Amber

Traffic & Transportation Direction

Subdivision and Uses Development

13L Narromine Road (Lot 22 DP1038924) and Jannali Road (Lot 7 DP223428), Dubbo

Traffic and Transport Assessment

August 2022

Reference: 354 rep 220830 final

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Traffic and Transport Assessment

Prepared for: The Bathla Group

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1. Introduction

1.1 Background

Amber Organisation has been engaged by The Bathla Group to advise on the traffic and transport matters of the proposed subdivision and future uses on the land at 13L Narromine Road and Lot 7 Jannali Road, Dubbo.

The proposal involves the subdivision of land at Lot 22 in DP1038924 and Lot 7 in DP223428, and construction of the associated internal road network. The northern part of the site is currently zoned IN2 – Light Industrial and is proposed to be established as B5 – Business Development zoned land with a total area of approximately 44.2 hectares with an additional 2 hectares zoned as B2 – Local Centre to accommodate a shopping centre. The southern part of the site is proposed to be established as residential land to provide approximately 1,631 lots.

Access to the site is proposed via a new connection with Narromine Road at its intersection with Richardson Road, prior to future connections with the wider road network that will be provided by others.

1.2 Purpose of Document

This Traffic and Transport Assessment has been prepared to assess the traffic impacts and the suitability of the road layout for the overall masterplan for the subdivision and future uses. The document is intended to be utilised for future Planning Proposals and Development Applications to allow the construction of the subdivision and future uses on the land. More specifically, the report addresses the following key matters:

- An assessment of the potential traffic impacts of the project on road network function and safety;
- An assessment of the capacity of the existing road network to accommodate the type and volume of traffic generated by the project;
- Review of the configuration for the internal road network to ensure suitable vehicle access is provided in a safe and efficient manner;
- Determine measures to mitigate and / or manage potential impacts and any other traffic control measures;
- An assessment of the parking provision against the relevant planning documents; and
- Ensure the proposed public transport, pedestrian and cyclist facilities connect with the existing facilities within the vicinity of the site.

The assessment also provides a sensitivity analysis in the event future connections are provided to Narromine Road and Minore Road following development of adjacent sites.

The document has been prepared based on the ultimate road layout for the site although it is acknowledged that the site will be developed in stages. Additional analysis is provided to assess the impacts of Stage 1 of the development which seeks to establish 579 residential lots. Stage 3 has also been assessed which proposes to increase the number of lots provided within the residential component of the site to 1,845 lots.

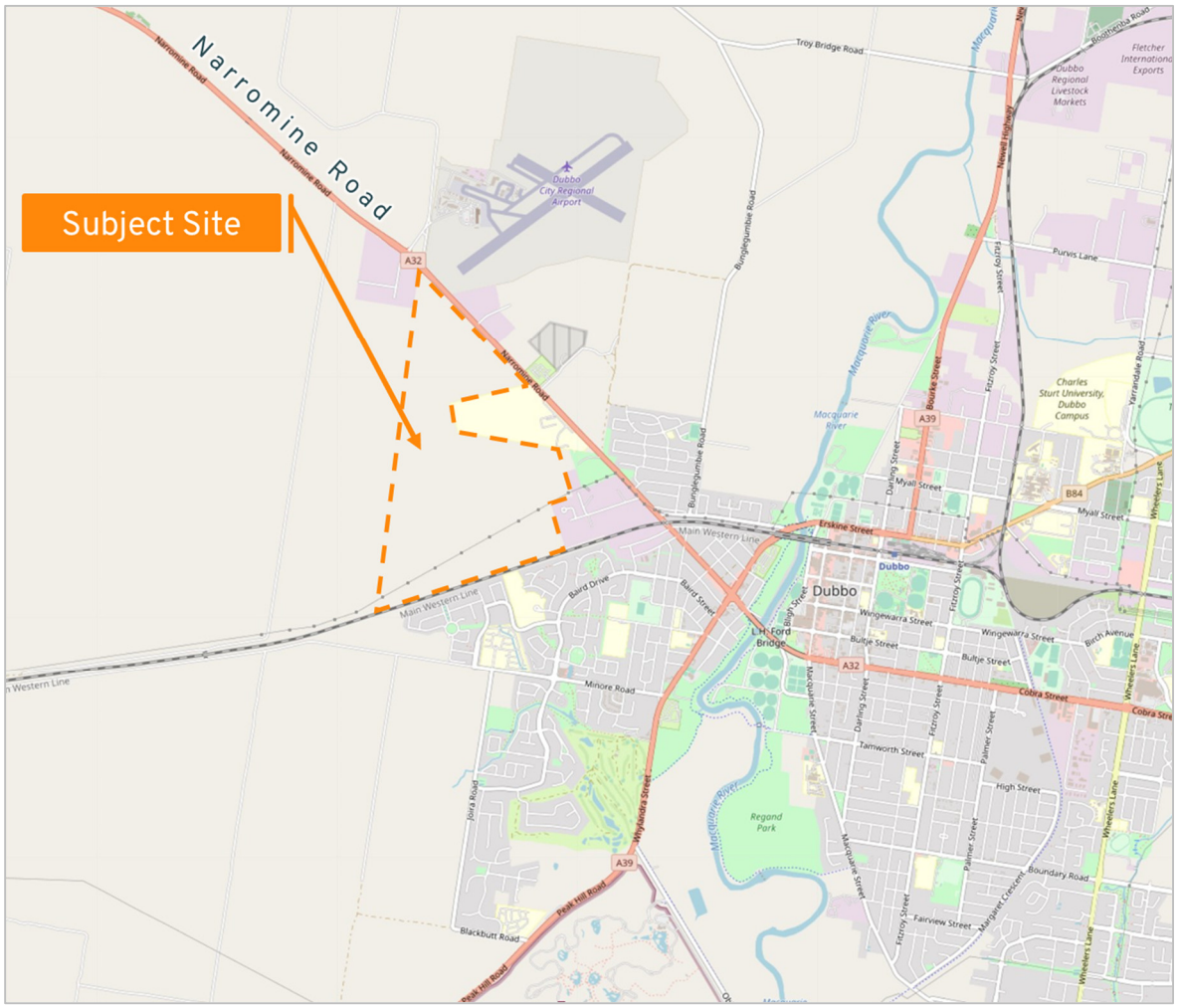
The traffic assessment has been undertaken in conjunction with consultation with Transport for NSW and Dubbo Regional Council.

2. Transport Environment

2.1 Site Location

The site is located at Lot 22 in DP1038924 and Lot 7 in DP223428 which is situated approximately 3.5 kilometres northwest of the Dubbo CBD. Figure 1 shows the location of the site in relation to the surrounding road network.

Figure 1: Site Location



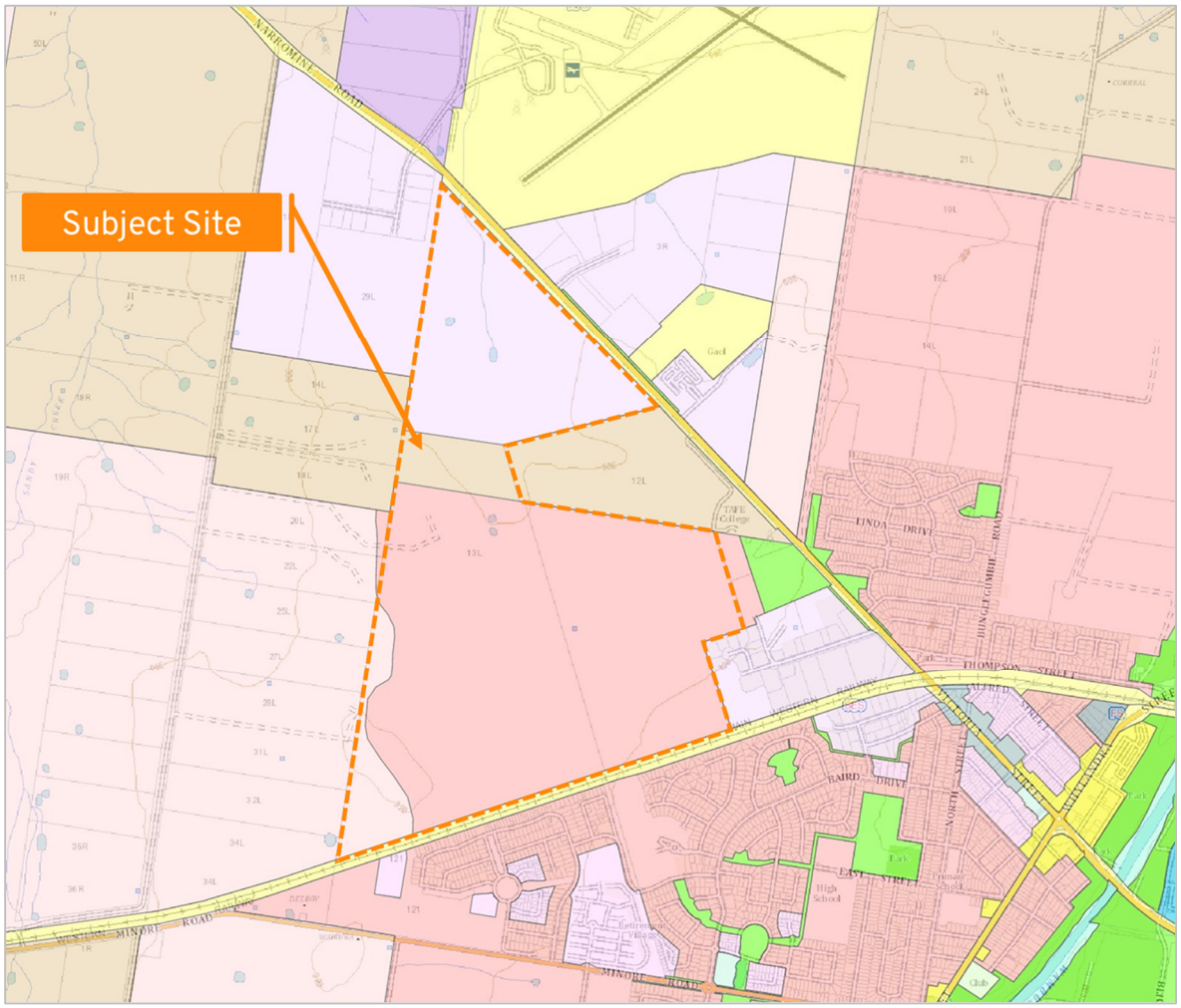
Source: OpenStreetMap

The site currently has the following land use zoning:

- The northern portion of the site is zoned IN2 – Light Industrial;
- The centre of the site has a small portion of RU2 – Rural Landscape;
- The southern portion of the site is primarily zoned R2 – Low Density Residential with some R5 – Large Lot Residential located in the southwestern corner of the site.

The land use zoning for the site and the surrounding area are shown within Figure 2.

Figure 2: Land Use Zoning



Source: ePlanning Spatial Viewer

The figure demonstrates the following surrounding land uses:

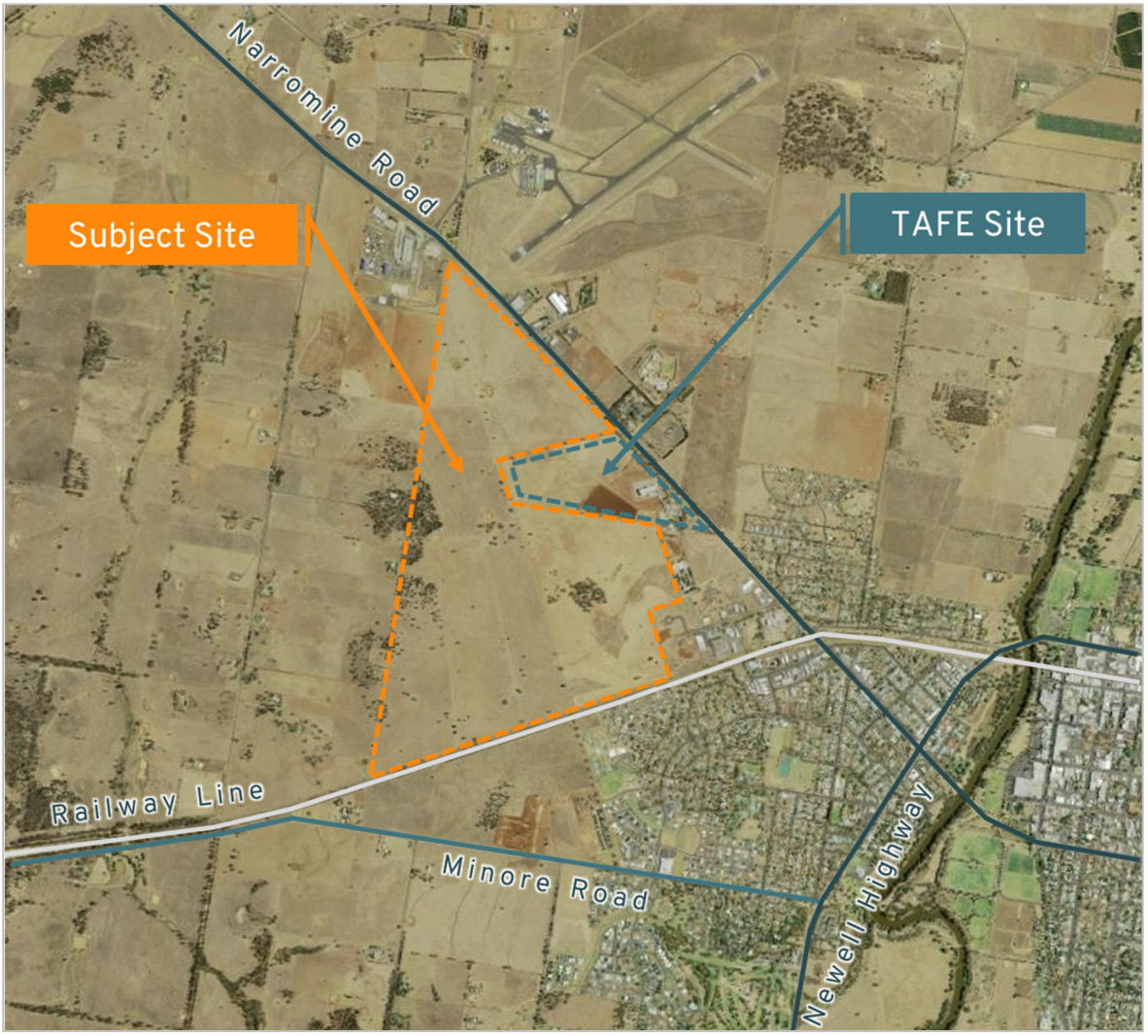
- Land to the west of the site reflects the zoning internally within the site, with IN2 land to the northwest, RU2 land to the west, and R5 land to the southwest;
- Land to the north of the site is also zoned IN2 with some SP2 – Air Transport and Emergency Services Facility land associated with the Dubbo City Regional Airport;
- Land along the southern boundary of the site is zoned SP2 – Railway and is associated with the railway line owned by Main Western Railway;
- Land further south of the railway line is primarily zoned R2 and is occupied by residential properties, with a small shopping centre provided approximately 1.0 kilometre southeast of the site; and
- Land to the east is zoned R2 and is occupied by residential dwellings.

The site has an irregular shape with a total area of approximately 273.52 hectares. The northern boundary of the site has a frontage with Narromine Road, and the southern boundary of the site has a frontage with the railway line. No vehicle access is currently provided to the site.

Figure 3 provides an aerial photograph view of the site and the surrounding area. The figure shows the site and the majority of the surrounding area is currently occupied by agricultural use.

Notably, TAFE NSW – Dubbo Narromine Road is located within the RU2 land to the east of the site and also fronts Narromine Road.

Figure 3: Aerial Photograph



Source: SixMaps

2.2 Road Network

Mitchell Highway (Narromine Road) is a State Road under the care and management of Transport for NSW. It runs in a general southeast-northwest alignment extending from Mid Western Highway in Bathurst to the NSW border at Barringun and into Queensland. Adjacent to the site it has a carriageway width of approximately 10 metres which accommodates one lane of traffic in each direction and sealed shoulders on both sides of the road. It has a speed limit of 90km/hr adjacent to the site which reduces to 60km/hr near Dubbo.

Richardson Road is a local road which provides access to a small area of industrial use. It extends northeast from Narromine Road for 320 metres to its termination. It has a carriageway width of approximately 9 metres which accommodates two-way vehicle movement.

The intersection of Narromine Road and Richardson Road is priority controlled, with vehicles exiting Richardson Road provided with Give Way signage and linemarking.

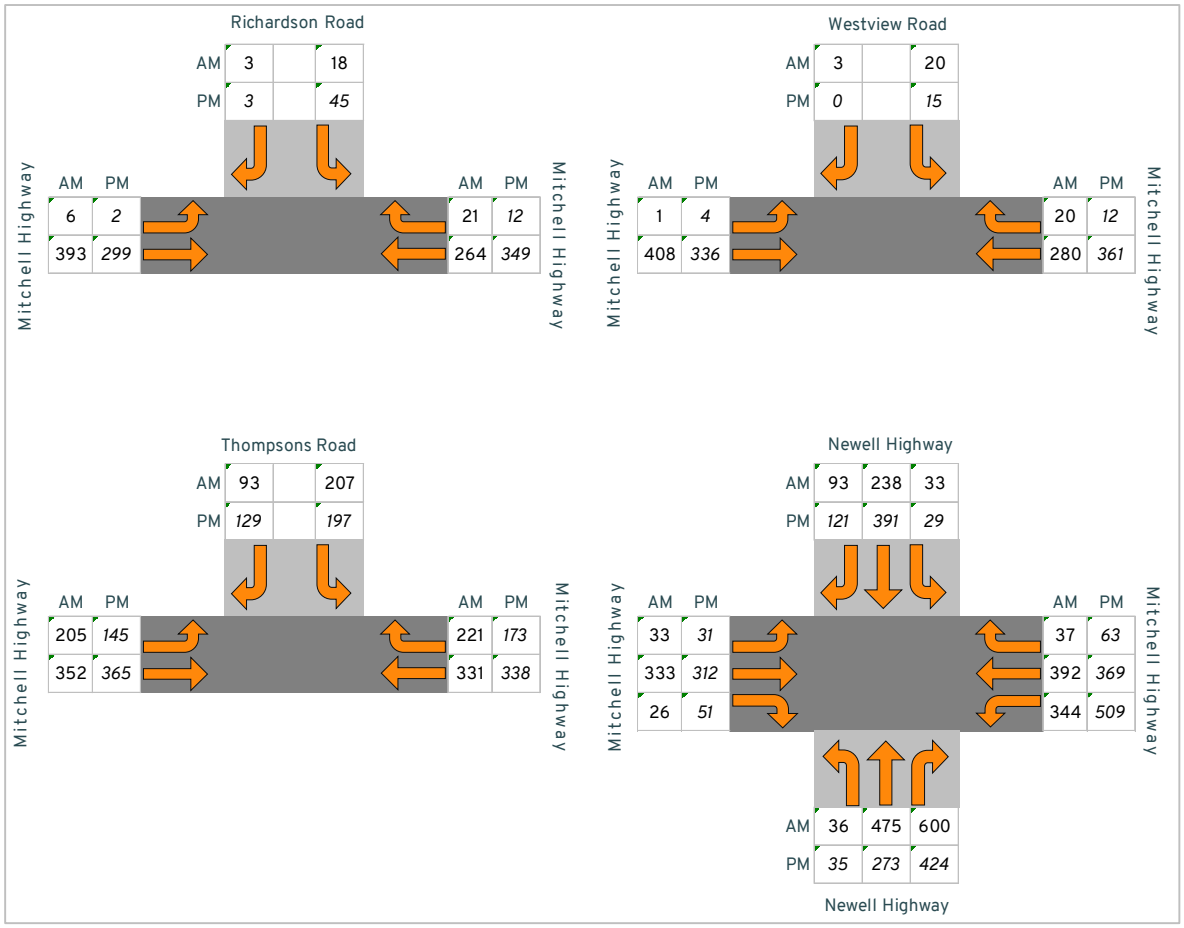
2.3 Traffic Conditions

Amber Organisation commissioned turning movement count surveys in order to determine the traffic conditions within the vicinity of the site. The surveys were undertaken on Thursday 12 May 2022 from 7:30am to 9:30am and 4:30pm to 6:30pm. The intersections surveyed included:

- Mitchell Highway / Richardson Road;
- Mitchell Highway / Westview Street;
- Mitchell Highway / Thompson Street; and
- Mitchell Highway / Newell Highway.

The results of the surveys are summarised in Figure 4 with the detailed survey results presented within Appendix A.

Figure 4: Turning Movement Count Survey Results

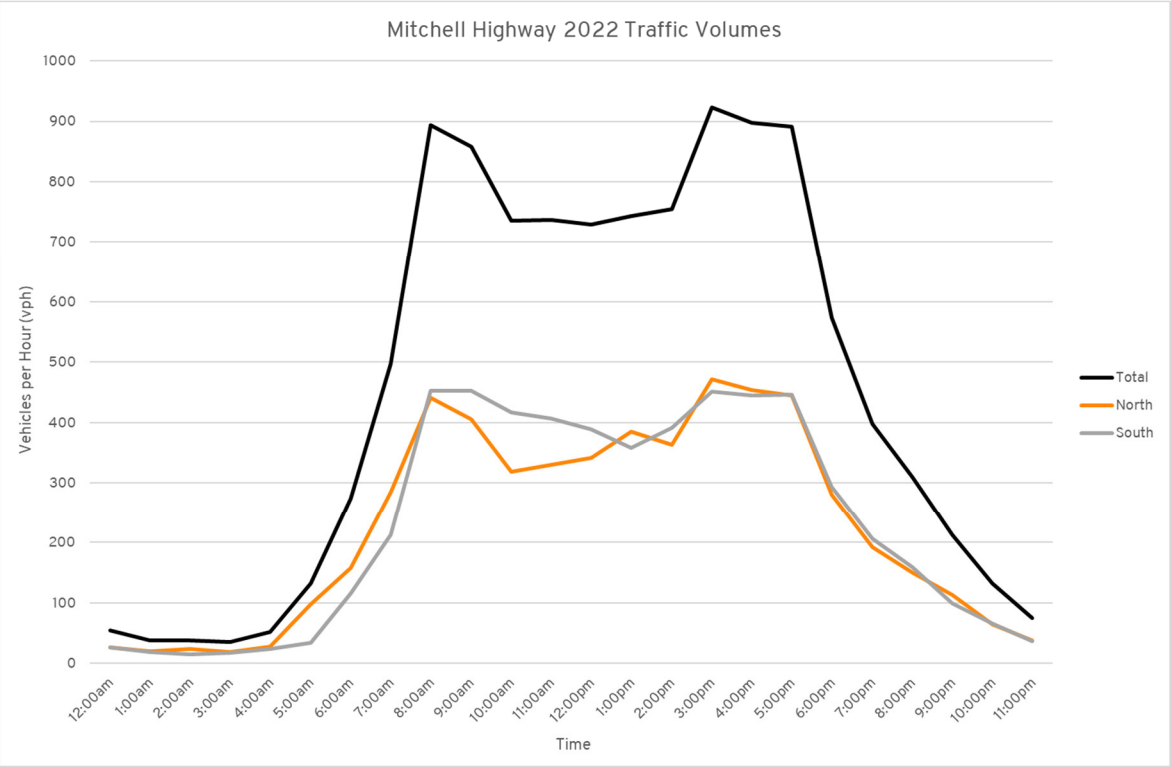


The results of the survey indicate that Mitchell Highway currently carries in the order of 650 vehicle movements in the peak hour adjacent to the site, which represents a moderate level of traffic. Mitchell Highway is expected to currently be operating with a good level of service based on the existing traffic volumes.

Traffic volume data for Mitchell Highway was obtained from the TfNSW traffic volume viewer. The closest available data was located 60 metres south of Thompson Street to the south of the site (Station ID: 93815) and was recorded in 2009.

Whilst it is acknowledged that the traffic volumes recorded in 2009 are older and subsequently lower than the volumes currently on the road network, it is considered that the data provides a useful indication of the traffic volume profile across a 24 hour period. The 2009 data has been factored so the peak hours align with the surveyed peak hour which represents a yearly growth factor of approximately 3.1%.

Figure 5: Mitchell Highway Traffic Volume Profile



The figure demonstrates that Mitchell Highway experiences peak hours during morning and evening commuter times and a lower level of traffic through the middle of the day. The peak times were recorded as having a relatively even distribution between north and southbound vehicle movements which reflects the traffic distribution in the recent traffic surveys at the intersection with Thompson Street.

2.4 Sustainable Transport

No public transport or dedicated pedestrian or bicycle facilities are currently provided on Narromine Road at the site frontage. However, the following public transport services operate nearby within the Dubbo area:

- Bus Route 555 (Narromine to Dubbo) provides a link between the two towns with several bus stops provided within each town. The closest bus stop to the site is located at the intersection of Victoria Street and Young Street. Services are provided four times per day in each direction, Monday to Friday.
- Bus Route 572 (Dubbo City Centre to West Dubbo via Rosewood Grove and Delroy Park) provides a loop service within Dubbo. The closest bus stop is located on Victoria Street near Thompson Street. Services are provided from 7:30am to 9:00pm approximately every 90 minutes, Monday to Friday, and 8:30am to 5:30pm every two hours on Saturdays.

- Bus Route 573 (Dubbo CBD to West Dubbo via Zoo and Delroy Park Shops) provides a loop service within Dubbo. The closest bus stop is located on Victoria Street near Thompson Street, with six services are provided Monday to Friday and 5 services are provided on Saturdays.

Within the Dubbo CBD the following additional bus services are provided:

- Bus Route 556 (Wellington to Dubbo);
- Bus Route 570 (Orana Mall to Dubbo City Centre via South Dubbo);
- Bus Route 571 (Orana Mall to Dubbo City Centre via Eastridge and North Dubbo); and
- Bus Route 575 (Dubbo CBD to Orana Mall via Darling Street, Tamworth Street and Wingewarra Street).

It is also noted that the Dubbo Railway Station is located approximately 3.5 kilometres southeast of the site which provides access to the surrounding towns and main centres.

The public transport services are currently not within convenient walking distance of the site. However, these services do provide future users of the site alternative modes of accessing the nearby towns.

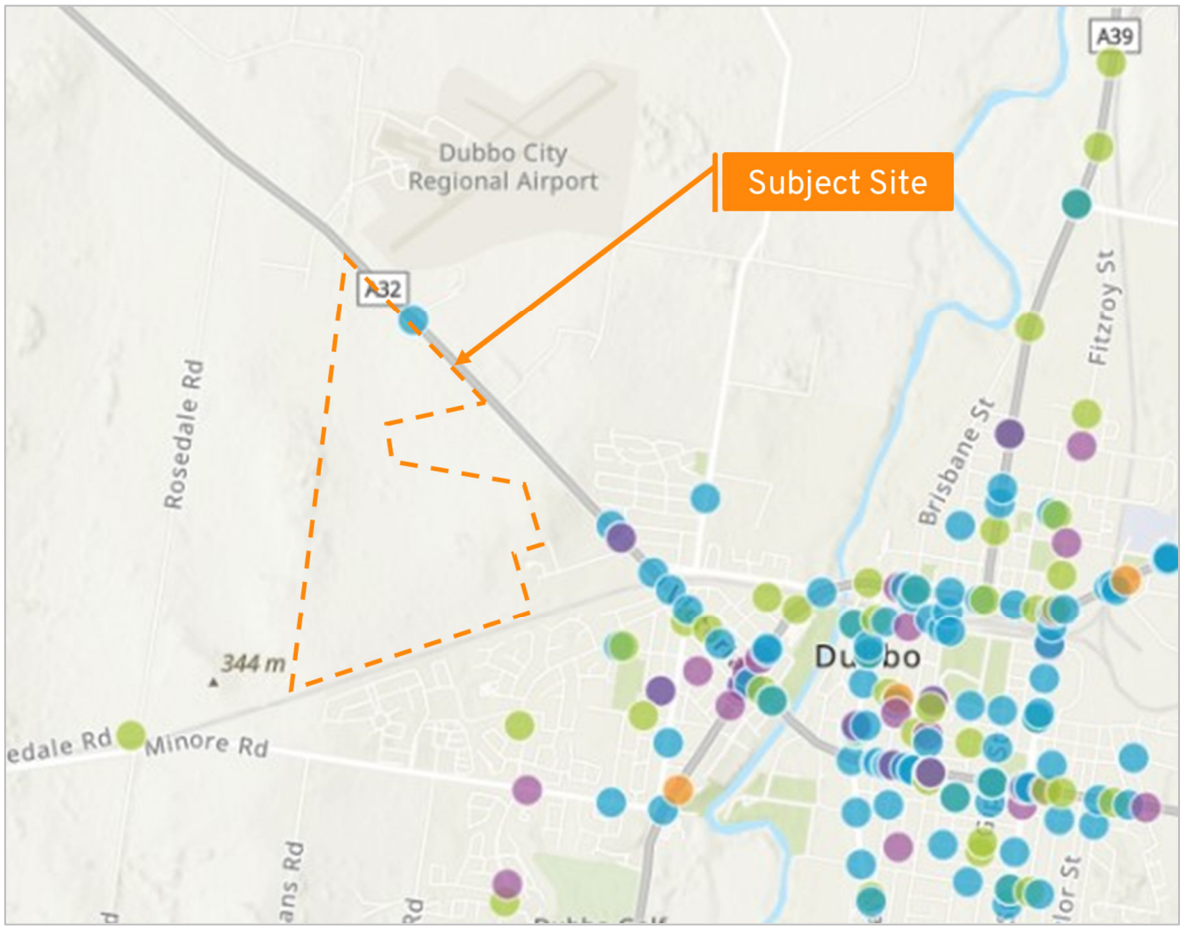
2.5 Crash History

Amber has conducted a review of the TfNSW Centre for Road Safety Crash and Casualty Statistics database for all injury crashes along Mitchell Highway between Rosedale Road and Newell Highway. The crash database provides the location and severity of all injury and fatal crashes for the five-year period from 2016 to 2020. The crash search revealed a total of 10 crashes within the search area including:

- One right rear crash was recorded at the intersection of Mitchell Highway and Richardson Road resulting in a minor injury;
- One midblock crash was recorded north of Yulong Street when a vehicle left the road to the right and hit an object resulting in moderate injuries;
- One right rear crash was recorded at the intersection of Mitchell Highway and Yulong Street resulting in a minor injury;
- Three moderate injury crashes were recorded at the intersection of Mitchell Highway and Thompson Street, including:
  - Two right near crashes; and
  - One rear end crash.
- One cross traffic crash was recorded at each of the intersections of Mitchell Highway with Depot Road and Young Street (two crashes total) resulting in moderate injuries;
- One ‘other manoeuvring’ crash was recorded on Mitchell Highway near the intersection with Bruce Avenue resulting in serious injuries; and
- One lane sideswipe crash was recorded near the intersection of Mitchell Highway and Newell Highway resulting in minor injuries.

