Cowaramup

Integrated Transport Strategy

Prepared for: Shire of Augusta Margaret River

Ref: 300305280 | Date: 19 June 2024

Revision Schedule

Revision No.	Date	Description	Prepared by	Quality Reviewer	Independent Reviewer	Project Manager Final Approval
A	19/04/2024	Draft Report	LR	SL		SL
B	19/06/2024	Client's Comments	LR/CR	SL		SL

Disclaimer

The conclusions in the report are Stantec's professional opinion, as of the time of the report, and concerning the scope described in the report. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. The report relates solely to the specific project for which Stantec was retained and the stated purpose for which the report was prepared. The report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorised use or reliance is at the recipient's own risk.

Stantec has assumed all information received from the client and third parties in the preparation of the report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

This report is intended solely for use by the client in accordance with Stantec's contract with the client. While the report may be provided to applicable authorities having jurisdiction and others for whom the client is responsible, Stantec does not warrant the services to any third party. The report may not be relied upon by any other party without the express written consent of Stantec, which may be withheld at Stantec's discretion.

Acknowledgment of Country

In the spirit of reconciliation, Stantec acknowledges the Traditional Custodians of country throughout Australia and their connections to land, sea and community. We pay our respect to their Elders past and present and extend that respect to all Aboriginal and Torres Strait Islander peoples.

Contents

List of tables

List of figures

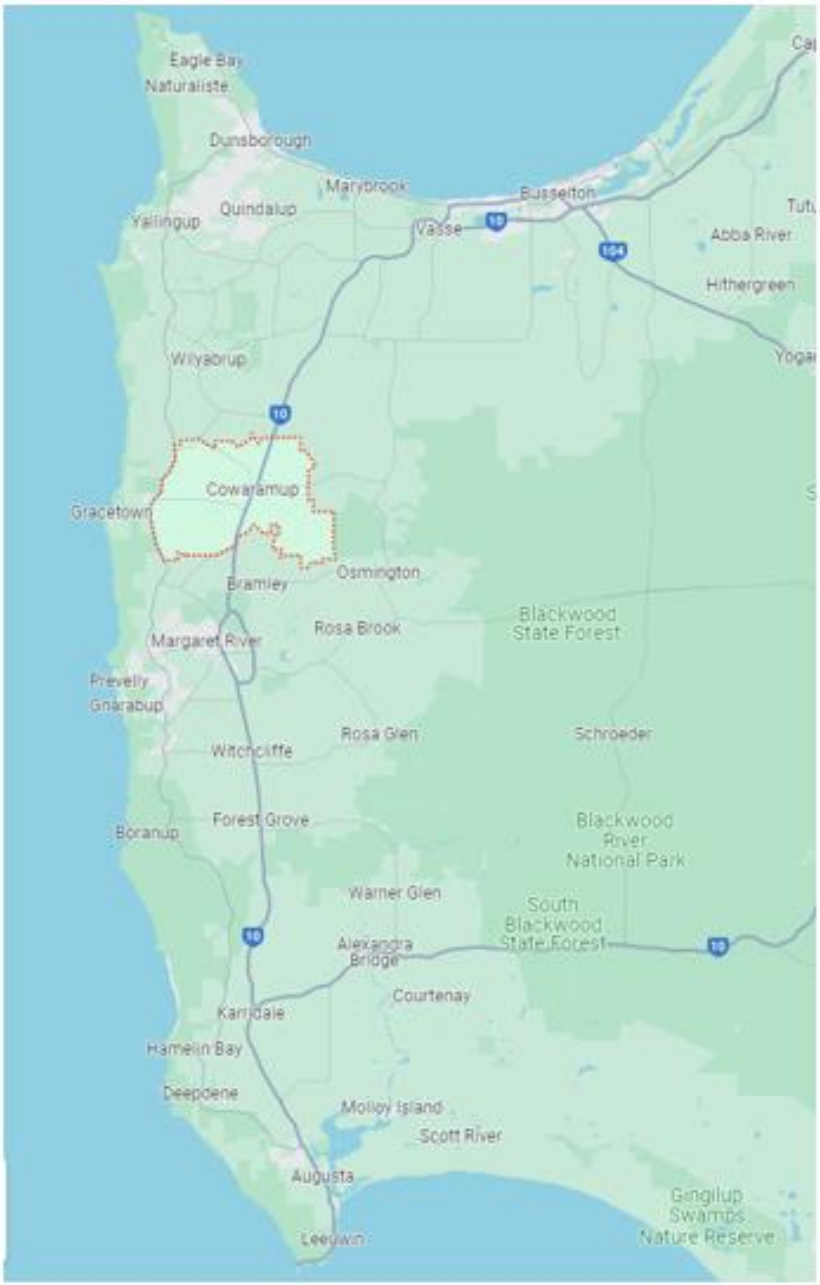
List of Appendices

1. Introduction

1.1 Background

Cowaramup is located in the Southwest of Western Australia, 12km north of Margaret River within the Shire of Augusta-Margaret River, refer to **Figure 1-1**. The town is bordered by the City of Busselton to the north, the Shire of Nannup to the east, Margaret River to the south and the Indian Ocean to the west.

Figure 1-1 Cowaramup Location

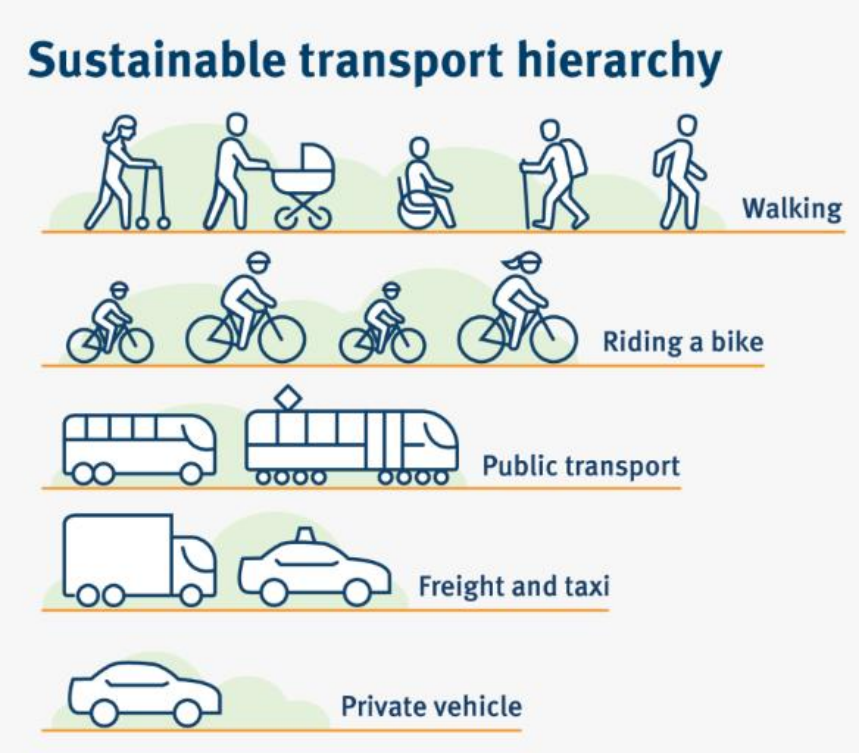


Source: Google maps

1.2 Scope of Work

Stantec has been engaged by the Shire of Augusta-Margaret River to prepare an Integrated Transport Strategy (ITS) for the town of Cowaramup. The objectives include a clear strategy to manage the road network for all road user types, improve town centre access and manage parking. The strategy also includes a SIDRA analysis of the existing and projected traffic volumes for the existing and projected traffic for the short and medium term and assesses the impacts associated with the projected traffic and includes some mitigation measures to improve the road network.

The strategy accommodates the needs of all road users and promotes transport equity. It aims to increase transport access options, reduce trip distances and vehicle emissions, and considers travel demand management programs to moderate growth in traffic and encourage the use of other transport modes.



Transport infrastructure, programs, and services were evaluated using a “triple bottom line” approach, which considered social, environmental, and economic factors. The Healthy Streets framework underpins the Strategy, and an assessment was undertaken on Bussell Highway between Peake Street and Botrill Street to determine how healthy the current environment is for the people it serves. The strategy also focuses on improving cycling facilities, including links to the Wadandi Track, and facilities for pedestrians of all levels of mobility, such as pedestrian crossings, footpaths, and street lighting. The Strategy is formed by meaningful community input with recognition of the views of all stakeholders.

Findings of previous studies and reviews contribute to analysis to understand current and forecasted travel behaviours. It identifies how future needs can be met within the transport options available, addresses the outcomes reached by other relevant and recent studies, and provides a long-term strategy for the development and management of transport assets.

> *“The objective of the integrated transport strategy is to develop an integrated transport system in the Cowaramup town centre and surrounds that meets the existing and future needs of the community and the local economy.*
>
> *The specific objectives of the strategy are to:*
>
> *-Identify opportunities to develop a more sustainable transport system, including encouraging walking and cycling and reducing dependency on private car use; and*
> *-Assess the need for improving road networks to enhance accessibility.”*

1.3 Literature Review

A summary of the literature is provided in **Table 1-1**, with the full review available in **Appendix A.**

Table 1-1 Literature Review Summary

Document	Summary
LSP Amendment No.1	The proposed subdivision of Lot 102 Bussell Highway to create a minimum of 124 lots will include a Connector Road between Bussell Highway and Sunset Drive, serving as the primary east-west link, along with a roundabout on Bussell Highway/Roy Earl Drive.
Village Strategy	It identifies a specific precinct near Hall Road, Bussell Highway, and Bottrill Street for commercial activities and proposes a roundabout at a four-way intersection on Bussell Highway. It also recommends a comprehensive pedestrian network and appropriate east/west connectors.
Local Planning Policy 2008	Car parking areas shall be located at the rear of the building and the access at the rear or side streets. Development within 100 metres of the proposed car park in Bottrill Street may obtain up to 100% cash-in-lieu dispensation of the normal car parking requirement.
LPS 2022	If speed reductions and traffic calming measures don't improve pedestrian experience and safety, a bypass road should be explored.
LPS 2036	Includes 5 areas for urban growth. 4 for residential and 1 for Industrial
Local Tourism Planning Strategy 2015	Development of Lot 200 Bay Road to accommodate 161 keys, gymnasium, swimming pool, spa, and restaurant.

1.4 Study Area

The study area shown in **Figure 1-2** is bounded by Wirring Road to the south, Miamup Road to the west, the green area north of Duggan Drive and the empty lots, east of the town. The study area excludes the existing residential areas (Symphony Waters and Lakeview Estates) and the existing Light Industrial Area located north of Wilyabrup Brook, the Parkwater Estate and the original townsite located west of Miamup Road / Sunset Drive.

Figure 1-2 Study Area

Source: Metromaps

1.4.1 Attractor Points

Cowaramup includes a diverse array of social infrastructure and services, serving as major attractions for both locals and visitors (refer to **Figure 1-3**). These facilities are situated on both sides of Bussell Highway, resulting in continuous traffic flow and pedestrian/cyclist activity along the Highway.

Figure 1-3 Attractor Points

Some important aspects to highlight regarding the location of attractor points include:

- The absence of safe pedestrian/cyclist crossing points along the highway.
- Limited shops/supermarkets, with the shop at the BP petrol station being the sole provider of essential items after hours, combined with the lack of path connections and crossing points on Bussell Highway.
- No connecting internal roads, resulting in movement forced onto Bussell Highway.
- Lack of door-door service from the Post Office, necessitates personal collection of all letters and parcels.
- Gaps in the shared path network reduce active transport connectivity.
- The town has the presence of a traffic warden at a school crossing on Bussell Highway during school periods on weekdays between 8:00-9:00am and 3:00-4:00pm.

1.5 Demographics

Over the years, the population of Cowaramup has shown consistent growth, and since the COVID-19 pandemic, the rate of growth has accelerated. Between 2016 to 2021, the population increased by 651 people, representing an average annual population change of 4.74%. Consequently, additional land is currently being rezoned to facilitate further residential development.

An analysis of the age distribution in Cowaramup (see **Figure 1-4**) reveals that a greater percentage of the population falls within the younger age groups (0-17 years) at 28.3%. The proportion of individuals in the older age bracket (60+years) is lower at 20%.

Cowaramup has a higher concentration of 5–11-year-olds ("primary schoolers") and 35–49-year-olds ("parents and homebuilders") compared to other areas within the Shire of Augusta-Margaret River.

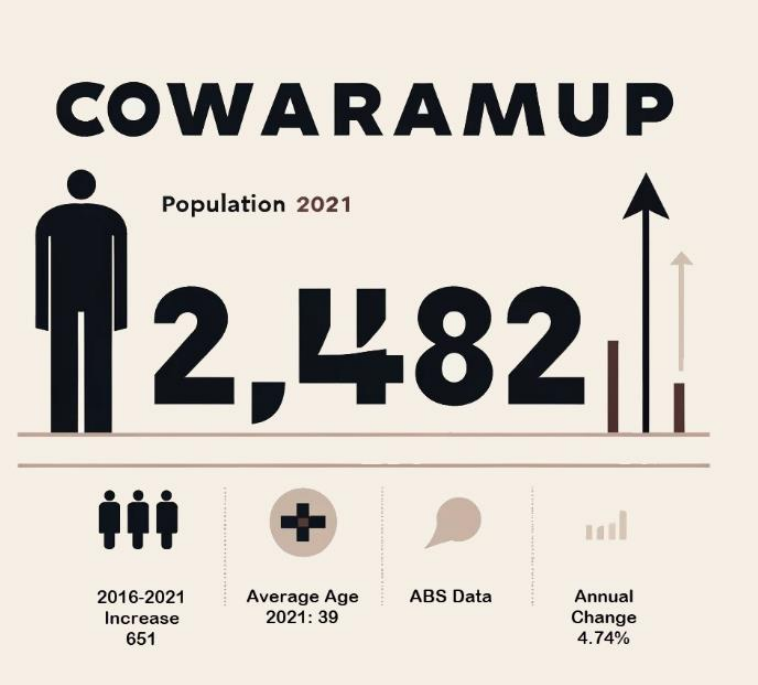
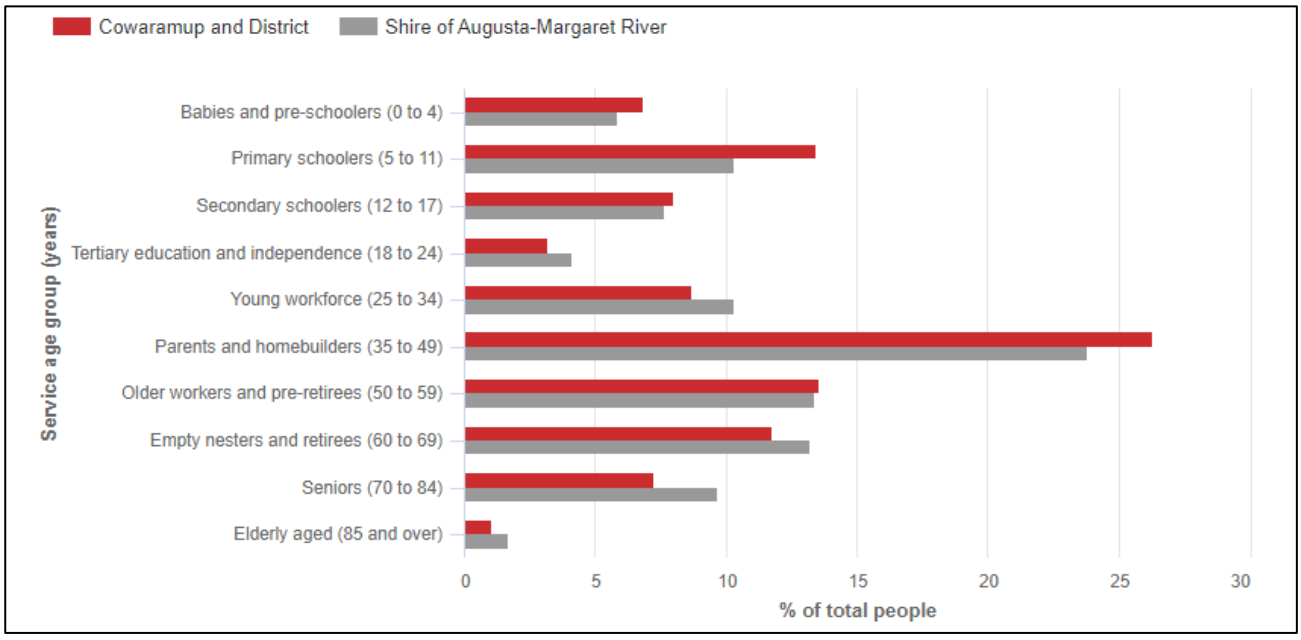


Figure 1-4 Age groups, 2021



Source: Id community

The rapid growth in Margaret River and Witchcliffe, as well as increased tourism activity has led to higher traffic volumes on Bussell Highway. This surge in traffic, combined with local growth, has resulted in congestion at intersections, making the road more difficult to negotiate for pedestrians and cyclists.

Bussell Highway is a major traffic and freight route that bisects Cowaramup. The safety of children walking and cycling to Cowaramup Primary School, as well as the operation of the school crossing on Bussell Highway, are significant community concerns. The extensive residential development on either side of the highway has resulted in a situation where residents, especially children, face serious risks when trying to access school, shops, leisure facilities or friends across town.

In 2022, the RAC (Royal Automotive Club) rated this stretch of road as the 6th most risky road for pedestrians in regional Western Australia. Additionally, the Bussell Highway / Memorial Drive intersection was ranked as the 7th most risky intersection where traffic signals or a roundabout were nominated as ways to reduce crash risks.

1.5.1 Tourism

Tourism plays a vital role in Cowaramup, not only due to the town's attractions but also due to its strategic location along Bussell Highway. According to Tourism Research Australia, in 2021/2022, approximately 2.4 million visitors stayed overnight in the Shire, while around 420,000 people visited for day trips only.

2. Movement Network

This section describes the existing conditions within the study area by mode type based on recently collected data and data obtained through desktop review.

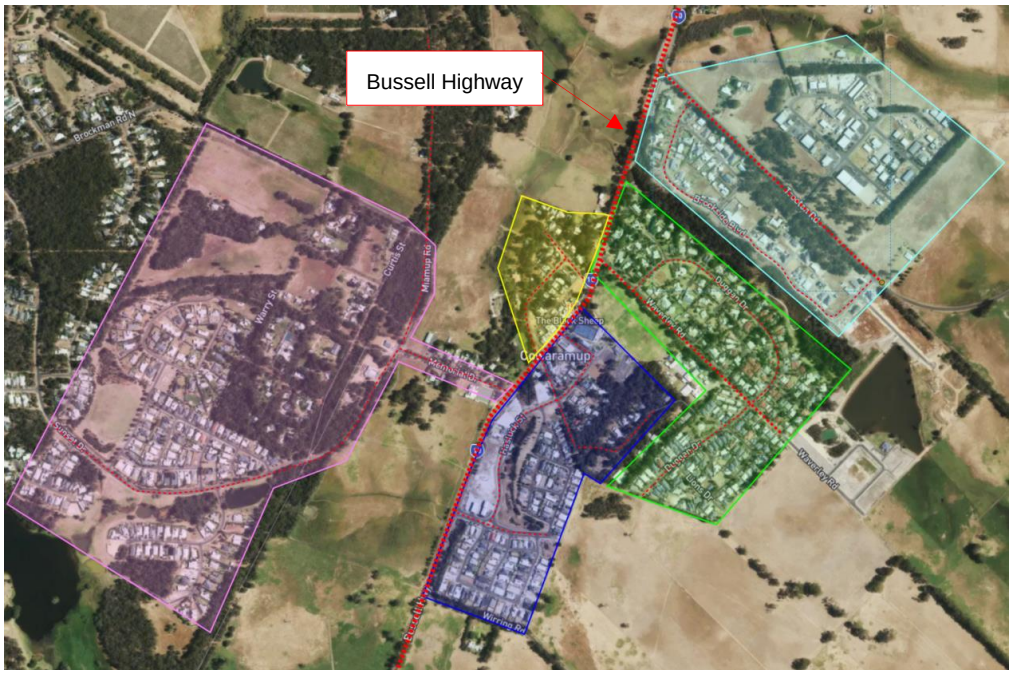
A matrix of Strengths, Weaknesses, Threats, and Opportunities (SWOT) is provided, in the context of existing land use and transport conditions, as well as best-practice transport planning principles for pedestrians/cyclists and private vehicles. The resulting SWOT analysis provides insight into areas of potential improvement. This is intended to identify infrastructure enhancement that will support the long-term success and viability of Cowaramup and be used as a baseline for recommendations.

2.1 Vehicles

A primary function of Cowaramup's roads is to move vehicles and freight, but they are also an integral part of community life, facilitating walking, cycling, and various social activities. Private vehicles will always have a role in this system – they are time-efficient and flexible, providing households with a variety of destination options. However, private vehicle transport has a range of environmental and health impacts well beyond their emissions. The existing road network presents opportunities for a range of future changes in transport.

As such, we can reduce our reliance on private cars by creating a transport network that emphasises a wide range of viable alternative modes and ensures a safe road environment for all users. Cowaramup is essentially divided into five (5) distinct areas, which are only connected via Bussell Highway as shown in **Figure 2-1**. A lack of connectivity between these areas increases the demand on Bussell Highway and its intersections.

Figure 2-1 Distribution areas



Source: Metromap

2.1.1 Road Hierarchy

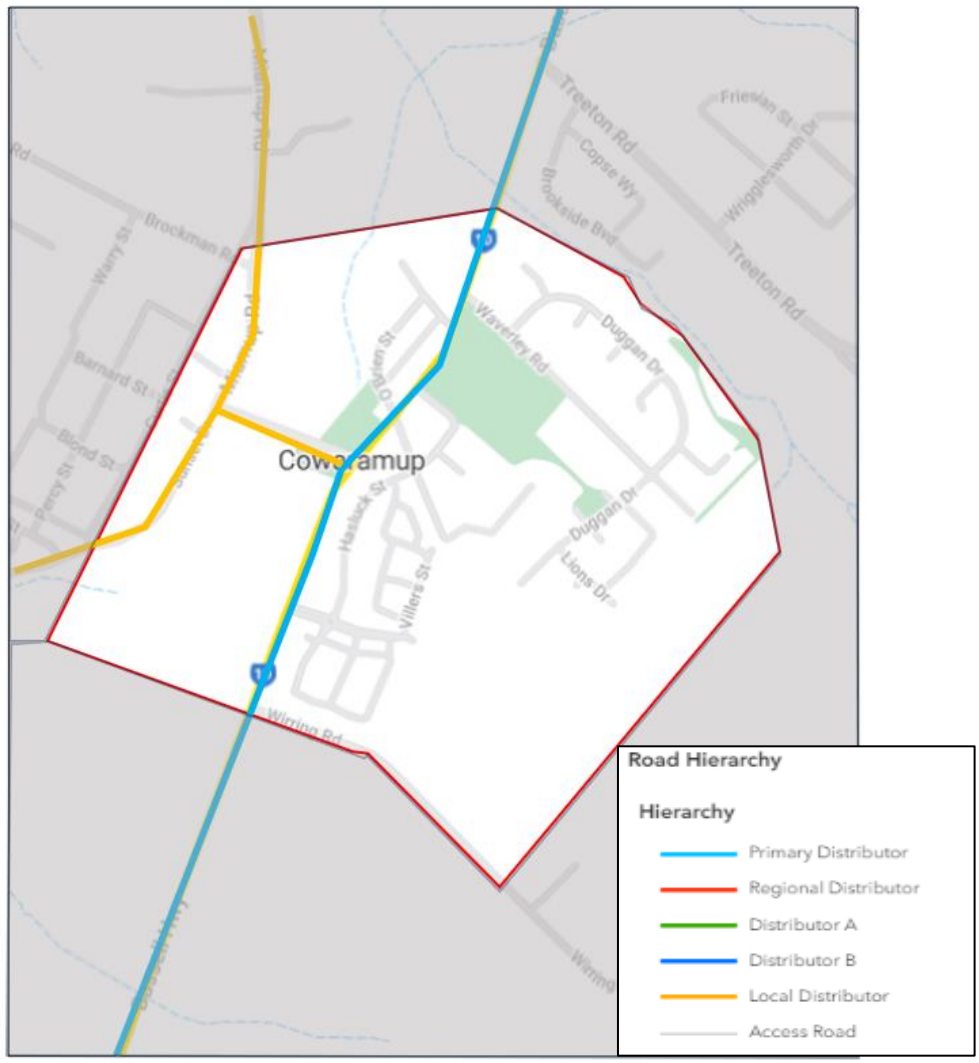
As shown in **Figure 2-2**, Bussell Highway is the primary access to Cowaramup, and it is classified as 'Primary Distributor' road under the Main Roads WA Functional Road Hierarchy. It is a two-lane-two-way carriageway and serves as the main north-south vehicle link between Busselton and Margaret River. While Bussell Highway operates as a high-speed, high-volume road, its passage through Cowaramup's town centre requires a transition to a slower more pedestrian-friendly environment that caters to the local residents.

Primary Distributors form the regional and inter-regional grid of Main Roads WA traffic routes carry large volumes of fast-moving traffic and are managed by Main Roads.

Memorial Drive, Sunset Drive and Miamup Road are classified as 'Local Distributor' Roads and serve as the main vehicle links to residential developments on the western side of Cowaramup and wider farming and wine regions. Local Distributors, managed by Local Governments, should accommodate buses but discourage truck movements.

The remaining road network within the study area is classified as 'Access Roads'. These are managed by the Shire and provide access to abutting properties. Main Roads define these roads as bicycle and pedestrian friendly.

Figure 2-2 Road Hierarchy



Source: Road Information Mapping System- MRWA

2.1.1.1 Restricted Access Vehicle -RAV Routes

MRWA defines the Restricted Access Vehicles (RAVs) as all combinations of vehicles exceeding 19m in length of 42.5 tonnes gross mass including B-doubles, road trains and truck-and-trailer combinations. RAV routes must be designed to accommodate the needs of heavy vehicle combinations, which include characteristics such as larger radius bends and fewer obstructions.

Bussell Highway is included within the Roads Register of Approved Vehicles (RAV) as part of Network 4 which allows vehicles of a maximum length of 27.5m and 88.5 tons.

Stantec has been informed ta

Figure 2-3 RAV Network

Source: MRWA Roadmap (Jan 2024)

According to data from the Main Roads traffic count station on Bussell Highway south of Memorial Drive, an average of 1,113 heavy vehicles travel daily along this this section of road (Monday to Sunday) constituting approximately 12.9% of the total traffic volume. During school starting and finishing hours, there are on average 98 RAV vehicles travelling daily in both directions between 8:00 and 9:00 am and 71 RAV between 3:00 and 4:00 pm.

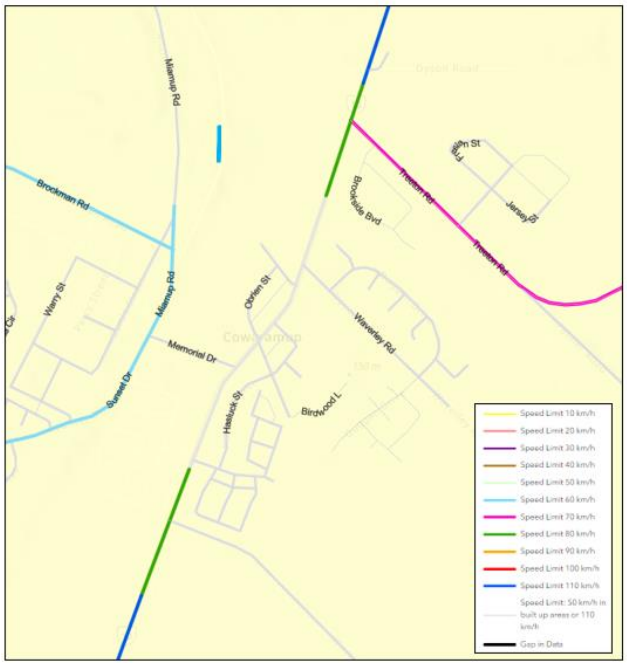
2.1.2 Speed Limits

The speed limits indicated by the Road Information Mapping System are depicted in **Figure 2-4**. However, upon conducting a desktop assessment, it was found that there are inconsistencies between the posted speed limits and the Main Roads Mapping system. **Figure 2-5** illustrates that the posted speed limit reduces to 60km/h at the approaches of the study area, further decreasing to 40km/h within the town centre. Beyond the town centre, the speed limit increases to 60km/h and eventually reaches 110km/h outside the study area. Sunset Drive / Miamup Road aligns with the posted speed of 60km/h as indicated by the Mapping System.

There are no posted speed limit signs on Memorial Drive, in built-up areas a default speed limit of 50km/hr applies unless there is a gazetted lower speed limit.

Stantec has been informed that a trial for safer speeds is being planned within the Shire of Augusta-Margaret River and the City of Busselton, where speed limits on up to 2,000 roads will be reduced for a 3-year trial. It is understood that roads within Cowaramup will be included in the trial.

Figure 2-4 Speed Limit as per Mapping System



Source: Road Information Mapping System (Jan 2024)

Figure 2-5 Posted Speed Limits

Source: Metromap

2.2 Traffic Volumes

The Main Roads WA Traffic Map includes four (4) traffic count stations within the study area. The data was collected between 2021/2022 and it is summarised below.

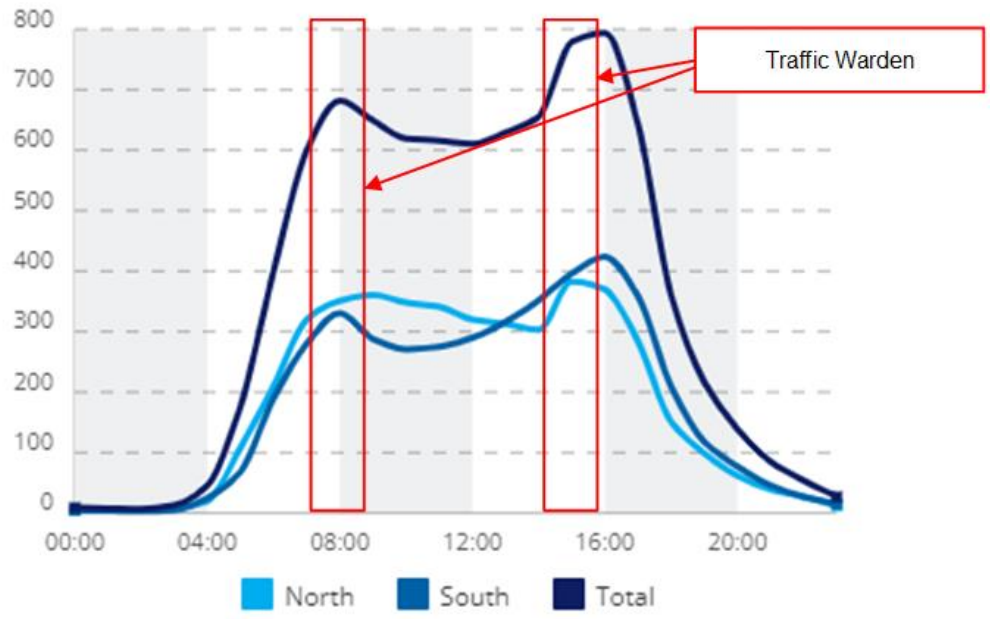
Table 2-1 Traffic Count stations summary

Location	Peak hour volumes *Monday to Sunday		ADT	Percentage of Heavy vehicles
	AM	PM		
Bussell Hwy South of Memorial Dr	10:00AM 703 vehicles	3:00PM 744 Vehicles	8,623	12.9%
O'Brien St North of Bussell Hwy	11:00AM 82 vehicles	12:00PM 63 vehicles	625	6.4%
Peake St West of Bussell Hwy	10:00AM 49 vehicles	1:00PM 33 vehicles	417	11.3%
Peake St West of Bussell Hwy	8:00AM 222 vehicles	3:00PM 230 vehicles	1,774	9.0%

To gain insight into traffic volumes on Bussell Highway during the traffic warden's presence, weekly traffic data was incorporated into **Figure 2-6**. The morning peak occurs from 8:00-9:00 am with 682 vehicles, coinciding with the traffic warden's shift. The evening peak is between 4:00-5:00 pm with 794 vehicles and takes place outside of the warden's shift.

