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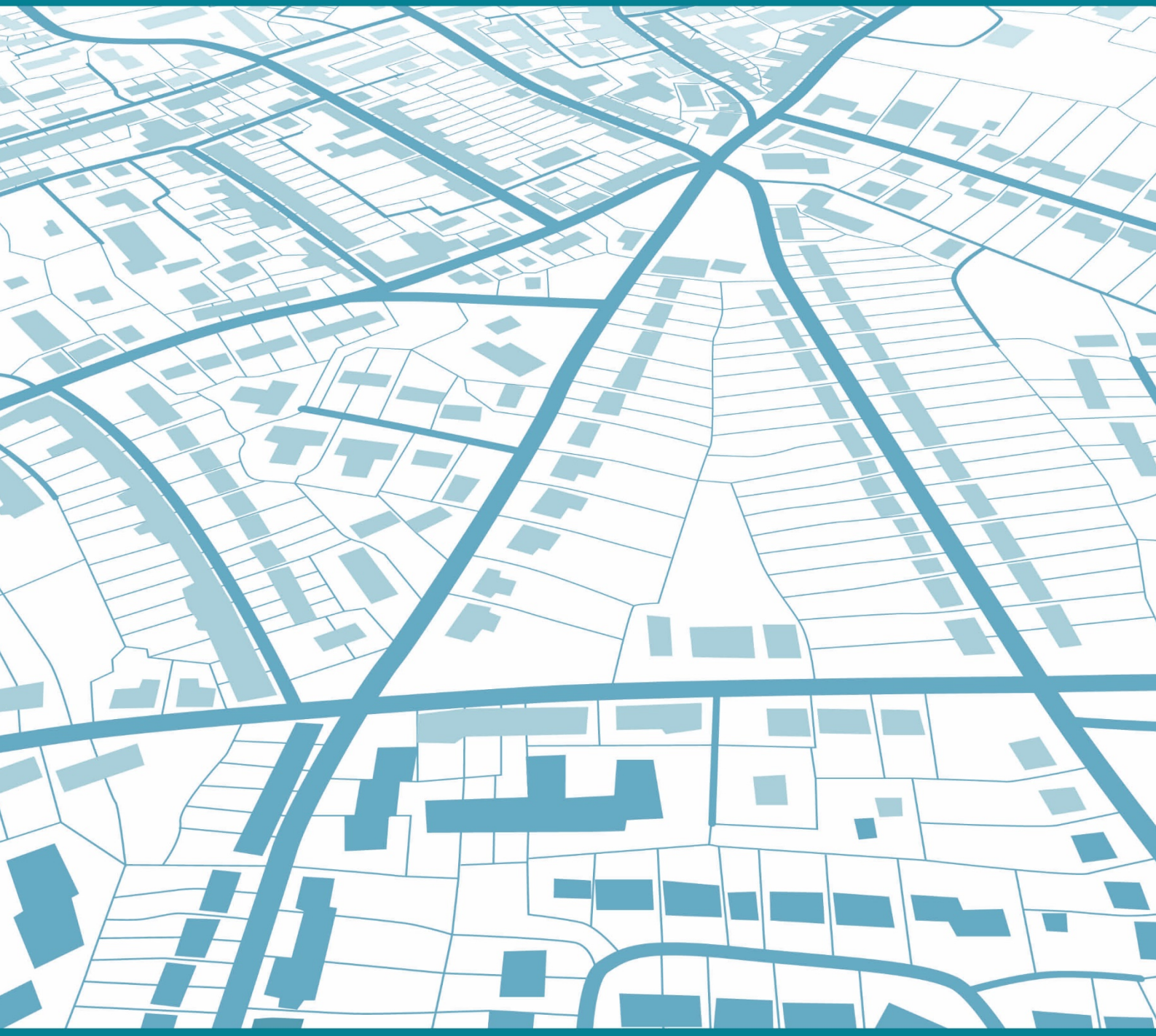


89-115 O'Connell Street, Caddens
Proposed Residential Subdivision

Traffic and Parking Impact Assessment

Ref: 21307
Date: October 2021
Rev: A

Table of Contents

List of Figures

List of Appendices

1.0 Introduction

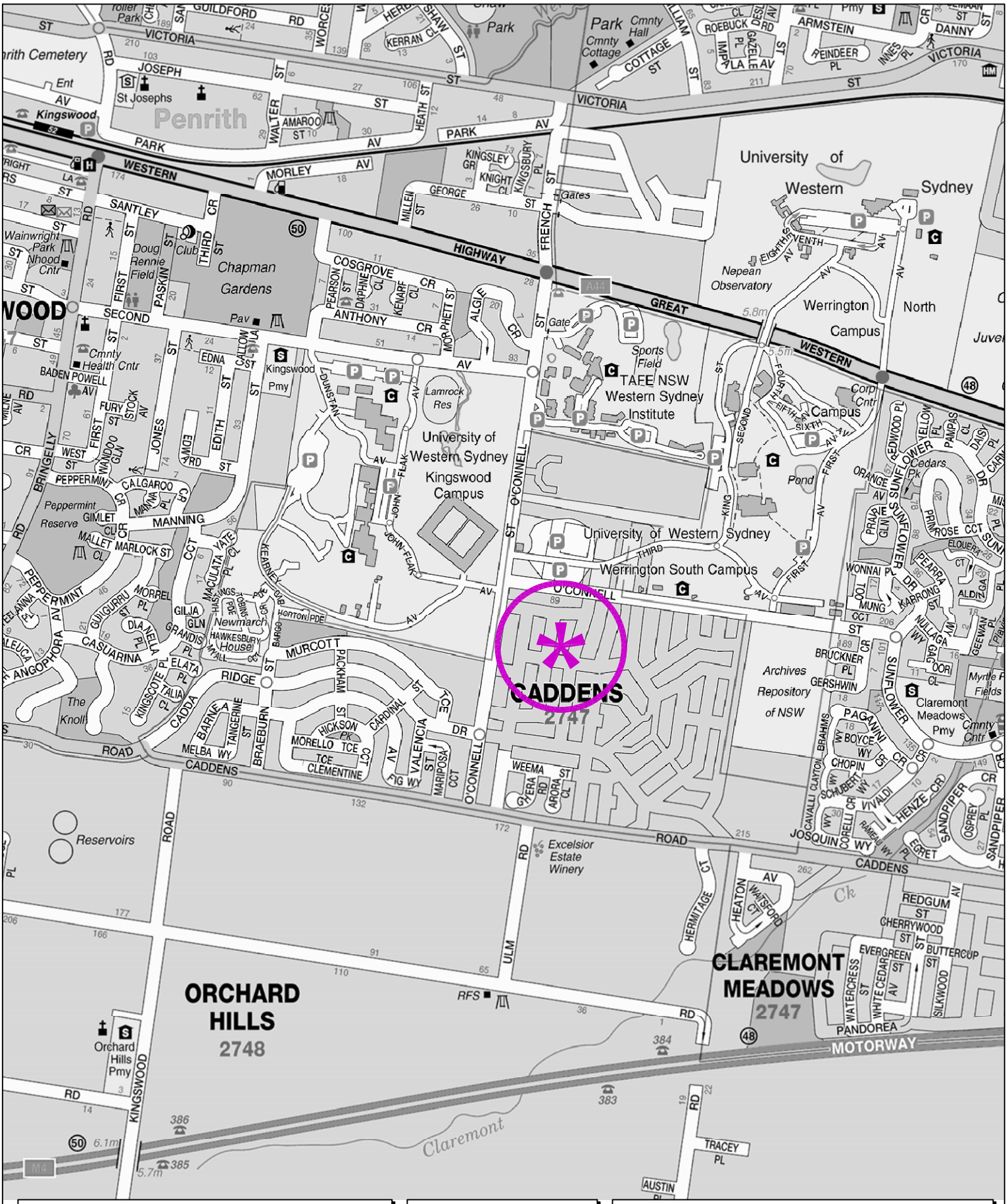
This report has been prepared to accompany a Development Application to Penrith City Council for a proposed residential subdivision on O'Connell Street at Caddens (Figure 1). The Caddens area is a large new urban precinct which will benefit from ready access to an upgraded arterial road system and the major regional facilities available nearby in Penrith CBD.

The development site is located towards the central part of the Precinct directly on the corner of O'Connell Street and O'Connell Lane and southeast of the Western Sydney University (WSU), Kingswood Campus. The subdivision application proposes a total of 121 Torrens title house lots in Stages 8 and 9.

It is noted that Stage 10 (Lot 1000) development, which has a yield of approximately 42 lots, would be subject to future (Stage 10) development application.

The purpose of this report is to:

* describe the site, the existing circumstances and the proposed subdivision
* describe the existing road network and the prevailing traffic conditions
* describe the future road network and traffic/traffic management circumstances
* assess the potential traffic implications of development on the proposed lots
* assess the suitability of the proposed subdivision access road and traffic control arrangements
* assess the appropriateness of provisions for lot access and servicing.



LOCATION

FIG 1

2.0 Proposed Development

2.1 Site, Context and Existing Circumstances

The site (Figure 2) is Lot 37 in DP 1044732, located in the central part of Caddens to the south of the Great Western Highway at 89-115 O'Connell Street, Caddens.

The surrounding uses comprise:

* the vast WSU campus to the north, northwest and northeast of the site
* the established residential areas to the east, west and south
* the large TAFE NSW – Kingswood Campus to the north
* the Caddens Corner to the north
* the WSU Werrington South Campus to the northeast

Caddens is a developing new suburb situated to the southeast of Kingswood residential/commercial/institutional area and the east of the WSU Kingswood campus.

The large Penrith CBD, with its regional retail, hospital and educational facilities, are located some 4 km to the west.

