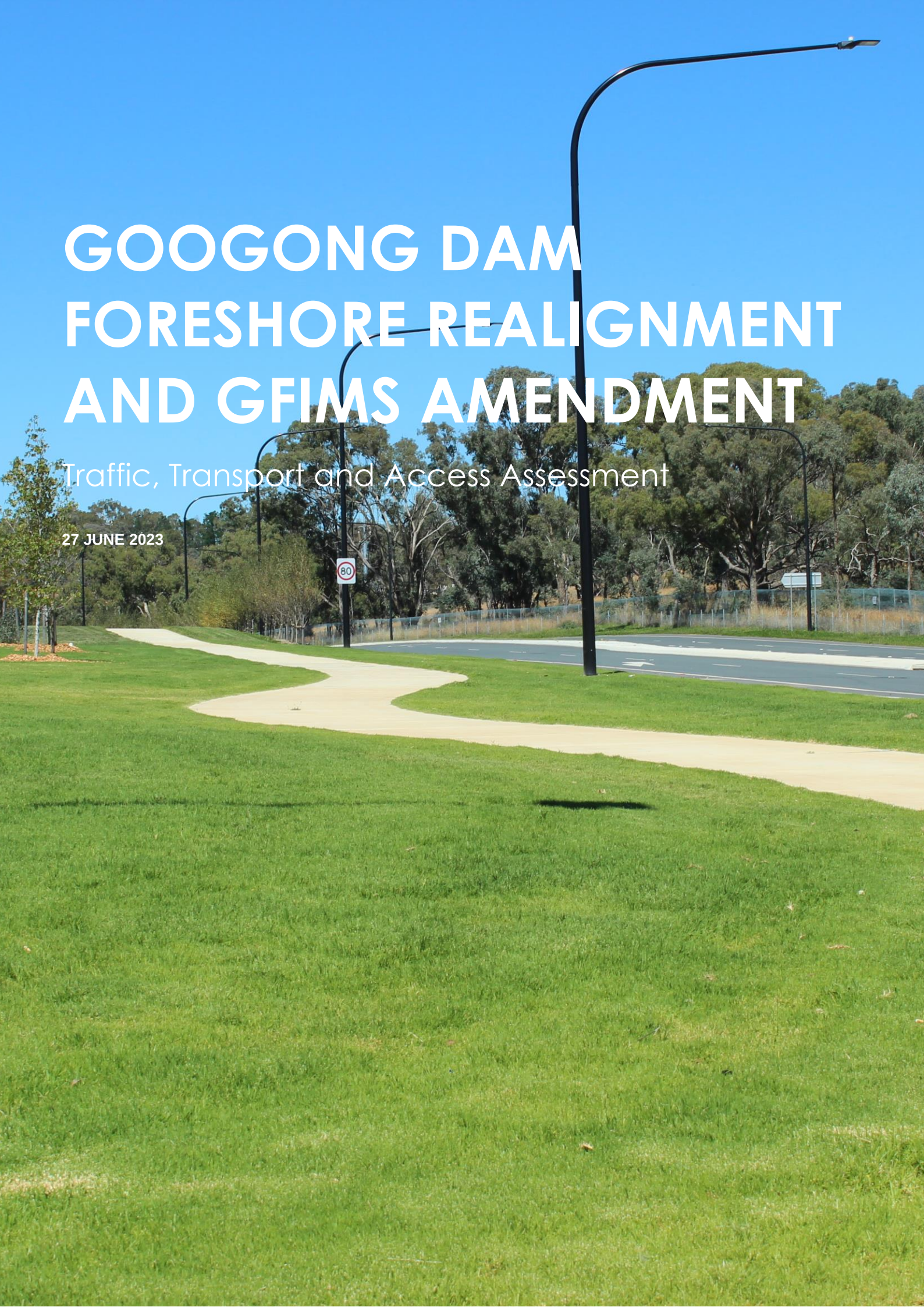
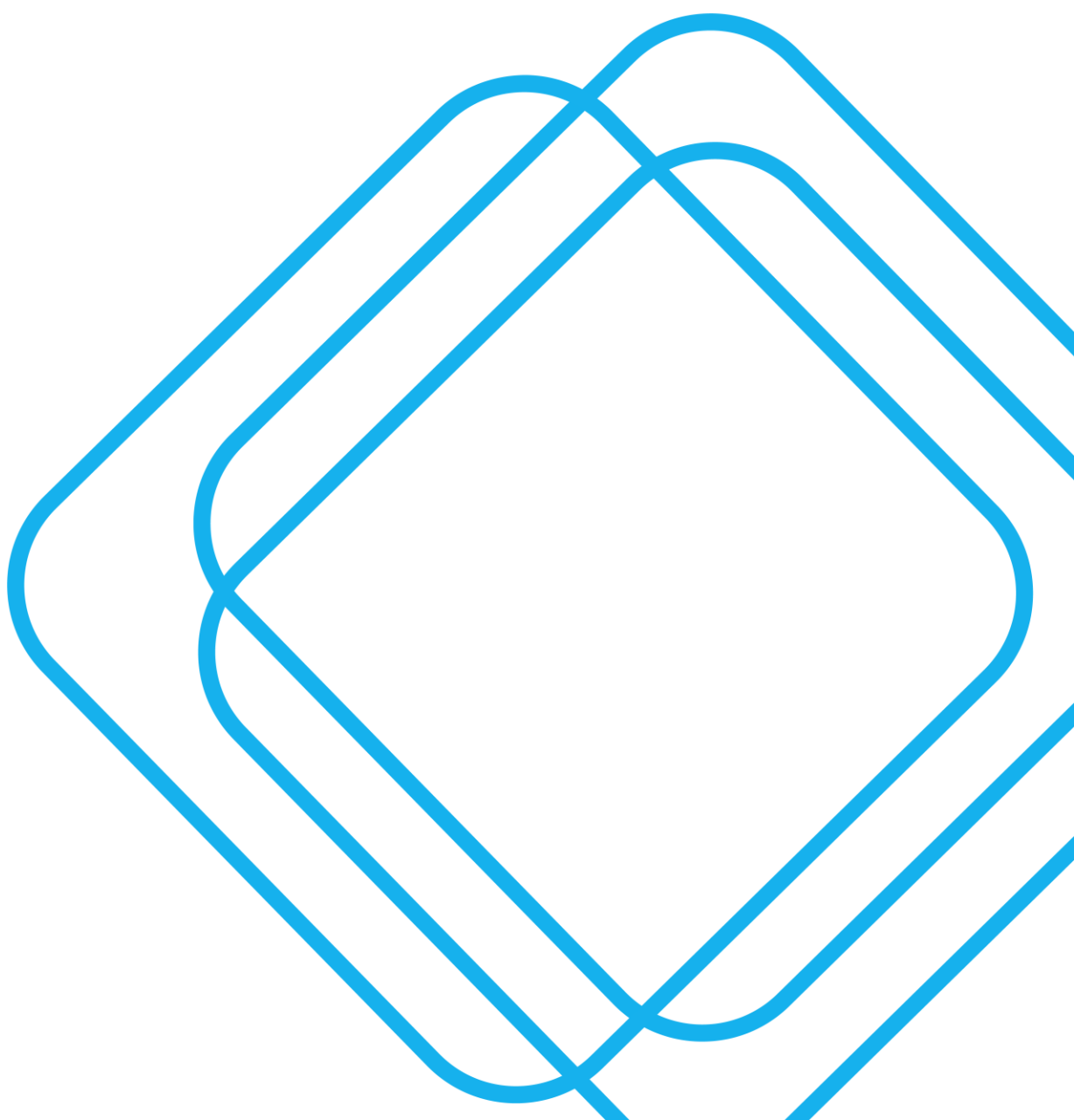


GOOGONG DAM FORESHORE REALIGNMENT AND GFIMS AMENDMENT

Traffic, Transport and Access Assessment

27 JUNE 2023





Quality Assurance

Project:	Googong Dam Foreshore Realignment and GFIMS Amendment		
Project Number:	SCT_00355		
Client:	Googong Township PTY. LTD. (GTPL)	ABN:	95 154 514 593
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APPENDIX A SIDRA modelling output A

Executive Summary

Purpose of the study

Googong Township has been planned and is being developed as a freestanding township with around 6,600 dwellings and a population of over 18,000 people over 25 years. There are five neighbourhoods within Googong:

- Neighbourhood 1 has been completed and is open.
- Neighbourhood 2 is currently under staged construction.
- The Development Application (DA) for Neighbourhood 345 was approved in September 2022.

This planning proposal is being prepared seeking minor amendments to the Queanbeyan Local Environmental Plan 2012 (QLEP 2012) as it applies to certain land in Googong within the Queanbeyan-Palerang Local Government Area. The planning proposal has been assessed with a net increase of 350 dwellings above the Neighbourhood 3, 4 and 5 (NH345) subdivision DA including:

- an additional 190 dwellings to be developed in NH345 with no changes in the planning controls
- an additional 160 dwellings to be increased by this planning proposal.

SCT Consulting was engaged by WSP Australia Pty Limited on behalf of Googong Township Pty Ltd to undertake traffic, transport, and access assessment to support the planning proposal.

Future planning context

The *Queanbeyan-Palerang Local Strategic Planning Statement (LSPS)* set out the vision of land use planning. Key actions will ensure new urban release areas and other large subdivisions have a range of transport options. It guides land use planning outcomes to support improved public transport and integrated multi-modal solutions. It also identifies transport corridors including active transport for increased development densities.

The proposed *Queanbeyan-Palerang Regional Council (QPRC) Integrated Transport Strategy 2019* investigates new bus services and park-and-ride facilities to service Googong directly into the ACT, seeks to implement a real-time information system for public transport and promotes increased densities. It also recommends mixed-use development in the vicinity of Queanbeyan CBD and major existing and future commercial centres, including Googong.

The Googong Master Plan sets the framework for the Googong township. The Neighbourhood Structure Plans develop a street hierarchy, catering for legible, safe, and efficient pedestrian, bicycle and vehicular movement and are public transport friendly. Four distinct levels of roads are identified for residential neighbourhoods, i.e., access street, local street, collector street and local sub-arterial.

SCT Consulting prepared a traffic, transport, and access assessment to support the subdivision DA within Neighbourhood 345. An update of the TRACKS model was conducted to forecast traffic volumes for the DA. The modelling confirms that the proposed road network is feasible given the traffic volumes generally adhere to the maximum loading criteria for each street type.

During the development of the road network in the DA, a sensitivity of an additional 350 residential lots was tested to ensure that the road hierarchy was not affected by the potential uplift and that roads are appropriately future-proofed and do not need to be modified should the planning proposal progress. There were no increases in areas that require an increase in the road hierarchy. The only road that tips over into a new category is the road adjoining NH5 local centre, which exceeds the collector volume of 3,000 vehicles per day (vpd). It is considered that the minor increase above the category by 300 vehicles per day does not warrant an increase into a cross-section that is a divided carriageway.

The DA was approved in September 2022 which specified a traffic signal at Bunyip Drive / Wellsvale Drive. GTPL is currently working with Council to define the traffic signal design for Bunyip Drive / Old Cooma Road and modify the DA (due to the approved intersection type being a priority intersection).

Existing conditions

Private car use accounts for over 80 per cent of the journey to work trips in main QPRC towns where the use of public transport is less than three per cent. Walking mode share ranges from three per cent to 15 per cent across different towns. Cycling trips typically comprise less than one per cent of travel.

There are eight bus stops in Neighbourhood 1. Bus route 837 serves these stops, operating between Googong and Queanbeyan with a typical service frequency of two trips in the weekday peak hour.

On-road bicycle lanes are provided on Gorman Drive, which extends to Wellsvale Drive and Old Cooma Road (north of Wellsvale Drive). The grid-like footpath network provides permeability, reducing circuitous trips and increasing the accessibility of the suburb by walking.

The daily traffic volume on Old Cooma Road and Googong Road ranges between 5,000 and 10,000 vehicles.

Proposed development

The planning proposal seeks to amend the Land Use Zoning and Minimum Lot Size controls. An additional 190 dwellings could be developed in NH345 with no changes in the planning controls. Furthermore, additional 160 dwellings will be increased by this planning proposal. Hence, the total dwellings in the NH345 would increase by 350 dwellings compared to the DA submission.

The proposed changes to the road network are limited to the modification of the approved access streets and local streets. The proposed cross-sections are expected to be consistent with what has been approved in the DA.

Transport assessment

This increase of 350 dwellings was tested earlier as a sensitivity scenario in the DA for NH345.

The TRACKS modelling confirms that the proposed road network is feasible for the planning proposal. The traffic volumes generally adhere to the maximum loading criteria for each street type. Wellsvale Drive and Bunyip Drive's being classified as local sub-arterial roads have been approved during the DA stage. The planning proposal results in minor variations from the approved DA on the two roads.

SIDRA intersection modelling was conducted for the intersections of Old Cooma Road / Bunyip Drive. A signal intersection has been adopted according to the ongoing modification of the intersection type to the approved DA. The modelling records a LoS B for both peak hours because of the planning proposal and indicates a limited increase in delay compared with the results of the approved DA.

Conclusions

The Transport Study concluded that the proposed subdivision is at a level able to be accommodated by the existing and proposed transport infrastructure. From a transport perspective, the site is suitable for additional residential dwellings.