Significant traffic volumes when the traffic warden is not on site emphasises the need to enhance pedestrian and cyclist safety along Bussell Highway, especially within the study area.

Figure 2-6 Weekday Traffic Volumes Bussell Highway



2.2.1 Crash Statistics

An assessment was undertaken of crash data within the study area encompassing the most recent five-year period 2019-2023. A total of 20 crashes were recorded across the 5-year period; of those, 1 resulted in hospital admission, 3 required medical attention, 11 recorded major property damage (PDO major) and 5 minor property damage (PDO minor). No fatalities were recorded.

The predominant location for the recorded crashes is the Cowaramup Town Centre with 11 crashes including one hit-pedestrian crash that resulted in a PDO minor severity.

The crashes recorded within the town centre area were predominantly rear end with 5 occurrences, and sideswipe related to vehicles leaving parking bays with 3 occurrences. This may support the inclusion of additional treatments such as pedestrian operated traffic signals or speed reduction treatments to reduce the likelihood of these occurrences.

Figure 2-7 Crash Map

Source: Crash Map (Jan 2024)

2.2.2 Parking Assessment

Parking is an essential and inherent component of both the transport and land use system and is unique in that behaviour can be influenced directly at the planning and policy stage rather than solely through infrastructure provision.

Cowaramup has approximately 211 public parking bays, located both on-street and off-street. The primary off-street car parking is located adjacent to the Cowaramup Tennis Club, accessible via the Bussell Highway / Hall Road intersection. There are no restrictions on any parking, except for the bus zone on Waverley Road, designated for school buses Monday to Friday from 8:10-8:40 am and 3:15-3:45pm. At any other times, up to four vehicles can be accommodated without time restrictions.

Moreover, to address parking overflow, several vacant lots within the town are utilised for parking purposes. There are no EV charging stations within the study area. Location, numbers, and restrictions are below and illustrated in **Figure 2-8**:

On-Street Car Parking Bays

- Roy Earl Dr 14 car parking bays
- Memorial Dr- 5 car parking bays
- Bottrill St- 12 car parking bays
- Hall Rd- 7 car parking bays
- Bussell Highway- 33 car parking bays
- O'Brien St- 6 car parking bays
- Duggan Dr- 5 car parking bays
- Waverley Rd- 73 car parking bays
- Waverley Rd- 4 car parking bays (Bus Zone- Monday to Friday 8:10 AM to 8:40 AM & 3:15 to 3:45 PM)

Off-Street Car Parking Bays

- Car park next to Cowaramup Tennis Club with 52 car parking bays including 4 ACROD bays.

Figure 2-8 Parking Assessment

2.2.3 Gaps in the Road Network

The analysis of the existing road network helped to identify the current gaps that are included in **Figure 2-20**. The local road network should connect the areas located both sides of town without the need to use Bussell Highway and low-volume-low-speed environment should be considered along the local roads.

Figure 2-9 Identified Gaps in the Road Network

Table 2-2 provides a summary of the gaps in the road network and proposed mitigation measures.

Table 2-2 Gaps and Proposed Improvements in the Road Network

ID	Location	Description	Proposed improvement
1	Waverley Road - Brookside Boulevard	Gap in the road network – No internal connection	Provide a local road connection to allow internal traffic to travel between the areas without the need to use Bussell Highway. This provides an opportunity to connect the northern area of the town with Waverley Road and the proposed Medium-Term development areas C4 and C5. See **Appendix B Section B3.5 and B3.6.** This is not feasible due to existing infrastructure and therefore any future development to the east should include a connection between Palmer Road and Waverley Road to improve permeability in the street network.
2	Roy Earl Drive and Duggan Drive	Missing link - Undeveloped area	Development of Lot 500 Wirring Road included in the Structure Plan (C5) See **Appendix B Section B3.6**. The inclusion of a road connection in the area will allow vehicles to travel between these areas without the need to use Bussell Highway.
3	Bussell Highway between Wirring Road and Waverley Road (ultimate scenario)	Speed reduction	Extend the 40km/h speed limit along Bussell Highway according to the function within a movement and place context. This should commence initially between Memorial Drive and Waverley Road, with an ultimate scenario up to Wirring Road once the proposed developments within the area are built. Provide a self-explaining road environment where motorists reduce the speed along the area by providing: • Street trees; • Narrower carriageway; • Median – traffic island at the intersections – bollards etc. • Speed Radar signs that detect and record the speed of each approaching vehicle and display messages accordingly i.e. illuminated smiley face if the approaching vehicle is travelling at the correct speed or a 'Slow down' message to vehicles exceeding the speed limit. • Include landscaping and public art. Install an entry statement either side of the town centre. i.e. 'Welcome to Cowaramup. Please drive safely and respect pedestrians, especially children"
4	Roy Earl Drive - Miamup Road	Missing link - Undeveloped area	Development of Lot 102 Bussell Highway included in the Structure Plan (C1) See **Appendix B Section B3.2**. The inclusion of a road connection in the area will allow vehicles to travel between these areas and cross Bussell Highway but without the need to drive along it.
5	Peake Street to connect to the proposed C3	Missing link- Undeveloped area	Provide a local road connection to allow internal traffic to travel between the areas without the need to use Bussell Highway. This provides an opportunity to connect Peake Street with the proposed Short-Term development areas C3. See **Appendix B Section B3.4**
6	Miamup Road	Speed reduction and school crossing	Reduce operating speed on the approaches of the pedestrian crossing to 30km/h by providing: • Street trees; • Narrower carriageway; • Line marking

			If a school crossing guard is available, provide a school crossing.
7	O'Brien Street	Informal parking	Formalise parking areas on O'Brien Street by sealing and marking bay areas to provide compliant parking for the Post Office, Pharmacy, and commercial area. See There is an opportunity to formalise parking areas on O'Brien Street through sealing and marking bays. This will provide additional capacity for public parking in the town centre, adjacent to the park with approximately 8 bays. The median can accommodate approximately 12 angled parking bays with wheelstops, noting this does not allow space for a path. Figure **2-10** Formalisation of parking may result in a minor reduction in the total informal bays; however, it will prioritise safety for users.
8	General	No EV charging stations for public use	Consider locations for public EV charging locations

There is an opportunity to formalise parking areas on O'Brien Street through sealing and marking bays. This will provide additional capacity for public parking in the town centre, adjacent to the park with approximately 8 bays. The median can accommodate approximately 12 angled parking bays with wheelstops, noting this does not allow space for a path.

Figure 2-10 Informal parking locations - O'Brien Street

2.2.4 SWOT Analysis Private Vehicles

The SWOT analysis for trips completed on private vehicles is presented below.

Strengths

- Convenience and flexibility for personal transportation
- Origin-destination trips within the town of Cowaramup can be achieved within less than 10 minutes
- Sufficient accessible parking which facilitates the use of private vehicle
- The primary road network is designed to accommodate large vehicle combinations. The extent of this network allows for efficient access to destinations across the southwest region of WA.
- Congestion effects do not currently impact freight operations to a significant degree.

Weaknesses

- Contributes to traffic congestion and pollution
- Lack of connectivity within the areas of the town
- Few approach routes concentrates traffic onto Bussell Highway
- Private vehicle transport is inherently space inefficient. That is, cars take up more space (per person) than any other mode of transport.
- Freight routes coincide with the key arterial through town. This implies that as development continues, conflicts with large vehicle combinations, including significant safety and congestion impacts will become more frequent.
- Freight function conflicts with safe pedestrian movements along Bussell Highway.
- 61.3% of the population travel to work by car

Opportunities

- To improve the local road network within the town to connect the different areas of the town reducing the need to connect through Bussell Highway
- The lack of opportunities for road expansion will support further improvements in sustainable transport to accommodate the movement of people.
- The future of private vehicle travel is likely to be in electric vehicles, with European regulations acting as a forcing factor in the lead up to 2040. Electric vehicle charging stations will be required, with likely requirements for additional baseload power.
- Jurisdictions across the world have adopted a 30km/hr residential speed limit, which allows for integration of mixed-traffic cycling and greatly improved road safety outcomes.
- Upgrading local street network to reflect low volume, low speed environment.
- The provission of a bypass road to deviate through traffic from the town of Cowaramup
- Provide a public EV charging station
- To improve the layout of the intersecting roads of Bussell Highway that are projected to perform poorly in the long term due to anticipated traffic growth from future developments, including subdivisions as shown in the modelling scenarios (Refer to **Appendix B**)

Threats

- As congestion increases, it will become more difficult to cross Bussell Highway and may result in risk taking behaviour.
- As the population grows, traffic increases,creating a more hostile environment for path users, resulting in a vicious cycle of more traffic from private vehicles and fewer people opting for active modes of transportation such as walking and cycling.
- Heavy vehicle movements along high-speed corridors reduce safety outcomes for vulnerable users wherever space is shared.
- The operational characteristics of heavy vehicles are not consistent with those of passenger vehicles. Therefore, a road network that is optimised for private cars will impinge upon the efficiency of freight operations, and vice versa.

2.2.5 Transport Modelling

A traffic modelling exercise was conducted to assess the impacts associated with the existing (2024) traffic volumes and the projected short term (2028) and medium term (2033) traffic volumes across key streets in Cowaramup Town Centre. The analysis, results, and proposed mitigation measures are presented in **0**.

This section includes a summary of the modelling exercise for the three scenarios based on the SIDRA results.

The SIDRA analysis indicates that for the existing situation, all key intersections are currently performing at satisfactory levels of service (LoS), with maximum delays of 18 seconds and no mitigation measures have been recommended.

Three models were included for the short-term scenario (2028); one for the existing layout and two with mitigation measures. The former analysis shows that Bussell Highway / Memorial Drive will fail in 2028 with LOS F and DOS greater than 0.80 recorded during the AM and PM peak periods; while the latter included upgrades to improve the operation of the network which are shown to accommodate future demand.

The SIDRA results for the medium-term scenario (2033) show that without any mitigation measures, most of the intersections will perform poorly; hence, upgrades are recommended to help improve the traffic conditions in the area. Additional measures were included as follows:

- Bussell Highway / Waverley Road intersection was upgraded from a priority-controlled intersection to a type A staged crossing. Additionally, a 60m left turn pocket on Waverley Road has been introduced.
- Bussell Highway / O'Brien Street / Bottrill Street was changed from a priority intersection to a four-way type A staged crossing.
- Bussell Highway / Memorial Drive was changed from a priority intersection to a type A staged crossing with a 20m left turn pocket on Memorial Drive (as per the mitigation measure adopted in the 2028 scenario).
- Bussell Highway / Wirring Road was changed from a priority intersection to a type A staged crossing.
- Bussell Highway / New Road and Bussell Highway / Roy Earl Drive were tested for two scenarios. One as staggered type A staged crossings, and another as a single 4-way roundabout (as per the mitigation measure adopted in the 2028 scenario).
- The following intersections are changed from full priority-controlled intersections to left-in left-out only intersections: Bussell Highway / Peake Street and Bussell Highway / Hall Road.

2.3 Pedestrian and Bicycle

Pedestrian travel is much more localised than other transport modes, but vital for the function of land use and transport systems. Outside of centres, high-quality pedestrian facilities support residential travel to shopping and schools, connection to public transport facilities and recreation. An attractive and safe pedestrian realm results in improved health and social outcomes for residents. Attractive pedestrian environments also improve economic outcomes, attracting more residents and businesses to the area.

Pedestrian activity and connectivity are critical factors in the effectiveness and vitality of towns. For this reason, the pedestrian environment must be carefully considered, particularly along primary pedestrian routes. This includes construction of high-quality paths, shade trees and street furniture to provide amenity. By allocating suitable resources to the pedestrian environment, the use of pedestrian modes will grow, reducing the demand for other modes as well as the requirement for parking.

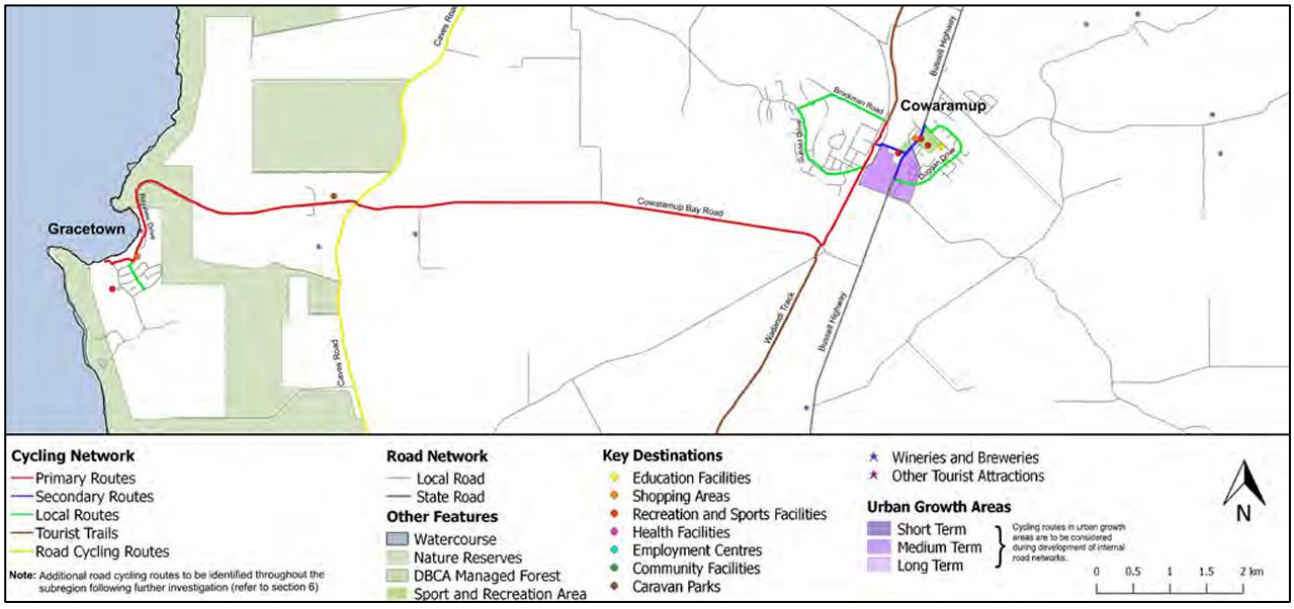
Higher-traffic areas with a concentration of pedestrians require good quality, connected, covered, and shaded paths, but so do paths which connect areas of high demand across relatively long distances, approaching or exceeding the nominal 400m or 800m walkable catchment.

Providing safe, attractive routes for cycling supports a wide range of different active travel modes, with benefits for disabled users, drivers, and pedestrians wherever the environment appropriately matches the user's speed. Cowaramup has a huge potential for increasing cycling / active transport, which can be realised through improvements to paths, the amenity, and increasing end-of-trip facilities. This Strategy's ambition for cycling is to create a comprehensive network of safe, attractive routes suitable for all abilities.

The Leeuwin-Naturaliste 2050 Cycling Strategy proposes cycling network improvements for Cowaramup including:

- A primary route linking Gracetown to the Wadandi Track along Cowaramup Bay Road. (a feasibility study is currently being conducted to determine the exact alignment).
- A secondary route along Bussell Highway from Waverley Drive to Roy Earl Drive.
- A secondary route along Memorial Drive providing a safe link between Cowaramup town centre and the western residential areas and the Wadandi track.
- Two local route loops providing access to the east and west and connecting to higher-order cycling facilities.

Figure 2-11 Proposed 2050 Cycling Network for Cowaramup



Source: Leeuwin-Naturaliste 2050 Cycling Strategy

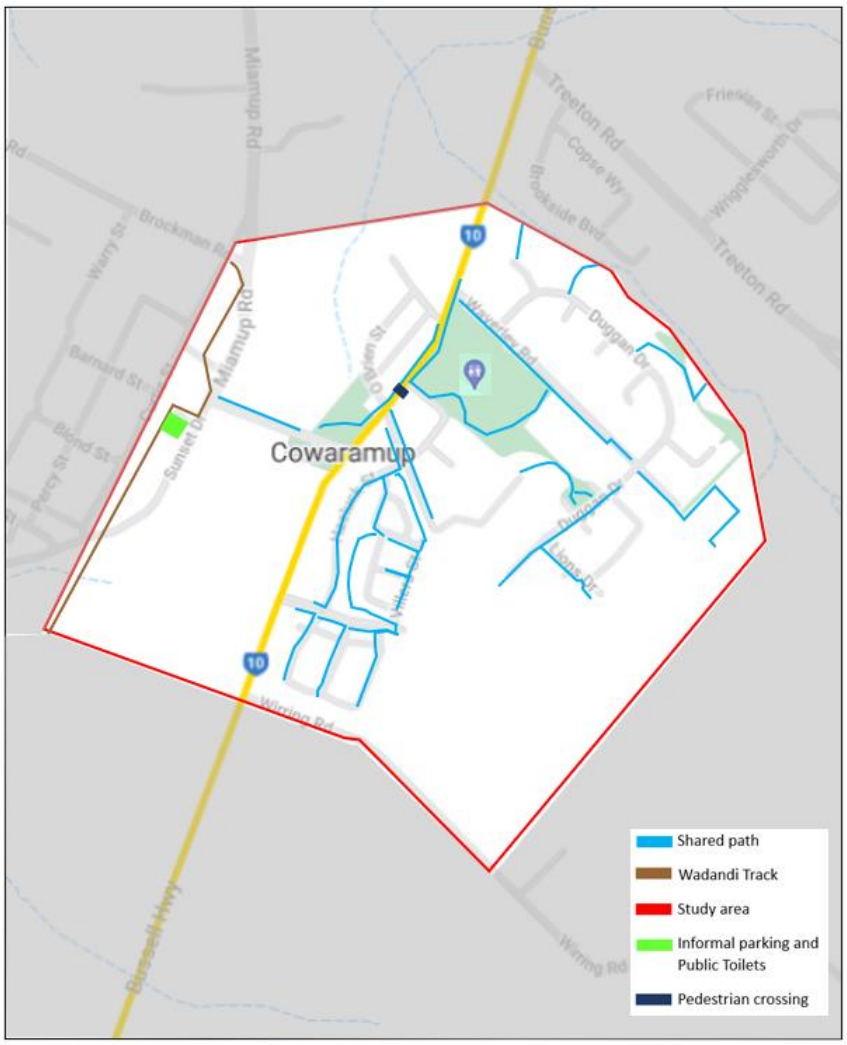
2.3.1 Facilities

The average width of the shared paths within the study area is 2.0m and **Figure 2-12** illustrates the existing pedestrian footpaths. Some paths end unexpectedly or there are some roads or sections without pedestrian or bicycle facilities leaving path users to use the carriageway and creating gaps in the network.

Figure 2-12 also shows the starting point of the Wadandi Track, a 31km shared path that starts at the intersection of Sunset Drive / Memorial Drive and extends to the Margaret River and onwards to Witchcliffe. The track follows the former railway line and passes through natural bushland and farmland. The facilities of the Wadandi Track include an informal parking area and public toilets both facilities located close to the fire station on Sunset Drive/Miamup Road. Additional toilets are located at Pioneer Park and Cowaramup Hall.

The State Government has recently allocated $17.5M over the next four financial years for completion of the Wadandi Track from Busselton to Augusta.

Figure 2-12 Shared Paths and Wadandi Track



There is only one marked pedestrian crossing within the study area (refer to **Figure 2-12)**. The crossing is a marked school crossing, and it is located on Bussell Highway south of Hall Road and prioritises vehicles over pedestrians, as a non-priority crossing. The crossing is an essential part of the town as it connects the west and east sections of town, including the commercial areas located on both sides of the Highway and the school located on the east side. A traffic warden is at the crossing point during school periods on weekdays between 8:00 and 9:00 AM and 3:00 and 4:00PM (refer to **Figure 2-13** and **Figure 2-14).**

Figure 2-13 Pedestrian Crossing Town Centre

Figure 2-14 Pedestrian Crossing Town Centre

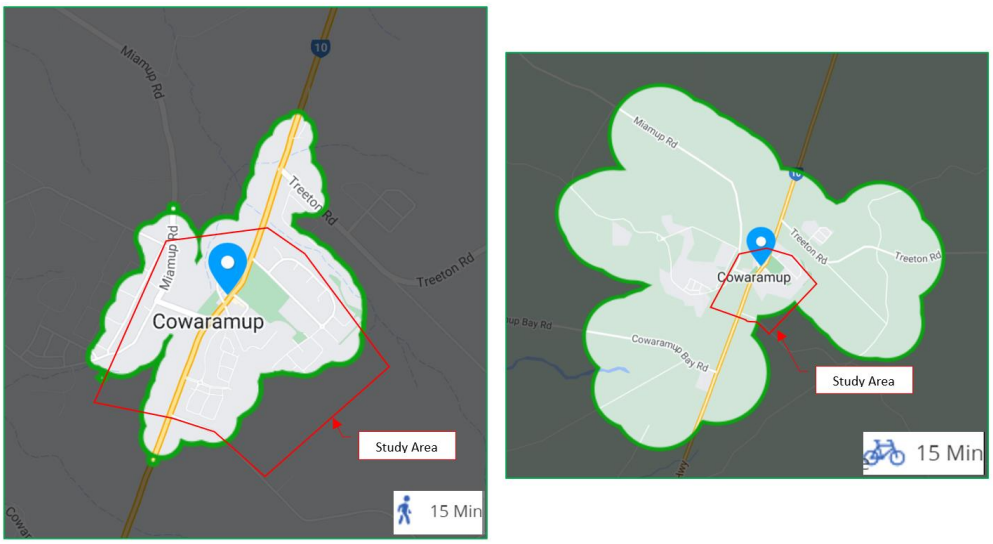
2.3.2 Access

The quality of the pedestrian environment greatly influences people's willingness to walk. The pedestrian experience is affected by aesthetics, safety and security, comfort, and ease of movement. The accessibility level for Cowaramup was measured from the centre of the town, being the location of the Post Office, pedestrian crossing, pharmacy, and commercial establishments. Accessibility levels are determined by the distance a person can walk/cycle or travel by car within a given travel time.

Figure 2-15 shows the distance pedestrians and cyclists can travel in 15 minutes. The developed area within the study area can be accessed by pedestrians and the entire town can be covered on bike. This reinforces the importance of enhancing active transportation infrastructure and safety measures to encourage people to leave their cars at home for short trips. The close proximity of attractors and residences in Cowaramup provides an opportunity to significantly reduce local trips by vehicle through the provision of safe and attractive active transport infrastructure.

The quality of the pedestrian environment plays a pivotal role in influencing individuals' willingness to walk. Factors such as aesthetics, safety, comfort, and ease of movement greatly impact the pedestrian experience. The accessibility of Cowaramup, measured from its centre, demonstrates that the town is conducive to walking and cycling, with most areas accessible within a 15-minute timeframe. These findings underscore the significance of improving active transportation infrastructure and safety measures to promote walking and cycling as viable alternatives to car travel for short-distance journeys.

Figure 2-15 Pedestrian and Cyclist accessibility



2.3.3 Pedestrian Crossing Survey

Video surveys were conducted 13 hours per day between 6:00am and 7:00pm over one week between 21 and 27 October 2021 recorded the movements at the crossing point and nearby areas shown in **Figure 2-16.**

It is worth noting that the pedestrian surveys were carried out during the COVID-19 pandemic, potentially resulting in lower pedestrian volumes than usual.

Figure 2-16 Pedestrian and Cyclist Survey Area

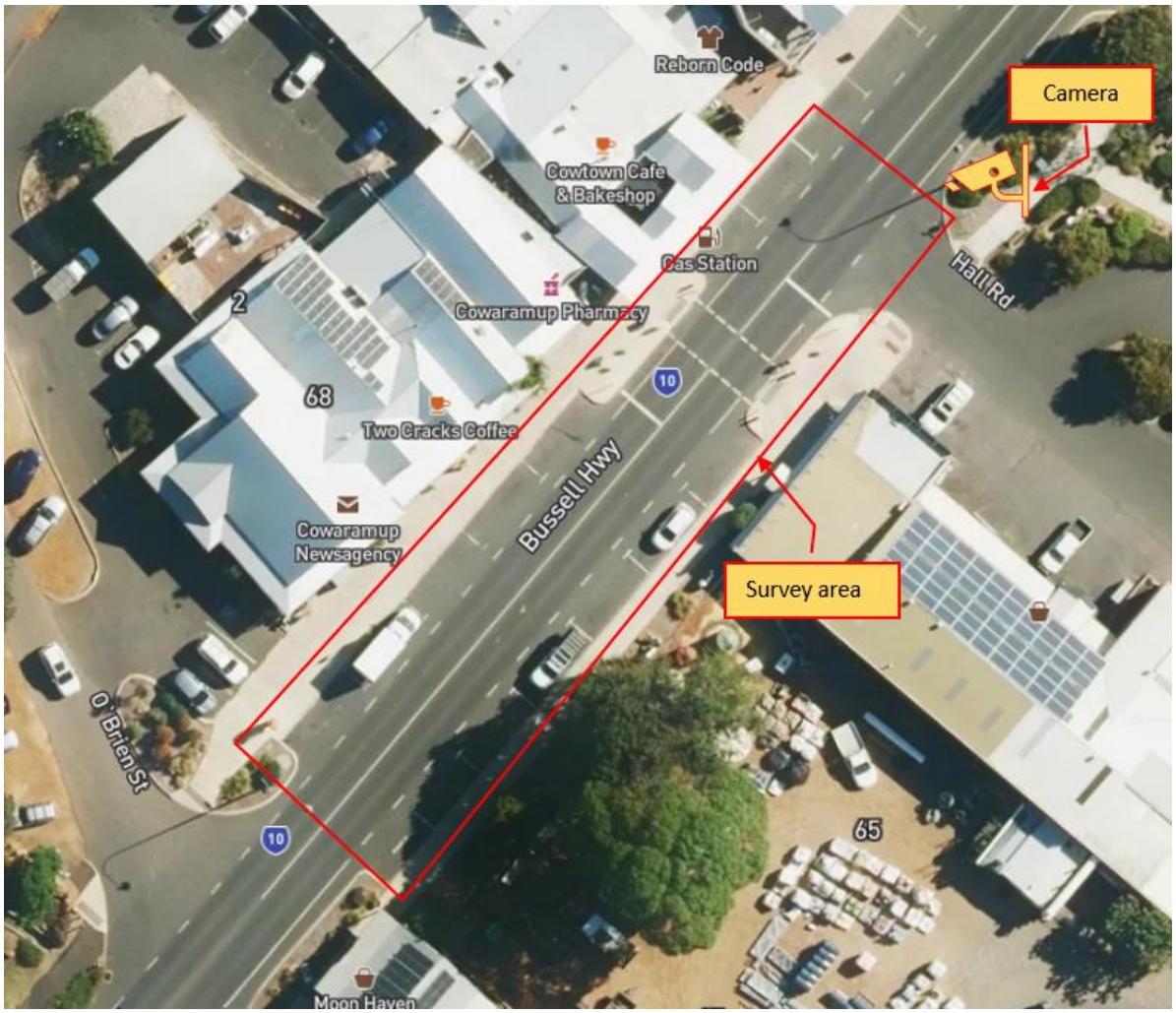


Figure 2-17 show the pedestrian movements recorded during the surveyed week.

Pedestrian movements vary throughout the day. Less than 40 pedestrians per hour cross the road between 6:00 and 9:00am and after 5:00pm, while during other times pedestrian volumes fluctuate between 40 and 140 pedestrians per hour.

In general, the highest peak of pedestrian movements takes place between 9:00am and 4:00pm. The traffic warden is on-site weekdays between 8:00-9:00am and 3:00-4:00pm during the school term; hence most of the pedestrian crossing movements occur without a traffic warden or pedestrian priority control on site.

Figure 2-17 Pedestrian movements

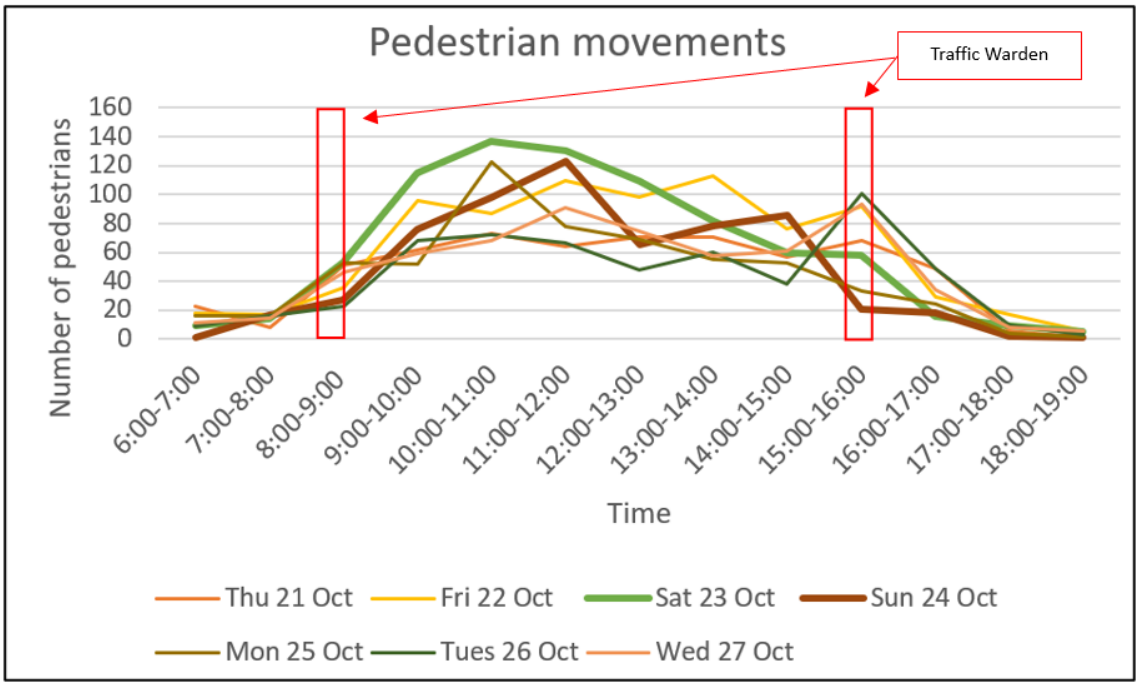
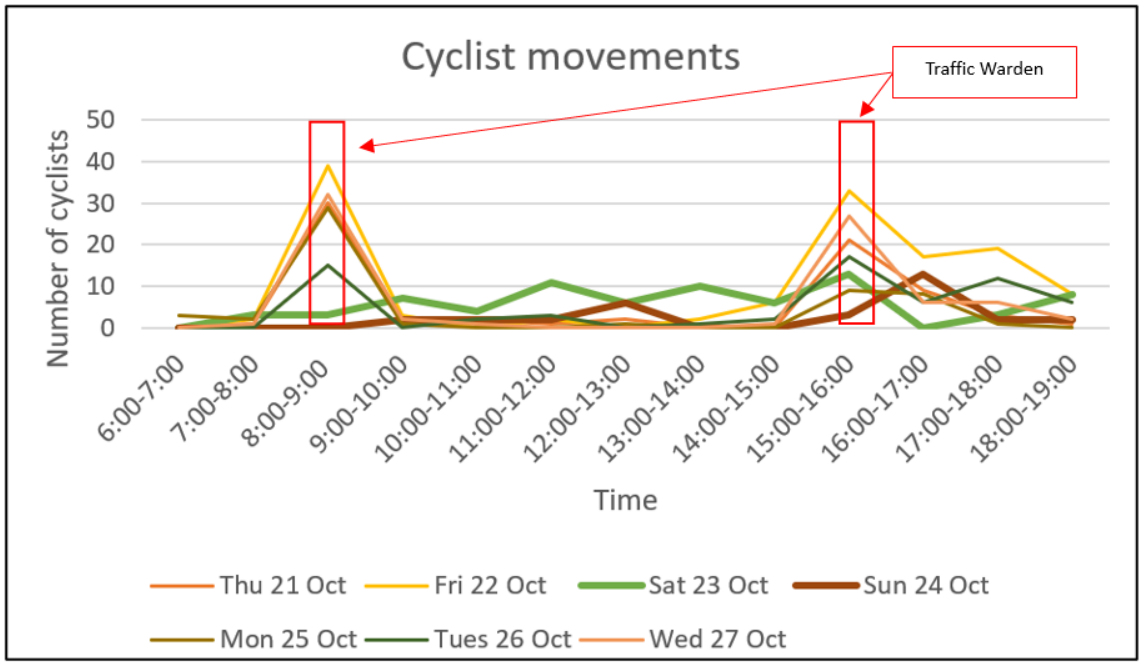


Figure 2-18 show the cyclist movements recorded during the surveyed week.

