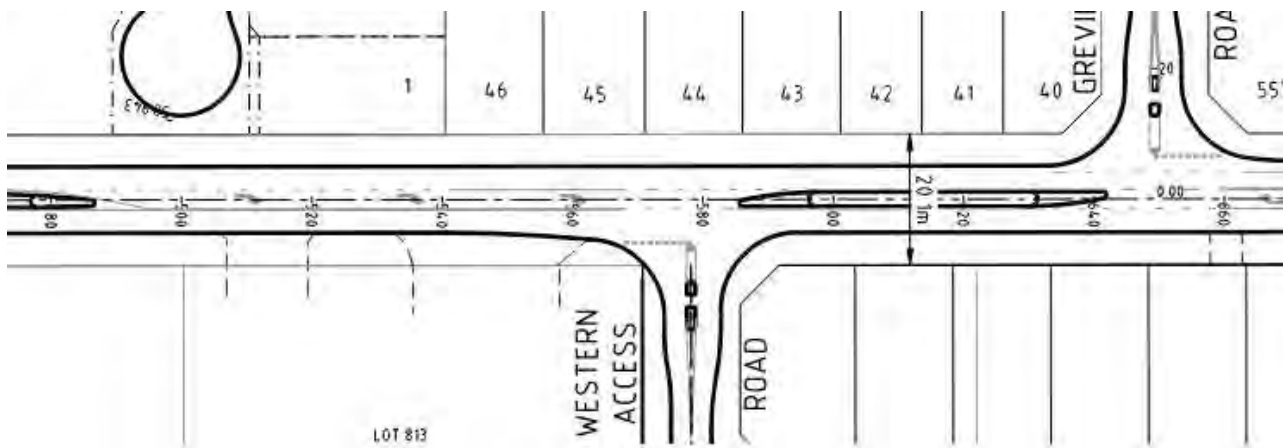


Figure 4-4 Wattleup Road / Access Road 2 Intersection Concept

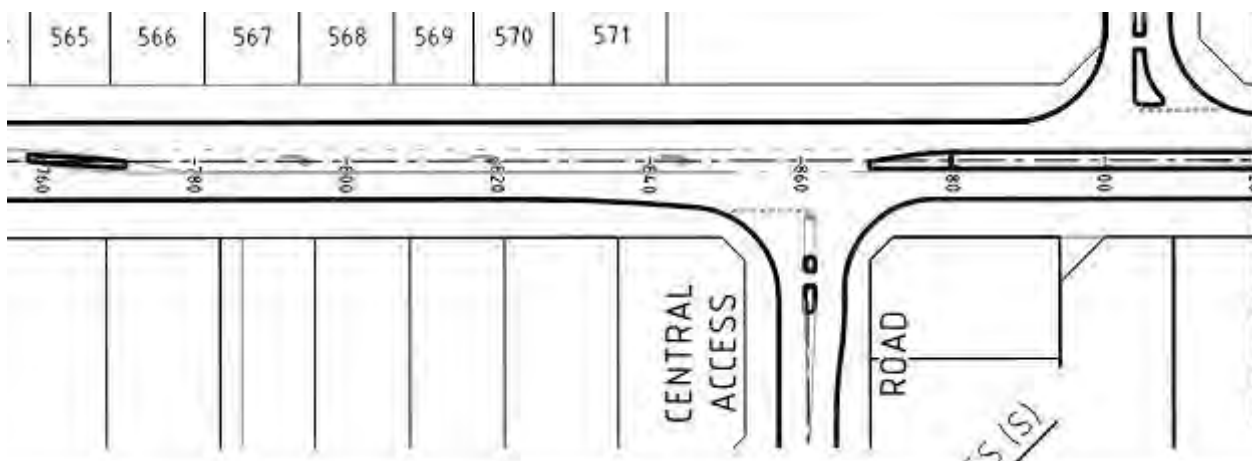
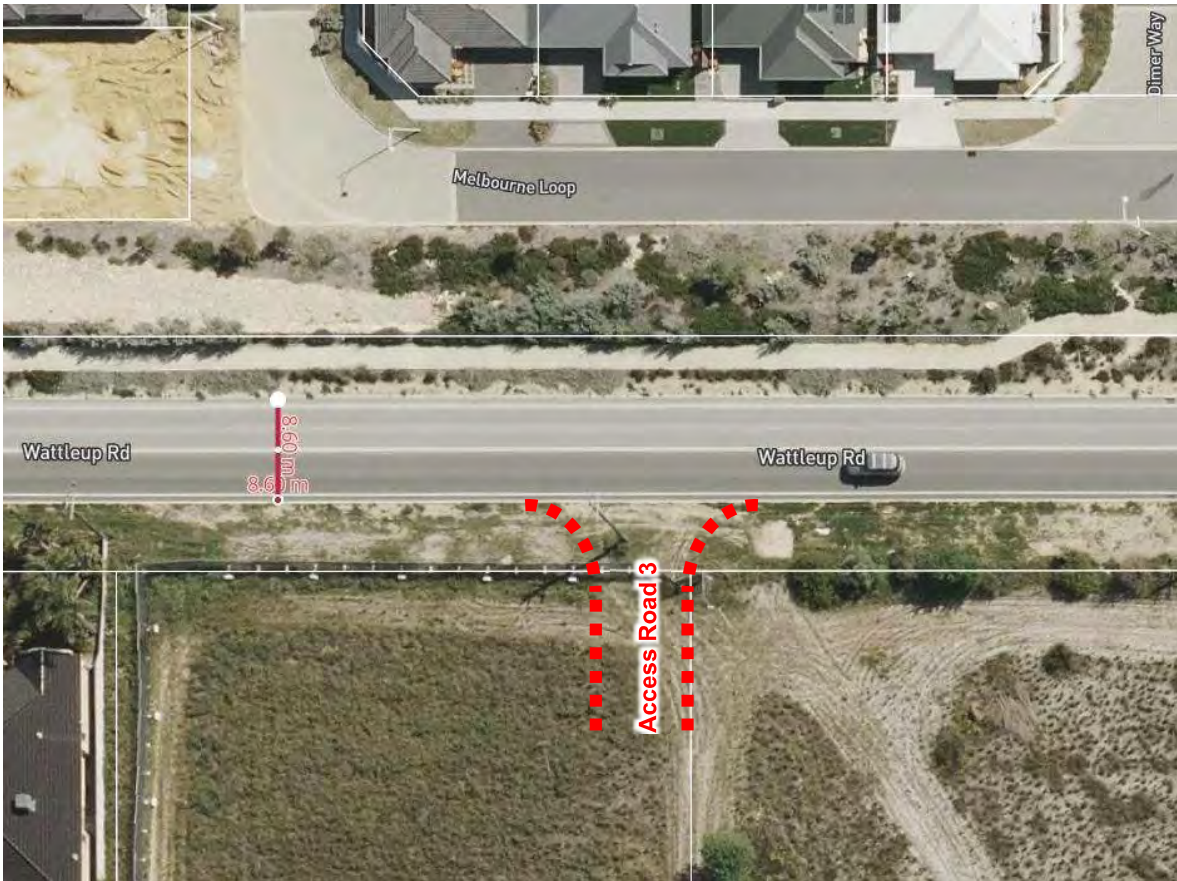


Figure 4-6 Wattleup Road Widening Design at Access Road 3



Figure 4-7 Wattleup Road at Access Road 3 – Current Situation



Source: MetroMap

4.1.4.3 Ultimate Intersection Form with Hammond Road

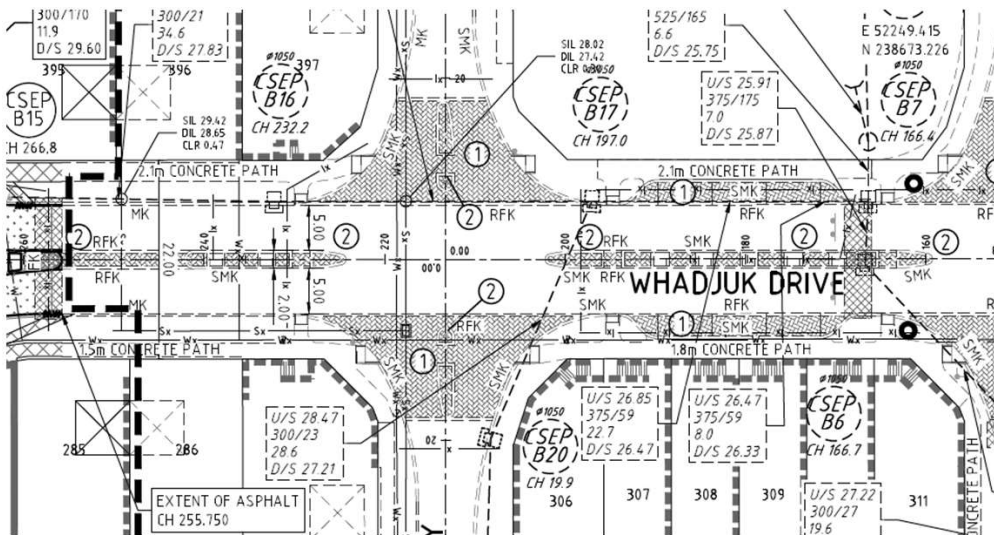
When Hammond Road is extended to Rowley Road, Wattleup Road is expected to be downgraded to an access road. The future intersection at Hammond Road in the ultimate scenario is not expected to be a full movement intersection but it is expected to be left-in left out only.