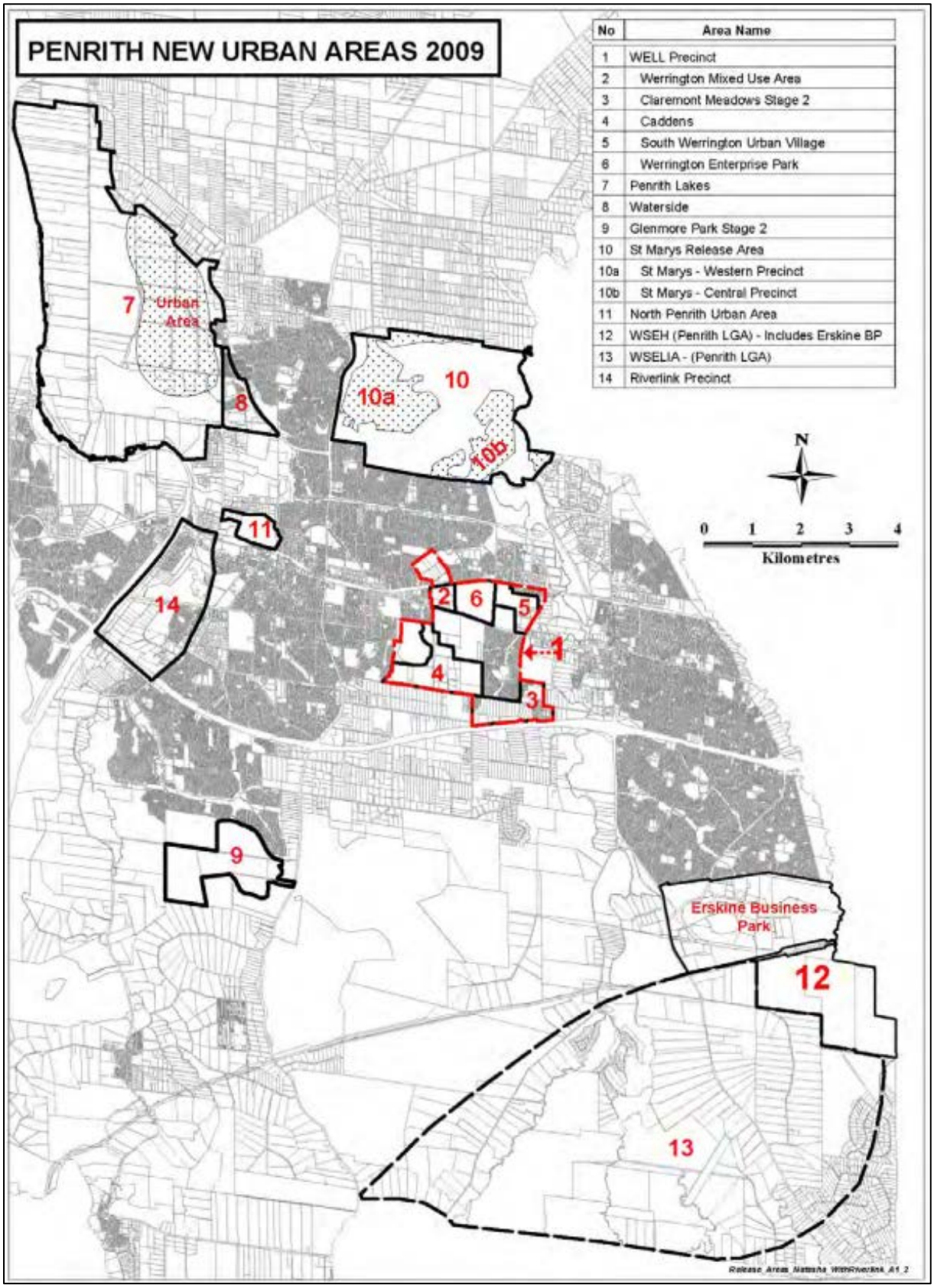
2.2 Precinct Planning

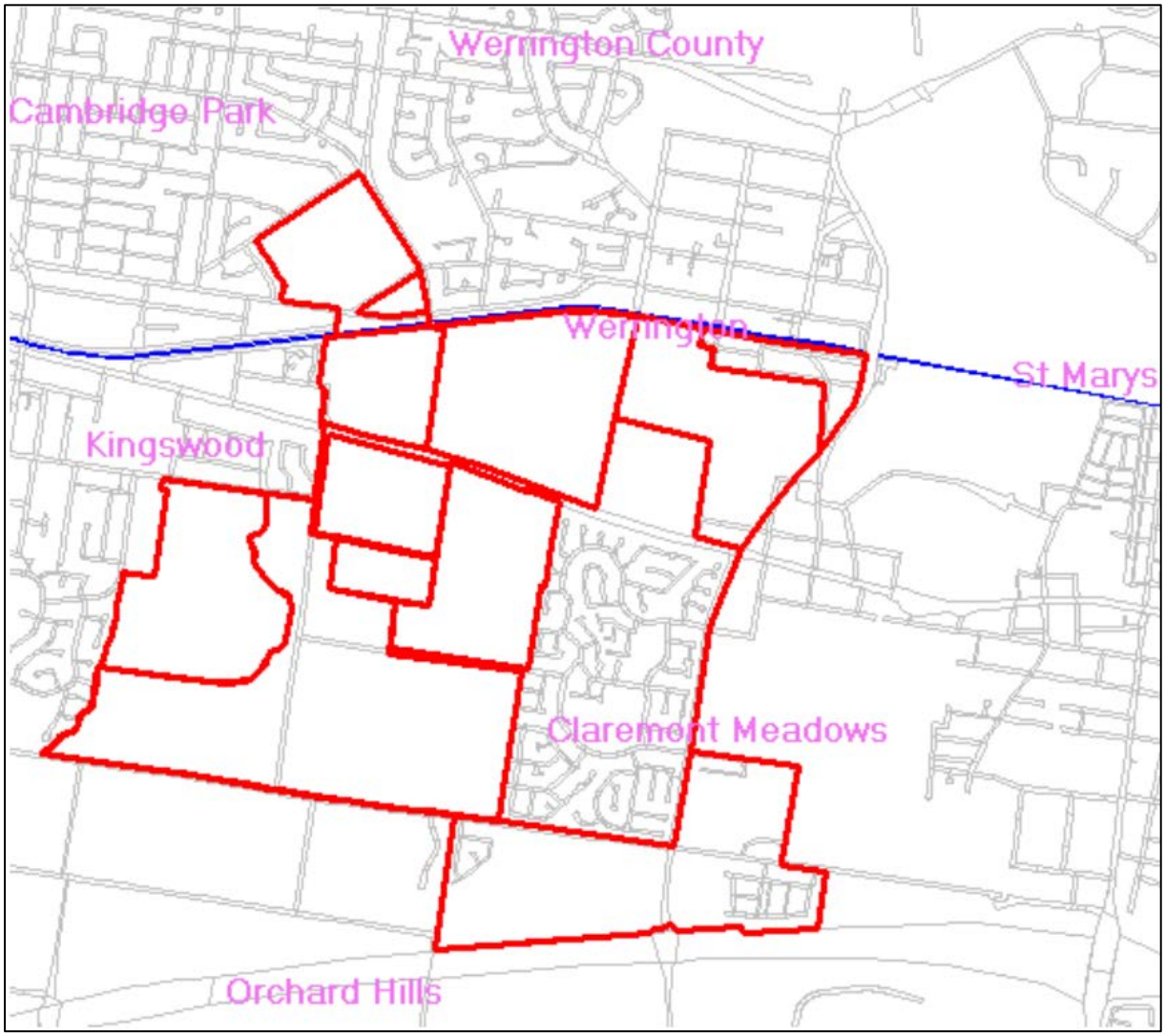
The site and surrounding lands have been identified for urban redevelopment and are centrally located within the Werrington Enterprise, Living and Learning (WELL) Precinct, as shown in the following figures.

N

SITE

FIG 2





The Precinct is generally bounded by the Railway line to the north, Caddens Road to the south, Gipps Street to the east and the South Kingswood residential area to the west. The Precinct comprises a number of sub precincts including Caddens Release Area, South Werrington Urban Village, Claremont Meadows Stage 2 and Werrington Mixed Use Area and is planned to:

* be developed as a “Village” within the Penrith Centres Hierarchy.
* create a residential neighbourhood with 3,000 dwellings (including 100 dwellings for student accommodation) to accommodate around 8,400 people
* provide a mix of housing types with sustainable development
* create 7,800 jobs, including up to 6,000 jobs in the WELL Technology Park and around 350 jobs in the Precinct Centre.

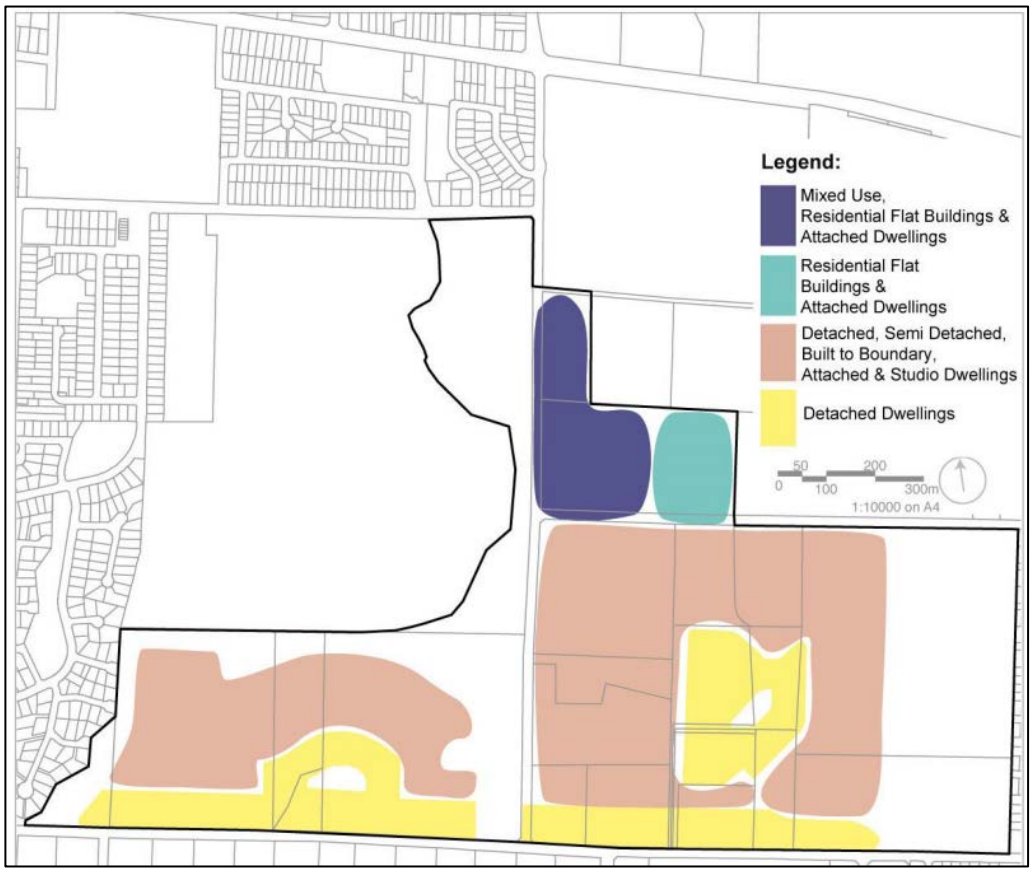
* reduce environmental impact and facilitate greater social interaction
* provide open space amenity with landscaping retaining/protecting areas with high conservation value
* ensure to full advantage is made of bus services as well as cyclist and pedestrian networks

The Structure Plan, Dwelling Yield Targets, and Indicative Dwelling Type Location for Caddens is shown in the following figures.

Structure Plan

Dwelling Yield Targets

Indicative Dwelling Type Location



2.3 Proposed Subdivision Scheme

The proposed subdivision will adopt a relatively conventional 'grid' format with 8-10m-wide "local streets".

The proposed subdivision will comprise a total of 163 residential lots:

* Stage 8 & 9 – 121 lots
* Stage 10 – approximately 42 lots
* 8m-wide carriageway within 16m-wide road reserve on Road 200, the northernmost east-west road, Ghera Road, Redhaven Street and Oxen Way
* 10.5m-wide carriageway within 21m-wide road reserve on Starline Road
* an access road system including
    - 1 road connection to/from Starline Road
    - 1 road connection to/from Ghera Road
    - 1 road connection to/from Redhaven Street
    - 1 road connection to/from Oxen Way

The proposal incorporates a minor departure from the road layout shown in the Caddens DCP. However, it retains the status quo in relation to the road connections on Starline Road, Ghera Street, Redhaven Street, and Oxen Way (as indicated in the DCP).

Details of the proposed subdivision scheme are provided on the plans prepared by J. Wyndham Prince, which accompany the Development Application and are reproduced in Appendix A.

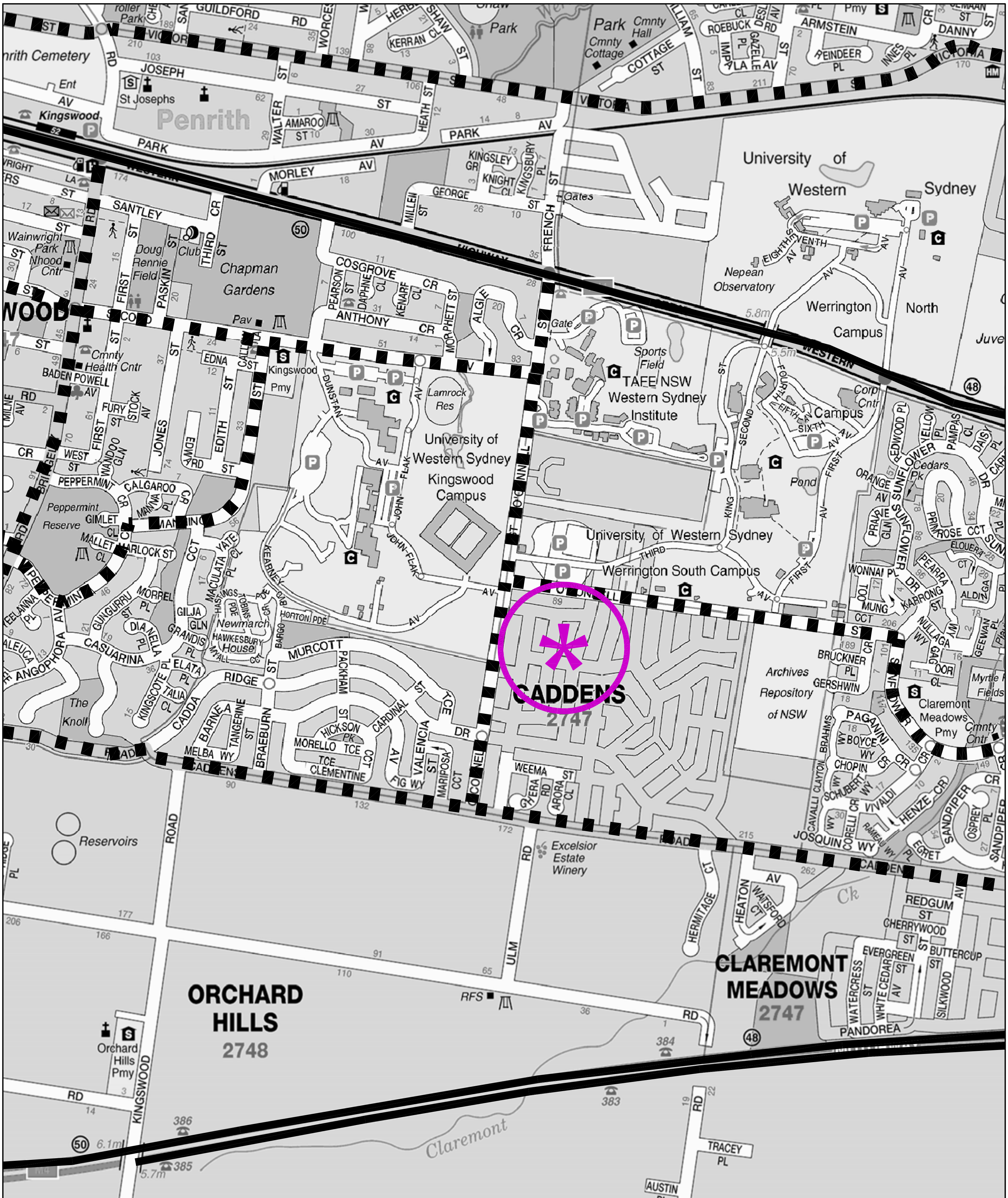
3.0 Existing Road Network and Traffic Conditions

3.1 Road Network

The road network serving the Kingswood area (Figure 3) comprises:

* *M4 Motorway* – a principal arterial route linking between the City and the Blue Mountains crossing
* *Great Western Highway* – a State Road and arterial route which provides the secondary connection between the City and Penrith
* *The Northern Road/Parker Street* – a State Road and a sub-arterial route which provides a connection between Campbelltown and Windsor
* *O'Connell Street* – a collector route which provides a connection between Great Western Highway and Caddens Road
* *O'Connell Lane* – a collector route which provides a connection between O'Connell Street and Caddens Road
* *Caddens Road* – a collector route connecting between Kingswood and Caddens
* *Derby Street/Second Avenue* – a collector route connecting between the WSU Campus and Penrith

O'Connell Street has an 11.8m-wide sealed pavement which connects to Second Avenue and Great Western Highway to the north and Sunflower Drive to the east.