The location of the crashes within the surrounding area are provided within Figure 6.

Figure 6: Crash Map - Dubbo Regional Council



Source: Transport for NSW Centre for Road Safety

The crash search indicates that there are no discernible crash trends. Given the low number of crashes and associated traffic volumes on the surrounding roads, it is concluded that the road network is currently operating in a relatively safe manner.

3. Future Transport Environment

3.1 Dubbo City Planning and Transport Strategy 2036

The Dubbo City Planning and Transport Strategy 2036, dated November 2009, is a result of an independent review of Council's Directions and Structure Plan which forms part of the Urban Development Strategy adopted by Council in 1996. The Strategy reviewed the growth of the city and the principles of future development of the city and made recommendations in respect of its findings.

The Strategy was set around five elements that can be worked together so that each element has synergies that add social, economic and ecological benefits. The elements included:

- Extension across and along the Macquarie River Front;
- The Freightway;
- The Green Ring;
- Regional Business Ring;
- Places.

The context of these strategies in relation to the city is shown within Figure 7.

Figure 7: Dubbo City Planning and Transport Strategy 2036 - Transport Elements

Source: Dubbo City Planning and Transport Strategy 2036 – Figure 1.5

The figure indicates an industrial area at the northern end of the site and a residential area at the southern end of the site.

The Freightway Ring is intended to divert heavy vehicle traffic around the city centre to improve amenity and reduce road upgrades within Dubbo. The concept is that over time freight traffic on the Newell Highway will be diverted to the west of the town centre and later traffic using Mitchell Highway will divert north through Purvis Lane.

From the elements outlined within Figure 7 the Strategy then identifies a road hierarchy which has been provided within Figure 8.

Figure 8: Dubbo City Planning and Transport Strategy 2036 – Road Hierarchy

Source: Dubbo City Planning and Transport Strategy 2036 – Figure 1.7

The figure indicates a north-south road through the centre of the site associated with the Freightway Ring which is to extend between Narromine Road (at Richardson Road) and Newell Highway. It also indicates an east-west road which is to extend between Narromine Road and the new north-south road which has been labelled as Western Boulevard.

The document provides the following recommendations in relation to road widths based on the above classifications:

- *20m for Connectors;*
- *25m for Distributors and Sub-Arterials;*
- *30m for Arterial Road;*
- *The right of way for local streets will vary with conditions.*

The traffic modelling results presented within the Strategy indicate that the north-south road referred to as Chapmans Street records in the order of 8,230 vehicles per day at the railway crossing in the assessment Year 2036 assuming the road is constructed between Narromine Road and Newell Highway.

3.2 Dubbo Transportation Strategy 2020

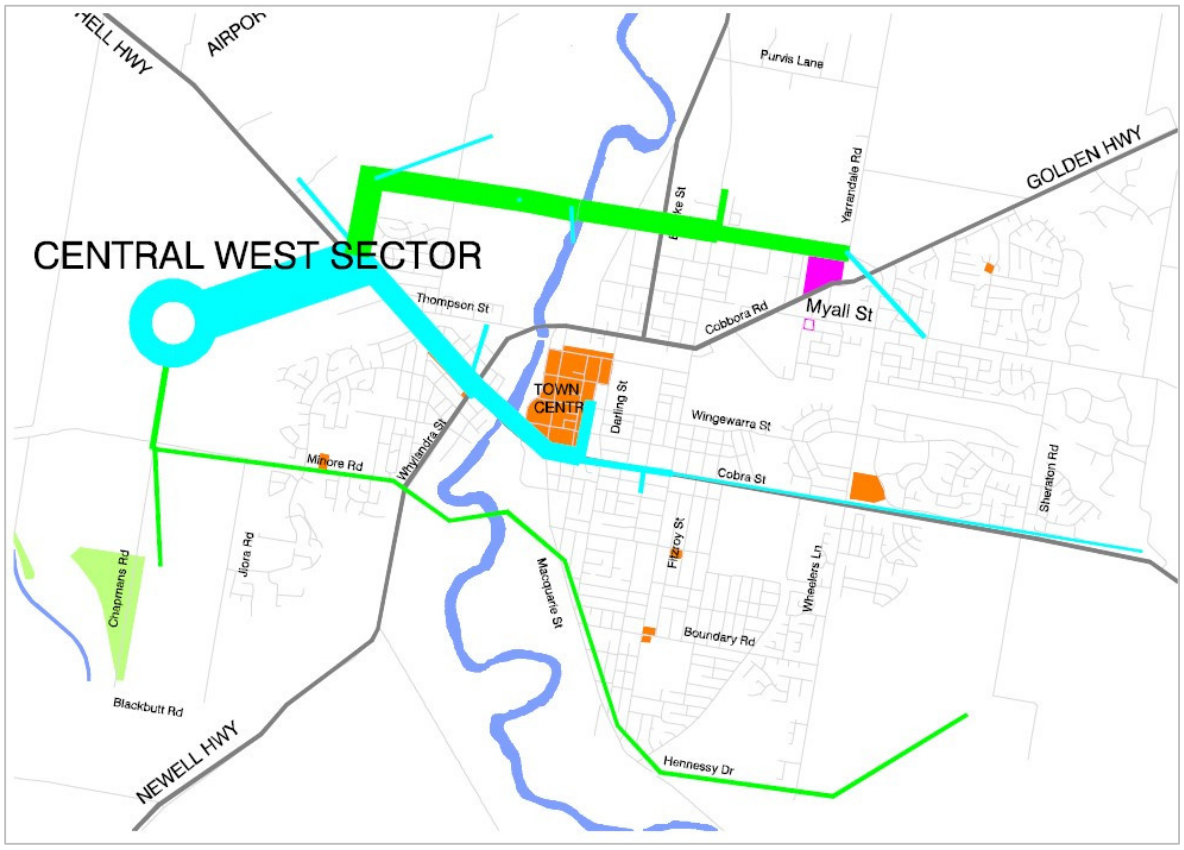
The Dubbo Transportation Strategy 2020, dated May 2020, provides an analysis of transport infrastructure based on a detailed 10 year plan, when most variables can be estimated accurately; a 20 year plan that supports the continuing trends in population and employment; and a 35 year horizon with the main purpose being to measure the ongoing role of projects built in the first 20 years. The document is supported by a transport model which reviews the impacts of traffic movements based on expected land development within the wider Dubbo area.

Figure 2.3 of the document identifies in the order of 250 dwellings within the subject site during the years 2030-2040 and an additional 900 lots during the years 2040-2055. Based on these values and the scale of the proposal it is considered that the model has underestimated the traffic generating potential of the subject site and any future models should be updated to accommodate the proposed changes to the number of dwellings in the area which is referred to as the Central West. It is also noted that the model does not appear to identify the industrial area within the site although this area has been noted within the Dubbo City Planning and Transport Strategy 2036.

The document considers that future growth within Dubbo is expected to primarily occur within the southeast of the city and following the development of the North Bridge project the northwest portion of the city will experience significant growth.

The Dubbo Transportation Strategy 2020 provides a summary of the potential traffic demands generated by the Central West sector and indicates that a crossing over the railway line at the southern boundary of the site is required. It also indicates a significant portion of the development traffic would utilise the northern Freightway Ring and the associated North Bridge project once completed. The associated demands are shown within Figure 3 of the document which is provided below.

Figure 9: Dubbo Transportation Strategy 2020 – Demand for Central West Sector



Source: Dubbo Transportation Strategy 2020 – Figure 3 (c)

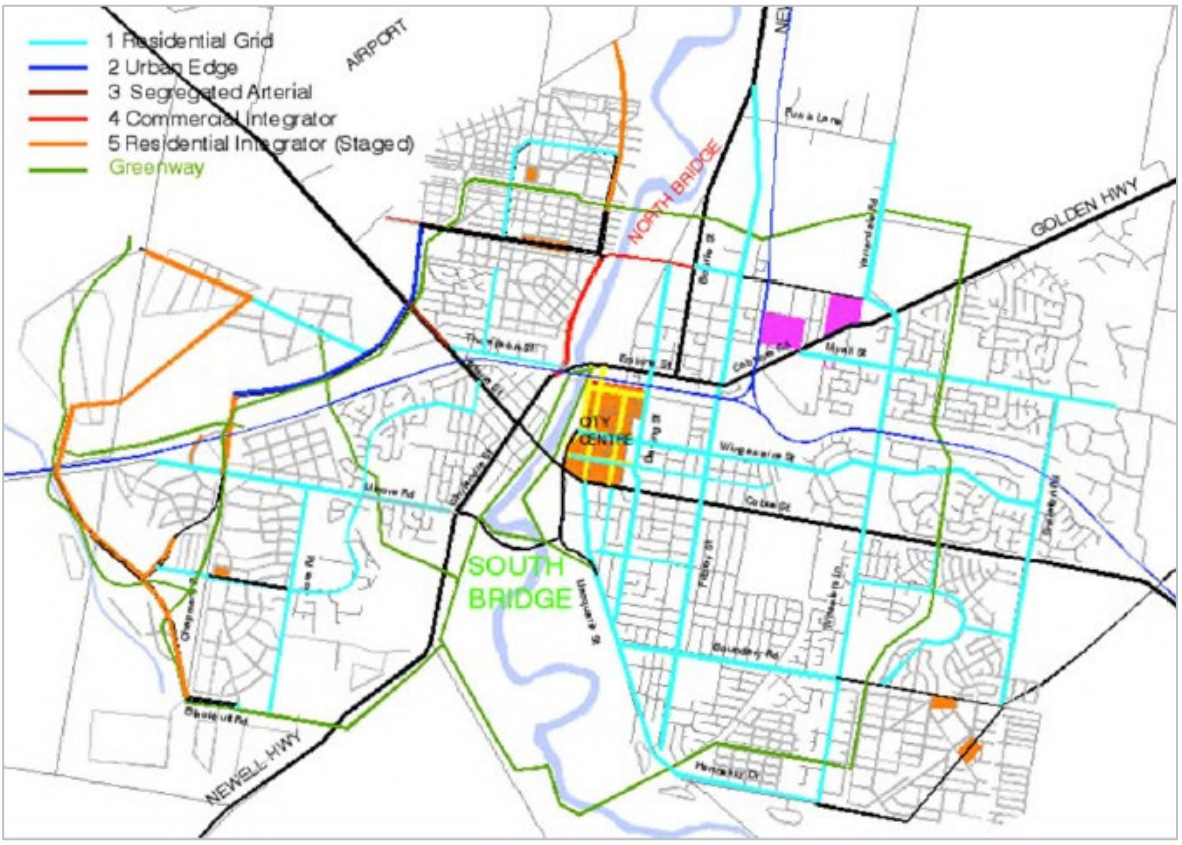
The document provides a list of key infrastructure projects that may be required in the future with the relevant projects summarised below:

- An upgrade of Mitchell Highway between Blizzardfield Road and Thompson Street by Year 2040;
- An extension of Chapmans Street over the railway line by Year 2040 and an additional crossing by Year 2055;
- A connection of the residential land with Mitchell Highway to connect with the Greenway.

The proposed road network for the Year 2055 is shown within Figure 5.5.3 of the Strategy document and is provided in Figure 10 for reference.

It is noted that the road network shown does not provide a northern connection from the site which is unsurprising given it has not taken into account any industrial land within the northern extent of the site. However, this is shown within Figure 5.7.1 and Figure 5.7.2 of the document which shows the long term strategy for the area.

Figure 10: Dubbo Transportation Strategy 2020 – Year 2055 Road Hierarchy



Source: Dubbo Transportation Strategy 2020 – Figure 5.1.1

Overall, the Transport Strategy is a response to the current pattern that centralises demand, the movement of employment more to the north and the centroid of population moving more to the west and little change in the proportion of external traffic. It also establishes suitable road sections for new transport infrastructure that can be costed for use in the Developer Contributions Plan and to make estimates of future infrastructure programs.

3.3 Alternative Transport Modes

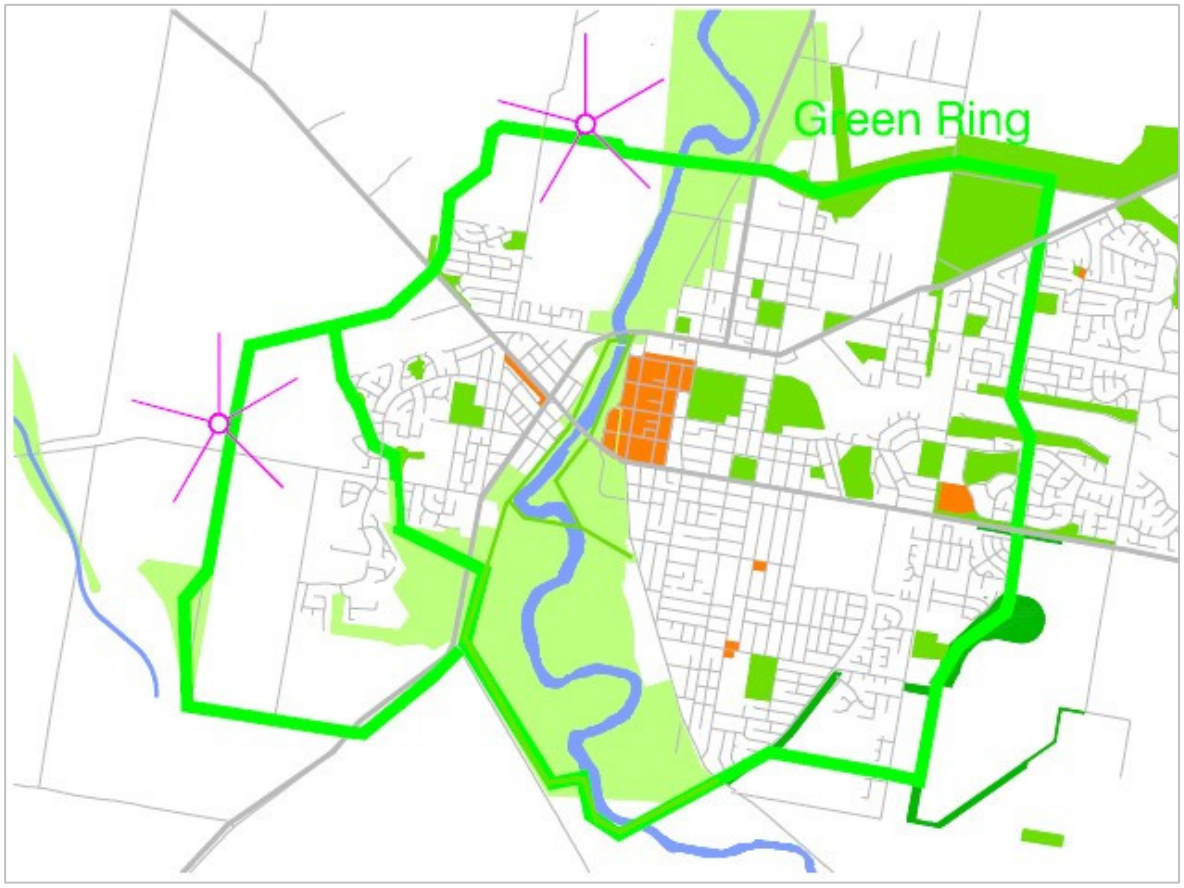
The Dubbo City Planning and Transport Strategy 2036 states the following in relation to public transport:

> *'The guiding principles for public transport are to create connective road systems that can accommodate buses that pass within 500m of most households in the existing and new areas of Dubbo.*
>
> *The concept is to allow bus routes to circulate throughout the City every half hour. These would fan out from the City centre to all suburbs and make a loop returning to the City. Hence by catching a local bus into the City and changing onto one of the other bus routes residents will be able to reach any part of the City by pubic transport every half hour. Figure 3.1 describes this system and a more detailed plan is contained in Section 6 which indicates how 12 or so bus routes (one bus on each route) could create this service.*
>
> *During parts of the day buses will stop when hailed along the residential streets.'*

The Strategy outlines that residential street are expected to be able to accommodate pedestrians and cyclists, and the Green Ring is able to be used to link the bicycle and pedestrian network.

The Dubbo Transportation Strategy 2020 identifies a 'Green Ring' within Dubbo with the proposed layout for the green ring shown within Figure 2.8 of the document and provided below.

Figure 11: Dubbo Transportation Strategy 2020 – Green Ring



Source: Dubbo Transportation Strategy 2020 – Figure 2.8

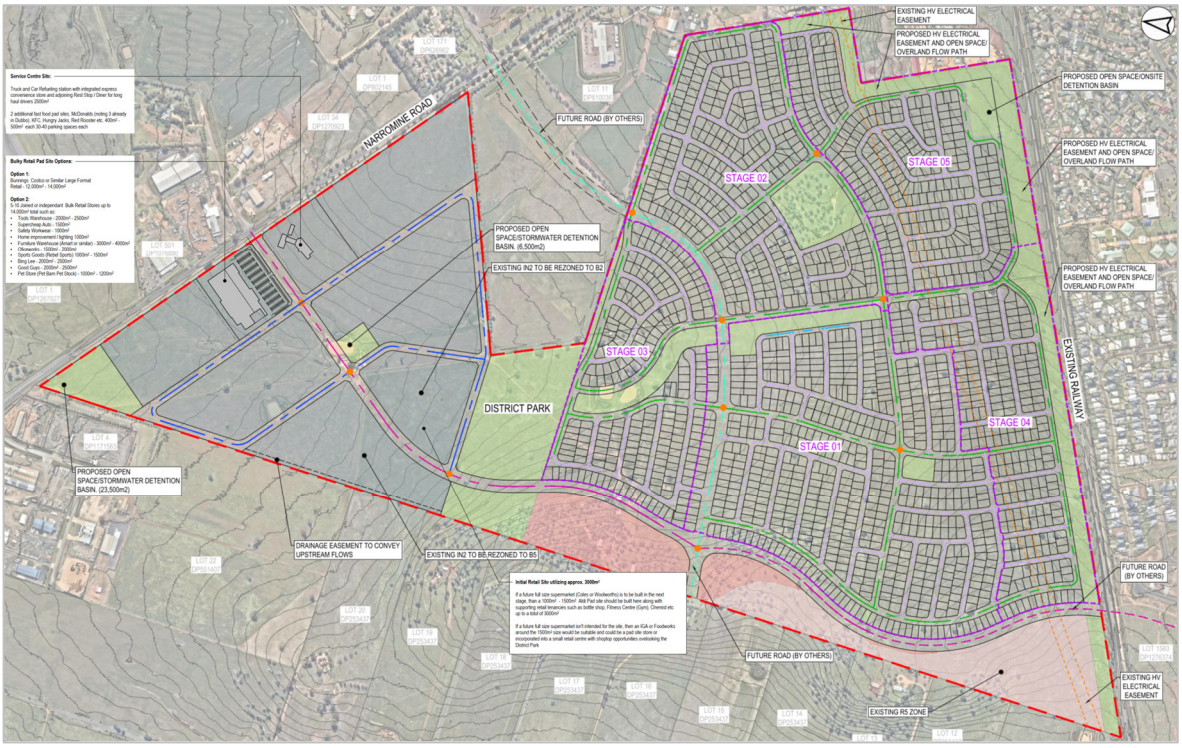
The document notes that a detailed review of public transport is not provided as part of the Dubbo Transportation Strategy 2020.

4. Development Proposal

4.1 Site Layout

The proposal involves the subdivision of land at 13L Narromine Road (Lot 22 DP1038924) and Jannali Road (Lot 7 DP223428), Dubbo. The proposed layout for the site is shown within Figure 12 which shows the various uses proposed and the indicative road layout.

Figure 12: Masterplan Site Layout



Source: MakerEng

The site layout plans show Narromine Road adjacent to the northeast site boundary and the railway corridor adjacent to the southern site boundary. The commercial areas are located toward the north of the site while the residential lots are located in the southern portion of the site.

4.2 Proposed Uses

The masterplan proposes a variety of land uses within the site which are to be established by planning proposals that would result in a change of land use zoning to facilitate subsequent development applications. More specifically, the proposal includes the following:

- The IN2 – Light Industrial zone at the northern end of the site is proposed to be rezoned to B2 – Local Centre and B5 – Business Development. The rezoning is expected to facilitate the following:
  - The B2 zone is proposed to facilitate the provision of a local retail centre which includes a full-size supermarket and a range of retail tenancies such as a bottle shop, fitness centre, chemist, etc. The retail centre is expected to accommodate a maximum gross floor area of 5,900sqm.

  - A service centre is proposed on the southern corner of the intersection of Narromine Road and the Bypass Road within the B5 zone. The service centre is proposed to have a floor area of 2,500sqm and accommodate a rest stop and diner. In addition, two fast food retailers are proposed with a floor area of 400sqm.
  - A bulky goods site is proposed on the western corner of the intersection of Narromine Road and the Bypass Road. The site is expected to either be occupied by one larger format retailer such as Bunnings or Costco, or by 5-10 smaller bulk goods stores. The site is expected to accommodate up to 14,000sqm gross floor area.
  - The remainder of the B5 zone is expected to be occupied by a mixture of industrial and warehouses uses and associated ancillary commercial properties.
- A district park is proposed within the centre of the site within the current RU2 – Rural Landscape land.
- The R2 – Low Density Residential land at the southern end of the site is proposed to be developed as residential lots with a total of 1,631 lots proposed as part of the masterplan.

4.3 Road Network

The road network has been provided in general accordance with the Dubbo City Planning and Transport Strategy 2036. A north-south road is provided within the site which represents the general alignment of Chapman Street (referred to within this document as the Bypass Road), and a Western Boulevard is proposed in an east-west alignment between Narromine Road and the Bypass Road. The intersections along the Bypass Road and Western Boulevard are controlled via a mixture of priority-controlled intersections for lower class roads and roundabouts for higher class roads.

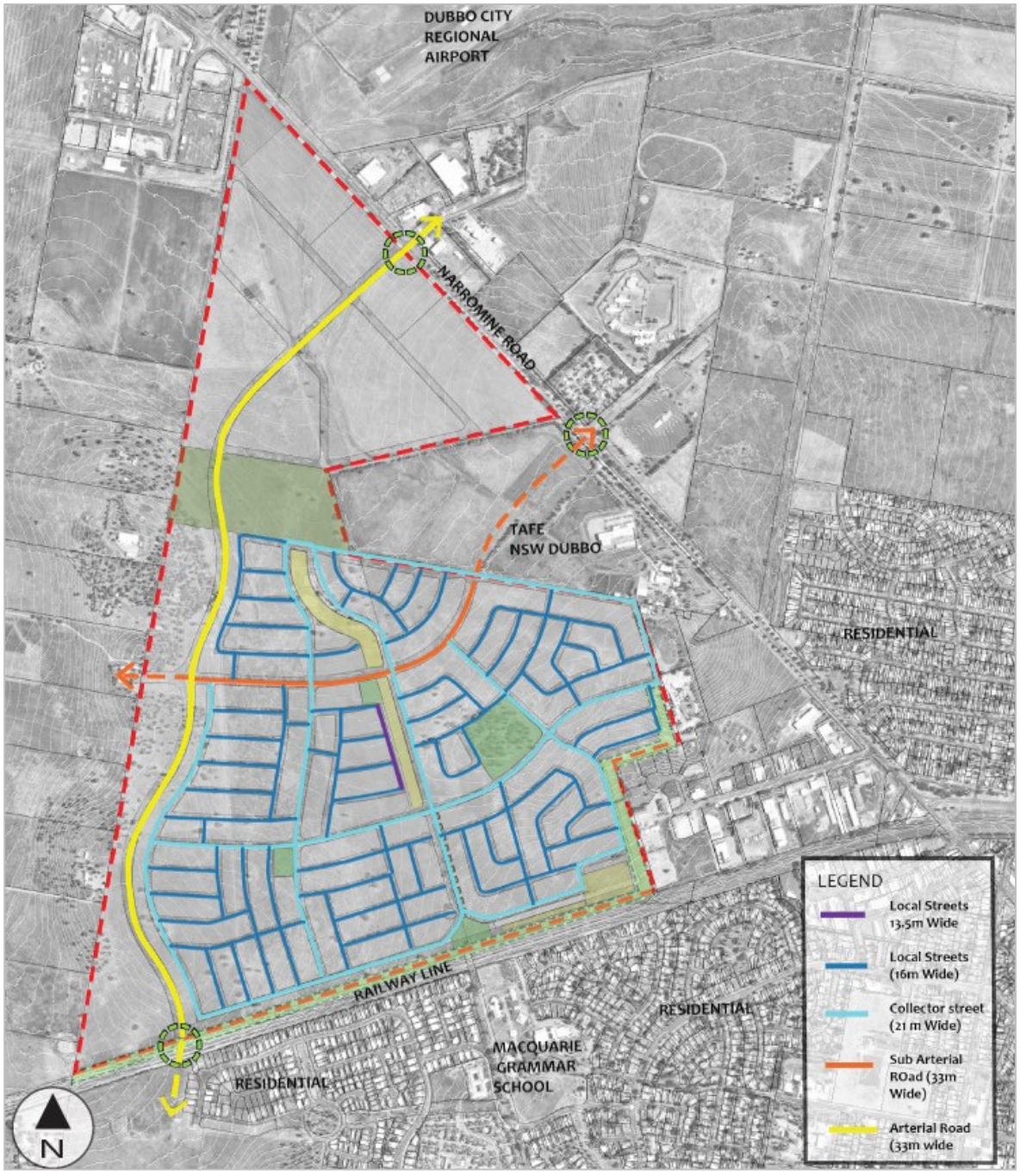
Figure 12 shows that the only access point for the site is via the connection with Narromine Road at Richardson Road. The intersection is proposed to be provided with traffic signals to suitably control vehicle movements. The ultimate road network is expected to also provide a connection of the Western Boulevard with Narromine Road which will be constructed as part of the development of the adjacent TAFE site, and an extension of the Bypass Road over the railway line which is proposed to be constructed by others.

5. Road Network

5.1 Road Layout

The road layout has been designed to reflect the future road layout outlined within the Dubbo City Planning and Transport Strategy 2036. The road hierarchy for the internal road network is provided within Figure 13.

Figure 13: Internal Road Hierarchy



Source: Sitios

A north-south road (the Bypass Road) has been provided within the site which is intended to act as part of the Freightway Ring. The road connects with Narromine Road at Richardson Lane and extends through to have a frontage with the railway line at the southern boundary of the site. The road is intended to be designed to allow it to be continued over the railway line which is to be constructed by others once the land to the south is developed. The road has been established with the intention that it is able to be operated as a State road in the future.

An east-west road is provided within the centre of the site which reflects the Western Boulevard outlined within the Strategy. The road has been established in order to allow it to be extended through the TAFE site to the east and connect with Narromine Road at Westview Street, and it has the ability to be extended to the western boundary of the site. It is proposed to be established as a Neighbourhood Sub-Arterial Road.

The above indicates that the arterial roads within the site have been established in line with the Dubbo City Planning and Transport Strategy 2036 in order to allow orderly road design for the wider road network and Dubbo region.

A network of collector roads extend from Western Boulevard within the residential area of the site which subsequently connect with the local road network. A review has been undertaken for the local road network which indicates suitable vehicle circulation is provided within the residential area.

The road network within the business zoned land at the northern end of the site is provided with a simple layout that allows suitable vehicle circulation.

The review of the internal road layout indicates that vehicles are able to suitably circulate within the site with minimal cul-de-sacs generated within the site. The modified grid system allows for a suitable number of connections enabling shorter, more direct journeys, whilst maintaining suitable traffic movement on the arterial road network.

Overall, the road layout is concluded to provide a street pattern that maximises movement, provides choice of routes, and support legibility, orientation and wayfinding for pedestrians. It also provides a clear road hierarchy developed in accordance with required size and function that provides good access to amenities and links to future public transport.

5.2 Road Design

The **Bypass Road** is proposed to be designed with two lanes in each direction within the business zones and one lane in each direction in all other locations. The road cross sections are provided with Figure 14.

The cross sections indicate the road reserve is provided with a width of 33 metres in order to allow further widening of the road in the future, if required. South of the business zones the road is provided with wide traffic lanes and a stopping lane on either side of the road. A painted central median is also proposed to improve capacity and safety.

Western Boulevard is also proposed to have a road reserve of 33 metres. A traffic lane, bicycle lane, and parking lane are proposed in each direction which are to be separated by a wide grassed central median. A footpath and planting are also proposed on both sides of the road. The road design is provided within Figure 15.

The **Industrial Roads** are proposed to be provided with a road reserve of 23 metres and a carriageway width of 13 metres. The carriageway width is expected to accommodate two-way

vehicle movements and kerbside parallel parking on both sides of the road. Wide grassed verges are proposed on both sides of the roads.