4.1.5 Whadjuk Drive (Neighbourhood Connector)

Whadjuk Drive is a Neighbourhood Connector that will form the main east-west connection for the residential area north of Wattleup Road. The proposed cross section alignment of Whadjuk Drive is required to be constructed based on the specifications set up by the City of Cockburn as shown in **Figure 4-8** within a road reserve width of 22m. **Figure 4-9** shows a conceptual sketch of Whadjuk Drive and **Figure 4-10** shows a section of Whadjuk Drive that has been constructed at another location east of the LSP.

Speed limits are likely to be 50km/h as is typical of built-up residential areas. Further restrictions will apply to the primary school frontage roads which would be designated "School Zones" with a 40km/h speed limit during peak school pickup and drop-off times.

Figure 4-8 Plan view of Whadjuk Drive



Source: City of Cockburn (2019)

Figure 4-9 Concept Sketch of Whadjuk Drive Cross Section (22m)

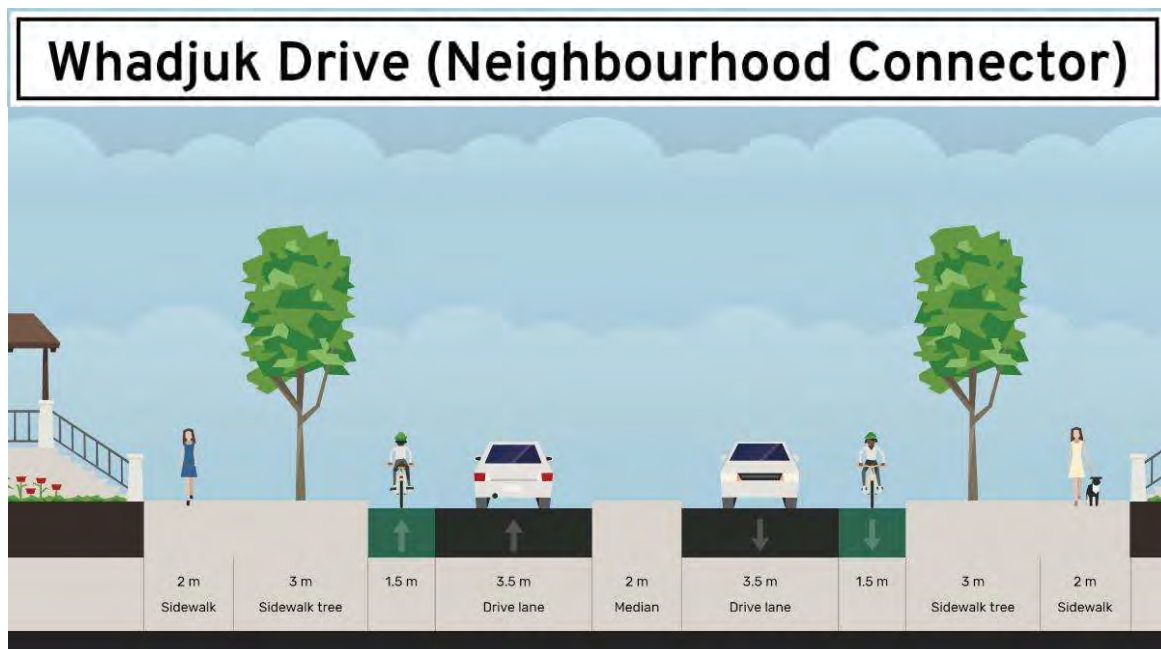


Figure 4-10 A Section of Completed Whadjuk Drive



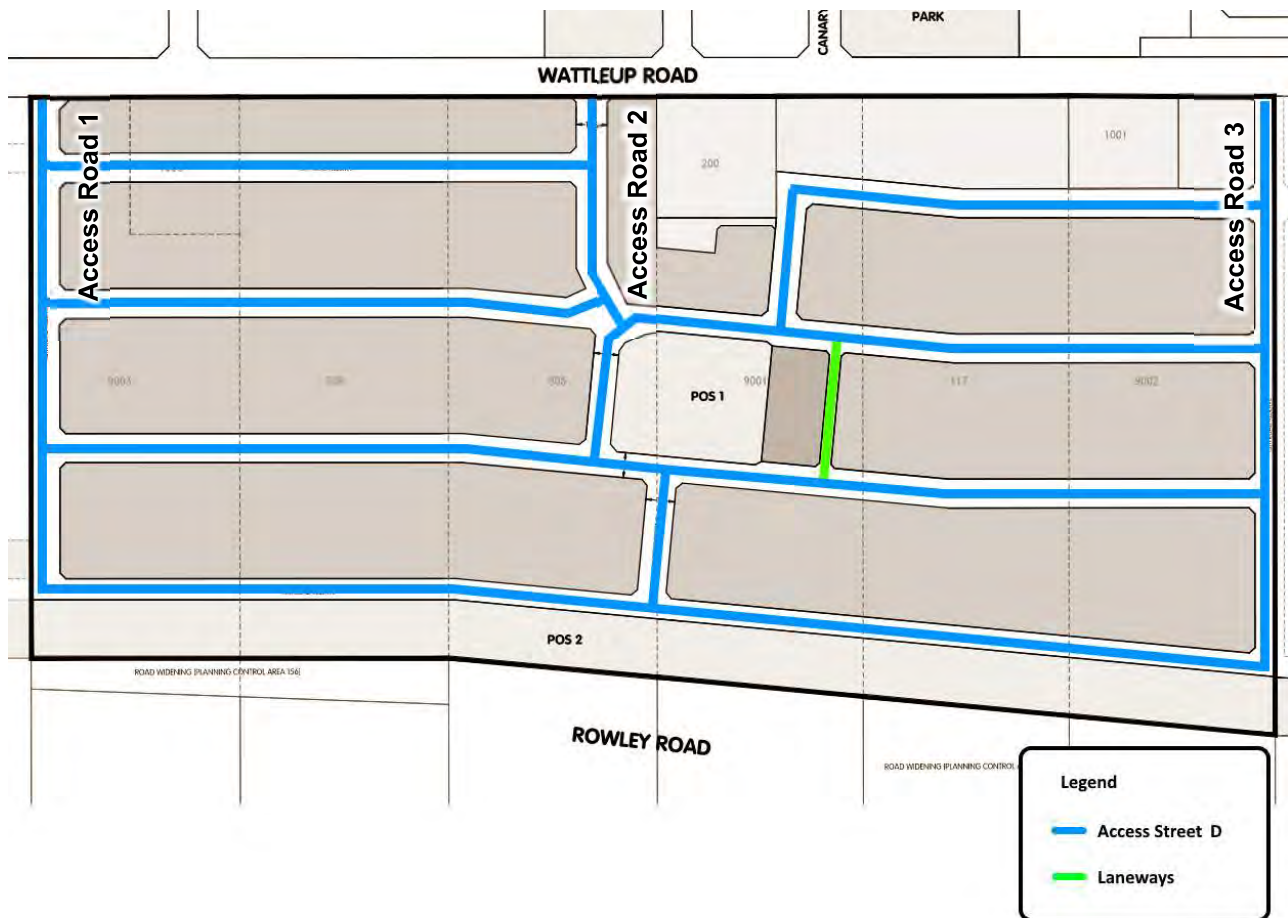
4.2 Road Hierarchy

4.2.1 Internal Road Hierarchy

Roads within the LSP will be classified as Access Streets as shown in **Figure 4-11**. There are 3 access points from the LSP to Wattleup Road:

- > Access Road 1 – Full movement access at Wattleup Road
- > Access Road 2 – Full movement access at Wattleup Road
- > Access Road 3 – left-in left out access at Wattleup Road

Figure 4-11 LSP Road Hierarchy



The road reserve widths of the internal access roads will be finalised during subdivision stage in order to accommodate final road and intersection geometry, however they would generally be 15m to 16.5m wide. Access roads adjacent to Public Open Space may be reduced to a 11 – 13m wide road reserve.

Indicative cross sections for access streets are shown in **Figure 4-12** through to **Figure 4-13**. Embayed on-street parking can be accommodated within the verge strips with some modifications. Additionally, if a 7.2 – 7.4m carriageway is adopted, informal on street parking can be provided.