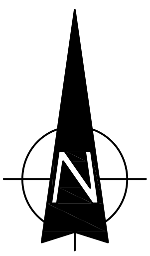


LEGEND

ARTERIAL

SUB-ARTERIAL

COLLECTOR



ROAD NETWORK

FIG 3

3.2 Traffic Controls

The existing traffic controls which have been applied to the roads in the vicinity of the site (Figure 4) include:

- the 50 kmph speed restriction on the local and collector road system with some 40 kmph school restrictions (e.g., Sunflower Drive, Manning Street and Second Avenue)
- the roundabouts along:
    - O'Connell Street at the intersections with Sunflower Drive, O'Connell Lane/WSU access and Second Avenue
    - Second Avenue at the intersections with Dunstan Avenue, Bringelly Road/Derby Street
- the traffic control signals along:
    - Great Western Highway at the intersections with Gipps Street, WSU Werrington access, O'Connell Street/French Street and Bringelly Road
    - Gipps Street at the intersections with Sunflower Drive, Sunflower Drive/Fowler Street and Caddens Road

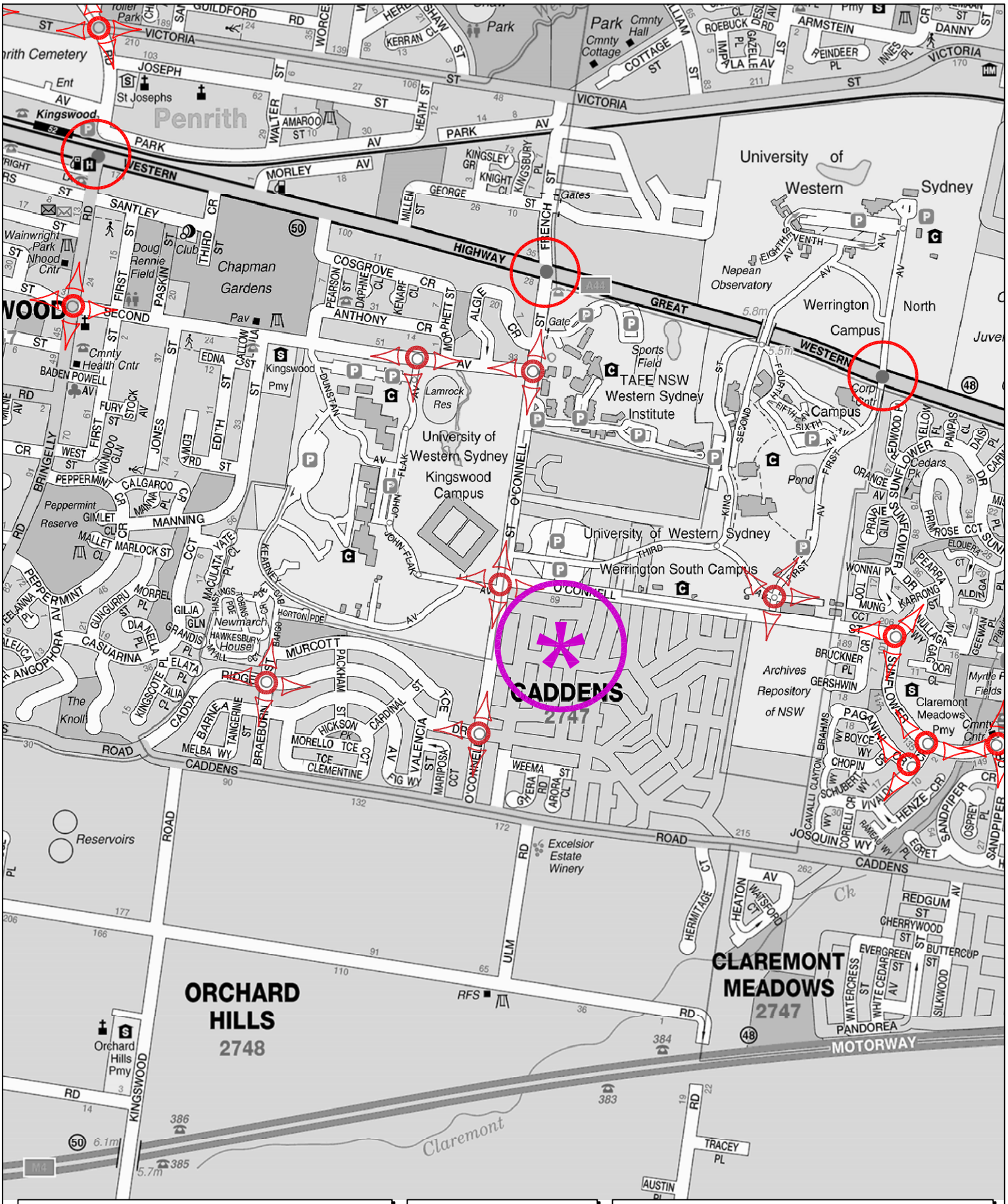
3.3 Traffic Conditions

Traffic counts were not completed as part of this assessments due to the current COVID-19 restrictions.

As such, reference has been made to the:

AM Peak

The traffic surveys were undertaken at the O'Connell Street/ O'Connell Lane/WSU Access Road intersection during the weekday AM peak periods as part of the 46-66 O'Connell Street site assessment.



LEGEND

- TRAFFIC SIGNAL CONTROL
- ROUNDABOUT

N

TRAFFIC CONTROLS

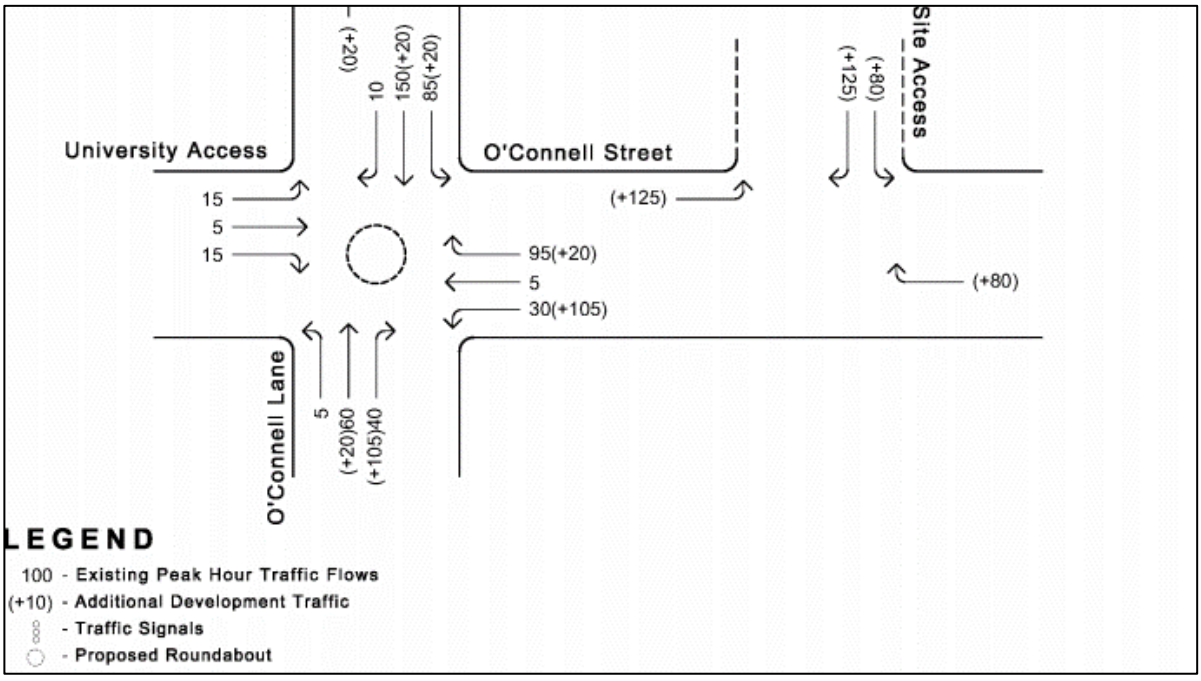
FIG 4

The results in terms of vehicle movements per hour are summarised in the following:

		AM
WSU Access	EB	1
	RT	2
	LT	14
O'Connell Street (North)	SB	74
	RT	46
	LT	79
O'Connell Street (East)	WB	6
	RT	120
	LT	47
O'Connell Street	NB	229
	RT	64
	LT	41

PM Peak

Colston Budd Rogers & Kafes traffic report dated October 2017, which provided an indication of the traffic conditions with the recently completed Caddens Corner to the north of the site, as shown in the following figure.



The results of the SIDRA assessments indicate that this intersection operates satisfactorily.

In summary, there are adequate capacities at this intersection to cater for the traffic generated by the background traffic growth and proposed development.

Vehicle access and movements are facilitated by priority-controlled intersections and roundabouts.

3.4 Transport Services

Bus services in the vicinity of the site are provided by Busways, which operate routes 770, 774, 775, 776 and 835 along Second Avenue, Cadda Ridge Drive and O'Connell Street.

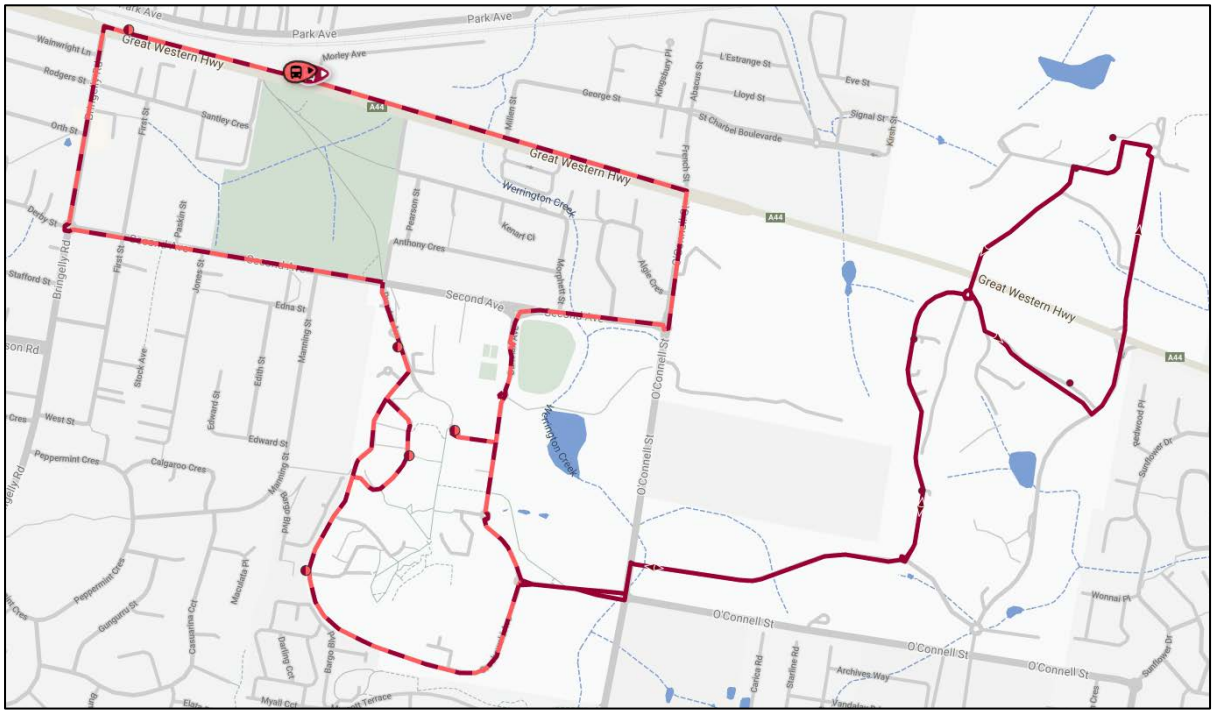
These services provide links to the Penrith and Mount Druitt Railway Stations, Penrith CBD/Nepean Hospital and St Marys CBD with 10-minute frequency during the weekday peak periods.

Details of the bus and rail services available near the site are provided in Appendix B.

In addition, WSU Penrith adopts a responsible policy of encouraging and facilitating travel to/from the Precinct by public transport, walking and cycling, as well as carpooling.

A Transport Access Guide (TAG) was prepared and presented on the WSU website (Appendix C).

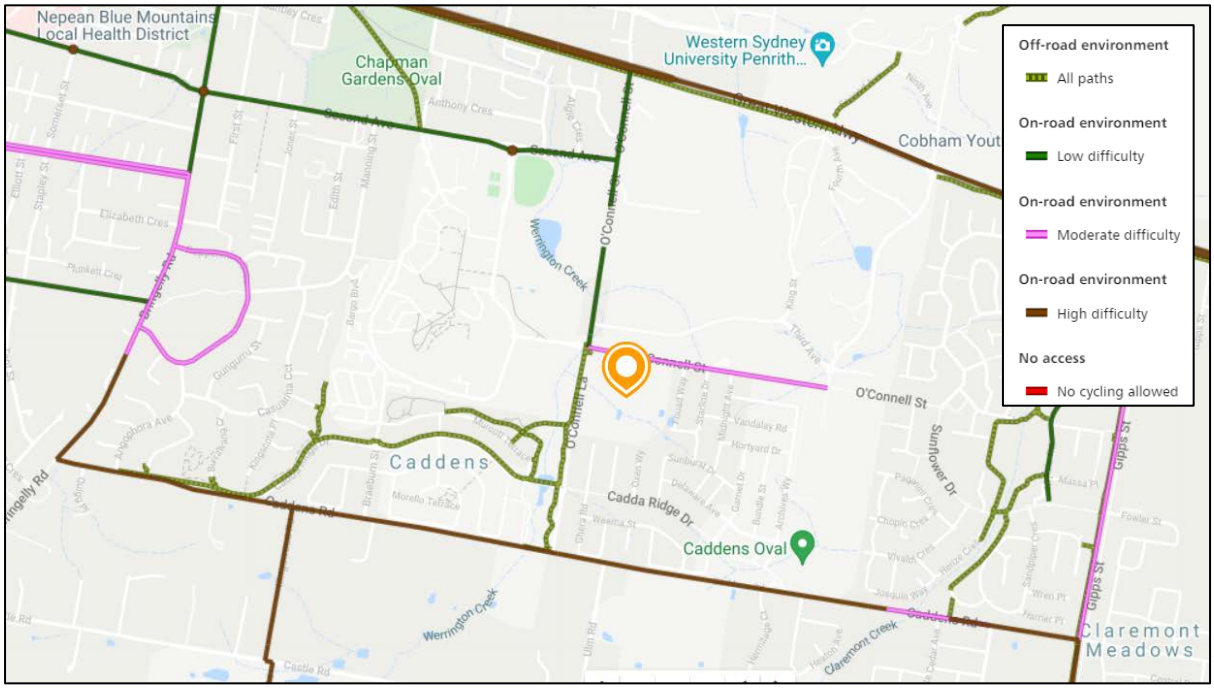
The TAG documents the available public transport services (bus and rail), including walking times, frequency and fares, while WSU Penrith also provides a free shuttle bus service (see the following figure) for staff and students operating every 10 to 15 minutes connecting the campuses with Kingswood Railway Station.



3.5 Cycling Facility

Off-road shared paths are provided on the northern side of the Great Western Highway between Parker Street and Bringelly Road, crossing at the intersection of the Great Western Highway /Bringelly Road and continuing to the southern side of the Great Western Highway towards Pages Road. A range of on-road bicycle facilities are provided along the Great Western Highway, Parker Street, Richmond Road, College Street, Bringelly Road, Derby Street, Second Avenue, Jamison Road, and O'Connell Street are available in the vicinity of the site.

WSU Penrith also provides an internal network of shared pathways which link to the regional network. The Kingswood Campus connects to the cycleway running along Second Avenue. Extracts from the RMS Cycleway Finder illustrating the cycleways in the vicinity of the site are shown in the figures below.



Source: https://www.rms.nsw.gov.au/maps/cycleway_finder

3.6 Pedestrian Facility

Dedicated shared paths are provided on both sides of O'Connell Lane, southern and eastern side of O'Connell Street, with pedestrian footpaths provided within the WSU campus. These paths provide good connectivity between the site and the Kingswood Centre and Railway Station and surrounding developments.

To allow safer pedestrian crossing, the following amenities are available in the vicinity of the site:

* Shared bicycle/pedestrian refuges are currently provided on all legs of the O'Connell Lane/O'Connell Street and Cadda Ridge Drive/O'Connell Lane roundabout intersections.