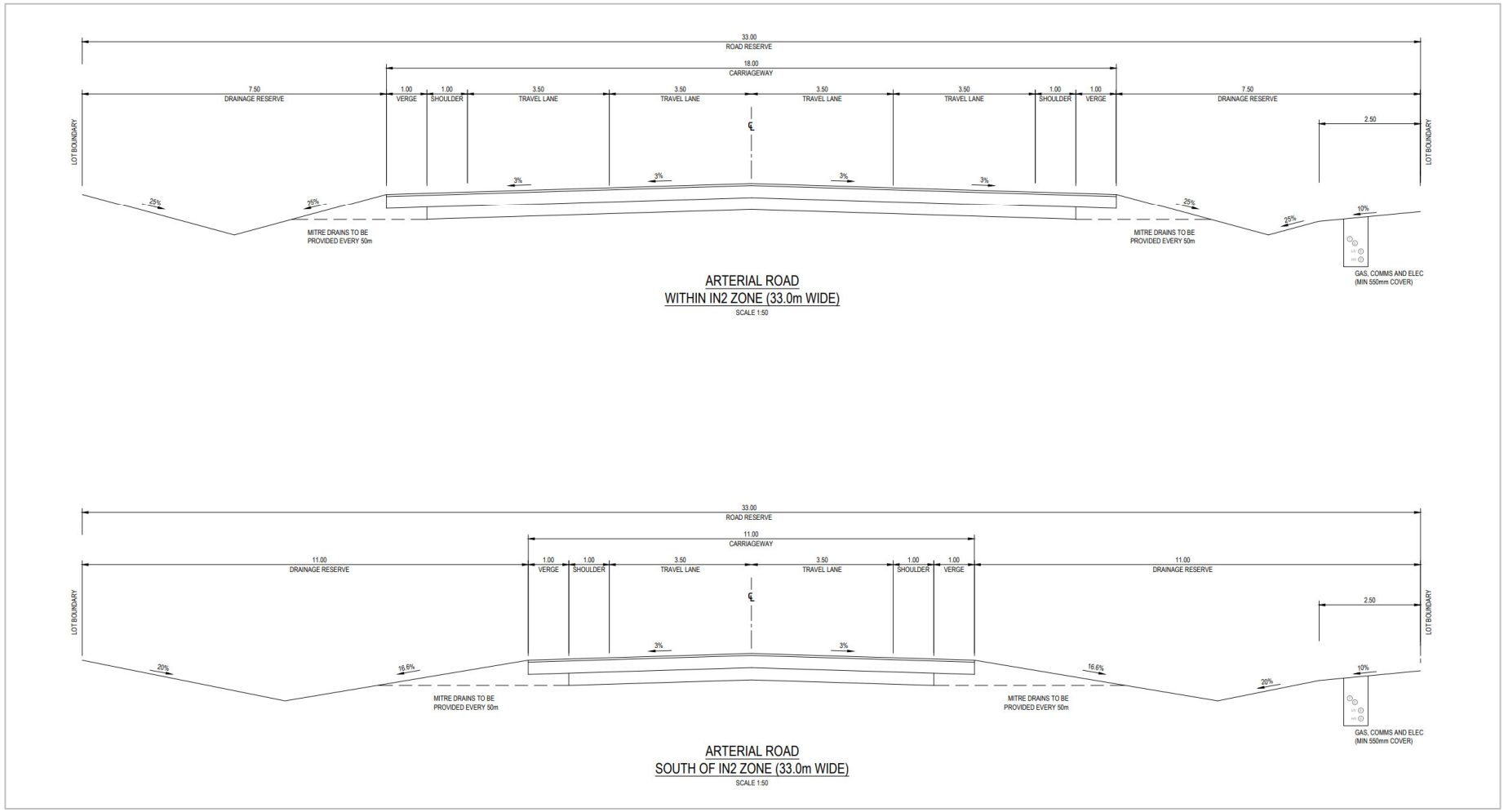
Collector Roads are proposed to be provided with a road reserve width of 21 metres and an associated carriageway width of 11.6 metres which accommodates one lane of traffic and a parking lane in each direction. A shared path is proposed on one side of all collector roads. The proposed cross section for collection roads is shown within Figure 15.

All **local roads** are proposed to be provided with a road reserve width of 16 metres. The road reserve is proposed to accommodate a carriageway width of 8.0 metres which provides one travel lane in each direction and permits kerbside parallel parking on both sides of the road. A footpath is proposed on one side of the road. The proposed cross section for local roads is shown within Figure 16.

The road cross sections are considered to be suitable to accommodate suitable vehicle movement and are reflective of the road classifications. Further, they are in general accordance with the recommend widths outlined within the Dubbo City Planning and Transport Strategy 2036.

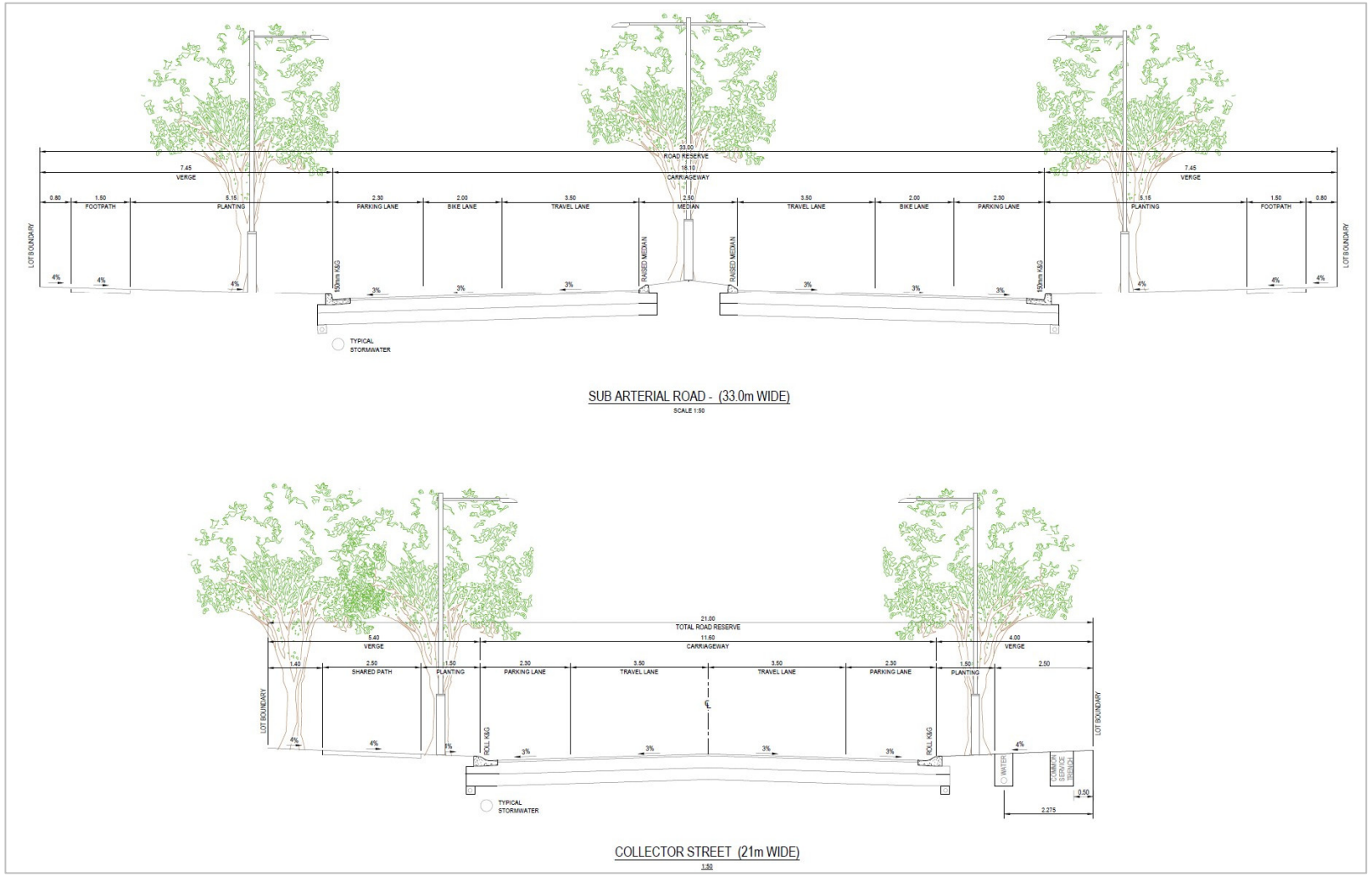
It is noted that the Dubbo Transportation Strategy 2020 provides a range of road cross-sections for the purposes of determining developer contributions which are presented within Table 4.2 of the document. However, given the roads are proposed to be constructed by the Applicant it is considered that the variation in road cross-section is acceptable.

Figure 14: Bypass Road Cross Section



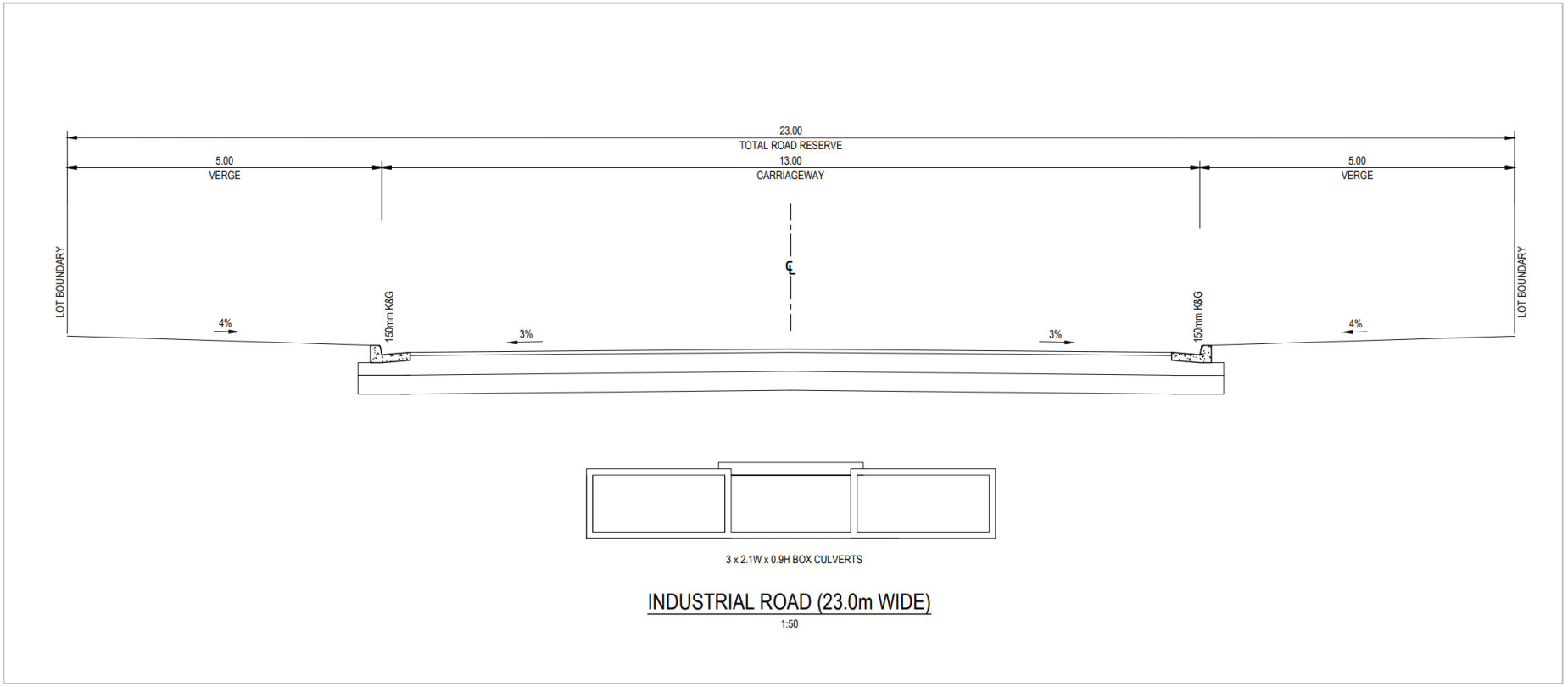
Source: Maker ENG

Figure 15: Western Boulevard and Collector Road Cross Section



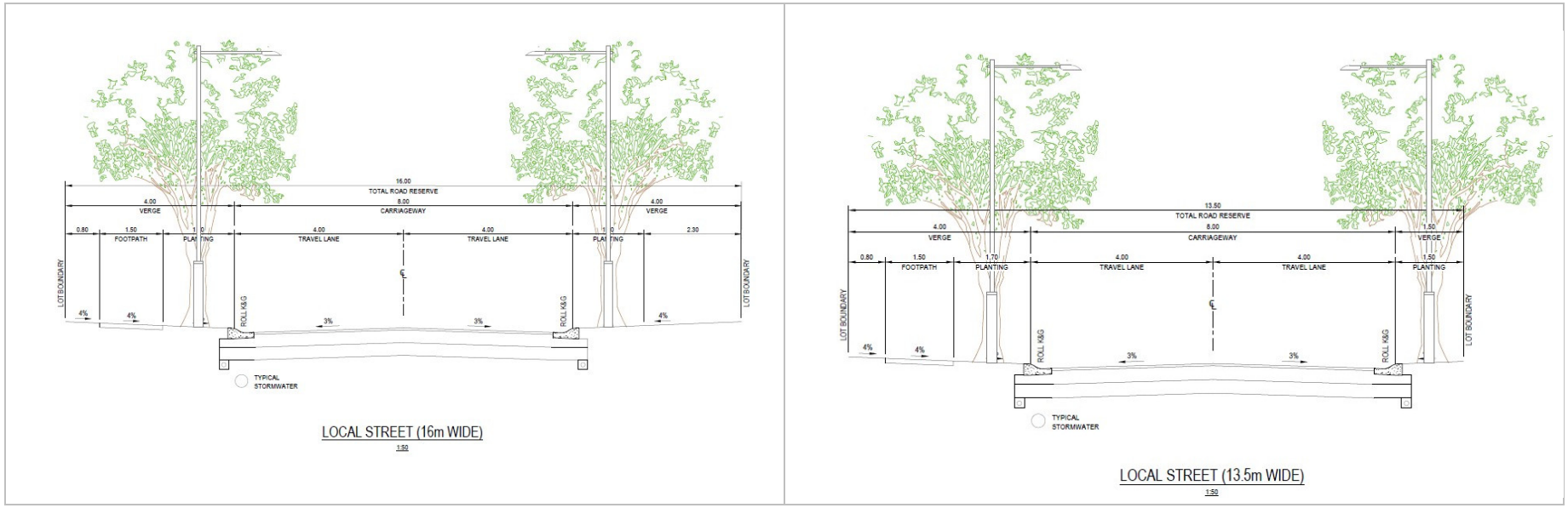
Source: Maker ENG

Figure 16: Industrial Road Cross Section



Source: Maker ENG

Figure 17: Typical Local Road Cross Section



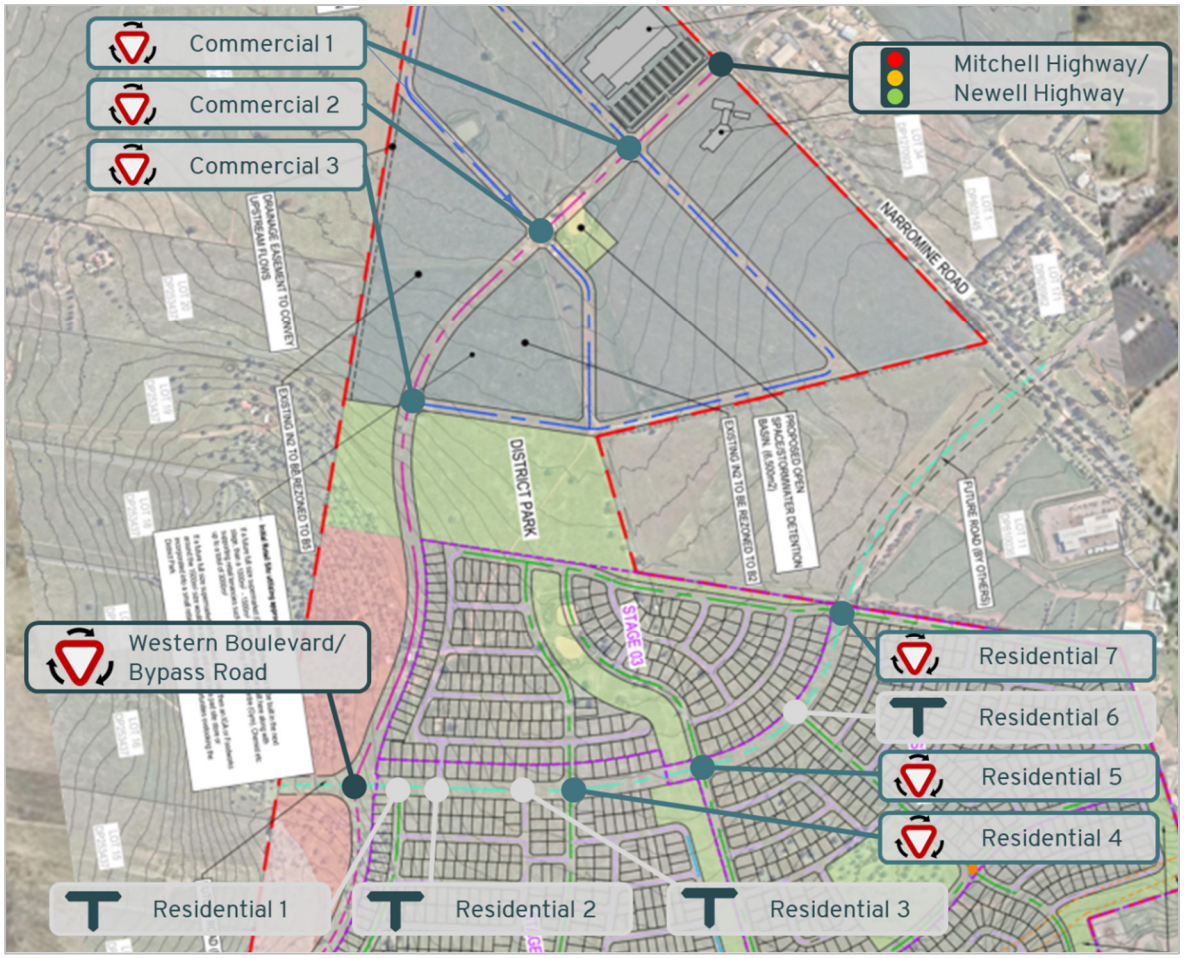
Source: Maker ENG

5.3 Intersection Design

The only access to the surrounding road network for the site is via the Bypass Road which is proposed to connect with Narromine Road at its connection with Richardson Road. The intersection is proposed to be constructed as a signalised intersection given the high number of turn movements at the intersection and associated road classifications. Richardson Road is proposed to continue to be provided with one lane of traffic in each direction. Two right turn lanes are proposed from the Bypass Road and a left turn slip lane is proposed to the Bypass Road due to the high volumes expected to travel between the site and Dubbo.

The proposed intersection controls within the site are illustrated within Figure 18.

Figure 18: Proposed Intersection Controls within the Site



The four intersections along the Bypass Road are proposed to be provided as roundabouts in order to allow suitable vehicle circulation and traffic calming measures. The three northern intersections are proposed to accommodate two lanes in the each of the north and south directions, and the intersection with Western Boulevard is proposed to accommodate one lane.

The Western Boulevard is proposed to be provided with three roundabouts along its length which provide access to the adjacent collector roads. The western priority-controlled intersections on Western Boulevard is proposed to be restricted to left-in / left-out movements due to the proximity to the adjacent roundabout, with all other priority controlled intersections provided with

all turn movements and suitable right turn facilities to ensure efficient and safe vehicle movement is provided along the road.

The remaining intersections within the residential component of the site are proposed to be priority controlled.

The above intersection controls are considered to be suitable for the associated road classifications and reflect the recommendations outlined within Table 3.6 of the *Austroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings Management* and subsequently the Safe System objectives.

5.4 Local Area Traffic Management

The road network provides a number of long sections of relatively straight and flat road. In order to suitably control vehicle travel speeds and provide a safe road network it is recommended that suitable traffic control measures be implemented to encourage drivers to adhere to the speed limit of the road network. The traffic control devices should be designed in accordance with *Austroads Guide to Traffic Management Part 8: Local Street Management.*

Chapter 4.3.2 Device Spacing and Speed-based Design of the Guide indicates that traffic calming measures should be implemented at regular lengths to ensure a low speed is maintained. Traffic calming measures will be detailed as part of the individual Development Applications within the subdivision. It is recommended that road lengths in the order of 300 metres should be provided with suitable traffic calming measures, such as speed humps, which should be provided every 80-120 metres. The traffic calming measures should be designed to accommodate a bus, particularly along the arterial and collector roads.

All local and collector roads within the site are expected to be provided with a speed limit of 50km/hr to encourage a safe road environment. Western Boulevard and the Bypass Road within the business park are to be provided with a speed limit of 60km/hr, with the remainder of the Bypass Road provided with a speed limit of 80km/hr. Any traffic management measures should consider the intended operating speed of the individual roads.

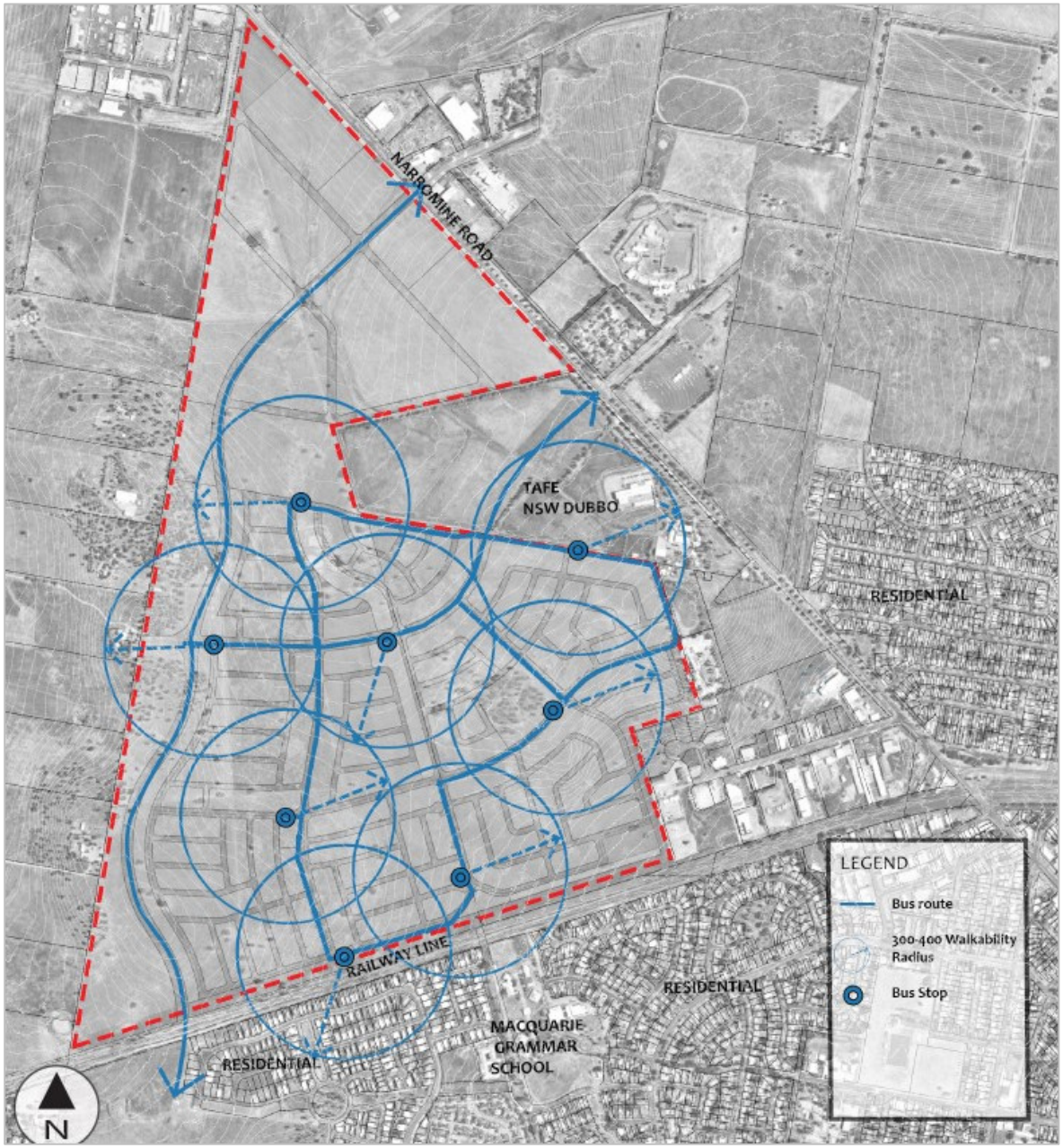
The adoption of the above recommendation is expected to ensure the road network will operate in a safe manner.

6. Alternative Transport

6.1 Public Transport

The arterial and collector road network is proposed to be constructed to accommodate buses which would allow the residential component of the site to be provided with a bus service within 500 metres walking distance of every residential lot. Indicative bus route(s) within the site are shown within Figure 19 which demonstrates the arterial and collector road network would provide suitable access for buses. The circles around the bus stops indicate a 300 metre radius.

Figure 19: Indicative Bus Routes within the Site



Source: Sitios

The roads within the business zone are proposed to be provided with a road carriageway that can accommodate buses. Accordingly, the road network is considered to be suitably designed to accommodate any future bus services.

It is noted the access to buses reflects the intentions of the Dubbo City Planning and Transport Strategy 2036.

6.2 Alternative Transport

The proposed cross sections presented previously indicate the following alternative transport services are provided within the site:

- An on-road bicycle lane is proposed on Western Boulevard;
- Shared paths are provided on one side of all collector roads; and
- A footpath is proposed on one side of all local roads.

The provision of a bicycle lane of Western Boulevard and shared paths on collector roads is considered to meet the expectations of the Dubbo City Planning and Transport Strategy 2036 which suggests that cyclists are able to utilise the carriageway of local roads. Further, shared paths are proposed along the open space corridors within the site. Suitable pedestrian facilities are provided on all roads excluding the Bypass Road.

All footpaths are proposed with a width of 1.5 metres and the shared paths are proposed with a width of 2.5 metres which meets the dimensional requirements outlined within relevant Austroads Guidelines. Accordingly, the site is provided with suitable cyclist and pedestrian facilities.

Figure 20 shows the proposed cycle network within the site. The figure demonstrates the pedestrian and cycle routes provide connections to amenities such as local parks, the district park, retail precinct and existing surrounding uses to the east, west and south. Key connections include:

- Narromine Road via Western Boulevard;
- Chapmans Road to the south via internal collector roads;
- A future link to R5 zoned residential land to the west; and
- A future link to residential land to the south of the TAFE site via collector roads.

Accordingly, it is concluded that the pedestrian and cycle road network is suitably designed and provides a network that links with key internal and external destinations.

Figure 20: Indicative Cycle Routes within the Site

Source: Sitios

7. Car Parking

7.1 Residential Use

The applicant has advised that all car parking is to be provided in accordance with the Dubbo Development Control Plan 2013 (DCP). The number of car parking spaces required for residential use under the DCP is provided below:

- *One space per one or two bedrooms; and*
- *Two spaces per three or more bedrooms.*

In addition, the carriageway width of the internal road network allows for two-way traffic and on-street parallel parking. The on-street spaces will be available to service the needs of visitors of future residents within the subdivision. Accordingly, the car parking provision within the residential component of the site is considered to be appropriate.

7.2 Other Uses

It is recommended that the full car parking demand associated with the retail shopping centre, bulky goods site, and service centre are full accommodated within the individual sites in order to prevent on-street parking congestion within the surrounding area.

Given the industrial component of the site is proposed to be provided in accordance with the DCP it is expected that there would be ample on-street parking to accommodate any overspill parking demands. Accordingly, the car parking provision within the site is considered to be appropriate.

8. Traffic Assessment

8.1 Traffic Generation

8.1.1 Residential Use

The *Roads & Maritime Services Technical Direction 04a: Guide to Traffic Engineering Developments - Updated Traffic Surveys*, dated August 2013, provides traffic generating information for various land uses. The traffic generation rates for low density residential land use in regional areas are as follows:

- Daily vehicle trips: 7.4 movements per dwelling;
- Weekday average morning peak hour vehicle trips: 0.71 movements per dwelling; and
- Weekday average evening peak hour vehicle trips: 0.78 movements per dwelling.

All the residential lots within the subdivision have been assessed on the basis they generate traffic at the rates specified within the RMS Technical Direction.

Application of the above rates to the 1,631 residential lots results in a future traffic generation of 12,069 vehicle movements per day, and 1,158 and 1,272 vehicle movements (two-way total) in the morning and evening peak hours respectively.

It is typical for traffic movements associated with residential activities to predominantly be outbound in the morning peak and inbound in the evening peak. The following traffic distribution has been used for the purposes of this assessment which are based on the survey data presented within the RMS Technical Direction:

- Morning Peak: 80% outbound and 20% inbound
- Evening Peak: 30% outbound and 70% inbound

As such, the residential component of the site is expected to generate the following traffic volumes during the morning and evening peak periods.

Table 1: Residential Peak Hour Traffic Generation

	AM Peak (vph)	PM Peak (vph)
Arriving Trips	232	891
Departing Trips	926	382
Total	**1,158**	**1,272**

The RMS Technical Direction notes that the rates do not include trips made internal to the subdivision, which may add up to an additional 25%. In order to allow for some internal traffic movements within the residential land use, a factor of 5% of the total trip volume has been applied to minor movements at intersections within the subdivision.

8.1.2 Industrial Use

The traffic generation for the industrial use has been based on data presented within the *Roads and Maritime Services Trip Generation Surveys - Business Parks and Industrial Estates Analysis Report*, dated December 2012.

The document provides survey data for a number of industrial estates including one located at Johnson Street in Dubbo. The land at Johnson Street provides 11 warehouses and 1 factory which have a total gross floor area of 14,400sqm (average gross floor area of 1,200sqm). The proposal is anticipated to provide industrial land that will be used in a manner similar to the survey site and subsequently would result in similar traffic generation rates.

The survey data indicates the following traffic generation rates which have been utilised for the industrial use:

- Daily vehicle trips: 197.7 trips per hectare;
- Weekday average morning peak hour vehicle trips: 18.4 trips per hectare; and
- Weekday average evening peak hour vehicle trips: 18.4 trips per hectare.

Application of the above rates to the 44.2 hectares of industrial land results in a future traffic generation of 8,738 vehicle movements per day, and 813 vehicle movements (two-way total) in the morning and evening peak hours.

The survey data suggests that these vehicle movements are evenly distributed between inbound and outbound vehicle movements which has been adopted for the purposes of this assessment. As such, the industrial component of the site is expected to generate the following traffic volumes during the morning and evening peak periods.

Table 2: Industrial Peak Hour Traffic Generation

	AM Peak (vph)	PM Peak (vph)
Arriving Trips	407	407
Departing Trips	406	406
Total	**813**	**813**

The survey data for the Johnson Street site indicates 21.8% of the traffic movements are associated with heavy vehicles which has been adopted for the purposes of this assessment.

8.1.3 Retail Use

The various uses within the proposed B2 zone are based on the Preliminary Market Potential report prepared by Location IQ which indicates the following uses could be supported.

Table 3: Location IQ Expected Retail Land Uses

Tenant Recommendation	Total GLA (sqm)		RTA Classification
	Short-Medium Term	Long-Term	
Supermarket	1,500	3,000	Supermarket
Food Retail	300	400	Supermarket
Food Catering	300	400	Specialty Shop
General Retail	200	200	Specialty Shop
Leisure	100	100	Specialty Shop
Retail Services		200	Office
Childcare Centre		250	Childcare Centre
Fast Food Drive Through		200	Specialty Shop
Service Station	250	250	Service Station
Medical	250	500	Office, Medical
Health and Wellness		200	Gymnasium
Other Non-Retail	200	200	Office, Medical
Total	**3,200**	**5,900**	-

For the purposes of this assessment and to future-proof the road network within the site, the following assessment has adopted the floor areas for the long-term scenario.