Figure 4-12 Concept Sketch of Access Street Cross Section (15m)



Figure 4-13 Concept Sketch of Access Street Cross Section Fronting Public Open Space (13m)

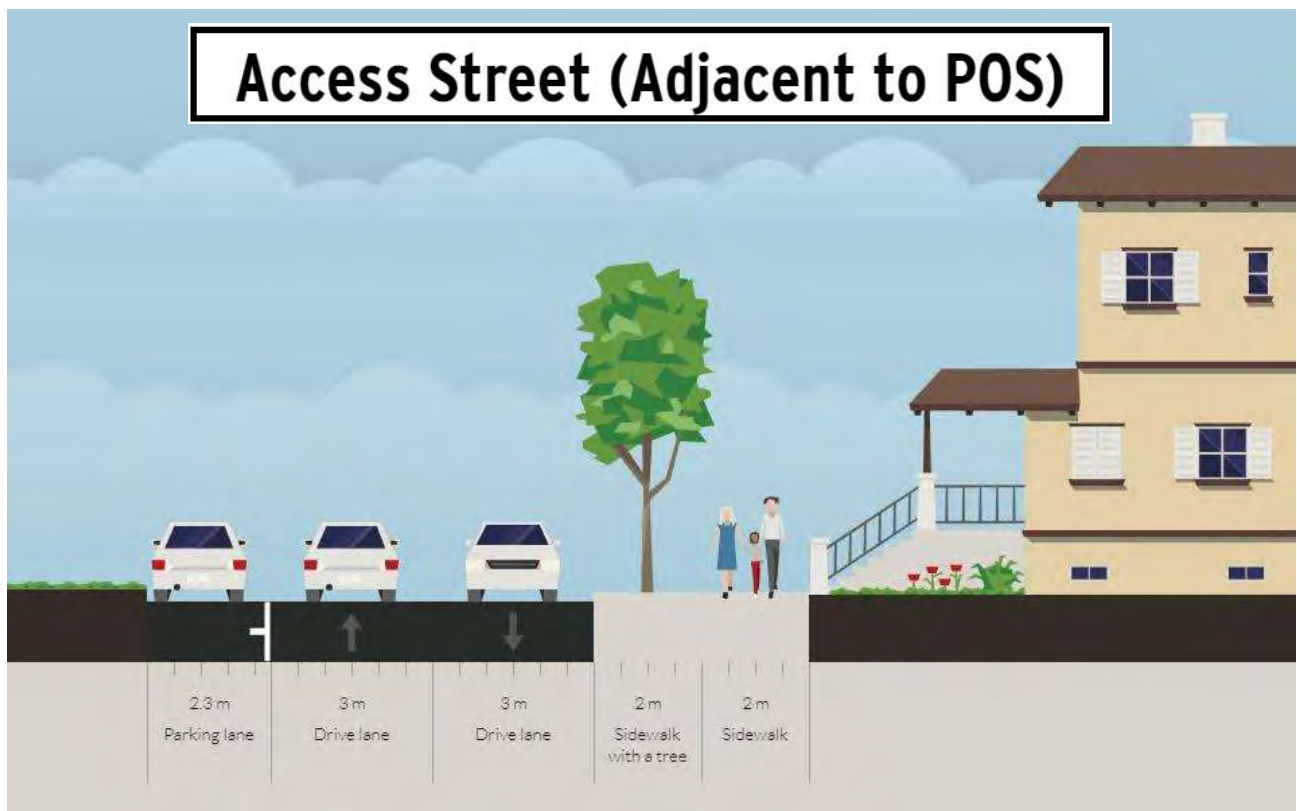
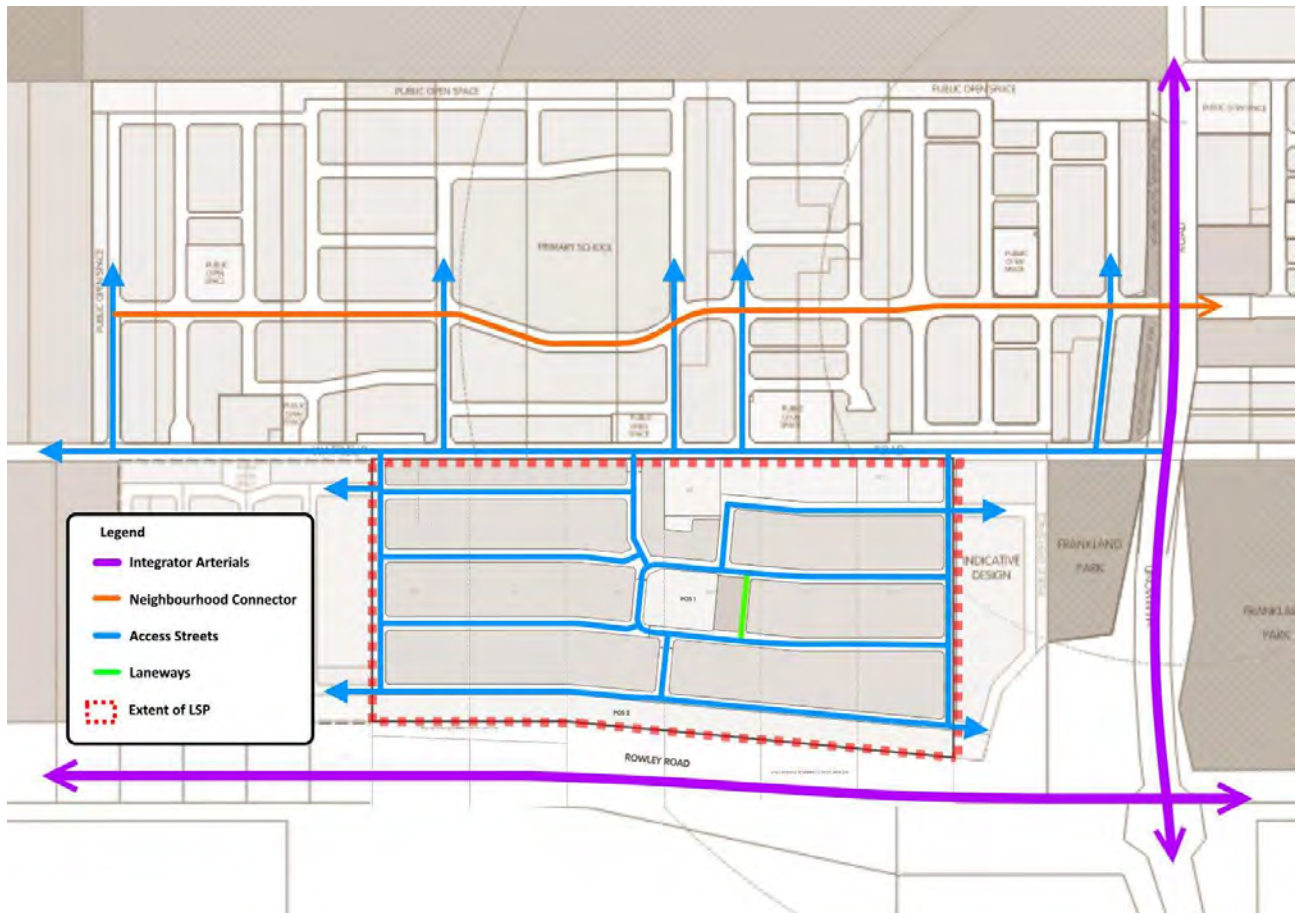


Figure 4-15 Indicative Internal Road Hierarchy – Long Term



4.3 Intersection Control & Traffic Management

All intersections internal to the LSP has been arranged as T-intersections and as such give-way control will be sufficient. Due to the length of east-west roads within the LSP, traffic calming measures will be provided along all east-west roads. The type of measure will be determined later in detailed design or subdivision stage, however they could be in the form of blister islands, chicanes, lane narrowing, etc.

4.4 Pedestrian/Cycling Network

As detailed in the SSDSP, an interconnecting network of shared paths is proposed within the District Structure Plan area with the main connections being identified as Hammond Road, Rowley Road, Wattleup Road, Aubin Grove Station and the Kwinana Freeway. Also, as detailed in the SSDSP, a major shared path will be provided on Whadjuk Drive.

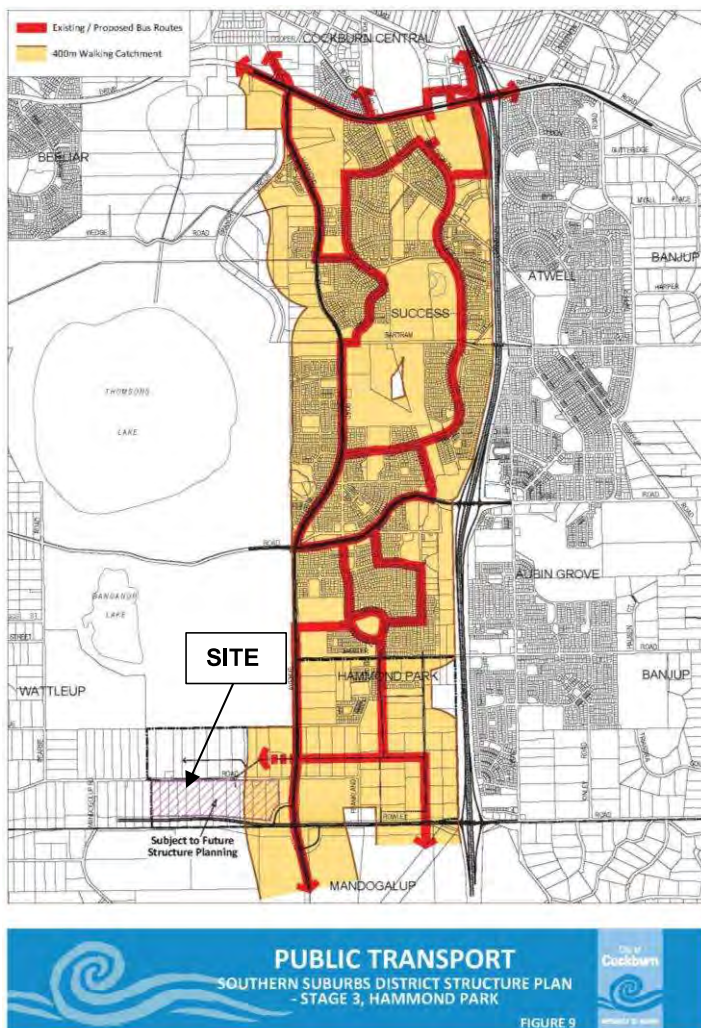
Pedestrian and cycling facilities will be provided within the LSP consistent with the appropriate road hierarchy as per Liveable Neighbourhood guidelines with at least a standard footpath along all roads within the LSP.