1.0 Introduction

1.1 Background

Googong Township is a 25-year project being developed in partnership with Peet and Mirvac, operating as Googong Township Pty Ltd (GTPL). The emerging township is in Southern NSW, 8 km from Queanbeyan and 15 km from Canberra. The Googong master plan is embedded in Queanbeyan-Palerang Regional Council's (QPRC) *Googong Development Control Plan* (DCP) and provides the overarching structure for the township. It has been planned and is being developed as a freestanding township with five neighbourhoods, around 6,600 dwellings and a population of over 18,000 people over 25 years.

Structure Plans and Development Applications for Neighbourhoods 1 and 2 (NH12 and also known as Googong North and Googong Central) have been completed. Neighbourhood 2 is currently under staged construction.

The Development Application (DA) for the following three neighbourhoods have been approved in September 2022:

- Neighbourhood 3 (including the Hamson land) – also known as Googong West
- Neighbourhood 4 – also known as Googong South
- Neighbourhood 5 – also known as Googong East.

Neighbourhoods 3, 4 and 5 (NH345) are 235 hectares (Ha) in size and are bounded by Old Cooma Road to the west, Neighbourhood 2 and Neighbourhood 1B to the north, the Googong Dam foreshore and Pink-Tailed Worm-Lizard Conservation Area to the east and rural land to the south.

The area around Googong is characterised by rural uses, while NH345 itself is characterised as former agricultural land.

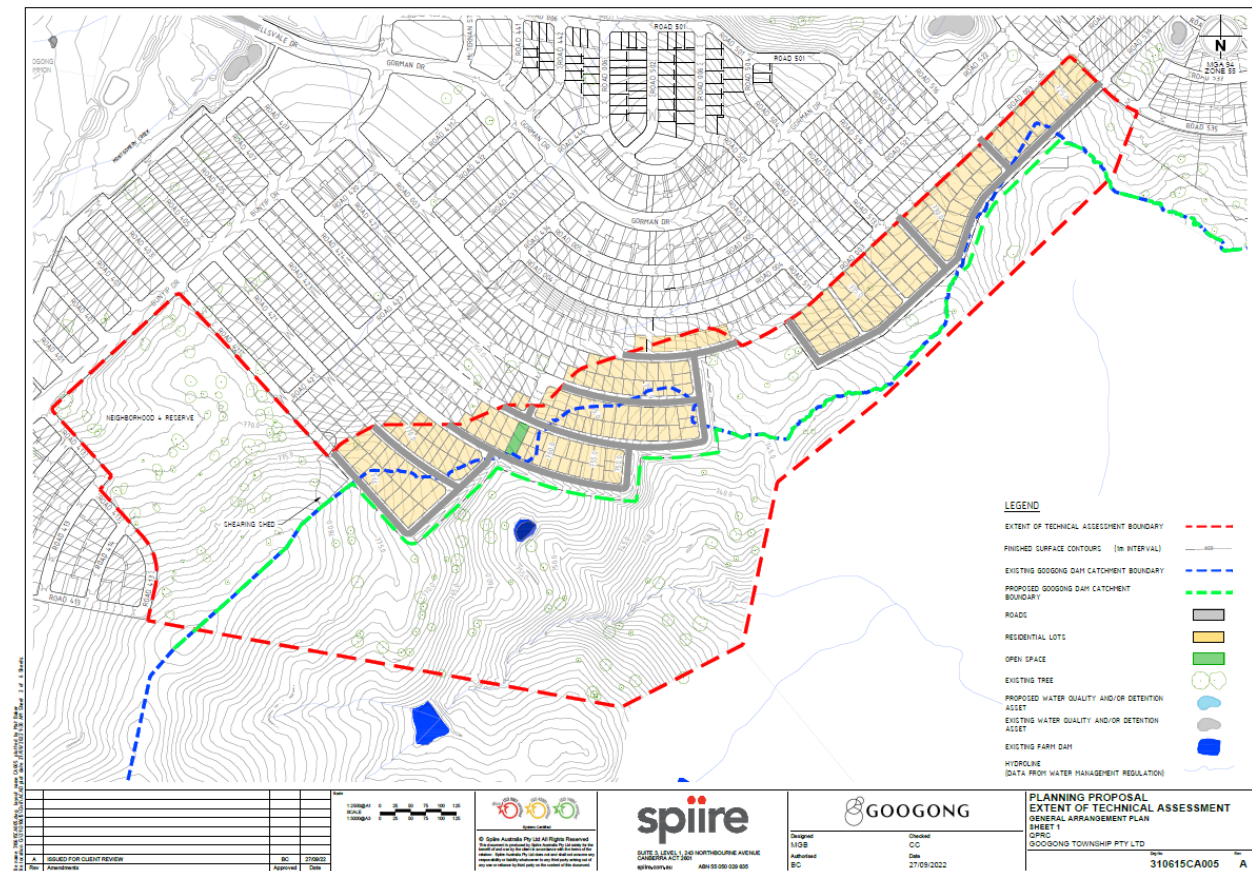
1.2 Project objective

A planning proposal is being prepared seeking minor amendments to *the Queanbeyan Local Environmental Plan 2012* (QLEP 2012) as it applies to certain land in Googong (the Site) within the Queanbeyan-Palerang Local Government Area (LGA).

The proposed amendments to the QLEP 2012 aim to rationalise the development boundary in response to the Biodiversity Certification of land that is currently zoned for urban uses to ensure that planning controls are aligned with the conservation objectives of Googong. Certain areas of residentially zoned land will be zoned conservation and a small area of land within the Googong Foreshore Interface Management Strategy (GFIMS) area to the south and east of Neighbourhood 1B and NH345 of the Site is proposed to be rezoned for residential uses. The proposed changes will facilitate the delivery of the development yield identified for the Site in the Googong Masterplan.

A general arrangement plan is shown in **Figure 1-1**, which would achieve a net increase of 350 dwellings in addition to the yield of NH345.

Figure 1-1 Proposed zoning changes



Source: Spiire, 2022

1.3 Purpose of this report

SCT Consulting has been engaged by WSP Australia Pty Limited on behalf of Googong Township Pty Ltd (GTPL) as a traffic and transport consultant, to support the planning proposal of the site. The purpose of this traffic, transport and access assessment is to support the land use and lot size amendments. The scope of work includes:

- Review relevant background documents and information including relevant state, regional and local planning policies, transport planning documents and parking DCP and standards including the Structure Plan Traffic Study and previous traffic reports of NH1, NH2 and NH345
- Review existing traffic and transport conditions, including road network connections, public transport accessibility and connectivity to walking and cycling routes
- Document and discuss assumptions (trip generation, trip distribution and TRACKS modelling) used to estimate traffic forecasts on the road network as a result of the planning proposal
- Undertake traffic modelling (in SIDRA) of the critical intersection for two peak periods (AM and PM peak) based on the final agreed traffic forecasts of a future year
- Identify public and active transport measures and sustainable travel initiatives for development.

1.4 Report structure

This report has been structured into the following sections:

- **Section 2.0** provides a summary of the review of all relevant background documents
- **Section 3.0** describes the existing transport conditions for all modes of transport
- **Section 4.0** describes the proposed development, its access strategy and a review of parking and access requirements

- **Section 5.0** outlines the traffic and transport appraisal which describes the modelling undertaken, the likely trip generation, and the indicative impact as a result of the proposed development
- **Section 6.0** summarises the report content and presents the conclusions.

2.0 Strategic Context

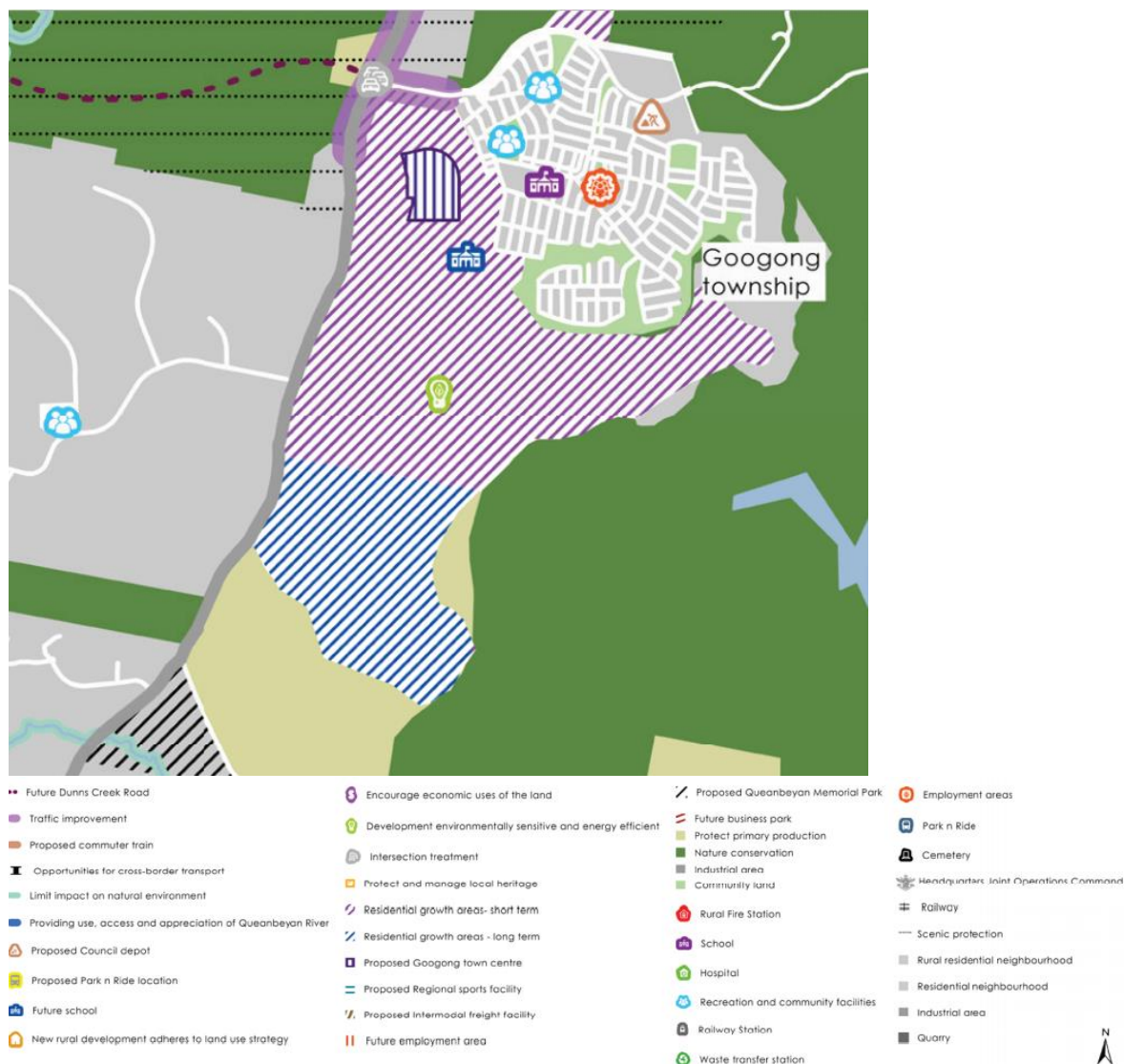
2.1 Queanbeyan-Palerang LSPS

Queanbeyan-Palerang Local Strategic Planning Statement (LSPS) sets out the vision of land use planning for Queanbeyan-Palerang. Queanbeyan-Palerang will provide opportunities for new housing in planned areas, whilst also protecting the existing character and amenities of established residential areas. The wealth of built heritage will continue to be conserved and celebrated. Its position within a borderless Canberra region allows the realisation of excellent transport connections throughout the region that drive a strong economy, support great centres, and provide easy access to jobs for all. Better roads, transport services, and walking and cycling links will make Queanbeyan-Palerang easy to get around for residents, workers and visitors.

Key actions related to transport include (**Figure 2-1**):

- Ensure new urban release areas and other large subdivisions have a range of transport options available that support safe ease of movement
- Guide land use planning outcomes to support improved public transport and integrated multi-modal solutions
- Identify transport corridors including active transport for increased development densities.

Figure 2-1 Vision for Queanbeyan and surrounds in 2040



Source: Queanbeyan-Palerang LSPS, 2020

Implications for the site: The site supports residential growth in the short term, which will provide future residents with additional transport options to access employment, services, and activities other than cars. With the development, a variety of housing types will be available in Googong together with high-quality recreational and sports facilities. The road network would expect an east-west connection to ACT to enhance cross border corridor.

2.2 Queanbeyan Residential and Economic Strategy 2031

The purpose of *Queanbeyan Residential and Economic Strategy 2031* (the Strategy) was to outline a 25-year framework for residential and employment land release in Queanbeyan. The Strategy set out a framework for ensuring ongoing economic growth and prosperity of Queanbeyan, whilst protecting key environmental attributes that are valuable to the community. The Strategy provided directions for the continued residential growth at Googong and South Jerrabomberra and adequate infrastructure to meet the needs of a growing population.

Council encourages sustainable transport modes throughout Queanbeyan. It has adopted a Pedestrian Access Mobility Plan (PAMPS) and a Bicycle Plan. It is recommended that public transport is available in Queanbeyan and streets in new urban areas are designed to allow for buses on the main roads to extend the services.

Implications for the site: The development of smaller lots and intensification of dwellings in certain areas of Googong is supported by the Council to provide for a variety of housing types and smaller household sizes. Council's strategic direction ensures connectivity to new urban areas.