The cyclist movement peaks coincide with the times where the traffic warden is on site with a maximum of 40 cyclists crossing the road. At other times, cyclist movements are less than 20 cyclists per hour.

Figure 2-18 Cyclist movements



During the one-week survey, it was observed:

- A total of 4,576 pedestrians were recorded crossing the road during the surveyed week.
- Saturday recorded the highest volume with 797 followed by Friday with 795.
- During weekdays 3,166 (69%) pedestrians crossed the road, while 1,410 (31%) crossed on the weekend.
- A total of 505 cyclists were recorded crossing the road during the surveyed week. Friday recorded the highest volume of cyclists with 131 movements followed by Wednesday with 78 cyclists.
- 399 (79%) cyclists were recorded crossing the road during weekdays and 106 (21%) on the weekend.
- 4 records of cyclists performing risky crossings were recorded.
- The Traffic Warden stopped traffic 234 times over the five days (Monday to Friday) to allow pedestrians and cyclists to cross the Highway. This corresponds to 6.6% of the weekly pedestrian and cyclist movements.
- 423 vehicles stopped to give way to pedestrians/cyclists over the surveyed week. Saturday recorded the highest value with 123 vehicles stopping, followed by Sunday with 57 vehicles stopping. This corresponds to 8.3% of the total pedestrian/cyclist movements.
- 3,546 pedestrians/cyclists crossed the road away from the crossing point, representing 69.8% of the total crossing movements. Saturday was the day with higher number of pedestrians with a total of 726 and Sunday the day with lower records with 212 pedestrians. An average of 507 pedestrians crossed per day away from the designated crossing.
- 16 vehicles were recorded performing U-turn manoeuvres on Bussell Highway.

The designated pedestrian crossing prioritises vehicles outside of the traffic warden hours (see **Figure 2-19**) and without priority, a many (69.8%) of pedestrians and cyclists choose to cross away from this designated area. Furthermore, a significant proportion of path users (93.4%) cross the road without the presence of a traffic warden, which is limited to a few hours of the day during school terms.

Figure 2-19 Pedestrians Give Way to Vehicles

The information collected reflects the need to enhance safety measures for pedestrians and cyclists in the surveyed area consistently. A considerable number of pedestrians and cyclists cross Bussell Highway at various points and throughout the day, while the traffic warden provides safer crossing only on specific days and times.

In 2023, a dashcam recorded a near miss event at the designated pedestrian crossing on Bussell Highway. Two pedestrians, including a child, were crossing Bussell Highway when an approaching vehicle failed to give way. The vehicle narrowly avoided hitting the pedestrians but ended up colliding head-on with vehicle recording the incident. This highlights the importance of enhancing safety measures for path users and providing clearer road signs for all road users, the crossing may be confusing to pedestrians who see it as a priority crossing. Fragments of the dashcam video are presented below.

2.3.4 Gaps and Improved Requirements in the Path Network

Examination of the current path network revealed gaps and necessary enhancements as outlined in **Figure 2-20** and detailed in **Table 2-3**. The path network should be continuous, particularly around areas that are likely to experience higher volumes of people walking and riding such as central commercial and retail areas, schools, and recreational facilities. In addition, paths widths in these locations should cater to the likely path users in line with DoT guidelines.

The Shire intends to review pathway plans for townsites including Cowaramup in 2024-25.

Figure 2-20 Identified Gaps in the Active Transport Network

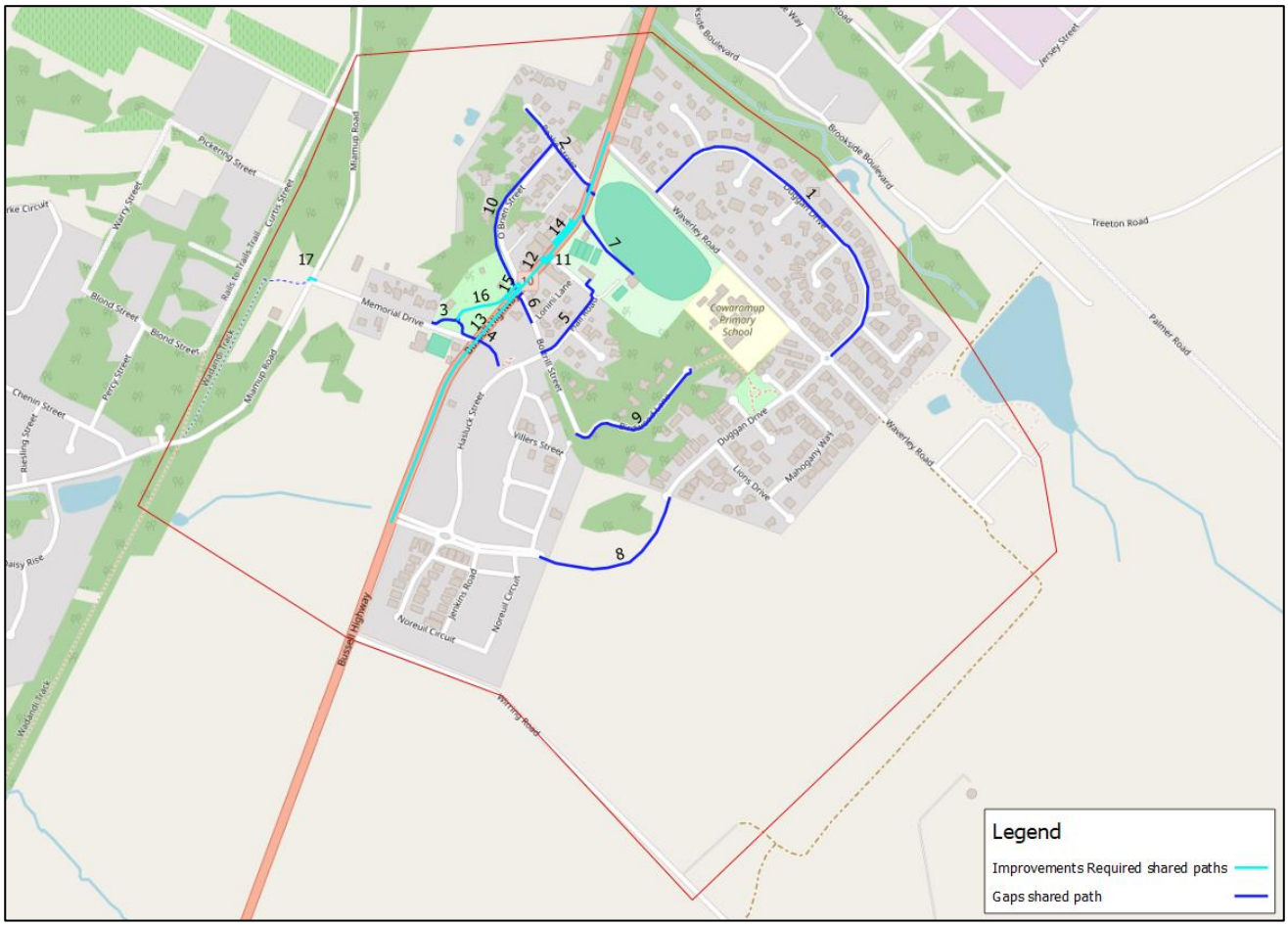


Table 2-3 Gaps and Proposed Improvements in the Pedestrian/Cycling Network

ID	Location	Description	Proposed improvement
1	Duggan Drive north of Waverley Road	Gap in the network – No path	Provide a shared path along Duggan Drive. Path proposed as a secondary route in the Leeuwin-Naturaliste 2050 Cycling Strategy Stantec has been advised that funding has been obtained from the WA Bicycle Network (WABN) for construction of a path along this area to close the gap in the network. Design stage in 2023-2024 for construction in 2023-2024 See **Figure 2-21**
2	Peake Street	Gap in the network – No path and crossing opportunity at Bussell Highway	Provide a shared path along Peake Street. Investigate a crossing opportunity of Bussell Highway at the northern end of the town to provide a connection to Waverley Road. See **Figure 2-22** This provides a future opportunity to connect to the future subdivision at the Corner of Miamup Road and Memorial Drive (C3) See **Appendix B Section B3.4** as well as for the approved childcare centre development
3	Pioneer Park to connect to Memorial Drive	Gap in the network -The existing path ends at the information bay without further connection to the Memorial Drive path	Provide a shared path that connects the existing paths on Pioneer Park and Memorial Drive. See **Figure 2-23** and **Figure 2-24**
4	Memorial Drive Hasluck Street	Gap in the network- No path that connects the existing infrastructure along Memorial Drive and Pioneer Park with Hasluck Street and no crossing opportunity at Bussell Highway	Provide a shared path that connects the existing network on Memorial Drive and Pioneer Park with the shared path along Hasluck Street. Investigate a crossing opportunity on Bussell Highway close to Memorial Drive intersection. Options include a pedestrian crossing and median at Bussell Highway to protect pedestrians or an underpass crossing. See **Figure 2-26**
5	Hall Road between Botrill Street and the path to school	Gap in the network – There is no path along Hall Road that connects the existing network on Botrill Street and the path to the Primary School	Provide a shared path along Hall Road and a crossing point to connect to the existing network. See **Figure 2-27**
6	Botrill Street	Gap in the network -existing path on Botrill Street ends unexpectedly and there is no crossing point to connect the existing path with the liquor store	Provide a shared path to connect the liquor store and the existing path and crossing point along Botrill Street. See **Figure 2-28, Figure 2-29**, and **Figure 2-30**
7	Bussell Highway – Cowaramup Oval	Gap in the network -there is a missing link between the Bussell	Provide a shared path to close the gap in the network. See **Figure 2-31**

		Highway path and the shared path on the Oval	
8	Roy Earl Drive and Duggan Drive	Missing link. Undeveloped area	Development of Lot 500 Wirring Road included in the Structure Plan (C5) See **Appendix B Section B3.6** Include quality shared paths to connect the existing shared path network and close the gap
9	Birdwood Lane	Gap in the network- existing path ends at the intersection to Birdwood Lane with no connection to the existing path on Botrill Street	Provide a shared path to close the gap or provide a shared area with a low-speed environment. See **Figure 2-32**
10	O'Brien Street	Gap in the network-there are no shared paths provided along O'Brien Street	Provide shared paths to close the gap in the network. This provides a future opportunity to connect to the future subdivision at the Corner of Miamup Road and Memorial Drive (C3) See **Appendix B Section B3.4.**
11	Hall Road – pedestrian crossing	Poor sightlines at the crossing point due to car parking bays and vegetation	Improve sightlines for pedestrians, including children by trimming vegetation regularly and modify or remove parking bays. See **Figure 2-33** to **Figure 2-36**
12	Bussell Highway – pedestrian crossing	Various safety issues at the crossing point including unclear right of way signs, lack of priority for pedestrian/cyclist, traffic warden present for short periods only	Improve safety for pedestrian/cyclist. Some recommendations for improvement include: • Install signalised pedestrian crossing • Provide median and pedestrian refuge • Install pedestrian and children crossing signs • Provide Zebra crossing • Redirect pedestrian and cyclist traffic via underpass crossing. Investigate the possibility of providing an underpass crossing between Pioneer Park and the Reserve.
13	Bussell Highway between Roy Earl Drive and Waverley Road (ultimate scenario)	Lack of safe opportunities for pedestrian and cyclist crossing Bussell Highway	The lack of save crossing points along Bussell Highway is one of the major safety concerns for pedestrian and cyclists. Some measures that will improve path users' safety include: • Extend the 40km/h speed limit within the active street frontages; initially between Memorial Drive and Waverley Road and progresively up to Wirring Road once the future subdivisions are being built. • Provide a self-explaining road environment where motorists reduce the speed along the area by providing: • Street trees; • Narrower carriageway; • Median – traffic island at the intersections – bollards etc. Speed Radar signs that detect and record the speed of each approaching vehicle and display messages accordingly i.e. illuminated smiley face if the approaching vehicle is travelling at the correct speed or a 'Slow down' message to vehicles exceeding the speed limit.

			Install an entry statement either side of the town centre. i.e. 'Welcome to Cowaramup. Please drive safely and respect pedestrians, especially children". Commence planning for a bypass road to deviate through traffic from the town of Cowaramup
14	Bussell Highway - Butcher Shop, Taphouse	The shared path is interrupted, and the layout of the crossover gives the impression that vehicles have the right of way	Improve the section of shared path to reinforce the legal priority of path users. Provide a physical and visual continuation of the shared path. See **Figure 2-37** to **Figure 2-39**.
15	Shared path at Pioneer Park approaching O'Brien Street	Steep path with uneven surface. Sight distance issues at crossing point due to road sign blocking Bussell Highway and vehicles blocking pedestrian crossing	Modify the section of shared path to provide compliant gradient, even surface and wider path. The Shire is committed to planning and designing of a compliant path in 2024-2025. Improve the crossing point at O'Brien Road as it is difficult to check for turning vehicles due to the presence of a wayfinding sign. Moreover, vehicles waiting for gaps on Bussell Highway block the pedestrian crossing point. See **Figure 2-40** to **Figure 2-43**
16	Pioneer Park shared path	Narrow path	Provide a wider path to accommodate all type of shared path users. See Figure **2-44**
17	Miamup Road/Memorial Drive pedestrian crossing	Unsafe crossing	The crossing is highly used by the community and the Wadandi Track users. Some measures that will improve path users' safety include: • Reduce the speed limit on the approaches of the crossing along Miamup Road to 40km/h • Provide pedestrian and children crossing signs from all approaches • Provide streetlighting at the intersection
18	General	Lack of bike racks	Provide additional bike racks across the town in convenient and safe locations; especially close to the attractor points

Figure 2-21 Duggan Drive north of Waverley Road - Gap in the network

Figure 2-22 Peake St. - Gap in the network

Figure 2-23 Pioneer Park at the Information bay

Figure 2-24 Pioneer park path at the Information bay

Figure 2-25 Pioneer Park Path at the Information Bay

Figure 2-26 Memorial Drive / Bussell Highway and connection to Hasluck Street

No pedestrian crossing or footpath. The area is used by pedestrians and cyclists to connect Memorial Drive and Hasluck Street

Figure 2-27 Hall Road north of Botrill Street

Figure 2-28 Botrill Street Candy Cow – Liquor Shop

Figure 2-29 Botrill Street Candy Cow – Liquor Shop

Figure 2-30 Gap in the Network Botrill Street

Figure 2-31 Cowaramup Oval Missing Link

Figure 2-32 Shared Path Ends at Birwood Lane

Figure 2-33 Hall Road Pedestrian Crossing Point

Figure 2-34 Hall Road Pedestrian Crossing Point

Figure 2-35 Hall Road Pedestrian Crossing Point

Figure 2-36 Hall Road Pedestrian Crossing Point

Figure 2-37 Shared Path Bussell Highway

Figure 2-38 Shared Path Bussell Highway

Figure 2-39 Shared Path Bussell Highway

Figure 2-40 O'Brien Street / Bussell Highway Intersection - Pedestrian Crossing

Figure 2-41 Pioneer Park Footpath

Figure 2-42 Pioneer Park Footpath

Figure 2-43 Pioneer Park Footpath

Figure 2-44 Pioneer Park Footpath

2.3.5 SWOT Analysis Pedestrian and Cyclist

The SWOT analysis for pedestrian and cyclist movements within the study area is shown below.

Strengths

- Every trip within the study area can be achieved within 15-min walking or cycling distance
- Shared paths provide a designated space for pedestrians and cyclists, enhancing safety and reducing traffic conflicts with private vehicles
- Pedestrian and cyclists contribute to reducing traffic congestion within the town, especially along Bussell Highway and its intersections
- More than 12% of Cowaramup residents are primary school kids that can walk or cycle to school
- Existing school warden crossing on Bussell Highway is heavily used

Weaknesses

- Limited accessibility for individuals with mobility impairments, disabilities, or the elderly
- There are many gaps in the network, with some paths deemed insufficient to cater for users. Crossing points and intersections often do not cater for safe movements by cyclists or other wheeled transport.
- Lighting is inconsistent, predominantly relying on street light spill to illuminate paths. This is often insufficient to provide a feeling of security, and this effect is exacerbated where tree cover obscures the lighting.
- Whilst the speed limit has been reduced to 40km/h on Bussell Highway between Memorial Drive and Waverley Road, there have been no changes to the driving environment or enforcement to speed reduction.
- No pedestrian refuge along Bussell Highway.
- Traffic Warden is present for 2 hours on school days. No warden is present outside these limited hours, on school holidays and weekends

Opportunities

- Most trips can be achieved within a 15-min walking or cycling trip if gaps in the network are addressed
- A safe crossing point along Bussell Highway at all times (not only when there is a Traffic Warden) will encourage active transport
- Increasing the crossing point opportunities on Bussell Highway to enable people to safely ride or walk around Cowaramup. This can be achieved through an underpass crossing, signalised pedestrian crossing, installing median on Bussell Highway, etc
- To provide pedestrian and cyclists crossing opportunities at intersecting roads of Bussell Highway that are projected to perform poorly in the medium and long term due to anticipated traffic growth from future developments, including subdivisions as shown in the modelling scenarios (Refer to **Appendix B**)
- 'Tactical urbanism' can be used to trial treatments to improve safety and encourage behavioural change for road users, in an inexpensive and less controversial manner.
- Collaboration with local businesses to enhance amenities along shared paths, including outdoors sitting

Threats

- Increase in traffic volumes along Bussell Highway and poor or no modifications of the road layout within the town, including speed limits
- Pedestrian environments are often squeezed by the demands of other transport modes with easy to define dimensions. In the search for a more efficient road network, verges are diminished to accommodate turning pockets, central median islands, parking bays and on-street bicycle facilities. This in turn creates a space that must provide for road signage, street furniture, above-ground utilities, land use activation, street trees and pedestrian paths. To combat this pressure, the needs of pedestrians must be considered in the context of their priority.
- The continued growth in private vehicle demand for road space and parking poses an ongoing threat to cycling. Opposition is likely to come from both community and Government stakeholders, requiring a strong and consistent response in policy and planning.

• The connection to Wadandi Track presents an opportunity to attract more tourist for cycling and hiking activities • Street trees provide shade and cooling and can be used to both slow traffic and support active mode shares. Implement an extensive street tree policy to provide shade and cooling. • There are ongoing opportunities to encourage cycling through additional behaviour change programs and initiatives. This can be tied to school programs, work incentive schemes or infrastructure construction. • Ensure bicycle riders are considered in the planning and design of new developments, particularly through the development approval process and existing communities through urban renewal projects and maintenance. • Upgrade footpaths on routes which lead to schools to shared paths with a minimum of 2.5m width. • Provide shared paths to close the gaps in the network • Encourage the community, the primary school and businesses to sign up for Your Move • Implement Slow Streets, Safe Streets within Cowaramup • Wadandi Track provides an opportunity for local residents to cycle to Margaret River rathern than driving. • The provission of a bypass road to deviate through traffic away from the town of Cowaramup • Update the Streescape Design Guidelines from 2009	

Case Study Example – Slow Streets, Safe Streets

To improve local amenity for residents and businesses, streets should be safe and accessible. The design of streets has a significant impact on how they feel, and how they are used. Narrowing carriageways and integrating trees into road design reduces the heat island and also reduce the speed of vehicles by changing the appearance of the street.

Canopy trees[1] located close to the carriageway create a feeling of enclosure. This changes the driver's perception of speed and has a significant impact on behaviour. In essence, people drive slower on streets with trees. Drivers on slower streets have the capacity to recognise faces, transforming pedestrians, cyclists and other drivers from obstacles to people. This, in turn, changes pedestrian behaviour, making them feel safer around traffic, with positive effects on healthy activity.

To achieve these outcomes requires an update of the 2009 Streetscape Design Guidelines that fit with the Shire's needs. They should include advice on parking geometry (on-street or embayed), offsets to street tress, local area traffic management devices, intersection forms, pedestrian and cycling infrastructure. Producing these guidelines will require close collaboration with MRWA to ensure that the outcomes meet the overall needs of the network.

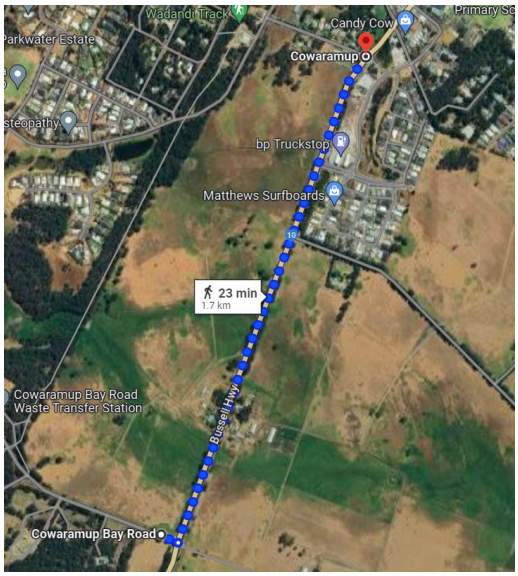
Once the Local Street Design guidelines are completed, they will need to be tested, using a pilot project in a local neighbourhood. The application could include a combination of temporary and permanent works, designed in consultation with the local community. The resulting street would then be monitored to see whether the desired outcomes were achieved: slower speeds, increased walking and cycling, etc.

2.4 Public Transport

Public transport is a critical enabler for many in the community, particularly seniors, for access to health services, education, and employment. There are limited public transport options in Cowaramup. TransWA offers coach that connect with different regions of Western Australia with very low frequency of a maximum of 2 services per day.

An assessment of the bus stop infrastructure was undertaken, identifying two stops located on Cowaramup Bay Road 1.7km from the town centre. Beyond the bus stop itself, the most important infrastructure component in support of public transport is the pedestrian facilities associated with the stop. This includes path infrastructure along the approach route, connections to the nearby residential/employment catchment or key destinations and critically, safe, and legible crossing points. The provision of such facilities is currently lacking, creating safety issues at the start and end of the trip for every user of the stop (see **Figure 2-45**).

Figure 2-45 TransWA service



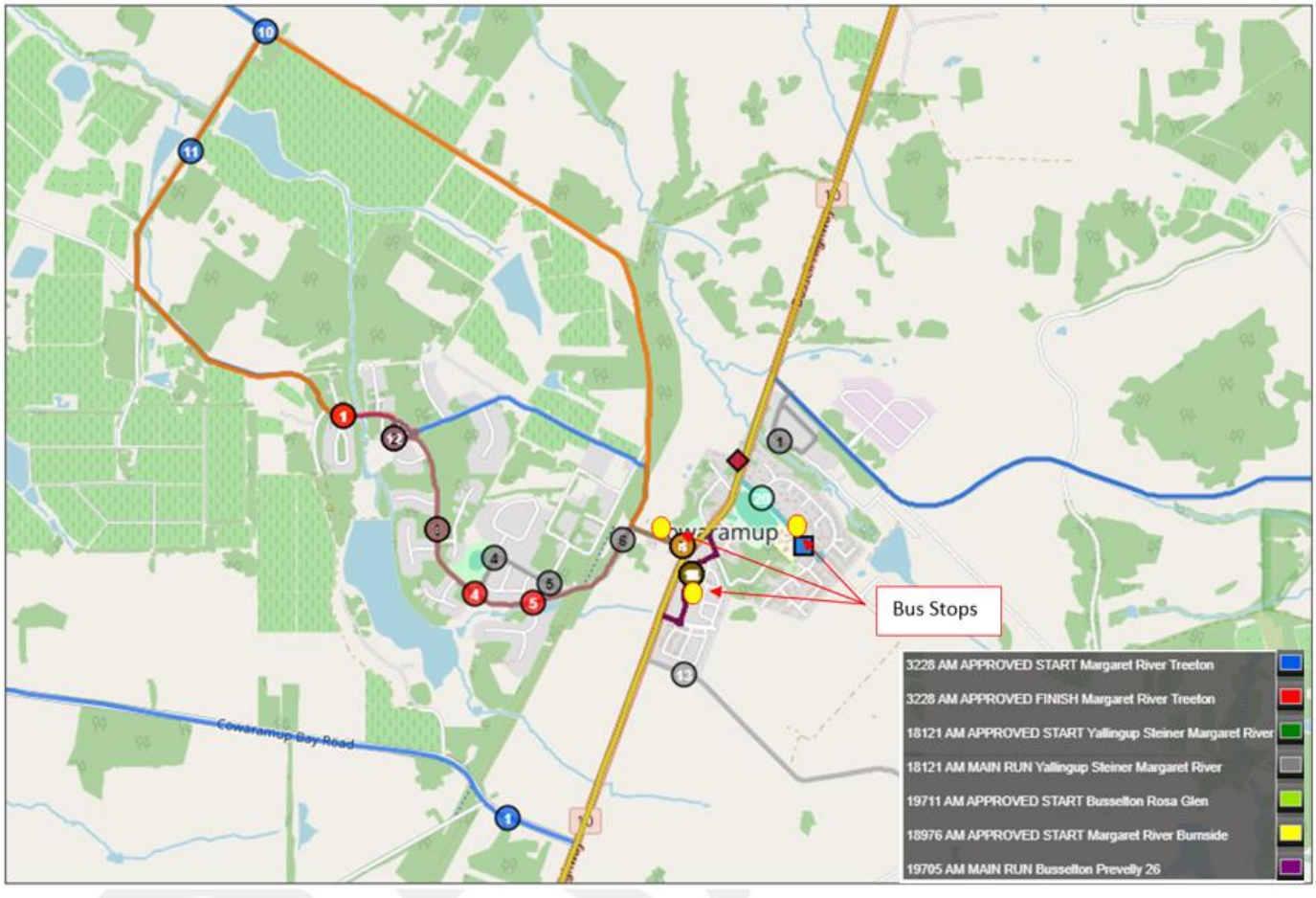
2.4.1 School buses

Cowaramup is served by 7 school bus services that cover the Margaret River, Yallingup, and Busselton areas.

There are currently 3 bus stops within the town located on:

- Hasluck Street between Villers Street and Roy Earl Drive. Shelter and bike racks provided (see **Figure 2-47**)
- Memorial Drive at the Community information Bay. Shelter provided. (see **Figure 2-48**)
- On Waverley Road at the Cowaramup Primary School

Figure 2-46 School Bus services



Source: School Bus Services-Public Transport Authority of Western Australia

Figure 2-47 Shelter and bike racks at the Hasluck Street bus stop

Figure 2-48 Shelter at the Memorial Drive bus stop (Information bay)

2.4.2 Gaps and Improved Requirements for Public Transport

The current situation of public transport in Cowaramup and the layout of the town presents some gaps and areas that can be improved by implementing a wide range of measures.

Table 2-4 Gaps and Proposed Improvements in the Public Transport Network

ID	Location	Description	Proposed improvement
1	School bus stops • Hasluck Street between Villers Street and Roy Earl Drive • Memorial Drive at the Community information Bay • On Waverley Road at the Cowaramup Primary School	School bus stop provisions. Currently, there are three (3) bus stops in town, leaving significant portions of residential areas without a close and convenient access to a school bus stop. Additionally, there are insufficient or no bike racks near these bus stops. There is a bus stop at the Memorial Drive community information bay. This bay is heavily used for parking private vehicles and lacks a path connection between Pioneer Park and the shared path on Memorial Drive	Increase the number of school bus stops within the town, and plan for future stops according to the town's future development. Install bike racks at the bus stop locations Close the gaps in the shared path network
2	Trans WA service	No pedestrian provisions connecting the town to the Trans WA service bus stops	Investigate extending the shared path network to connect to the Trans WA service bus stops, or Investigate feasibility of relocating the bus stop into the town centre.

2.4.3 SWOT Analysis Public Transport

The SWOT analysis for public transport within the study area is shown below.

Strengths	Weaknesses
• Seven school bus routes serve Cowaramup • A significant portion of the town's population comprises students, with over 12% being primary schoolers and approximately 8% being secondary schoolers	• No public transport service within the study area • The bisection of Cowaramup by Bussell Highway disrupts the town and its services
Opportunities	**Threats**
• Provide sheltered bus stops at the TransWA bus stops on Cowaramup Bay Road and provide a shared path that connects the bus stops with the town • Run a trial for a shuttle bus within Cowaramup to serve key locations like the Post Office, Pharmacy, care home, PB grocery shopping, and other essential services • Relocate bus stops into the town centre	• Low usage of Trans WA services by Cowaramup residents • Personal preference for parents to drive children to school

3. Healthy Streets Assessment

Every decision we make about our built environment, however small, is an opportunity to deliver better places for people to live in and thereby improve their health. Healthy Streets is a human-centred and evidence-based framework for embedding public health in streets to create fairer, more sustainable, and attractive environments for people. At the core of the Healthy Streets Approach are 10 Healthy Streets Indicators that focus on the human experience needed on all streets, everywhere, for everyone.

This approach can be applied to any street, anywhere in the world. It builds improvements onto the existing environment rather than seeking a fixed end goal. Taking this approach requires incremental changes in all aspects of the decision-making processes related to streets and transport.

3.1.1 How a Healthy Streets™ Score is Generated?

The street segment is assessed in relation to 19 metrics (refer to **Figure 3-1**) which align with the 10 Healthy Streets indicators to produce the overall score.

Each metric can score between 0-3 and an overall score out of 100 is generated, which is weighted to reflect the relative impact of each metric. When the score is improved, it is demonstrated that the environment is healthier, more accessible and welcoming to walk, cycle and spend time.

When a metric receives a score of 0, it indicates a significant weakness, meaning that the weakest area of the analysed section fails to meet the criteria outlined in scores 1 to 3, or that the metric itself is absent. For example, in the case of public seating; if within the full length of the street, the longest distance between public seats is 400m or more, this metric will receive a score of 0.

Figure 3-1 Healthy Streets Metrics

	Metric	Everyone feels welcome	Easy to cross	Shade and shelter	Places to stop and rest	Not too noisy	People choose to walk and cycle	People feel safe	Things to see and do	People feel relaxed	Clean air
1	Traffic speed	●	●			●	●	●		●	●
2	Volume of motorised traffic	●	●			●	●	●		●	●
3	Mix of vehicles	●	●			●	●	●		●	●
4	Conflict between cycles and turning vehicles	●					●	●		●	
5	Turning speeds at side-street intersections	●	●				●	●		●	
6	Ease of crossing mid block	●	●				●	●		●	
7	Priority of crossing at intersections	●	●				●	●		●	
8	Quality of the footpath	●					●			●	
9	Space for walking	●			●		●	●		●	
10	Appropriate separation of people walking from traffic	●				●	●	●		●	
11	Space for cycling	●			●		●	●		●	
12	Lighting	●					●	●		●	
13	Availability of drinking water	●			●		●	●	●	●	
14	Public seating	●			●		●		●	●	
15	Cycle parking	●			●		●			●	
16	Shade for walking	●		●			●		●	●	
17	Shade for cycling	●		●			●		●	●	
18	Reducing through traffic	●	●			●	●			●	
19	Bus stops	●		●	●		●			●	

3.1.2 Assessment Results – Existing Situation

A Healthy Streets Assessment of the existing road layout was conducted on Bussell Highway between Bottrill Street and Peake Street (see **Figure 3-2**) on 26/02/2024. The performance of this section of road was assessed and some recommendations have been provided to improve accessibility, environment, and the overall healthiness of this section.

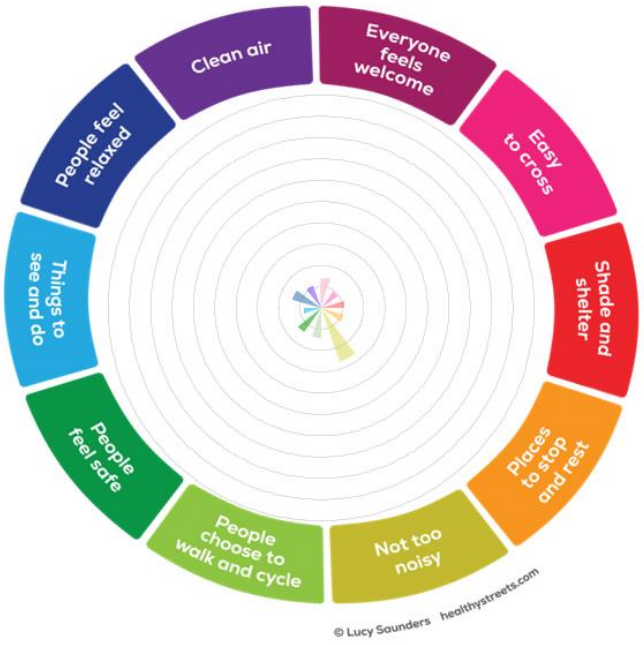
Figure 3-2 Healthy Streets Assessment Area

The result of the assessment is shown below in **Figure 3-3**.