A crossing facility should be provided on Wattleup Road to provide a safer crossing location for parents and students to cross from the residential area within the LSP towards the future primary school located to the north of Wattleup Road.

4.5 Public Transport Network

The SSDSP also provides detail on the provision of a future bus service potentially along Whadjuk Drive and Wattleup Road which may also link to the Latitude 32 Industrial area and terminate at the Fremantle Rockingham transit system which is to be routed down the west side of the freight line within the industrial area. The proposed bus and train services will provide a comprehensive public transport system for the area linking major land use activities. The proposed location of the future bus routes are shown on **Figure 4-16**.

Figure 4-16 Proposed Public Transport Routes



Source: Southern Suburbs District Structure Plan (SSDSP) (2012)

5 Integration with Surrounding Area

5.1 Surrounding Attractors and Generators

Hammond Park Primary School is located approximately 1km to the north east, while Hammond Park Catholic Primary School and Hammond Park Secondary School is located approximately 1.2km east of the LSP boundary. Additionally, a future primary school is proposed to be built within the residential area to the north of Wattleup Road. These schools are likely to be a major trip attractor from the LSP.

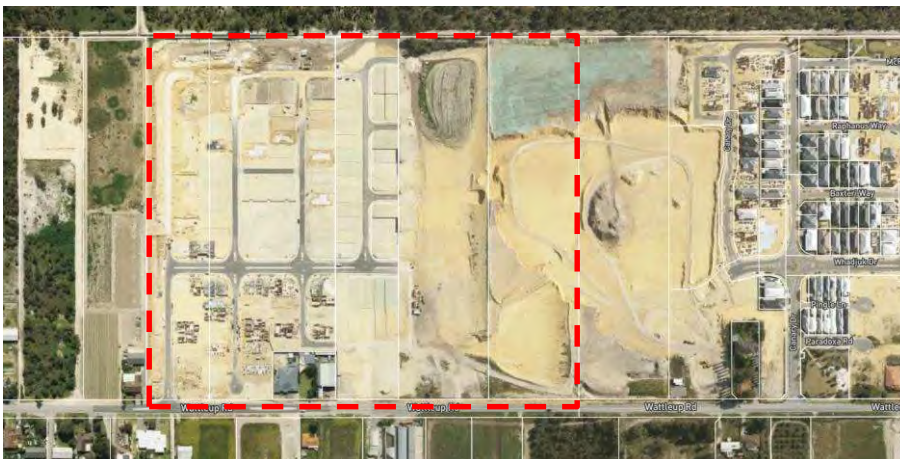
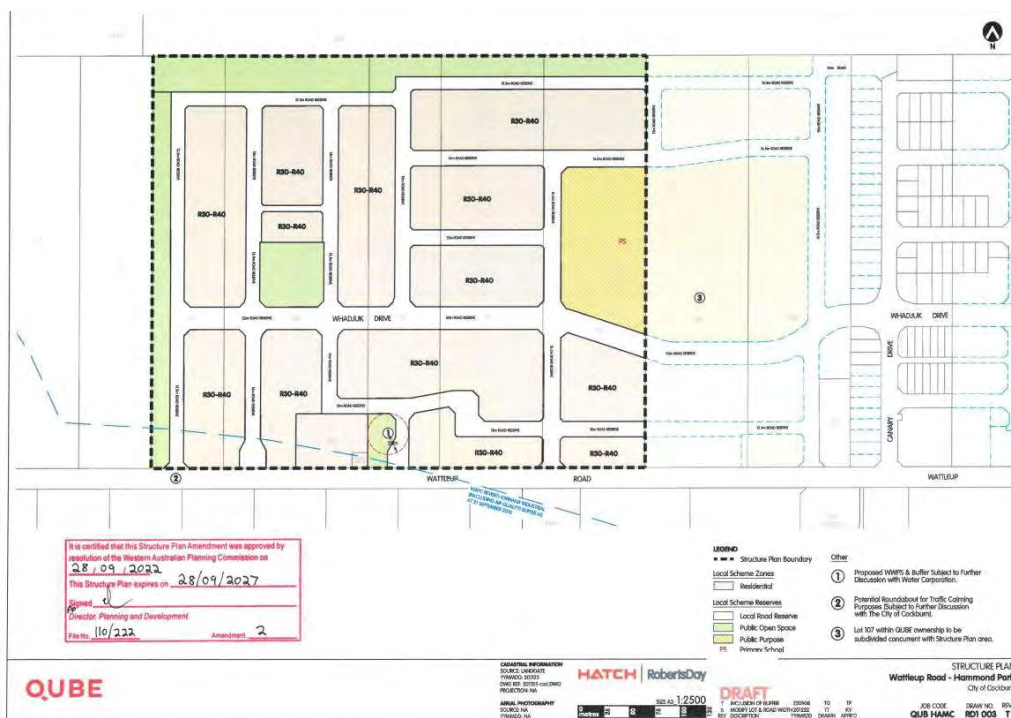
Other site that would attract trips from the LSP includes a “Neighbourhood Centre” adjacent to the future intersection of Whadjuk Drive and Hammond Road, as well as the Aubin Grove train station.

5.2 Proposed Changes to Surrounding Land Uses

5.2.1 Hammond Park West Structure Plan (North of Wattleup Road)

The land to the north of Wattleup Road is currently being developed into residential area and a primary school. **Figure 5-1** below shows the approved Structure Plan layout and its current development status as of September 2022.

Figure 5-1 Hammond Park West Structure Plan



5.2.2 Future Development Adjacent to the Site

Vacant lands to the east and west of the Site are also currently zoned as 'Development' and are likely to be developed into residential lots. **Figure 5-2** below shows an indicative layout of the future residential area (highlighted in red). There are no approved structure plans for these areas.

Figure 5-2 Future Residential Development Adjacent to the Site



Source: Hatch Roberts Day

5.3 Transport Connectivity to Surrounding Areas

The proposed development will have easy vehicular access to Kwinana Freeway from Wattleup Road via Frankland Avenue and Rowley Road.

With regards to pedestrian and cyclist accessibility, as mentioned in **Section 4.2.2**, a network of shared paths is proposed in the SSDSP. Shared path and footpaths will be provided along internal access roads providing access to nearby schools and local centres. A crossing facility is also proposed on Wattleup Road near the future primary school to provide safer crossing location for students and parents from the LSP.

6 Analysis of Transport Network

6.1 Assessment Parameters

6.1.1 Assessment Years and Time Period

The assessment years are assumed as follows:

- > Year 2031 – Future year with LSP completed.

As per WAPC TIA Guidelines for Structure Plans, analysis will be undertaken only for the full build-out of the development due to the nature of the development occurring over a number of years. Peak times selected are 7:45am – 8:45am and 4:00pm – 5:00pm, which are the peak times of Frankland Avenue and Wattleup Road intersection based on the 24-hour intersection count provided in Main Roads WA Traffic Map.

6.1.2 Subject Intersections

SIDRA analysis was undertaken at the following intersection to estimate the impact of the development generated traffic on the surrounding transport network:

- > Wattleup Road/ Access Road 2
- > Hammond Road / Wattleup Road (as 3-way roundabout)

The South Access Road 2 is one of two full movement intersections servicing the LSP. The central location would see it having a wider traffic catchment, and therefore is selected for analysis.

Hammond Road / Wattleup Road 3-way roundabout is an intersection that is proposed by the City of Cockburn to be included in the analysis. In this scenario, Hammond Road is only extended until Wattleup Road with Rowley Road not yet constructed. This represents a worst-case scenario, in which Wattleup Road still function as the major east-west regional distributor road instead of Rowley Road. In this scenario Whadjuk Drive is assumed to be constructed, therefore it would be the main east-west local distributor for residential area north of Wattleup Road.

Figure 6-1 Subject Intersections



6.2 LSP Traffic Generation

The trip generation rates for the residential component were sourced from *Road and Maritime Services (RMS) New South Wales Guide to Traffic Generating Developments, Updated Surveys (2013)*. **Table 6-1** below shows the adopted trip rates for the proposed land use and **Table 6-2** shows the directional distribution. **Table 6-3** shows the resultant trip generation.