8.1.3.1 Shopping Centre Uses

The traffic generation for the majority of the proposed uses within the retail area can be based on the rates presented within the *RTA Guide to Traffic Generating Developments*, October 2002 (RTA Guide) for shopping centres. The above uses can be broken into the following classifications that are adopted by the RTA Guide:

- *A(S): Slow Trade gross leasable floor area (Gross Leasable Floor Area in square metres) includes major department stores such as David Jones and Grace Bros., furniture, electrical and whitegoods stores.*
- *A(F): Faster Trade GLFA - includes discount department stores such as K-Mart and Target, together with larger specialist stores such as Fosseys.*
- *A(SM): Supermarket GLFA - includes stores such as Franklins and large fruit markets.*
- *A(SS): Specialty shops, secondary retail GLFA - includes specialty shops and take-away stores such as McDonalds. These stores are grouped as they tend to not be primary attractors to the centre.*
- *A(OM): Office, medical GLFA: includes medical centres and general business offices.*

The subsequent traffic generation rate for a Thursday evening peak hour is as follows per 1,000sqm of Gross Leasable Area:

- *V(P) = 20 A(S) + 51 A(F) + 155 A(SM) + 46 A(SS) + 22 A(OM)*

Application of the relevant parking rates to the proposed uses within the retail area is provided within Table 4 based on the definitions provided within the RTA Guide.

Table 4: Expected Retail Land Uses Traffic Generation

Classification	Traffic Generation Rate	Number/Size	Traffic Generation (vph)
Supermarket	155 trips per 1,000sqm GLA	3,400sqm	527
Specialty Shops	46 trips per 1,000sqm GLA	700sqm	32
Office, Medical	22 trips per 1,000sqm GLA	900sqm	20
Total			**579**

It is noted that the service station has been excluded from the above calculations given this is provided within its own site and is discussed further below.

The traffic survey data for regional shopping centres indicates that the traffic volumes for the morning peak hour are 68% of the evening peak hour. Accordingly, the above uses are expected to generate 394 vehicle movements during the morning peak hour.

The data presented within the *Trip Generation and Parking Demand Surveys of Shopping Centre Analysis Report*, September 2011, indicates that 54% of trips to shopping centres was associated with sole purpose trips. The document provides findings of other databases which identified that surveys undertaken in Western Australia show a 50:50 in/out distribution in the evening peak and an 80:20 in/out distribution in the morning peak.

8.1.3.2 Childcare Centre

The RTA Guide provides guidance on the traffic generation rates for childcare centres. The document indicates that the average number of children is 6.7sqm per 100sqm of floor area, which equates to approximately 37 children. The traffic generation rate has conservatively been adopted as 1 vehicle movement per child during the peak hour. Therefore, the childcare centre is expected to generate 37 vehicle movements in the morning and evening peak hour which will be distributed evenly between inbound and outbound movements.

8.1.3.3 Gymnasium

The RTA Guide rate for gymnasiums is 9 vehicle movements per 100sqm of gross floor area in the evening peak hour. The gymnasium is expected to have a floor area of 200sqm which equates to 18 vehicle movements in the peak hour. The same traffic volume has been adopted for the morning peak hour and the movements have been assumed to be evenly distributed between inbound and outbound movements.

8.1.3.4 Summary

The expected traffic generation for the retail use during the morning and evening peak periods is provided within Table 5.

Table 5: Retail Use Peak Hour Traffic Generation

	AM Peak (vph)	PM Peak (vph)
Arriving Trips	343	317
Departing Trips	106	317
Total	**449**	**634**

8.1.4 Bulky Goods Tenancy

The bulky goods tenancy is proposed to be provided as one store or 5-10 smaller stores, with either option providing in the order of 14,000sqm of gross floor area. The RTA Guide states the following in relation to the traffic generation of bulky goods tenancies:

> *'Surveys were undertaken in 1990 of a variety of bulky goods retail stores, ranging from specialist furniture stores to lighting and electrical appliance retailers. The trip generation rates varied so widely that average generation rates cannot be recommended.'*

The data collected indicates that larger hardware stores such as Bunnings or Mitre10 generate a higher level of traffic than smaller bulky goods stores. Accordingly, it is proposed to assume the bulky goods site is occupied by one large hardware store as this represents the worst case scenario.

A total of four regional hardware stores were surveyed which recorded the following average traffic generation rates:

- Daily vehicle trips: 31.79 trips per 100sqm gross floor area;
- Weekday average morning peak hour vehicle trips: 2.50 trips per 100sqm gross floor area; and
- Weekday average evening peak hour vehicle trips: 3.03 trips per 100sqm gross floor area.

Application of the above rates to the 14,000sqm of gross floor area results in a future traffic generation of 4,451 vehicle movements per day, and 350 and 424 vehicle movements (two-way total) in the morning and evening peak hours respectively.

The vehicle movements are expected to be evenly distributed between inbound and outbound vehicle movements which has been adopted for the purposes of this assessment. As such, the bulky goods component of the site is expected to generate the following traffic volumes during the morning and evening peak periods.

Table 6: Bulk Goods Tenancy Peak Hour Traffic Generation

	AM Peak (vph)	PM Peak (vph)
Arriving Trips	175	212
Departing Trips	175	212
Total	**350**	**424**

The survey data indicates that 4.5% of trips associated with the bulky goods tenancy is expected to be heavy vehicles.

8.1.5 Service Centre

Based on our experience with similar service station developments, the traffic volumes generated by the proposed use depends on the following:

- Traffic generation heavily depends on the traffic volumes of the adjacent roads rather than the size of the site or the number of bowsers as the majority of visitors to the site are already on the road network and choose to purchase fuel based on convenience;

- Service stations typically generate higher traffic generation rates during the evening peak period when compared to the morning peak period. This is primarily due to drivers choosing to purchase fuel on their homeward journey as opposed to their journey to a destination when they have a target arrival time; and
- The provision of other uses on-site, which may include a convenience store or fast food outlet, can generate additional vehicle movements.

The following assessment has focused on the evening peak period with lower traffic rates anticipated during the morning peak period.

8.1.5.1 Service Station and Convenience Store

The NSW RTA Guide to Traffic Engineering Developments (RTA Guide), October 2002, specifies the expected evening peak hour trip generation rates for service stations and convenience stores. The trip generation rate is calculated using the following formula:

Evening peak hour vehicle trips = 0.04 A(S) + 0.3 A(F)

Where: A(S) = Area of the site (sqm)

A(F) = Gross floor area of convenience store (sqm)

The service station component of the site has a total area of 2,500sqm and the convenience store is expected to have an area of approximately 200sqm. Using the formula above, the service station and convenience store are expected to generate approximately 160 vehicle movements during the evening peak hour.

8.1.5.2 Fast Food Outlet

The RTA Guide suggests that McDonald's Restaurants are the highest traffic generating facilities when compared to similar convenience restaurants and are expected to generate in the order of 180 vehicle movements per hour. The second highest traffic generator is a Kentucky Fried Chicken Restaurant which generate an average of 100 vehicle movements per hour.

If the fast food outlets were a McDonalds and KFC the associated traffic generation based on the RTA Guide would be 280 vehicle movements during the peak hour.

8.1.5.3 Summary

For the purposes of this assessment the following assumptions have been made when determine the potential traffic generation for the service station and associated convenience store and fast food outlets:

- The morning peak hour has conservatively been assessed as having the same traffic generation as the evening peak hour;
- It has been assumed that 80% of the vehicle movements for the fast food outlets are associated with vehicles using the service station and are not expected to generate an additional vehicle movement on the road network. As such, the fast food outlets are expected to generate 54 vehicle movements in each of the peak hours; and
- The vehicle movements are evenly split between inbound and outbound vehicle movements.

Based on the above assumptions the service station and associated convenience store and fast food outlets are expected to generate the following traffic volumes in the morning and evening peak hour.

Table 7: Service Station Peak Hour Traffic Generation

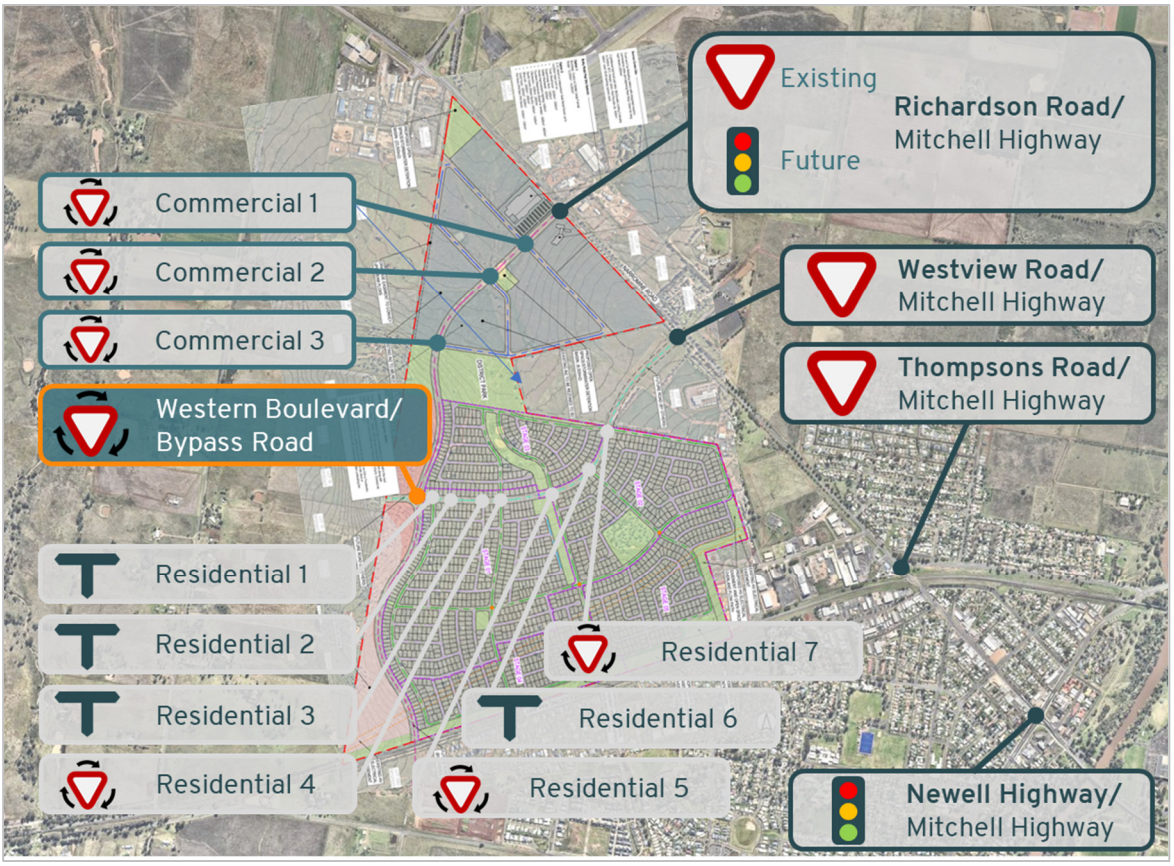
	AM Peak (vph)	PM Peak (vph)
Arriving Trips	107	107
Departing Trips	107	107
Total	**214**	**214**

8.2 Traffic Assessment

In order to determine the ability of the proposed internal and external road network to accommodate the traffic expected to be generated by the site a traffic modelling exercise has been undertaken using the SIDRA intersection modelling software. The intersection modelling analysis has been undertaken for all key internal intersections and the following external intersections, with all intersections presented in Figure 21:

- Mitchell Highway / Richardson Road;
- Mitchell Highway / Westview Street;
- Mitchel Highway / Thompson Street; and
- Mitchell Highway / Newell Highway.

Figure 21: Intersections Assessed with SIDRA Modelling



The existing external intersections have been assessed based on the current traffic volumes recorded at the intersections as presented within Section 2.3. All of the intersections have been assessed for a base year (2022) assuming all of the development has been realised. A future year (2032) has then been assessed assuming all of the development has been realised which includes an increase in the base traffic volumes on the surrounding road network. Accordingly, the following assessments have been provided for the road network:

- 2022 AM/PM Peak – without project (external intersections only);
- 2022 AM/PM Peak – with project;
- 2032 AM/PM Peak - without project (external intersections only); and
- 2032 AM/PM Peak – with project.

The assessment has been undertaken in accordance with the TfNSW Traffic Modelling Guidelines. The concepts of intersection capacity and level of service, as defined in the guidelines published by the RTA Guide, are discussed in Appendix B together with the criteria for their assessment.

Level of Service is a qualitative measure used to describe the operating conditions of a section of road or an intersection. Levels of Service are designated from A to F from best (free flow conditions) to worst (forced flow with stop start operation, long queues and delays) and represent the perception of the road conditions by motorists including speed and travel time, freedom to manoeuvre, traffic interruptions, comfort and convenience, and safety. The SIDRA intersection LOS criteria are summarised in Table 8.

Table 8: Level of Service Criteria for Intersections

Level of Service	Average Delay per Vehicle (sec/veh)	Traffic Signals, Roundabouts	Give Way and Stop Signs
A	Less than 14	Good operation	Good operation
B	15 – 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 – 42	Satisfactory	Satisfactory, but accident study required
D	43 – 56	Operating near capacity	Near capacity and accident study required
E	57 - 70	At capacity. Signals, incidents will cause excessive delays. Roundabouts require other control mode	At capacity, require other control mode

8.2.1 Assumptions

When preparing the traffic models the following assumptions have been made:

- Traffic generation for the individual uses and are based on the volumes presented within Section 8.1 of this report;
- The background traffic movements for the external intersections are based on the peak hour for the traffic survey data provided in Section 2.3 which was collected in 2022;
- Future background traffic movements are based on the growth rate of traffic on the Mitchell Highway/Newell Highway intersection between 2009 and 2022. The growth rate was found to be 3.34% and 2.84% per annum in the morning and evening peak hours respectively.

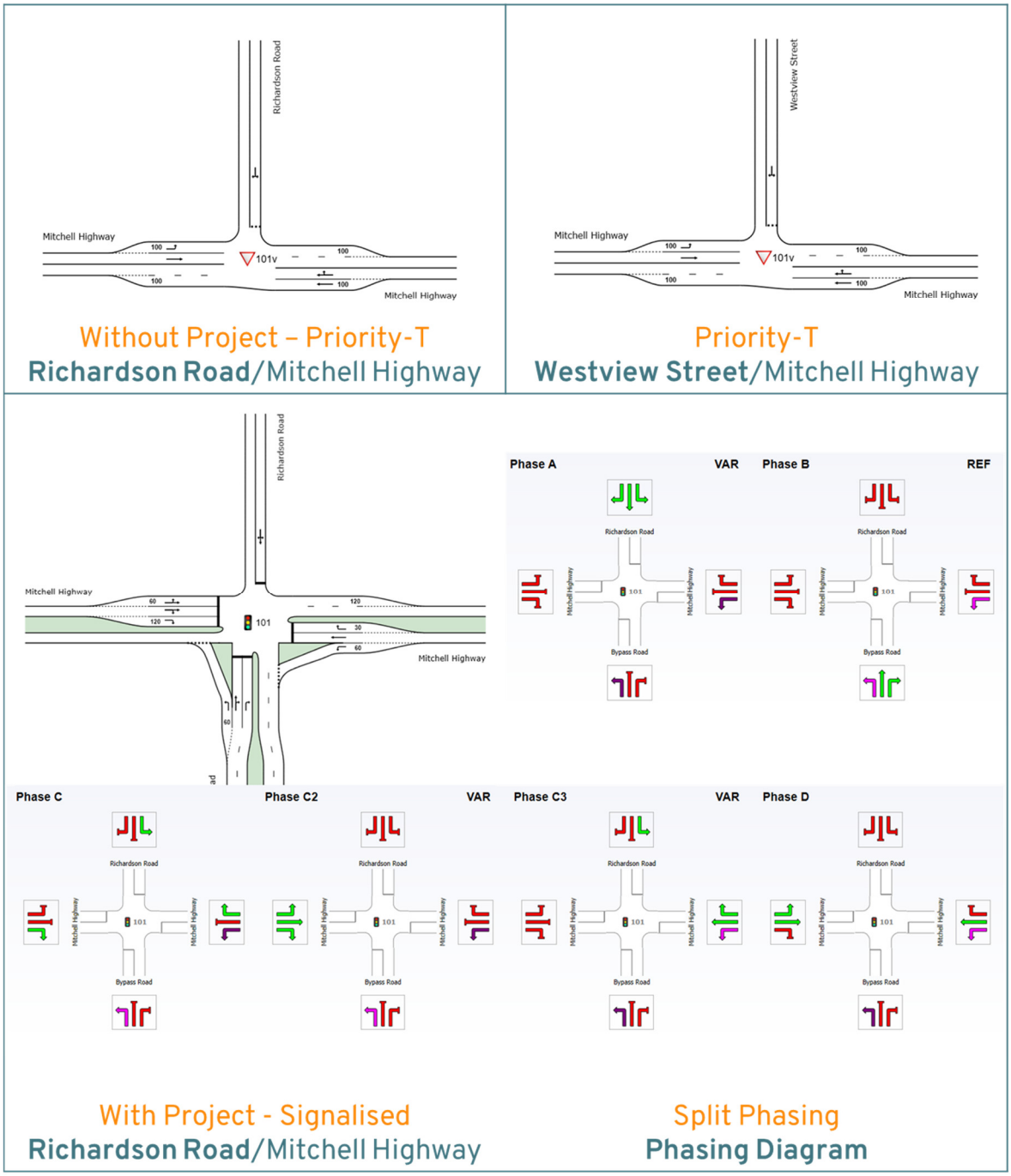
- The distribution of site traffic at existing intersections on Mitchell Highway are based on the existing traffic distributions recorded as part of the traffic survey data collected in 2022;
- It has been assumed that 79% of all vehicle movements associated with the residential component of the site travel to/from the east (towards Dubbo) at the intersection of the Bypass Road and Mitchell Highway, 20% travel to/from the west, and the remaining 1% travel to/from Richardson Road;
- The distribution of retail and commercial trips at the intersection of the Bypass Road and Mitchell Highway is 30% west, 2% north, and 68% east;
- In order to account for internal trips within the residential component of the site, intersection movements with no turn volumes have been provided with a value equal to 5% of all approach traffic on the respective leg of the intersection;
- The access arrangements for the service station have been assumed to include the following:
  - A left-turn slip lane from Mitchell Highway;
  - A left-turn slip lane from Western Boulevard; and
  - A two-way access via Commercial Road 1 East.
- The service station traffic comprises 80% through trips and 20% return trips;
- The Market Potential report prepared by Location IQ indicates that 70-80% of the retail patronage is accounted for within the 'primary' zone, and that the proposed residential estate makes up 60-65% of the 'primary' zone. Accordingly, 47% associated with the retail component of the site are attributed to the residential estate;
- The industrial and bulky goods trips attributed to the residential estate equates to 24% of the total trips associated with these uses, based on a 50% reduction from the retail proportion which represents a wider catchment area associated with these uses;
- Retail, industrial, and bulky goods trips with an origin or destination of the residential estate are distributed with the *in/out* split of the residential movements. All other trips are distributed with the *in/out* split of the relevant land use;

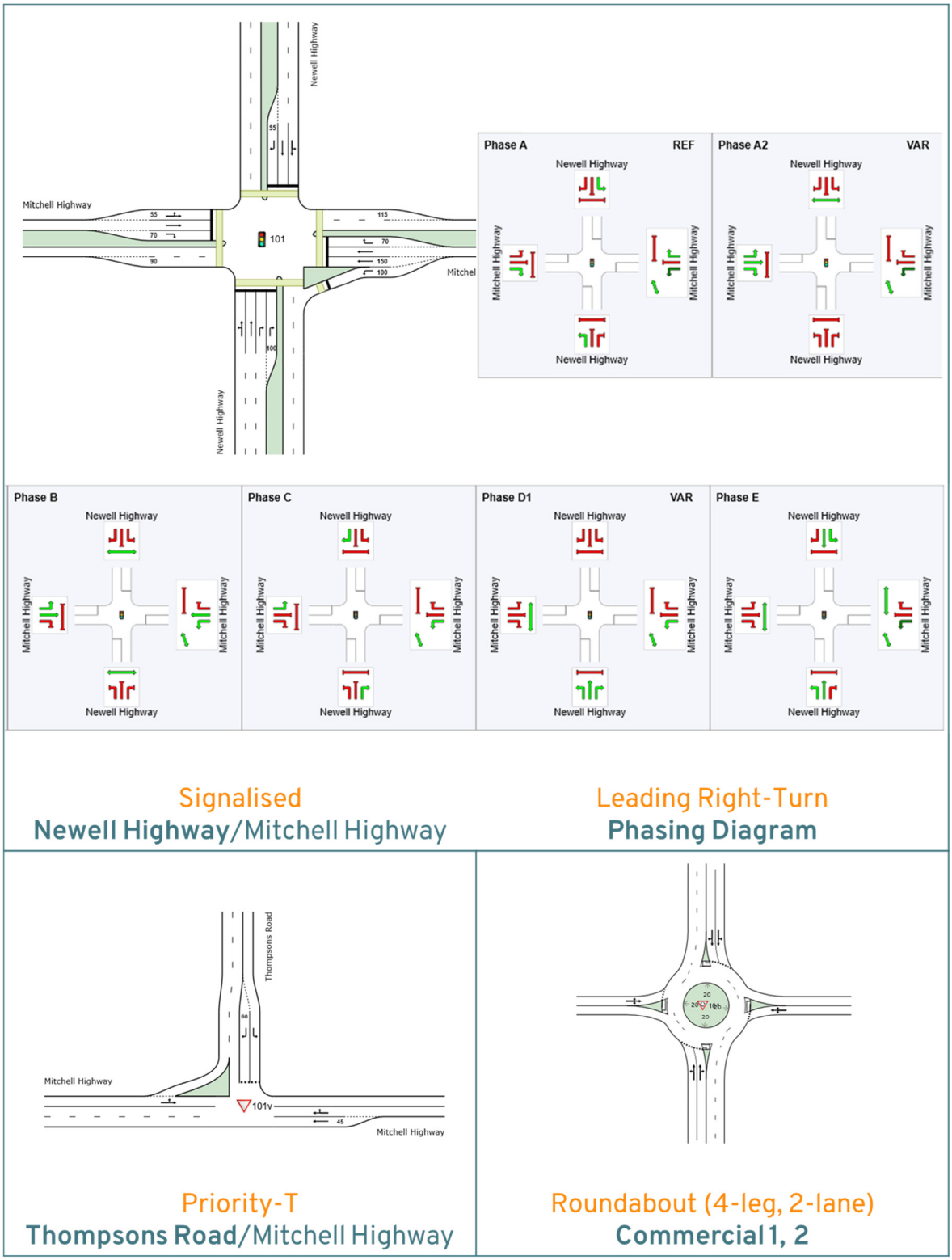
The above assumptions have been adopted in order to determine the distribution of traffic associated with the various land uses on the internal and external road network.

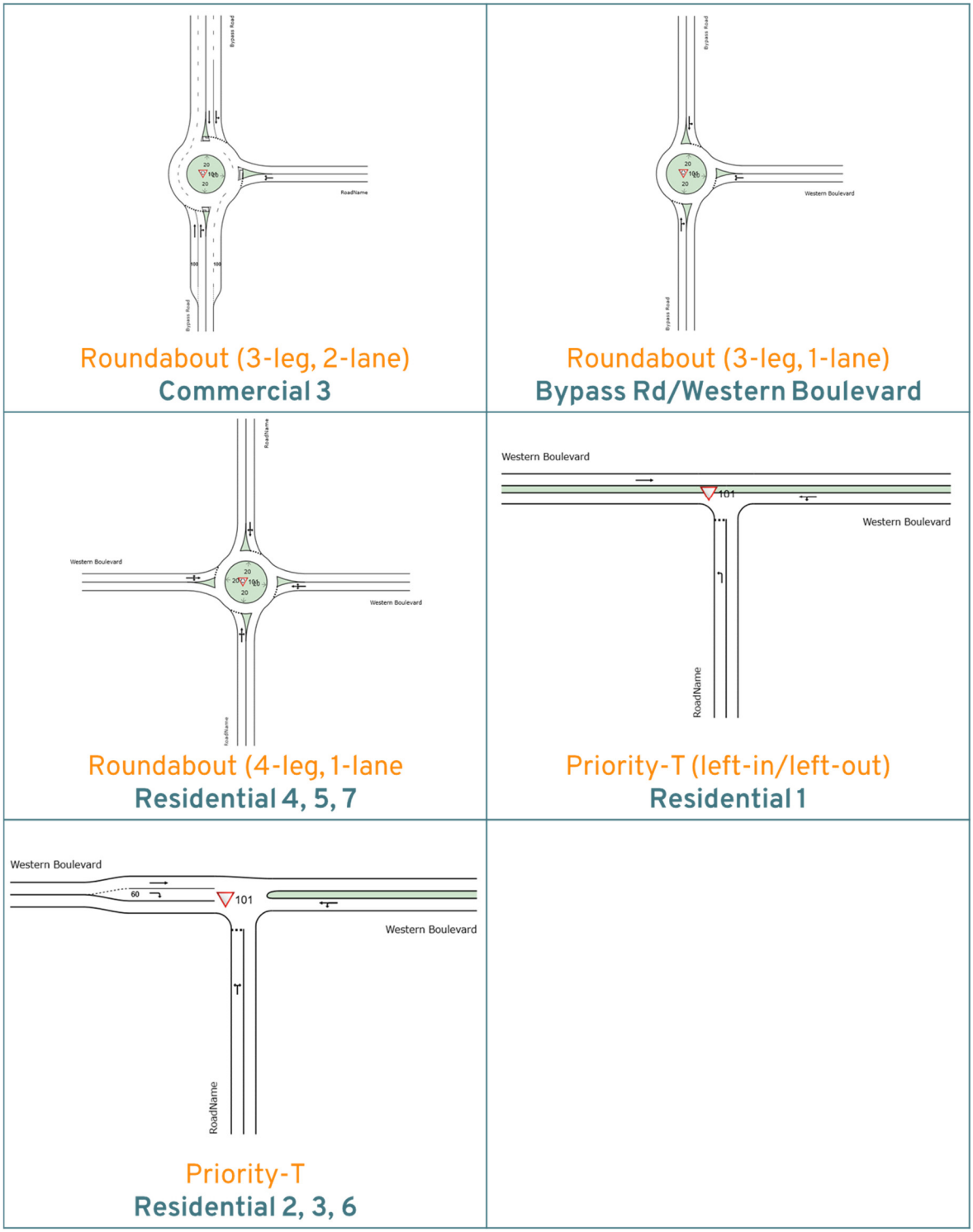
8.2.2 Key Intersections

The layout of key intersections that has been adopted for the modelling exercise in SIDRA are set out in Figure 22. The phasing diagrams for the signalised intersections are also provided. The numbering of the intersections is based on Figure 21.

Figure 22: Key Intersections




Newell Highway
Mitchell Highway
101
Phase A
REF
Phase A2
VAR
Phase B
Phase C
Phase D1
VAR
Phase E
Signalised
Newell Highway/Mitchell Highway
Leading Right-Turn
Phasing Diagram
Thompsons Road
101v
Priority-T
Thompsons Road/Mitchell Highway
Roundabout (4-leg, 2-lane)
Commercial 1, 2



8.2.3 Modelling Results

Based on the above assumptions, traffic models were prepared for each of the intersections and associated time periods. A summary of the modelling results is presented within Table 9 and Table 10 which shows the worst case movement for each intersection. Due to the extent of outputs from the models within this report the movements summaries for each intersection have not been provided. Detailed SIDRA outputs are able to be provided upon request.

Table 9: Masterplan Traffic Modelling Results – Year 2022 External Intersections

Intersection	Peak	Without Project				With Project			
		DOS	Average Delay	95% queue (m)	LOS	DOS	Average Delay	95% queue (m)	LOS
Mitchell Highway/ Bypass Road	AM	0.22	0.5	2.4	LOS B	0.78	30.1	211.5	LOS E
	PM	0.17	0.3	1.6	LOS B	0.72	25.6	158.5	LOS E
Mitchell Highway/ Westview Street	AM	0.23	0.4	2.0	LOS B	1.22	8.8	102.7	LOS F
	PM	0.19	0.3	1.2	LOS B	1.07	5.3	27.6	LOS F
Mitchell Highway/ Thompson Street	AM	0.42	1.9	13.4	LOS B	27.52	1313.4	1249.2	LOS F
	PM	0.46	2.1	15.3	LOS B	24.96	1755.9	1559.2	LOS F
Mitchell Highway/ Newell Highway	AM	0.87	26.7	108.3	LOS C	0.94	39.1	233.5	LOS E
	PM	0.88	23.7	67.2	LOS C	0.94	34.4	231.6	LOS E

Table 10: Masterplan Traffic Modelling Results – Year 2032 External Intersections (Future Condition)

Intersection	Peak	Without Project				With Project			
		DOS	Average Delay	95% queue (m)	LOS	DOS	Average Delay	95% queue (m)	LOS
Mitchell Highway/ Bypass Road	AM	0.30	0.9	4.8	LOS C	0.89	37.1	261.0	LOS F
	PM	0.22	0.5	2.5	LOS B	0.85	30.7	201.4	LOS E
Mitchell Highway/ Westview Street	AM	0.32	0.7	3.8	LOS C	1.68	18.9	161.6	LOS F
	PM	0.25	0.4	1.9	LOS C	1.12	6.5	30.4	LOS F
Mitchell Highway/ Thompson Street	AM	1.36	16.1	131.1	LOS F	59.86	2722.9	1848.4	LOS F
	PM	1.11	11.8	93.8	LOS F	83.51	5711.0	2661.5	LOS F
Mitchell Highway/ Newell Highway	AM	0.91	36.2	207.2	LOS E	1.13	66.9	487.2	LOS F
	PM	0.94	30.5	105.7	LOS D	1.03	50.4	350.1	LOS F

Table 11: Masterplan Traffic Modelling Results – Internal Intersections

Intersection	Peak	DOS	Average Delay	95% queue (m)	LOS
Bypass Road/ Western Boulevard	AM	0.61	0.2	41.7	LOS B
	PM	0.55	0.0	40.1	LOS A
Residential 1	AM	0.43	1.0	9.7	LOS A
	PM	0.49	0.2	2.0	LOS A
Residential 2	AM	0.39	0.6	3.8	LOS B
	PM	0.49	0.6	2.9	LOS C
Residential 3	AM	0.40	0.4	2.1	LOS B
	PM	0.36	0.4	5.5	LOS C
Residential 4	AM	0.39	1.1	19.0	LOS A
	PM	0.42	0.5	22.5	LOS A
Residential 5	AM	0.22	0.8	9.1	LOS A
	PM	0.29	0.4	12.9	LOS A
Residential 6	AM	0.10	0.2	3.1	LOS A
	PM	0.13	0.1	4.3	LOS A
Residential 7	AM	0.04	0.2	1.3	LOS A
	PM	0.06	0.1	1.9	LOS A
Commercial 1	AM	0.54	3.9	37.5	LOS B
	PM	0.79	8.4	84.1	LOS E
Commercial 2	AM	0.35	1.2	16.6	LOS B
	PM	0.38	1.3	21.3	LOS B
Commercial 3	AM	0.33	0.5	16.7	LOS A
	PM	0.47	2.4	26.4	LOS B

8.2.4 Modelling Summary

8.2.4.1 Mitchell Highway / Bypass Road

The without project SIDRA results have been assessed based on the existing priority controlled intersection layout and indicate the intersection is expected to operate under good conditions. The with project SIDRA results have assumed the intersection is upgraded to be provided with traffic signals.