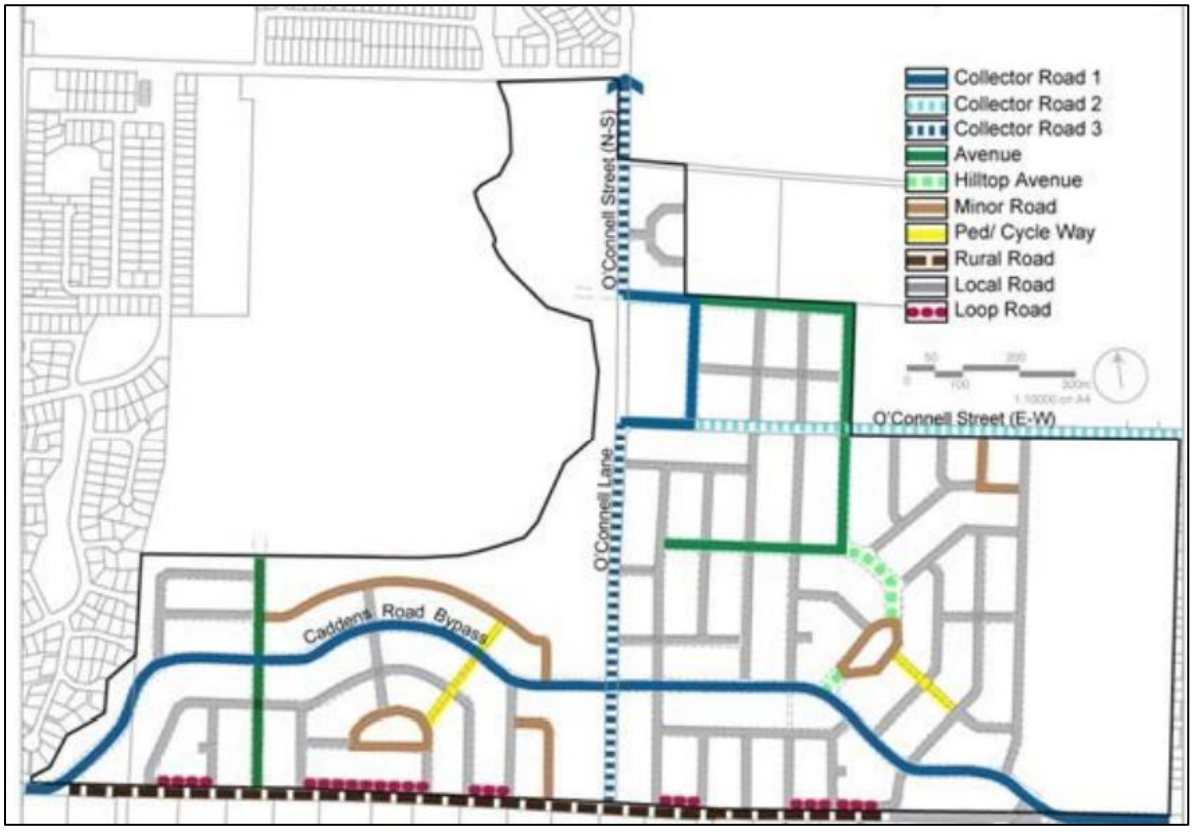
* Pedestrian refuges are currently provided on the southern and western legs of the Second Avenue/O'Connell Street roundabout intersection.

4.0 Future Road Network, Traffic and Transport Circumstances

4.1 Road Network

The Caddens Release Area includes the portion of the site, which is located within the "Precinct Centre" sub precinct as defined by the WELL Precinct.

Extracts from the Penrith DCP 2014, showing the design principles for the street hierarchy, is shown in the following figure.

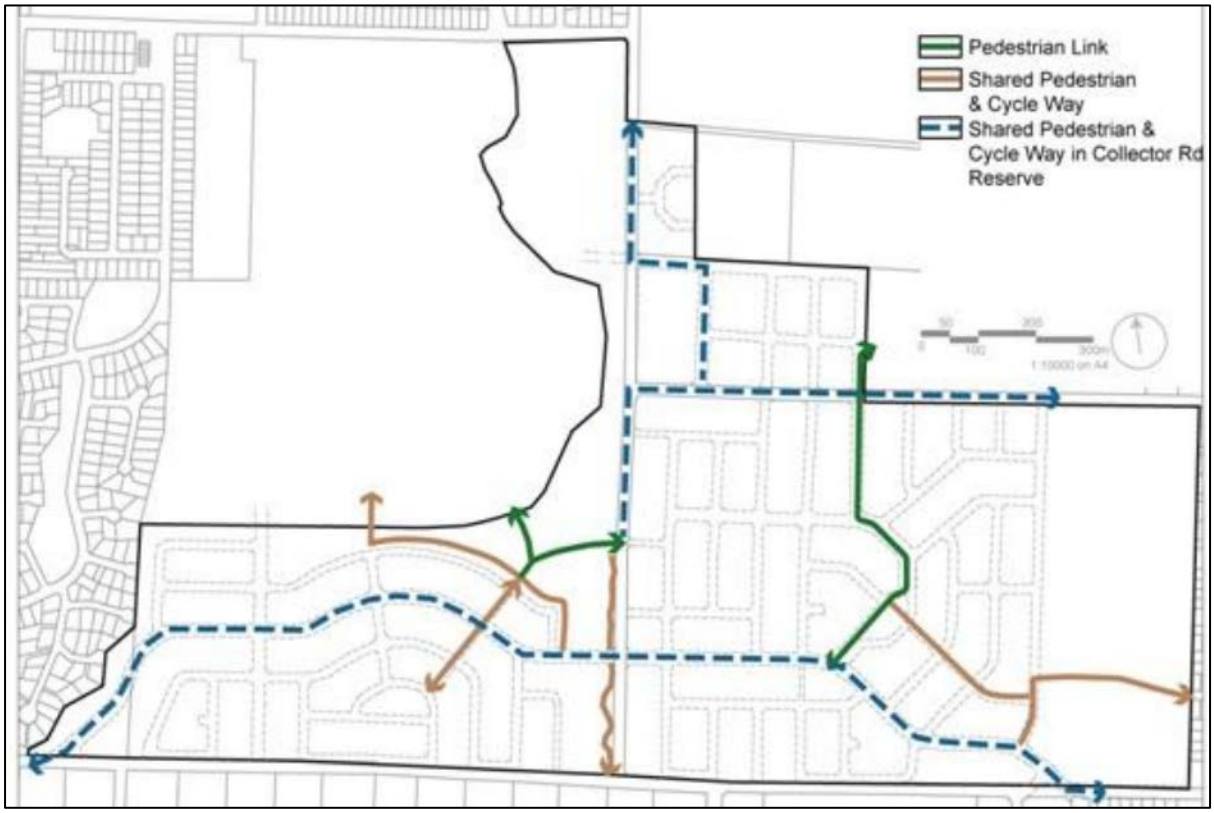


Caddens Road Hierarchy

A key feature of the DCP that is relevant to the development concept for the site includes the primary vehicle access to/from the site is via the intersections along O'Connell Street at Starline Drive and Fouad Way.

4.2 Bicycle and Pedestrian Network

Details of the planned bicycle and pedestrian network are provided in the following figure.



There will be a dedicated shared path along the eastern side of O'Connell Street and the southern side of the new Collector/Avenue Road, as well as through Caddens Corner. All local and collector roads will have paved footways.

The above measures provide opportunities for the development of the site to link to the broader networks and facilitate improved connectivity through the site.

4.3 Transport Services

Bus

The following figure provides an indicative concept plan of the route and bus stops.

With bus stops located on O'Connell Street, ensure that all of the residents living within the site are located within the 400m catchment of the bus stops.

5.0 Proposed Subdivision Road System

Whilst there is flexibility permitted in much of the future access road system, there is a number of “fixed” roads which have already been fully constructed.

The proposed road system deviates slightly from the road network identified in the DCP; however, this proposed change does not impact the existing roads. These deviations comprise:

* deletion of two east-west local road links onto O’Connell Lane
* deletion of one north-south road link onto O’Connell Street
* deletion of the north-south internal local road and replaced by an east-west internal local road

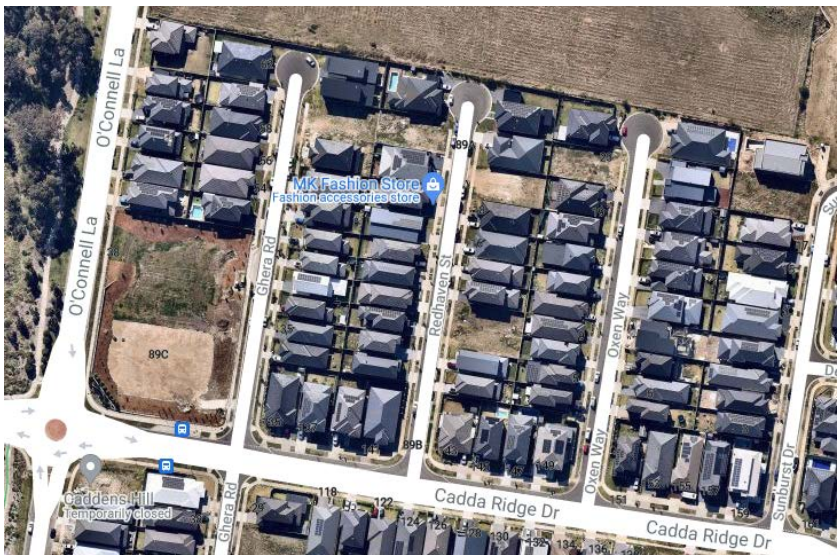
In compliance with the DCP, the proposed roadworks will involve:

- **Construction of one east-west local road (Ghera Road)**
  The roadway will be constructed with a carriageway and footways which accord with the requirements for an 8m-wide roadway in a 16m-wide reserve.

- **Construction of one east-west Avenue (Extended Starline Drive)**
  The extended Starline Drive will be constructed with a 10.5m-wide carriageway within a 21m-wide reserve.

- **Construction of two north-south local roads (Ghera Road "Loop") within the subdivision, north of Starline Drive**
  The roadway will be constructed with carriageway and footways which accord with the requirements of an 8m-wide roadway in a 16m-wide reserve.

- **Extension of Ghera Road, Redhaven Street and Oxen Way to link to the extended Starline Drive**
  The roadway will be constructed with carriageway and footways which accord with the requirements of an 8m-wide roadway in a 16m-wide reserve. The existing cul-de-sacs (see the following figure) at the northern ends of Ghera Road, Redhaven Street and Oxen Way will be removed and any temporary rights of way/carriageway will be extinguished under a separate application.



6.0 Parking

6.1 Parking and Access

The DCP requires that:

- 2 spaces per dwelling – stack or tandem parking acceptable
- at least one car parking space for each dwelling shall be covered the second space may be "stacked" or "tandem" or located on a driveway.
- Parking provided on site is to meet AS 2890

It is apparent that the proposed lots and their relationship to the access road system will be able to be developed for dwellings with compliant provisions for access and parking.

6.2 Servicing

Refuse will be removed from the street by Council's collection service via a 12.5m heavy rigid vehicle (HRV). Service personnel and small service vehicles may be able to park in the frontage driveways.

However, the nature of the proposed local road carriageways will suitably provide for the on-street standing of service and delivery vehicles.

The geometry of the proposed local road network has been designed to accommodate HRVs.

The number of heavy vehicles would be low during the peak hours and is expected to be no more than 4%.

6.3 Intersection Access and Lot Driveway Access

Details of satisfactory internal circulation with ample passing opportunities between an HRV (Council's refuse vehicles and other service/delivery vehicles) and a car (including the 90-degree bend in Ghera Road at the drainage basin) are provided on the turning path assessment in Appendix D.

The vehicle accesses for all corner lot accesses have been designed to be located at least 6m clear of the corner kerb return tangent points in accord with AS2890.1.

6.4 Sightline Assessment

AS2890.1 for Proposed Driveways

Figure 3.2 of AS2890.1 indicates that access in and out of single residential dwellings will have to provide a minimum of 40m No Stopping zone adjacent to each driveway.

This is clearly not practical, unrealistic and excessive, noting that:

* the existing low-density residential driveways in the surrounding neighbourhoods, with the presence of street trees and kerbside parking have operated with no safety concerns

* the proposed development of low-density housing is a low traffic generator and, as such, the driveway will not be excessively used

* consistent with the other similar uses, drivers on the road display common courtesy and allow drivers leaving the dwellings to reverse into the traffic lane

* typically, drivers (owner or tenant) who are familiar with the driveway and the fronting road will leave the site, stop at the kerb line and then proceed to edge safely and slowly in order to see oncoming traffic. After edging out, drivers are expected to be able to see past kerbside parked vehicles.

* furthermore, vehicles parked on-street provide a buffer between the through traffic lane and vehicles leaving driveways, whereby through bound vehicles do not drive

near the kerb. This allows for drivers leaving driveways to edge out safely and enter the road safely

* the proposed road network is relatively straight and level, where there are excellent sight distances available

* the sightlines for the corner lots will be facilitated by the provisions of convex mirrors and speed humps (see Appendix E for proposed locations) with a posted speed limit of 15 kmph.

In summary, the proposed driveways will be safe, functional and adequate for the intended use.