Table 6-1 Trip Generation Rate – Peak hour of Generator

Land Use	Source	AM Peak	PM Peak
Residential	RMS	0.95 trips per dwelling	0.99 trips per dwelling

Table 6-2 Directional Distribution

Land Use	AM Peak		PM Peak	
	In	Out	In	Out
Residential	26%	74%	65%	36%

Table 6-3 Net Trip Generation of the Proposed Development

Land Use	Yield	AM Peak		PM Peak	
		In	Out	In	Out
Residential Dwellings	294 dwellings	73	207	187	105
Total		280		292	

6.3 LSP Traffic Distribution

Residential trip distribution into the surrounding network is based on likely routes taken by the residents towards employment destinations and such as Perth CBD, Kwinana, Henderson, Cockburn Central, and Bibra Lake. As such, the following distribution percentage were adopted:

- > 30% heading west along Wattleup Road
- > 70% heading east along Wattleup Road

Due to the likely demand for left turns into the site during the PM peak (traffic returning from Freeway), it is proposed to install an AUL on the easternmost LI/LO access, where 60% of west bound trips are likely to enter the LSP from. With a provision of this turn treatment installed on access 3, it is expected that a larger proportion of traffic entering the LSP site will use the eastern most access, reducing the demand on the other two accesses. This has been reflected in values shown in **Figure 6-5**.

6.4 Background Traffic

Background traffic data for Wattleup Road is sourced from 24-hour intersection count of Frankland Avenue/Wattleup Road provided in Main Roads WA Traffic Map.

Background traffic growth assumption of 1% per annum has been adopted to derive background traffic volume for year 2031 on Wattleup Road. Additional traffic growth on Wattleup Road will also be derived from future developments in the area including the structure plans north of Wattleup Road currently under construction and the proposed LSP itself, which is further discussed in **Section 6.4.1**.

6.4.1 Other Developments to be Included

Adjacent developments and structure plans, shown in **Figure 6-2** below, will also be included in background traffic 2031.

Figure 6-2 Adjacent Developments Included in Background Traffic



The estimated yield and trip generation for these developments are summarised in **Table 6-4** and **Table 6-7** below. For the school component, the rates provided in the WAPC *Traffic Impact Assessment Guidelines* will be used. Some assumptions on the trip distribution of the adjacent developments are:

- > 70% internal school traffic catchment is assumed for this analysis, i.e. 30% of school trips arrived externally e.g. via Wattleup Road.
- > Whadjuk Drive is assumed to have been constructed, providing east-west connection to Frankland Avenue. Therefore, less traffic generated from Hammond West structure plan would rely on Wattleup Road for access. For the purpose of the assessment, approximately 60% of residential traffic on the north of Wattleup Road is assumed to use Wattleup Road.

Table 6-4 Other Developments

Development	Estimated Yield
Hammond West Structure Plan + Adjacent undeveloped land	330 residential dwellings - Primary school for 540 students

Table 6-5 Trip Generation Rate

Land Use	Source	AM Peak Rate	PM Peak Rate
Residential Dwellings	RMS	0.95 trips per dwelling	0.99 trips per dwelling
Primary School	WAPC	1 trip per student	1 trip per student

Table 6-6 Trip Directional Distribution

Land Use	AM Peak		PM Peak	
	In	Out	In	Out
Residential Dwellings	23%	74%	65%	36%
Primary School	50%	50%	50%	50%

Table 6-7 Other Developments Trip Generation

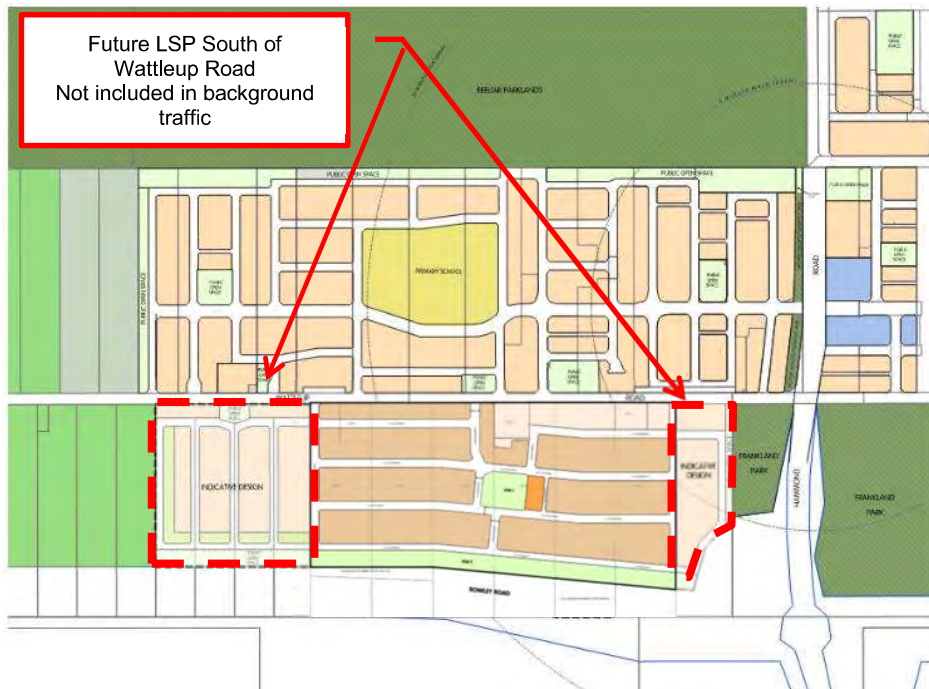
Development	Yield	AM Peak		PM Peak	
		IN	OUT	IN	OUT
Hammond West Structure Plan + Adjacent undeveloped land	330 residential dwellings - Primary school for 540 students*	163	313	291	199

*Note: only external school trips included in the trip generation estimate

6.4.2 Other Developments Not Included

Figure 6-3 below shows future development area that will not be included in background traffic 2031. These future development areas do not have a structure plan proposal as of the writing of this report and as such, will be assumed to be completed after 2031.

Figure 6-3 Adjacent Developments Not Included in Background Traffic



6.4.3 Hammond Road

For the Hammond Road / Wattleup Road 3-way roundabout, the estimated traffic volumes on Hammond Road is obtained from the existing 2021 midblock traffic data on Hammond Road, 310m south of Gaebler Road, obtained from the City of Cockburn (see **Table 3-3** in **Section 3.3**). 2% of annual growth will be applied to this base volume.

As no other traffic data or modelling is available for the extension of Hammond Road, this existing traffic volume will be assumed to be the midblock volume of Hammond Road just north of Wattleup Road. The assumed volume on the Hammond Road extension is then distributed to Wattleup Road, further adding to the assumed traffic growth on Wattleup Road for robust assessment.

6.5 Peak Hour Total Traffic Flow

Figure 6-4 and **Figure 6-5** below show the adopted traffic flow at Hammond Road / Wattleup Road 3-way roundabout and at the Access Roads.

Figure 6-4 Hammond Road / Wattleup Road 3-way Roundabout Peak Hour Traffic Volume (2031 +Development)

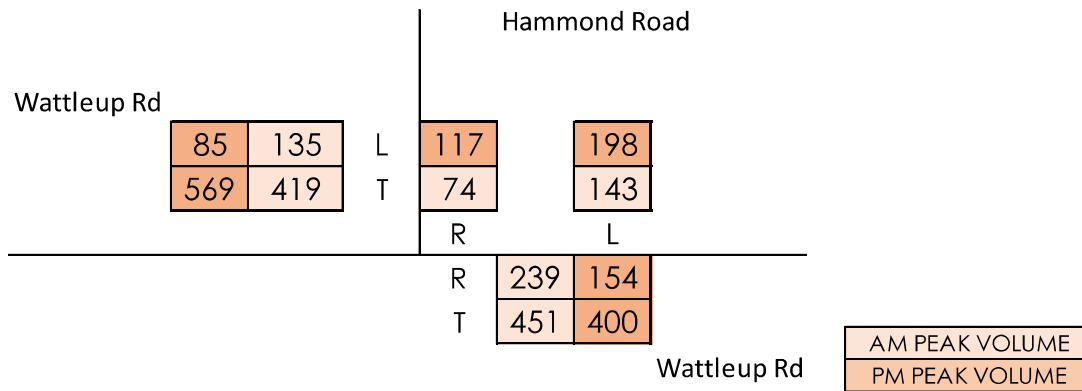
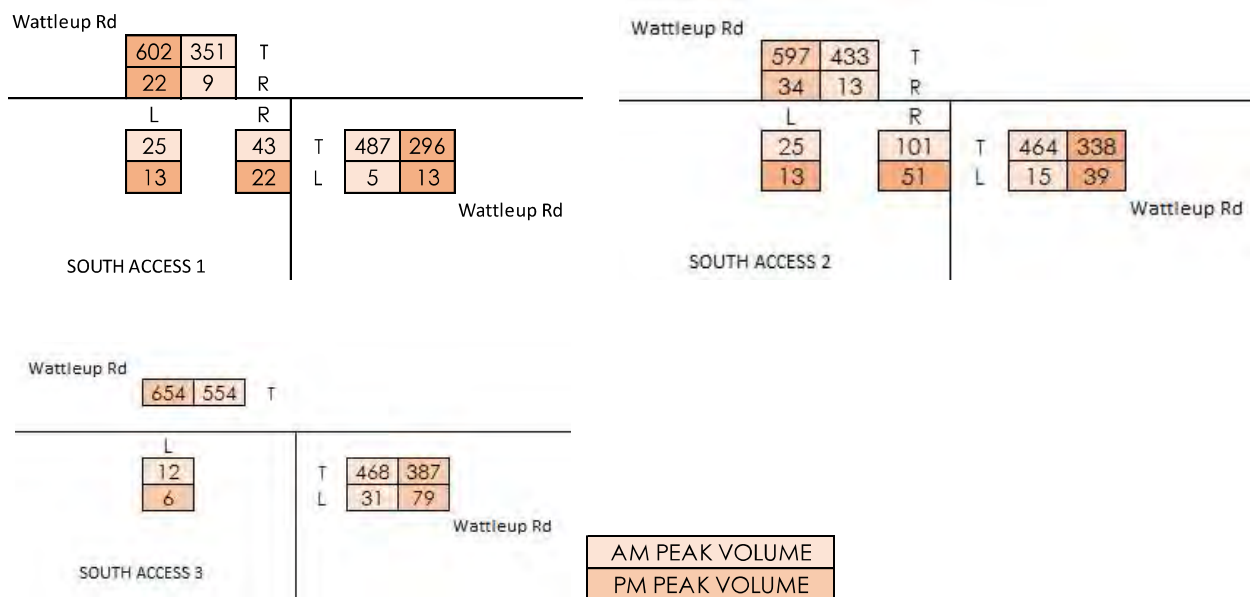