2.3 QPRC Integrated Transport Strategy 2019

AECOM prepared an *Integrated Transport Strategy (ITS)* for Queanbeyan-Palerang Regional Council (QPRC) in 2020. The document guides future investment in the transport network in the region and provides direction for the public transport, cycling and footpath networks and links, heavy vehicle management, future road planning and regional integration with the ACT and the broader NSW. It describes proposed actions and broad priorities for future implementation.

The Strategy identifies the lack of public transport services to isolated communities or new urban areas such as Googong. The land use planning resulted in dispersed development and would not encourage public transport use. Hence, the proposed strategy response includes:

- Investigate new bus services and park-and-ride facilities to service Googong directly into the ACT
- Seek to implement a real-time information system for public transport
- Promote increased densities and mixed-use development in the vicinity of Queanbeyan CBD and major existing and future commercial centres, including Googong.

Implications for the site: The site will benefit from the ITS vision where integrated transport and land use planning, effective policy development and investment will be delivered to support a connected community with affordable and convenient access to services.

2.4 Googong DCP

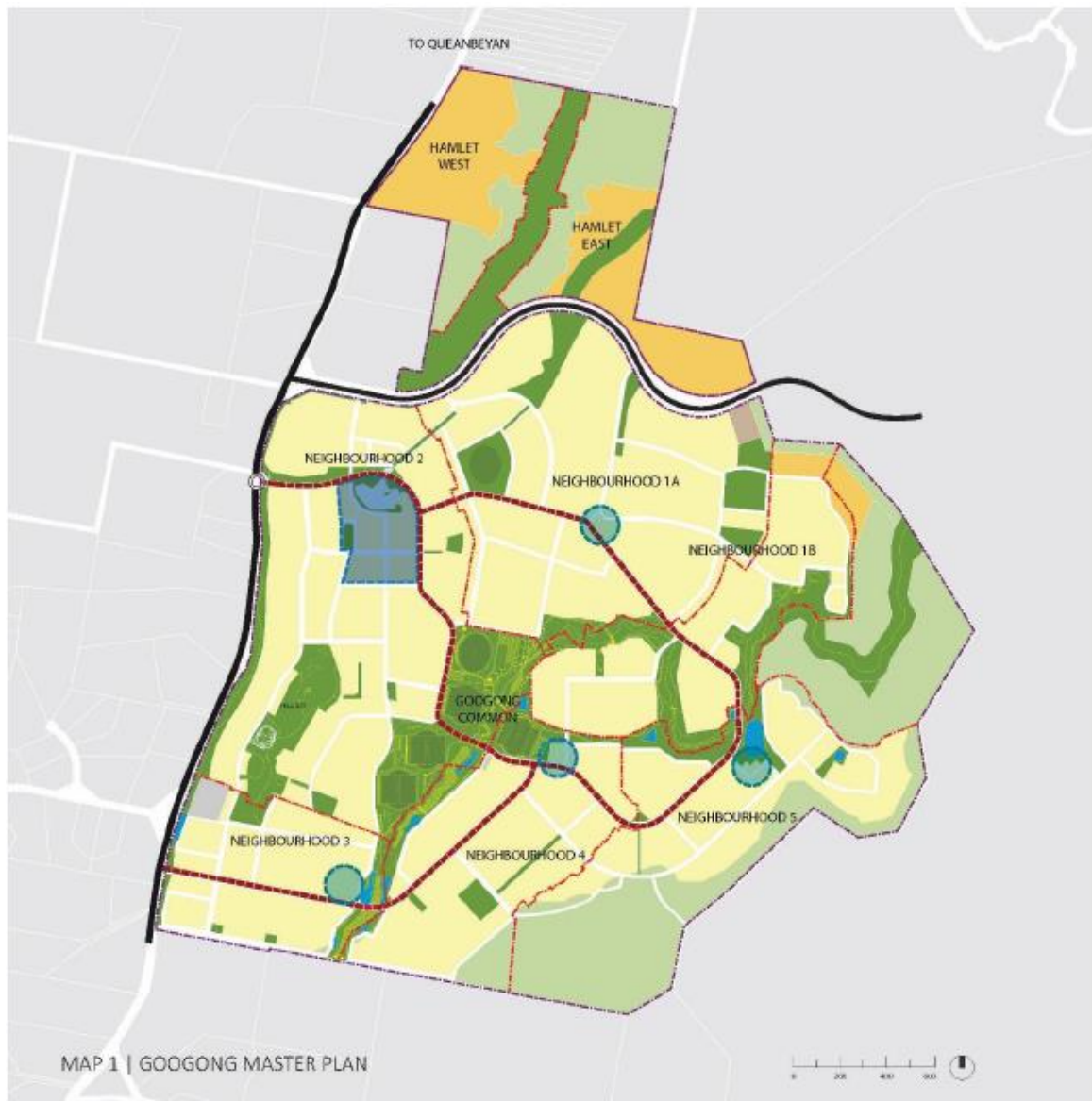
2.4.1 Googong Masterplan

The Googong Master Plan sets the framework for the Googong township. The Master Plan has the following objectives (**Figure 2-2**):

- Establish high-quality liveable neighbourhoods within a sustainable township
- Create a transition from lower-density residential fringes to urban mixed-use centres
- Promote interconnectivity within and between neighbourhoods through safe and legible pedestrian paths, cycleways and streets
- Focus each neighbourhood around a 'neighbourhood centre' which is to be a hub of community, commercial and retail activity

- Create a connected open space network catering for all ages with a range of civic, active, passive and civic spaces
- Provide opportunities for future residents and visitors to meet their social, cultural and economic needs.

Figure 2-2 Googong Master Plan



LEGEND

	GOOGONG TOWNSHIP BOUNDARY		RESIDENTIAL		NATURAL AREAS		WATER BODIES
	NEIGHBOURHOOD BOUNDARIES		RESIDENTIAL (LARGER LOT SIZE)		WATER RECYCLING TREATMENT PLAN		EXISTING ROADS
	TOWN CENTRE		OPEN SPACE		UTILITIES		INDICATIVE ROADS
	INDICATIVE NEIGHBOURHOOD CENTRE						

Source: Googong DCP Appendix 8, 2020

The access and movement network objectives under the master plan include:

- Streets in Googong are to be designed to facilitate legible, safe and efficient pedestrian, bicycle, public transport and private car movement.
- A network of pedestrian and cycle paths in Googong is to provide good access to key destinations such as the town centre, neighbourhood centres, parks and community facilities.

- Main Avenue is to connect the five neighbourhoods and provide an identifiable public transport route. Vehicular access to Googong will be from Googong Dam Road and Old Cooma Road.

The Master Plan requires that future Neighbourhood Structure Plans must:

- Provide a street hierarchy that reflects the function and character of each street and forms part of a legible network.
- Make provision for legible, safe and efficient pedestrian, bicycle and vehicular movement throughout the township and connections to the established network.
- Make provision for a public transport route through Googong.
- The Master Plan requires that the street network creates legibility and contributes to a sense of place, social sustainability, casual surveillance and active vibrant places. A legible well-connected street network ensures that people move easily between key activity nodes such as town centres, schools etc. It will also ensure privacy for neighbourhoods by supporting local destination traffic rather than through traffic.
- The Plan also requires that streets in Googong will be designed to facilitate efficient pedestrian, bicycle, public transport and private car movement. A network of pedestrian and cycle paths in Googong will provide good access to key destinations such as the town centre, neighbourhood centres, parks and community facilities. There are four distinct levels of roads identified for residential neighbourhoods, i.e. access street, local street, collector street and local sub-arterial, which will be further discussed in **Section 2.5**.

2.4.2 Car parking requirements

Part 7 of the Googong DCP, specifies requirements that are generally consistent with those in Queanbeyan DCP except for the following:

- **Small Lot Housing and Studio Dwellings:** one space for one-bedroom dwellings and two spaces for two or more bedroom dwellings.
- **Multi-Dwelling Housing and Dual Occupancies:** one space per one-bedroom unit and two spaces for other units. Three visitor parking spaces are required for 11-15 dwellings and one additional space is needed for every five units thereafter.

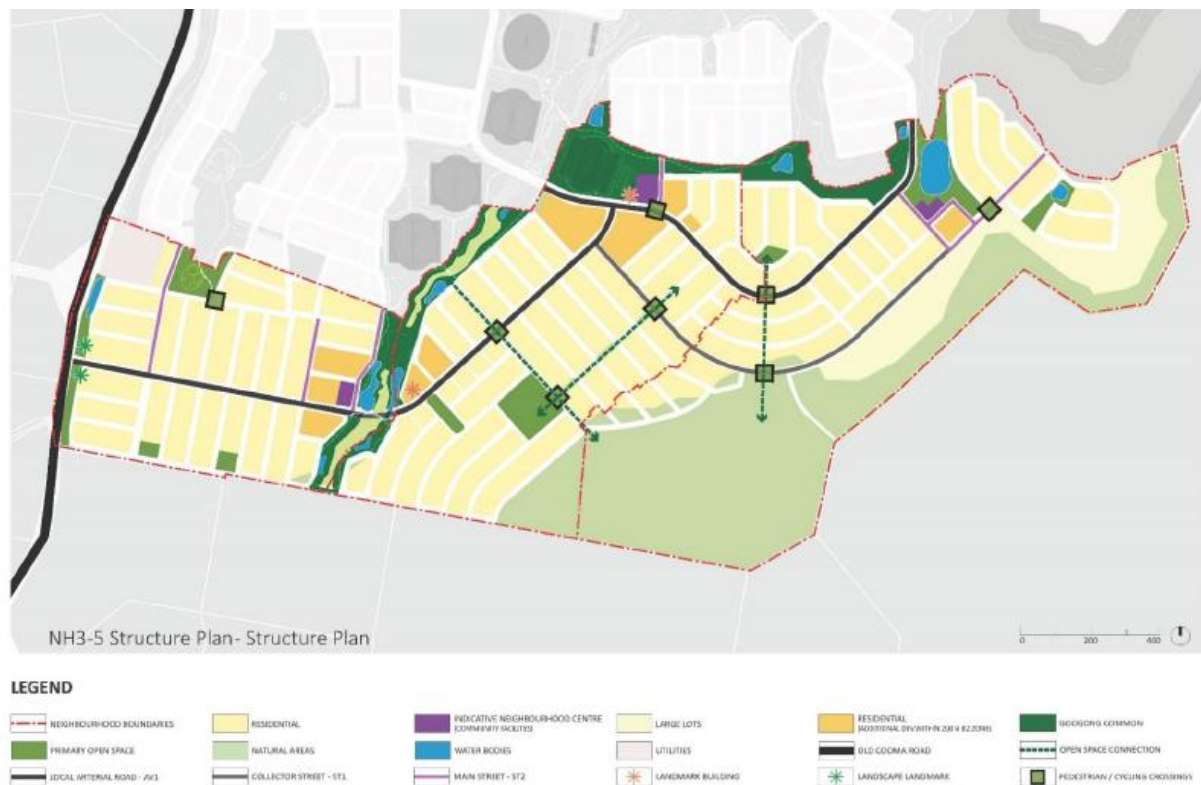
2.4.3 Structure Plans Neighbourhoods 345

Under the Structure Plans of NH345 (**Figure 2-3**), Wellsdale Drive and Bunyip Drive are two local arterial roads to connect the precinct to a wider road network. The two roads intersect and form a signalised intersection near the proposed Googong Common and the Neighbourhood Centre 4. The plan requires that there will be bus stops along the two roads to accommodate the proposed major bus routes, which makes public transport accessible for the majority of the precinct. A dedicated on-road bicycle lane will be also available on the two roads.

Key paths and a shared path network would well connect Googong Common, multiple open spaces, water features and natural areas within the precinct. Pedestrian crossings are provided at a few locations to improve walkability.

A collector street is planned in parallel to Gorman Drive to connect Bunyip Drive with the eastern part of the precinct. Other lower hierarchy streets include many local streets and access streets to improve the connectivity and permeability of the precinct.

Figure 2-3 NH345 Structure Plan



Source: Googong DCP Appendix 10, 2010

2.4.4 Structure Plans Neighbourhoods 1 and 2 (connections to 345)

The NH345 has an interface with NH2 and NH1B to the north where the majority of the roads have been completed.

Interface with NH2

As shown in **Figure 2-4**, Wellsvale Drive in the north of NH345 extends northwest through the heart of NH2 and intersects with Old Cooma Road, providing an access alternative for NH345 users. Multiple local streets would also provide connections between NH2 and NH345.

Dedicated bicycle lanes are provided on the full length of Wellsvale Drive. There will also be shared path connections between the two neighbourhoods in the open spaces, which facilitates active transport use in a wider area.

Public transport is proposed on Wellsvale Drive in NH2.

Interface with NH1B

Gorman Drive in NH345 is extended to NH1B to the northeast with the continuity of the planned dedicated bicycle lane. Gorman Drive has been completed and travels through NH1, intersecting back with Wellsvale Drive in NH2.

Another connection point is McTernan Avenue, which is extended as a local street in NH1 and a collector road in NH4 as it joins Gorman Drive.