Figure 3-3 Healthy Streets assessment for existing conditions

	Existing Layout Score
Healthy Streets Score	13
Everyone feels welcome	14
Easy to cross	10
Shade and shelter	11
Places to stop and rest	11
Not too noisy	27
People choose to walk and cycle	14
People feel safe	14
Things to see and do	8
People feel relaxed	14
Clean air	11

Major Weaknesses (Score 0)



- **Traffic Speeds**. At the time where speeds are higher, the 85th percentile is 50km/h or above
  - Bussell Highway south of Memorial Drive reported an 85th percentile speed of 76km/h at 3:00am in a 60km/h road environment. Although no speed data was available within the area of the assessment, due to the alignment and width of the road similar to the one at the count station, an 85th percentile speed of more than 50km/h is expected.
- **Mix of vehicles**: percentage of heavy vehicles greater than 3% at peak hour
  - The proportion of HV reported at the PM peak hour is 11.4%. It is expected that within the area of this assessment, this percentage to be similar.
- **Conflict between cycles and turning vehicles**: no measures in place or restrictions on speed or number of turning vehicles and no space allocated for cyclists
  - There are 4 intersections within the assessed area. Bottrill St, O'Brien St, Hall Rd, Peake St.
    i. Bottrill St.: does not have a crossing point
    ii. O'Brien St.: no restrictions on speed, wide radii, no separate path for cyclists, the path is adjacent to intersection, so path users need to check over the shoulder for oncoming traffic.

iii. Hall Rd.: Vegetation and parked vehicles block the sightlines for cyclists crossing the road.

iv. Peake St.: pram ramps on one side of the road only with no further provisions, wide radii, no restrictions on speed, no separate path for cyclists, path adjacent to intersection so path users need to check over the shoulder for oncoming traffic.

- **Ease of crossing mid-block**: no pedestrian refuge crossings
  - There are no mid-block crossing facilities along Bussell Highway

    v. Bottrill St. does not have crossing point

    vi. O'Brien St. no restrictions on speed, wide radii, no separate path for cyclists, path adjacent to intersection.
- **Priority of crossing at intersections**: no pedestrian priority at any crossing
- **Quality of the footpath**: the path on Pioneer Park has a crossfall of more than 3%
- **Space for walking**: The space for walking on the path at Moon Haven is 1.1m due to the presence of products for sale displayed on path and metallic columns of the undercover path
- **Space for cycling**: Speed is greater than 30km/h and there are no cycle lanes
- **Lighting**: no street lighting at all intersections or at the crossing point
  - Botrill St does not include street lighting. The pedestrian crossing does not include lighting.
- **Availability of drinking water**: only one bubbler within the area between Hall Road and the Tennis Club
- **Public seating**: only one public sitting area on Bussell Highway north of Hall Road
- **Shade for walking**: less than 50% with 42% of linear coverage of walking space
- **Reducing through traffic**: Through movements for private vehicles are permitted and the posted speed limit is 40km/h
- **Bus stops**: There are no bus stops or buses stopping within the area There are school buses travelling along Bussell Highway, but no bus stops along this road.

Minor Weaknesses (Score 1)

- **Volume of motorised traffic**: Between 500-900 vehicles from both directions at peak hour
  - Bussell Highway south of Memorial Drive report 682 vehicles travelling both directions at **4**:00pm. It is expected that the traffic volume within the assessment area would have similar numbers due to the proximity of the counting point.
- **Turning speeds at side-street intersections**: no geometry provided to slow down turning traffic
  - There are 4 intersections within the assessed area. Bottrill St, O'Brien St, Hall Rd, Peake St.

    vii. Bottrill St. does not have a crossing point

    viii. O'Brien St. no restrictions on speed, wide radii, no separate path for cyclists, path adjacent to intersection so path users need to check over the shoulder for oncoming traffic.

    ix. Hall Rd. not the weakest crossing

    x. Peake St. pram ramps on one side of the road only with no further provisions, wide radii, no restrictions on speed, no separate path for cyclists, path adjacent to intersection so path users need to check over the shoulder for oncoming traffic.
- **Shade for cycling**: no cycle lanes but shared paths, there is 42% of linear coverage of walking space.

Acceptable (Score 2)

- **Cycle parking**: 5 opportunities for cycle parking within the area

Strength (Score 3)

- Appropriate separation of people walking from traffic: buffer zone greater than 2.1m

According to the Healthy Street assessment, this road section has an overall score of 13/100, with most metrics scoring 0 or 1. The objective is not to attain a score of 100, but to improve the score through small or large changes. There are numerous areas where enhancements could be made, ranging from relatively inexpensive modifications such as:

- Installing additional bike racks close to commercial/education/recreation areas such as Bussell Highway, Bottrill Street, Cowaramup Oval, Pioneer Park.
- Install a bubbler in Pioneer Park.
- Install additional benches and outdoor seating close to commercial/recreation areas.
- Increase the shaded area along shared paths – street trees.
- Provide traffic calming measures and enforcements towards speed reduction to achieve speeds of 30-39km/h along Bussell Highway.

To more complex and costly changes such as:

- Intersection upgrades to prioritise pedestrians and cyclists.
- Wider shared paths as per design guidelines
- Install streetlights.
- Install median along Bussell Highway and pedestrian/cyclist priority crossing points.

Implementing improvements in this road section would result in a higher overall Healthy Street score, making it more accessible and inviting for walking, cycling, and spending time. The Healthy Streets design guidance, provided in the following sections, offers recommendations to further enhance the healthy street score.

3.1.3 Design Guidance

3.1.3.1 Path Widths

The quality of the existing path network seen during the saddle survey is reasonable, however paths are narrow in some places. More significantly there are many gaps in the network. Healthy Streets recommends the following path widths dependent on the flow of people per hour:

Table 3-1 Recommended path widths (Healthy Streets)

People per hour	A (3 points)	B (2 points)	C (1 point)	D (0 points)
Fewer than 7	2.0m or more	1.6m-1.99m	1.5m-1.59m	Less than 1.5m
7-69	2.6m or more	2.2m-2.59m	1.9m-2.19m	Less than 1.9m
70-399	3.2m or more	2.8m-3.19m	2.3m-2.79m	Less than 2.3m
400-1999	3.9m or more	3.4m-3.89m	2.9m-3.39m	Less than 2.9m
2000 or more	3.9m or more and less than 9.5 people per metre per minute	3.4m or more and less than 13.5 people per metre per minute	2.9m or more and less than 18 people per metre per minute	Less than 2.9m or more than 18 people per metre per minute

Source: Healthy Streets

Shared paths should be a minimum of 2m in accordance with Austroads Guide to Road Design Part 6A: Pedestrian and Cyclist Paths and 2.5m in accordance with the Department of Transport's Shared and Separated Path Guidelines (September 2021).

Given that these guidelines are a WA State Government Guide, it is recommended that all shared paths are a minimum of 2.5m wide, and for Secondary Routes where there is higher patronage such as along routes to schools, a 2.5m to 3m wide shared path is recommended (pedestrian surveys may need to be undertaken to comply with Healthy Streets recommendations above). Shared paths that are currently less than 2.5m wide are recommended to be increased as upgrades are undertaken, or for new sections, subject to achieving the required offsets from trees, light poles etc. as these reduce the effective widths for walking.

Healthy Streets assessments identify the width of a path at its weakest point to determine the effective width, and this may actually turn out to be narrower than footpath standards require. Where foot traffic is likely to be high, these widths should be addressed during upgrade activities.

In other locations on local routes where footfall is low, footpaths should be upgraded as per the recommended footpath policy to a minimum of 1.5m.

3.1.3.2 Lighting

Lighting is assessed in regard to whether the provision of lighting of paths is by default as a result of lighting the carriageway or purposefully designed for path users. To score full points the lighting should be designed to prioritise comfort and safety of people walking and cycling with the light quality specifically selected for colour and glare.

3.1.3.3 Surface Defects

Footpath quality is assessed in regard to the size of the defect, and whether the path is level. Paths should be even with a non-slip surface.

3.1.3.4 Space for Cycling

Space for cycling is assessed at the weakest point of the section of street being assessed (i.e. obstructions caused by cobbles or drainage for example may reduce the effective width). If there is no cycle lane in part of the section, then this is the section that is assessed in relation to this criterion.

If space for cycling at its narrowest point is under 1.8m, or cycles are mixing with general traffic in speed limits of over 30km/h then no points are available.

3.1.3.5 Crossings

Crossings in the town are problematic in some locations, particularly in relation to Bussell Highway. While the Shire cannot act alone in the implementation or adaptation of crossings on such roads, it can commission studies to assess their performance, and work collaboratively with MRWA to improve safety and amenity for people walking and riding.

For crossings at signalised intersections, Healthy Streets guidance states that there should be a crossing on every leg AND that wait times[1] to cross should be a maximum of 60 seconds. In order to get one point at unsignalised crossings (including roundabouts), there should be no need to cross more than one lane of traffic with a minimum of 2m wide refuge, Or the speed zone is under 20km/hr OR the crossing has a raised entry threshold. If there is a slip lane, a missing crossing on any leg of the intersection, the crossing is not on the desire line, or a dropped kerb is missing, the crossing does not score any points.

3.1.3.6 Traffic Speeds and Volumes

A reduction in 85th percentile speeds on local roads to under 50 kph would likely create the conditions for safer and comfortable cycling, particularly on roads with lower volumes.

[1] Maximum wait time is the sum of the flashing and the red “don’t walk” periods

4. Future Changes

The Shire outlined several key development projects for the town including:

- Design of a shared path on Duggan Drive
- Provide a safe connection between Memorial Drive and Pioneer Park through the Information Centre Bay.
- Complete the improvements at the existing Memorial Drive/Miamup Drive intersection
- Upgrade the existing path from O'Brien Street into Pioneer Park
- Proposed median island on Bussell Highway north of O'Brien Street – Main Road WA

These projects, along with other enhancements, have been incorporated into this strategy. The aim is to create a comprehensive plan that not only serves the growing local community but also enhances the experience for visitors to the area.

4.1 Development

The Shire's local planning framework sets out key locations for future growth. This information and additional proposed development are included in **Appendix B Transport Modelling.**

4.2 Changing Demographics

Demographics are influenced by various factors such as population growth, aging, migration, and economic development. Cowaramup has experienced steady population growth over the years. The townsite has seen around a 4% pa increase in population steadily since 2001. Continued growth is likely, especially if the region remains attractive to residents seeking a peaceful lifestyle, proximity to natural beauty, and community-oriented living. As with many regions, Cowaramup will likely see an increase in its aging population. People are living longer, and this trend is expected to continue. The median age was 35 years in 2016 and 39 years in 2021. An increase in new permanent residents will substantially increase the demand for key transport infrastructure and services throughout the townsite. It is also imperative that transport choice is allowed for to support the diverse transport needs throughout the townsite.

5. Prioritised Action Plan

This study has highlighted a number of key short (1-3 years), medium (4-6 years) and long-term (7-10) actions for parking, traffic and active transport summarised in the table below and shown in .

Table 5-1 Implementation Plan

ID	Action	Timescale	Indicative Cost	Responsibly Authority	Priority	Comment
Active Transport						
AT1	Provide a shared path along Duggan Drive	Short	Medium	Shire	Medium	Already included within the town's key projects. To be designed in 2023-2024 and constructed in 2024-2025
AT2	Provide a shared path along Peake Street. This provides a future opportunity to connect to the future subdivision at the Corner of Miamup Road and Memorial Drive (C3)	Long	Low	Shared between shire and developer of C3	Medium	
AT3	Investigate a crossing opportunity of Bussell Highway at the northern end of the town to provide connection to Waverley Road, The Oval and the Primary School	Short	Low	Shire	High	Potential to connect to proposed AT8
AT4	Provide a shared path that connects the existing paths on Pioneer Park and Memorial Drive	Short	Low	Shire	High	Confirm with the Shire that this connection will be provided
AT5	Provide a shared path that connects the existing network on Memorial Drive and Pioneer Park with the shared path along Hasluck Street	Medium	High	Shire	High	Potential underpass to cross Bussell Highway
AT6	Provide a shared path along Hall Road and a crossing point to connect to the existing network	Medium	Low	Shire	Medium	This is considered a low priority project by the Shire and has not been included in the latest iteration of the Shire's 10 year forward capital works program.
AT7	Provide a shared path to connect the liquor store and the existing path and crossing point along Botrill Street	Medium	Low	Shire	High	This is considered a low priority project by the Shire and has not been included in the latest iteration of the Shire's 10 year forward capital works program.

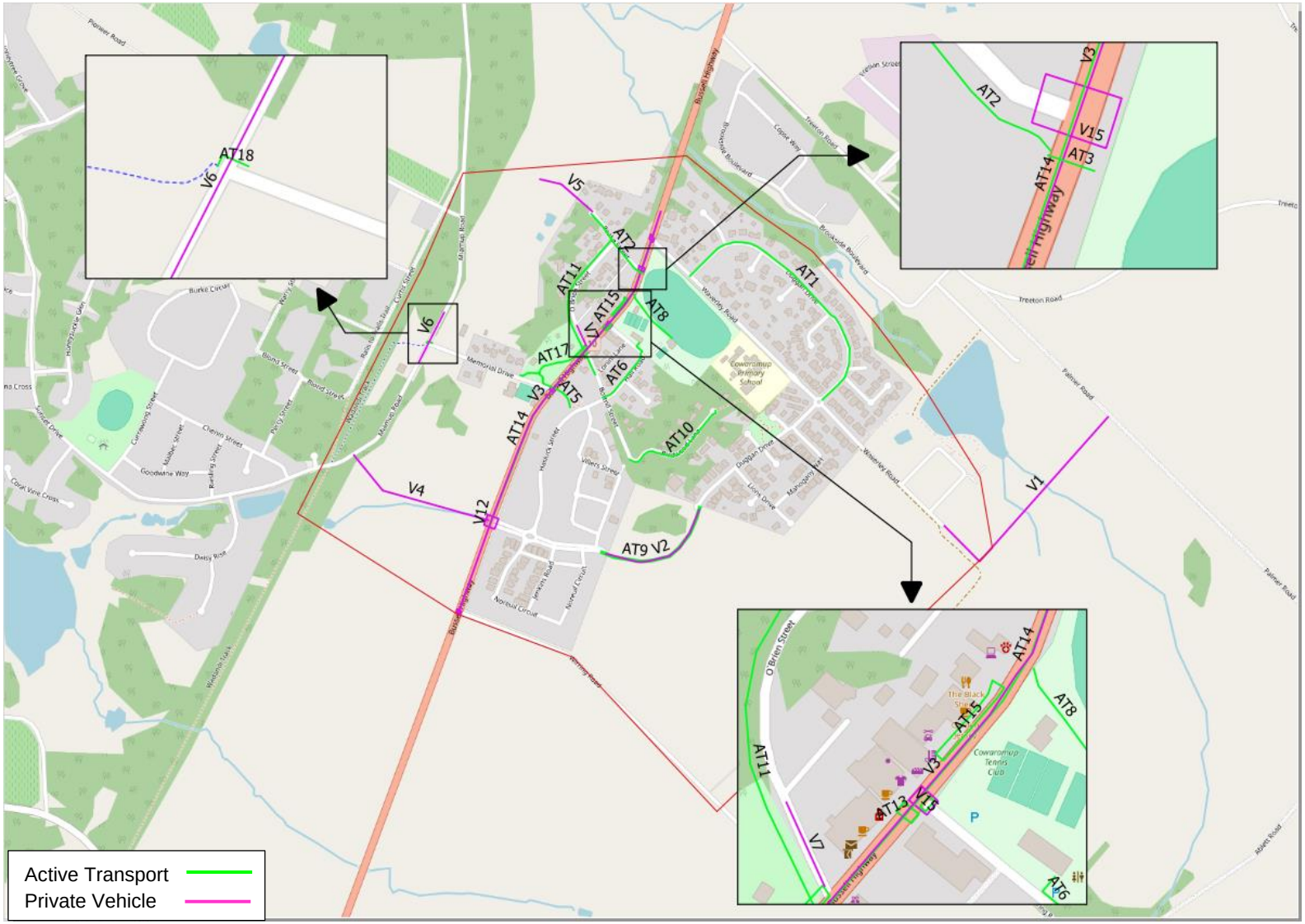
ID	Action	Timescale	Indicative Cost	Responsibly Authority	Priority	Comment
AT8	Provide a shared path from Bussell Highway existing path that connects to the Cowaramup Oval path on the northern part of the town	Medium	Low	Shire	High	
AT9	Include quality shared paths at the proposed development of Lot 500 Wirring Road included in the Structure Plan (C5)	Long	High	Shared between shire and developer of C5	Medium	Linked to V2
AT10	Provide a shared path along Birdwood Lane	Medium	Medium	Shire	Medium	Temporary solution is to provide shared road area
AT11	Provide a shared path along O'Brien Street	Short	Medium	Shire	High	
AT12	Improve pedestrian crossing on Hall Road at the intersection to Bussell Highway	Short	Low	Shire	High	
AT13	Upgrade the existing pedestrian crossing on Bussell Highway to a pedestrian priority crossing	Short	Medium	Shire and Mainroads	High	
AT14	Increase pedestrian crossing opportunities on Bussell Highway according to its function within Movement and Place. Initially extend between Memorial Drive and Waverley Road for an ultima scenario up to Wirring Road once the future subdivisions are being built.	Short	Medium-High	Shire and Mainroads	High	
AT15	Improve the section of shared path along Bussell Highway - Butcher Shop, Taphouse to meet Healthy Streets design guidelines	Short	Low	Shire	High	
AT16	Modify the section of shared path on Pioneer Park approaching O'Brien Street to provide compliant gradient, even surface and wider path	Short	Low-Medium	Shire	High	Urban pathway project currently proposed with investigation to be conducted in 2024-2025
AT17	Provide a wider path (2.5m) at the Pioneer Park to accommodate all type of shared path users	Short	Low	Shire	High	
AT18	Improve the Miamup Road/Memorial Drive pedestrian crossing, include consideration of a school crossing	Short	Low	Shire and developers of the areas	High	Linked to V6

ID	Action	Timescale	Indicative Cost	Responsibly Authority	Priority	Comment
				westside of town		
AT19	Provide additional bike racks across the town in convenient and safe locations such as Bussell Highway, Botrill Street, Hall Road, Cowaramup Oval, etc.	Short	Low	Shire	High	
AT20	Improve path users' safety on Bussell Highway between Roy Earl Drive and Waverley Road according to its function within Movement and Place. This can be done by implementing: • speed limit reduction; • Street trees; • Narrower carriageways; • Median – traffic island at the intersections – bollards etc.	Short	High	Shire and Mainroads	High	Linked to V3 Initially extend between Memorial Drive and Waverley Road for an ultima scenario up to Roy Earl Drive once the future subdivisions are being built.
Private Vehicle						
V1	Provide a local road connection between Waverley Road and Palmer Road if subdivision of land to the east occurs in the future, to allow internal traffic to travel between the areas without the need to use Bussell Highway	Medium	High	Shire	Low	
V2	Provide a local road connection between Roy Earl Drive and Duggan Drive to allow vehicles to travel between these areas without the need to use Bussell Highway. included in the Structure Plan (C5)	Medium	High	Development of C5.	Low	Linked to AT9
V3	Extend the 40km/h speed limit on Bussell Highway between Wirring Road and Waverley Road. (ultimate scenario)	Short to Long term	Low	Main Roads / Shire	High	Linked to AT20. Extend the 40km/h speed limit along Bussell Highway according to its function within Movement and Place. Initially extend between Memorial Drive and Waverley Road for an ultima scenario up to Wirring Road once the future subdivisions are being built.

ID	Action	Timescale	Indicative Cost	Responsibly Authority	Priority	Comment
V4	Provide a local road connection between Roy Earl Drive and Miamup Road to allow vehicles to travel between these areas and cross Bussell Highway without the need to drive along it	Short	High	Development of C1.	Medium	
V5	Provide a local road connection between Peake Street and the proposed C3 to allow vehicles to travel between these areas without the need to use Bussell Highway	Short	High	Development of C3.	Medium	
V6	Reduce speed limit on Miamup Road in the approaches of the pedestrian crossing to 40km/h	Short	Low	Shire	High	Linked to AT18
V7	Formalise parking areas on O'Brien Street to provide compliant parking capacity for the Post office, Pharmacy, and commercial area	Medium/long	Medium	Shire	High	
V8	Provide one public EV charging station	Medium/long	Low - Medium	Shire-WA Government	Low	
V9	Improve intersections to provide opportunities for locals to cross Bussell Highway, specifically to increase safe pedestrian crossings, e.g. Bussell/Waverley/Peake St	Medium	High	Main Roads / Shire	High	
V10	Investigate the feasibility of a bypass road	Long	High	Main Roads / Shire	Low	
V11	Upgrade Bussell Highway / Memorial Drive with projections of poor performance due to anticipated traffic growth from future developments including subdivisions (see discussion in **Appendix B**)	Short	High	Main Roads / Shire	High	
V12	Upgrade Bussell Highway / New Road and Bussell Highway / Roy Earl Drive with projections of poor performance due to anticipated traffic growth from future developments including subdivisions (see discussion in **Appendix B**)	Short	High	Main Roads / Shire	High	

ID	Action	Timescale	Indicative Cost	Responsibly Authority	Priority	Comment
V13	Upgrade Bussell Highway / Waverley Road with projections of poor performance due to anticipated traffic growth from future developments including subdivisions (see discussion in **Appendix B**)	Medium	High	Main Roads / Shire	High	
V14	Upgrade Bussell Highway / Wirring Road with projections of poor performance due to anticipated traffic growth from future developments including subdivisions (see discussion in **Appendix B**)	Medium	High	Main Roads / Shire	High	
V15	Upgrade Bussell Highway / Peake Street and Bussell Highway / Hall Road to improve network conditions. (see discussion in **Appendix B**)	Medium	High	Main Roads / Shire	High	

Figure 5-1 Location of Proposed Actions – Prioritised Action Plan



6. Conclusion

The Cowaramup Integrated Transport Strategy (ITS) highlighted traffic, public transport, parking, walking, and cycling issues currently facing the town and presents a strategy to manage the road network and improve access for all road user types. The strategy includes:

- A comprehensive investigation of the study area, including attractor points, demographics, distribution areas, parking, and road network.
- Identification of gaps in the network per mode and proposed improvements.
- SWOT Analysis per mode to provides insight into areas of potential improvement and to be used as a baseline for recommendations.
- A traffic modelling exercise to assess the impacts of current and projected traffic along key intersections. The assessment included three scenarios (2024-exisitng, 2028-short term, and 2033-medium term) and mitigation measures to improve the flow of traffic.
- Healthy Street Assessment on Bussell Highway between Bottrill Street and Peake Street including proposed modifications to improve current score and implementation of design guidelines
- Prioritised action plan that includes short-, medium- and long-term actions for active transport and private vehicles.

Appendices

We design with community in mind

Appendix A Relevant Literature

This section includes a summary of the literature relevant to the planning strategies and proposed road modifications within the study area.

A.1 Cowaramup Country Local Structure Plan Amendment No.1 Lot 102 Bussell Highway, November 2023

The purpose of this amendment is to facilitate the subdivision and development of Lot 102 Bussell Highway, located south-west of the study area as shown in **Figure A 1**. An online submission form was available for the community to comment until 13 February 2024.

Figure A 1 Structure Plan Map

Source: Shire of Augusta Margaret River

The structure plan aims to create a minimum of 124 lots in accordance with the residential density code. Different density codes have been allocated to specific areas within the plan:

- An 'R60' Designated for a development site in the north-eastern corner, suitable for a "Key Workers Accommodation Village" or similar coordinated residential development.
- R30: Assigned to land fronting Memorial Drive, considering its proximity to the Cowaramup Town Centre and public open spaces.
- R25: Applied to most of the Structure Plan area as a base coding.
- R12.5: Allocated to land along the western and southern interfaces, serving as a low-density interface to the adjacent rural area.

The development will include a Connector Road between Bussell Highway and Sunset Drive, serving as the primary east-west link, along with a roundabout on Bussell Highway/Roy Earl Drive. Additional requirements include tree retention, managing transport noise, and necessary infrastructure for the subdivision.

The opportunities identified to improve people movement within the locality include:

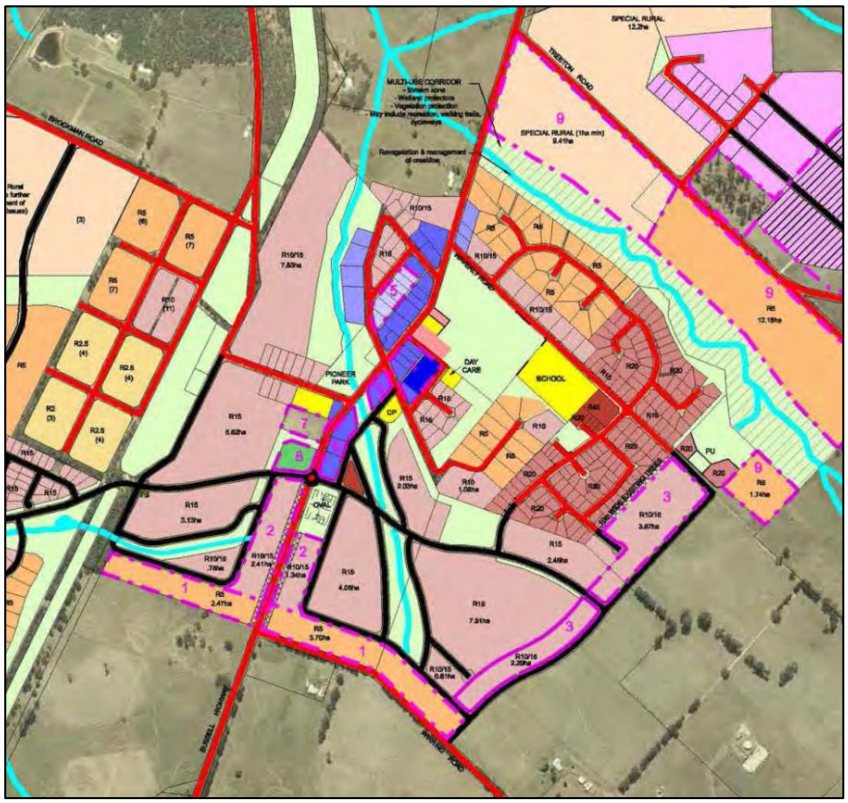
- The realignment of the east-west connection between Sunset Drive and Bussell Highway to directly link to the existing Bussell Highway and Roy Earl Drive intersection, in lieu of a staggered T-intersection. This will maximise connectivity and provide a more direct east-west connection, and ease pressure on the Memorial Drive and Bussell Highway intersection as the only existing east-west connection.
- Extension of the existing footpath network on the western side of Bussell Highway (approximately 500m) to link in with the proposed pedestrian connections on the eastern flank of the Structure Plan area and proposed internal footpath network. This will improve pedestrian access to the Cowaramup Town Centre.

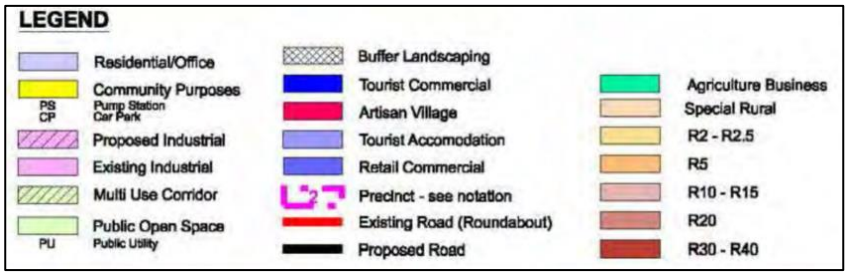
The Shire of Augusta-Margaret River Local Planning Strategy was prepared by the Shire and endorsed by the WAPC on 18 January 2022 for the purpose of setting out the strategy planning framework for development within the municipality to 2036.

A.2 Cowaramup Village Strategy 2005

The Cowaramup Village Strategy, initially approved by the WAPC in 2005 and later updated in 2010, serves as a strategic planning framework for the Cowaramup Townsite's growth. It acknowledges the reliance of commercial development on passing trade, with most commercial land situated along Bussell Highway. The strategy emphasizes maximizing business exposure and identifies a specific precinct near Hall Road, Bussell Highway, and Bottrill Street for commercial activities. The updated plan includes proposed roads and a roundabout at a four-way intersection on Bussell Highway as shown below.

Figure A 2 Village Strategy 2005





The actions and guidelines recommended:

- A welcoming entry statement at the north and south entry to the town;
- An comprehensive pedestrian network to facilitate the safe movement of pedestrians and cyclists
- Appropiate east/west connections

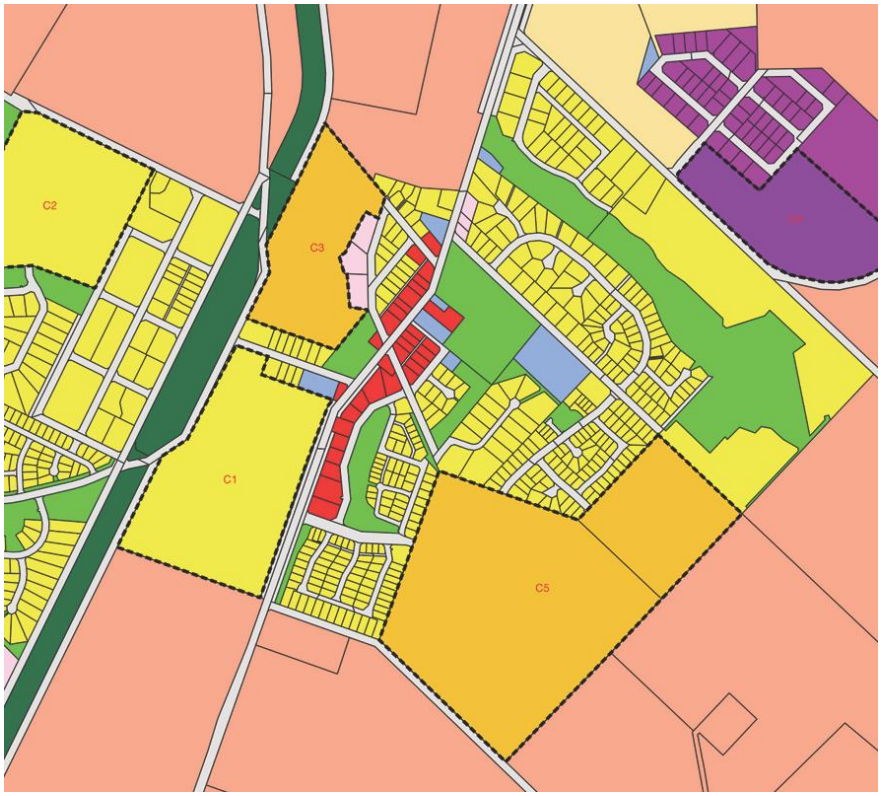
A.3 Local Planning Policy 2008

- Car parking areas of new commercial development or extensions to existing commercial development shall be located at the rear of the building and the access shall be from rear laneways or side streets.
- Development within 100 metres of the proposed car park in Bottrill Street may obtain up to 100% cash-in-lieu dispensation of the normal car parking requirement following provision of at least one service vehicle parking bay and one disabled persons vehicle parking bay on-site.

A.4 Shire of Augusta-Margaret River Local Planning Strategy 2022

The Strategy mentions that Cowaramup is among the most congested areas of the Shire. And that if speed limit changes and traffic calming not lead to an improvement on the pedestrian experience in the Cowaramup town centre, explore the feasibility and community desire for a Cowaramup bypass road.