Figure 6-5 Wattleup Road and Access Roads Peak Hour Traffic Volume (2031 +Development)



6.6 Turn Warrant Assessment

A turn warrant was undertaken for the three main accesses to the Site as discussed in **Section 2.2**. The assessment was conducted as per *Main Roads WA Supplement to Austroads Guide to Road Design – Part 4 Appendix A*, using the provided spreadsheet (See **Figure 6-1**)

Figure 6-1 Turn Warrant Assessment Spreadsheet Example

INTERSECTION WARRANTS
Main Roads WA Supplement to Austroads Guide to Road Design - Part 4 A.6

DESIGN SPEED = 70km/h
SPLITTER ISLAND YES / NO = No
DUAL CARRIAGEWAY YES / NO = No

MOVEMENT	COUNT (v/h)	HV (%)
Q _{T1}	200	10
Q _{R1}	20	1
Q _{T2}	100	10
Q _L	20	1
Q _{LM}	50	1
Q _{RM}	50	1

RIGHT TURN ASSESSMENT

Q_m = 320
% HV = 9.438
x = 1.48
TREATMENT = BAR

LEFT TURN ASSESSMENT

Q_m = 100
% HV = 10.000
x = 0.51
TREATMENT = BAL
OFFSET? = NO

Source: Austroads GTM Part 6 - 2017

Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings

Figure 2.27: Calculation of the major road traffic volume Q_m

Road type	Turn type	Splitter island	Q _m (veh/h)
Two-lane two-way	Right	No	$Q_{T1} + Q_{T2} + Q_L$
	Left	Yes	$Q_{T1} + Q_{T2}$
Four-lane two-way	Right	Yes or No	Q_{T2}
	Left	No	$Q_{T1} + Q_{T2} + Q_L + Q_{LM}$
Six-lane two-way	Right	Yes	$Q_{T1} + Q_{T2} + Q_L + Q_{LM}$
	Left	Yes or No	$Q_{T1} + Q_{T2} + Q_L + Q_{LM}$
Six-lane two-way	Right	No	$Q_{T1} + Q_{T2} + Q_L + Q_{LM}$
	Left	Yes	$Q_{T1} + Q_{T2} + Q_L + Q_{LM}$
Six-lane two-way	Right	No	$Q_{T1} + Q_{T2} + Q_L + Q_{LM}$
	Left	Yes	$Q_{T1} + Q_{T2} + Q_L + Q_{LM}$

Source: TMR (2016a)

6.6.1 Peak Hour Assessment

The AM Peak assessment results are shown in **Figure 6-2**

Figure 6-2 Turn Warrant Assessment (AM Peak – 60km/h)

WESTERN ACCESS AM

DESIGN SPEED = 60km/h
SPLITTER ISLAND YES / NO = No
DUAL CARRIAGEWAY YES / NO = No

MOVEMENT	COUNT (v/h)	HV (%)
Q _{T1}	351	20
Q _{R1}	9	1
Q _{T2}	487	20
Q _L	5	1
Q _{LM}	25	1
Q _{RM}	43	1

RIGHT TURN ASSESSMENT

Q_m = 943
% HV = 19.897
x = 2.77
TREATMENT = AUR

LEFT TURN ASSESSMENT

Q_m = 487
% HV = 20.000
x = 1.33
TREATMENT = SL
OFFSET? = NO

CENTRAL ACCESS AM

DESIGN SPEED = 60km/h
SPLITTER ISLAND YES / NO = No
DUAL CARRIAGEWAY YES / NO = No

MOVEMENT	COUNT (v/h)	HV (%)
Q _{T1}	433	20
Q _{R1}	13	1
Q _{T2}	464	20
Q _L	13	1
Q _{LM}	25	1
Q _{RM}	101	1

RIGHT TURN ASSESSMENT

Q_m = 910
% HV = 19.729
x = 3.45
TREATMENT = AUR

LEFT TURN ASSESSMENT

Q_m = 464
% HV = 20.000
x = 1.87
TREATMENT = BAL
OFFSET? = NO

EASTERN ACCESS AM

DESIGN SPEED = 60km/h
SPLITTER ISLAND YES / NO = No
DUAL CARRIAGEWAY YES / NO = No

MOVEMENT	COUNT (v/h)	HV (%)
Q _{T1}	554	20
Q _{R1}	0	1
Q _{T2}	465	20
Q _L	33	1
Q _{LM}	12	1
Q _{RM}	1	1

RIGHT TURN ASSESSMENT

Q_m = 1052
% HV = 19.404
x = 0.00
TREATMENT = SR

LEFT TURN ASSESSMENT

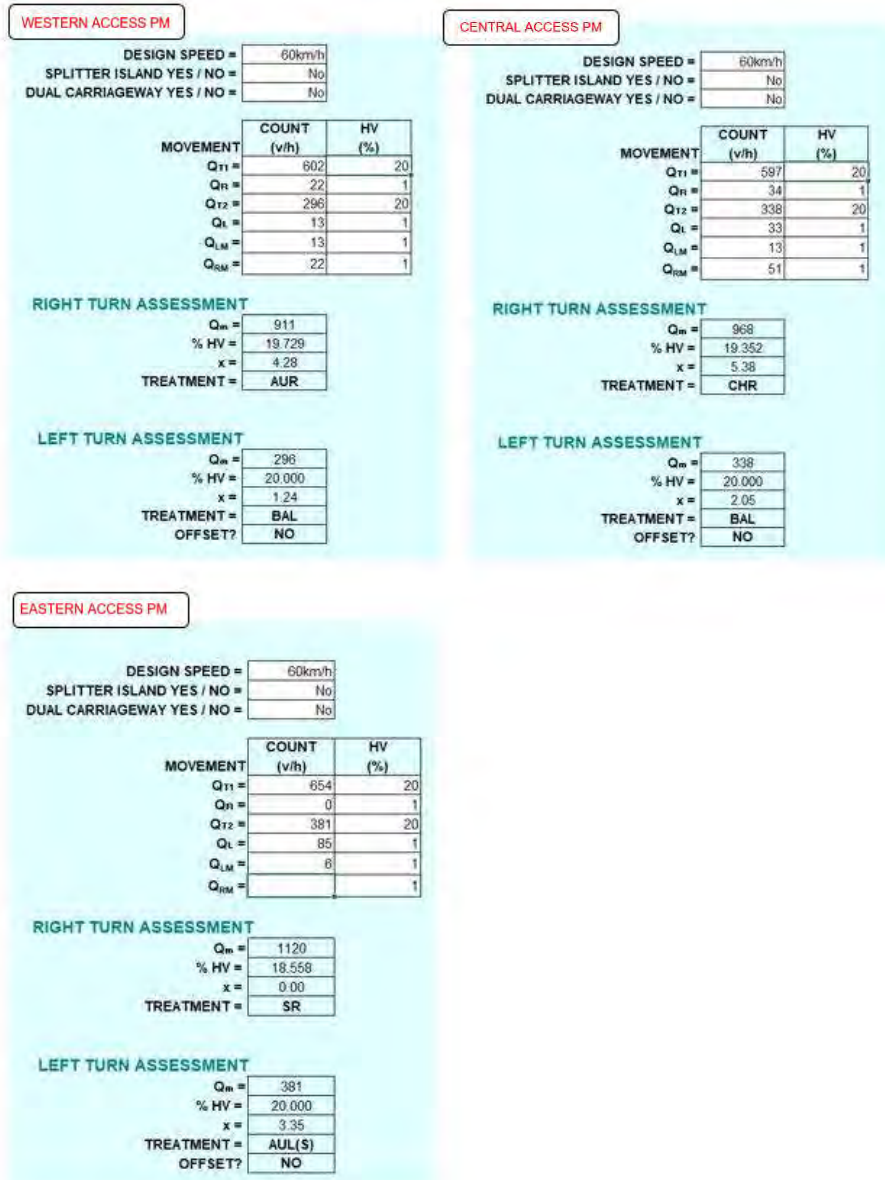
Q_m = 465
% HV = 20.000
x = 2.74
TREATMENT = AUL(S)
OFFSET? = NO

Table 6-1 AM Peak Turn Warrant Assessment Summary

AM Peak Turn Warrant Assessment Results Summary								
Intersection	Q _{T1} (EB)	Q _{T2} (WB)	Q _R	Q _L	Q _{LM}	Q _{RM}	Right Turn Treatment	Left Turn Treatment
Western Access	351	487	9	5	25	43	AUR	SL
Central Access	433	464	13	13	25	101	AUR	BAL
Eastern Access (Left-in left-out only)	554	465	-	33	12	-	-	AUL (S)

The PM Peak assessment results are shown in Figure 6-3.