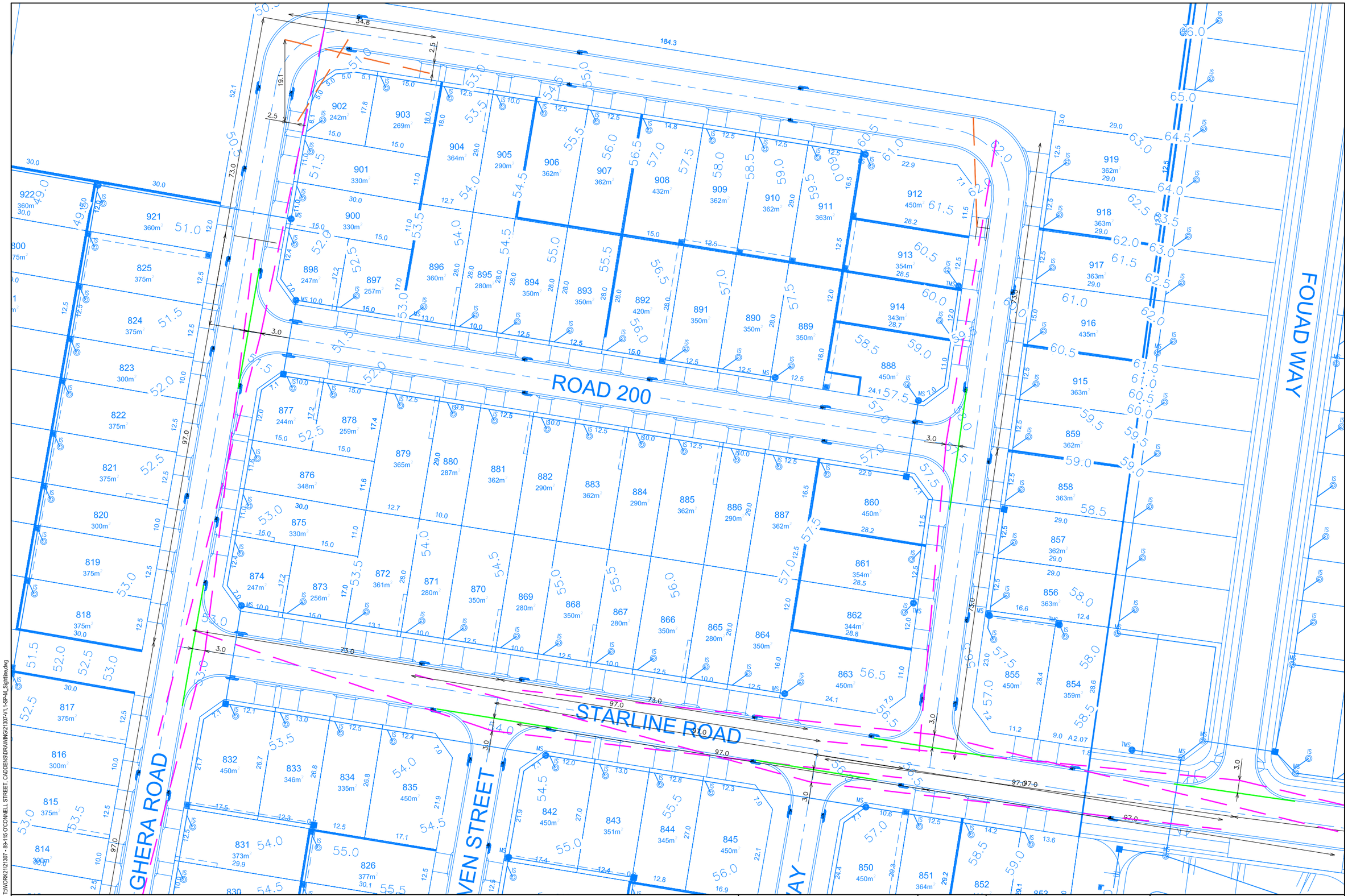
SISD for Proposed Intersection Access

SISD is the minimum distance which should be provided on the major road at an intersection. Adequate SISD is required to ensure sufficient distance for a driver of a vehicle on the minor roads to observe a vehicle on the major road approach moving into a collision situation and decelerate to a stop before reaching the collision point. Reference to the Austroads – Guide to Road Design: Part 4A Austroads Guide indicates that a minimum Safe Intersection Sight Distance (SISD) should be provided at these intersections:

- 23m for 15 kmph design speed (vehicle slowing down with the speed hump and reduced posted speed limit of 15 kmph around the 90-degree bend)
- 73m for 40 kmph design speed (vehicle slowing down while turning)
- 97m for 50 kmph design speed

The figures overleaf show the SISD requirements at the intersection (with the driver on the minor road located at 3m (minimum) from the future kerb line).

Based on the assessments and proposed mitigation measures, all intersections and the 90-degree bends would achieve the minimum SISD.



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Plot by Meg

89-115 O'CONNELL STREET, CADDENS

SIGHTLINE ASSESSMENTS

DRAWING REF NO. 21307-V1.1-SP-M_Sightline

ISSUE DATE 11 October 2021

DESIGNED BY S,YOU

REVIEWED BY M,KONG

SCALE A3

0 8 16 1:800

PRELIMINARY PLAN

FOR DISCUSSION PURPOSES ONLY SUBJECT TO CHANGE WITHOUT NOTIFICATION

WARNING

THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY. THE EXACT LOCATION SHALL BE PROVEN ON SITE. ALL EXISTING SERVICES SHOWN ARE NOT GUARANTEED.

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7.0 Traffic

7.1 Future Background Traffic

The future increase over a 20-year period in intersection turning volumes was extracted from the approved Concept Plan DA report prepared by The Transport Planning Partnership (TTPP) for a site on 46-66 & 46A O'Connell Street, Caddens.

As indicated in the TTPP report, the future traffic conditions have been based on traffic flow scenarios from the following reports:

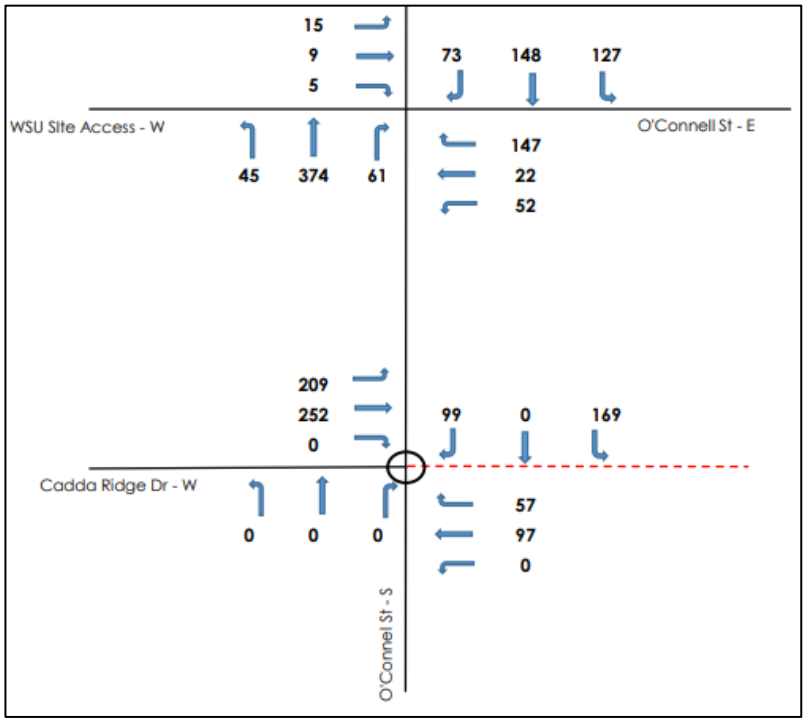
- WELL Precinct TMAP (Maunsell / AECOM 2007)
- Caddens Release Area TMAP (MWT, 2008); and
- Caddens Knoll DA Traffic Assessment (Halcrow, 2012).

The TTPA report has assumed that the future developments to the east and north, including the current WSU and TAFE lands, are in accordance with the expectations set out in the WELLS Precinct planning and site design set out in the Penrith DCP (2014).

The additional traffic resultant from the 20-year traffic growth considering the cumulative traffic conditions associated with the envisaged development within the WELLS Precinct and specifically the Caddens Release area and the development has been distributed onto the prevailing traffic flows.

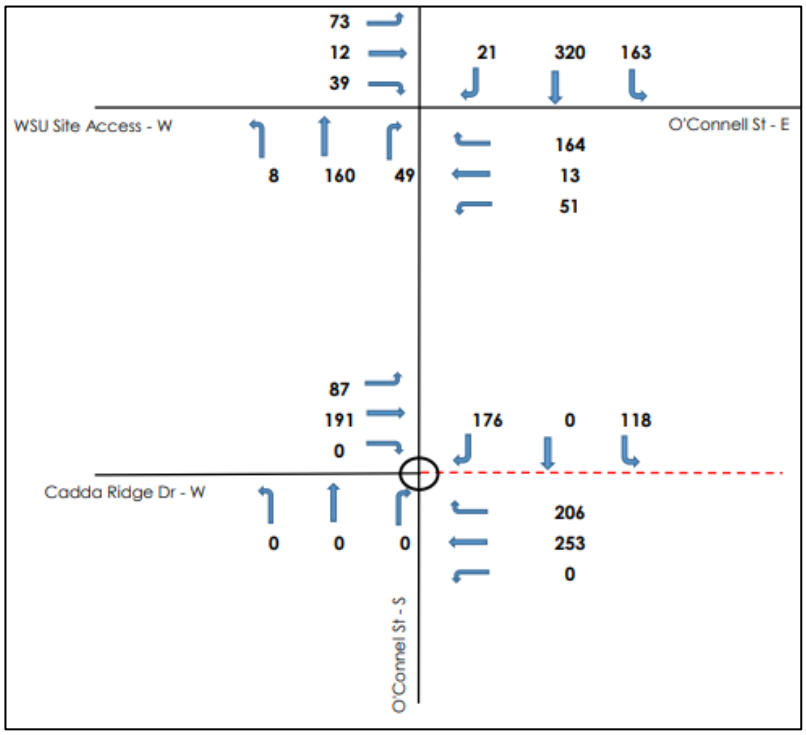
The future AM and PM peak turning volumes are shown in the following figures.

Future Background Traffic during Thursday AM Peak



. *Peak hour traffic generated to/from the southern leg of Cadda Ridge Drive/O'Connell Street South has been estimated based on 30 dwellings

Future Background Traffic during Thursday PM Peak



. *Peak hour traffic generated to/from the southern leg of Cadda Ridge Drive/O'Connell Street South has been estimated based on 30 dwellings
* Caddens Corner traffic added

7.2 Development Traffic

As discussed in Section 2.2, the Structure Plan indicated a dwelling yield target for Area B of 634 units.

A review of Area B (without the proposed development) indicated that a total of 657 dwellings (including 90 dwellings planned for construction. With the proposed development of 163 units, Area B will achieve a dwelling yield of 820 units. This exceeds the yield target by 186 dwellings.

The RMS Development Guidelines specify a peak traffic generation rate of 0.85 vtph per dwelling for new residential suburbs noting that up to 25% of trips may not be on the external road network (i.e., to/from local schools and shops, etc.). However, there is no survey assessment basis to these criteria and the more recent RMS Circular adds confusion to the situation as the surveyed precincts include school, retail, hospital and medical centre facilities and present a variation in excess of 100%.

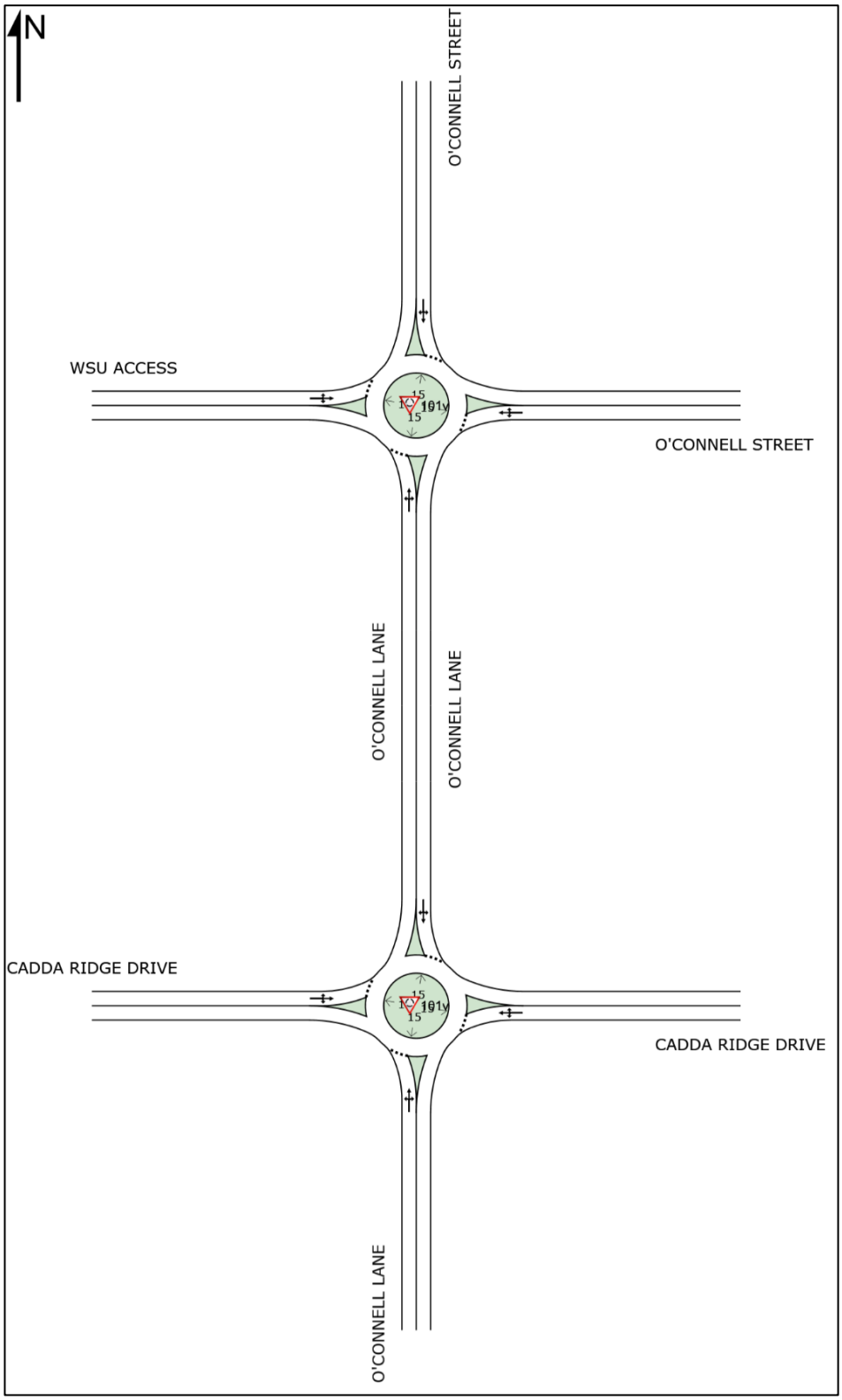
TTPA undertook a very extensive survey of the traffic generation of Glenmore Park Stage 1 (Appendix F), which comprised some 5,447 dwellings and established an "external" generation rate of 0.65 vtph per dwelling in the peak periods. It is understood that this is very similar to the generation rate used by the Growth Centres in its modelling for new release areas. Based on the above-established rate, the additional 186 dwellings will provide for the resultant peak period generation is 121 vtph as follows:

AM		PM	
IN	**OUT**	**IN**	**OUT**
24	97	97	24

A SIDRA assessment was undertaken for the future performance of the intersections along O'Connell Street intersecting with O'Connell Lane/ WSU Access Road and Cadda Ridge Drive. The assessment considered the traffic generated by the additional

dwellings, including the proposed subdivision.