Figure A 3 Local Planning Strategy 2022



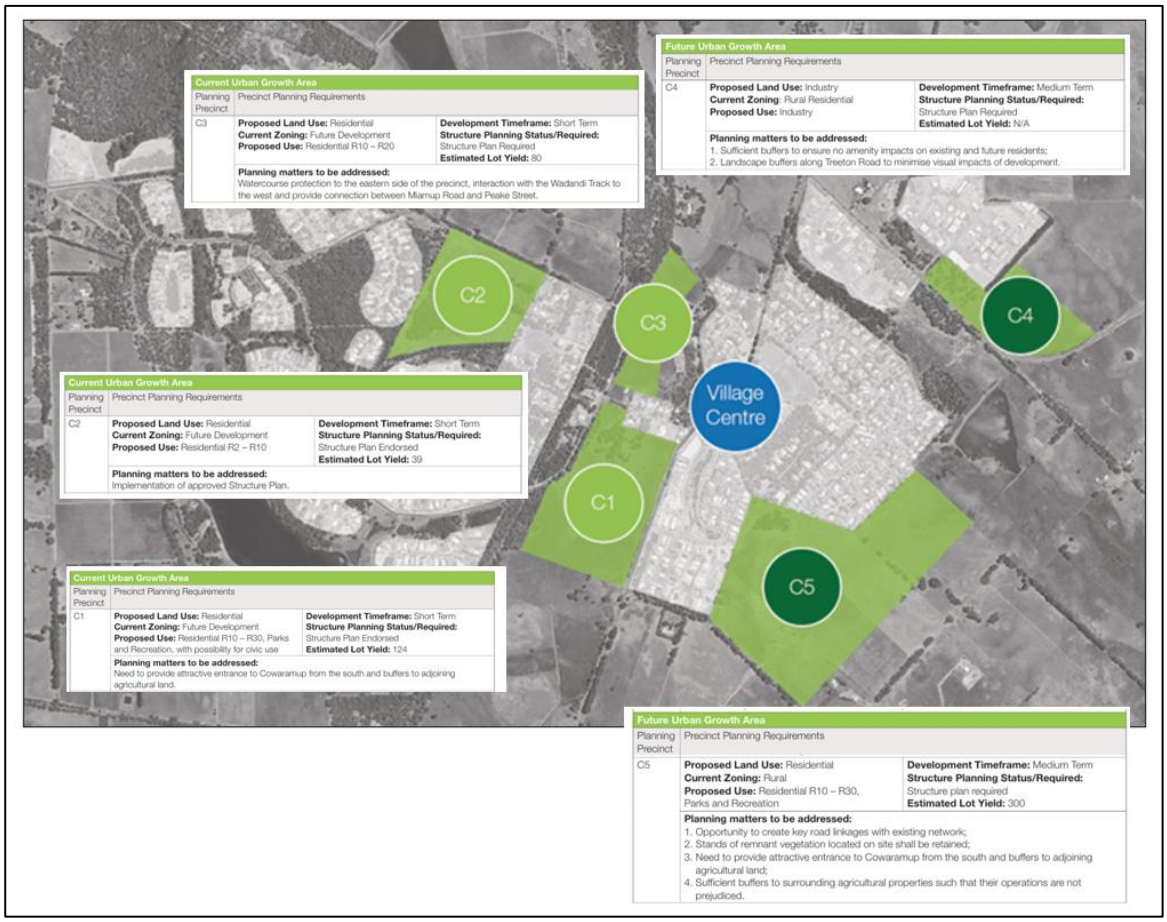
Land Use Designation		
Key	Title	Summary
	Planning Precinct	Areas identified for current, future or long term growth.
*	Planning Investigation Area	Land designated in the LNRSRS that is subject to detailed planning investigations by the WAPC to explore the suitability of the area for urban growth.
Land Use Classification		
	Rural	Broad acre agricultural activities such as cropping and grazing and intensive uses such as horticulture which may be coupled with small scale tourism and/or conservation uses.
	Conservation	Land which has special environmental characteristics which warrant its preservation.
	Industry	Existing land for industrial uses varying in levels of intensity from composite, light through to general.
	Future Industry	Land where the necessary investigations may take place to explore its potential to be rezoned, structure planned and developed for industrial purposes within the planning period.
	Residential	Land which is or will be developed for housing.
	Future Urban	Land where the necessary investigations may take place to explore its potential to be rezoned, structure planned and developed for more intensive urban purposes within the planning period.
	Rural Residential	Lots ranging from 1ha through to 5ha which accommodate lifestyle residential accommodation.
	Future Rural Residential	Land where the necessary investigations may take place to explore its potential to be rezoned, structure planned and developed for rural residential purposes within the planning period.
	Service Commercial	Suitable for commercial development of a low intensity and bulky nature such as showrooms, located outside of town centres.
	Tourism	Land where the primary use is for tourist accommodation facilities and services.
	Future Tourism	Land where the necessary investigations may take place to explore its potential to be rezoned, structure planned and developed for tourism purposes within the planning period.
	Town Centre	Focal centres comprising of retail, commercial, professional, entertainment and community activities together with residential accommodation to service the populations of surrounding area.
	Local Centre	Centres that provide for the day to day needs of local communities. These centres provide an important role in providing walkable access to services and facilities for local communities.
Reserve Classification		
	Civic Use	Physical infrastructure available for community use such as halls, libraries and schools.
	Foreshore Reserve	Reserved land directly abutting waterways where the primary objective is to support good waterway health.
	National Parks and Nature Reserves	Land which is under the ownership of the State Government, and protected for conservation and complimentary tourism purposes.
	Parks and Recreation	Land for both passive and active recreation purposes, ranging in size from small 'pocket parks' through to district level playing fields.
	Rails to Trails Reserve	The Wadandi walking and cycling trail which links Augusta with the City of Busselton.
	State Forest and Public Purpose Reserve	Land owned by the State Government and managed for the production of timber.
	Transportation	The Shire's road network.
	Water Resources	The Shire's river and estuary systems.

A.5 Shire of Augusta-Margaret River Local Planning Strategy 2036

Since the adoption of the Shire's previous LPS2011, Cowaramup has nearly doubled in size, making it one of the fastest growing towns in the state. Together with the entrance of Margaret River, the entrance to Cowaramup is the most congested areas of the Shire.

The Shire's land use planning strategy aims to facilitate a vibrant, inclusive, and resilient community. The current and future urban growth areas within Cowaramup have been included below.

Figure A 4 Summary of Urban growth areas Cowaramup



A.6 Local Tourism Planning Strategy 2015

As per mentioned in the Strategy, Cowaramup and Margaret River offer the majority of tourist attractions in the Shire consisting mostly of artisan galleries and cellar doors as well as high activity for wine tasting.

The Lot 200 Cowaramup Bay Road with an area of 12.1ha is located south of the townsite and it is currently undeveloped and zoned for tourism. A Development Guide Plan was approved to establish 161 accommodation keys, gymnasium, swimming pool, health spa and restaurant.

Figure A 5 Lot 200 Cowaramup Bay Road

Appendix B Transport Modelling

B.1 Introduction

Stantec undertook a traffic modelling exercise to assess the impacts associated with the assumed future demands on key intersections. The SIDRA models were prepared for AM and PM peak time periods. Below is a summary of scenarios modelled as part of this project:

- Scenario 1 – 2024 Existing
- Scenario 2 – 2028 Short Term
- Scenario 3 – 2033 Medium Term

B.2 Existing Traffic Demand

The performance of seven key intersections were analysed under the three scenarios. The intersection turn volumes for those intersections were based on the following sources shown in **Table B-1**.

Table B-1 Existing Turn Volumes Sources

ID	Intersection	Source	Type of Data	Year
1	Bussell Highway / Waverley Road	Traffic Map	Midblock Count	2021
2	Bussell Highway / Peake Street	Traffic Map	Midblock Count	2021
3	Bussell Highway / Hall Road	Traffic Survey	Turn Count	2024
4	Bussell Highway / O'Brien Street / Bottrill Street	Traffic Survey	Turn Count	2024
5	Bussell Highway / Memorial Drive	TIA (PJA)[1]	Turn Count	2023
6	Bussell Highway / Roy Earl Drive	TIA (PJA) [1]	Turn Count	2023
7	Bussell Highway / Wirring Road	TIA (Cardno)[2]	Turn Count	2022

Note:

[1] Goldfields Lot 102 Bussell Highway, Cowaramup Transport Impact Assessment by Phil Jones Associates (PJA) (October 2023)

[2] Transport Impact Assessment Cowaramup Subdivision, Lot 500 Wirring Road for Rodney William Duggan by Cardno (29 May 2022)

Majority of the sources found provided data for turning movements; however, volumes for the Bussell Highway / Waverley Road and Bussell Highway / Peake Street intersections were available only as midblock counts. Turning movements at these intersections were derived per the following:

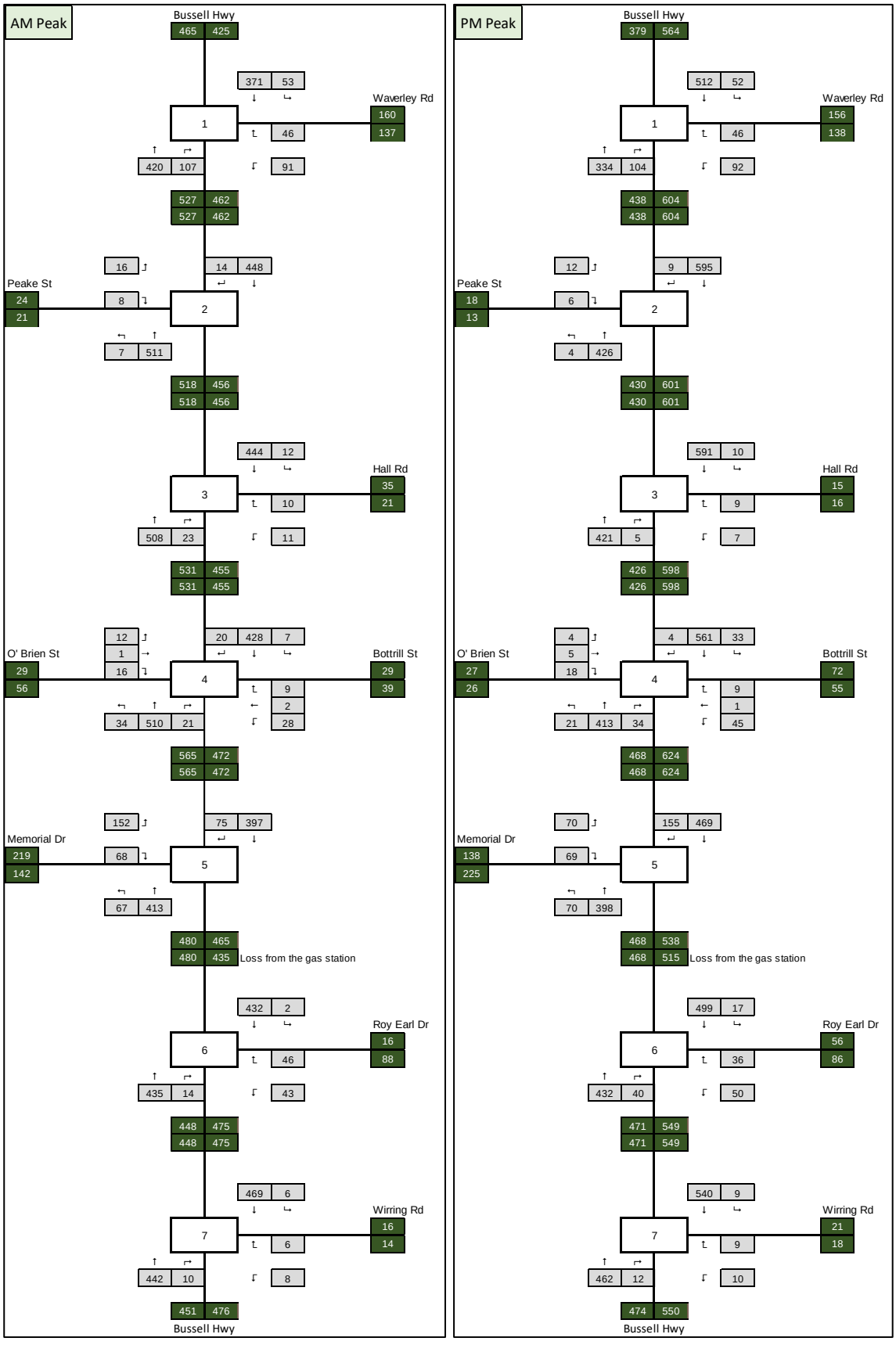
- Majority (around 65%) of the Waverley Road traffic will originate from or travel to the south with the assumption that the majority of the traffic will be for the primary school and would attract traffic from the nearby residential area on the south.
- Majority (around 65%) of the Peake Street traffic will originate from or travel to the north. This is considering that O'Brien Street can be an alternative road for vehicles travelling to / from the south.
- The through movements along Bussell Highway were calculated based on the midblock traffic produced from the turn counts for Hall Road intersection and the information provided after distributing the midblock counts of Waverley Road and Peake Street.

The other assumptions used to produce the existing traffic volumes are listed below:

- The peak hours of these counts vary at around 15 – 60 minutes from each other. For a conservative approach, the AM and PM peak volumes assume the highest volumes in all the intersections regardless of their specific time during AM and PM.
- For consistency, all older turn volumes were grown to 2024 using a 4% per annum growth rate calculated from the available traffic counts on Bussell Highway, north of Gardiner Road.
- Final manual adjustments were undertaken to ensure minimal losses between intersections.
- For turns with available heavy vehicle percentages, the analysis used their corresponding heavy vehicle percentages while for turns without heavy vehicles percentages, the analysis used a general value of 6% for the AM peak period and 5% for the PM peak period taken from the average heavy vehicle percentages of the minor roads.

The resulting turn counts for 2024 AM and PM peak time periods are shown in **Figure B-1**.

Figure B-1 Base Case Turn Volumes



B.3 Future Traffic Demand

B.3.1 Future Development Traffic Demand

11 developments were identified near Bussell Highway and were included in the analysis. These developments are shown in **Figure B-2**. The image was taken from the Draft Local Planning Strategy 2036 by the Shire of Augusta Margaret River (17 August 2020) but was updated to include C6 - C11. C1 - C3 and C6 - C11 were considered in the analysis starting from the 2028 Scenario while C4 and C5 were considered starting from the 2033 Scenario. The following subsections discuss the generated traffic by each of the developments and the distribution to the key intersections.

Figure B-2 Future Developments

Source: Draft Local Planning Strategy 2036 by the Shire of Augusta Margaret River (17 August 2020)

B.3.2 Lot 102 Bussell Highway, Cowaramup (C1)

The structure plan for C1 is included in the report as **Figure B-3**. The structure plan shows that the development is mostly residential (124 lots) with some public open spaces. The development assumes a road network that includes a north-south road that will intersect with Memorial Drive and a new east-west road that will intersect with Sunset Drive and Bussell Highway / Roy Earl Drive intersection. The structure plan assumes Bussell Highway / Roy Earl Drive intersection to be upgraded to a 4-legged roundabout.

Figure B-3 Lot 102 Bussell Highway, Cowaramup (C1) Structure Plan

Source: Cowaramup Country Local Structure Plan – Amendment No. 1. Lot 102 Bussell Highway, Cowaramup; Plan 1

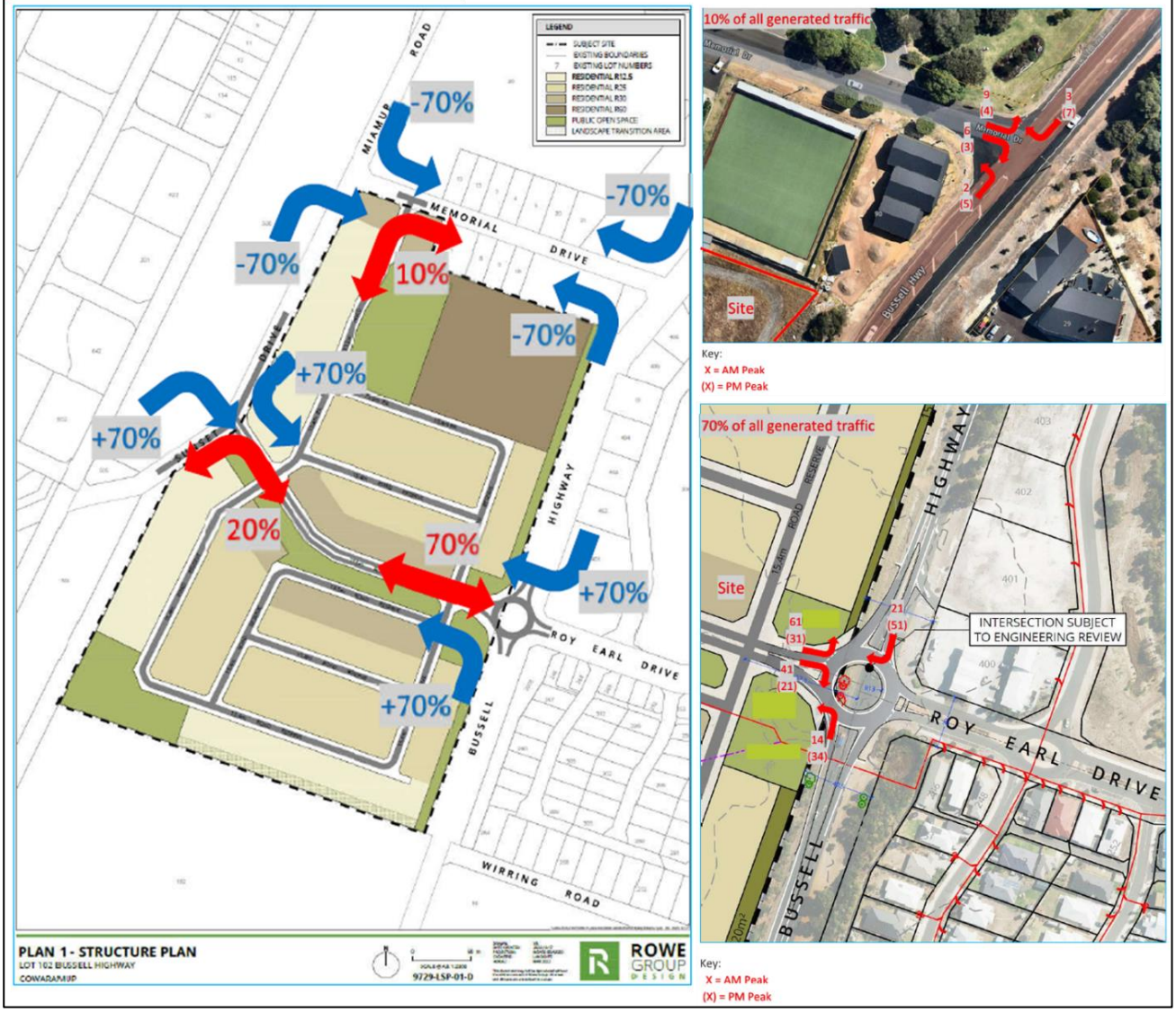
A TIA was prepared by Phil Jones Associates (PJA) for Lot 102 Bussell Highway, Cowaramup. **Figure B-4** is a compilation of tables and figures of the development traffic assumptions extracted from the TIA. The development traffic assumptions

used in Stantec's analysis were made consistent with the future development demand and distribution from PJA's TIA. As well as the 70% redistribution of traffic from Memorial Drive to the new east-west road connecting to Roy Earl Drive.

Figure B-4 Extract from PJA TIA

Land Use	AM Peak Hour		PM Peak Hour	
	IN	OUT	IN	OUT
Residential	0.2 trips per dwelling	0.6 trips per dwelling	0.5 trips per dwelling	0.3 trips per dwelling

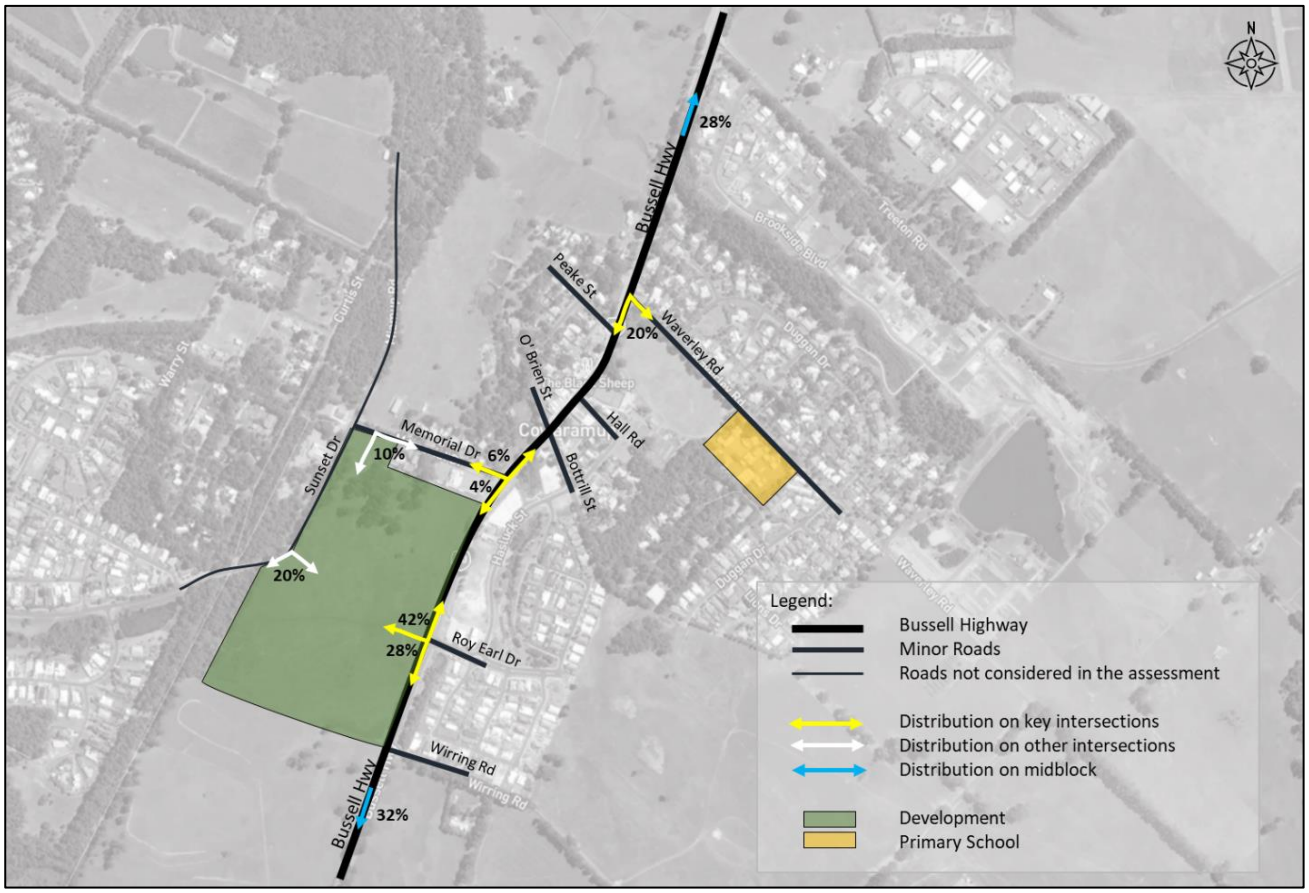
No of Units	AM Peak Hour		PM Peak Hour	
	IN	OUT	IN	OUT
243	49	146	122	73



Source: Goldfields Lot 102 Bussell Highway, Cowaramup Transport Impact Assessment by Phil Jones Associates (PJA) (October 2023); Table 7-1, Table 7-2, Figure 7-12, Figure 7-16 and Figure 7-17.

In addition to PJA's assumptions, considering that majority of the traffic generated by the development are residential, it was assumed that 20% of the dwellings will travel between the development and the primary school along Waverley Road. These trips were considered as part of the trips travelling to and from the north of the development. The trip distribution is shown in **Figure B-5**.

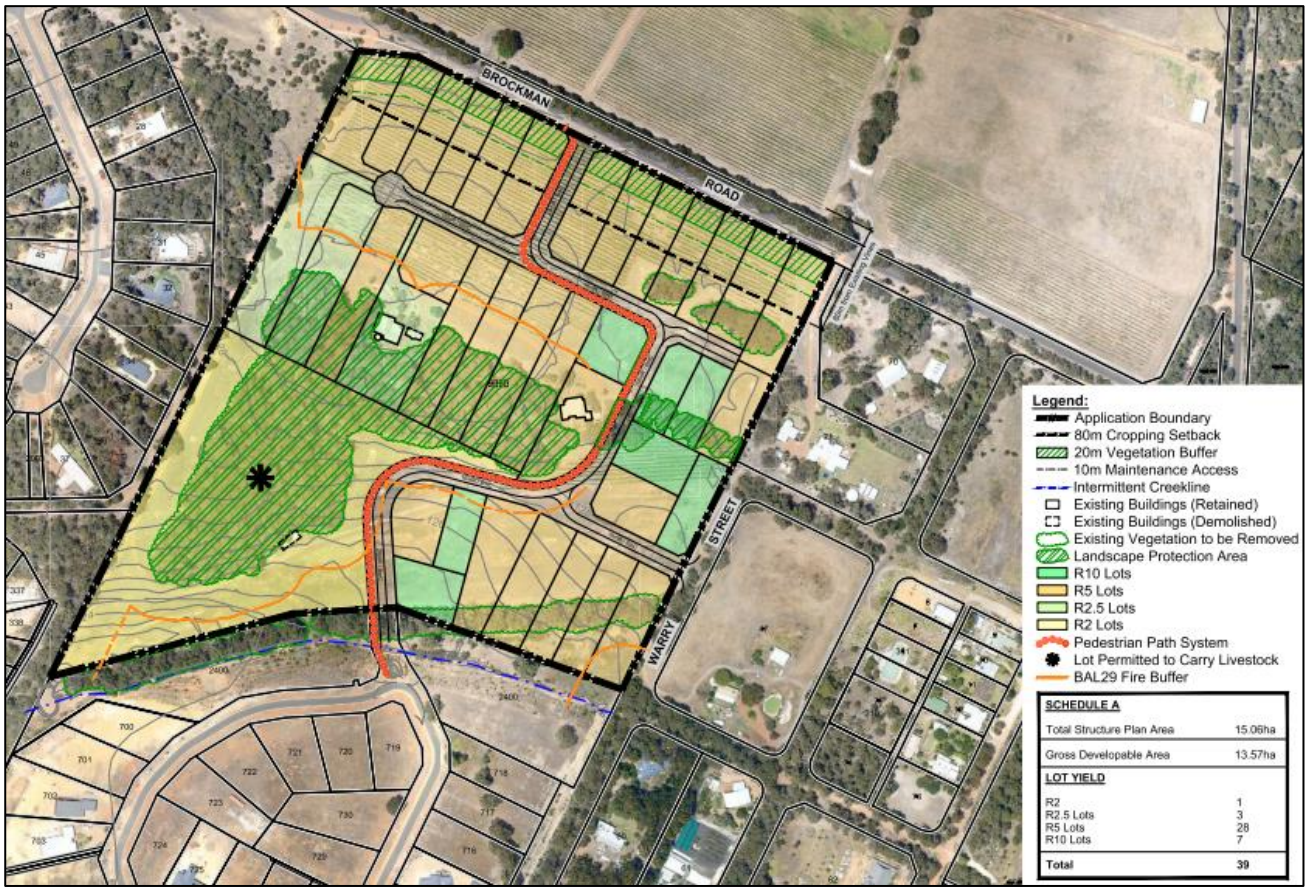
Figure B-5 C1 Trip Distribution



B.3.3 Lot 9000 Brockman Road, Cowaramup (C2)

The structure plan for C2 is included in the report as **Figure B-6**. Based on the structure plan, majority of the development is residential, and it is proposed to have a yield of around 39 dwellings.

Figure B-6 Lot 9000 Brockman Road, Cowaramup (C2) Structure Plan



Source: Structure Plan. Lot 9000 Brockman Road, Cowaramup. Appendix A

It is assumed that 20% of the dwellings are travelling between the development and the primary school. The remaining 80% follows the current split between the north and south based on information found in Main Roads' Traffic Map. The trip rates were taken from WAPC TIA Guideline Volume 5. This along with the trips generated are shown in **Table B-2**. A total of 33 trips were generated for each of the peak periods. **Figure B-7** shows how these trips were distributed within the study area.

Table B-2 C2 Trip Generation

Total Dwellings (39)		Trip Rate				Trips Generated			
		AM Peak		PM Peak		AM Peak		PM Peak	
Distribution of Dwellings		In	Out	In	Out	In	Out	In	Out
31	Residential Trips	0.2	0.6	0.5	0.3	6	19	16	9
8	To and from primary school	0.5	0.5	0.5	0.5	4	4	4	4

Figure B-7 C2 Trip Distribution

B.3.4 Lot Corner of Miamup Road and Memorial Drive (C3)

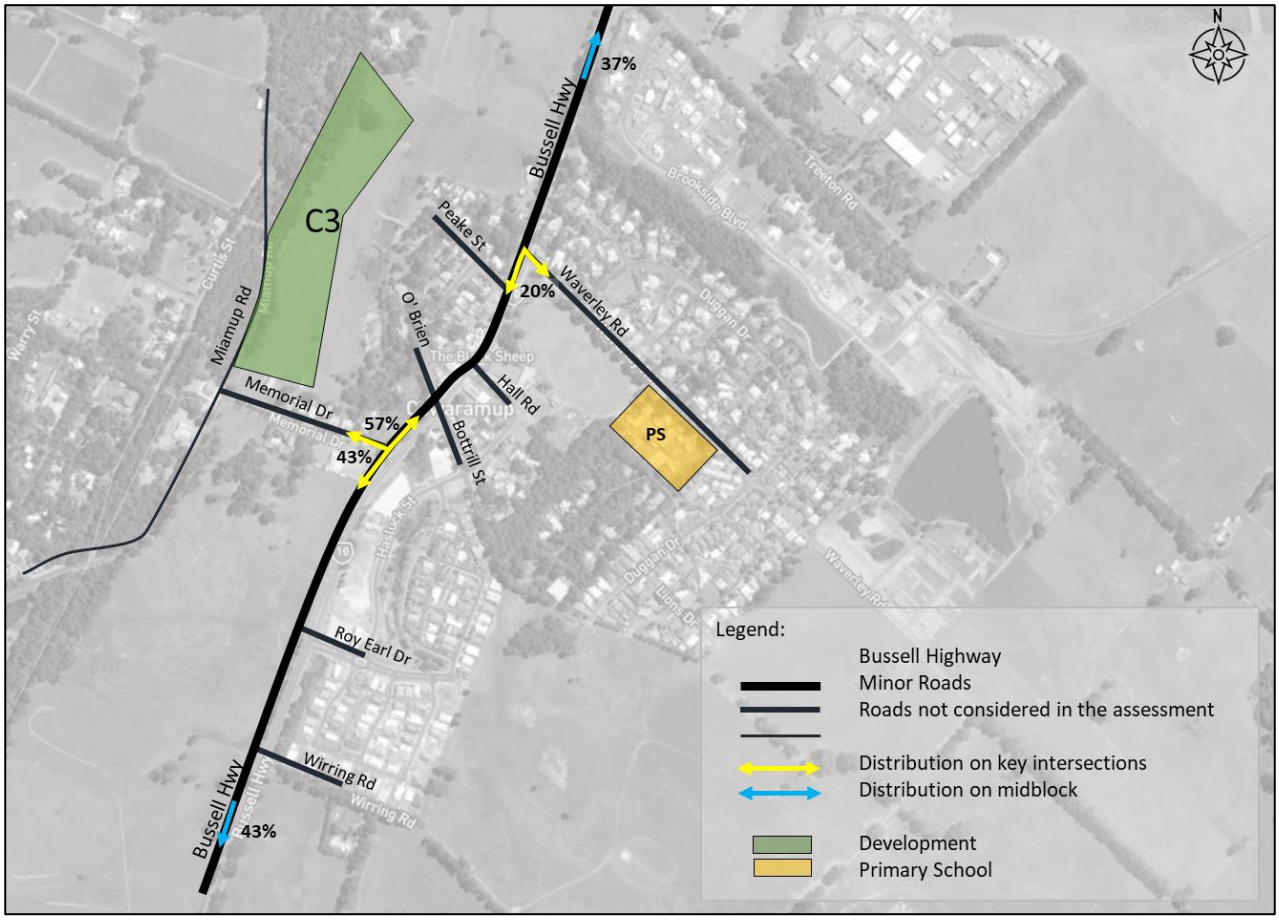
There was not much information for C3 other than it will mostly be residential (R10-R20) and is expected to be constructed in the short term. Due to lack of information, the number of dwellings was determined from the area measured from Metromap and an assumed average lot area of 725 sqm per dwelling for an estimate of 83 dwellings.