In the 2022 scenario the intersection is expected to operate with a LOS E and has a degree of saturation (DOS) of 0.78 in the morning peak and 0.72 in the evening peak. It is generally considered that signalised intersections should operate with a desirable maximum DOS of 0.90 and at 0.95 the intersection is considered to be operating at capacity. The maximum DOS presented within the tables for signalised intersections represents the worst-case movement. The DOS at the intersection is less than 0.90 which indicates the intersection is operating below the desired maximum capacity.

The maximum average delay at the intersection is 56 seconds which is recorded for eastbound traffic on the western leg of Mitchell Highway in the morning peak for the 2032 year. The highest delays recorded at the intersection are experienced by right turn movements on Mitchell Highway and are in the order of 70 seconds during the morning peak which represents the worst case scenario. Overall, the delays at the intersection during the 2022 and 2032 assessment year are considered to be acceptable and are less than one phase cycle.

A maximum queue length of 261 metres is recorded on the Bypass Road in the morning peak for the 2032 year. The longer queue lengths recorded on the Bypass Road in the morning peak hour are expected to extend back to the intersection to the south and as such, these intersections have been modelled as a network.

Overall, the assessment indicates that the intersection is operating satisfactorily during the morning and evening peak hours for the 2022 and 2032 scenario.

8.2.4.2 Mitchell Highway / Westview Street

The SIDRA results indicate that the intersection is expected to operate under acceptable conditions without the project. With the project the intersection is expected to operate with a LOS F which is experienced by turning vehicles to/from Westview Street as a result of the increase in through movements at the intersection. Further discussion is provided later within this report regarding the potential upgrade of this intersection associated with the extension of the Western Boulevard.

8.2.4.3 Mitchell Highway / Thompson Street

The assessment indicates that without the development traffic the intersection would operate above capacity in the 2032 assessment year, and with the development traffic in 2022 the intersection would reach capacity. The delays and queue lengths presented within the above tables for the with development scenario are not reflective of the actual delays and queues as SIDRA results are not accurate once an intersection has failed.

The results indicate that the increase in through and turn movements at the intersection generated by background traffic would result in the intersection failing. The results also indicate

that the project would result in the intersection failing in 2022 and would exacerbate any delays and queue lengths in 2032.

Overall, the intersection is required to be upgraded to allow vehicles to safely and efficiently turn at the intersection with or without the development traffic. Further, discussion is provided within Section 12 of this document which provides potential intersection upgrades and the associated traffic impacts. It is understood that the intersection is proposed to be upgraded as part of the Building a Better Dubbo Project which should consider the increase in traffic associated with the project and growth in the wider Dubbo region.

8.2.4.4 Mitchell Highway/ Newell Highway

The results indicate that the intersection is already operating near capacity even following recent road upgrades, and is expected to fail in the 2032 assessment year without the project traffic. With the development traffic the intersection is expected to operate within the intersection capacity in 2022. Any upgrade of this intersection to accommodate the increase in background and project traffic should be undertaken with consideration for future growth in the wider Dubbo area.

8.2.4.5 Internal Intersections

The SIDRA results indicate that the internal intersections are all expected to operate with a good level of service excluding the northernmost intersection within the business zone which is expected to operate with a LOS E in the evening peak. This is generated by the eastern leg of the intersection which is expected to experience delays of approximately 65 seconds and a queue length of 84 metres and is generated by the high number of through movements along the Bypass Road. All other legs of the intersection operate with a LOS A or B. Overall, it is considered that the intersection operates under acceptable conditions and the internal road network is expected to operate in a suitable manner.

8.2.5 Midblock Assessment

The concept of carriageway capacity and Level of Service are discussed in Appendix C together with criteria for their assessment. The surrounding road network has been assessed against the criteria for the 2032 year and is summarised within Table 12.

Table 12: One-Way Peak Hour Carriageway Capacity Assessment – Year 2032

Road Segment	Northbound/Westbound				Southbound/Eastbound			
	Existing (vph)	Project (vph)	Total (vph)	LOS	Existing (vph)	Project (vph)	Total (vph)	LOS
Mitchell Highway *Richardson Road – Westview Street*	479	915	1394	E	568	808	1376	E
Mitchell Highway *Westview Street – Thompson Street*	623	920	1543	F	778	813	1590	F
Mitchell Highway *Thompson Street – Newell Highway*	723	548	1271	E	544	505	1049	E
Thompson Street *North of Mitchell Highway*	593	299	892	D	431	339	770	D

Newell Highway *South of Mitchell Highway*	1543	34	1577	C	1258	35	1293	B
Bypass Road *Mitchell Highway - Commercial* 1			1106	B			1232	B
Bypass Road *Commercial 1 - Commercial 2*			972	B			1088	B
Bypass Road *Commercial 2 - Commercial 3*			906	B			1014	B
Bypass Road *Commercial 3 – Western Boulevard*			958	E			897	D
Western Boulevard *Bypass Road – Residential 1*			942	E			894	D
Western Boulevard *Residential 1 – Residential 4*			465	C			436	C
Western Boulevard *Residential 4 – Residential 5*			249	B			209	B
Western Boulevard *Residential 5 – Residential 7*			94	A			79	A
Western Boulevard *Residential 7 – Mitchell Highway*			16	A			5	A

8.2.5.1 External Road Network

The results of the midblock analysis show that the expected increase in traffic on the external road network associated with the project is typically within the capacity of the existing road infrastructure.

The worst case LOS is F which is expected to occur on Mitchell Highway between Westview Street and Thompson Street. This is expected to occur within the morning peak hour which is primarily generated by vehicles from the residential component of the site travelling towards Dubbo.

The RTA Guide states the following in relation to the capacity of urban roads:

> *'…typical oneway midblock lane capacities on urban arterial roads under interrupted flow conditions are 900-1000 veh/hr/lane. This calculation assumes Clearway conditions. The capacity falls to 600 veh/hr/lane for a kerbside lane with occasional parked vehicles. These capacities at times may increase under ideal conditions to 1200-1400 veh/hr.'*

The above LOS have been based on the assumption that the road network is an urban setting. However, this section of Mitchell Highway is more reflective of a rural road which is expected to have a higher capacity. Based on the RTA Guide the road is expected to have a capacity in the order of 1,400 vehicles per lane per hour which adopts a conservative estimate given Mitchell Highway provides a higher order road function.

Based on the above results Mitchell Highway would exceed the expected capacity in the morning peak hour. It is recommended that any future road upgrades by Council or TfNSW at the intersection of Thompson Street and Mitchell Highway consider the provision of additional lanes on Mitchell Highway to increase the capacity of the road network. Further discussion on when the road may reach capacity is provided within Section 12 of this report.

8.2.5.2 Internal Road Network

The results indicate the internal road network is able to accommodate the traffic volumes generated by the proposed land uses. However, the western end of Western Boulevard and the southern end of the Bypass Road (which has one lane in each direction) would operate at or near capacity given the traffic volumes are near 1,000 vehicles per hour per lane adopting the recommended capacity of 900-1,000 veh/hr/lane from the RTA Guide.

Austroads Guide to Traffic Management Part 3 indicates a typical midblock one-way lane capacity of 900-1000pc/h (passenger cars per hour). It is expected that this can be increased to 1200-1400pc/h per lane when ideal conditions are present, including:

- *adequate flaring at major upstream intersections*
- *uninterrupted flow from a wider carriageway upstream of an intersection approach and flowing at capacity*
- *control or absence of crossing or entering traffic at minor intersections by major road priority controls*
- *control or absence of parking*
- *control or absence of right turns by banning turning at difficult intersections*
- *high-volume flows of traffic from upstream intersections during more than one phase of a signal cycle*
- *good co-ordination of traffic signals along the route*

Western Boulevard is considered to meet some of the criteria outlined above resulting in an increase capacity to what is presented within the RTA Guide. Amber Organisation has undertaken a review of similar roads which provide the following characteristics:

- A raised central median;
- One lane of traffic in each direction;
- A bicycle lane in each direction;
- Kerbside parallel parking on both sides of the roads;
- Regular crossovers to dwellings along the length of the road; and
- Interrupted conditions with intersections along the length of the road.

The assessment indicated that the roads typically had a carriageway capacity in the order of 1,200 vehicles per lane per hour. Accordingly, Western Boulevard is expected to operate within its estimated capacity based on the traffic volumes presented above.

8.3 Summary

Overall, the SIDRA analysis indicates that the internal road network is expected to operate with a good level of service, and acceptable queue lengths and delays. The only exception is the eastern leg of the northernmost intersection on the Bypass Road which is expected to operate with a delay of up to 65 seconds and queue lengths of 84 metres which represents a LOS E. Notwithstanding this, the internal road network is concluded to be suitably designed and expected to operate in an acceptable manner.

The following conclusions are provided in relation to the external road network:

- The assessment indicates that the intersection of the Bypass Road and Mitchell Highway is suitably designed and will operate with acceptable conditions in the 2032 year.
- The intersections of Westview Street and Mitchell Highway is expected to reach capacity. Further discussion is provided within this report that assesses a potential upgrade to the intersection assuming the Western Boulevard extends to Mitchell Highway.
- The intersection of Mitchell Highway and Thompson Street is already reaching capacity and is expected to fail by the year 2032 even without the project traffic. The intersection requires a form of traffic control to allow vehicles to safely turn at the intersection and it is understood the intersection is proposed to be upgraded as part of the Building a Better Dubbo Project.
- The intersection of Mitchell Highway and Newell Highway is already operating near capacity and reaches capacity with the development traffic. It is recommended that the upgrade of the intersection consider growth within the wider Dubbo area. It is noted that the intersection would fail in the 2032 assessment year with an increase in background traffic alone.
- The through movements on Mitchell Highway are expected to be nearing capacity in the 2032 assessment year with the development traffic.

The project is expected to be constructed in stages over an extended period of time. Therefore, the impacts to the wider road network are expected to be gradual and do not necessarily mean road upgrades are immediately required. Further discussion is provided on when road upgrades may be required within Section 12 of this document.

Overall, the road network is generally able to accommodate the development traffic subject to upgrades at the intersection of Thompson Street/Mitchell Highway and Newell Highway/ Mitchell Highway. Both are expected to reach capacity in 2032 without the development traffic and would fail in 2022 with the development traffic.

9. Future Road Network Upgrades

A sensitivity analysis has been undertaken to assess the internal and external road network once the adjacent connections are made with the wide road network following development of the adjacent sites. The scenarios include (assuming the assessment above represents Scenario 1):

- Scenario 2: Western Boulevard is extended through the TAFE site and connects with Mitchell Highway at Westview Street; and
- Scenario 3: In addition to the Western Boulevard extension, the Bypass Road is extended to the south to provide a diversion around Dubbo which reflects the ultimate road configuration for the Freight Ring outlined within the Dubbo City Planning and Transport Strategy 2036.

Each of the scenarios has been run for the 2022 and 2032 years assuming full development of the site. The results of the analysis are summarised below.

9.1 Scenario 2: Western Boulevard Extension

The extension of the Western Boulevard to Narromine Road is expected to result in a significant redistribution of traffic within the site, particularly for the residential component as the majority of vehicle movements to/from Dubbo would subsequently utilise the new intersection. The following provides a review of the traffic impacts of the new connection to Narromine Road.

9.1.1 Assumptions

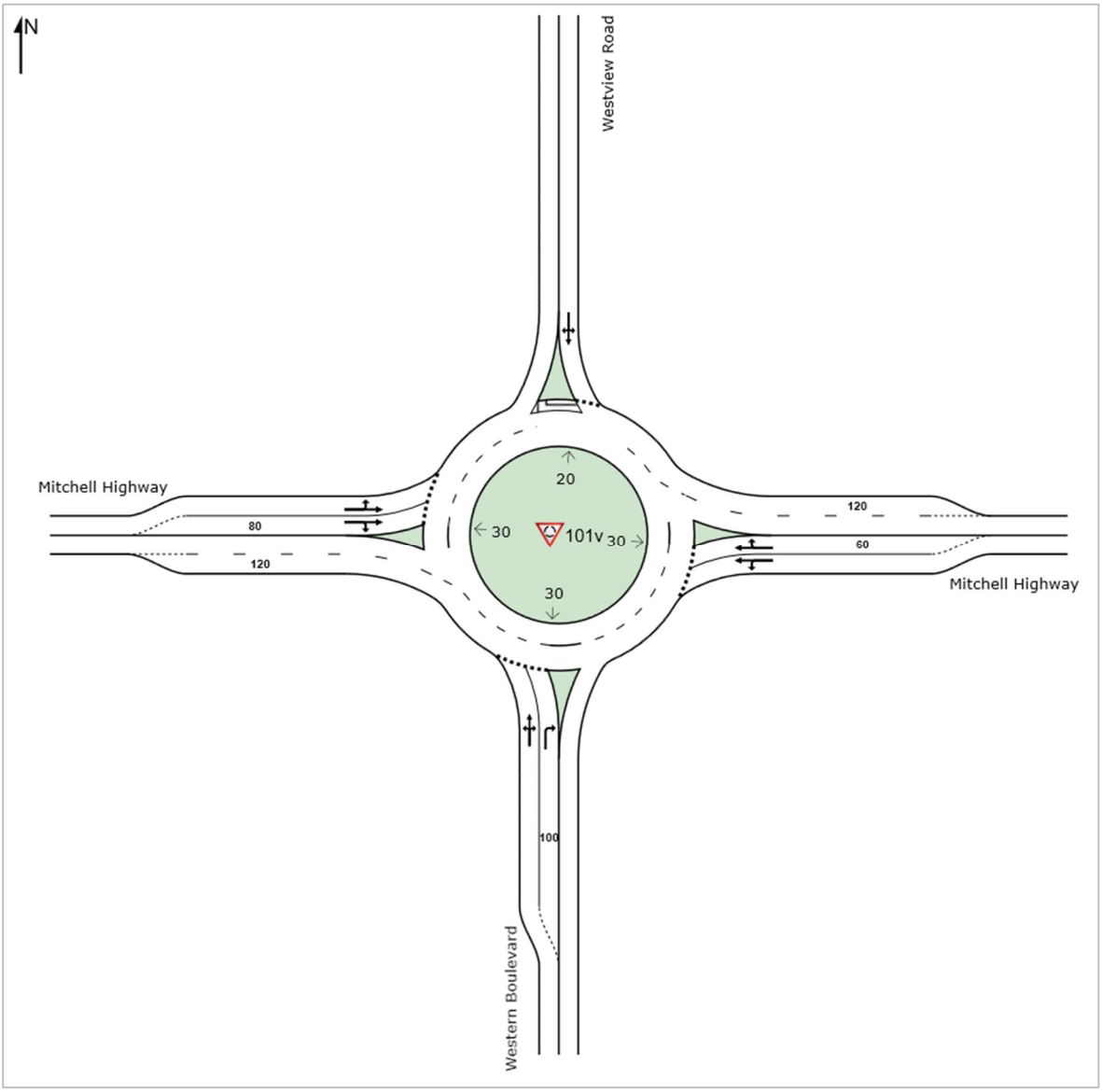
When preparing the traffic models the following assumptions have been made:

- The total number of residential westbound movements on Mitchell Highway remains constant from the previous scenario (20% of total residential traffic);
- Westbound residential traffic on Western Boulevard is primarily trips to the commercial precinct, with some trips ultimately travelling west on Mitchell Highway;
- No land uses, other than the residential use, generates traffic on Western Boulevard; and
- The intersection of Mitchell Highway and Western Boulevard is upgraded from the priority-T intersection layout to a 4-leg roundabout intersection.

9.1.2 Key Intersections

The assessment has analysed all of the intersections that were assessed as part of the masterplan. It is noted that the intersection of Western Boulevard and Mitchell Highway has been assessed as a roundabout intersection with the layout provided shown within Figure 23.

Figure 23: Western Boulevard / Mitchell Highway SIDRA Intersection Layout



9.1.3 Modelling Results

Based on the above assumptions, traffic models were prepared for each of the intersections and associated time periods. A summary of the modelling results is presented within the following tables which shows the worst case movement for each intersection with the development traffic. Detailed SIDRA outputs are able to be provided upon request.

Table 13: Scenario 2 Traffic Modelling Results – Year 2022 External Intersections

Intersection	Peak	Without Project				With Project			
		DOS	Average Delay	95% queue (m)	LOS	DOS	Average Delay	95% queue (m)	LOS
Mitchell Highway/ Bypass Road	AM	0.22	0.5	2.4	LOS B	0.57	26.5	115.7	LOS E
	PM	0.17	0.3	1.6	LOS B	0.61	27.7	124.3	LOS E
Mitchell Highway/ Westview Street	AM	0.23	0.4	2.0	LOS B	0.49	3.3	25.5	LOS C
	PM	0.19	0.3	1.2	LOS B	0.51	1.6	32.7	LOS B
Mitchell Highway/ Thompson Street	AM	0.42	1.9	13.4	LOS B	25.98	1239.8	1218.6	LOS F
	PM	0.46	2.1	15.3	LOS B	23.48	1639.5	1516.6	LOS F
Mitchell Highway/ Newell Highway	AM	0.87	26.7	108.3	LOS C	0.91	38.4	212.8	LOS E
	PM	0.88	23.7	67.2	LOS C	0.93	34.0	224.6	LOS E

Table 14: Scenario 2 Traffic Modelling Results – Year 2032 External Intersections (Future Condition)

Intersection	Peak	Without Project				With Project			
		DOS	Average Delay	95% queue (m)	LOS	DOS	Average Delay	95% queue (m)	LOS
Mitchell Highway/ Bypass Road	AM	0.30	0.9	4.8	LOS C	0.67	28.2	153.0	LOS E
	PM	0.22	0.5	2.5	LOS B	0.76	30.4	170.2	LOS E
Mitchell Highway/ Westview Street	AM	0.32	0.7	3.8	LOS C	0.60	4.5	37.4	LOS D
	PM	0.25	0.4	1.9	LOS C	0.55	1.9	38.6	LOS B
Mitchell Highway/ Thompson Street	AM	1.36	16.1	131.1	LOS F	59.66	2716.7	1845.9	LOS F
	PM	1.11	11.8	93.8	LOS F	77.83	5291.6	2553.3	LOS F
Mitchell Highway/ Newell Highway	AM	0.91	36.2	207.2	LOS E	1.15	66.8	455.9	LOS F
	PM	0.94	30.5	105.7	LOS D	1.08	49.6	341.3	LOS F

Table 15: Scenario 2 Traffic Modelling Results – Internal Intersections

Intersection	Peak	DOS	Average Delay	95% queue (m)	LOS
Bypass Road/ Western Boulevard	AM	0.26	0.1	10.5	LOS A
	PM	0.24	0.0	11.0	LOS A
Residential 1	AM	0.19	0.2	1.9	LOS A
	PM	0.21	0.1	0.7	LOS A
Residential 2	AM	0.18	0.2	1.2	LOS A
	PM	0.18	0.2	0.7	LOS A
Residential 3	AM	0.21	0.9	6.0	LOS A
	PM	0.16	0.6	2.9	LOS A
Residential 4	AM	0.20	0.7	8.0	LOS A
	PM	0.27	0.6	11.8	LOS A
Residential 5	AM	0.28	0.7	12.6	LOS A
	PM	0.33	0.6	15.5	LOS A
Residential 6	AM	0.25	0.5	4.4	LOS A
	PM	0.27	0.7	4.5	LOS A
Residential 7	AM	0.36	0.4	17.6	LOS A
	PM	0.35	0.2	16.6	LOS A
Commercial 1	AM	0.30	2.0	14.1	LOS A
	PM	0.42	2.6	21.1	LOS B
Commercial 2	AM	0.16	0.8	6.6	LOS A
	PM	0.21	0.9	9.4	LOS A
Commercial 3	AM	0.14	0.3	5.6	LOS A
	PM	0.31	1.0	13.5	LOS A

9.1.4 Modelling Summary

The modelling results indicate that the internal intersections operate with improved traffic conditions as the internal movements are better distributed on the road network given vehicles are provided with two accesses to Mitchell Highway. Notably all legs of the northernmost intersection on the Bypass Road now operate with a good level of service.

The following comments are provided in relation to the external road network:

- The degree of saturation at the intersection of the Bypass Road and Mitchell Highway operates with improved conditions with a LOS E and has a DOS well below 0.90;
- The intersection of Western Boulevard and Mitchell Highway is expected to operate with acceptable conditions based on the roundabout intersection design used for the assessment.
- The intersections of Thompson Street and Mitchell Highway is expected to operate above capacity as previously outlined within Section 8.2.3. It is understood that the intersection is proposed to be upgraded as part of the Building a Better Dubbo Project which should consider the increase in traffic associated with the project.
- The intersection of Newell Highway and Mitchell Highway is still expected to operate at or above capacity. The results presented within Section 8.2.3 indicate that the intersection is already operating near capacity even following recent road upgrades, and is expected to fail in the 2032 assessment year without the project traffic. Any upgrade of this intersection to accommodate the increase in background and project traffic should be undertaken with consideration for future growth in the wider Dubbo area.

Overall, the extension of Western Boulevard to Mitchell Highway is expected to result in improved operating conditions within the site and at the intersection of the Bypass Road with Mitchell Highway.

9.1.5 Midblock Assessment

The midblock traffic volumes and subsequent change in the operation on the surrounding road network is summarised within Table 16.

Table 16: One-Way Peak Hour Carriageway Capacity Assessment

Road Segment	Northbound/Westbound				Southbound/Eastbound			
	Existing (vph)	Project (vph)	Total (vph)	LOS	Existing (vph)	Project (vph)	Total (vph)	LOS
Mitchell Highway *Richardson Road – Westview Street*	479	459	938	E	568	341	909	E
Mitchell Highway *Westview Street – Thompson Street*	623	898	1522	F	778	795	1573	F
Mitchell Highway *Thompson Street – Newell Highway*	723	537	1261	E	544	497	1041	E

Thompson Street *North of Mitchell Highway*	593	294	887	D	431	332	764	D
Newell Highway *South of Mitchell Highway*	1543	37	1580	C	1258	41	1299	B
Bypass Road *Mitchell Highway - Commercial 1*			668	A			716	A
Bypass Road *Commercial 1 - Commercial 2*			418	A			572	A
Bypass Road *Commercial 2 - Commercial 3*			356	A			509	A
Bypass Road *Commercial 3 – Western Boulevard*			407	C			395	C
Western Boulevard *Bypass Road – Residential 1*			392	C			392	C
Western Boulevard *Residential 1 – Residential 4*			353	B			334	B
Western Boulevard *Residential 4 – Residential 5*			432	C			450	C
Western Boulevard *Residential 5 – Residential 7*			488	C			517	C
Western Boulevard *Residential 7 – Mitchell Highway*			517	C			555	C

The results indicate the road network is expected to operate with similar conditions to Scenario 1 and what was presented within Table 12.

9.2 Scenario 3: Bypass Road Extension

The extension of the Bypass Road over the railway line to the south and through to Newell Highway is expected to result in an increase in through traffic movements on the Bypass Road. The following provides an assessment of the potential traffic impacts of the continuation of the Bypass Road.

9.2.1 Assumptions

When preparing the traffic models the following assumptions have been made:

- The construction of the Bypass Road extension is expected to remove 80% of traffic turning between Mitchell Highway (west) and Newell Highway (south). The traffic recorded as part of the survey results presented in Section 2.3 has been taken from the intersection and added to the background traffic on the Bypass Road;
- The Western Boulevard has been extended to Mitchell Highway;
- 10% of the total residential trips are redistributed to/from the south via the Bypass Road;
- 15% of industrial, bulky goods, and retail trips are redistributed to/from the south via the Bypass Road; and

- The intersection layouts are the same as has been adopted for Scenario 2.

9.2.2 Key Intersections

The intersections that experience an increase in traffic volumes as a result of the extension of the Bypass Road are limited to the intersections along the Bypass Road and include:

- Mitchell Highway / Bypass Road;
- Commercial 1, 2 and 3; and
- Bypass Road / Western Boulevard.

9.2.3 Modelling Results

Based on the above assumptions, traffic models were prepared for each of the intersections and associated time periods. A summary of the modelling results is presented within Table 17 and Table 18 which shows the worst case movement for each intersection. Detailed SIDRA outputs are able to be provided upon request.

Table 17: Scenario 3 Traffic Modelling Results with Development Traffic – 2022 and 2032 Projection

Intersection	Peak	2022				2032			
		DOS	Average Delay	95% queue (m)	LOS	DOS	Average Delay	95% queue (m)	LOS
Mitchell Highway/ Bypass Road	AM	0.48	25.6	84.1	LOS E	0.58	27.0	117.5	LOS E
	PM	0.56	27.7	111.6	LOS E	0.65	29.0	147.6	LOS E

Table 18: Scenario 3 Traffic Modelling Results with Development Traffic – Internal Intersections

Intersection	Peak	DOS	Average Delay	95% queue (m)	LOS
Bypass Road/ Western Boulevard	AM	0.39	1.0	18.5	LOS A
	PM	0.43	0.8	24.4	LOS A
Commercial 1	AM	0.30	2.2	14.2	LOS A
	PM	0.45	2.9	23.6	LOS B
Commercial 2	AM	0.18	0.9	7.6	LOS A
	PM	0.24	1.0	11.0	LOS A
Commercial 3	AM	0.20	0.5	9.0	LOS A
	PM	0.35	1.3	16.1	LOS A

9.2.4 Modelling Summary

The SIDRA results indicate that the intersection of the Bypass Road and Mitchell Highway is expected to continue to operate with acceptable conditions even with the addition of Dubbo bypass traffic. Further, all internal intersections are expected to operate under good conditions.

9.2.5 Midblock Assessment

The midblock traffic volumes and subsequent change in the operation along the Bypass Road are summarised within Table 12.

Table 19: One-Way Peak Hour Carriageway Capacity Assessment

Road Segment	Northbound/Westbound				Southbound/Eastbound			
	Existing (vph)	Project (vph)	Total (vph)	LOS	Existing (vph)	Project (vph)	Total (vph)	LOS
Bypass Road *Mitchell Highway - Commercial 1*			615	A			674	A
Bypass Road *Commercial 1 - Commercial 2*			482	A			634	A
Bypass Road *Commercial 2 - Commercial 3*			480	A			625	A
Bypass Road *Commercial 3 – Western Boulevard*			569	C			564	C

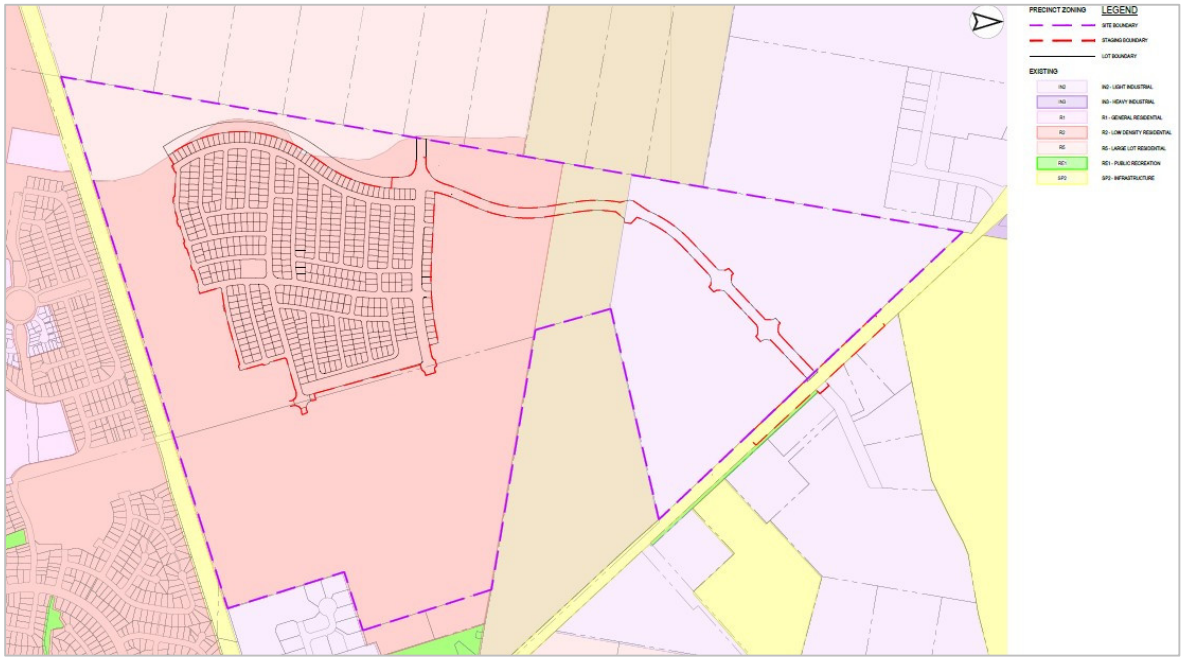
The results indicate the Bypass Road is expected to operate with an acceptable level of service.

Overall, the road network is expected to operate with a good level of service following the extension of the Bypass Road to the south.

10. Stage 1 Assessment

Amber Organisation has been asked to provide a review of the traffic impacts associated with Stage 1 of the development. Stage 1 includes the construction of 578 residential lots and the associated road network. The layout for the site as part of Stage 1 is shown within Figure 24.

Figure 24: Stage 1 Site Layout



Source: Maker ENG

10.1 Traffic Assessment

The traffic generation for Stage 1 has been based on the same rates outlined within Section 8.1 and are as follows for the 578 lots.

Table 20: Residential Peak Hour Traffic Generation

	AM Peak (vph)	PM Peak (vph)
Arriving Trips	82	136
Departing Trips	329	316
Total	**411**	**452**

When preparing the traffic models the following assumptions have been made:

- The residential intersections 1, 2 and 3 have been fully developed;
- The intersections within the business zone and Bypass Road have been fully developed.