Figure 2-4 NH2 Structure Plan



Source: Googong DCP Appendix 8, 2016

2.5 QPRC Design Specification

2.5.1 Geometric road design

This section sets out the specifications developed specifically for the design of subdivision roadworks using principles of street design to ensure safety and improved amenities and to reduce pedestrian / vehicular conflicts. A hierarchical

road network is essential to maximise road safety, residential amenity and legibility. Each class of road in the network serves a distinct set of functions and is designed accordingly. The design should convey to motorists the predominant function of the road. Four distinct levels of roads are identified for residential neighbourhoods:

- **Access Street:** The lowest order road having as its primary function, residential space - amenity features that facilitate pedestrian and cycle movements, and where vehicular traffic is subservient in terms of speed and volume, to those elements of space, amenity, pedestrians and cyclists.
- **Local Street:** The next level road as a local residential street should provide a balance between the status of that street in terms of its access and residential amenity functions. Resident safety and amenity are dominant but to a lesser degree than access streets.
- **Collector Street:** The second highest-order road has a residential function but also carries higher volumes of traffic collected from lower-order streets. A reasonable level of residential amenities and safety is maintained by restricting traffic volumes and speeds, however, amenity and resident safety do not have the same priority as access or local streets.
- **Local Sub-Arterial Road:** The highest-order road within a residential development should have as its main function the convenient and safe distribution of traffic generated by the development. Direct access should not be provided for single dwelling allotments but access can be provided to multi-unit developments and non-residential land uses. The local sub-arterial should serve only the development and should not attract through traffic.

The cross-section of the road reserve must provide for all functions that the road is expected to fulfil, including the safe and efficient movement of all users, provision for parked vehicles, acting as a buffer from traffic nuisance for residents, and the provision of public utilities and streetscaping.

Bus routes should be agreed in principle with the bus operator's prior DA lodgement, in some circumstances, they may be identified by Council during application assessment. It is important that the road hierarchy adequately caters for buses. The main criteria in determining the location of bus routes are that no more than five per cent of residents should have to walk over 400 metres to catch a bus. Normally roads above the local street in the hierarchy are designed as bus routes. **Table 2-1** details the minimum criteria for bus route design.

Table 2-1 Bus route criteria

Road	Carriageway width (min)	Stops (Spacing)	Bays
Local*	8.0 m	400 m**	2.5m indented bay if carriageway less than 9.0m
Collector	11.2 m	400 m	Shelters***
Local Sub-Arterial	13 m	400 m	Shelters***

Source: Engineering Design and Construction Specifications D1 Geometric Road Design - QPRC, 2018

*Local roads identified as bus routes to demonstrate manoeuvring of busses and road width amended as required.

**Loop roads with single entry/exit only require stops and bays on one side road.

***At identified bus stops shelters shall be provided. Shelters are subject to Council's requirements and will include a concrete or paving slab to the floor area.

2.5.2 Vehicular access design

This specification sets out requirements to be used in the design of vehicular access for application in all types of development, including residential, commercial, industrial and subdivision development.

This specification aims to set standards related to the provision of vehicular access to proposed allotments, which are to be safe and convenient and shall maintain a satisfactory level of service for the user. It also aims to set the minimum design standards required for the provision of vehicular footpath crossings and driveways, located within allotments and the Council's road reserve.

The number of vehicular kerb crossings required to be provided to each allotment in a subdivision is usually one crossing. In urban areas, the number of vehicular kerb crossings may be extended to two provided that the combined width of the vehicular kerb crossings does not exceed seven metres and there is an adequate driveway and turning areas within the lot to justify the need for two vehicular crossings.

Vehicular access is prohibited from being constructed in the locations within six metres from the kerb returns of the intersection.

2.5.3 Cycleway and pathway

This specification sets out requirements to be used in the design of various types of cycleways and pathways associated with development. It aims to set standards and document requirements related to the provision of cycleways and pathways which encourage pedestrian activities and cycling for transportation and recreational purposes. Cycleways and pathways are to be safe and convenient and shall maintain a satisfactory level of service for all pathway users including users with disabilities and limited mobility.

Consideration must be given to the design of adequate facilities at common destinations for cyclists and pedestrians to encourage cycleway and pathway usage.

The minimum standards have been determined for off-road path types, as shown in **Table 2-2**.

Table 2-2 Off-road path types - Minimum design standards (excerpts)

Item	Cycleway	Pathway	Shared use pathway	
			Low use	High use
Path width	2.0 m	1.5 m	2.0 m	2.5-3.0 m
Formation width	3.0 m	2.0 m	3.0 m	3.5-4.0 m
Grade (max)	3% 5% for 120 m 10% for 30 m	N/A	5% 10% for 30 m	

Source: Engineering Design and Construction Specifications D9 Cycleway and Pathway Design - QPRC, 2019

2.6 TRACKS model

TRACKS is a strategic transport modelling suite originally developed by Gabites Porter in the early 1960s and managed by Transportation and Traffic Systems (TTS) (now Stantec), which uses the location and intensity of land uses, the transportation system that links them and forecasts the travel behaviour that results.

QPRC provided GTPL with a download link for the “2031Revised_SthJ_and_GoogongNH2345_Mar19” version of the Queanbeyan TRACKS model. One of the input files supplied by the Council was corrupted – being Assign7.exe. SCT Consulting worked with TTS (now Stantec) to replace this file with a newer release. As there was no documentation supplied for the model, it was not possible to validate any changes due to the update of Assign7.exe.

The 2031Revised_SthJ_and_GoogongNH2345_Mar19 was reviewed against Googong Structure Plan Neighbourhoods 3,4 & 5 Traffic Report (Calibre, 2019). The issues observed are outlined as follows:

- Volumes do not match those of the Googong NH345 structure plan.
- Zone geometry is unclear.
- Zones are highly aggregated.
- The number of households exceeds that anticipated by the structure plan.
- Location of schools inconsistent with current planning.
- Road alignments are not consistent with structure plan approvals.

Hence, the TRACKS model required updates not only to address the refinements of the development application from the structure plan but also to address deficiencies in the model for the structure plan. This will be further discussed in **Section 5.1**.

2.7 Neighbourhood 3, 4, & 5 Development Application

SCT Consulting prepared a traffic, transport, and access assessment to support the subdivision DA for Neighbourhoods 3, 4, & 5 (NH345). The DA proposal sought approval for:

- Torrens title subdivision of Neighbourhoods 3, 4 and 5 to create:
 - 1,476 residential lots

- 20 lots for future subdivision of higher density housing and other uses including the Neighbourhood Centre sites, to accommodate approximately 320 dwellings
- Public reserves including, local parks, sports fields and Googong Common
- Public roads and drainage reserves.

An update of the TRACKS model has been conducted to forecast traffic volumes for the development application traffic assessment. The modelling confirms that the proposed road network is feasible for the DA given the traffic volumes generally adhere to the maximum loading criteria for each street type:

- For Wellsvale Drive, some localised widening will be proposed at the intersection of Wellsvale Drive / Bunyip Drive / Gorman Drive as required to achieve acceptable performance.
- For Bunyip Drive, a two-lane per direction cross-section is considered appropriate with one traffic lane and one parking lane in each direction.
- For Gorman Drive, a deviation is proposed for a sub-section to allow lots with frontage to have driveway access at sections where traffic forecasts are lower (less than 1,500 vpd).

SIDRA intersection modelling was conducted for key intersections in Googong. A suite of options was developed for both Wellsvale Drive / Bunyip Drive / Gorman Drive and Old Cooma Road / Bunyip Drive acknowledging different design criteria.

Local sub-arterial roads in the precinct are proposed to be bus capable, enabling the majority of the area to be covered by bus services. The bus route proposed remains consistent with the master plan in closing the loop on Gorman Drive and Wellsvale Drive. The completion of the loop will also provide an easy extension of the route for future K-12 schools.

An additional 350 residential lots on top of the yield for the DA were tested as part of a scenario for a potential planning proposal to ensure that the road hierarchy was not affected by the potential uplift. This has ensured that roads are appropriately future-proofed and do not need to be modified should the planning proposal progress.

The DA was approved in September 2022 which specified a traffic signal at Bunyip Drive / Wellsvale Drive. GTPL is currently working with Council to define the traffic signal design for Bunyip Drive / Old Cooma Road and modify the DA (due to the approved intersection type being a priority intersection).

3.0 Existing Conditions

3.1 Travel behaviour

AECOM conducted an Integrated Transport Strategy analysis for QPRC to guide future investment in the transport network in the region in 2020. It was found that:

- Most jobs and services are in Canberra.
- Travel to the ACT is integral to economic growth.
- Prosperity for the region and bus connection between Queanbeyan and Canberra is a priority.

Private car use accounts for over 80 per cent of the journey to work trips in main QPRC towns where the use of public transport is less than three per cent. Walking mode share ranges from three per cent to 15 per cent across different towns. Cycling trips typically comprise less than one per cent of travel.

In 2016, over 62 per cent of the QPRC residents worked outside the LGA, indicating the need to further integrate the transport system of Queanbeyan into a wider Canberra urban area.

3.2 Road network

The major completed roads within Googong include Old Cooma Road, Wellsvale Drive, Gorman Drive and Googong Road as shown in **Figure 3-1**.

The key features of the roads within the site are:

- **Old Cooma Road** connects Edwin Land Parkway to the north and Monaro Highway to the south. It has a signposted speed limit of 80 km/h adjacent to the site. The duplication of this arterial road has been completed in 2020 between Edwin Land Parkway and Googong Road. It remains one lane in each direction to the south of Wellsvale Drive. A signalised T-intersection is provided at the Old Cooma Road / Wellsvale Drive with a pedestrian crossing on Wellsvale Drive. A footpath is provided on the east side of Old Cooma Road. On-road bicycle lanes are available in both directions to the north of Wellsvale Drive while parking is unrestricted on both sides of the road.
- **Wellsvale Drive** is classified as a combination of Arterial Road (AV1b between Old Cooma Road and Courtney Street) and Local Arterial Road (AV1 between Courtney Street and Gorman Drive) in the vicinity of the site. It has a signposted speed limit of 50 km/h with a variation of one to two lanes in each direction. Footpaths and on-road bicycle lanes are provided on both sides of the road. The section of Wellsvale Drive, south of Gorman Drive has recently been constructed until Heazlett Street (north of the site but not opened to traffic).
- **Gorman Drive** is an arterial road, which starts from Wellsvale Drive and extends to the Googong Neighbourhood 1 to the east. It has one lane in each direction with a signposted speed limit of 50 km/h. The school zone is in operation to the east of Hearne Street. There is on-street parking alongside the on-road bicycle lanes on both sides of the road. Two bus stops are located to the east and west of Hearne Street, respectively. Footpaths are available on both sides.
- **Googong Road** is a collector street on the northern edge of the Site. It generally has one lane in each direction with a signposted speed limit of 60 km/h. Intersection widening and right turn bay treatment are provided at Old Cooma Road, Courtney Street and Beltana Avenue intersections. Parking is permitted on both sides of the road whereas a footpath is available on the southern side of the road.

Figure 3-1 Road network for Googong Neighbourhood



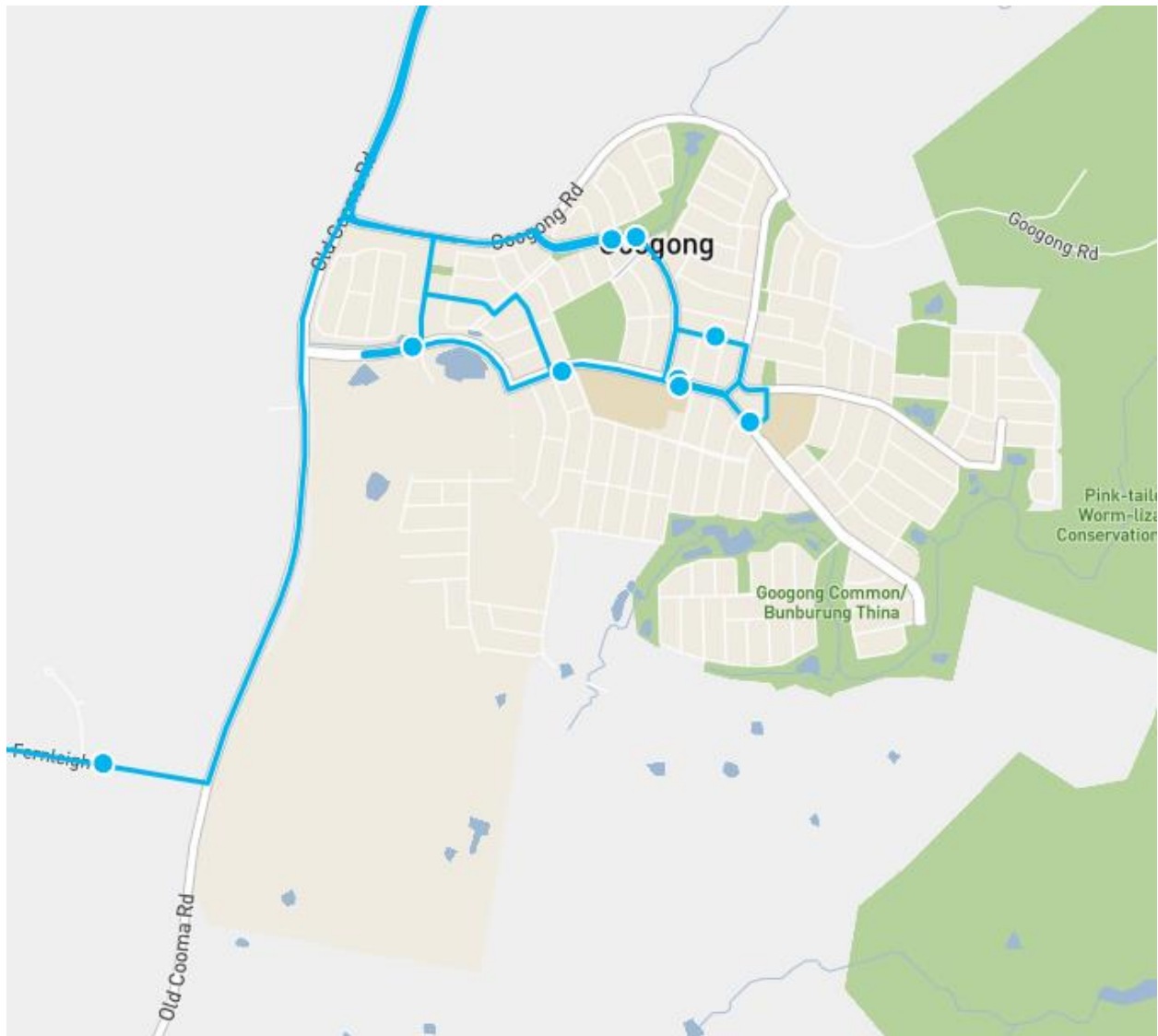
Source: Nearthmap, 2022

3.3 Bus network

The bus network in the vicinity of the site is shown in **Figure 3-2**. There are eight bus stops in the opened NH1. Bus route 837 is available at those bus stops, which operates between Googong and Queanbeyan.