The SIDRA network layout of the proposed intersections is in the following figure.



The assessment detailed in Appendix G reveals that satisfactory operations will continue as follows:

	AM Peak		PM Peak	
Intersection	**LOS**	**AVD**	**LOS**	**AVD**
O'Connell Street/ O'Connell Lane/WSU Access Road	A	12.0s	A	11.3s
O'Connell Street/ Cadda Ridge Road	A	10.2s	A	13.5s

In addition, the traffic generation of this order of magnitude being equivalent to some 2-3 vehicles every minute during the peak hours is minor in the context of the local and arterial road system and will not act to create unacceptable traffic congestion or conflict either at the vehicle access point or at adjacent intersections.

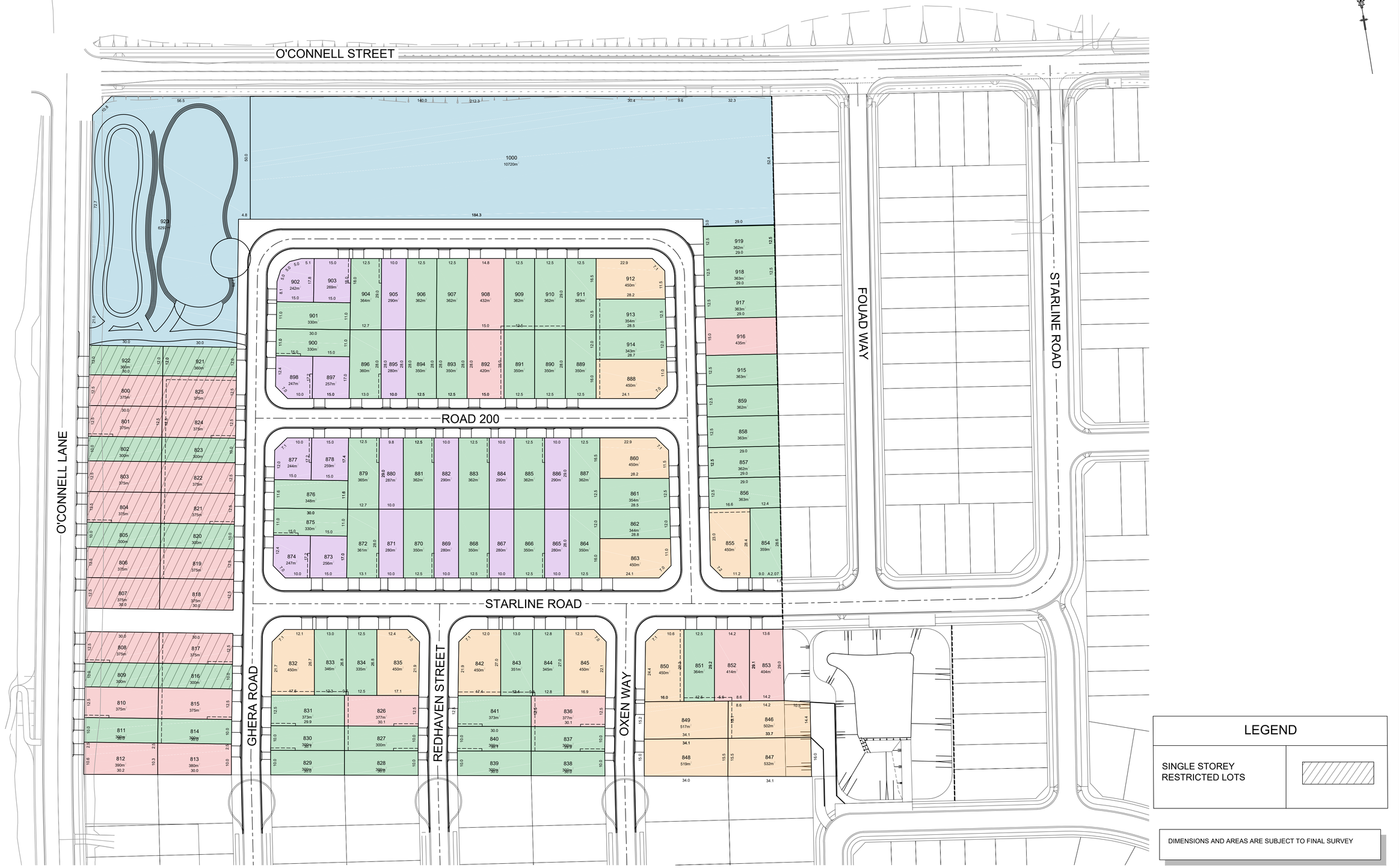
8.0 Conclusion

The proposed subdivision on O'Connell Street at Caddens will provide for the development of 165 dwellings. Assessment of the proposal has concluded that:

* the proposed road system will be appropriate and generally compliant with the DCP specifications
* the intersection access and lot driveway access are in accordance with Austroads Guides, TfNSW Guides, AS2890 1, 2 and 6 and Council's DCP
* adequate sightlines have been provided at all intersections and driveway accesses with the proposed convex mirrors and speed humps (with posted speed limit 15 kmph) at the 90-degree bends on Ghera Road.
* the provisions for servicing will be satisfactory
* there will be no adverse traffic implications

Appendix A

Proposed Subdivision Scheme



DRAFT ISSUE ONLY
PRELIMINARY DESIGNS SUBJECT TO CHANGE

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15 7.5 0 7.5 15 22.5 30 37.5 45 525. 60 67.5 75
METRES

10	ISSUE FOR INFORMATION	GA	GA			29/09/21
9	ISSUE FOR INFORMATION	GA	GA			24/09/21
8	ISSUE FOR INFORMATION	GA	GA		DJ	24/09/21
7	ISSUE FOR INFORMATION	GA	GA			23/09/21
6	ISSUE FOR INFORMATION	GA	GA			10/09/21
5	ISSUE FOR INFORMATION	GA	GA			08/09/21
4	ISSUE FOR INFORMATION	GA	GA			24/08/21
	AMENDMENT	DES	DRN	CKD	APR	DATE

J. WYNDHAM PRINCE CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS
PO Box 4366 PENRITH WESTFIELD NSW 2750
P 02 4720 3300 W www.jwprince.com.au E jwp@jwprince.com.au

AZIMUTH:
DATUM:
ORIGIN:

CLIENT:
LEGACYPROPERTY

THIS DRAWING MUST NOT BE USED FOR CONSTRUCTION UNLESS SIGNED AS PART OF AN APPROVED CONSTRUCTION CERTIFICATE.

ADVANCE COPY ONLY
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CADDENS HILL
STAGES 8-10
CONCEPT LAYOUT PLAN

PLAN No: 110358/SK26 10
FILE No: 11035809SK26
SHEET SIZE: A1 ORIGINAL

Plotted: 1 October , 2021 2:58:52 PM File Name: J:\110358 - OConnell Lane Caddens\09 - Masterplanning\CD\SK\11035809SK26.dwg

Transport and Traffic Planning Associates

Appendix B

Public Transport Services

Greater Western Sydney Bus Network Map - Effective: 18 April 2021

Busways

Bus routes

- 668 Windsor to Richmond via Wilberforce, Glossodia & North Richmond
- 669 Wilberforce to Sackville
- 671 Windsor to Riverstone via McGraths Hill
- 672 Windsor to Pitt Town & Wisemans Ferry via McGraths Hill
- 673 Windsor to Penrith via Bligh Park, Llandilo & Cranebrook
- 674 Windsor to Mt Druitt via Bligh Park, Shanes Park & Whalan
- 675C Windsor - RAAF -Richmond - UWS Hawkesbury - Bligh Park - Windsor
- 675A Windsor - Bligh Park - UWS Hawkesbury - Richmond - RAAF - Windsor
- 676 Windsor to South Windsor
- 677 Richmond to Penrith via Londonderry & The Northern Rds
- 668 Richmond to Penrith via Agnes Banks, Castlereagh & Cranebrook
- 679 Windsor to Maraylya & Oakville
- 680 Richmond to Bowen Mtn via Nth Richmond, Grose Wold & Grose Vale
- 682 Richmond to Kurrajong & Berambing via Nth Richmond & Kurmond
- 718 Seven Hills to Kings Langley
- 721 Blacktown to Blacktown Hospital
- 722 Blacktown to Prospect via Flushcombe Rd
- 723 Blacktown to Mt Druitt via Huntingwood & Eastern Creek
- 724 Blacktown to Arndell Park & Eastern Creek Industrial
- 726 Blacktown to Doonside via Monash Rd
- 728 Blacktown to Mt Druitt via Bungarribee & Rooty Hill
- 729 Blacktown to Mt Druitt via Kildare Rd & Minchinbury
- 730 Blacktown to Castle Hill via Glenwood & Norwest Business Park
- 731 Blacktown to Rouse Hill via Stanhope Gardens & Kellyville Ridge
- 732 Blacktown to Rouse Hill via Pye Rd & The Ponds
- 734 Blacktown to Riverstone via The Ponds & Schofields
- 735 Blacktown to Rouse Hill via T-way
- 738 Mt Druitt to Eastern Creek Business Park via Rooty Hill
- 739V Mt Druitt to Frank St
- 740 Rouse Hill to Box Hill via Windsor Rd
- 741 Riverstone to Oakville via Box Hill
- 742 Rouse Hill to Marsden Park (Hollinsworth Rd) via Riverstone
- 743 Blacktown to Kings Langley via Kings Park
- 744 Blacktown to Bessemer St Industrial
- 745 St Marys to Bella Vista via Plumpton & Glenwood
- 746 Rouse Hill to Riverstone via Box Hill
- 747 Mt Druitt to Rouse Hill via Marsden Park (Elara Estate) & Riverstone
- 748 Rouse Hill to Marsden Park (Elara Estate) via Schofields
- 750 Blacktown to Mt Druitt via Richmond Rd & Carlisle Av
- 751 Blacktown to Marsden Park (Elara Estate) via Colebee
- 752 Blacktown to Rouse Hill via Quakers Hill & The Ponds
- 753 Blacktown to Doonside via Tallagandra Dr
- 754 Blacktown to Mt Druitt via Dean Park & Hassall Grove
- 755 Mt Druitt to Shalvey & Plumpton
- 756 Mt Druitt to Blacktown via Plumpton & Woodcroft
- 758 Mt Druitt to St Marys via Shalvey & Tregear
- 759 Mt Druitt to St Marys via Emerton, Willmot & Ropes Crossing
- 761 Mt Druitt to Bidwill via Carlisle Av
- 770 Mt Druitt to Penrith via Colyton, St Marys & Claremont Meadows
- 771 Mt Druitt to St Marys via Colyton
- 774 Penrith to Mt Druitt via Caddens, Claremont Meadows, St Marys & Oxley Park
- 775 Penrith to via UWS, St Marys, St Clair & Erskine Park
- 776 Penrith to Mt Druitt via Nepean Hospital, UWS & St Clair
- 779 St Marys to Erskine Park Industrial Area
- 780 Penrith to Mt Druitt via Cambridge Park, Ropes Crossing & Tregear
- 781 Penrith St Marys via Glenmore Park, Orchard Hills & Claremont Meadows
- 782 Penrith to Werrington & St Marys via Cambridge Gardens
- 783 Penrith to Werrington via Jordan Springs
- 784 Penrith to Cranebrook via Castlereagh Rd
- 785 Penrith to Werrington via Cambridge Park
- 786 Penrith to Cranebrook via Greygums Rd
- 789 Penrith to Luddenham
- 791 Penrith to Jamisontown via South Penrith
- 793 Penrith to South Penrith
- 794 Penrith to Glenmore Park via South Penrith
- 795 Penrith to Warragamba via Nepean Shores & Mulgoa Rd
- 797 Penrith to Glenmore Park via Mulgoa Rd
- 799 Penrith to Glenmore Park & Blue Hills Estate

Sydney rail network

NSW GOVERNMENT | Transport

Metro Trains

Sydney metro and train lines

M Metro North West Line: Chatswood, Tallawong	T1 North Shore & Western Line: North Shore, Western, Richmond	T2 Inner West & Leppington Line: Inner West, Leppington, City	T3 Bankstown Line: Liverpool, Lidcombe, City	T4 Eastern Suburbs & Illawarra Line: Eastern Suburbs, Illawarra, Cronulla
T5 Cumberland Line: Leppington, Richmond	T6 Carlingford Line: Carlingford, Clyde	T7 Olympic Park Line: Olympic Park, Lidcombe	T8 Airport & South Line: Airport, South, City	T9 Northern Line: Northern, Gordon

Stop | Interchange | Interchange | End of line

Line under construction

NORTH

Check timetables and trip planners for train services and connections

Visit transportnsw.info

Transport and Traffic Planning Associates

Appendix C

WSU Transport Access Guide

Getting to and from UWS Penrith campus

The Penrith campus consists of three sites: Werrington North, Werrington South and Kingswood. Below are the walking options to each campus from the closest train station. Please look out for wildlife when walking on unmade paths.

The **walk to Werrington North** from Werrington train station is approximately 1.25kms and will take about 15 minutes. Exit Werrington station onto Railway Street. Turn left into Landers Street then right into Chapman Street. Follow until the end then step over the vehicle bar gate which takes you into the University grounds. Follow the partially unmade path across the grounds to the Werrington North campus.

The **walk to Werrington South** from the Werrington train station is approximately 2kms and will take about 20–30 minutes. Exit Werrington Station onto Railway Street. Turn left into Landers Street then right into Chapman Street and follow until the end and into the University grounds. Follow the partially unmade path across the grounds to the Werrington North campus. Use the 'highway cross over bridge' between North and South campuses to enter Werrington South campus.

The **walk to the Kingswood campus** from the Werrington South campus is just over 1km and will take approximately 10–15 minutes. From the Werrington South campus, follow King St, passing building BD to the roundabout and turn right at the roundabout. Follow the road until you reach the hockey parking site and then turn left into O'Connell Street. Pass the hockey fields on your right and then follow the footpath.

The **walk to the Kingswood campus** from Kingswood train station is approximately 1.5kms and will take about 10–15 minutes. Exit Kingswood Station onto the Great Western Highway. Follow the walking path on the Highway to Kingswood Park and then the footpath across the park onto Second Avenue to the entrance of the Kingswood campus.

Bicycle parking and showers are located on all Penrith campuses. Please see www.uws.edu.au/cycling for locations.

Cycling options include on-road cycling on the Great Western Highway. Please download a copy of the Penrith-Windsor-Blue Mountains cycle-ways map at www.uws.edu.au/campus.