Based on the above assumptions, traffic models were prepared for each of the intersections and associated time periods. A summary of the modelling results is presented within Table 21 and Table 22 which shows the worst-case movement for each intersection. Detailed SIDRA outputs are able to be provided upon request.

Table 21: Stage 1 Traffic Modelling Results – Year 2022 External Intersections

Intersection	Peak	Without Project				With Project			
		DOS	Average Delay	95% queue (m)	LOS	DOS	Average Delay	95% queue (m)	LOS
Mitchell Highway/ Bypass Road	AM	0.22	0.5	2.4	LOS B	0.36	25.6	77.2	LOS E
	PM	0.17	0.3	1.6	LOS B	0.38	22.5	86.6	LOS E
Mitchell Highway/ Westview Street	AM	0.23	0.4	2.0	LOS B	0.37	0.7	3.5	LOS C
	PM	0.19	0.3	1.2	LOS B	0.24	0.4	1.6	LOS C
Mitchell Highway/ Thompson Street	AM	0.42	1.9	13.4	LOS B	0.91	5.9	41.9	LOS F
	PM	0.46	2.1	15.3	LOS B	1.19	18.0	138.1	LOS F
Mitchell Highway/ Newell Highway	AM	0.87	26.7	108.3	LOS C	0.81	28.8	111.4	LOS D
	PM	0.88	23.7	67.2	LOS C	0.79	25.8	87.2	LOS C

Table 22: Stage 1 Traffic Modelling Results – Year 2032 External Intersections (Future Condition)

Intersection	Peak	Without Project				With Project			
		DOS	Average Delay	95% queue (m)	LOS	DOS	Average Delay	95% queue (m)	LOS
Mitchell Highway/ Bypass Road	AM	0.30	0.9	4.8	LOS C	0.44	25.4	108.0	LOS E
	PM	0.22	0.5	2.5	LOS B	0.48	24.6	119.6	LOS E
Mitchell Highway/ Westview Street	AM	0.32	0.7	3.8	LOS C	0.46	1.3	7.7	LOS F
	PM	0.25	0.4	1.9	LOS C	0.30	0.6	2.8	LOS E
Mitchell Highway/ Thompson Street	AM	1.36	16.1	131.1	LOS F	3.20	71.3	336.7	LOS F
	PM	1.11	11.8	93.8	LOS F	2.77	101.9	464.6	LOS F
Mitchell Highway/ Newell Highway	AM	0.91	36.2	207.2	LOS E	0.95	40.1	234.1	LOS E
	PM	0.94	30.5	105.7	LOS D	0.94	33.7	136.9	LOS E

Table 23: Stage 1 Traffic Modelling Results – Internal Intersections

Intersection	Peak	DOS	Average Delay	95% queue (m)	LOS
Bypass Road/ Western Boulevard	AM	0.22	0.0	8.4	LOS A
	PM	0.20	0.0	8.8	LOS A
Residential 1	AM	0.12	0.2	2.8	LOS A
	PM	0.17	0.1	1.0	LOS A
Residential 2	AM	0.11	0.1	0.2	LOS A
	PM	0.18	0.1	0.2	LOS A
Residential 3	AM	0.08	0.2	1.3	LOS A
	PM	0.11	0.1	3.7	LOS A
Residential 4	AM	0.10	0.1	3.5	LOS A
	PM	0.09	0.1	3.3	LOS A
Residential 5	AM	0.01	0.0	0.3	LOS A
	PM	0.01	0.0	0.3	LOS A
Residential 6	AM	0.00	0.0	0.1	LOS A
	PM	0.00	0.0	0.1	LOS A
Residential 7	AM	0.01	0.0	0.3	LOS A
	PM	0.01	0.0	0.3	LOS A
Commercial 1	AM	0.12	0.1	4.3	LOS A
	PM	0.11	0.1	4.1	LOS A
Commercial 2	AM	0.12	0.1	4.3	LOS A
	PM	0.11	0.1	4.1	LOS A
Commercial 3	AM	0.11	0.0	4.1	LOS A
	PM	0.13	0.1	4.6	LOS A

10.2 Modelling Summary

The results of the analysis indicate that the internal road network is expected to operate with good operating conditions. The intersection of the Bypass Road with Mitchell Highway is expected to operate with a LOS E and have an average delay of 25 seconds.

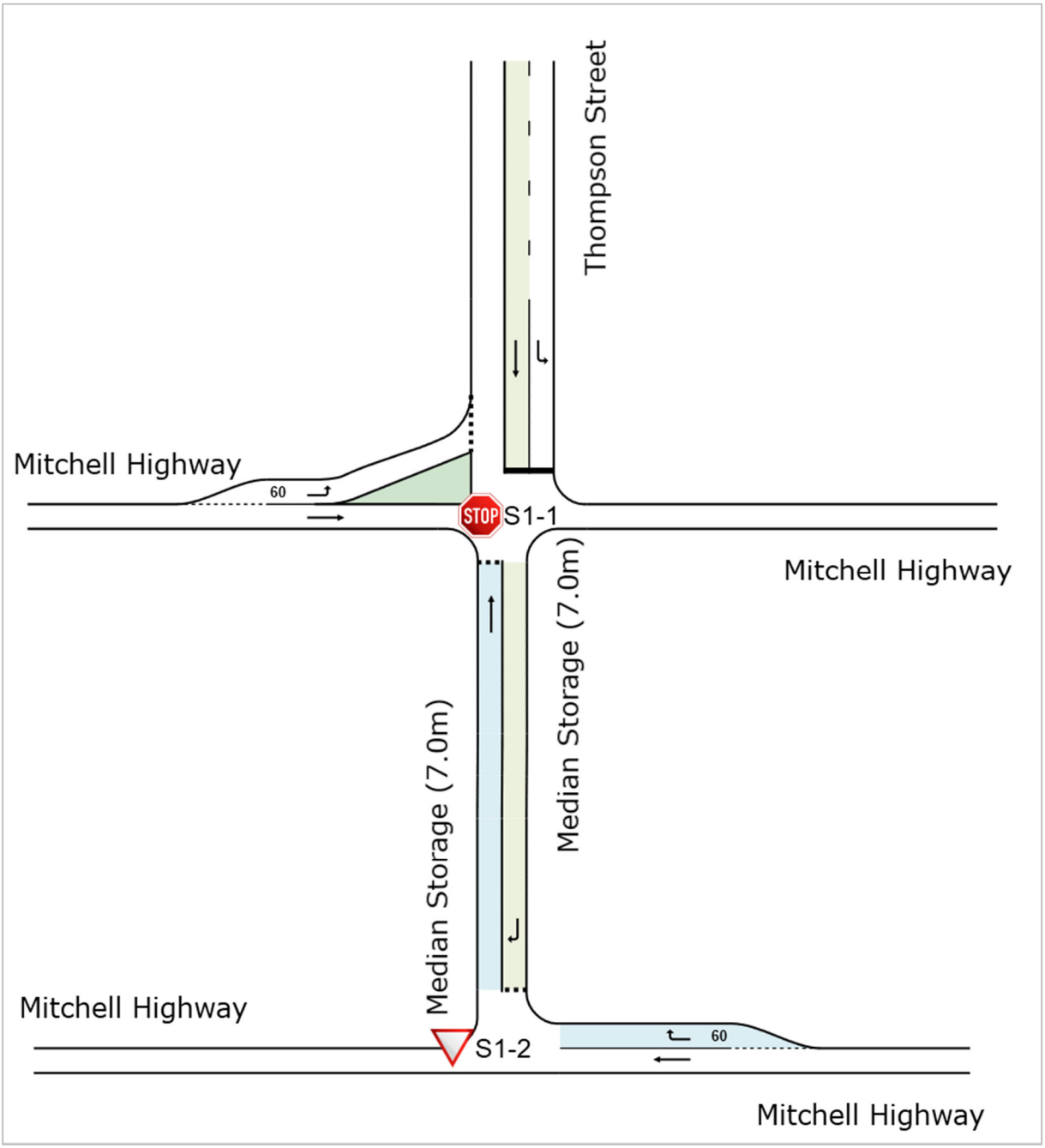
The following provides a summary of the impacts at the external intersections:

- The intersection of Mitchell Highway and Westview Street is expected to operate with acceptable conditions in both the 2022 and 2032 year. Right turn movements from Westview Street are expected to experience delays of up to 77 seconds in the morning peak which represents a LOS F which is considered an acceptable outcome given there are only 4 movements in the peak hour;
- The intersection of Mitchell Highway and Thompson Street is generally expected to operate with good conditions excluding the right turn movement from Thompson Street which operates with a LOS F. In the 2022 assessment year the right turn movement is expected to experience a maximum delay of 140 seconds and a queue length of 138 metres. These vehicles are expected to utilise the signalised intersection of Mitchell Highway and Newell Highway as an alternative in the event long delays are experienced. In the 2032 assessment year the intersection reaches capacity without the development traffic and any delays and queues are exacerbated by the Stage 1 vehicle movements.
- The intersection of Mitchell Highway and Newell Highway is expected to operate near capacity in the 2022 year and above capacity in the 2032 year which is reflective of the operating conditions recorded without the development traffic.

Overall, the traffic generated by Stage 1 of the project is expected to be able to be accommodated on the wider road network with minor increases in delay expected on Mitchell Highway.

Whilst it is expected that increases in delay for right turn movements from Thompson Street would result in a redistribution of traffic to the intersection of Mitchell Highway and Newell Highway, a sensitivity analysis has been provided whereby the intersection has been assessed as a seagull arrangement to allow right turn vehicles to perform a staged manoeuvre. The layout for the intersections is provided within Figure 25.

Figure 25: Thompson Street / Mitchell Highway SIDRA Intersection Layout – Sensitivity Analysis



The assessment was undertaken for 2032 with the Stage 1 traffic and provides the following results.

Table 24: Stage 1 Traffic Modelling Results – 2032 Sensitivity Analysis

Intersection	Peak	Scenario 1			
		DOS	Average Delay	95% queue (m)	LOS
Mitchell Highway/ Thompson Street	AM	0.295	5.1	4.1	LOS A
	PM	0.374	5.3	4.5	LOS A

The results indicate that the seagull arrangement is expected to result in the intersection operating with acceptable conditions which could be adopted as an interim arrangement prior to the intersection being upgraded to either a roundabout or signal control.

10.3 Midblock Assessment

The midblock traffic volumes and subsequent change in the operation on the surrounding road network is summarised within Table 25.

Table 25: One-Way Peak Hour Carriageway Capacity Assessment

Road Segment	Northbound/Westbound				Southbound/Eastbound			
	Existing (vph)	Project (vph)	Total (vph)	LOS	Existing (vph)	Project (vph)	Total (vph)	LOS
Mitchell Highway *Richardson Road – Westview Street*	479	249	728	D	568	259	827	D
Mitchell Highway *Westview Street – Thompson Street*	623	249	872	D	778	259	1037	E
Mitchell Highway *Thompson Street – Newell Highway*	723	128	852	D	544	163	707	D
Thompson Street *North of Mitchell Highway*	593	93	686	D	431	90	521	C
Newell Highway *South of Mitchell Highway*	1543	3	1546	C	1258	5	1263	B
Bypass Road *Mitchell Highway - Commercial 1*			328	A			315	A
Bypass Road *Commercial 1 - Commercial 2*			328	A			315	A
Bypass Road *Commercial 2 - Commercial 3*			328	A			315	A
Bypass Road *Commercial 3 – Western Boulevard*			328	B			315	B
Western Boulevard *Bypass Road – Residential 1*			328	B			315	B

As outlined within Section 8.2.5, Mitchell Highway is expected to currently be operating with a capacity of 1,400 vehicles. The above results indicate the road network is expected to continue to operate with acceptable conditions and the traffic associated with Stage 1 of the project is expected to be able to be accommodated on the road network in a suitable manner.

11. Stage 3 Assessment

Amber Organisation has been asked to provide a review of the traffic impacts associated with Stage 3 of the residential development. The assessment has been based on the assumption that a Planning Proposal is submitted to Council in order to allow a reduction in the lot size within the northern component of the residential part of the site resulting in an increase of approximately 250 lots. Subsequently the total number of residential lots expected on-site would be 1,881 lots.

The following provides a review of the potential traffic impacts of the increase in residential lots associated with Stage 3 against each of the scenarios outlined previously:

- Base development conditions (Scenario 1);
- Scenario 2: Western Boulevard Extension; and
- Scenario 3: Bypass Road Extension.

When preparing the traffic models the following assumptions have been made:

- The land uses within the business zones are fully constructed;
- The residential component of the site is fully constructed;
- The relevant assumptions from each scenario apply to the Stage 3 assessment; and
- The traffic generation rate for the higher density housing remains equal to the traffic generation rate adopted for the previous scenarios.

The assessment has analysed the same intersections that have been assessed within Section 8 of this report for the masterplan which is considered to represent the worst case scenario.

11.1 Modelling Results

Based on the above assumptions, traffic models were prepared for each of the intersections and associated time periods. A summary of the modelling results is presented within the following tables which shows the worst case movement for each intersection. Detailed SIDRA outputs are able to be provided upon request.

Table 26: Stage 3 Traffic Modelling Results – 2022

Intersection	Peak	Scenario 1				Scenario 2				Scenario 3			
		DOS	Average Delay	95% queue (m)	LOS	DOS	Average Delay	95% queue (m)	LOS	DOS	Average Delay	95% queue (m)	LOS
Mitchell Highway/ Bypass Road	AM	0.85	31.9	256.8	LOS E	0.58	26.4	119.2	LOS E	0.53	26.0	108.2	LOS E
	PM	0.81	27.3	185.0	LOS E	0.66	28.8	141.9	LOS E	0.58	27.9	118.8	LOS E
Mitchell Highway/ Westview Street	AM	1.35	12.2	138.3	LOS F	0.53*	4.1*	29.5*	LOS C*	0.44*	2.9*	21.2*	LOS B*
	PM	1.07	5.6	27.3	LOS F	0.57*	2.0*	39.7*	LOS B*	0.48*	1.4*	29.1*	LOS B*
Mitchell Highway/ Thompson Street	AM	43.42	2070.7	1548.3	LOS F	40.73	1942.8	1499.2	LOS F	14.15	638.4	923.2	LOS F
	PM	35.10	2562.1	1824.4	LOS F	27.88	1986.4	1639.6	LOS F	12.70	867.8	1224.3	LOS F
Mitchell Highway/ Newell Highway	AM	0.90	41.4	270.5	LOS F	0.96	41.1	255.8	LOS E	0.88	36.5	191.4	LOS E
	PM	0.96	35.9	256.7	LOS E	0.94	34.4	229.2	LOS E	0.88	32.1	194.9	LOS D
Bypass Road/ Western Boulevard	AM	0.69	0.2	57.1	LOS B	0.26	0.1	10.8	LOS A	0.40	1.0	19.4	LOS A
	PM	0.62	0.0	52.4	LOS A	0.25	0.0	11.3	LOS A	0.44	0.9	24.6	LOS A
Residential 1	AM	0.50	1.3	12.5	LOS A	0.20	0.2	1.8	LOS A	0.24	0.3	2.5	LOS A
	PM	0.55	0.3	2.1	LOS A	0.22	0.1	0.7	LOS A	0.27	0.1	0.9	LOS A
Residential 2	AM	0.44	1.6	10.6	LOS B	0.18	0.2	2.1	LOS A	0.22	0.3	2.5	LOS A
	PM	0.55	1.2	7.3	LOS D	0.18	0.3	1.2	LOS A	0.23	0.3	1.4	LOS A
Residential 3	AM	0.44	0.5	2.4	LOS C	0.23	1.0	6.7	LOS A	0.26	1.1	7.8	LOS A
	PM	0.40	0.4	5.7	LOS D	0.17	0.6	3.2	LOS A	0.21	0.6	3.1	LOS A
Residential 4	AM	0.45	1.4	24.0	LOS A	0.22	0.9	9.6	LOS A	0.24	0.9	10.5	LOS A
	PM	0.48	0.6	27.6	LOS A	0.31	0.6	14.3	LOS A	0.32	0.7	14.7	LOS A
Residential 5	AM	0.24	1.0	9.7	LOS A	0.34	0.9	15.9	LOS A	0.29	0.9	13.5	LOS A
	PM	0.32	0.4	15.1	LOS A	0.40	0.7	19.9	LOS A	0.36	0.7	17.1	LOS A

Residential 6	AM	0.10	0.2	3.1	LOS A	0.30	0.6	5.1	LOS A	0.26	0.5	4.3	LOS A
	PM	0.13	0.2	4.5	LOS A	0.32	0.8	5.0	LOS A	0.28	0.7	5.2	LOS A
Residential 7	AM	0.04	0.2	1.4	LOS A	0.43	0.5	23.3	LOS A	0.36	0.4	18.1	LOS A
	PM	0.06	0.1	2.1	LOS A	0.42	0.3	21.9	LOS A	0.36	0.3	17.3	LOS A
Commercial 1	AM	0.68	5.7	57.7	LOS D	0.30	2.1	14.1	LOS A	0.30	2.2	14.2	LOS A
	PM	1.07	17.2	185.1	LOS F	0.41	2.6	20.4	LOS A	0.44	2.8	23.3	LOS B
Commercial 2	AM	0.39	1.4	19.8	LOS B	0.16	0.8	6.7	LOS A	0.18	0.9	7.6	LOS A
	PM	0.42	1.4	24.9	LOS B	0.19	0.8	8.5	LOS A	0.24	1.0	10.9	LOS A
Commercial 3	AM	0.38	0.5	19.9	LOS A	0.15	0.3	5.7	LOS A	0.20	0.5	8.9	LOS A
	PM	0.53	3.1	34.0	LOS B	0.29	1.0	12.2	LOS A	0.35	1.3	16.0	LOS A

**Intersection assessed with two-lane roundabout upgrade as discussed in Section 9.1*

Table 27: Stage 3 Traffic Modelling Results – 2032

Intersection	Peak	Scenario 1				Scenario 2				Scenario 3			
		DOS	Average Delay	95% queue (m)	LOS	DOS	Average Delay	95% queue (m)	LOS	DOS	Average Delay	95% queue (m)	LOS
Mitchell Highway/ Bypass Road	AM	0.96	42.2	327.8	LOS F	0.68	28.3	158.0	LOS E	0.62	27.3	139.4	LOS E
	PM	0.88	32.9	210.3	LOS E	0.78	31.9	193.3	LOS E	0.70	29.4	160.9	LOS E
Mitchell Highway/ Westview Street	AM	2.32	22.7	125.7	LOS F	0.65*	6.0*	43.5*	LOS F*	0.55*	3.8*	31.0*	LOS C*
	PM	1.14	7.4	130.5	LOS F	0.62*	2.3*	47.0*	LOS C*	0.52*	1.7*	33.9*	LOS B*
Mitchell Highway/ Thompson Street	AM	61.43	2774.3	1867.4	LOS F	61.22	2766.9	1864.8	LOS F	55.06	2454.1	1739.0	LOS F
	PM	95.38	6703.1	2898.1	LOS F	90.84	6273.1	2799.5	LOS F	34.28	2333.8	1745.1	LOS F
Mitchell Highway/ Newell Highway	AM	1.18	72.8	570.1	LOS F	1.16	72.1	526.9	LOS F	1.12	62.0	412.8	LOS F
	PM	1.02	51.9	387.8	LOS F	1.10	51.0	366.3	LOS F	1.02	45.5	317.0	LOS F

Bypass Road/ Western Boulevard	AM	0.69	0.2	57.1	LOS B	0.26	0.1	10.8	LOS A	0.41	1.1	19.7	LOS A
	PM	0.62	0.0	52.4	LOS A	0.25	0.0	11.3	LOS A	0.45	0.9	25.5	LOS A
Residential 1	AM	0.50	1.3	12.5	LOS A	0.20	0.2	1.8	LOS A	0.24	0.3	2.5	LOS A
	PM	0.55	0.3	2.1	LOS A	0.22	0.1	0.7	LOS A	0.27	0.1	0.9	LOS A
Residential 2	AM	0.44	1.6	10.6	LOS B	0.18	0.2	2.1	LOS A	0.22	0.3	2.5	LOS A
	PM	0.55	1.2	7.3	LOS D	0.18	0.3	1.2	LOS A	0.23	0.3	1.4	LOS A
Residential 3	AM	0.44	0.5	2.4	LOS C	0.23	1.0	6.7	LOS A	0.26	1.1	7.8	LOS A
	PM	0.40	0.4	5.7	LOS D	0.17	0.6	3.2	LOS A	0.21	0.6	3.1	LOS A
Residential 4	AM	0.45	1.4	24.0	LOS A	0.22	0.9	9.6	LOS A	0.24	0.9	10.5	LOS A
	PM	0.48	0.6	27.6	LOS A	0.31	0.6	14.3	LOS A	0.32	0.7	14.7	LOS A
Residential 5	AM	0.24	1.0	9.7	LOS A	0.34	0.9	15.9	LOS A	0.29	0.9	13.5	LOS A
	PM	0.32	0.4	15.1	LOS A	0.40	0.7	19.9	LOS A	0.36	0.7	17.1	LOS A
Residential 6	AM	0.10	0.2	3.1	LOS A	0.30	0.6	5.1	LOS A	0.26	0.5	4.3	LOS A
	PM	0.13	0.2	4.5	LOS A	0.32	0.8	5.0	LOS A	0.28	0.7	5.2	LOS A
Residential 7	AM	0.04	0.2	1.4	LOS A	0.43	0.5	23.3	LOS A	0.36	0.4	18.1	LOS A
	PM	0.06	0.1	2.1	LOS A	0.42	0.3	21.9	LOS A	0.36	0.3	17.3	LOS A
Commercial 1	AM	0.68	5.7	57.7	LOS D	0.30	2.1	14.1	LOS A	0.31	2.2	14.4	LOS A
	PM	1.07	17.2	185.1	LOS F	0.41	2.6	20.4	LOS A	0.45	2.9	23.8	LOS B
Commercial 2	AM	0.39	1.4	19.8	LOS B	0.16	0.8	6.7	LOS A	0.19	0.9	7.8	LOS A
	PM	0.42	1.4	24.9	LOS B	0.19	0.8	8.5	LOS A	0.24	1.0	11.2	LOS A
Commercial 3	AM	0.38	0.5	19.9	LOS A	0.15	0.3	5.7	LOS A	0.21	0.5	9.1	LOS A
	PM	0.53	3.1	34.0	LOS B	0.29	1.0	12.2	LOS A	0.36	1.3	16.2	LOS A

**Intersection assessed with two-lane roundabout upgrade as discussed in Section 9.1*

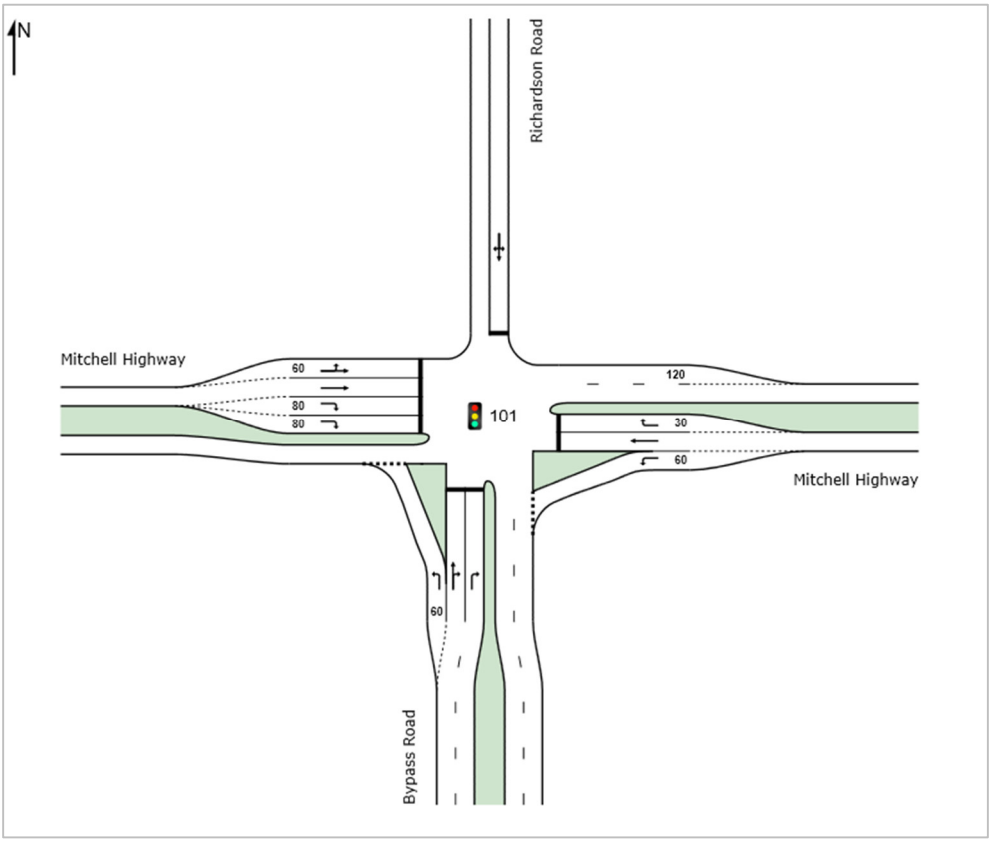
11.2 Modelling Summary

Overall, the modelling results indicate that the road network is expected to operate in a similar manner to the overall masterplan. A summary of the results is provided below:

- The internal road network is expected to operate with good operating conditions excluding the eastern leg of the northernmost intersection on the Bypass Road which is expected to reach capacity. It is expected that when this occurs vehicles would choose to access the Bypass Road via the intersection to the south.
- The intersection of the Bypass Road and Mitchell Highway is expected to operate with suitable conditions and within the intersection's acceptable capacity, excluding in the morning peak in the 2032 year when the intersection operates with a DOS of 0.96.
- The intersection of Western Boulevard and Mitchell Highway is expected to operate with acceptable conditions once upgraded to the proposed roundabout design.
- Once the Western Boulevard is extended to connect with Mitchell Highway the vehicle movements are better distributed within the site and all internal intersections are expected to operate with good conditions.
- The intersections of Thompson Street and Mitchell Highway is expected to operate above capacity as previously outlined within Section 8.2.3. It is understood that the intersection is proposed to be upgraded as part of the Building a Better Dubbo Project which should consider the increase in traffic associated with the project.
- The intersection of Newell Highway and Mitchell Highway is still expected to operate at or above capacity. The results presented within Section 8.2.3 indicate that the intersection is already operating near capacity even following recent road upgrades and is expected to fail in the 2032 assessment year without the project traffic. Any upgrade of this intersection to accommodate the increase in background and project traffic should be undertaken with consideration for future growth in the wider Dubbo area.

Given the intersection of the Bypass Road and Mitchell Highway is expected to operate at capacity in 2023 a sensitivity analysis has been provided whereby the intersection has been assessed with an additional right turn slip lane has been provided on the western leg of the intersection of Mitchell Highway. The layout for the intersections is provided within Figure 26.

Figure 26: Bypass Road / Mitchell Highway SIDRA Intersection Layout – Sensitivity Analysis



The assessment was undertaken for 2032 for Scenario 1 (Western Boulevard is not extended to Mitchell Highway) and provides the following results.

Table 28: Stage 3 Traffic Modelling Results – 2032 Sensitivity Analysis

Intersection	Peak	Scenario 1			
		DOS	Average Delay	95% queue (m)	LOS
Mitchell Highway/ Bypass Road	AM	0.866	37.2	267.1	LOS C
	PM	0.826	33.1	194.6	LOS C

The results indicate that the additional lane is expected to result in the intersection operating with acceptable conditions, which should be provided in the event the lot size is reduced as part of Stage 3.

11.3 Midblock Assessment

The midblock traffic volumes for the Stage 3 assessment scenario assuming the full development of the subdivision are provided as maximums of the three scenarios assessed within Table 29.

Table 29: One-Way Peak Hour Carriageway Capacity Assessment

Road Segment	Northbound/Westbound				Southbound/Eastbound			
	Existing (vph)	Project (vph)	Total (vph)	LOS	Existing (vph)	Project (vph)	Total (vph)	LOS
Mitchell Highway *Richardson Road – Westview Street*	479	1008	1487	F	568	904	1472	F
Mitchell Highway *Westview Street – Thompson Street*	623	1014	1637	F	778	910	1688	F
Mitchell Highway *Thompson Street – Newell Highway*	723	606	1330	E	544	566	1110	E
Thompson Street *North of Mitchell Highway*	593	335	927	E	431	373	804	D
Newell Highway *South of Mitchell Highway*	1543	39	1582	C	1258	42	1301	B
Bypass Road *Mitchell Highway - Commercial* 1			1228	B			1350	B
Bypass Road *Commercial 1 - Commercial 2*			1095	B			1206	B
Bypass Road *Commercial 2 - Commercial 3*			1028	B			1131	B
Bypass Road *Commercial 3 – Western Boulevard*			1079	E			1014	E
Western Boulevard *Bypass Road – Residential 1*			1064	E			1011	E
Western Boulevard *Residential 1 – Residential 4*			522	C			491	C
Western Boulevard *Residential 4 – Residential 5*			520	C			548	C
Western Boulevard *Residential 5 – Residential 7*			589	C			622	D
Western Boulevard *Residential 7 – Mitchell Highway*			626	D			669	D

The results reflect the volumes presented within Section 8.2.5 based on the proposed masterplan whereby the internal road network is expected to be able to accommodate the traffic volumes generated by the proposed uses. Western Boulevard is anticipated to accommodate up to 1,011vph between Bypass Road and the Residential 1 intersection, which results in a LOS D. It is expected that Western Boulevard will continue to operate efficiently under these conditions.

Mitchell Highway is expected to reach capacity between the Bypass Road and Thompson Street and it is recommended that future road upgrades be considered as part of the proposed upgrades of the intersection of Mitchell Highway and Thompson Street.

11.4 Summary

Overall, the assessment indicates that the increase in lots associated with Stage 3 is expected to result in similar operating conditions to the masterplan. The internal road network is expected to continue to operate with a good level of service and acceptable delays and queue lengths. The intersections of the Mitchell Highway with the Bypass Road and Western Boulevard are expected to operate near capacity but with acceptable conditions.

The midblock volumes within the site are expected to be readily accommodate by the road network. The external midblock traffic volumes indicate that Mitchell Highway is approaching capacity at its connection with Thompson Street and that future road network upgrades are required which should consider development within the wider Dubbo region.

12. Sensitivity Analysis

The above assessment indicates that the internal road network has been designed to suitably accommodate the traffic expected to be generated by the proposed land uses. Further, the intersection of the Bypass Road and Mitchell Highway has been designed to accommodate the development traffic and is expected to operate with acceptable conditions. However, the assessment has indicated the following impacts to the external road network:

- The following nearby intersections are expected to operate above capacity:
  - Westview Street / Mitchell Highway;
  - Thompson Street / Mitchell Highway; and
  - Newell Highway / Mitchell Highway.
- The midblock traffic volumes on Mitchell Highway to the west of Thompson Street is expected to reach capacity during the morning peak.