Service frequency for this bus route is two trips for a typical weekday peak hour between 7am and 8am and a total of four trips on Saturday.

Figure 3-2 Bus network around the site



Source: TfNSW, 2022

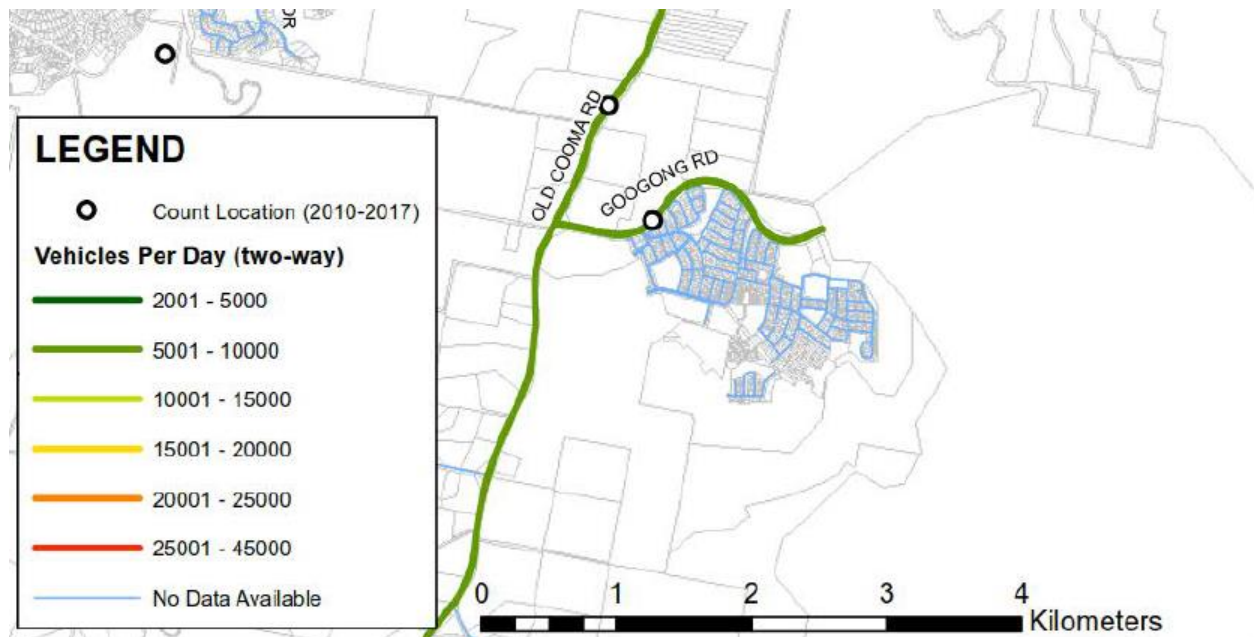
3.4 Active transport

There are extensive walking and cycling facilities in the existing Googong NH1 development. On-road bicycle lanes are available on Gorman Drive, which is further extended onto Wellsvale Drive and Old Cooma Road (north of Wellsvale Drive). The grid-like footpath network enables pedestrians to have high-quality facilities for short-distance trips.

3.5 Existing traffic conditions

AECOM's QPRC Integrated Transport Strategy quoted *QPRC data base 2017* for the daily traffic volumes on Old Cooma Road and Googong Road as shown in **Figure 3-3**.

Figure 3-3 Queanbeyan daily traffic volumes

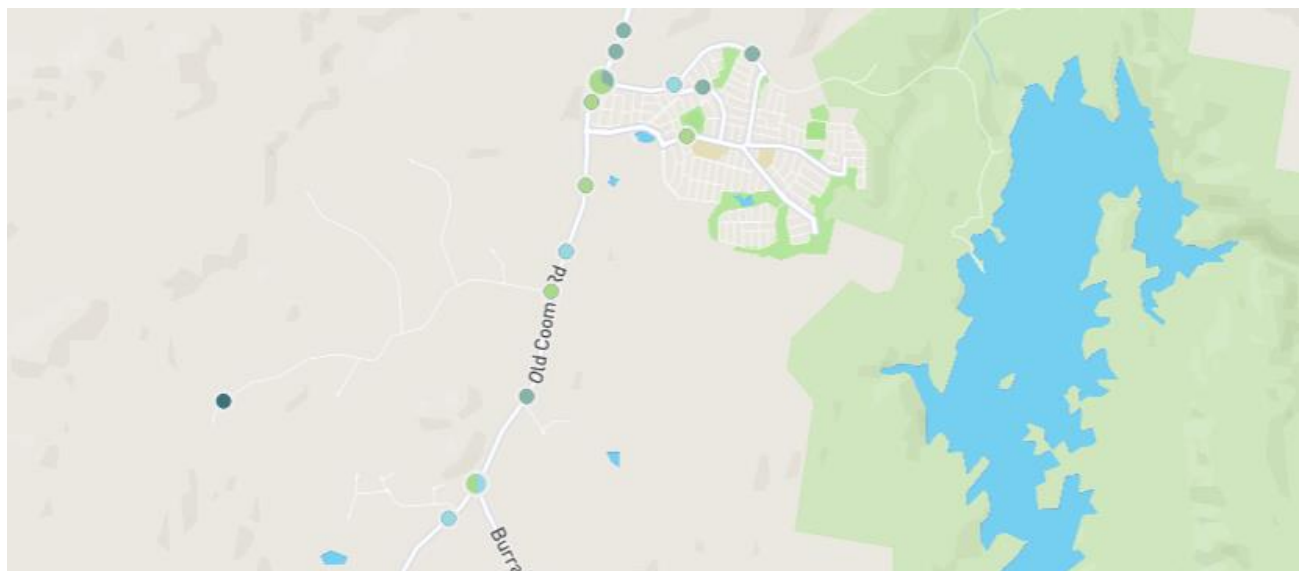


Source: QPRC Integrated Transport Strategy, 2020

It is understood that the daily traffic volume on the two roads ranges between 5,000 and 10,000 vehicles in the vicinity of the site.

According to the crash severity map, as shown in **Figure 3-4**, there were four moderate injuries from 2015 to 2019 on Old Cooma Road near the site (0.68 per km), which indicates higher crash rates per kilometre than the NSW state average (0.183 per km for a 3R rural road). The other two moderate injuries occurred in NH1.

Figure 3-4 Crashes map



Source: [Crash and casualty statistics - LGA view - Interactive crash statistics - Statistics - NSW Centre for Road Safety](#), 2021

4.0 The Proposed Development

4.1 Description of the proposal

The proposal seeks minor amendments to the *Queanbeyan Local Environmental Plan 2012* (QLEP 2012) as it applies to certain land in Googong (the Site) within the Queanbeyan-Palerang LGA.

The proposed amendments to the QLEP 2012 aim to rationalise the development boundary in response to the Biodiversity Certification of land that is currently zoned for urban uses to ensure that planning controls are aligned with the conservation objectives of Googong. Certain areas of residentially zoned land will be zoned conservation and a small area of land within the Googong Foreshore Interface Management Strategy (GFIMS) area to the south and east of Neighbourhood 1B and Neighbourhoods 3-5 of the Site is proposed to be rezoned for residential uses. The proposed changes will facilitate the delivery of the development yield identified for the Site in the Googong Masterplan.

It is advised that this planning proposal would enable an additional 160 dwellings.

4.2 Proposed transport network

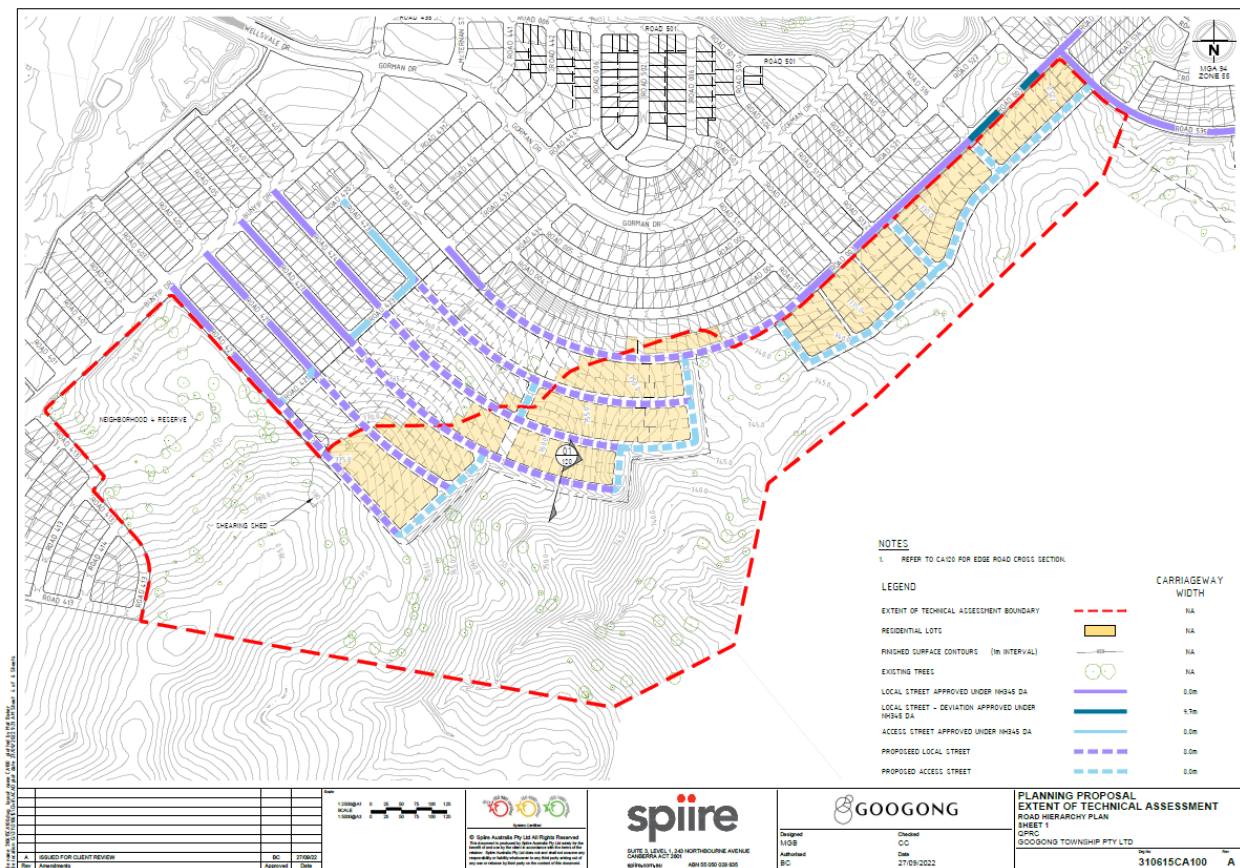
The proposed transport network needs to cater for the travel characteristics of the proposed land uses as well as integrate appropriately with the surrounding network. The majority of trips leaving the Site are expected to be by private vehicle, so the most important interface for the precinct is with the existing and the planned road network.

4.2.1 Road network and hierarchy

The proposed change to the street and the hierarchy are shown in **Figure 4-1**, which are slightly different from the street network specified in the approved DA.

- The proposed E2 land use replaced the current R1 in a square shape, resulting in the shortening of the access streets to the west of the proposed E2 area and a new edge street.
- The local streets to the east of the E2 area are extended further to the east to shape the additional R1 land use and terminated by an edge street (categorised as an access street).
- With the lot size reduced to 600m² per lot, additional access streets will be provided for access to the proposed residential dwellings.