The University is continuing to improve its cycling facilities. Bike parking is available at most locations. Thinking about cycling to campus? Need more confidence? Register for cycling proficiency skills training at transportaccess@uws.edu.au.

Werrington Station is serviced by the Western Line. From the station it is a 15 minute walk to the Werrington North campus and a 30 minute walk to the Werrington South campus.

Kingswood Station is serviced by the Western Line. The Kingswood campus is a 10–15 minute walk from the station or a 5 minute bus trip via the UWS Shuttle.

Penrith Station is serviced by the Western and Blue Mountains lines and has the most frequent services. The Penrith campus is a 15 minute bus trip from the Penrith Station Interchange at stop number 275080 via Westbus 774-776 services.

St Marys Station is serviced by the Western Line. The Penrith campus is a 15 minute bus trip from St Marys Station Interchange at stop number 2760215 via Westbus 774-776 services.

Westbus Services 774-776 operate from the St Marys and Penrith stations, stopping at the Kingswood campus on Second Avenue and on the Great Western Highway for the Werrington North and South campuses. Services run approximately every 10 minutes.

UWS Shuttle operates between the Penrith campus and Kingswood train station every 10 to 15 minutes. There is no charge to use the UWS Shuttle but a current UWS staff or student ID card must be shown upon boarding. For shuttle hours of operation and for real time tracking visit http://uwsconnect.com.au/shuttlebus.html.

Westbus Services 774-776 offer wheelchair accessible services at limited times. Please consult the Busways timetable and look for the accessible symbol for these services.

Werrington, St Marys and **Penrith train stations** are wheelchair accessible. **Kingswood train station** may be accessible with assistance from a friend or carer. Specific station details can be found on the CityRail website www.cityrail.com.au or contact Transport Info.

University of Western Sydney
Bringing knowledge to life

Transport Access Guide

Your guide for accessing Penrith campus

Penrith campus

Fares

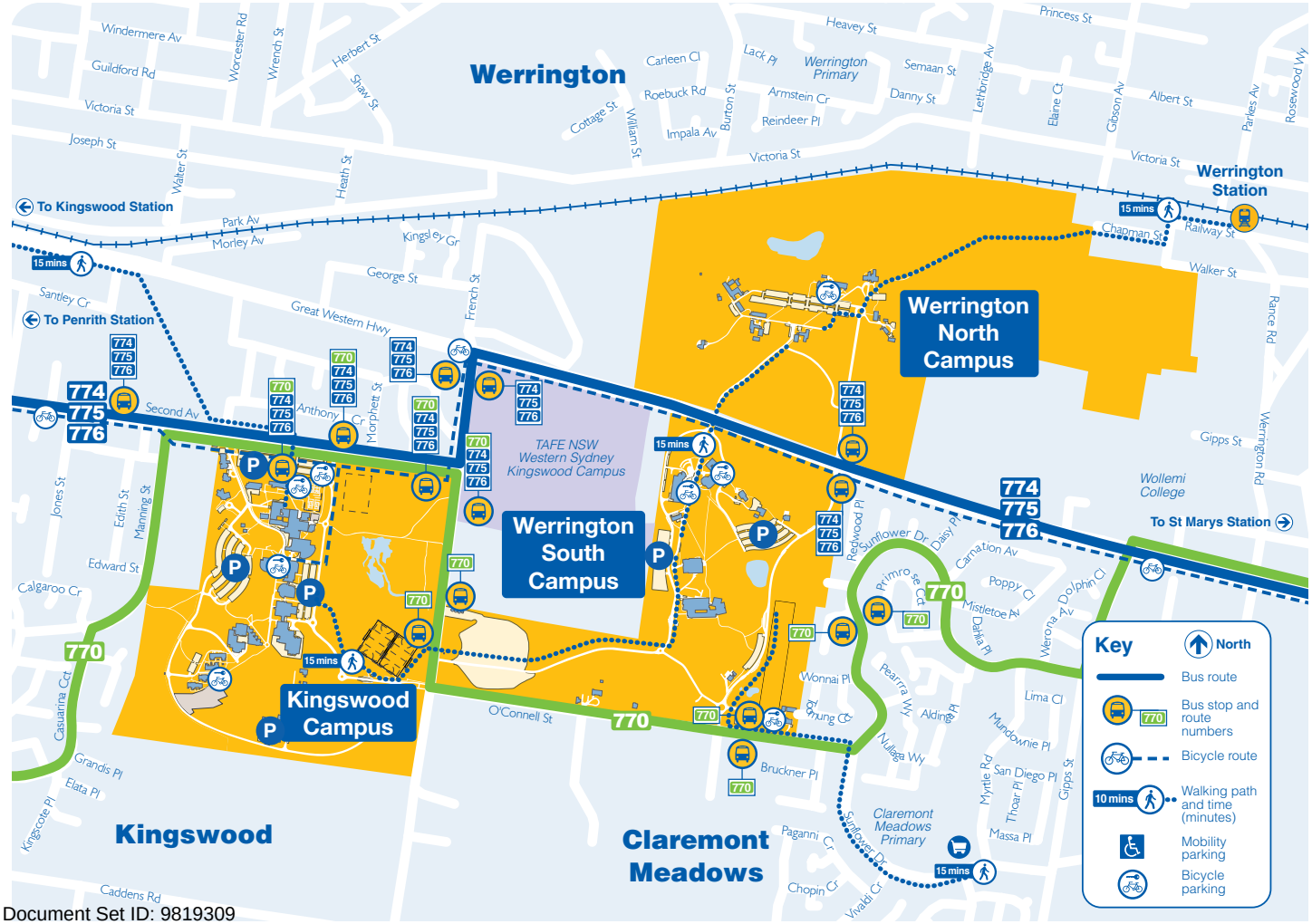
Please contact Transport Info on 131 500 for latest fare information and travel passes.

Westbus Bus Fare Information

Bus Service	Departing	Fare Section	Adult	Concession
774 to 776	Penrith Station	4	$3.50	$1.70
774 to 776	St Marys Station	3	$3.50	$1.70

Entrance to the Werrington North and South campuses is via the Great Western Highway. Entrance to the Kingswood campus is via O'Connell Street then turn into Second Avenue. The closest motorway to the campuses is the M4. Take the Mamre Road exit and follow until the end where you turn left onto the Great Western Highway.

Please be aware that parking is limited on this campus and parking permits and fees apply. For further information on parking please visit www.uws.edu.au/parking. To plan your trip using this travel option please use the UWS Interactive Map at www.uws.edu.au/campus.



Planning your Trip

UWS recommends contacting the service providers below to plan your trip and obtain the latest timetable, fare and wheelchair accessible information.

131500.com.au Transport Info
Information for people on the move

Westbus (bus services)
Phone: 02 9890 0000
Website: www.westbus.com.au

UWS Campus Map

In conjunction with this travel access guide, it is recommended you download a copy of the UWS Penrith campus map available at http://www.uws.edu.au/campus.

UWS Campus Safety and Security

UWS Information Centre, Building K
Phone: (02) 4736 0431

For comments, suggestions and feedback on travelling to UWS please email transportaccess@uws.edu.au.

University of Western Sydney
Bringing knowledge to life

Version 3

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Appendix D

Swept Path Assessments

ROAD 200

STARLINE ROAD

GHERA ROAD

VEN STREET

FOUAD WAY

R=8.5m

89-115 O'CONNELL STREET, CADDENS

CONCEPT LAYOUT

DRAWING REF NO. 21307-V1.3-SP-M

SHEET NO. 01 OF 03

ISSUE DATE 11 OCTOBER 2021

DESIGNED BY S.YOU

REVIEWED BY M.KONG

SCALE A3 1:800

PRELIMINARY PLAN

FOR DISCUSSION PURPOSES ONLY SUBJECT TO CHANGE WITHOUT NOTIFICATION

WARNING

THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY. THE EXACT LOCATIONS SHALL BE PROVEN ON SITE. ALL EXISTING SERVICES SHOWN ARE NOT GUARANTEED.

ttpa TRANSPORT AND TRAFFIC PLANNING ASSOCIATES

Established 1994

Address: Level 5, Suite 502 / 282 Victoria Ave, Chatswood NSW 2067

P: 02 9411 5660 E: info@ttpa.com.au W: www.ttpa.com.au

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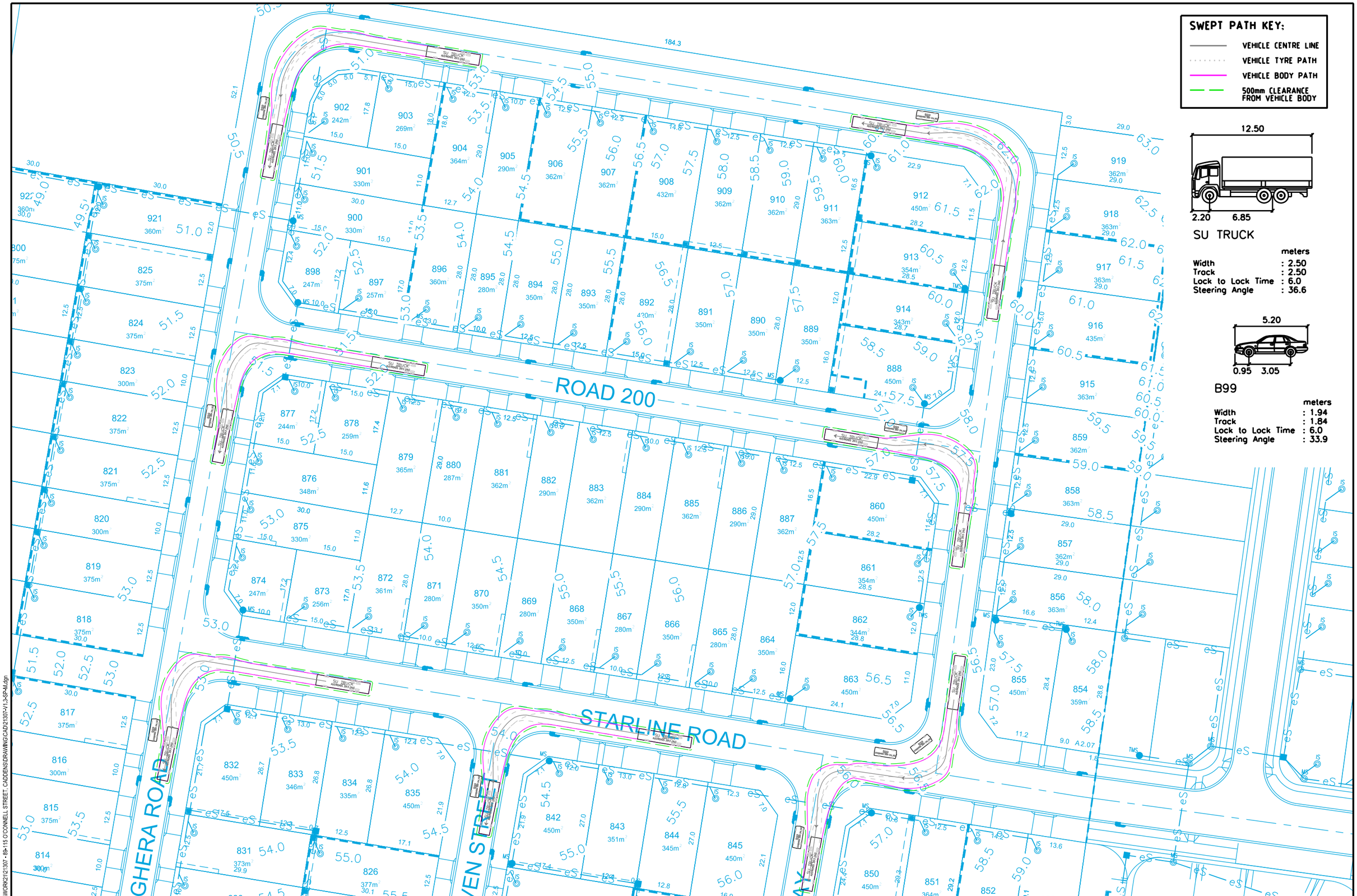
Plot by Sherlock



89-115 O'CONNELL STREET, CADDENS

SWEPT PATH ASSESSMENT

DRAWING REF NO. 21307-V1.3-SP-M

SHEET NO. 02 OF 03

ISSUE DATE 11 OCTOBER 2021

DESIGNED BY S.YOU

REVIEWED BY M.KONG

SCALE A3 0 8 16 1:800

PRELIMINARY PLAN

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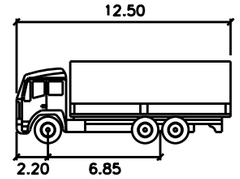
Plot by Sherlock

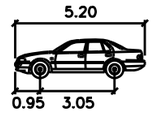
SWEPT PATH KEY:

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- 500mm CLEARANCE FROM VEHICLE BODY



SU TRUCK

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 36.6



B99

	meters
Width	: 1.94
Track	: 1.84
Lock to Lock Time	: 6.0
Steering Angle	: 33.9

ROAD 200

STARLINE ROAD

GHERA ROAD

VEN STREET

89-115 O'CONNELL STREET, CADDENS

SWEPT PATH ASSESSMENT

DRAWING REF NO. 21307-V1.3-SP-M

SHEET NO. 03 OF 03

ISSUE DATE 11 OCTOBER 2021

DESIGNED BY S.YOU

REVIEWED BY M.KONG

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PRELIMINARY PLAN
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Plot by Sherlock

Appendix E

Proposed Convex Mirrors and Speed Humps

PROPOSED CONVEX MIRROR

PROPOSED SPEED CUSHIONS

PROPOSED CONVEX MIRROR

PROPOSED SPEED CUSHIONS

1000
10720m²

902
242m²

903
269m²

904
364m²

905
290m²

906
362m²

907
362m²

908
432m²

909
362m²

910
362m²

911
363m²

912
450m²

901
330m²

900
330m²

898
247m²

897
257m²

896
360m²

895
280m²

894
350m²

893
350m²

892
420m²

891
350m²

890
350m²

889
350m²

888
450m²

913
354m²

914
343m²

877
244m²

878
259m²

879
365m²

880

ROAD 200

184.3

W5-10

W1-3(R)

W1-3(L)

W8-2

15 km / h

MS

TMS

IS

T:\WORK\21\21307 - 89-115 O'CONNELL STREET, CADDENS\DRAWING\CAD\21307-V2.1-SP-M.dgn

Plot by Sherlock

89-115 O'CONNELL STREET, CADDENS

PROPOSED MITIGATION MEASURES FOR SIGHTLINES

DRAWING REF NO. 21307-V2.1-SP-M

SHEET NO. 01 OF 01

ISSUE DATE 11 OCTOBER 2021

DESIGNED BY S.YOU

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PRELIMINARY PLAN
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Appendix F

Extract from TTPA Study

PROPOSED GLENMORE PARK STAGE 2

Transport Management and Accessibility Plan

October 2005

Reference 0338

TRANSPORT AND TRAFFIC PLANNING ASSOCIATES
Transportation, Traffic and Design Consultants
Suite 603, Level 6
282 Victoria Avenue
CHATSWOOD 2067
Telephone (02) 9411 5660
Facsimile (02) 9904 6622
Email: ttpa@ttpa.com.au

5.2 EXISTING GLENMORE PARK

The 2001 Census established that there were some 5,447 occupied dwellings in the existing Glenmore Park development at the time of the survey.