The following provides a review of when these intersections and midblock sections of road are expected to reach capacity.

12.1 External Intersections

12.1.1 Mitchell Highway / Westview Street

The intersection is expected to operate with acceptable conditions during the 2022 and 2032 assessment year without the development traffic. The intersection is also expected to operate with acceptable conditions following construction of Stage 1 but reaches capacity prior to the full realisation of the masterplan.

It is understood that the development is proposed to be constructed in the following order:

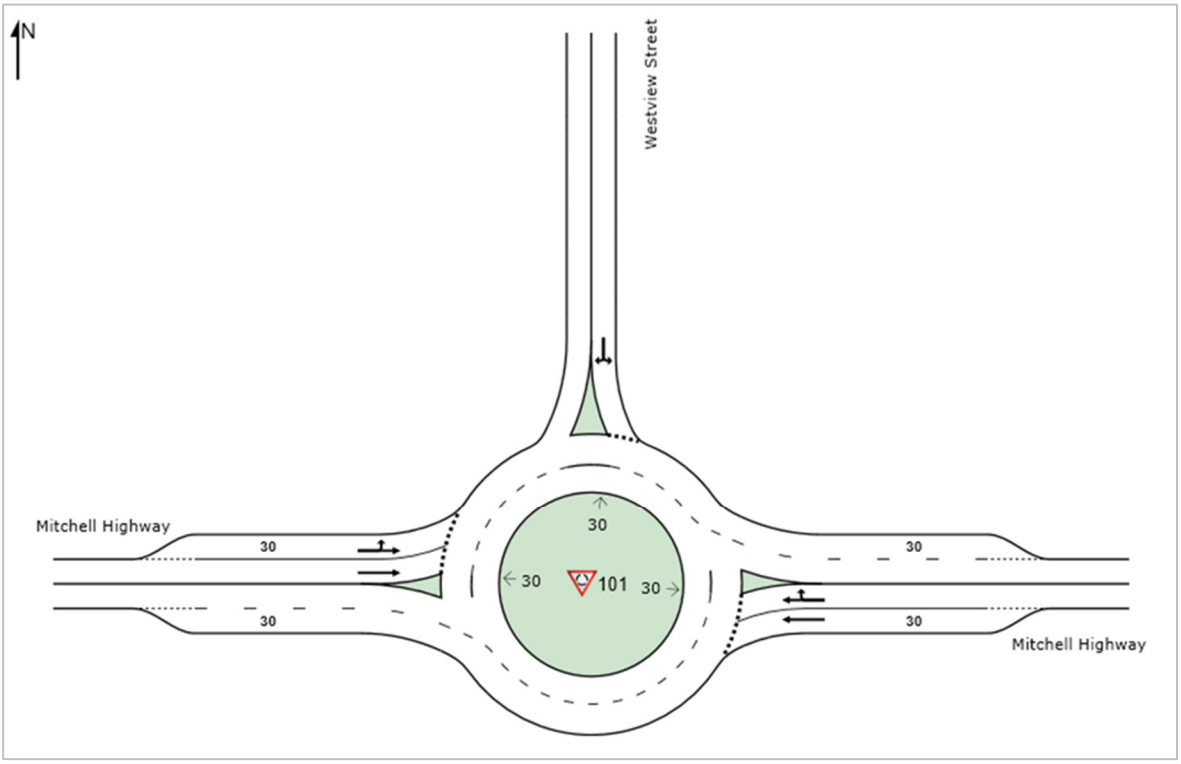
- Stage 1 of the residential use (estimated completion 2024);
- The industrial and retail use (estimated completion 2024);
- Stage 2 and then Stage 3 of the residential use (estimated completion 2026 and 2028); and
- Stage 4 and then Stage 5 of the residential use (estimated completion 2030 and 2032).

In order to determine when the intersection reaches capacity an assessment was undertaken based on the above development timeframe. The assessment indicates the intersection is expected to fail at the end of completion of Stage 3 (year 2028) assuming the increase in lot density is not provided. This represents the full retail and industrial component and approximately 1,131 residential lots.

Accordingly, it is recommended that the intersection of Westview Street and Mitchell Highway be upgraded prior to the construction of Stage 4 of the project.

A sensitivity analysis has been provided whereby the intersection has been assessed as a roundabout to allow vehicles to turn to/from Mitchell Highway. The layout for the intersections is provided within Figure 27.

Figure 27: Westview Street / Mitchell Highway SIDRA Intersection Layout – Sensitivity Analysis



The assessment was undertaken for 2032 assuming the full development of the subdivision, including the increase in residential lots associated with Stage 3, and provides the following results.

Table 30: Scenario 1 Traffic Modelling Results – 2032 Sensitivity Analysis

Intersection	Peak	Scenario 1			
		DOS	Average Delay	95% queue (m)	LOS
Mitchell Highway/ Westview Street	AM	0.749	5.6	63.7	LOS A
	PM	0.706	5.3	70	LOS A

The results indicate that the roundabout arrangement is expected to result in the intersection operating with acceptable conditions.

12.1.2 Mitchell Highway / Thompson Street

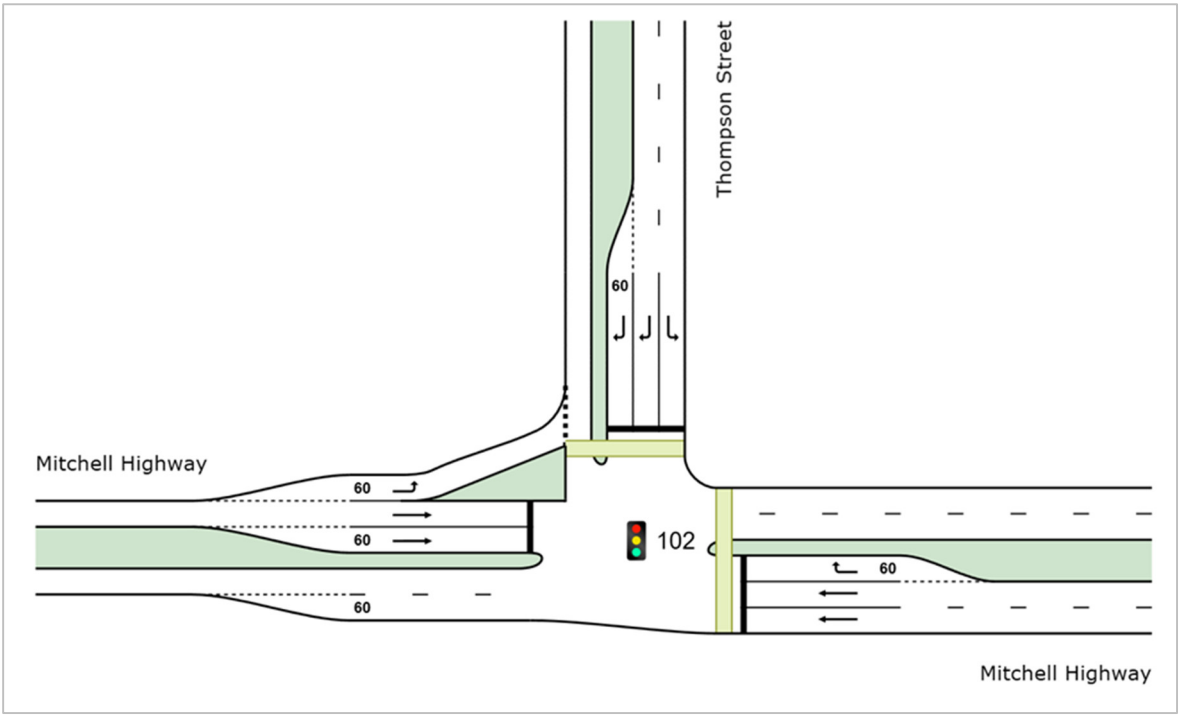
The intersection is expected to fail in the 2032 assessment year without the development traffic. Applying the growth factors provide earlier in this report the intersection is expected to fail by 2030 without project traffic which occurs in the evening peak hour.

The intersection would also fail in the 2022 assessment year with the Stage 1 traffic. The analysis presented within Section 10.2 indicates that a seagull intersection arrangement would allow traffic associated with Stage 1 to be suitably accommodated at the intersection.

A sensitivity analysis has been provided whereby the intersection has been assessed as a signalised intersection to determine a suitable design in the event the site is fully developed

(including the increase in lots associated with Stage 3). The layout for the intersections is provided within Figure 28.

Figure 28: Thompson Street / Mitchell Highway SIDRA Intersection Layout – Sensitivity Analysis



The assessment was undertaken for 2032 and provides the following results.

Table 31: Stage 3 Traffic Modelling Results – 2032 Sensitivity Analysis

Intersection	Peak	Scenario 1			
		DOS	Average Delay	95% queue (m)	LOS
Mitchell Highway/ Thomson Street	AM	0.867	18.6	107	LOS B
	PM	0.882	30.8	206	LOS C

The results indicate that the proposed arrangement is expected to result in the intersection operating with acceptable conditions.

It is understood that the intersection is proposed to be upgraded as part of the Building a Better Dubbo Project which should consider the increase in traffic associated with this project and other projects in the wider Dubbo region.

12.1.3 Mitchell Highway / Newell Highway

The above assessment indicates that the intersection would operate with acceptable conditions in the 2022 assessment year with the Stage 1 traffic. However, the intersection is expected to reach capacity in the 2032 assessment year without the development traffic. The assessment indicates intersection upgrades are required in the next 10 years which should considered increases in traffic from the wider Dubbo region.

The sensitivity analysis indicates the intersection is expected to fail following Stage 2 which is expected to be completed in 2026. Accordingly, a review of the intersection should be undertaken at this time to ensure the intersection continues to operate with an acceptable level of service and considers any future growth of the wider Dubbo area.

12.2 External Midblock

Mitchell Highway west of Thompson Street is expected to reach its estimated capacity of 1,400 vehicles per land per hour in the morning peak hour. When the development is fully constructed and assuming a growth factor in background traffic to 2032 the road is expected to accommodate up to 1,688 vehicles in the southeast bound lane in the morning peak.

Based on the traffic generation rates and distributions outlined within this report the traffic volume is expected to reach 1,400 vehicles per lane per hour in 2028 when 1,240 of the residential lots are constructed. This represents the completion of Stage 1, the industrial and residential component, and Stage 2 and Stage 3. However, if the residential lot density is increased then the midblock would reach capacity prior to the full realisation of Stage 3.

It is recommended that future road upgrades be considered as part of the proposed upgrades of the intersection of Mitchell Highway and Thompson Street.

13. Conclusions

Amber Organisation has been engaged by The Bathla Group to advise on the traffic matters of the proposed subdivision at 13L Narromine Road and Jannali Road, Dubbo.

The proposal involves the subdivision of land at Lot 22 in DP1038924 and Lot 7 in DP223428, and construction of the associated internal road network. The northern part of the site is proposed to be established as B5 – Business Development zoned land with a total area of approximately 44.2 hectares with an additional 2 hectares zoned as B2 – Local Centre to accommodate a shopping centre. The southern part of the site is proposed to be established as residential land to provide approximately 1,631 lots.

Access to the site is proposed via a new connection with Narromine Road at its intersection with Richardson Road, prior to future connections with the wider road network that will be provided by others.

Based on the above assessment, the following conclusions are provided regarding the layout of the site:

- The road layout has been designed to reflect the future road layout outlined within the Dubbo City Planning and Transport Strategy 2036. A north-south road (the Bypass Road) has been provided within the site which is intended to act as part of the Freightway Ring. The road connects with Narromine Road at Richardson Lane and extends through to have a frontage with the railway line at the southern boundary of the site. An east-west road is provided within the centre of the site which reflects the Western Boulevard outlined within the Strategy. The road has been established in order to allow it to be extended through the TAFE site to the east and connect with Mitchell Highway at Westview Street
- A network of collector roads extend from Western Boulevard within the residential area of the site which subsequently connect with the local road network. A review has been undertaken for the local road network which indicates suitable vehicle circulation is provided within the residential area.
- The arterial and collector road network is proposed to be constructed to accommodate buses which would allow the residential component of the site to be provided with a bus service within 500 metres walking distance of every residential lot.
- An on-road bicycle lane is proposed on Western Boulevard, shared paths are provided on one side of all collector roads, and a footpath is proposed on one side of all local roads.

The assessment indicates that the road layout is expected to allow vehicles, cyclists, and pedestrians to suitably circulate within the site. Further, the road network has been designed to allow development of adjacent lots and connection to the wider road network.

A traffic modelling analysis has been undertaken to determine the impacts of the development traffic on the surrounding road network. Overall, the results indicate the following:

- The intersection of the Bypass Road and Mitchell Highway is suitably designed and will operate with acceptable conditions in the 2032 year.
- The intersections of Westview Street and Newell Highway is expected to reach capacity. The intersection is expected to be upgraded to a roundabout as part of the extension of the Western Boulevard to Mitchell Highway. The proposed intersection arrangement at this time is shown within Figure 23.

- The intersection of Mitchell Highway and Thompson Street is already reaching capacity and is expected to fail with the addition of the project traffic. The intersection requires a form of traffic control to allow vehicles to safely turn at the intersection and it is understood the intersection is proposed to be upgraded as part of the Building a Better Dubbo Project.
- The intersection of Mitchell Highway and Newell Highway is already operating near capacity and reaches capacity with the development traffic. It is recommended that any future intersection upgrades consider growth within the wider Dubbo area.
- Through movements on Mitchell Highway are expected to be nearing capacity in the 2032 assessment year with the development traffic.
- The internal intersections and road network are expected to generally operate with good conditions.

The project is expected to be constructed in stages over an extended period of time. Therefore, the impacts to the wider road network are expected to be gradual and do not necessarily mean road upgrades are immediately required. Overall, the road network is generally able to accommodate the development traffic subject to upgrades at the intersections of Thompson Street/Mitchell Highway and Newell Highway/Mitchell Highway.

A sensitivity analysis was undertaken for the following scenarios:

- Western Boulevard is extended to connect with Mitchell Highway: The modelling results indicate that the internal intersections operate with improve traffic conditions as the internal movements are better distributed on the road network given vehicles are provided with two accesses to Mitchell Highway.
- The Bypass Road is extended further south: The road network is expected to continue to operate with acceptable conditions with the inclusion of the minor increase in through movements along the Bypass Road.
- Stage 1: Stage 1 is associated with a component of the residential use only with all roads expected to continue to operate with acceptable conditions.
- Stage 3: A total of 1,881 residential lots are proposed by reducing the lot size in the northern portion of the site. The results indicate similar conditions to the original masterplan whereby the road network is expected to operate with acceptable conditions subject to the adoption of future road upgrades along Mitchell Highway.

Overall, the road network within the site is concluded to be suitably designed and the intersection of the Bypass Road is expected to be able to accommodate the traffic volumes generated by the project. Future upgrades are required to Mitchell Highway and the nearby intersections which should consider the growth of the wider Dubbo area.

Appendix A

Survey Results

TRANS TRAFFIC SURVEY

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TURNING MOVEMENT SURVEY

Intersection of East St and Newell Hwy, Dubbo

GPS *-32.251286,148.590820*

Date:	Fri 13/05/22
Weather:	Fine
Suburban:	Dubbo
Customer:	Amber

North:	Newell Hwy
East:	East St
South:	Newell Hwy
West:	East St

Survey Period	AM:	7:30 AM-9:30 AM
	PM:	4:30 PM-6:30 PM
Traffic Peak	AM:	8:15 AM-9:15 AM
	PM:	4:30 PM-5:30 PM

All Vehicles

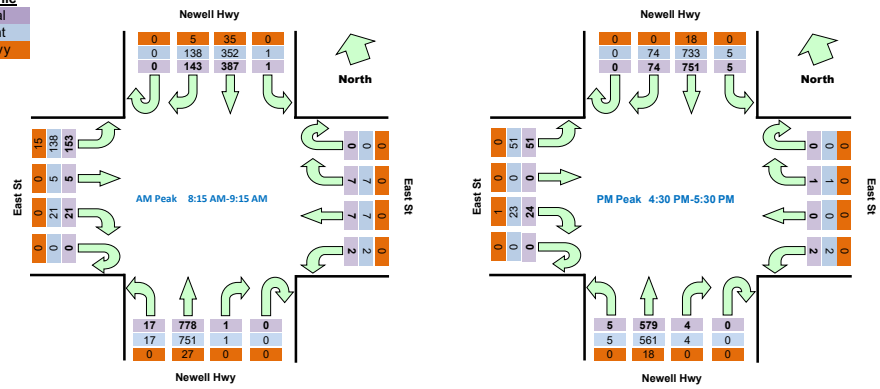
Time		North Approach Newell Hwy				East Approach East St				South Approach Newell Hwy				West Approach East St				Hourly Total	
Period Start	Period End	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	Hour	Peak
7:30	7:45	0	20	41	0	0	0	0	0	0	0	123	0	0	7	0	1	1141	
7:45	8:00	0	17	63	0	0	0	0	1	0	0	191	0	0	2	0	5	1329	
8:00	8:15	0	23	47	0	0	3	0	0	0	0	194	3	0	2	0	17	1461	
8:15	8:30	0	26	84	0	0	1	1	1	0	0	219	4	0	5	1	39	1522	Peak
8:30	8:45	0	42	86	0	0	1	2	1	0	1	205	2	0	4	1	35	1407	
8:45	9:00	0	50	107	0	0	0	2	0	0	0	196	7	0	6	1	42		
9:00	9:15	0	25	110	1	0	5	2	0	0	0	158	4	0	6	2	37		
9:15	9:30	0	18	93	0	0	0	0	0	0	0	133	2	0	9	0	11		
16:30	16:45	0	17	171	1	0	0	0	0	0	2	131	3	0	2	0	22	1496	Peak
16:45	17:00	0	16	192	2	0	1	0	1	0	1	135	0	0	7	0	8	1490	
17:00	17:15	0	19	180	1	0	0	0	1	0	0	159	0	0	10	0	11	1471	
17:15	17:30	0	22	208	1	0	0	0	0	0	1	154	2	0	5	0	10	1378	
17:30	17:45	0	28	169	0	0	2	0	1	0	0	122	1	0	11	1	8	1231	
17:45	18:00	0	33	159	3	0	1	0	1	0	0	128	3	0	8	1	7		
18:00	18:15	0	19	127	2	0	1	1	1	1	0	121	2	0	9	0	4		
18:15	18:30	0	18	132	2	0	0	0	0	0	2	92	3	0	3	0	4		

Peak Time		North Approach Newell Hwy				East Approach East St				South Approach Newell Hwy				West Approach East St				Peak
Period Start	Period End	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	total
8:15	9:15	0	143	387	1	0	7	7	2	0	1	778	17	0	21	5	153	1522
16:30	17:30	0	74	751	5	0	1	0	2	0	4	579	5	0	24	0	51	1496

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.

Graphic

Total
Light
Heavy



TRANS TRAFFIC SURVEY

trafficsurvey.com.au

TURNING MOVEMENT SURVEY

Intersection of Minore Dr and Baird Dr, Dubbo

GPS	*-32.254760,148.576949*
Date:	Fri 13/05/22
Weather:	Fine
Suburban:	Dubbo
Customer:	Amber

North:	Baird Dr
East:	Minore Dr
South:	St Andrews Dr
West:	Minore Dr

Survey Period	AM:	7:30 AM-9:30 AM
	PM:	4:30 PM-6:30 PM
Traffic Peak	AM:	8:15 AM-9:15 AM
	PM:	4:45 PM-5:45 PM

All Vehicles

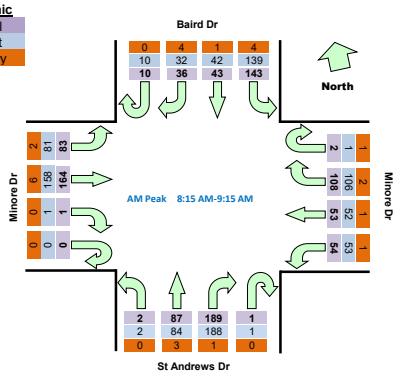
Time		North Approach Baird Dr				East Approach Minore Dr				South Approach St Andrews Dr				West Approach Minore Dr				Hourly Total	
Period Start	**Period End**	**U**	**R**	**SB**	**L**	**U**	**R**	**WB**	**L**	**U**	**R**	**NB**	**L**	**U**	**R**	**EB**	**L**	**Hour**	**Peak**
7:30	7:45	2	1	3	18	0	7	10	6	0	28	7	0	0	0	22	5	756	
7:45	8:00	0	8	5	23	1	13	11	10	1	51	18	2	0	1	37	13	911	
8:00	8:15	1	3	8	16	0	12	9	2	0	41	20	1	0	0	46	19	957	
8:15	8:30	3	6	10	40	1	24	12	11	1	67	33	1	0	0	45	21	976	Peak
8:30	8:45	1	6	11	35	0	28	11	11	0	53	31	1	0	0	56	20	854	
8:45	9:00	2	12	12	39	1	32	14	11	0	45	12	0	0	1	34	25		
9:00	9:15	4	12	10	29	0	24	16	21	0	24	11	0	0	0	29	17		
9:15	9:30	3	10	12	19	0	13	17	14	0	17	8	0	0	0	31	9		
16:30	16:45	4	16	16	39	0	27	32	39	0	13	18	2	0	0	17	11	1050	
16:45	17:00	4	23	23	30	0	26	33	43	1	21	16	1	0	1	29	15	1078	Peak
17:00	17:15	4	18	18	35	1	31	39	38	0	33	5	1	0	1	21	17	1077	
17:15	17:30	1	20	23	38	0	32	52	45	0	28	8	0	0	1	27	13	1012	
17:30	17:45	5	19	17	37	1	24	38	47	0	26	11	0	0	0	24	13	895	
17:45	18:00	3	19	23	31	0	33	33	44	0	24	11	2	0	0	31	11		
18:00	18:15	5	14	21	18	1	16	30	23	0	27	14	1	0	1	19	7		
18:15	18:30	3	8	15	16	0	20	27	30	0	18	7	0	0	0	19	8		

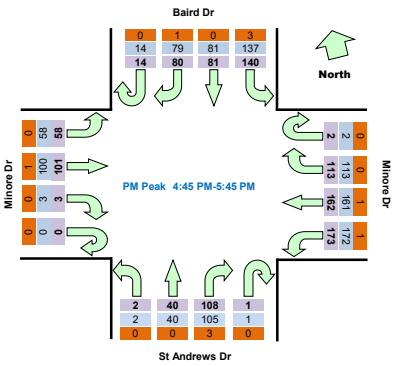
Peak Time		North Approach Baird Dr				East Approach Minore Dr				South Approach St Andrews Dr				West Approach Minore Dr				Peak
Period Start	**Period End**	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	**total**
8:15	9:15	10	36	43	143	2	108	53	54	1	189	87	2	0	1	164	83	976
16:45	17:45	14	80	81	140	2	113	162	173	1	108	40	2	0	3	101	58	1078

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.

Graphic

Total
Light
Heavy





TRANS TRAFFIC SURVEY

trafficsurvey.com.au

TURNING MOVEMENT SURVEY

Intersection of Minore Dr and Champagne Dr, Dubbo

GPS *-32.253770,148.569686*

Date:	Fri 13/05/22
Weather:	Fine
Suburban:	Dubbo
Customer:	Amber

North:	Champagne Dr
East:	Minore Dr
South:	N/A
West:	Minore Dr

Survey Period	AM:	7:30 AM-9:30 AM
	PM:	4:30 PM-6:30 PM
Traffic Peak	AM:	8:00 AM-9:00 AM
	PM:	5:00 PM-6:00 PM

All Vehicles

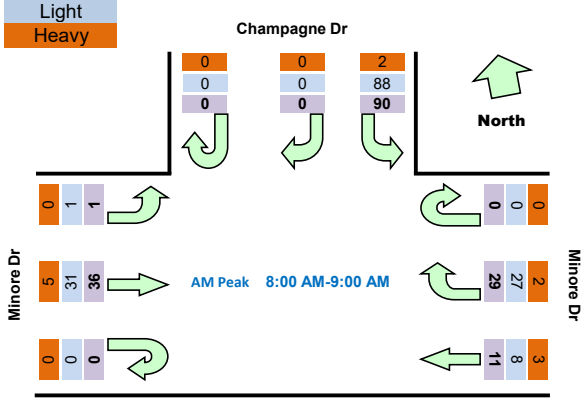
Time		orth Approach Champagne I			East Approach Minore Dr			West Approach Minore Dr			Hourly Total	
Period Start	**Period End**	**U**	**R**	**L**	**U**	**R**	**WB**	**U**	**EB**	**L**	**Hour**	**Peak**
7:30	7:45	0	0	7	0	3	5	0	4	1	126	
7:45	8:00	0	0	13	0	8	5	0	9	0	158	
8:00	8:15	0	0	21	0	7	2	0	5	1	167	Peak
8:15	8:30	0	0	20	0	5	1	0	9	0	164	
8:30	8:45	0	0	28	0	7	3	0	14	0	163	
8:45	9:00	0	0	21	0	10	5	0	8	0		
9:00	9:15	0	0	17	0	10	3	0	3	0		
9:15	9:30	0	0	11	0	12	7	0	4	0		
16:30	16:45	0	0	15	0	20	10	0	4	0	239	
16:45	17:00	0	0	22	0	20	9	0	8	0	243	
17:00	17:15	0	0	16	0	20	10	0	9	0	246	Peak
17:15	17:30	0	0	17	0	25	26	0	8	0	227	
17:30	17:45	0	0	11	0	21	10	0	10	1	195	
17:45	18:00	0	0	16	0	24	14	0	8	0		
18:00	18:15	0	0	8	0	18	4	0	6	0		
18:15	18:30	0	0	13	0	20	5	0	6	0		

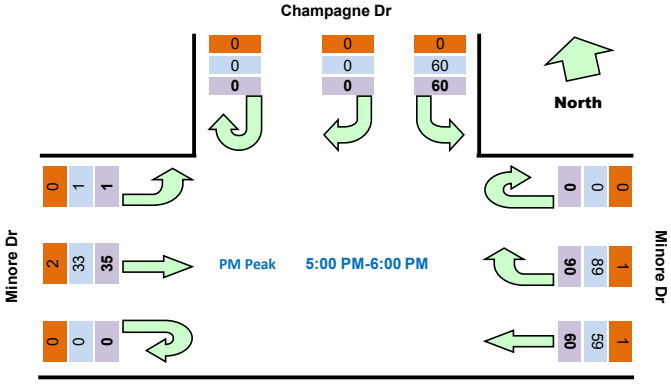
Peak Time		orth Approach Champagne I			East Approach Minore Dr			West Approach Minore Dr			Peak
Period Start	**Period End**	U	R	L	U	R	WB	U	EB	L	**total**
8:00	9:00	0	0	90	0	29	11	0	36	1	167
17:00	18:00	0	0	60	0	90	60	0	35	1	246

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.

Graphic

Total
Light
Heavy





TRANS TRAFFIC SURVEY

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TURNING MOVEMENT SURVEY

Intersection of Mitchell Hwy and Richardson Rd, Dubbo

GPS *-32.227292, 148.569882*

Date:	Fri 13/05/22
Weather:	Fine
Suburban:	Dubbo
Customer:	Amber

North:	Richardson Rd
East:	Mitchell Hwy
South:	N/A
West:	Mitchell Hwy

Survey Period	AM:	7:30 AM-9:30 AM
	PM:	4:30 PM-6:30 PM
Traffic Peak	AM:	8:00 AM-9:00 AM
	PM:	4:30 PM-5:30 PM

All Vehicles

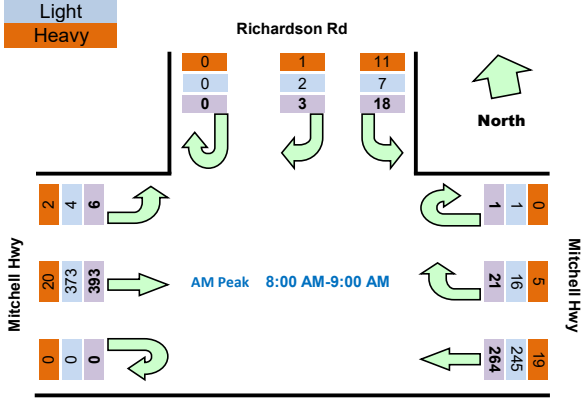
Time		orth Approach Richardson R			East Approach Mitchell Hwy			West Approach Mitchell Hwy			Hourly Total	
Period Start	**Period End**	**U**	**R**	**L**	**U**	**R**	**WB**	**U**	**EB**	**L**	**Hour**	**Peak**
7:30	7:45	0	0	5	0	9	46	0	57	1	604	
7:45	8:00	0	0	3	0	12	62	0	68	0	656	
8:00	8:15	0	1	4	0	9	67	0	89	1	706	Peak
8:15	8:30	0	0	5	0	4	55	0	105	1	701	
8:30	8:45	0	2	6	1	3	60	0	95	3	677	
8:45	9:00	0	0	3	0	5	82	0	104	1		
9:00	9:15	0	0	4	0	2	71	0	88	1		
9:15	9:30	0	0	6	0	4	61	0	74	1		
16:30	16:45	0	1	6	0	6	79	0	75	1	710	Peak
16:45	17:00	0	1	11	0	2	85	0	88	1	687	
17:00	17:15	0	1	15	0	2	87	0	61	0	624	
17:15	17:30	0	0	13	0	2	98	0	75	0	573	
17:30	17:45	0	0	0	0	0	87	0	58	0	490	
17:45	18:00	0	0	1	0	1	74	0	49	0		
18:00	18:15	0	4	2	0	0	64	0	45	0		
18:15	18:30	0	0	0	0	1	39	0	65	0		

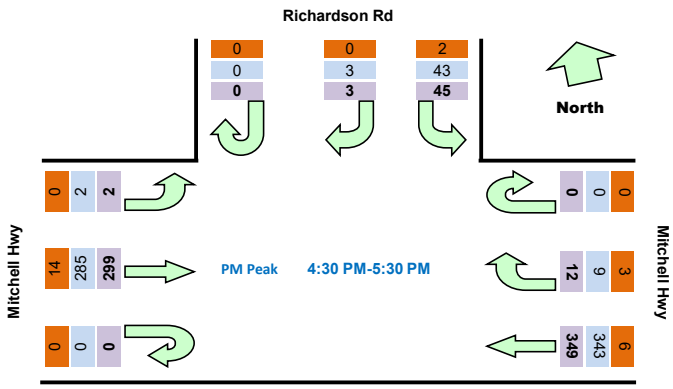
Peak Time		orth Approach Richardson R			East Approach Mitchell Hwy			West Approach Mitchell Hwy			Peak
Period Start	**Period End**	U	R	L	U	R	WB	U	EB	L	**total**
8:00	9:00	0	3	18	1	21	264	0	393	6	706
16:30	17:30	0	3	45	0	12	349	0	299	2	710

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.