Figure 4-1 Proposed road network

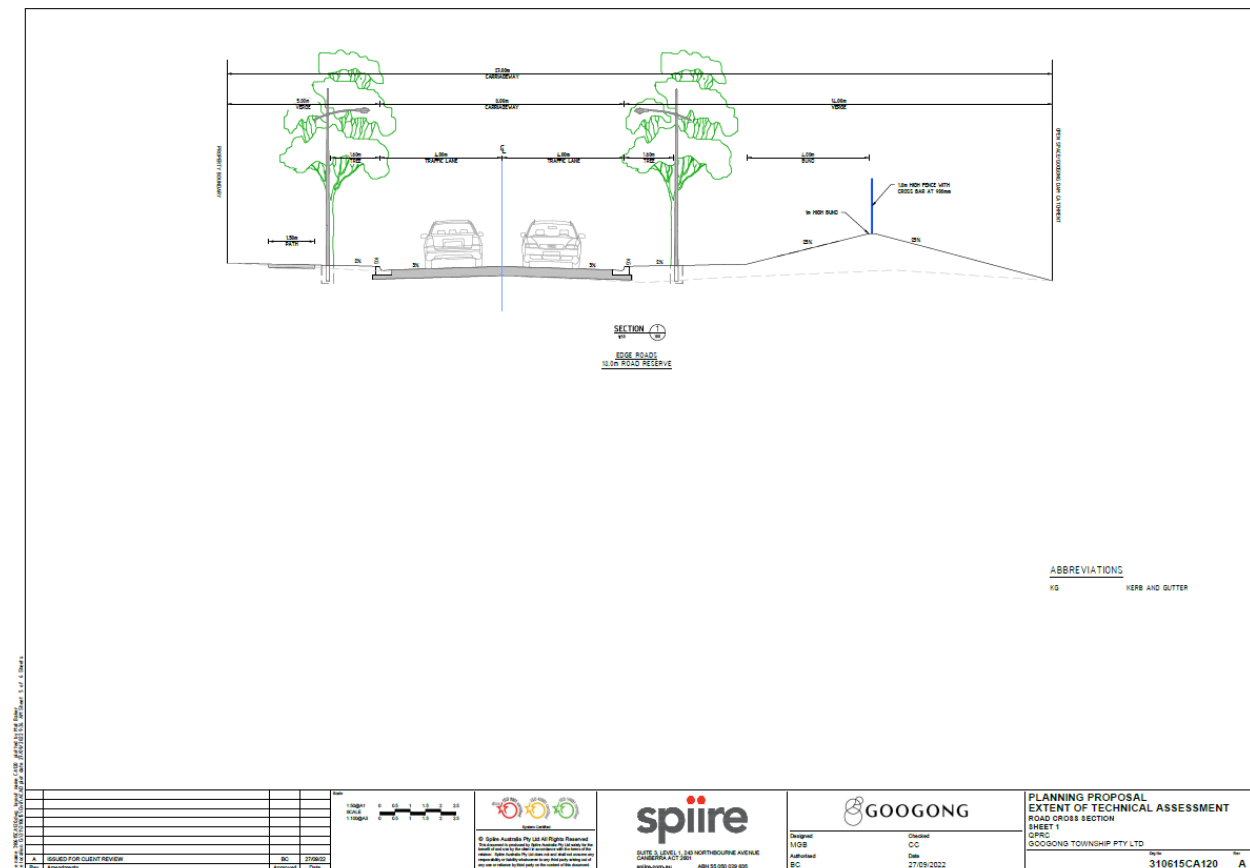


Source: Spiire, 2022

4.2.2 Proposed cross-section

The proposed cross-sections are expected to be consistent with what has been approved in DA since the changes to the road network are limited to extensions/shortening of the approved lower-hierarchy streets. The proposed cross-section for the edge road is shown in **Figure 4-2**.

Figure 4-2 Proposed cross-section for edge road



Source: Spiire, 2022

4.2.3 Public transport network

There would be no changes to the approved bus network for NH345 which would operate on Wellsvale Drive, Gorman Drive and Bunyip Drive with a total of six pairs of bus stops provided. Bus stops presented in the plan would be on both sides of the road and will cover the majority of the additional residential dwellings for this planning proposal.

The approved bus route would connect with the existing bus route in NH2 (Wellsvale Drive) and NH1 (Gorman Drive).

4.2.4 Active transport network

The delivery of Bunyip Drive, Wellsville Drive and Gorman Drive in NH345 will extend the precinct cycleway network via the dedicated cycle lanes on both sides of the proposed local sub-arterial road and collector street deviation.

A minimum of 1.5 m wide paths will be provided on at least one side of all roads. Together with the road network change as a result of the planning proposal, the 1.5m wide paths will be extended on local streets and access streets to facilitate walking. No change will occur to the cycleway network.

4.3 Proposed parking provision

The parking requirements are set out in Queanbeyan DCP and Googong DCP, as discussed in **Sections 2.4 and 2.5**. It is implied that residential parking will generally be provided off-street, while only visitor parking be provided on-street. Given on-street parking would be provided on access streets (partially), and local streets, the visitor parking demand is expected to be satisfied which will be compliant with the DCPs.

5.0 Traffic and Transport Impact Appraisal

5.1 Traffic modelling approach in the approved development application for NH345

5.1.1 Tracks Model Review 2021

As part of the DA for NH345, the local Tracks model was received and updated to be useful for forecasting.

Queanbeyan-Palerang Regional Council (QRPC) provided GTPL with a download link for the "2031Revised_SthJ_and_GoogongNH2345_Mar19" version of the Queanbeyan TRACKS model.

TRACKS is a strategic transport modelling suite originally developed by Gabites Porter in the early 1960s and managed by Transportation and Traffic Systems (TTS) (now Stantec), which uses the location and intensity of land uses, the transportation system that links them and forecasts the travel behaviour that results.

The model was supplied with documentation for a 2011 model-building effort but not related to the current version of the model supplied. SCT Consulting also located a TRACKS model development report for select road improvements in South Jerrabomberra and Queanbeyan (TDG, 2014). This report provides no information on the development of the TRACKS model but supplies information about scenarios tested for QRPC regarding road improvements. Some assumptions made in this report have been replicated where possible within this TRACKS modelling exercise.

One of the input files supplied by the Council was corrupted – Assign7.exe. SCT Consulting worked with TTS (now Stantec) to replace this file with a newer release. As there was no documentation supplied for the model, it was not possible to validate any changes due to the update of Assign7.exe.

The 2031Revised_SthJ_and_GoogongNH2345_Mar19 was reviewed against Googong Structure Plan Neighbourhoods 3,4 & 5 Traffic Report (Calibre, 2019). The issues observed are outlined below.

- Volumes do not match those of the Googong NH345 structure plan
- Zone geometry is unclear
- Zones are highly aggregated
- The number of households exceeds that anticipated by the structure plan
- Location of schools inconsistent with current planning
- Road alignments are not consistent with structure plan approvals.

Hence the TRACKS model required updates not only to address the refinements of the planning proposal but also to address deficiencies in the model for the structure plan.

The TRACKS model was updated holistically for the entirety of the Googong area – neighbourhoods 1 through 5 – to ensure that the model was fit for purpose and suitable for planning local roads. The following parameters were adjusted in the model:

- Zone structure, including a disaggregation effort to improve assignment on smaller-order roads
- Zone demands to ensure consistency with current and future land use
- Road network geometry, particularly in the NH345 area
- Road hierarchy.

5.1.2 Updates of the TRACKS demands

The zone geometry was updated, including:

- Zone disaggregation using unused zones from elsewhere in the model
- Update of zone connector locations
- Update of zone demands in the .znd file.

In general, zone connectors are placed either at the centroid of the zone or at a location that would encourage wider distribution of trips (e.g. zone 1079, which connects to the point farthest away from the collector network).

The network changes included the conversion of some intersections to left in-left out only, which are located on Bunyip Drive, Wellsvalle Drive.

5.1.3 Household updates

The number of dwellings was counted by Spiire using the proposed subdivision plans. The number of Queanbeyan households was set to an identical figure. This is summarised in **Table 5-1**.

Table 5-1 Population summary

Area	Households	Population
NH12	4,214	13,316
NH345	2,297	7,259
Total	6,511	20,575

The TRACKS model assumes no major differences in household structure depending on dwelling type.

5.1.4 Employment updates

An update to the number of jobs in each zone requires the population of the following job categories:

- Retail
- Finance
- Community (education and health)
- Manufacturing (mining, etc.)
- Other jobs.

Jobs relating to land use such as shopping centres, cafés, retail, sporting, and schools were determined by review of typical proportions of GFA or students to staff. Home-based employment is slightly more challenging in that any house may have a self-employed person or it may not. The presence of a house does not directly guarantee that a job will occur on that premise.

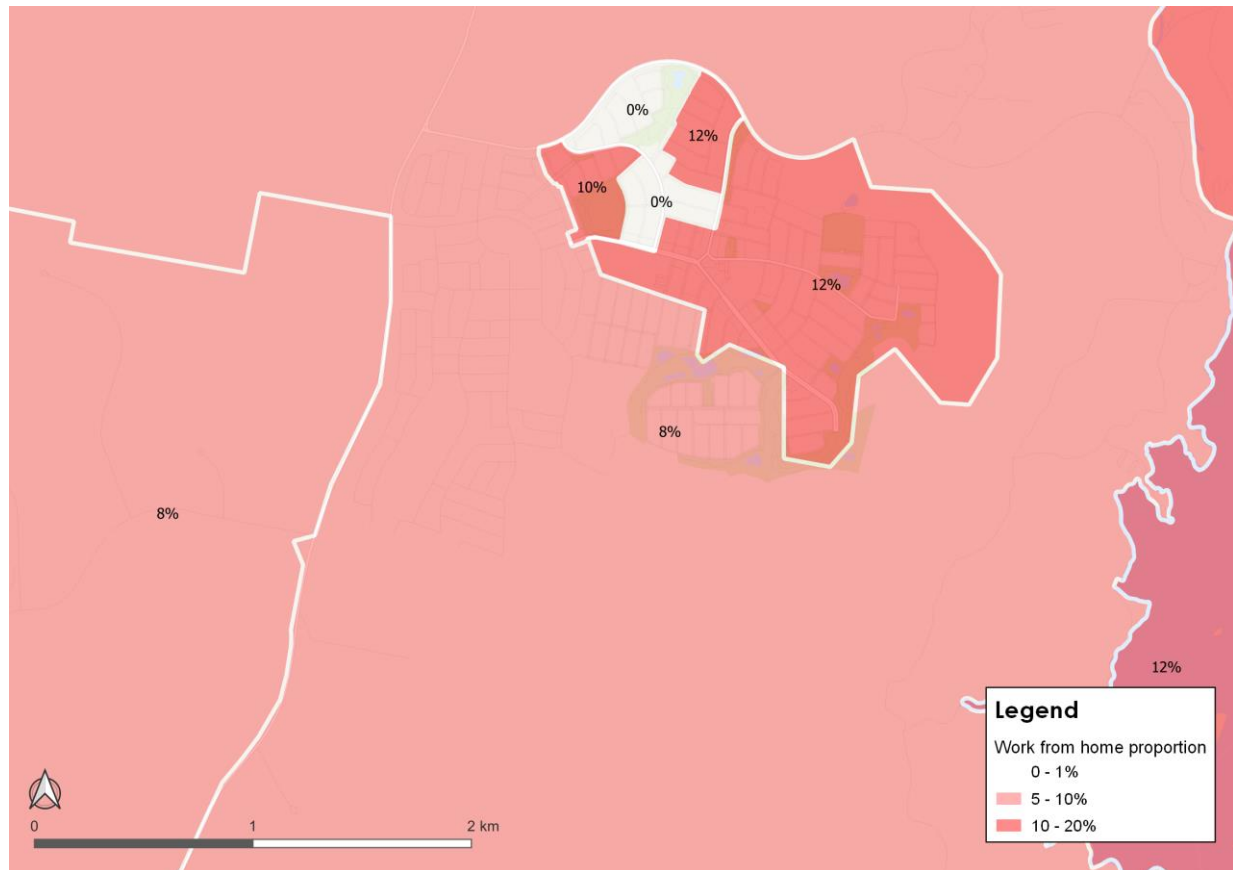
The Googong-Tralee-Environs area had the following key statistics on the night of the census in 2016:

- There was a total of 911 dwellings, 839 of which were occupied
- The household size was an average of 3.16 persons per dwelling
- Of the total population of 2,702, 1,854 people were between the ages of 15 and 65. Of this, 1,489 were employed.

Hence the employed population represents 1.74 persons per household.

Method of travel to work data was obtained from the 2016 Census, which included the travel mode “Worked from home”. The data is mapped to the Statistical Area 1 geography as shown in **Figure 5-1**. As the census occurred in 2016, there are significant areas not yet delivered within Googong Neighbourhoods 1 and 2.

Figure 5-1 Work from home proportion in Googong



Source: SCT Consulting, © OpenStreetMap Contributors, Australian Bureau of Statistics, 2021

Despite the census' historic view, the data appear to be relatively stable in the outcome – approximately 10 per cent of workers worked from home in 2016. This was before COVID-19, which is expected to change working-from-home behaviours.

This data is used to make the inference that home-based businesses create employment at the rate of 10 per cent of workers. Therefore, the total employment for residential dwellings would be at the rate of 0.174 jobs per household. Without any further information about the industry type of these jobs, an even division will be applied across retail (e.g. salons), finance (e.g. financial planners), community (e.g. daycare centres), and other jobs. It is assumed that manufacturing isn't compatible with home-based businesses.

The proposed job rates used in the TRACKS model are provided in **Table 5-2**.