Figure 6-3 Turn Warrant Assessment (PM Peak)



PM Peak Turn Warrant Assessment Summary

PM Peak Turn Warrant Assessment Results Summary								
Intersection	Q _{T1} (EB)	Q _{T2} (WB)	Q _R	Q _L	Q _{LM}	Q _{RM}	Right Turn Treatment	Left Turn Treatment
Western Access	302	296	22	13	13	22	AUR	BAL
Central Access	597	338	34	33	13	51	CHR	BAL
Eastern Access (Left-in left-out only)	654	381	-	85	6	-	-	AUL (S)

6.6.2 Assessment Results Summary

Based on the assessment for both peak hours the required turn treatments are:

- Western Access: AUR and BAL
- Central Access: CHR and BAL
- Eastern Access: AUL (s)

According to *Austrroads Guide to Road Design Part 4A*, a Simple Left (SL) and Basic Left-turn treatment (BAL) is a simple treatment where the kerb lines of the intersecting roads are joined by a single radius circular arc and tapers to accommodate the swept path of turning (design) vehicles. The left turn should be designed to enable the design vehicle to turn from the left lane into the minor road without crossing the centreline of the minor road.

6.6.3 Road Reserve Constraint

Road reserve constraints prevent the construction of both right and left turn treatment along Wattleup Road. As such it is recommended that right turn lane treatments are constructed as a priority over left turn pockets as left turning movements do not have opposing movements and as such would have minimal impact to traffic flow. Given that the eastern most access is left in / left out only and no right turn pocket is required, a left turn pocket can likely be accommodated at this access.

It is also noted that consideration for turn warrants should have due regard to the long term planning for Wattleup Road, where the district structure planning suggests a downgrading of the road environment leading to lower speed limits and significantly reduced traffic volumes (**See Section 6.8**). As such, given the peak demand for turning vehicles into the LSP will take several years to occur, by which time the environment of Wattleup Road is likely to have downgraded, the requirements for left turning treatments at the western and central access are expected to still only warrant BAL treatments in the future. This assessment is also consistent with the sections of Wattleup Road east of the LSP which have already been upgraded to urban standard and where no intersection turning treatments have been provided.

6.7 Key Intersections Analysis

6.7.1 SIDRA Results Definition

The subject intersections have been analysed using the SIDRA analysis program. This program calculates the performance of intersections based on input parameters, including geometry and traffic volumes. As an output SIDRA provides values for the Degree of Saturation (DOS), queue lengths, delays, level of service, and 95th Percentile Queue. These parameters are defined as follows:

- > Degree of Saturation (DOS) is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The theoretical intersection capacity is exceeded for an un-signalized intersection where $DOS > 0.80$;
- > 95% Queue is the statistical estimate of the queue length up to or below which 95% of all observed queues would be expected;
- > Average Delay is the average of all travel time delays for vehicles through the intersection. An unsignalised intersection can be considered to be operating at capacity where the average delay exceeds 55 seconds for any movement; and
- > Level of Service (LOS) is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. The different levels of service can generally be described as shown in **Table 6-8**.

Table 6-8 Level of Service (LoS) Performance Criteria

LOS	Description	Signalised Intersection	Unsignalised Intersection
A	Free-flow operations (best condition)	≤10 sec	≤10 sec
B	Reasonable free-flow operations	10-20 sec	10-15 sec
C	At or near free-flow operations	20-35 sec	15-25 sec
D	Decreasing free-flow levels	35-55 sec	25-35 sec
E	Operations at capacity	55-80 sec	35-50 sec
F	A breakdown in vehicular flow (worst condition)	≥80 sec	≥50 sec

A LOS exceeding these values indicates that the road section is exceeding its practical capacity. Above these values, users of the intersection are likely to experience unsatisfactory queueing and delays during the peak hour periods.

6.7.2 Hammond Road / Wattleup Road (3-way Roundabout)

The following presents the results of the analysis of the Hammond Road / Wattleup Road 3-way roundabout in the assumed year of completion. **Figure 6-6** is a SIDRA layout representation of the intersection. Hammond Road is assumed to have dual carriageway with two lanes on each carriageway. This represents the ultimate cross-section for Hammond Road. Wattleup Road is assumed to still be a single carriageway road.

Table 6-9 shows the results of the analysis. It shows that the proposed intersection layout would be able to cater for the development traffic, as well as the additional traffic from adjacent structure plans to be developed or currently under construction.

Figure 6-6 Hammond Road / Wattleup Road 3-way Roundabout SIDRA Layout

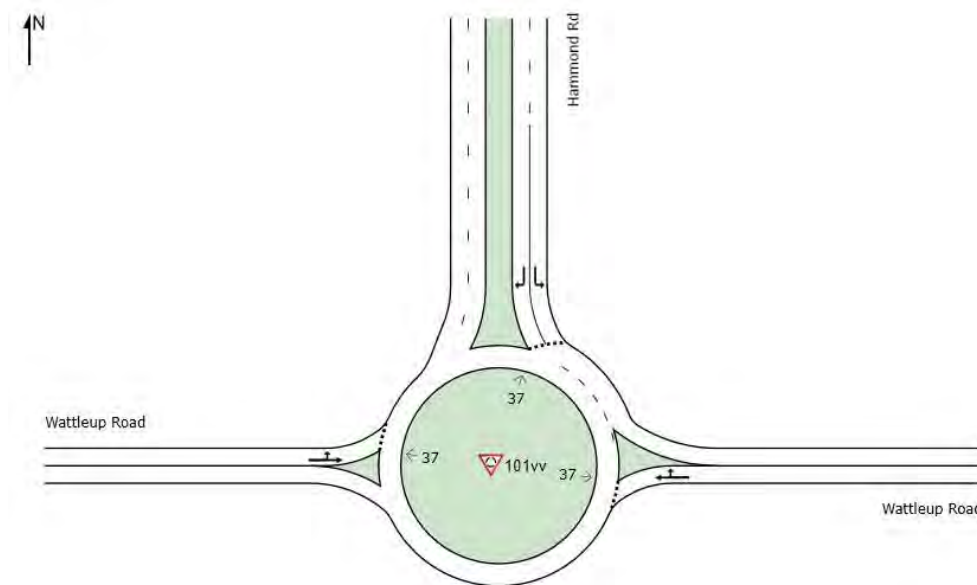


Table 6-9 2031 + Development Results – Hammond Road / Wattleup Road 3-way Roundabout

Intersection Approach		2031withDevelopment AM Peak				2031withDevelopment PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Wattleup Rd (East)	T	0.529	5.2	A	50.1	0.44	5.3	A	32.9
	R	0.529	11.5	B	50.1	0.44	11.8	B	32.9
Hammond Road (North)	L	0.134	4.5	A	7.7	0.193	5.1	A	11.3
	R	0.094	10.7	B	4.8	0.155	11.4	B	8
Wattleup Rd (West)	L	0.582	6.4	A	54.1	0.525	5.5	A	38.5
	T	0.582	7.7	A	54.1	0.525	5.6	A	38.5
All Vehicles		0.582	7.3	A	54.1	0.525	6.5	A	38.5

6.7.3 Wattleup Road / LSP Access Road 2

The following presents the results of the analysis of the Wattleup Road / Access Road 2 intersection in the assumed year of completion. **Figure 6-7** is a SIDRA layout representation of the intersection. Note that right turn pocket length is to be further confirmed during detailed design stage.

Table 6-10 shows the results of the analysis. It shows that the proposed intersection layout would be able to cater for the development traffic. No significant queue within the right turn pocket, indicating that the proposed right turn lane would be sufficient to cater for the queue length. Left turn movement performance from Wattleup Road is also performing satisfactorily within minimal impact to Wattleup Road.

Some delay may be experienced by drivers exiting from the access road, however this level of service may be expected at the completion of the LSP with Wattleup Road still functioning as a regional distributor road. When Rowley Road is built, it is expected that through traffic along Wattleup Road will ease and delays when exiting from the access road would be reduced.