Graphic

Total
Light
Heavy





TRANS TRAFFIC SURVEY

trafficsurvey.com.au

TURNING MOVEMENT SURVEY

Intersection of Mitchell Hwy and Thompson St, Dubbo

GPS *-32.242123,148.586600*

Date:	Fri 13/05/22
Weather:	Fine
Suburban:	Dubbo
Customer:	Amber

North:	Thompson St
East:	Mitchell Hwy
South:	Carpark
West:	Victoria St

Survey Period	AM:	7:30 AM-9:30 AM
	PM:	4:30 PM-6:30 PM
Traffic Peak	AM:	8:15 AM-9:15 AM
	PM:	4:30 PM-5:30 PM

All Vehicles

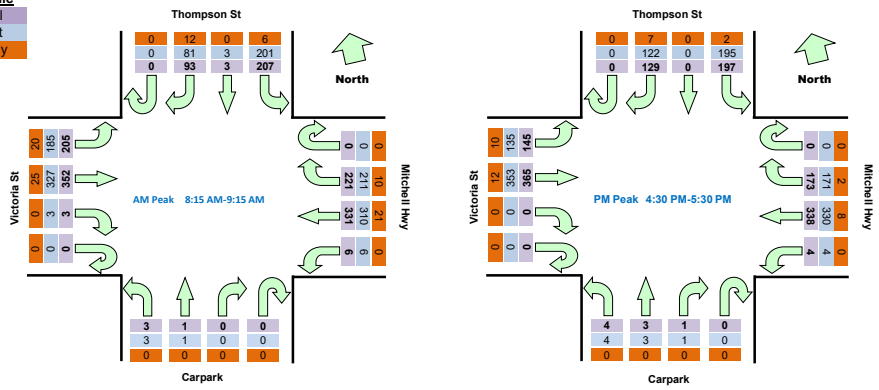
Time		North Approach Thompson St				East Approach Mitchell Hwy				South Approach Carpark				West Approach Victoria St				Hourly Total	
Period Start	Period End	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	Hour	Peak
7:30	7:45	0	22	0	13	0	33	71	1	0	0	0	0	0	1	65	28	1172	
7:45	8:00	0	26	0	36	0	41	108	1	0	0	0	0	0	0	51	41	1286	
8:00	8:15	0	25	0	33	0	38	82	1	0	0	0	0	0	0	74	35	1379	
8:15	8:30	0	16	0	58	0	59	70	0	0	0	0	0	0	0	96	47	1425	Peak
8:30	8:45	0	23	0	51	0	56	74	4	0	0	0	1	0	1	87	51	1387	
8:45	9:00	0	28	2	52	0	63	102	0	0	0	0	1	0	0	98	51		
9:00	9:15	0	26	1	46	0	43	85	2	0	0	1	1	0	2	71	56		
9:15	9:30	0	29	0	29	0	49	64	5	0	1	0	2	0	1	82	46		
16:30	16:45	0	31	0	49	0	45	86	1	0	1	3	2	0	0	86	46	1359	Peak
16:45	17:00	0	30	0	47	0	38	91	2	0	0	0	1	0	0	101	28	1310	
17:00	17:15	0	35	0	52	0	36	88	1	0	0	0	0	0	0	97	44	1278	
17:15	17:30	0	33	0	49	0	54	73	0	0	0	0	1	0	0	81	27	1190	
17:30	17:45	0	26	0	57	0	41	80	5	0	0	1	1	0	0	69	21	1086	
17:45	18:00	0	33	0	50	0	37	85	0	0	1	0	1	0	0	74	25		
18:00	18:15	0	23	0	39	1	31	74	1	0	2	0	0	0	0	60	34		
18:15	18:30	0	14	0	31	0	27	52	0	0	0	0	0	0	0	75	15		

Peak Time		North Approach Thompson St				East Approach Mitchell Hwy				South Approach Carpark				West Approach Victoria St				Peak
Period Start	Period End	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	total
8:15	9:15	0	93	3	207	0	221	331	6	0	0	1	3	0	3	352	205	1425
16:30	17:30	0	129	0	197	0	173	338	4	0	1	3	4	0	0	365	145	1359

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.

Graphic

Total
Light
Heavy



TRANS TRAFFIC SURVEY

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TURNING MOVEMENT SURVEY

Intersection of Mitchell Hwy and Newell Hwy, Dubbo

GPS *-32.248159,148.593236*

Date:	Fri 13/05/22
Weather:	Fine
Suburban:	Dubbo
Customer:	Amber

North:	Newell Hwy
East:	Mitchell Hwy
South:	Newell Hwy
West:	Mitchell Hwy

Survey Period	AM:	7:30 AM-9:30 AM
	PM:	4:30 PM-6:30 PM
Traffic Peak	AM:	8:15 AM-9:15 AM
	PM:	4:30 PM-5:30 PM

All Vehicles

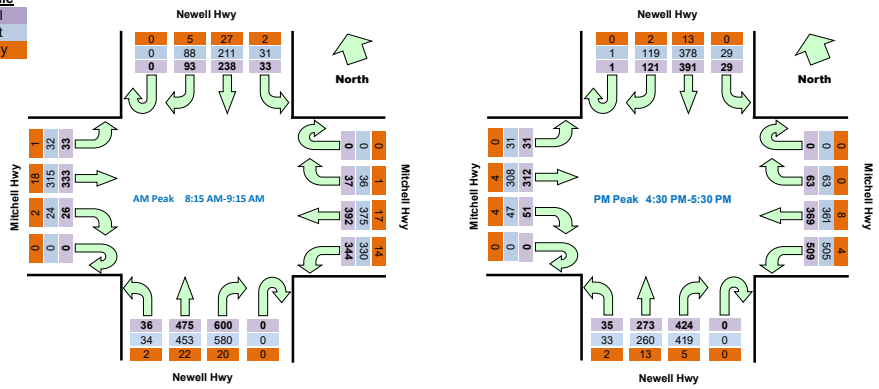
Time		North Approach Newell Hwy				East Approach Mitchell Hwy				South Approach Newell Hwy				West Approach Mitchell Hwy				Hourly Total	
Period Start	Period End	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	Hour	Peak
7:30	7:45	0	8	26	7	0	10	72	33	0	65	59	4	0	5	47	7	2014	
7:45	8:00	0	21	34	7	0	8	87	57	0	98	96	14	0	5	42	5	2361	
8:00	8:15	0	18	30	10	0	8	90	49	1	125	94	8	0	5	69	8	2584	
8:15	8:30	0	19	47	4	0	13	94	92	0	162	147	4	0	8	87	5	2640	Peak
8:30	8:45	0	33	57	12	0	6	128	78	0	151	132	4	0	2	76	11	2418	
8:45	9:00	0	28	80	10	0	9	93	88	0	153	110	15	0	13	87	11		
9:00	9:15	0	13	54	7	0	9	77	86	0	134	86	13	0	3	83	6		
9:15	9:30	0	16	49	6	1	8	73	73	0	82	56	7	1	9	71	8		
16:30	16:45	0	34	83	5	0	13	90	131	0	101	73	12	0	11	79	9	2609	Peak
16:45	17:00	0	24	118	6	0	16	88	115	0	95	66	4	0	12	74	8	2541	
17:00	17:15	1	34	94	10	0	17	95	110	0	107	68	11	0	16	81	7	2528	
17:15	17:30	0	29	96	8	0	17	96	153	0	121	66	8	0	12	78	7	2423	
17:30	17:45	0	14	85	4	0	9	78	129	0	79	57	8	0	19	80	11	2211	
17:45	18:00	0	20	73	5	0	20	107	147	0	79	51	8	0	16	82	5		
18:00	18:15	0	15	81	4	0	13	80	98	0	92	59	7	0	15	72	10		
18:15	18:30	0	14	75	7	1	13	59	108	0	79	36	3	0	6	74	4		

Peak Time		North Approach Newell Hwy				East Approach Mitchell Hwy				South Approach Newell Hwy				West Approach Mitchell Hwy				Peak
Period Start	Period End	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	total
8:15	9:15	0	93	238	33	0	37	392	344	0	600	475	36	0	26	333	33	2640
16:30	17:30	1	121	391	29	0	63	369	509	0	424	273	35	0	51	312	31	2609

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.

Graphic

Total
Light
Heavy



TRANS TRAFFIC SURVEY

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TURNING MOVEMENT SURVEY

Intersection of North St and Newell Hwy, Dubbo

GPS *-32.256136, 148.587107*

Date:	Fri 13/05/22
Weather:	Fine
Suburban:	Dubbo
Customer:	Amber

North:	Newell Hwy
North:	North St
South:	Newell Hwy
West:	Minore Rd

Survey Period	AM:	7:30 AM-9:30 AM
	PM:	4:30 PM-6:30 PM
Traffic Peak	AM:	8:00 AM-9:00 AM
	PM:	5:15 PM-6:15 PM

All Vehicles

Time		Newell Hwy South Approach				Minore Rd West Approach				North St North Approach				Newell Hwy North Approach			
Period Start	Period End	Uturn	Minore Rd	North St	ell Hwy N	Uturn	ell Hwy S	North St	ell Hwy N	Uturn	ell Hwy S	Minore Rd	ell Hwy N	Uturn	ell Hwy S	Minore Rd	North St
7:30	7:45	0	0	3	57	0	4	1	66	0	4	1	1	0	24	16	1
7:45	8:00	0	6	3	80	0	3	7	101	0	6	5	0	0	48	29	0
8:00	8:15	0	5	6	68	0	1	4	112	0	8	9	1	0	30	12	1
8:15	8:30	0	10	8	93	0	2	23	129	0	1	4	1	0	45	39	0
8:30	8:45	0	8	8	60	0	3	11	133	0	4	7	0	0	56	33	1
8:45	9:00	0	1	5	69	0	3	12	101	0	7	11	0	0	66	35	1
9:00	9:15	0	2	3	53	0	1	14	82	0	7	8	2	0	48	57	1
9:15	9:30	0	1	3	48	0	5	4	68	0	6	4	1	0	55	40	2
16:30	16:45	0	6	2	67	0	8	3	52	0	5	5	3	0	64	96	0
16:45	17:00	0	4	0	46	0	3	2	81	0	3	8	3	0	82	105	1
17:00	17:15	0	5	1	55	0	4	4	79	0	1	10	3	1	67	99	0
17:15	17:30	0	5	3	62	0	7	6	77	0	10	7	1	0	78	127	0
17:30	17:45	0	2	3	34	0	6	3	75	0	4	10	2	0	63	111	0
17:45	18:00	0	4	1	55	0	6	3	71	0	3	13	3	0	46	104	0
18:00	18:15	0	3	2	40	0	4	1	74	0	4	5	1	0	61	55	0
18:15	18:30	0	5	1	43	0	1	5	49	0	4	10	0	0	50	84	0

Light Vehicles (AustRoad Class 1 to 2)

Time		Newell Hwy South Approach				Minore Rd West Approach				North St North Approach				Newell Hwy North Approach			
Period Start	Period End	Uturn	Minore Rd	North St	ell Hwy N	Uturn	ell Hwy S	North St	ell Hwy N	Uturn	ell Hwy S	Minore Rd	ell Hwy N	Uturn	ell Hwy S	Minore Rd	North St
7:30	7:45	0	0	3	53	0	4	1	65	0	4	1	1	0	21	14	1
7:45	8:00	0	6	2	80	0	3	6	99	0	6	5	0	0	40	27	0
8:00	8:15	0	5	6	65	0	1	3	110	0	8	9	1	0	22	12	0
8:15	8:30	0	10	8	90	0	2	22	126	0	1	4	1	0	38	39	0
8:30	8:45	0	8	7	56	0	3	11	132	0	4	7	0	0	48	32	1
8:45	9:00	0	1	5	67	0	3	12	99	0	7	10	0	0	60	35	0
9:00	9:15	0	2	3	51	0	1	14	81	0	7	8	2	0	40	56	0
9:15	9:30	0	1	2	46	0	5	4	67	0	6	4	1	0	51	40	2
16:30	16:45	0	6	2	65	0	8	3	52	0	5	5	3	0	63	96	0
16:45	17:00	0	4	0	45	0	3	2	79	0	3	8	3	0	76	104	1
17:00	17:15	0	5	1	53	0	4	3	77	0	1	10	3	1	59	99	0
17:15	17:30	0	5	3	61	0	7	6	77	0	10	7	1	0	74	126	0
17:30	17:45	0	2	3	33	0	6	3	75	0	4	10	2	0	60	111	0
17:45	18:00	0	4	1	51	0	6	2	68	0	3	13	3	0	43	103	0
18:00	18:15	0	2	2	40	0	4	1	74	0	4	5	1	0	55	54	0
18:15	18:30	0	5	1	41	0	1	5	48	0	4	10	0	0	48	84	0

TRANS TRAFFIC SURVEY

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TURNING MOVEMENT SURVEY

Intersection of Newell Hwy and Thompson St, Dubbo

GPS *-32.243245, 148.598180*

Date:	Fri 13/05/22
Weather:	Fine
Suburban:	Dubbo
Customer:	Amber

North:	Thompson St
East:	Newell Hwy
South:	N/A
West:	Newell Hwy

Survey Period	AM:	7:30 AM-9:30 AM
	PM:	4:30 PM-6:30 PM
Traffic Peak	AM:	8:15 AM-9:15 AM
	PM:	4:30 PM-5:30 PM

All Vehicles

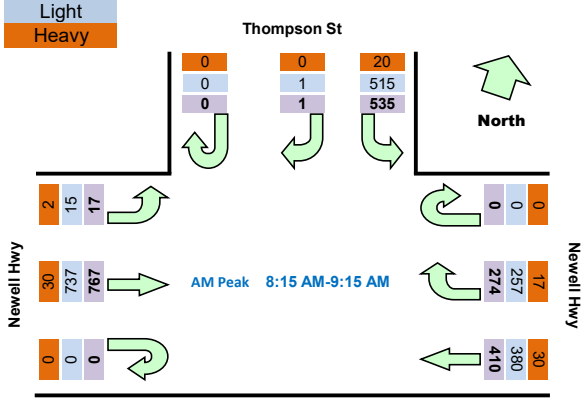
Time		North Approach Thompson S			East Approach Newell Hwy			West Approach Newell Hwy			Hourly Total	
Period Start	**Period End**	**U**	**R**	**L**	**U**	**R**	**WB**	**U**	**EB**	**L**	**Hour**	**Peak**
7:30	7:45	0	0	74	0	42	48	0	107	4	1519	
7:45	8:00	0	1	113	1	56	73	0	116	2	1815	
8:00	8:15	0	0	109	0	55	65	0	168	1	1965	
8:15	8:30	0	0	142	0	62	81	0	196	3	2004	Peak
8:30	8:45	0	0	150	0	66	118	0	232	5	1846	
8:45	9:00	0	1	128	0	70	121	0	189	3		
9:00	9:15	0	0	115	0	76	90	0	150	6		
9:15	9:30	0	1	87	0	59	75	0	100	4		
16:30	16:45	0	0	94	0	111	149	0	107	3	1868	Peak
16:45	17:00	0	0	83	0	95	151	0	94	9	1838	
17:00	17:15	0	0	96	0	125	181	0	102	7	1787	
17:15	17:30	0	1	91	0	119	154	0	87	9	1640	
17:30	17:45	0	2	74	0	102	154	0	98	4	1463	
17:45	18:00	0	1	75	0	101	109	0	88	7		
18:00	18:15	0	0	76	0	80	114	0	87	7		
18:15	18:30	0	1	46	0	55	109	0	66	7		

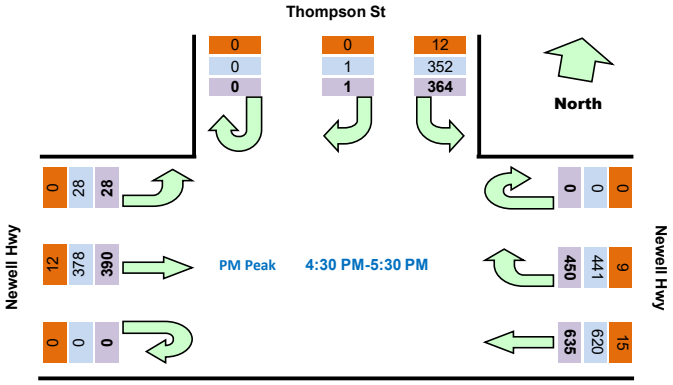
Peak Time		North Approach Thompson S			East Approach Newell Hwy			West Approach Newell Hwy			Peak
Period Start	**Period End**	U	R	L	U	R	WB	U	EB	L	**total**
8:15	9:15	0	1	535	0	274	410	0	767	17	2004
16:30	17:30	0	1	364	0	450	635	0	390	28	1868

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.

Graphic

Total
Light
Heavy





TRANS TRAFFIC SURVEY

trafficsurvey.com.au

TURNING MOVEMENT SURVEY

Intersection of Mitchell Dr and Westview St , Dubbo

GPS *-32.232432, 148.575624*

Date:	Fri 13/05/22
Weather:	Fine
Suburban:	Dubbo
Customer:	Amber

North:	Westview St
East:	Mitchell Dr
South:	N/A
West:	Mitchell Dr

Survey Period	AM:	7:30 AM-9:30 AM
	PM:	4:30 PM-6:30 PM
Traffic Peak	AM:	8:15 AM-9:15 AM
	PM:	4:30 PM-5:30 PM

All Vehicles

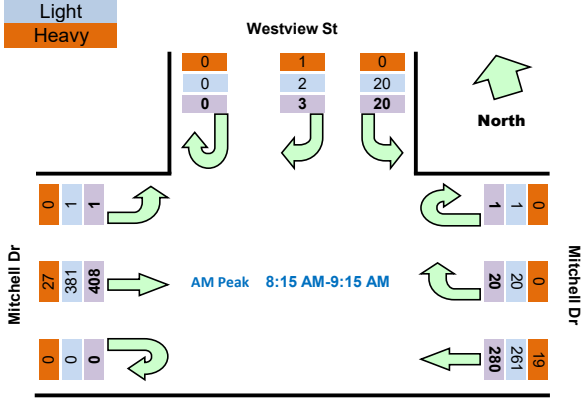
Time		North Approach Westview St			East Approach Mitchell Dr			West Approach Mitchell Dr			Hourly Total	
Period Start	**Period End**	**U**	**R**	**L**	**U**	**R**	**WB**	**U**	**EB**	**L**	**Hour**	**Peak**
7:30	7:45	0	4	0	0	2	51	0	60	2	636	
7:45	8:00	0	1	4	0	8	73	0	71	1	687	
8:00	8:15	0	0	0	0	9	76	0	93	0	732	
8:15	8:30	0	2	4	0	9	57	0	108	1	733	Peak
8:30	8:45	0	1	3	0	2	63	0	101	0	709	
8:45	9:00	0	0	7	0	3	87	0	106	0		
9:00	9:15	0	0	6	1	6	73	0	93	0		
9:15	9:30	0	1	9	0	3	64	0	80	0		
16:30	16:45	0	0	2	0	4	85	0	79	1	728	Peak
16:45	17:00	0	0	1	0	2	87	0	97	1	714	
17:00	17:15	0	0	10	0	4	89	0	74	1	658	
17:15	17:30	0	0	2	0	2	100	0	86	1	594	
17:30	17:45	0	0	7	0	6	87	0	57	0	510	
17:45	18:00	0	0	3	0	4	75	0	50	0		
18:00	18:15	0	0	2	0	1	64	0	47	0		
18:15	18:30	0	0	0	1	1	40	0	65	0		

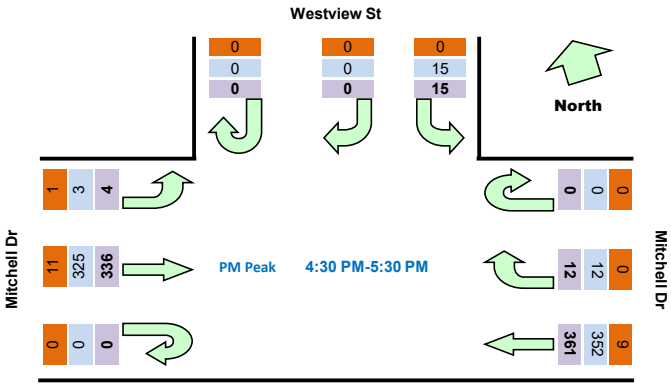
Peak Time		North Approach Westview St			East Approach Mitchell Dr			West Approach Mitchell Dr			Peak
Period Start	**Period End**	U	R	L	U	R	WB	U	EB	L	**total**
8:15	9:15	0	3	20	1	20	280	0	408	1	733
16:30	17:30	0	0	15	0	12	361	0	336	4	728

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.

Graphic

Total
Light
Heavy





Appendix B

Guidelines for Assessing Intersection Performance

The *RTA Guide to Traffic Generating Developments* (October 2002, Issue 2.2), details the assessment of intersections. The assessment of the level of service of an intersection is based on the evaluation of the following Measures of Effectiveness:

- Average delay (seconds/veh) (all forms of control)
- Delay to critical movement (seconds/veh) (all forms of control)
- Degree of saturation (traffic signals and roundabouts)
- Cycle length (traffic signals)

SIDRA was used to calculate the relevant intersection parameters. The SIDRA software is an advanced lane-based micro-analytical tool for design and evaluation of individual intersections and networks of intersections including modelling of separate movement classes (light vehicles, heavy vehicles, buses, cyclists, large trucks, light rail / trams and so on). It provides estimates of capacity, level of service and a wide range of performance measures, including; delay, queue length and stops for vehicles and pedestrians, as well as fuel consumption, pollution emissions and operating costs.

It can be used to analyse signalised intersections (fixed-time / pretimed and actuated), signalised and unsignalised pedestrian crossings, roundabouts (unsignalised), roundabouts with metering signals, fully-signalised roundabouts, two-way stop sign and give-way / yield sign control, all-way stop sign control, single point interchanges (signalised), freeway diamond interchanges (signalised, roundabout, sign control), diverging diamond interchanges and other alternative intersections and interchanges. It can also be used for uninterrupted traffic flow conditions and merge analysis.

The best indicator of the level of service at an intersection is the average delay experienced by vehicles at that intersection. For traffic signals, the average delay over all movements should be taken. For roundabouts and priority control intersections (with Stop and Give Way signs or operating under the T-junction rule) the critical movement for level of service assessment should be that with the highest average delay.

With traffic signals, delays per approach tend to be equalised, subject to any over-riding requirements of signal co-ordination as well as to variations within individual movements. With roundabouts and priority control intersections, the critical criterion for assessment is the movement with the highest delay per vehicle. With this type of control the volume balance might be such that some movements suffer high levels of delay while other movements have minimal delay. An overall average delay for the intersection of 25 seconds might not be satisfactory if the average delay on one movement is 60 seconds.

The average delay for level of service E should be no more than 70 seconds. The accepted maximum practical cycle length for traffic signals under saturated conditions is 120 - 140 seconds. Under these conditions 120 seconds is near maximum for two and three phase intersections and 140 seconds near maximum for more complex phase designs. Drivers and pedestrians expect cycle lengths of these magnitudes and their inherent delays in peak hours. A cycle length of 140 seconds for an intersection which is almost saturated has an average vehicle delay of about 70 seconds, although this can vary. If the average vehicle delay is more than 70 seconds, the intersection is assumed to be at Level of Service F.

Table 32 sets out average delays for different levels of service. There is no consistent correlation between definitions of levels of service for road links as defined elsewhere in this section, and the ranges set out in Table 32. In assigning a level of service, the average delay to the motoring public needs to be considered, keeping in mind the location of the intersection. For example, drivers in

inner urban areas of Sydney have a higher tolerance of delay than drivers in country areas. Table 32 provides a recommended baseline for assessment.

Table 32: Level of Service Criteria for Intersections

Level of Service	Average Delay per Vehicle (sec/veh)	Traffic Signals, Roundabouts	Give Way and Stop Signs
A	Less than 14	Good operation	Good operation
B	15 – 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 – 42	Satisfactory	Satisfactory, but accident study required
D	43 – 56	Operating near capacity	Near capacity and accident study required
E	57 - 70	At capacity Signals, incidents will cause excessive delays Roundabouts require other control mode	At capacity, require other control mode

The figures in Table 32 are intended as a guide only. Any particular assessment should take into account site-specific factors including maximum queue lengths (and their effect on lane blocking), the influence of nearby intersections and the sensitivity of the location to delays. In many situations, a comparison of the current and future average delay provides a better appreciation of the impact of a proposal, and not simply the change in the level of service.

Appendix C

Concept of Level of Service

An important consideration in determining the impact of a development proposal on the road system is to assess the effect on traffic efficiency, the objective of which is to maintain the existing level of service. Level of Service is defined within the *Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis* as:

> *'... a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers. A level of service definition generally describes these conditions in terms of factors such as speed and travel time, freedom to manoeuvre, traffic interruptions, comfort and convenience, and safety.'*

Levels of service are designated from A to F from best (free flow conditions) to worst (forced flow with stop start operation, long queues and delays) as follows:

Table 33: Level of Service Definition for Uninterrupted Traffic Flow

Level of Service	Description
A	A condition of free-flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.
B	In the zone of stable flow where drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is a little less than with level of service A.
C	Also in the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level.
D	Close to the limit of stable flow and approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow will generally cause operational problems.
E	Traffic volumes are at or close to capacity, and there is virtually no freedom to select desired speeds or to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream will cause breakdown.
F	In the zone of forced flow, where the amount of traffic approaching the point under consideration exceeds that which can pass it. Flow breakdown occurs, and queuing and delays result.

Austroads provides the following discussion when referring to two-way rural roads:

> *'Two-lane rural roads have one lane for use by traffic travelling in each direction. Overtaking of slower vehicles requires the use of the opposing traffic lane when sight distance and gaps in the opposing traffic stream permit. At low traffic volumes and under ideal conditions, drivers are able to travel at their desired speed without interference. As traffic volumes increase, and as roadway, terrain and traffic conditions become less than ideal, drivers are increasingly affected by the presence of other vehicles on the road, and bunches form in the traffic stream. Vehicles in these bunches are subjected to delay because of the inability to overtake slower moving vehicles.'*

The guide also differentiates rural roads into the following three categories:

Table 34: Level of Service Definition for Uninterrupted Traffic Flow

Category	Description
Class I	These are two-lane highways on which motorists expect to travel at relatively high speeds. Two-lane highways that are major intercity routes, primary arterials connecting major traffic generators, daily commuter routes, or primary links in state or national highway networks generally are assigned to Class I. Class I facilities most often serve long-distance trips or provide connecting links between facilities that serve long-distance trips.
Class II	These are two-lane highways on which motorists do not necessarily expect to travel at high speeds. Two-lane highways that function as access routes to Class I facilities, serve as scenic or recreational routes that are not primary arterials, or pass through rugged terrain generally are assigned to Class II. Class II facilities most often serve relatively short trips, the beginning and ending portions of longer trips, or trips for which sightseeing plays a significant role.
Class II	These are two-lane highways serving moderately developed areas. They may be portions of a Class I or Class II highway that pass through small towns or developed recreational areas. On such segments, local traffic often mixes with through traffic, and the density of unsignalised roadside access points is noticeably higher than in a purely rural area. Class III highways may also be longer segments passing through more spread-out recreational areas, also with increased roadside densities. Such segments are often accompanied by reduced speed limits that reflect the higher activity level.

The three classes of road perform markedly different functions and are not totally dependent on the highway's role in the hierarchy. A highway between major urban centres through mountainous terrain might be classified as Class II instead of Class I if it is established that drivers appreciate that higher speeds are inappropriate.

The level of Service (LOS) criteria used for the different highway classes differ. The Austroads Guide notes that:

- The LOS for Class I highways on which efficient mobility is paramount is defined in terms of both percent time-spent-following and average travel speed.
- On Class II highways, mobility is less critical, and LOS is defined only in terms of per cent time-spent-following.
- On Class III highways, high speeds are not expected. Because the length of Class III segments is generally limited, passing restrictions are also not a major concern. In these cases, drivers would like to make steady progress at or near the speed limit. Therefore, on these highways, per cent free-flow speed is used to define LOS.

Determining the LOS based on percent time-spent-following and average travel speeds is suitable when reviewing existing traffic conditions as they can be measured by on-site observations and measurements. However, the value of these criteria are difficult to estimate when trying to predict the impact generated by an increase in traffic on the road network. As an alternative, the LOS can be determined based on the service volume of the particular section of road and the expected traffic volume on that section of road.

A service volume, as defined by Austroads, is the maximum number of vehicles that can pass over a given section of roadway in one direction over one hour while operating conditions are maintained at a specified level of service. The *RTA Guide to Traffic Generating Developments*, dated October 2002, suggests that ideally rural roads should not exceed service volumes at Level of Service C. At this level, whilst most drivers are restricted in their freedom to manoeuvre,

operating speeds are still reasonable and acceptable delays experienced. However, on weekends roads operating at Level of Service D are still considered adequate.

Table 4.3 of the RTA Guide sets out one-way hourly road capacities for urban roads and is provided below.

Table 35: Typical Midblock Capacities for Urban Roads with Interrupted Flows

Type of Road	One-Way Midblock Lane Capacity (pcu/hr)	
Median or Inner Lane	Divided Road	1,000
	Undivided Road	900
Outer or Kerb Lane	With Adjacent Parking Lane	900
	Clearway Conditions	900
	Occasional Parked Cars	600
4 Lane Undivided	Occasional Parked Cars	1,500
	Clearway Conditions	1,800
4 Lane Divided	Clearway Conditions	1,900

Table 4.4 of the RTA Guide sets out peak hour flows for one and two lanes of unidirectional travel, based on volume / capacity ratios applicable for urban roads in level terrain with no sight distance restrictions on overtaking. It should be noted that these are indicative figures based on the rural volume / capacity ratios with a lane capacity of 1400 veh/hr. This figure can be achieved under normal urban interrupted flow conditions and are shown below.

Table 36: Urban Road Peak Hour Flows per Direction

Level of Service	One Lane (veh/hr)	Two Lanes (veh/hr)
A	200	900
B	380	1,400
C	600	1,800
D	900	2,200
E	1,400	2,800

The figures in the above table are provided for strategic planning purposes only, and are not intended as a substitute for basic exercises in intersection analysis.

Contact

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