It is assumed that 20% of the dwellings are travelling between the development and the primary school. The remaining 80% follows the current split between the north and south based on information found in Main Roads' Traffic Map. The trip rates were taken from WAPC TIA Guideline Volume 5. This along with the trips generated are shown in **Table B-3**. A total of 71 trips were generated for each of the peak periods**. Figure B-8** shows how these trips were distributed within the study area.

Table B-3 C3 Trip Generation

Total Dwellings (83)		Trip Rate				Trips Generated			
		AM Peak		PM Peak		AM Peak		PM Peak	
Distribution of Dwellings		In	Out	In	Out	In	Out	In	Out
66	Residential Trips	0.2	0.6	0.5	0.3	13	40	33	20
17	To and from primary school	0.5	0.5	0.5	0.5	9	9	9	9

Figure B-8 C3 Trip Distribution



B.3.5 Lot Corner of Treeton Road and Wrigglesworth Road (C4)

C4 is proposed for industrial land use, it is assumed that the type of industrial land use as well as lot size will match that of the adjacent existing industrial area off Wrigglesworth Drive. It was estimated a total area of 112,343sqm. Existing available data from Traffic Map encompassed traffic count locations on Treeton Road both directly east and west of Wrigglesworth Drive. As such, a trip generation rate is derived from the existing industrial area utilising these counts – with the derived trip generation rate applied to the total area proposed for C4.

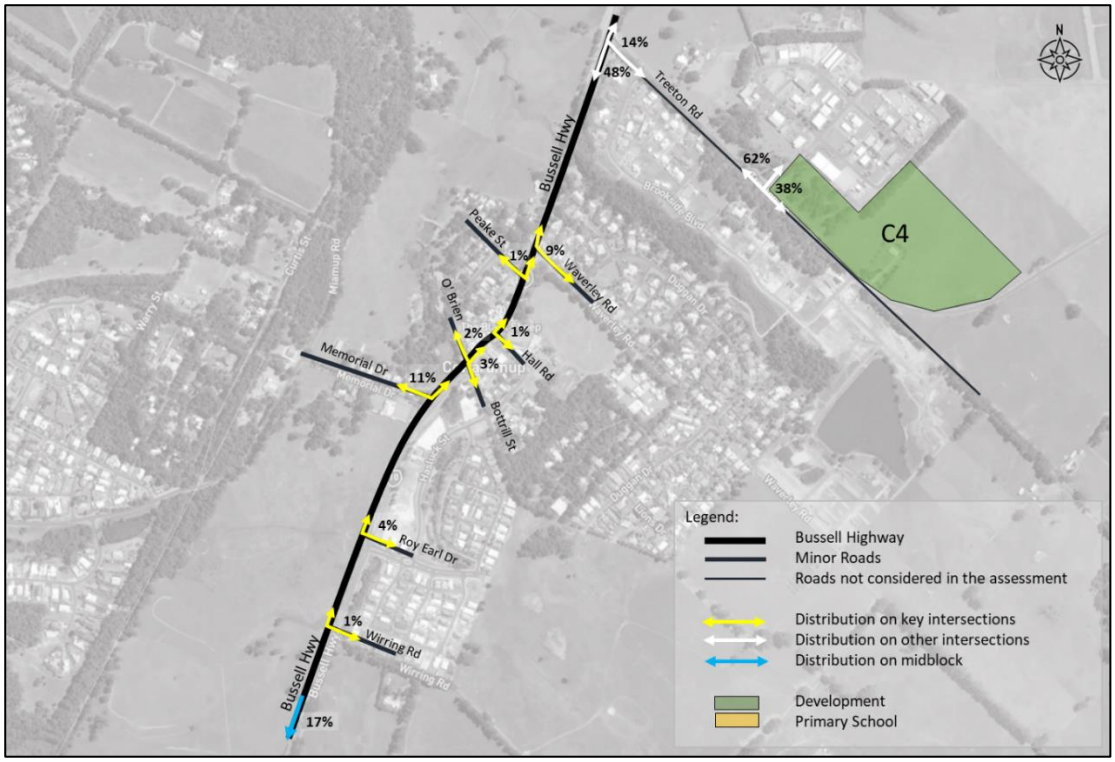
The Traffic Map data was also used to determine the direction split of the future demand. It is assumed that 50% of the future demand travelling on Treeton Road west of Wrigglesworth Drive will travel between the development and the nearby residential area to south. The remaining 50% follows the current split between the north and south based on information found in Main Roads' Traffic Map.

This along with the trips generated are shown in **Table B-4**. A total of 152 trips were generated for the AM peak and 165 trips were generated for the PM peak**. Figure B-9** shows how these trips were distributed within the study area.

Table B-4 C4 Trip Generation

Industrial Total Yield (1,123 per 100sqm)	Trip Rate				Trips Generated			
	AM Peak		PM Peak		AM Peak		PM Peak	
	In	Out	In	Out	In	Out	In	Out
Treeton Road west of Wrigglesworth Drive	0.04	0.04	0.04	0.05	45	47	46	58
Treeton Road east of Wrigglesworth Drive	0.03	0.02	0.02	0.03	34	26	26	35

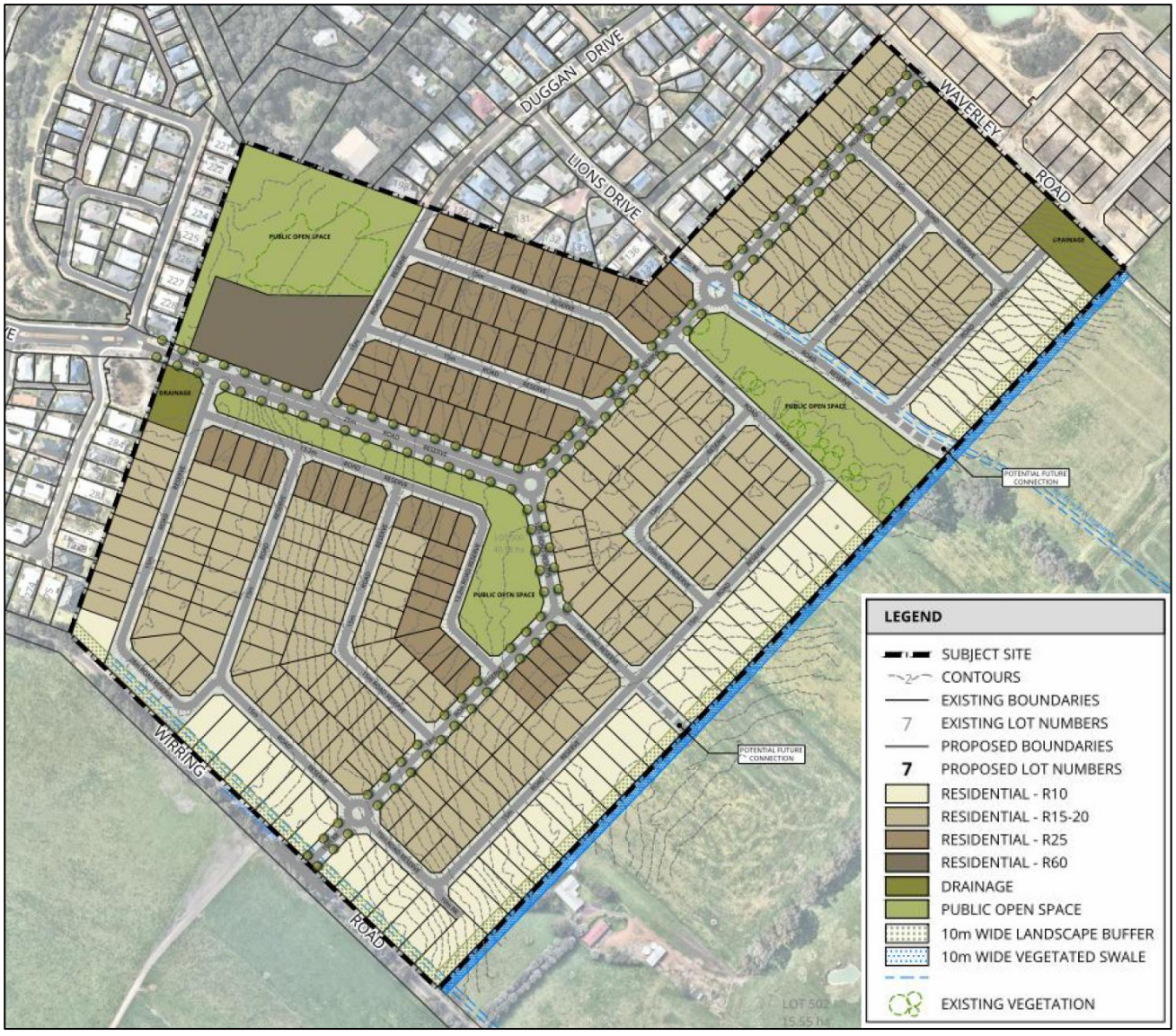
Figure B-9 C4 Trip Distribution



B.3.6 Lot 500 Wirring Road, Cowaramup (C5)

The structure plan for C5 is included in the report as **Figure B-10**. The structure plan shows that the development is mostly residential with some public open spaces. There is an estimate of 350 residential lots and 45 lots for the retirement village. The development assumes a road network that includes a north-south road that will intersect with Waverley Road and an extension of Roy Earl Drive.

Figure B-10 Lot 500 Wirring Road, Cowaramup (C5) Structure Plan



Source: Transport Impact Assessment Cowaramup Subdivision, Lot 500 Wirring Road for Rodney William Duggan by Cardno (29 May 2022)

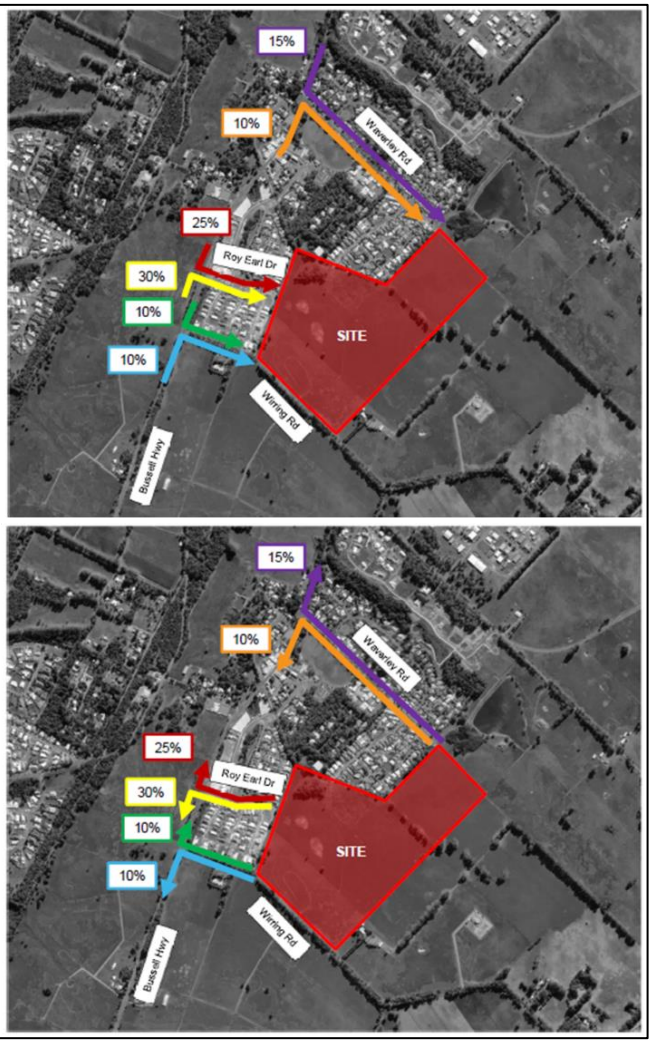
A TIA was prepared by Cardno for Lot 500 Wirring Road, Cowaramup **Figure B-11** is a compilation of tables and figures of the development traffic assumptions extracted from the TIA. The development traffic assumptions used in Stantec's analysis were made consistent with the future development demand and distribution from Cardno's TIA.

Figure B-11 Extracts from Cardno TIA

Land Use	Source	Weekday AM Peak	Weekday PM Peak	Daily
Residential	ITE 210	0.76 per dwelling	1.00 per dwelling	9.44 per dwelling
Retirement Village	ITE 252	0.33 per dwelling	0.31 per dwelling	3.7 per dwelling

Land Use	Weekday AM Peak		Weekday PM Peak		Daily	
	In	Out	In	Out	In	Out
Residential	26%	74%	64%	36%	50%	50%
Retirement Village	47%	53%	53%	47%	50%	50%

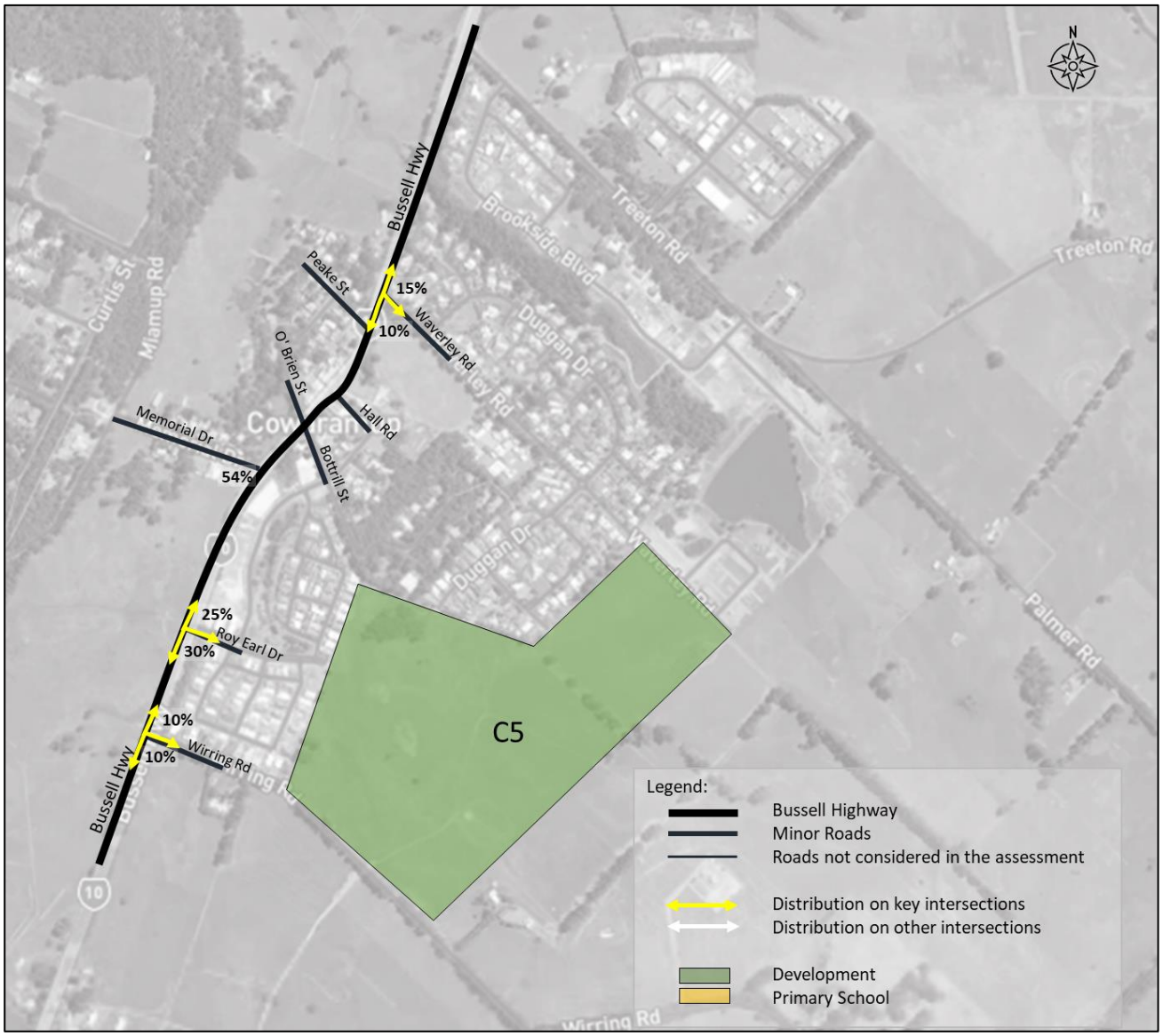
Land Use	Weekday AM Peak		Weekday PM Peak		Daily	
	In	Out	In	Out	In	Out
Residential	69	197	224	126	1,648	1,648
Retirement Village	7	8	7	7	78	78
Total	76	205	231	133	1,726	1,726
	281		364		3,452	



Source: Transport Impact Assessment Cowaramup Subdivision, Lot 500 Wirring Road for Rodney William Duggan by Cardno (29 May 2022); Table 6-1, Table 6-2, Table 6-3, Figure 6-1 and Figure 6-2

Though the trips are mostly residential, the primary school trips were not added in the analysis as it is likely that these trips will be internal considering that the road network is directly connected to Waverley Road. The trip distribution is made consistent with the TIA as shown in **Figure B-12**.

Figure B-12 C5 Trip Distribution



B.3.7 Lot 48 Treeton Road and Lot 49 Friesian Street, Cowaramup (C6)

The structure plan for C6 is included in the report as **Figure B-13**. The structure plan shows that the development will contain around 7 residential lots. The development assumes a road network that includes a new road that will intersect with Treeton Road.

Figure B-13 Lot 48 Treeton Road and Lot 49 Friesian Street, Cowaramup (C6) Structure Plan

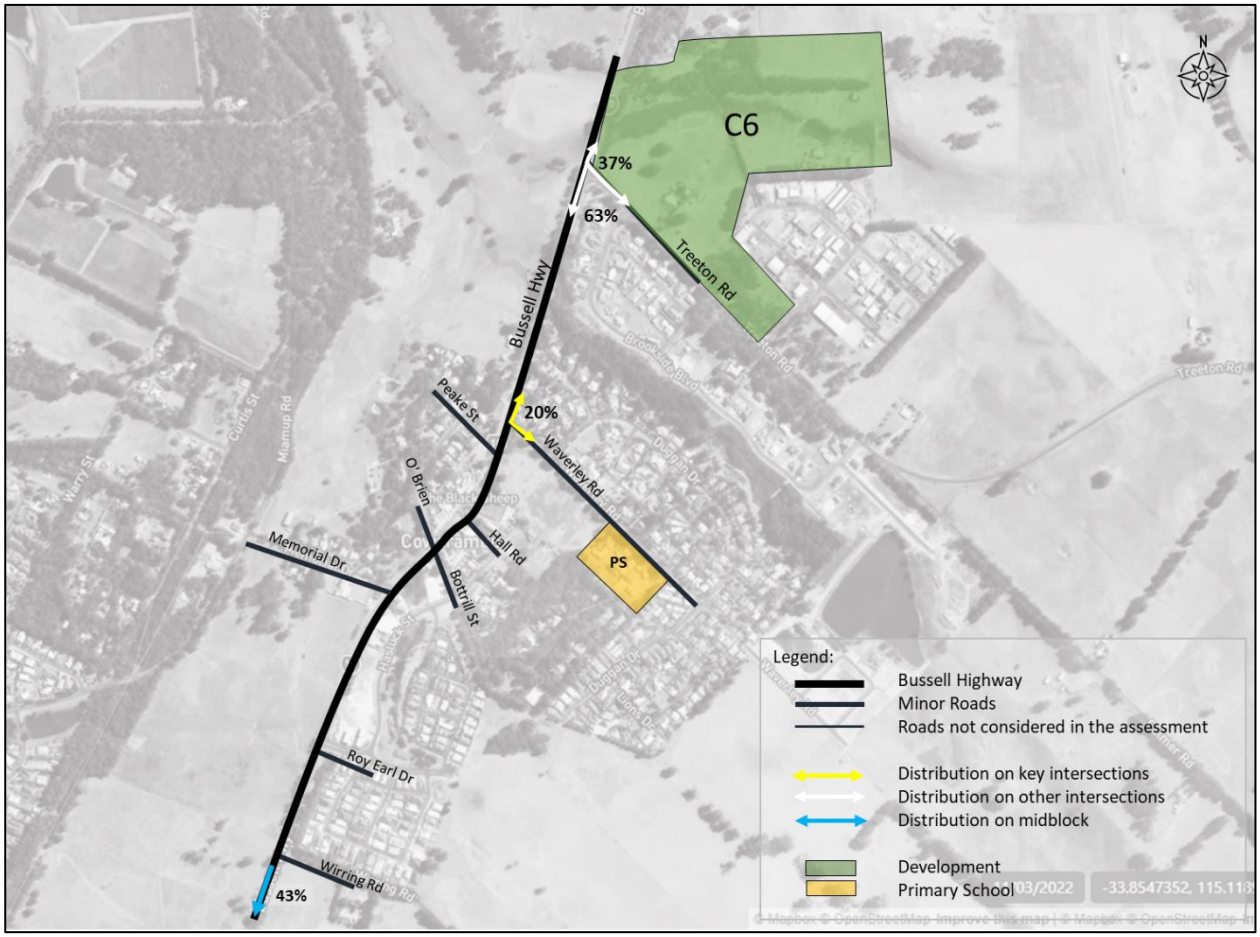
Source: Proposed Structure Plan. Lot 48 Treeton Road and Lot 49 Friesian Street, Cowaramup by Halsall & Associates (May 2022); Appendix A

It is assumed that 20% of the dwellings are travelling between the development and the primary school. The remaining 80% follows the current split between the north and south based on information found in Main Roads' Traffic Map. The trip rates were taken from WAPC TIA Guideline Volume 5. This along with the trips generated are shown in **Figure B-14**. A total of 7 trips were generated for each of the peak periods**. Table B-5** shows how these trips were distributed within the study area.

Table B-5 C6 Trip Generation

Total Dwellings (7)		Trip Rate				Trips Generated			
		AM Peak		PM Peak		AM Peak		PM Peak	
Distribution of Dwellings		In	Out	In	Out	In	Out	In	Out
6	Residential Trips	0.2	0.6	0.5	0.3	1	4	3	2
1	To and from primary school	0.5	0.5	0.5	0.5	1	1	1	1

Figure B-14 C6 Trip Distribution



B.3.8 Parkwater (C7)

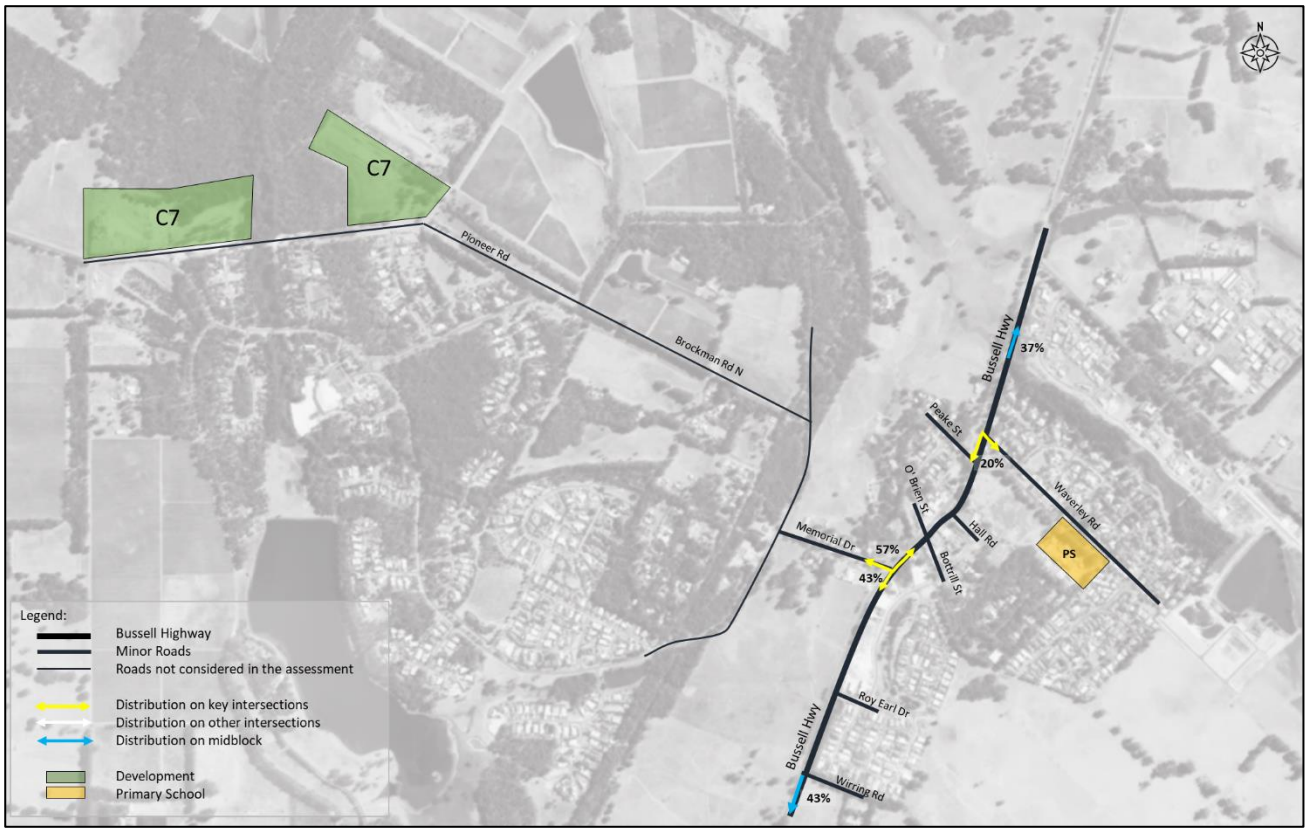
Parkwater is located west of Bussell Highway beyond Pioneer Road. It has 106 vacant residential lots that are assumed to be occupied in the short term.

It is assumed that 20% of the dwelling are travelling between the development and the primary school. The remaining 80% follows the current split between the north and south based on information found in Main Roads' Traffic Map. The trip rates were taken from WAPC TIA Guideline Volume 5. This along with the trips generated are shown in **Table B-6**. A total of around 90 vehicles were generated for each of the peak periods. **Figure B-15** shows how these trips were distributed within the study area.

Table B-6 C7 Trip Generation

Total Dwellings (106)		Trip Rate				Trips Generated			
		AM Peak		PM Peak		AM Peak		PM Peak	
Distribution of Dwellings		In	Out	In	Out	In	Out	In	Out
85	Residential Trips	0.2	0.6	0.5	0.3	17	51	43	26
21	To and from primary school	0.5	0.5	0.5	0.5	11	11	11	11

Figure B-15 C7 Trip Distribution



B.3.9 Symphany Waters (C8)

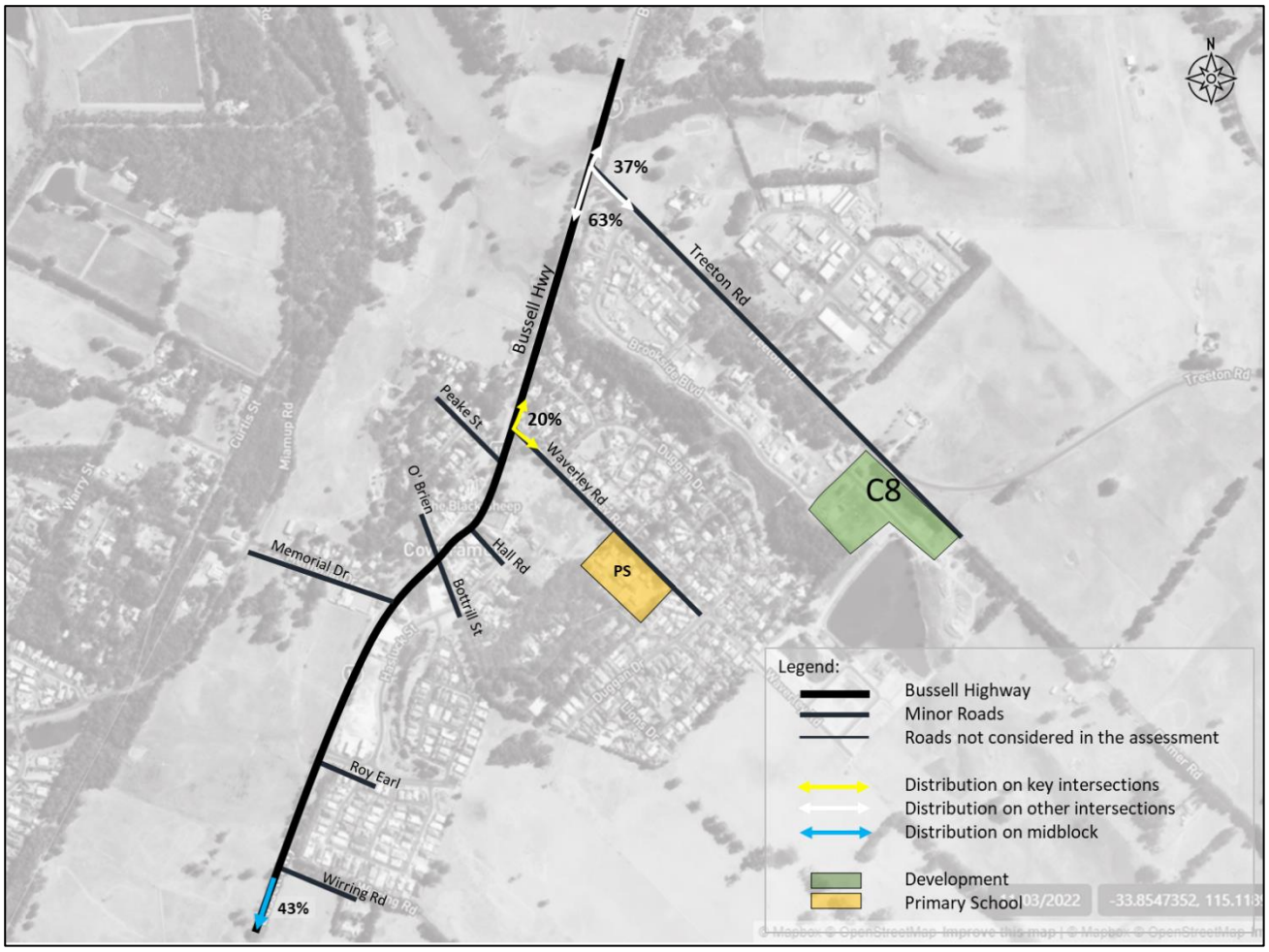
Symphany Waters is located east of Bussell Highway along Treeton Road. It has 18 vacant residential lots that are assumed to be occupied in the short term.

It is assumed that 20% of the dwelling are travelling between the development and the primary school. The remaining 80% follows the current split between the north and south based on information found in Main Roads' Traffic Map. The trip rates were taken from WAPC TIA Guideline Volume 5. This along with the trips generated are shown in **Table B-7**. A total of 15 vehicles were generated for each of the peak periods. **Figure B-16** shows how these trips were distributed within the study area.

Table B-7 C8 Trip Generation

Total Dwellings (18)		Trip Rate				Trips Generated			
		AM Peak		PM Peak		AM Peak		PM Peak	
Distribution of Dwellings		In	Out	In	Out	In	Out	In	Out
14	Residential Trips	0.2	0.6	0.5	0.3	3	8	7	4
4	To and from primary school	0.5	0.5	0.5	0.5	2	2	2	2

Figure B-16 C8 Trip Distribution



B.3.10 Lakeview Estate (C9)

Lakeview Estate is located east of Bussell Highway along Waverley Road. There are 33 vacant residential lots that are assumed to be occupied in the short term.