Table 5-2 Employment by land use

TRACKS employment category (sic) ¹	Retail jobs	Finance	Community	Manufacturing	Other jobs
Centre (retail, various community,	1 job / 20m ² GFA, 80% of total jobs ²	Nil	1 job / 20m ² GFA, 20% of total jobs ³	Nil	Nil
Sporting facilities/fields/etc.	Nil	Nil	1 job / 90m ² GFA of buildings only ⁴	Nil	Nil
Primary and secondary schools	Nil	Nil	1 teacher per 18 students ⁵	Nil	Nil
Detached dwellings – home-based businesses or working from home	0.04 per household	0.04 per household	0.04 per household	Nil	0.04 per household

Source: SCT Consulting and various others 2021

Other key assumptions in employment generation are:

- Where measuring from satellite, GFA is equivalent to 80% of Gross Building Area
- Passive open space does not generate any employment specifically. This is equivalent to assuming that landscaping jobs are captured by home-based employment.

The results of this analysis are summarised in **Table 5-3**.

Table 5-3 Employment summary

Area	Retail jobs	Finance jobs	Community jobs	Manufacturing jobs	Other jobs	Total jobs
NH12	910	169	606	0	169	1,854
NH345	398	93	169	0	93	753
Total	1,308	262	775	0	262	2,607

Source: SCT Consulting based on Spiire and various others, 2021

As a method of internal consistency checking, the job containment was measured, which is the proportion of the workforce that could live and work in Googong (**Table 5-4**).

Table 5-4 Estimated upper limit of job containment

Area	Dwellings	Workforce	Total jobs	Job containment
NH12	4,214	7,332	1,854	25%
NH345	2,297	3,997	753	19%
Total	6,511	11,329	2,607	23%

At an average of 23 per cent, the job containment is at a reasonable level – not exceeding 100% and having a value consistent with a satellite township of Canberra.

¹ Validation reporting was not available at the time of writing, so the job types are referenced directly as specified in the model.² Employment Densities: A Full Guide (Arup) <https://neregenarchive.online/wp-content/uploads/2018/01/2001-07-English-Partnerships-Employment-Densities-A-Full-Guide.pdf> it is assumed 80% is retail and 20% is community jobs.³ Employment Densities: A Full Guide (Arup) <https://neregenarchive.online/wp-content/uploads/2018/01/2001-07-English-Partnerships-Employment-Densities-A-Full-Guide.pdf> it is assumed 80% is retail and 20% is community jobs.⁴ ibid⁵ School Infrastructure NSW based on our work on the school delivery program

5.2 Trip generation and distribution

An additional 190 dwellings could be developed in NH345 with no changes in the planning controls. Furthermore, additional 160 dwellings will be increased by this planning proposal. The total dwellings in the NH345 would increase by 350 dwellings compared to the DA submission. The impact due to additional dwellings was tested as a result of this planning proposal to understand the impact of the land rezoning and LEP amendment.

The trip generation, distribution and assignment processes were run using the new build functions provided by TTS (now Stantec) as previous versions provided with the model were corrupted. It is assumed that there are no major changes in functionality., Assign7.exe was used, which is a similar build to that used in the previous Googong run (Assign7.exe of a previous build).

5.3 Road network impacts

5.3.1 Road network

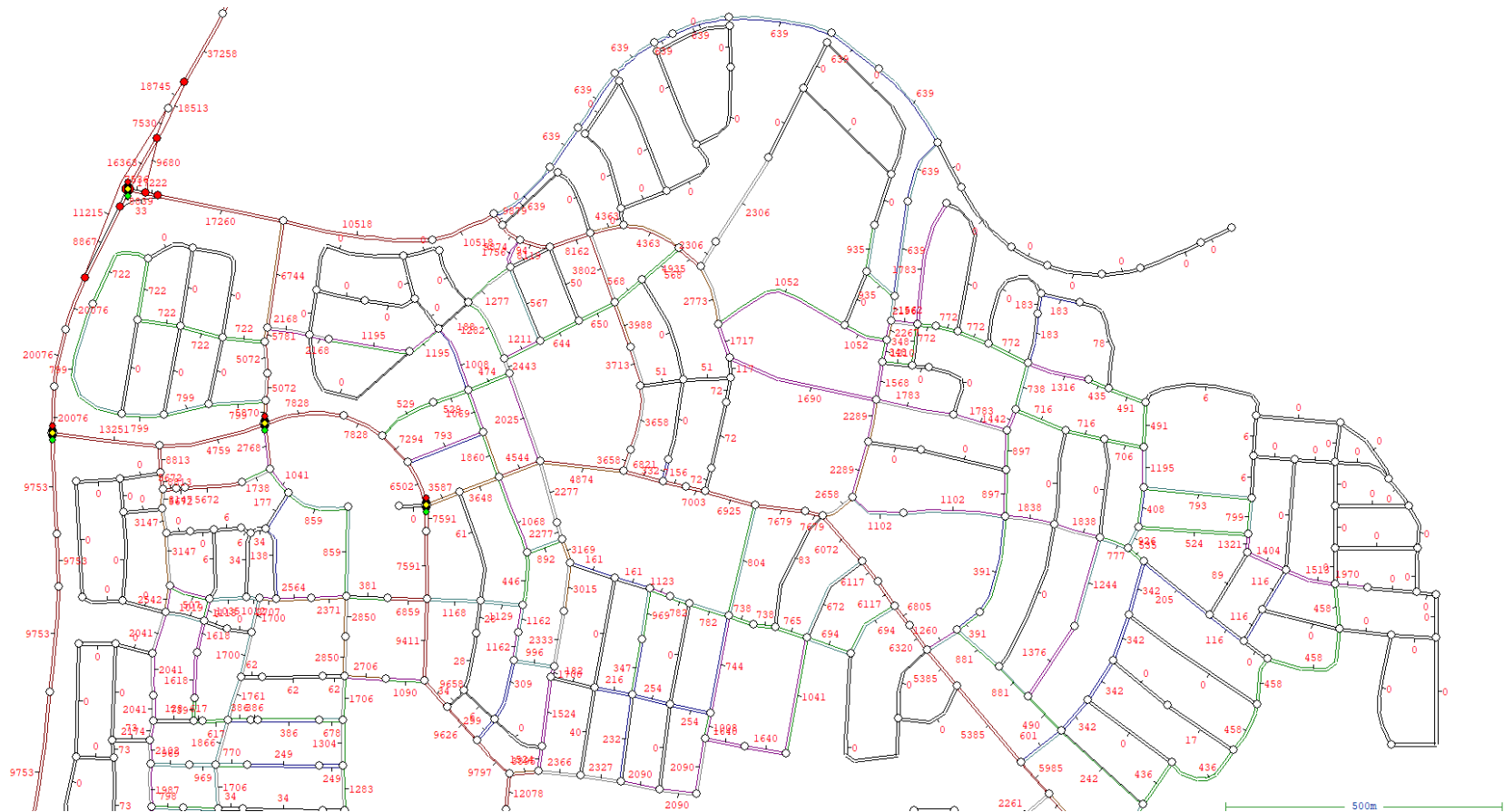
An additional 350 residential lots were tested as part of the planning proposal scheme during the DA stage to ensure that the road hierarchy was not affected by the potential uplift and that roads are appropriately future-proofed and do not need to be modified should the planning proposal progress.

There were no increases in areas that require an increase in the road hierarchy. The only road that tips over into a new category is the road adjoining NH5 local centre, which exceeds the collector volume of 3,000 vpd. It is considered that the minor increase above the category by 300 vehicles per day does not warrant an increase into a cross-section that is a divided carriageway.

The planning proposal has been assessed with a net increase of 350 dwellings above the Neighbourhood 3, 4 and 5 (NH345) subdivision DA, which was tested as a sensitivity scenario in the DA submission.

Figure 5-2 and **Figure 5-3** show the daily network vehicle volume from the TRACKS outputs and **Figure 5-4** to **Figure 5-7** show bidirectional volume for the morning and the evening peak hour. The modelling confirms that the approved road network is still feasible for the planning proposal (**Table 5-5**).

Figure 5-2 2031 24-hour link two-way volumes (northern part)



This figure is a detailed map of a river network, likely the Rhine, showing various tributaries and confluences. The map is color-coded: red for the main river, green for tributaries, and blue for smaller streams. Numerous numerical values are placed along the river segments, possibly representing flow rates or distances. A scale bar at the bottom right indicates 500m.

Figure 5-4 2031 AM peak link two-way volumes (northern part)

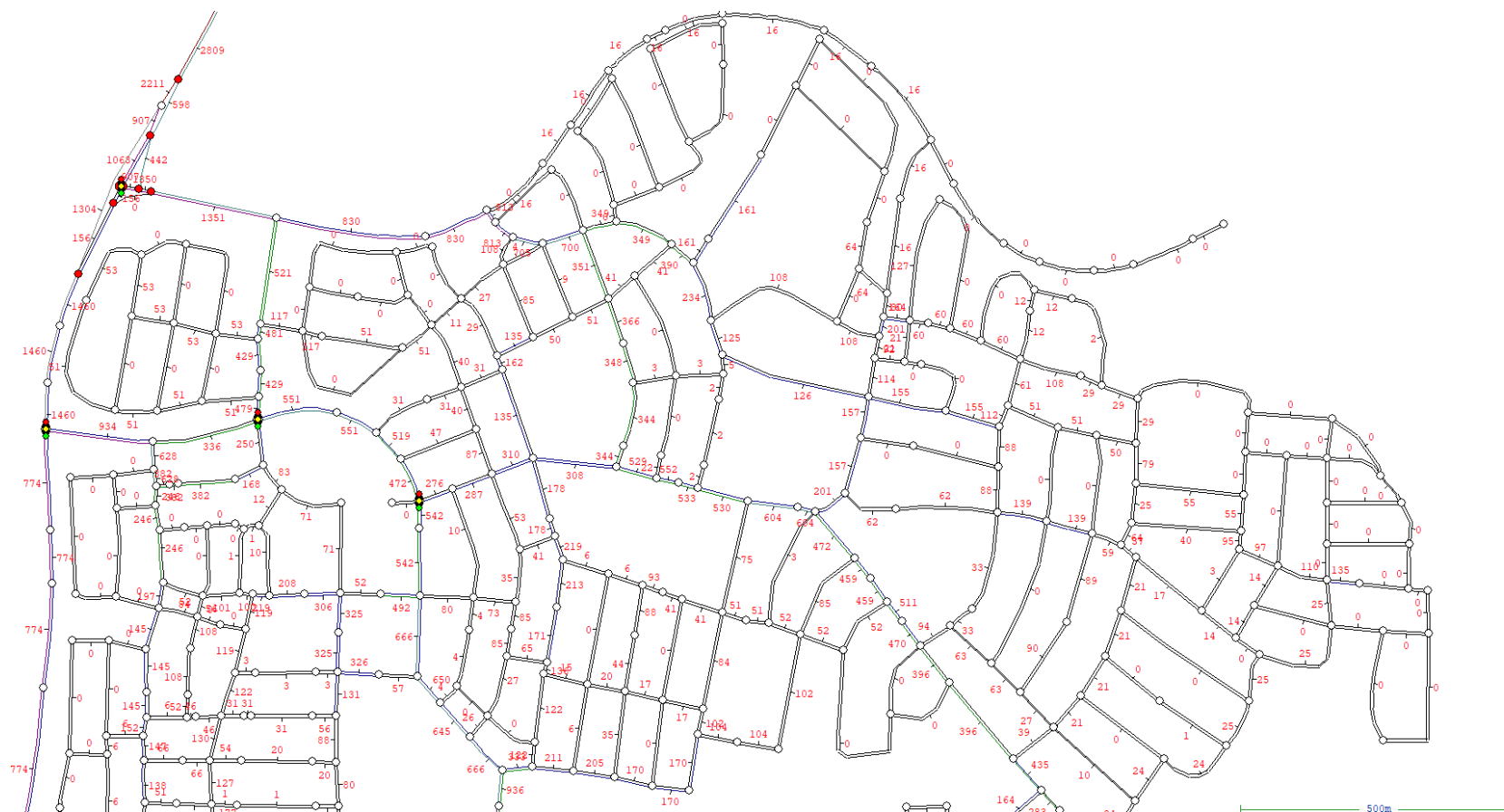


Figure 5-5 2031 AM peak link two-way volumes (southern part)