Access to and from the surrounding Arterial Road network (ie The Northern Road and Mulgoa Road) from the existing development is restricted to the Glenmore Parkway and Garswood Road intersection. This circumstance and the circuitous internal road layout provides the relatively unique situation where it is possible to establish the vehicle trip generation rate of the estate without the complication of non-related external through movements. An assessment of the AM and PM peak hour movements at the 3 'access' intersections from the 'June' survey indicate the following IN/OUT movements from the Glenmore Park Estate.

	Total Movements	IN	OUT
AM Peak	3283	915	2368
PM Peak	3706	2666	1040

(NB The earlier survey provided similar results to the June survey being within ± 2% of the total movements)

On the conservative estimate that there were some 200 dwellings built and occupied between the undertaking of the 2001 Census (ie 5,647 dwellings), and the traffic surveys (and that a 6% vacancy rate), the traffic movements indicated above translate to the following external trip generation rates and peak period IN vs OUT ratios for the estate.

	Total (vtph)	IN (%)	OUT (%)
AM Peak	0.62	27	73
PM Peak	0.70	72	28

5.3 ORIOLE STREET CATCHMENT

The street layout within the existing Glenmore Park development provided an opportunity to undertake a 'sensitivity test' of the published RTA generation rate and the rates established in Section 5.2. To ascertain the traffic generation rate of residential only development, a survey was carried out of the vehicle movements in the AM (7.00 –9.00am) and PM (4.00 - 6.30pm) peak period travelling to/from Oriole Street at its intersection with Woodlands Drive. This intersection is the only means of vehicular access to some 340 residences and is an area of the estate which was fully developed and at the time of the survey had no new residential construction activity taking place.

The results of the survey indicate the following movements to/from Oriole Street.

LOCATION: ORIOLE STREET/WOODLANDS DRIVE
VEHICLE MOVEMENTS

		AM Peak (7.45 – 8.45am)	PM Peak (5.15 – 6.15pm)
Oriole Street (OUT)	Left Right	38 128	11 51
Woodlands Drive (IN)	Left Right	8 34	35 132
Total		**206**	**229**

On the assumption that of the 340 residences within the surveyed area, approximately 6% (20 residences) were unoccupied, the traffic movements represent an AM and PM peak generation of 0.64 vehicle trips per hour per residence and 0.72 vehicle trips per hour per residence respectively.

5.4 ASSESSMENT

From the assessment it is apparent that the RTA published trip generation rate for residential development of 0.85 vtph is not a true reflection of the circumstances which prevail at Glenmore Park. On the basis that the trip generation rate attained from the Oriole Street assessment also includes a component of 'internal' trips (say 6%), the data from this analysis and that of the 'whole' of Glenmore Park would suggest that an external trip generation rate of 0.65 vtph per dwelling in the peak periods is more reflective of the existing traffic activity generated by the Glenmore Park Estate.

Application of this rate (0.65 vtph) to the detached dwelling component and a 0.5 vtph rate to the medium density element, indicates the following likely AM and PM peak vehicle movements for the various phases of construction activity:

Transport and Traffic Planning Associates

Appendix G

SIDRA Modelling Outputs

MOVEMENT SUMMARY

Site: 101v [FUTURE BACKGROUND AM O'CONNELL STREET - WSU ACCESS + ADDITIONAL DWELLINGS (Site Folder: General)]

Network: N101 [FUTURE AM PEAK + ADDITIONAL DWELLINGS (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: O'CONNELL LANE														
1	L2	48	4.0	48	4.0	0.527	6.3	LOS A	1.8	12.8	0.74	0.70	0.75	42.9
2	T1	403	4.0	403	4.0	0.527	6.4	LOS A	1.8	12.8	0.74	0.70	0.75	44.3
3	R2	64	4.0	64	4.0	0.527	10.4	LOS A	1.8	12.8	0.74	0.70	0.75	44.9
Approach		516	4.0	516	4.0	0.527	6.9	LOS A	1.8	12.8	0.74	0.70	0.75	44.2
East: O'CONNELL STREET														
4	L2	55	4.0	55	4.0	0.289	4.9	LOS A	0.8	5.7	0.54	0.64	0.54	37.3
5	T1	24	4.0	24	4.0	0.289	5.0	LOS A	0.8	5.7	0.54	0.64	0.54	42.5
6	R2	226	4.0	226	4.0	0.289	9.0	LOS A	0.8	5.7	0.54	0.64	0.54	42.5
Approach		305	4.0	305	4.0	0.289	8.0	LOS A	0.8	5.7	0.54	0.64	0.54	41.8
North: O'CONNELL STREET														
7	L2	148	4.0	148	4.0	0.290	3.7	LOS A	0.9	6.4	0.33	0.46	0.33	43.5
8	T1	159	4.0	159	4.0	0.290	3.8	LOS A	0.9	6.4	0.33	0.46	0.33	37.5
9	R2	77	4.0	77	4.0	0.290	7.8	LOS A	0.9	6.4	0.33	0.46	0.33	44.2
Approach		384	4.0	384	4.0	0.290	4.5	LOS A	0.9	6.4	0.33	0.46	0.33	42.0
West: WSU ACCESS														
10	L2	16	4.0	16	4.0	0.049	7.9	LOS A	0.1	0.9	0.75	0.68	0.75	38.7
11	T1	11	4.0	11	4.0	0.049	8.0	LOS A	0.1	0.9	0.75	0.68	0.75	42.0
12	R2	6	4.0	6	4.0	0.049	12.0	LOS A	0.1	0.9	0.75	0.68	0.75	32.5
Approach		33	4.0	33	4.0	0.049	8.8	LOS A	0.1	0.9	0.75	0.68	0.75	39.1
All Vehicles		1238	4.0	1238	4.0	0.527	6.5	LOS A	1.8	12.8	0.56	0.61	0.57	43.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101v [FUTURE BACKGROUND AM O'CONNELL LANE - CADDA RIDGE DRIVE + ADDITIONAL DWELLINGS (Site Folder: General)]

Network: N101 [FUTURE AM PEAK + ADDITIONAL DWELLINGS (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: O'CONNELL LANE														
1	L2	2	4.0	2	4.0	0.047	6.1	LOS A	0.1	0.8	0.61	0.57	0.61	44.0
2	T1	36	4.0	36	4.0	0.047	6.2	LOS A	0.1	0.8	0.61	0.57	0.61	35.1
3	R2	2	4.0	2	4.0	0.047	10.2	LOS A	0.1	0.8	0.61	0.57	0.61	43.7
Approach		40	4.0	40	4.0	0.047	6.4	LOS A	0.1	0.8	0.61	0.57	0.61	36.9
East: CADDA RIDGE DRIVE														
4	L2	1	4.0	1	4.0	0.299	3.7	LOS A	0.9	6.6	0.34	0.53	0.34	41.8
5	T1	135	4.0	135	4.0	0.299	3.8	LOS A	0.9	6.6	0.34	0.53	0.34	45.6
6	R2	260	4.0	260	4.0	0.299	7.8	LOS A	0.9	6.6	0.34	0.53	0.34	38.6
Approach		396	4.0	396	4.0	0.299	6.4	LOS A	0.9	6.6	0.34	0.53	0.34	42.2
North: O'CONNELL LANE														
7	L2	138	4.0	138	4.0	0.220	5.0	LOS A	0.6	4.3	0.57	0.62	0.57	44.3
8	T1	3	4.0	3	4.0	0.220	5.1	LOS A	0.6	4.3	0.57	0.62	0.57	44.9
9	R2	79	4.0	79	4.0	0.220	9.1	LOS A	0.6	4.3	0.57	0.62	0.57	46.4
Approach		220	4.0	220	4.0	0.220	6.5	LOS A	0.6	4.3	0.57	0.62	0.57	45.1
West: CADDA RIDGE DRIVE														
10	L2	220	4.0	220	4.0	0.483	5.8	LOS A	1.5	11.0	0.68	0.65	0.68	42.6
11	T1	272	4.0	272	4.0	0.483	5.9	LOS A	1.5	11.0	0.68	0.65	0.68	46.1
12	R2	1	4.0	1	4.0	0.483	9.9	LOS A	1.5	11.0	0.68	0.65	0.68	45.5
Approach		493	4.0	493	4.0	0.483	5.9	LOS A	1.5	11.0	0.68	0.65	0.68	44.8
All Vehicles		1148	4.0	1148	4.0	0.483	6.2	LOS A	1.5	11.0	0.54	0.60	0.54	44.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101v [FUTURE BACKGROUND PM O'CONNELL STREET - WSU ACCESS + ADDITIONAL DWELLINGS (Site Folder: General)]

Network: N101 [FUTURE PM PEAK + ADDITIONAL DWELLINGS (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: O'CONNELL LANE														
1	L2	9	4.0	9	4.0	0.352	5.1	LOS A	1.1	7.8	0.61	0.63	0.61	42.9
2	T1	192	4.0	192	4.0	0.352	5.2	LOS A	1.1	7.8	0.61	0.63	0.61	44.2
3	R2	162	4.0	162	4.0	0.352	9.2	LOS A	1.1	7.8	0.61	0.63	0.61	44.9
Approach		363	4.0	363	4.0	0.352	7.0	LOS A	1.1	7.8	0.61	0.63	0.61	44.5
East: O'CONNELL STREET														
4	L2	164	4.0	164	4.0	0.457	6.9	LOS A	1.4	10.3	0.78	0.79	0.78	36.2
5	T1	15	4.0	15	4.0	0.457	7.0	LOS A	1.4	10.3	0.78	0.79	0.78	41.7
6	R2	212	4.0	212	4.0	0.457	11.0	LOS A	1.4	10.3	0.78	0.79	0.78	41.7
Approach		391	4.0	391	4.0	0.457	9.1	LOS A	1.4	10.3	0.78	0.79	0.78	39.8
North: O'CONNELL STREET														
7	L2	253	4.0	253	4.0	0.571	5.3	LOS A	2.1	15.4	0.68	0.61	0.68	42.3
8	T1	367	4.0	367	4.0	0.571	5.4	LOS A	2.1	15.4	0.68	0.61	0.68	35.4
9	R2	22	4.0	22	4.0	0.571	9.4	LOS A	2.1	15.4	0.68	0.61	0.68	42.7
Approach		642	4.0	642	4.0	0.571	5.5	LOS A	2.1	15.4	0.68	0.61	0.68	39.5
West: WSU ACCESS														
10	L2	77	4.0	77	4.0	0.171	7.2	LOS A	0.4	3.1	0.71	0.73	0.71	39.0
11	T1	14	4.0	14	4.0	0.171	7.3	LOS A	0.4	3.1	0.71	0.73	0.71	42.2
12	R2	42	4.0	42	4.0	0.171	11.3	LOS A	0.4	3.1	0.71	0.73	0.71	32.9
Approach		133	4.0	133	4.0	0.171	8.5	LOS A	0.4	3.1	0.71	0.73	0.71	38.0
All Vehicles		1528	4.0	1528	4.0	0.571	7.0	LOS A	2.1	15.4	0.69	0.67	0.69	41.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101v [FUTURE BACKGROUND PM O'CONNELL LANE - CADDA RIDGE DRIVE + ADDITIONAL DWELLINGS (Site Folder: General)]

Network: N101 [FUTURE PM PEAK + ADDITIONAL DWELLINGS (Network Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: O'CONNELL LANE														
1	L2	1	4.0	1	4.0	0.013	9.4	LOS A	0.0	0.2	0.82	0.64	0.82	41.8
2	T1	5	4.0	5	4.0	0.013	9.5	LOS A	0.0	0.2	0.82	0.64	0.82	30.7
3	R2	1	4.0	1	4.0	0.013	13.5	LOS A	0.0	0.2	0.82	0.64	0.82	40.7
Approach		7	4.0	7	4.0	0.013	10.0	LOS A	0.0	0.2	0.82	0.64	0.82	35.6
East: CADDA RIDGE DRIVE														
4	L2	2	4.0	2	4.0	0.564	7.2	LOS A	2.1	15.5	0.81	0.79	0.86	39.8
5	T1	268	4.0	268	4.0	0.564	7.3	LOS A	2.1	15.5	0.81	0.79	0.86	44.2
6	R2	253	4.0	253	4.0	0.564	11.3	LOS A	2.1	15.5	0.81	0.79	0.86	36.0
Approach		523	4.0	523	4.0	0.564	9.2	LOS A	2.1	15.5	0.81	0.79	0.86	41.6
North: O'CONNELL LANE														
7	L2	222	4.0	222	4.0	0.525	5.2	LOS A	1.9	13.6	0.67	0.66	0.67	43.5
8	T1	36	4.0	36	4.0	0.525	5.3	LOS A	1.9	13.6	0.67	0.66	0.67	43.9
9	R2	316	4.0	316	4.0	0.525	9.3	LOS A	1.9	13.6	0.67	0.66	0.67	45.7
Approach		574	4.0	574	4.0	0.525	7.5	LOS A	1.9	13.6	0.67	0.66	0.67	44.8
West: CADDA RIDGE DRIVE														
10	L2	105	4.0	105	4.0	0.329	5.1	LOS A	1.0	7.2	0.61	0.59	0.61	42.8
11	T1	224	4.0	224	4.0	0.329	5.2	LOS A	1.0	7.2	0.61	0.59	0.61	46.2
12	R2	2	4.0	2	4.0	0.329	9.2	LOS A	1.0	7.2	0.61	0.59	0.61	45.6
Approach		332	4.0	332	4.0	0.329	5.2	LOS A	1.0	7.2	0.61	0.59	0.61	45.4
All Vehicles		1436	4.0	1436	4.0	0.564	7.6	LOS A	2.1	15.5	0.71	0.69	0.73	43.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.