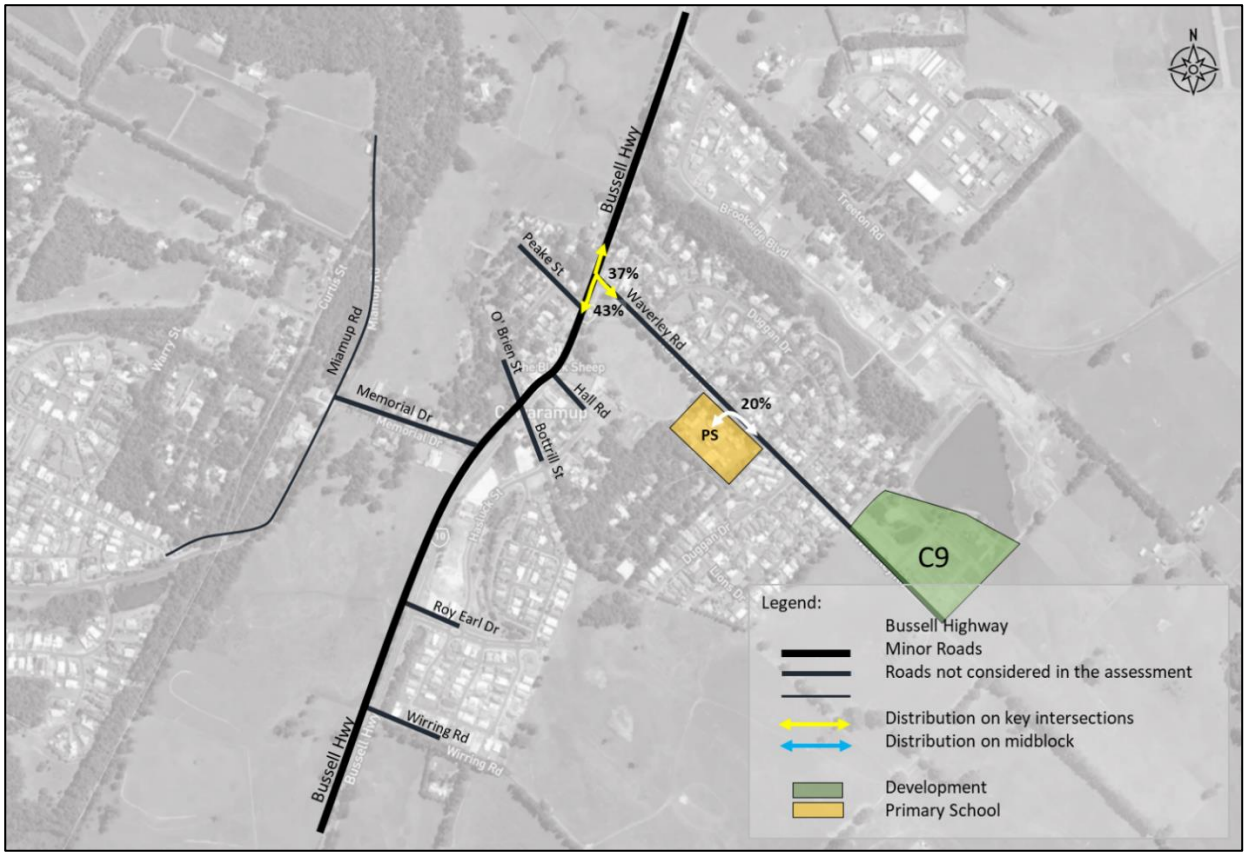
It is assumed that 20% of the dwellings are travelling between the development and the primary school. Considering that the development is on Waverley Road, the trips are assumed to be internal and will not use any of the analysed intersections.

The remaining 80% follows the current split between the north and south based on information found in Main Roads' Traffic Map. The trip rates were taken from WAPC TIA Guideline Volume 5. This along with the trips generated are shown in **Table B-8,** Table B-13**,** and Table B-3. A total of 29 trips were generated for each of the peak periods however only 21 vehicles used the key intersections. **Figure B-17** shows how these trips were distributed within the study area.

Table B-8 C9 Trip Generation

Total Dwellings (33)		Trip Rate				Trips Generated			
		AM Peak		PM Peak		AM Peak		PM Peak	
Distribution of Dwellings		In	Out	In	Out	In	Out	In	Out
26	Residential Trips	0.2	0.6	0.5	0.3	5	16	13	8
7	To and from primary school	0.5	0.5	0.5	0.5	4	4	4	4

Figure B-17 C9 Trip Distribution



B.3.11 Country Vines Estate (C10)

Country Vines Estate is located east of Bussell Highway along Noreuil Circuit. There are five vacant residential lots that are assumed to be occupied in the short term.

It is assumed that 20% of the dwellings are travelling between the development and the primary school. The remaining 80% follows the current split between the north and south based on information found in Main Roads' Traffic Map. The trip rates were taken from WAPC TIA Guideline Volume 5. This along with the trips generated are shown in **Table B-9**. A total of 5 trips were generated for each of the peak periods. **Figure B-18** shows how these trips were distributed within the study area.

Table B-9 C10 Trip Generation

Total Dwellings (5)		Trip Rate				Trips Generated			
		AM Peak		PM Peak		AM Peak		PM Peak	
Distribution of Dwellings		In	Out	In	Out	In	Out	In	Out
4	Residential Trips	0.2	0.6	0.5	0.3	1	2	2	1
1	To and from primary school	0.5	0.5	0.5	0.5	1	1	1	1

Figure B-18 C10 Trip Distribution

B.3.12 Commercial Development (C11)

A 1,110 sqm commercial development area located east of Bussell Highway is assumed to be occupied in the short term. Due to lack of information, the yield was determined from the area measured from Metromap.

It is assumed that 75% will travel between the development and the surrounding residential areas. The remaining 25% follows the current split between the north and south based on information found in Main Roads' Traffic Map. The trip rates were taken from WAPC TIA Guideline Volume 5. This along with the trips generated are shown in **Table B-10**. A total of 22 trips were generated for each of the peak periods.

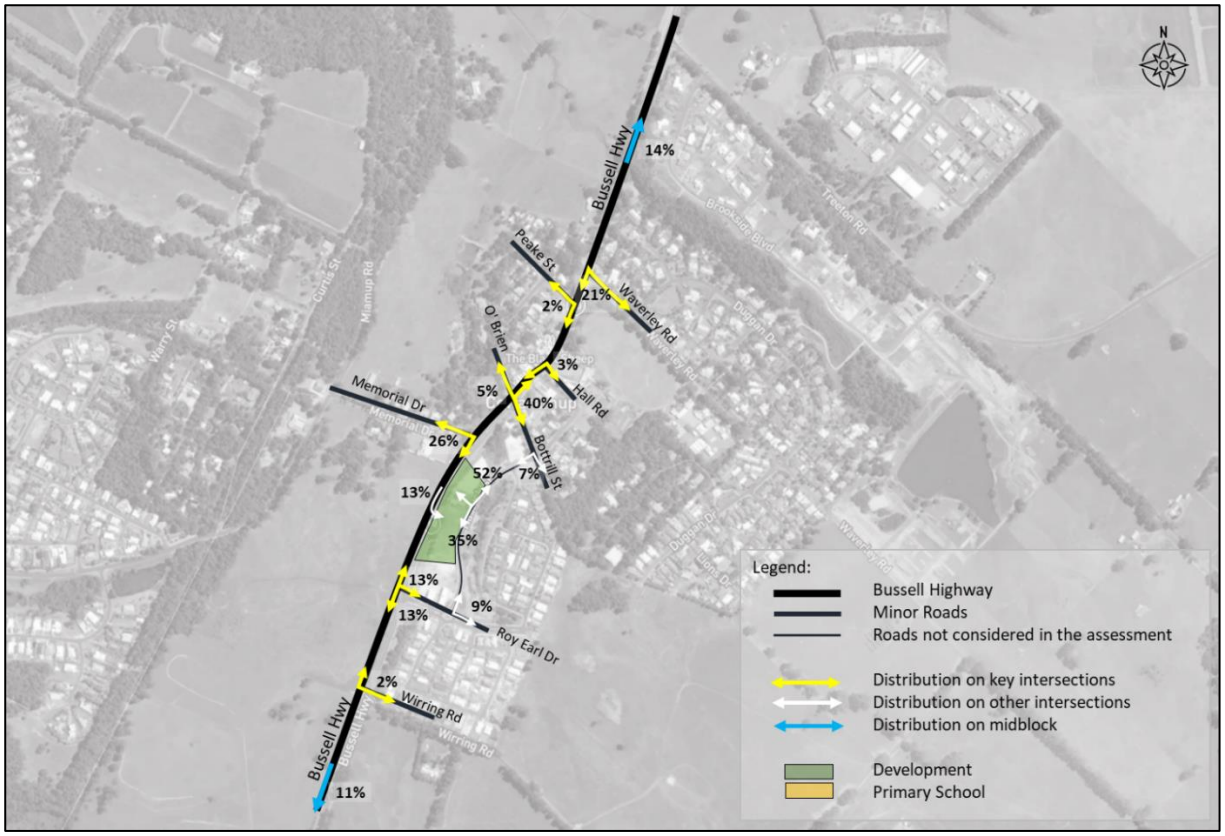
Due to lack of information regarding the future access arrangement of the commercial area, it was assumed that the access will be similar to the service station to the south. There will be a left-in access along Bussell Highway and an access that allows all movements along Hasluck Street.

Figure B-19 shows how the trips were distributed within the accesses and the study area.

Table B-10 C11 Trip Generation

Total Dwellings (11 per 100qm)	Trip Rate				Trips Generated			
	AM Peak		PM Peak		AM Peak		PM Peak	
Distribution of Dwellings	In	Out	In	Out	In	Out	In	Out
Commercial	1.6	0.4	0.4	1.6	18	4	4	18

Figure B-19 C11 Trip Distribution



B.4 Future Through Traffic Demand

To remain consistent with the base year assumptions, the same growth rate of 4% per annum was used to grow the existing traffic volumes to years 2028 and 2033. It is also assumed that 70% of the through traffic on Memorial Drive will transfer to the new east-west road connecting to Roy Earl Drive.

B.5 Future Traffic Volumes

The resulting AM and PM peak traffic volumes from the above assumptions are shown in **Figure B-20** for year 2028 and **Figure B-21** for year 2033.

Figure B-20 2028 Traffic Volumes

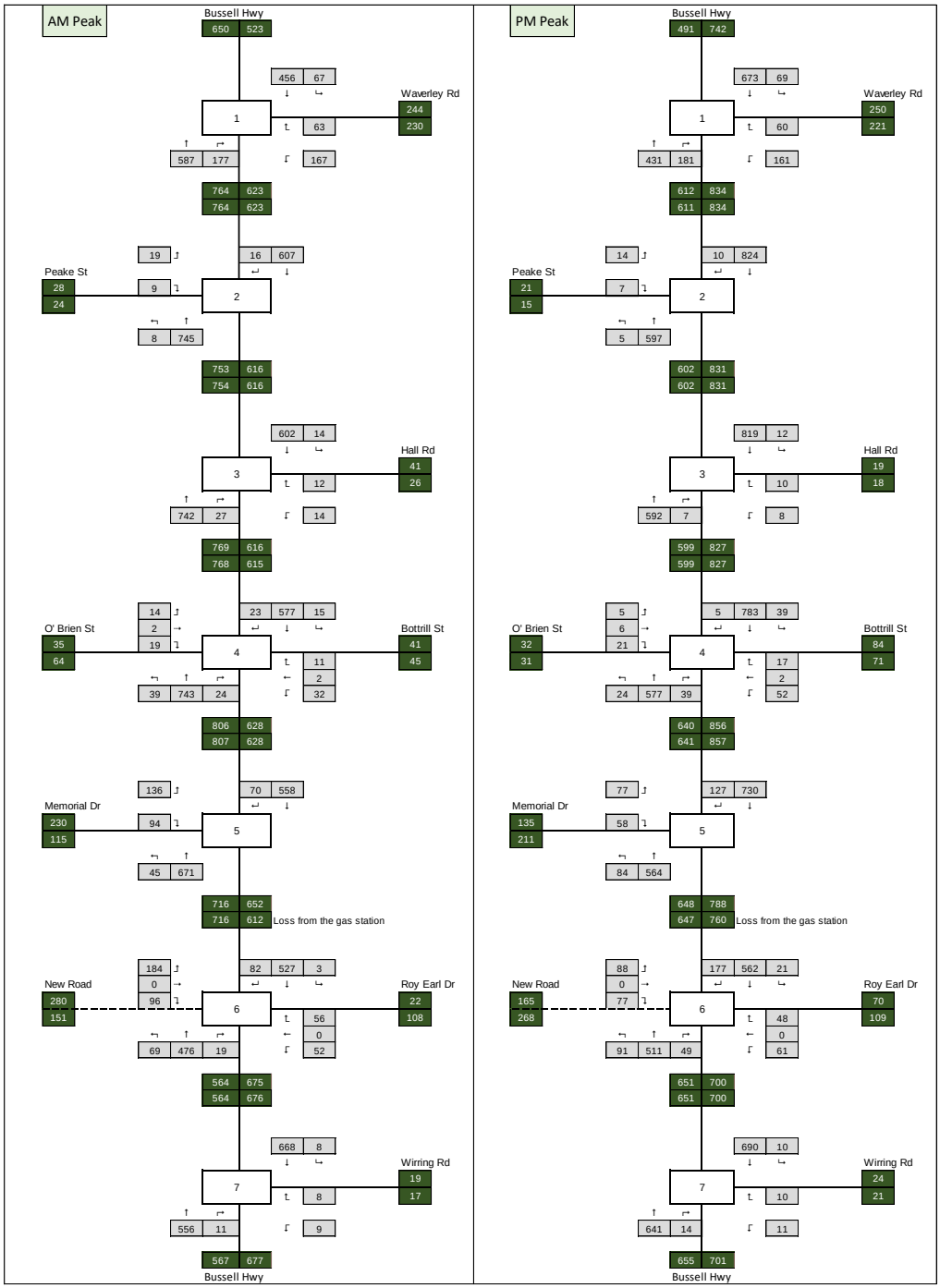
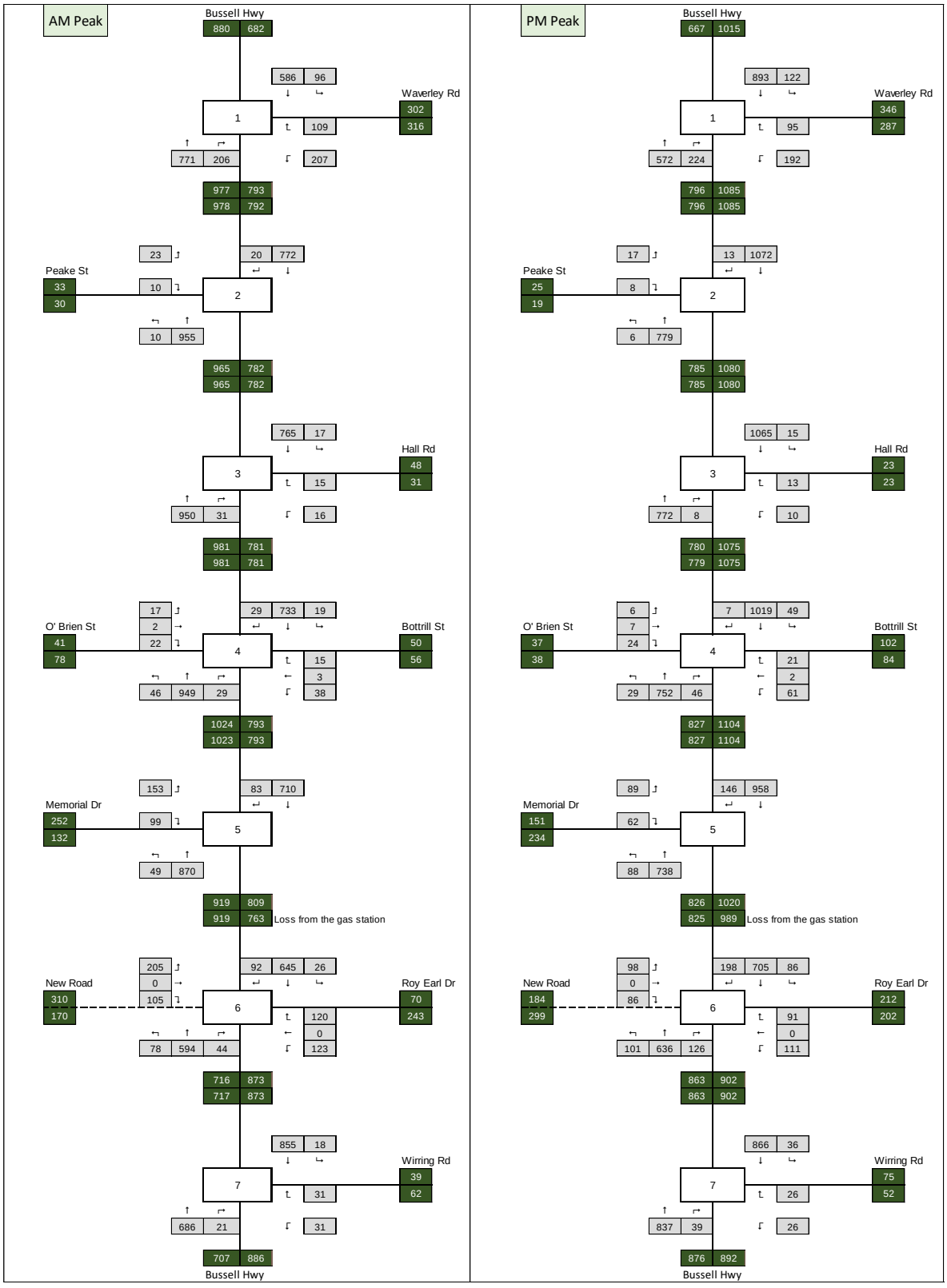


Figure B-21 2033 Traffic Volumes



B.5.1 Output Definitions

SIDRA intersection analysis was undertaken for the subject intersection. SIDRA 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 (LOS) and the 95th percentile queue.

- Degree of Saturation (DOS): the ratio of the arrival traffic flow to the capacity of the approach during the same period. The theoretical intersection capacity is exceeded from an intersection with DOS > 0.80 for unsignalised intersections, 0.85 for roundabouts and 0.90 for signalised intersections.
- 95% percentile queue: the statistical estimate of the queue length up to or below which 95% of all observed queues would be expected.
- Average delay: the weighted average of the delays computed from all the turns was used as the average delay of signalised intersections and roundabouts while the weighted average of the delays computed from yielding/stopping turns was used as the average delay priority and stop controlled intersections.
- Level of Service (LOS): a qualitative measure describing operational conditions within a traffic stream and perception by motorists and/or passengers. The different levels of service can generally be described as shown in **Table B-11**.

Table B-11 Intersection Level of Service Criteria

LOS	Description	Signalised Intersection	Roundabouts	Unsignalised Intersection
A	No or minimal delays (best condition). Queues are rarely more than one vehicle.	≤10 sec	≤10 sec	≤10 sec
B	Short traffic delays. Occasionally more than one queued vehicle.	10-20 sec	10-20 sec	10-15 sec
C	Average traffic delays. Often more than one queued vehicle.	20-35 sec	20-35 sec	15-25 sec
D	Long traffic delays. Regularly more than one queued vehicle.	35-55 sec	35-50 sec	25-35 sec
E	Very long traffic delays. Traffic demand is near or equal to the practical capacity of the intersection. Almost always more than one queued vehicle.	55-80 sec	50-70 sec	35-50 sec
F	Forced flow conditions with extensive delays caused by geometric and/or operational constraints external to the intersection	≥80 sec	≥70 sec	≥50 sec

Source: Highway Capacity Manual, 1997

B.5.1.1. Staged Crossings

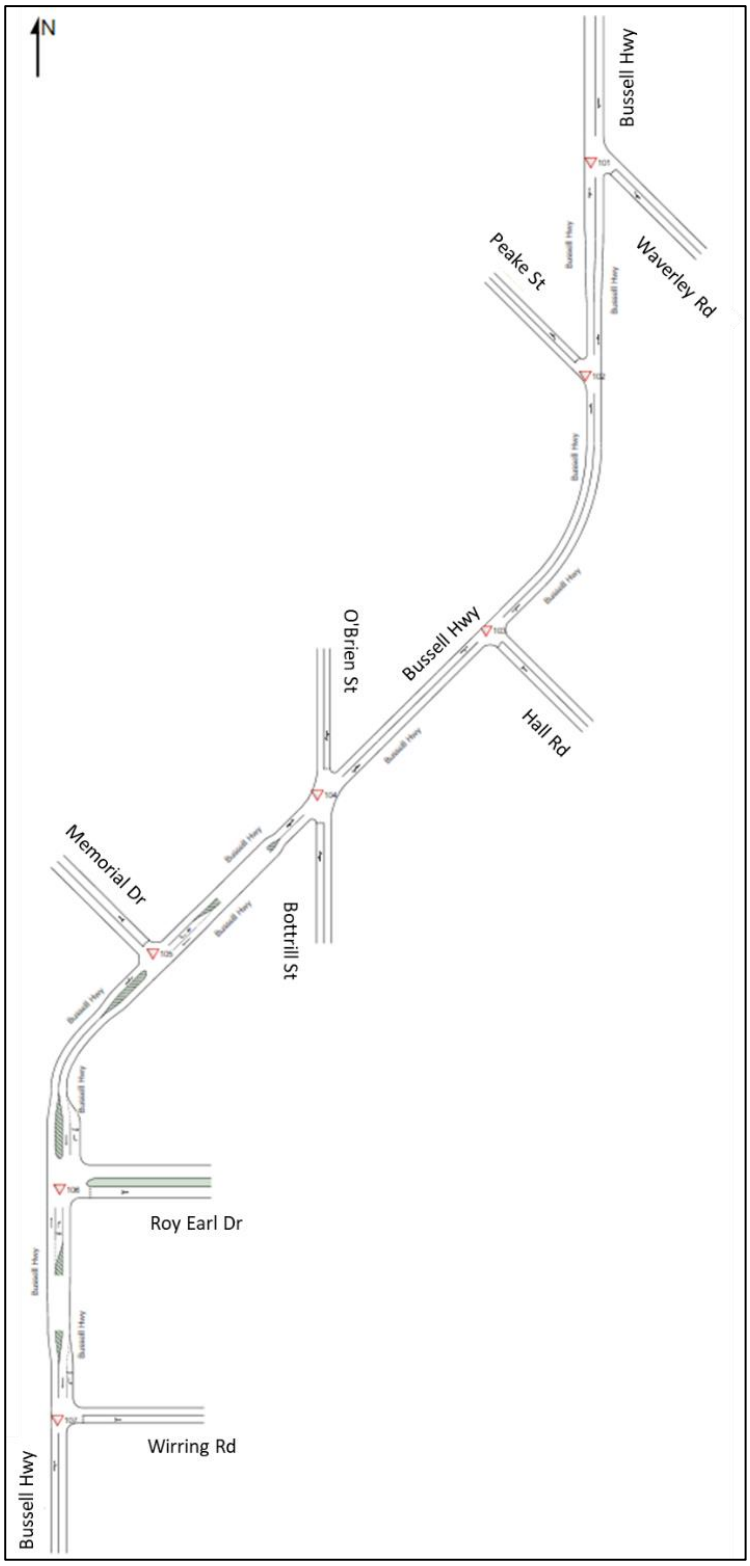
As mentioned in the MRWA Operational Modelling Guidelines, the modelling results for staged crossing movements should be based on the overall condition for both sites:

- DOS: maximum degree of saturation for two stages
- Overall average delay: sum of average delay for two stages
- LOS: based on the overall average delay for two stages

B.5.2 Scenario 1 – 2024 Base Case SIDRA model and Results

The SIDRA models were coded as a network due to the distance of the intersections from each other to capture any interactions between the intersections. The Scenario 1 SIDRA network is shown in **Figure B-22**.

Figure B-22 Scenario 1 – SIDRA Network



The results of the SIDRA network are shown in **Table B-12** for the AM peak period and **Table B-13** for the PM peak period. Based on the results, all intersections are currently performing satisfactorily with LOS A to LOS C.

Table B-12 Scenario 1 - AM Peak - SIDRA Results

ID	Intersection	DOS	Delay (seconds)	LOS	Queue (m)
1	Bussell Hwy / Waverley Rd	0.35	8	A	10
2	Bussell Hwy / Peake St	0.29	9	A	2
3	Bussell Hwy / Hall Rd	0.33	9	A	3
4	Bussell Hwy / O'Brien St / Bottrill St	0.35	10	B	3
5	Bussell Hwy / Memorial Dr	0.55	16	C	18
6	Bussell Hwy / Roy Earl Dr	0.28	14	B	8
7	Bussell Hwy / Wirring Rd	0.28	11	B	1

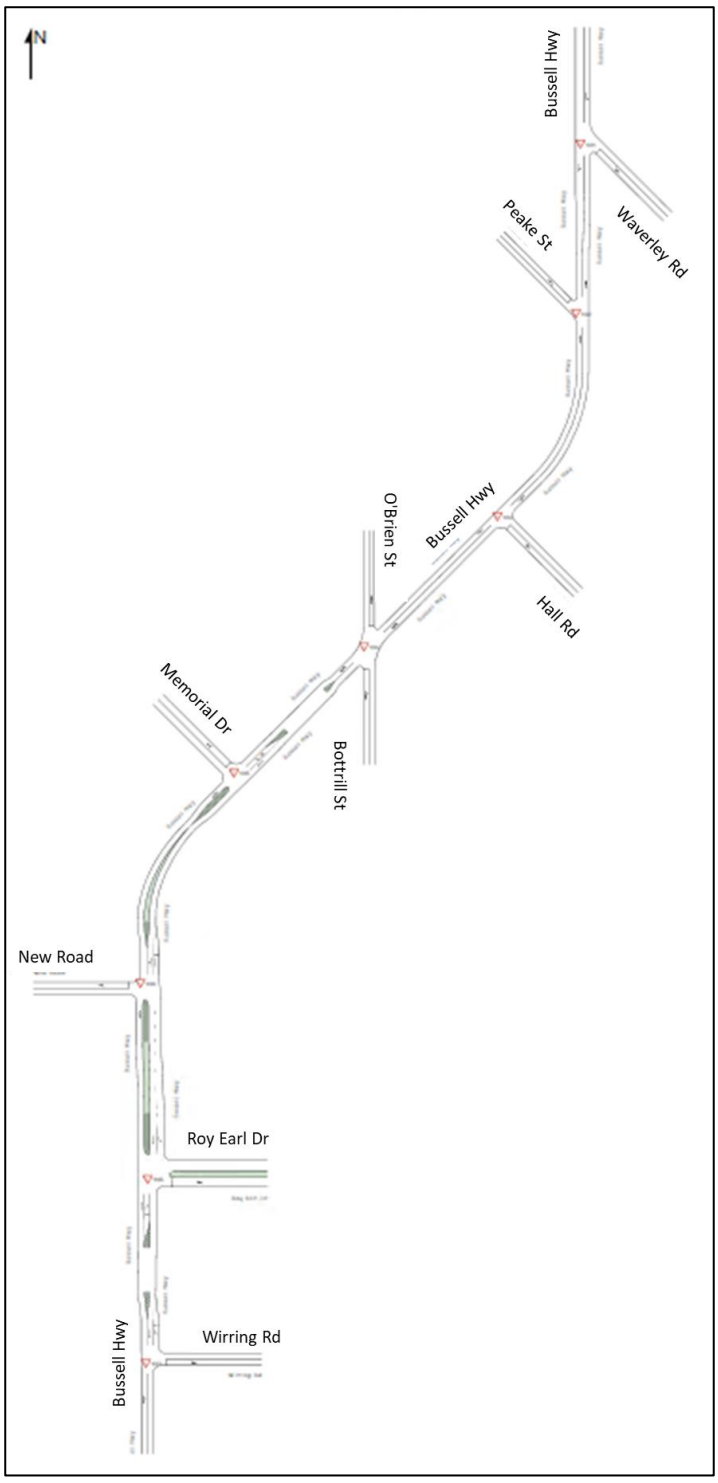
Table B-13 Scenario 1 - PM Peak - SIDRA Results

ID	Intersection	DOS	Delay (seconds)	LOS	Queue (m)
1	Bussell Hwy / Waverley Rd	0.32	9	A	11
2	Bussell Hwy / Peake St	0.36	8	A	1
3	Bussell Hwy / Hall Rd	0.26	10	B	1
4	Bussell Hwy / O'Brien St / Bottrill St	0.35	11	B	5
5	Bussell Hwy / Memorial Dr	0.59	18	C	25
6	Bussell Hwy / Roy Earl Dr	0.28	13	B	8
7	Bussell Hwy / Wirring Rd	0.29	13	B	2

B.6 Scenario 2 – 2028 Short Term SIDRA model and Results

The SIDRA models were coded as a network due to the distance of the intersections from each other to capture any interactions between the intersections. The Scenario 2 SIDRA network is shown in **Figure B-23**. For this analysis, the intersections remain the same as Scenario 1 except for the new road (from Lot 102: C1) from the west intersecting with Bussell Highway between Memorial Drive and Roy Earl Drive.

Figure B-23 Scenario 2 – SIDRA Network



The results of the 2028 SIDRA network are shown in **Table B-14** for the AM peak period and **Table B-15** for the PM peak period. The analysis shows that Bussell Highway / Memorial Drive will fail in 2028 with LOS F and DOS greater than 0.80 recorded during the AM and PM peak periods. Vehicles exiting Memorial Drive onto Bussell Highway experienced significant delays and queueing due to the high Bussell Highway through traffic. The Bussell Highway / New Road intersection is shown to operate close to capacity with a DOS recorded greater than 0.80 and a LOS D.

Upgrades are recommended for Bussell Highway / Memorial Drive intersection to help improve the flow of traffic for year 2028. The mitigation measures are discussed in the subsection below.