Figure 6-7 Wattleup Road / LSP South Access Road 2 SIDRA Layout

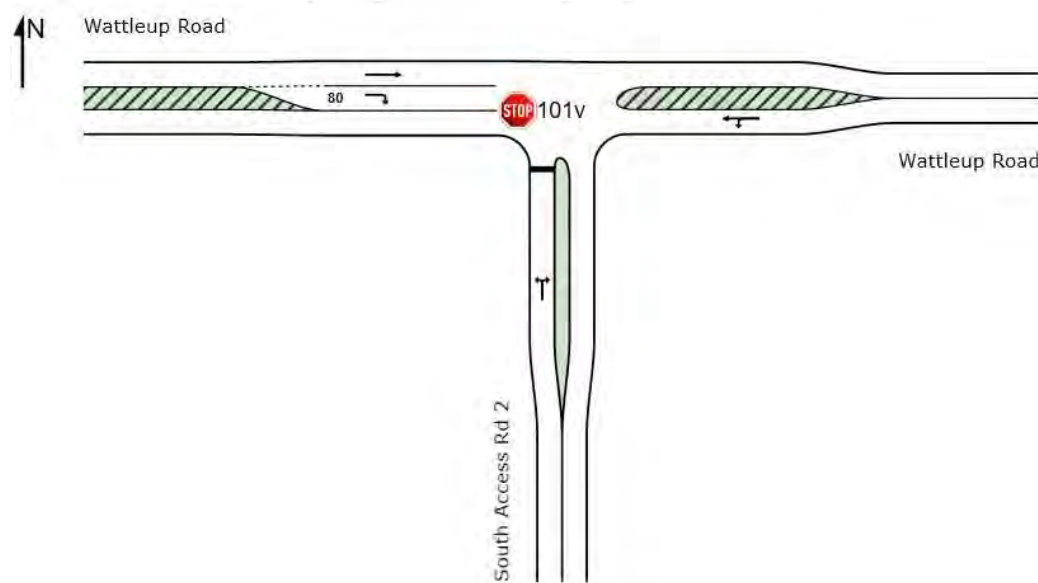


Table 6-10 2031 + Development Results – Wattleup Road / Access Road 2

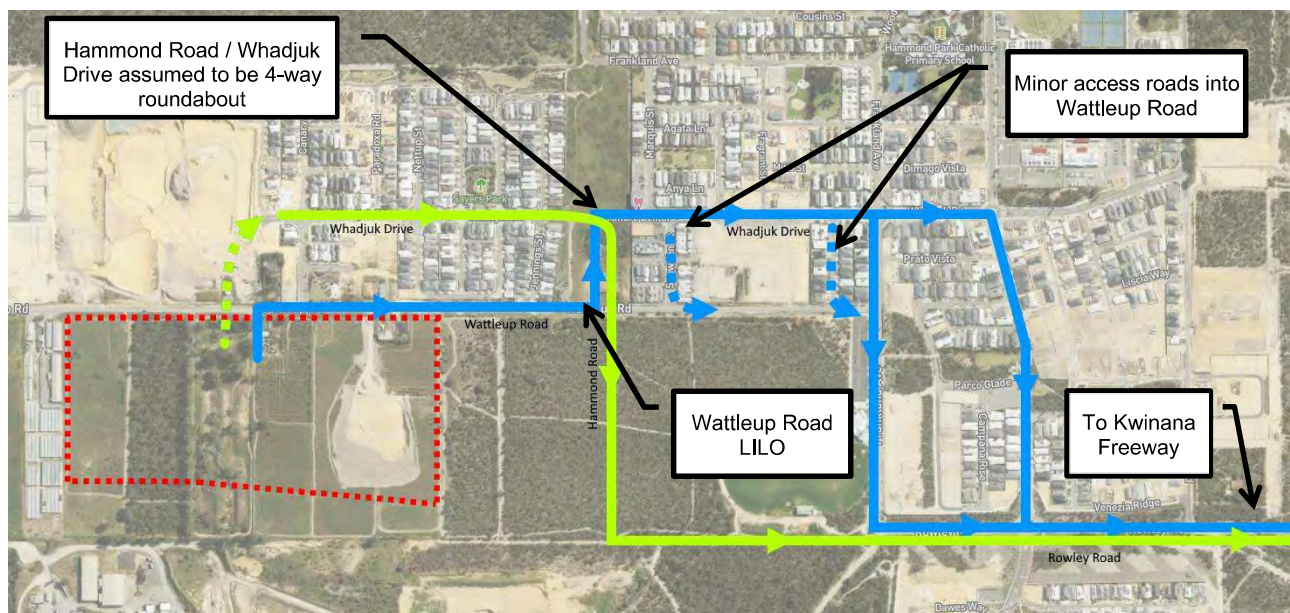
Intersection Approach		2031withDevelopment AM Peak				2031withDevelopment PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
South Access Rd 2 (South)	L	0.622	21.4	C	22.5	0.298	11.5	B	8.2
	R	0.622	39.9	E	22.5	0.298	28.9	D	8.2
Wattleup Rd (East)	L	0.332	6.5	A	0	0.244	6.5	A	0
	T	0.332	0.1	A	0	0.244	0.1	A	0
Wattleup Rd (West)	T	0.341	0.1	A	0	0.344	0.1	A	0
	R	0.014	8.5	A	0.4	0.032	7.8	A	1

6.8 Review of Future Wattleup Road LILO at Hammond Road

Following the construction of Rowley Road and the extension of Hammond Road to Rowley Road, Wattleup Road is expected to terminate at Hammond Road with only left-in and left-out movement permitted. In this future scenario, some changes to traffic behaviour are expected:

- > Regional and heavy vehicle traffic will shift to Rowley Road, causing Wattleup Road to be downgraded in function as an access road, and traffic will decrease significantly.
- > LSP traffic bound for Kwinana Freeway (southbound) will be required to go via a different traffic route. The LSP traffic is expected to go via the following routes (**Figure 6-8**):
 - Wattleup Road > Hammond Road > Whadjuk Drive > Frankland Avenue or Irvine Parade > Rowley Road > Kwinana Freeway
 - Wattleup Road > any residential access roads north of Wattleup Road > Whadjuk Drive > Hammond Road > Rowley Road > Kwinana Freeway
- > Whadjuk Drive will replace Wattleup Road's function as the 'Neighbourhood Connector' as indicated in the expected travel route in the above bullet point, and expected to be able to cater for the volume.
- > The expected travel route to reach Rowley Road en route to Kwinana Freeway would also be divided into three major roads: Hammond Road, Frankland Avenue, and Irvine Parade. There are also minor access roads that connects to Wattleup Road.

Figure 6-8 Expected Travel Route to Kwinana Freeway with Wattleup Road LILO



As discussed above, there will be changes in traffic behaviour due to Wattleup Road LILO, particularly route from the LSP towards Kwinana Freeway. The surrounding road network is permeable enough to be able to cater for the traffic diversions and therefore, Wattleup Road LILO is not expected to have detrimental impact to the surrounding area or road network.

6.9 Pedestrian and Cycling Network

Pedestrian and cycling facilities will be provided within the LSP consistent with the appropriate road hierarchy, including pedestrian paths along at least one side of all roads within the LSP. This would provide excellent connectivity to the surrounding path network and any future public transport services.

6.10 Safe Walk and Cycling to School

As mentioned previously, a path is expected to be provided on at least one side of all roads within the LSP. This would provide excellent facility for nearby students to walk or cycle to school.

A crossing facility should be provided on Wattleup Road to provide a safer crossing location for parents and students to cross from the Site towards the primary school located on the structure plan area north of Wattleup Road.

6.11 Public Transport Access

At present public transport access is poor as there are no bus routes passing through the LSP. As mentioned previously, the SSDSP indicates a provision of a future bus service along Wattleup Road which may also link to the Latitude 32 Industrial area. Further discussion with PTA should be held to provide bus services in the vicinity of the area once the local road network is complete.

7 Conclusion

Stantec has been commissioned by Qube Property to prepare a Transport Impact Assessment (TIA) for the proposed Structure Plan (the Site) located in Hammond Park, City of Cockburn. The Structure Plan consists of lots 117, 200, 805, 809, 1000, 1001, 9001, 9002, 9003 Wattleup Road.

This assessment has been prepared in accordance with the WAPC *“Transport Impact Assessment Guidelines Volume 2: Planning Schemes, Structure Plans and Activity Centre Plans”* (2016).

The following conclusions have been made:

- > The LSP is proposed to yield 294 residential dwellings.
- > The LSP contemplated is estimated to generate approximately 280 trips in the AM peak and 292 trips in the PM peak
- > A SIDRA analysis of Wattleup Road and access roads indicates that the intersections would be performed adequately in the year of completion. Some delay may be experienced by drivers exiting right out from the access roads, however this level of service can be expected at the completion of the LSP with Wattleup Road still functioning as a regional distributor road. When Rowley Road is built, it is expected that through traffic along Wattleup Road will ease and delays when exiting from the access road would be reduced.
- > The SIDRA analysis of Hammond Road / Wattleup Road the 3-way roundabout scenario, shows that the roundabout can cater for the LSP and background traffic growth, including other approved LSP currently under construction.
- > Wattleup Road speed limit is proposed to be reduced to 60km/h at the opening of the LSP subdivision. In the long term following the completion of Rowley Road, Wattleup Road would be downgraded into a Neighbourhood Connector as all regional and freight traffic would move into Rowley Road. At this point Wattleup Road speed limit is proposed to be reduced to 50km/h.
- > Future Wattleup Road LILO intersection at Hammond Road will not have detrimental impact to the surrounding road network. The existing and future road network surrounding the LSP is permeable and will be able to cater for the traffic diversions caused by Wattleup Road LILO.

Hammond Quarter Structure Plan

APPENDIX

A

STRUCTURE PLAN



now



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