Table B-14 Scenario 2 - AM Peak - SIDRA Results

ID	Intersection	DOS	Delay (seconds)	LOS	Queue (m)
1	Bussell Hwy / Waverley Rd	0.50	12	B	29
2	Bussell Hwy / Peake St	0.39	12	B	3
3	Bussell Hwy / Hall Rd	0.45	15	C	6
4	Bussell Hwy / O'Brien St / Bottrill St	0.46	16	C	6
5	Bussell Hwy / Memorial Dr	2.12	808	F	646
6a	Bussell Hwy / New Road	0.83	26	D	54
6b	Bussell Hwy / Roy Earl Dr	0.62	31	D	20
7	Bussell Hwy / Wirring Rd	0.36	17	C	2

Table B-15 Scenario 2 - PM Peak - SIDRA Results

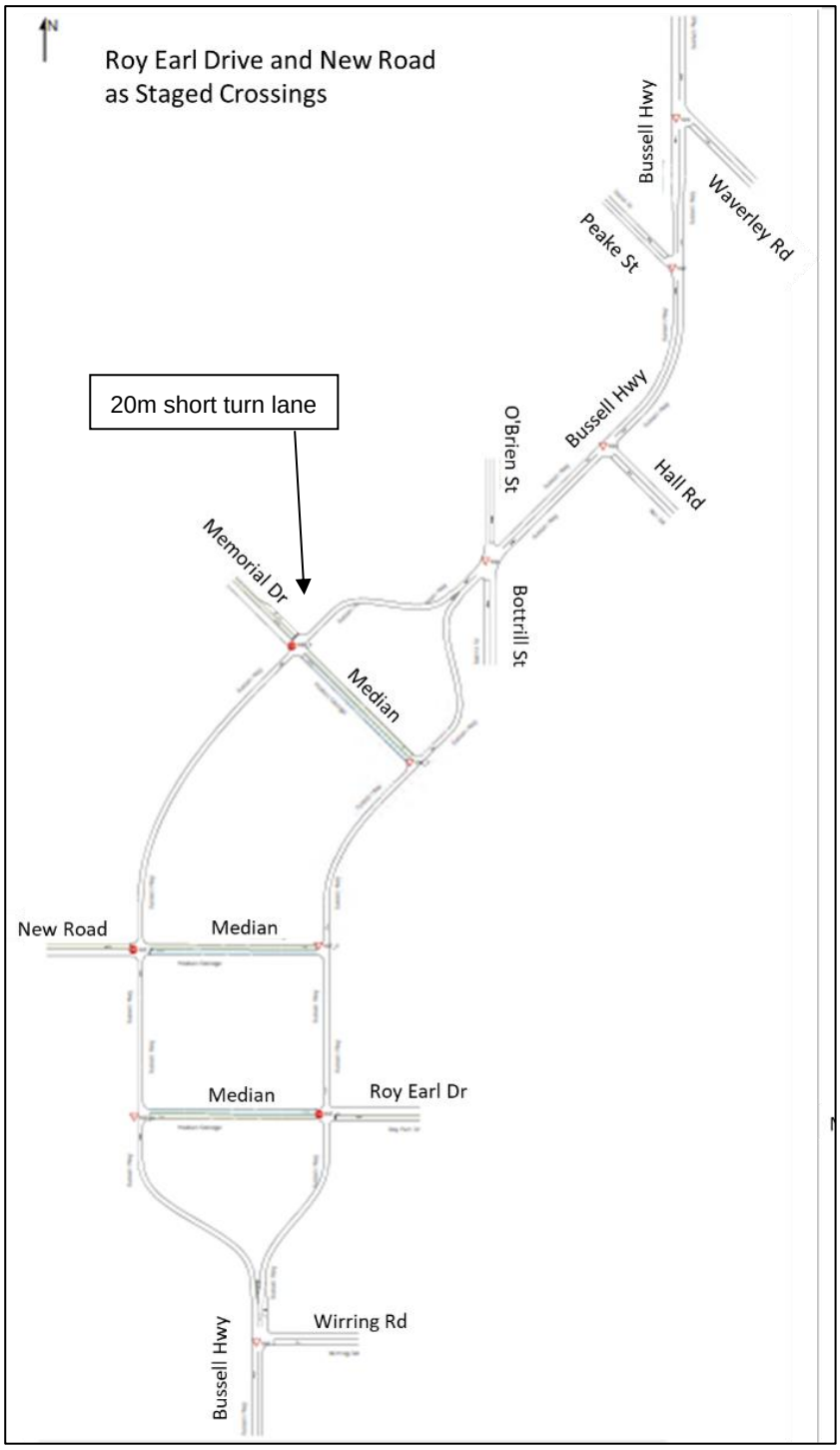
ID	Intersection	DOS	Delay (seconds)	LOS	Queue (m)
1	Bussell Hwy / Waverley Rd	0.60	16	C	42
2	Bussell Hwy / Peake St	0.50	13	B	2
3	Bussell Hwy / Hall Rd	0.35	19	C	2
4	Bussell Hwy / O'Brien St / Bottrill St	0.49	22	C	13
5	Bussell Hwy / Memorial Dr	1.76	385	F	319
6a	Bussell Hwy / New Road	0.83	27	D	39
6b	Bussell Hwy / Roy Earl Dr	0.71	33	D	24
7	Bussell Hwy / Wirring Rd	0.41	20	C	4

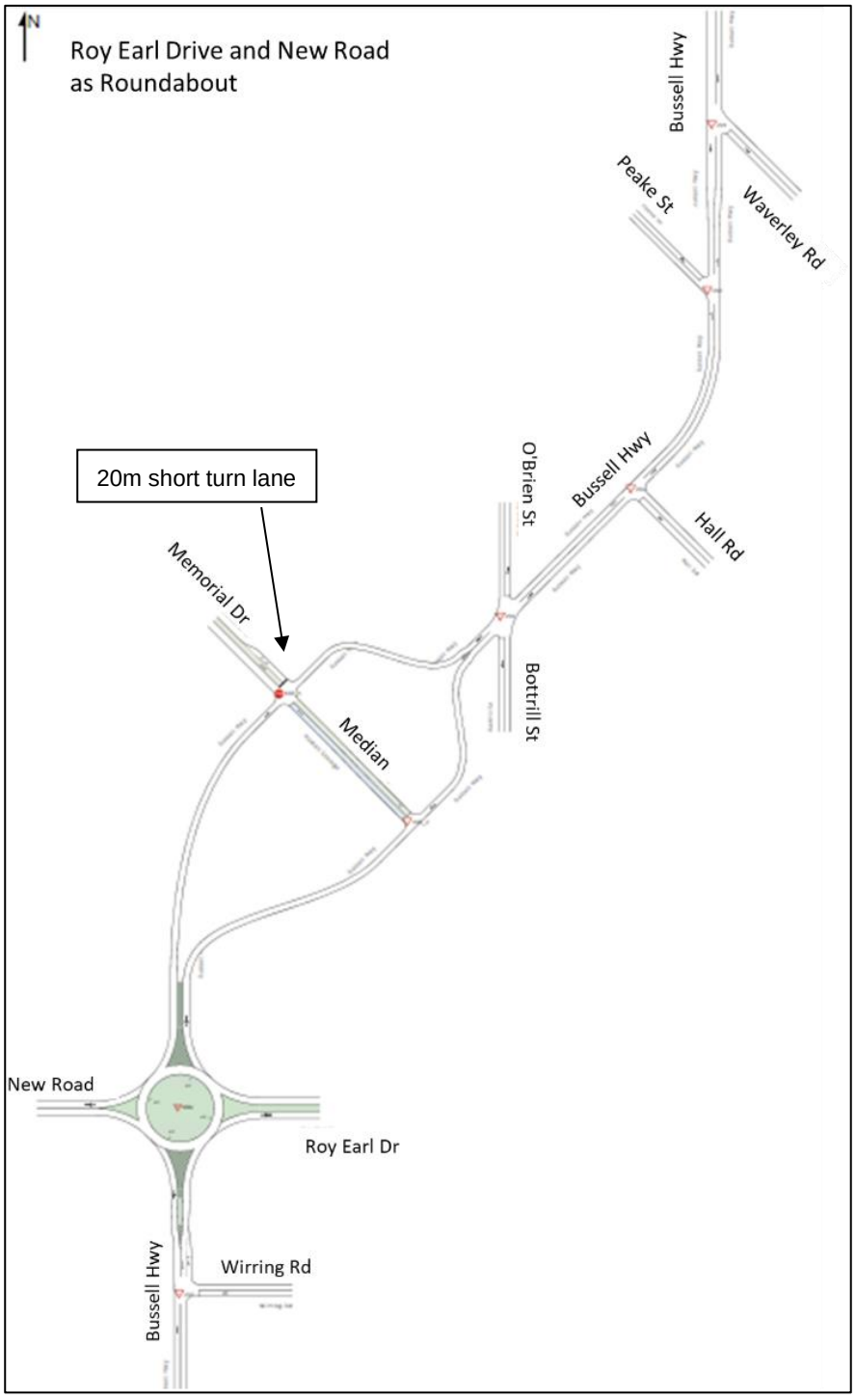
B.6.1 Scenario 2 with Mitigation Measures

The SIDRA layouts for Scenario 2 with mitigation measures are shown in **Figure B-24**. To improve the operation of the Bussell Highway / Memorial Drive intersection, an upgrade to a type A staged crossing with a 7-meter-wide median is proposed with an additional 20m left turn pocket on Memorial Drive.

Two options were tested for the Bussell Highway / New Road and Bussell Highway / Roy Earl Drive intersections. The first of the figures shows a staggered type A staged crossing layout. The second figure shows a single 4-way roundabout for the New Road and Roy Earl Drive intersection.

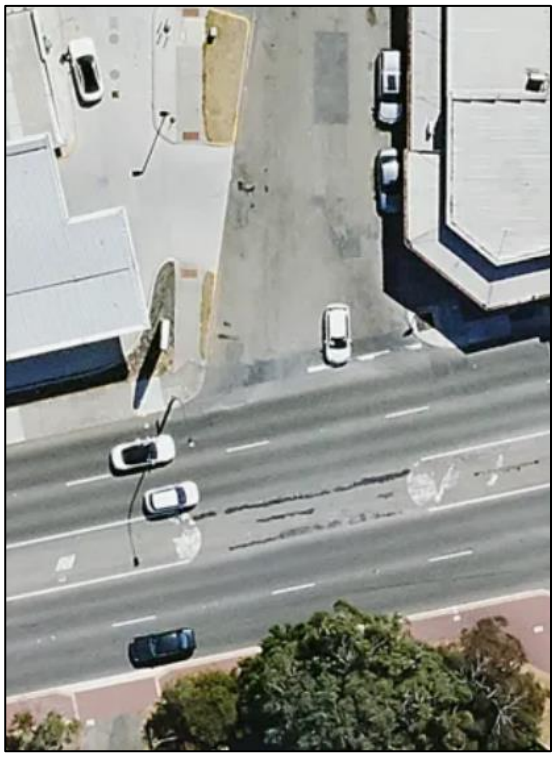
Figure B-24 Scenario 2 with Mitigation Measures – SIDRA Network





A sample of a type A staged crossing is shown in **Figure B-25**. To mimic the behavior of vehicles storing in the space between the medians, the SIDRA was modelled to have a 7-meter road between the northbound and southbound lanes of Bussell Highway. A type A staged crossing will require widening short sections of the road near the intersections to accommodate the medians.

Figure B-25 Type A Stafed Crossing Sample – Stirling Highway / Broome Street



Based on measurements from the aerial photograph in **Figure B-26** and **Figure B-27**, there is approximately 4m on the eastern median and5m on the western median of additional road reservation space for the Bussell Highway / Memorial Drive intersection and around 2m on the eastern median and 13m on the western median for the Bussell Highway / Roy Earl Drive intersection. Measurements were made from the edge of the outer lanes to the cadastre near the intersections for each side of the roads which can potentially provide enough space to accommodate the 7-meter wide median. It should be noted that the recommendations are subject to detailed design.

Figure B-26 Bussell Highway / Memorial Drive – Aerial Photograph

Figure B-27 Bussell Highway / Roy Earl Drive – Aerial Photograph

The results of the 2028 SIDRA network with mitigation measures are shown in **Table B-16** for the AM peak period and **Table B-17** for the PM peak period. The analysis shows that upgrading Bussell Highway / Memorial Drive improves the performance of the intersection from LOS F to LOS C during the AM peak and to LOS B during the PM peak. While for the Bussell Highway / New Road and Bussell Highway / Roy Earl Drive, it shows that both layouts will improve the DOS.

Due to the improved performance of the Bussell Highway / Memorial Drive intersection, the Memorial Drive traffic has been fully released. As such, the right turn out from Bottrill Street onto Bussell Highway experiences a large delay at 51 seconds during the PM peak, noting that the overall intersection performance is at LOS C for both peak periods.

Table B-16 Scenario 2 with Mitigation Measures

ID	Intersection	DOS	Delay (seconds)	LOS	Queue (m)
1	Bussell Hwy / Waverley Rd	0.56	14	B	36
2	Bussell Hwy / Peake St	0.39	14	B	4
3	Bussell Hwy / Hall Rd	0.49	16	C	7
4	Bussell Hwy / O'Brien St / Bottrill St	0.51	19	C	8
5	Bussell Hwy / Memorial Dr	0.38	18	C	9
6a	Bussell Hwy / New Road (as a Staggered Staged Type A Crossing)	0.47	17	C	20
6b	Bussell Hwy / Roy Earl Dr (as a Staggered Staged Type A Crossing)	0.34	17	C	6
6	Bussell Hwy / Roy Earl Dr / New Road (as a roundabout)	0.48	3	A	33
7	Bussell Hwy / Wirring Rd	0.36	18	C	2

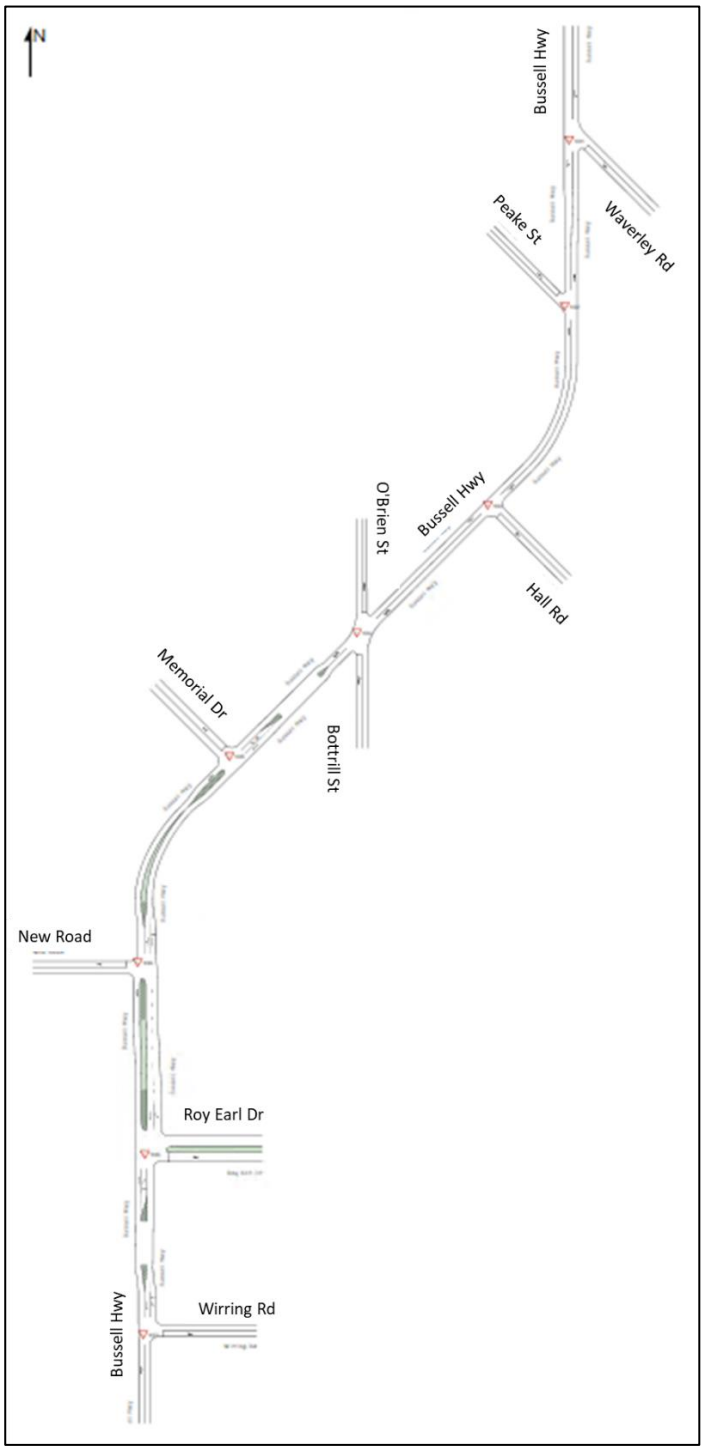
Table B-17 Scenario 2 with Mitigation Measures

ID	Intersection	DOS	Delay (seconds)	LOS	Queue (m)
1	Bussell Hwy / Waverley Rd	0.62	17	C	47
2	Bussell Hwy / Peake St	0.50	13	B	2
3	Bussell Hwy / Hall Rd	0.37	20	C	2
4	Bussell Hwy / O'Brien St / Bottrill St	0.49	23	C	14
5	Bussell Hwy / Memorial Dr	0.51	15	B	5
6a	Bussell Hwy / New Road (as a Staggered Staged Type A Crossing)	0.47	14	B	9
6b	Bussell Hwy / Roy Earl Dr (as a Staggered Staged Type A Crossing)	0.39	16	C	6
6	Bussell Hwy / Roy Earl Dr / New Road (as a roundabout)	0.59	4	A	44
7	Bussell Hwy / Wirring Rd	0.41	21	C	4

B.7 Scenario 3 – 2033 Medium Term SIDRA model and Results

The SIDRA models were coded as a network, due to the distance of the intersections to capture any interactions between the intersections. The Scenario 3 SIDRA network is shown in **Figure B-28**. For this analysis, the intersections remain the same as Scenario 2.

Figure B-28 Scenario 3 – SIDRA Network



The results of the 2033 SIDRA network are shown in **Table B-18** for the AM peak period and

Table B-19 for the PM peak period. The SIDRA network results show that the following intersections will perform poorly by year 2033 without any mitigation measures:

- Bussell Highway / Waverley Road
- Bussell Highway / O'Brien Street / Bottrill Street
- Bussell Highway / Memorial Drive
- Bussell Highway / New Road
- Bussell Highway / Roy Earl Drive
- Bussell Highway / Wirring Road

Upgrades are recommended for these intersections to help improve the flow of traffic for year 2033. The mitigation measures are discussed in the subsection below.

Table B-18 Scenario 3 - AM Peak - SIDRA Results

ID	Intersection	DOS	Delay (seconds)	LOS	Queue (m)
1	Bussell Hwy / Waverley Rd	1.16	123	F	276
2	Bussell Hwy / Peake St	0.48	16	C	7
3	Bussell Hwy / Hall Rd	0.50	22	C	10
4	Bussell Hwy / O'Brien St / Bottrill St	0.51	25	D	10
5	Bussell Hwy / Memorial Dr	4.49	2425	F	1021
6a	Bussell Hwy / New Road	1.49	376	F	555
6b	Bussell Hwy / Roy Earl Dr	2.33	1056	F	734
7	Bussell Hwy / Wirring Rd	0.47	32	D	12

Table B-19 Scenario 3 - PM Peak - SIDRA Results

ID	Intersection	DOS	Delay (seconds)	LOS	Queue (m)
1	Bussell Hwy / Waverley Rd	1.94	562	F	729
2	Bussell Hwy / Peake St	0.60	21	C	4
3	Bussell Hwy / Hall Rd	0.40	37	E	5
4	Bussell Hwy / O'Brien St / Bottrill St	0.78	52	F	29
5	Bussell Hwy / Memorial Dr	3.94	1445	F	591
6a	Bussell Hwy / New Road	1.76	384	F	428
6b	Bussell Hwy / Roy Earl Dr	2.93	1107	F	693
7	Bussell Hwy / Wirring Rd	0.67	45	F	22

B.7.1 Scenario 3 with Mitigation Measures

Mitigation measures to alleviate the congestion were completed iteratively to obtain a solution for the network to perform sufficiently and accommodate all future year demands in 2033. Initially, additional turn pockets were placed on the minor roads. The results demonstrated that the additional turn pockets were not enough to improve the performance of the intersections.

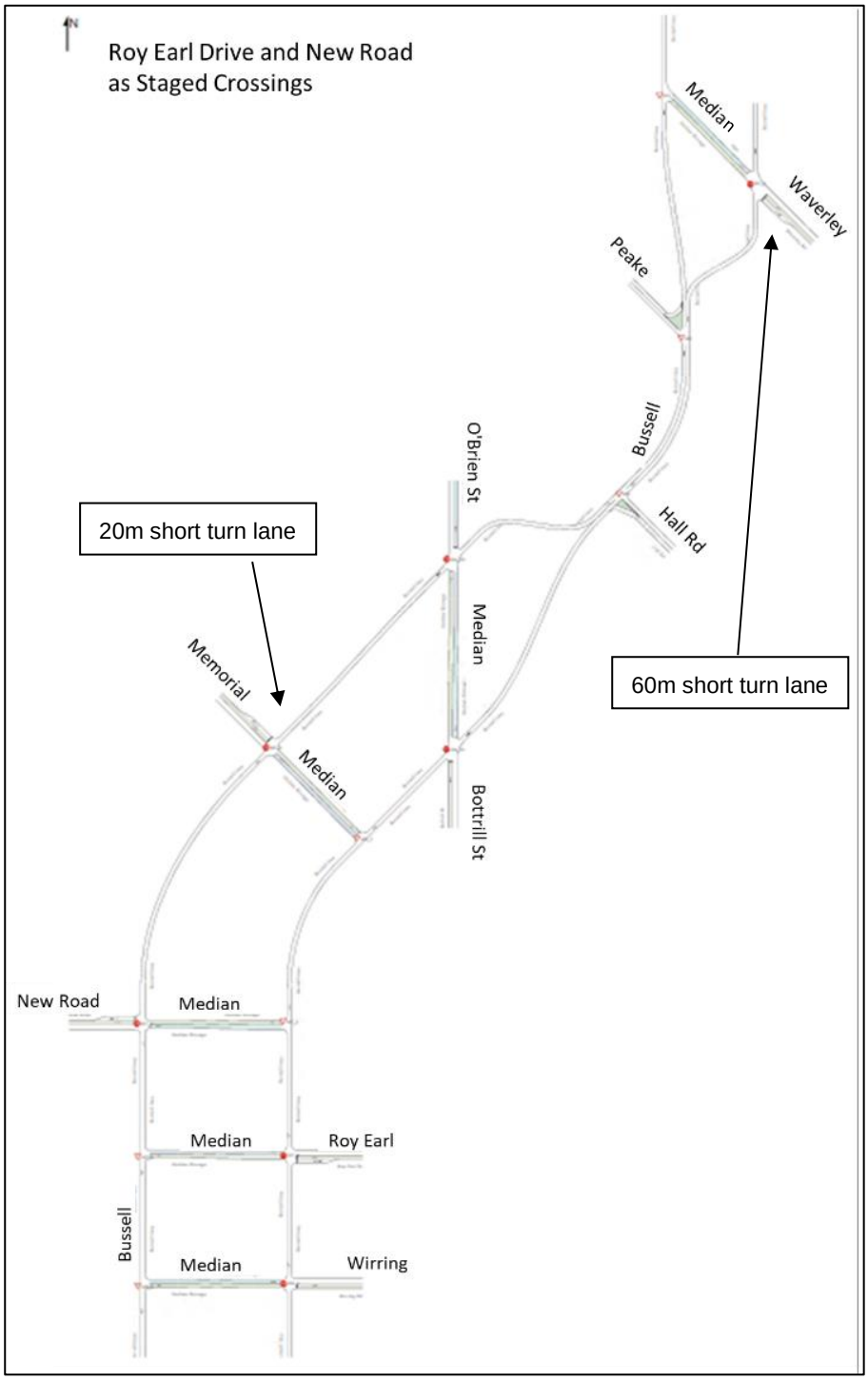
As such, more significant mitigation measures were introduced into Scenario 3 as shown in **Figure B-29**, and detailed as follows:

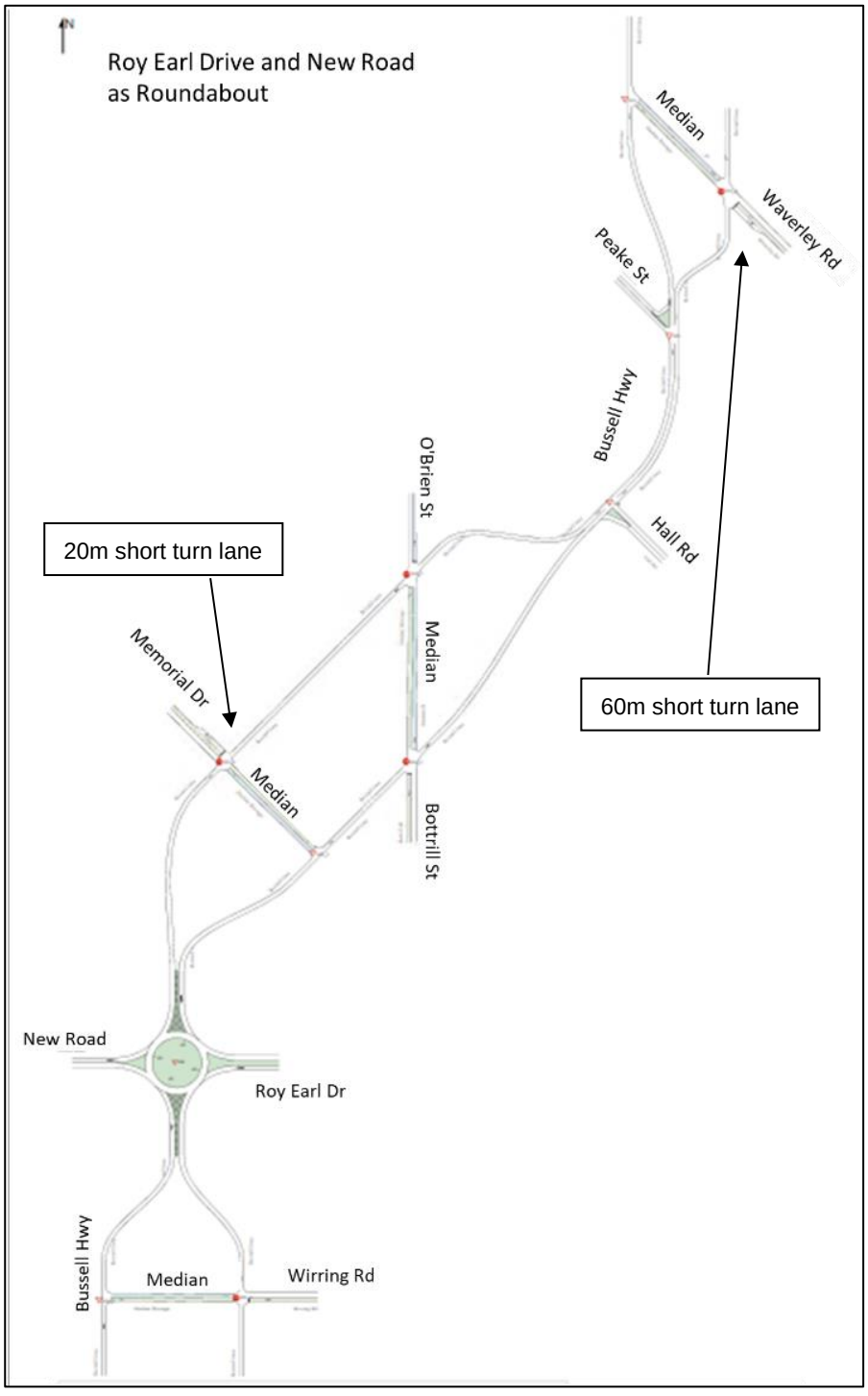
- Bussell Highway / Waverley Road intersection was upgraded from a priority-controlled intersection to a type A staged crossing. Additionally, a 60m left turn pocket on Waverley Road has been introduced.
- Bussell Highway / O'Brien Street / Bottrill Street was changed from a priority intersection to a four-way type A staged crossing.
- Bussell Highway / Memorial Drive was changed from a priority intersection to a type A staged crossing with a 20m left turn pocket on Memorial Drive (as per the mitigation measure adopted in the 2028 scenario).
- Bussell Highway / Wirring Road was changed from a priority intersection to a type A staged crossing.
- Bussell Highway / New Road and Bussell Highway / Roy Earl Drive were tested for two scenarios. One as staggered type A staged crossings, and another as a single 4-way roundabout (as per the mitigation measure adopted in the 2028 scenario).
- The following intersections are changed from full priority-controlled intersections to left-in left-out only intersections: Bussell Highway / Peake Street and Bussell Highway / Hall Road.

All type A staged crossings are assumed to have a 7m wide median. For the left-in left-out only intersections, it is assumed that the traffic turning right in and out of Bussell Highway / Peake Street and Bussell Highway / Hall Road will shift to the Bussell Highway / O'Brien Street / Bottrill Street intersection.

Two options were tested for the Bussell Highway / New Road and Bussell Highway / Roy Earl Drive intersections. The first of the figures shows a staggered type A staged crossing layout.. The second figure shows a single 4-way roundabout for the New Road and Roy Earl Drive intersection.

Figure B-29 Scenario 3 with Mitigations – SIDRA Network





Based on measurements from the aerial photograph in **Figure B-30** and **Figure B-31**, there is approximately 6m on the eastern median and 7m on the western median for Bussell Highway / O'Brien Street / Bottrill Street and approximately 4m on the eastern median and 7m on the western median for Bussell Highway / Waverley Road. Measurements taken from the edge of the outer lanes to the cadastre near the intersections for each side of the roads which can potentially provide enough space to accommodate the 7-meter wide median. Some of the on-street parking to the east of O'Brien Street and Bottrill Street may need to be removed or relocated to accommodate the 7-meter wide median. It should be noted that the recommendations are subject to detailed design.

Figure B-30 Bussell Highway / O'Brien Street / Bottrill Street – Aerial Photograph

Figure B-31 Bussell Highway / Waverley Raod – Aerial Photograph

The results of the 2033 SIDRA network with mitigation measures are shown in **Table B-20** for the AM peak period and **Table** B-21 for the PM peak period. The key takeaways from the analysis:

- The results demonstrate that with the mitigation measures introduced will help improve the performance of the intersections with LOS ranging from LOS A to LOS D for all intersections.
- Some of the queues on the median of the staged crossings will spill onto Bussell Highway and the local roads. The following maximum 95th percentile queues were observed that will fill the median:
  - Bussell Highway / Waverley Road: 15m (right out) and 17m (right in)
  - Bussell Highway / O'Brien Street / Bottrill Street: 6m (northbound and southbound)
  - Bussell Highway / Memorial Drive: 8m (right out) and 10m (right in)
- Both layouts for Bussell Highway / New Road and Bussell Highway / Roy Earl Drive will perform well however for the roundabout a 126m 95th percentile queue is observed on the south approach of Bussell

Highway / Roy Earl Drive during the PM peak however there is enough distance between Roy Earl Drive and Wirring Road to prevent this queue from affecting the vehicles at the Wirring Road / Bussell Highway intersection.

Table B-20 Scenario 3 with Mitigation Measures - AM Peak - SIDRA Results

ID	Intersection	DOS	Delay (seconds)	LOS	Queue (m)
1	Bussell Hwy / Waverley Rd	0.65	22	C	15
2	Bussell Hwy / Peake St	0.07	15	C	2
3	Bussell Hwy / Hall Rd	0.04	11	B	1
4	Bussell Hwy / O'Brien St / Bottrill St	0.62	19	C	6
5	Bussell Hwy / Memorial Dr	0.53	28	D	17
6a	Bussell Hwy / New Road (as a Staggered Staged Type A Crossing)	0.47	22	C	17
6b	Bussell Hwy / Roy Earl Dr (as a Staggered Staged Type A Crossing)	0.43	24	C	10
6	Bussell Hwy / Roy Earl Dr / New Road (as a roundabout)	0.64	5	A	53
7	Bussell Hwy / Wirring Rd	0.43	22	C	5

Table B-21 Scenario 3 with Mitigation Measures - PM Peak - SIDRA Results

ID	Intersection	DOS	Delay (seconds)	LOS	Queue (m)
1	Bussell Hwy / Waverley Rd	0.84	35	D	26
2	Bussell Hwy / Peake St	0.03	11	B	1
3	Bussell Hwy / Hall Rd	0.04	18	C	1
4	Bussell Hwy / O'Brien St / Bottrill St	0.64	27	D	13
5	Bussell Hwy / Memorial Dr	0.67	25	C	11
6a	Bussell Hwy / New Road (as a Staggered Staged Type A Crossing)	0.65	22	C	15
6b	Bussell Hwy / Roy Earl Dr (as a Staggered Staged Type A Crossing)	0.52	23	C	9
6	Bussell Hwy / Roy Earl Dr / New Road (as a roundabout)	0.84	9	A	126
7	Bussell Hwy / Wirring Rd	0.52	21	C	4

B.8 Traffic Modelling Conclusion

The following summarises the traffic modelling analysis:

- The intersections are currently performing satisfactorily.
- A growth rate of 4% per annum was utilised to determine the future through traffic demand on Bussell Highway.
- All the future developments considered around the area will generate approximately 834 vehicles for during the AM peak and 926 vehicles during the PM peak by year 2033.
- Overall, the intersections will perform satisfactorily by year 2028 with exception for the Bussell Highway / Memorial Drive intersection which records a LOS F and Bussell Highway / New Road operating close to capacity with DOS greater than 0.80 recorded in both AM and PM peaks. It is recommended that the Bussell Highway / Memorial Drive intersection is upgraded to a type A staged crossing and for Bussell Highway / New Road and Bussell Highway / Roy Earl Drive is upgraded to either a staggered type A staged crossing or a single 4-way roundabout to accommodate the 2028 demands.
- For year 2033, all the intersections will perform poorly without any treatments. The following mitigations are recommended to improve the performance of the network:
  - Upgrade the following intersections to a type A staged crossing:
    (i) Bussell Highway / Waverley Road.
    (ii) Bussell Highway / O'Brien Street / Bottrill Street.
    (iii) Bussell Highway / Memorial Drive.
    (iv) Bussell Highway / Wirring Road.
  - Upgrade the following intersections to only allow left-in and left-out movements to the local roads:
    (i) Bussell Highway / Peake Street.
    (ii) Bussell Highway / Hall Road.
  - Upgrade the following intersections to either a staggered type A staged crossing or a single 4-way roundabout:
    (i) Bussell Highway / New Road.
    (ii) Bussell Highway / Roy Earl Drive.

Stantec Australia Pty Ltd
Ground Floor,
226 Adelaide Terrace
Perth WA 6000
Tel +61 8 6222 7000