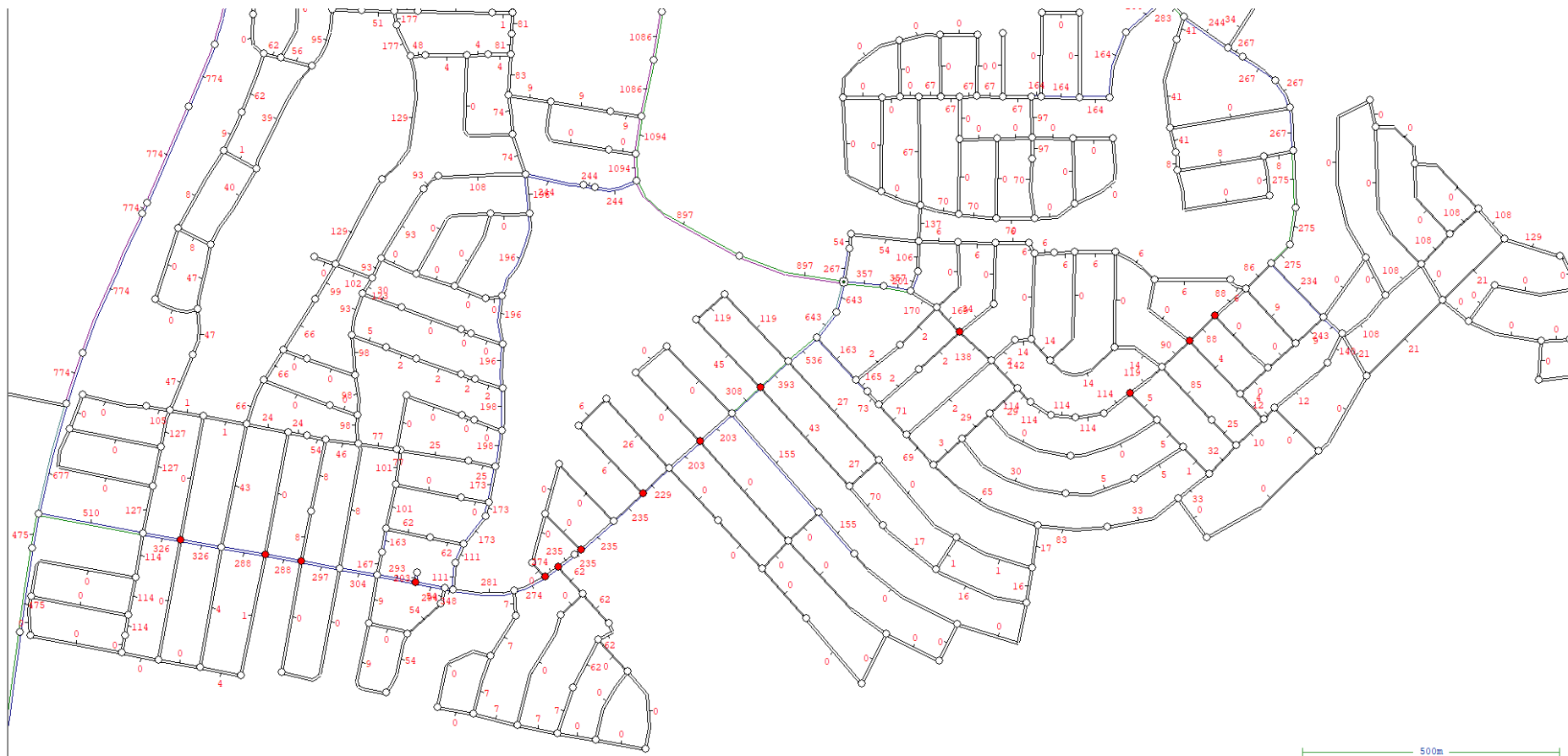


Figure 5-7 2031 PM peak link two-way volumes (southern part)

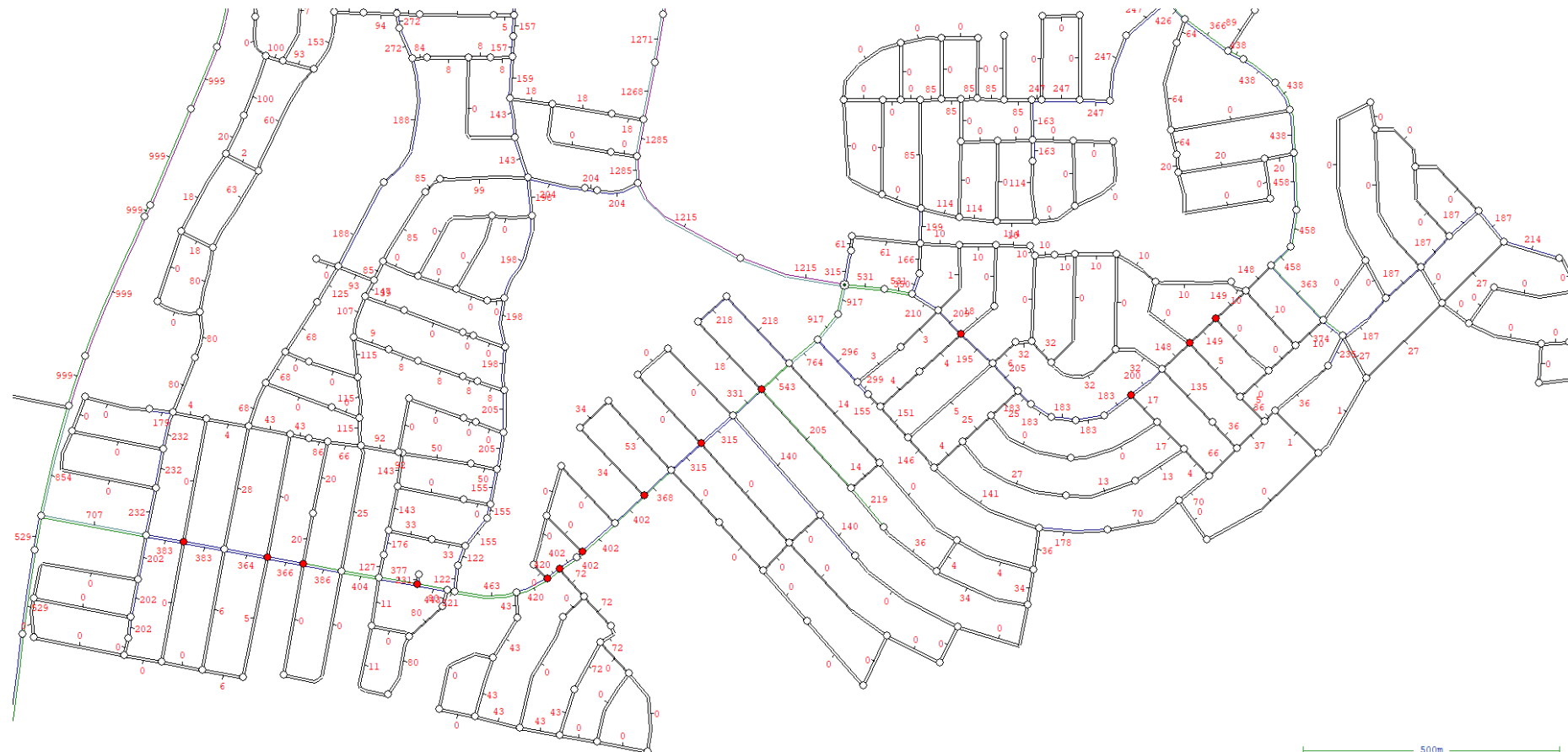


Table 5-5 Road hierarchy and volume analysis

Link	Road hierarchy	Volume comparison
Wellsvale Drive	Local sub-arterial (max 6,000vpd)	11,500 vpd in the NH345 area. This is less than previous forecasts for Wellsvale Drive where the Local sub-arterial road type was approved. Some localised widening will be proposed at the intersection of Wellsvale Dr / Bunyip Dr / Gorman Dr as required to achieve acceptable performance.
Bunyip Drive		8,600 vpd near the intersection of Gorman Drive / Wellsvale Drive. This is over the traffic volumes expected for a local sub-arterial. Further discussion of Bunyip Drive is provided below this table.
Gorman Drive		4,900 vpd near Bunyip Drive. A deviation is proposed for a sub-section to allow lots with frontage to have driveway access at sections where traffic forecasts are lower (less than 1,800 vpd). Lots will be of sufficient width to allow safe movement of vehicles.
New collector road adjoining Bunyip Drive	Collector road (max 3,000 vpd)	2,500 vpd near Bunyip Drive
Road adjoining NH5 local centre		3,300 vpd, This is slightly over the traffic volumes expected for a collector road. A minor increment in the daily volume does not require an increase in a road hierarchy.
Glenrock Drive	Local road (max 2,000 vpd)	1,800 vpd
Lanbrigg Road		1,900 vpd
Various others		<2,000 vpd

The result indicates that there are no additional roads in the study area that requires an increase in the road hierarchy.

Despite exceeding the 6,000 vehicles per day volume, a two-lane Bunyip Drive is considered appropriate because:

- There is no higher-order road specification within *QPRC-D1-Geometric Road Design Specification* for the road volume.
- The peak hour volumes are less than the *Austroads Guide to Traffic Management* capacity figures.
- Intersection modelling shows that only localised turning bays are necessary.
- Potential capacity issues on Wellsvale Drive do not require dual lanes to make Bunyip Drive attractive.
- Dual lane for the duration would have downsides, regardless of how it is implemented.
- Narrower roads lead to safer pedestrian crossing.

The only road that tips over into a new category is the road adjoining NH5 local centre, which exceeds the collector volume of 3,000 vpd. It is considered that the minor increase above the category by 300 vehicles per day does not warrant an increase into a cross-section that is a divided carriageway.

5.3.2 Intersection modelling

SIDRA modelling is proposed to evaluate intersection performance for Bunyip Drive / Old Cooma Road, which has been used for the previous stages of planning in Googong.

5.3.2.1 Intersection level of service

Intersection Level of Service (LoS) is a typical design tool used by traffic engineers to identify when roads are congested. The Level of Service as defined in TfNSW Traffic Modelling Guidelines is provided in **Table 5-6**.

Table 5-6 Level of Service definitions

Level of Service	Average delay per vehicle (seconds)	Performance explanation
A	Less than 14.5	Good operation
B	14.5 to 28.4	Good with acceptable delays and spare capacity
C	28.5 to 42.4	Satisfactory
D	42.5 to 56.4	Operating near capacity
E	56.5 to 70.4	At capacity, at signals incidents will cause excessive delays. Roundabouts require other control method.
F	70.5 or greater	At capacity, signals incidents will cause excessive delays. Roundabouts require other control method.

Source: Roads and Maritime Services (2002), Traffic Modelling Guidelines

In addition, the **Degree of Saturation (DoS)** is included to complement the Level of Service. It is a measure of the volume/capacity for the worst turning movement at the intersection. A DoS of 1.0 implies that the turning movement is at capacity.

5.3.2.2 Intersection performance

The turning volumes identified in the core TRACKS were tested in the SIDRA modelling.

For the Bunyip Drive / Old Cooma Road intersection, a signal intersection has been adopted according to the ongoing modification for the intersection type to the approved DA. The modelling records a LoS B for both peak hours as a result of the planning proposal and indicates a limited increase in delay compared with the results of the approved DA. This shows that there is no significant impact on the intersection performance associated with the planning proposal.

Table 5-7 Intersection performance for Old Cooma Road / Bunyip Drive

Intersection type	Performance metric	Approved DA		Planning proposal	
		AM peak	PM peak	AM peak	PM peak
Signal	DoS	0.38	0.34	0.39	0.35
	Delay	20.1s	17.4s	20.3s	18.1s
	LoS	B	B	B	B

5.4 Public transport impacts

Local sub-arterial roads in the Site are proposed to be bus capable, enabling the majority of the area for the planning proposal to be covered by bus services. A meeting between QCity, GTPL and Spiire was held in March 2021 to discuss the proposed bus routes during the DA process. Key discussions in the meeting noted that:

- The bus route proposed remains consistent with the structure plan in closing the loop on Gorman Drive and Wellsville Drive. The completion of the loop will also provide an easy extension of the route for future K-12 schools.

- NH3 could be serviced by a route down Bunyip Drive which also provides another exit from Googong onto Old Cooma Road.

5.5 Active transport impacts

With footpaths proposed on both sides of all roads, active transport can be one of the most convenient modes for short-distance trips. The road network is grid-like in structure, providing numerous crossing opportunities and reducing travel distance between residential areas and the neighbourhood centre.

Although dedicated on-road cycle lanes are only available on Bunyip Drive and Wellsvale Drive, the rest of the road network within the precinct would expect relatively low vehicle traffic demand and slow traffic speeds. Hence, cycling on those streets would still be encouraged.

6.0 Conclusion

This traffic study shows that the planning proposal is suitable:

- The planning proposal seeks to amend the Land Use Zoning and Minimum Lot Size controls and maps under the QLEP 2012.
- The planning proposal has been assessed with a net increase of 350 dwellings above the Neighbourhood 3, 4 and 5 (NH345) subdivision DA including:
 - an additional 190 dwellings to be developed in NH345 with no changes in the planning controls
 - an additional 160 dwellings to be increased by this planning proposal.
- There is minimal change to the road alignment and road hierarchy across the Site which mainly includes the extension of the approved local and access streets and the addition of lower-hierarchy roads.
- The proposed cross-sections are expected to be consistent with the approved DA.
- This planning proposal was assessed as a sensitivity test in DA considering a yield of 350 dwellings. The TRACKS modelling confirms that the proposed road network is feasible for the planning proposal. The traffic volumes generally adhere to the maximum loading criteria for each street type.
- Wellsvale Drive and Bunyip Drive's being local sub-arterial roads have been approved during the DA stage. The planning proposal generally maintains the same traffic volume as the approved DA on the majority of the roads with a minor increase in the volume at a few locations.
- SIDRA intersection modelling was conducted for the intersections of Old Cooma Road / Bunyip Drive. A signal intersection has been adopted according to the ongoing modification of the intersection type to the approved DA. The modelling records an LoS B for both peak hours as a result of the planning proposal and indicates a limited increase in delay compared with the results of the approved DA.
- The bus stops in the approved NH345 will still cover most of the residential dwellings for the planning proposal.
- Dedicated on-road cycle lanes are available on Bunyip Drive and Wellsvale Drive. The rest of the road network within the Site would expect relatively low vehicular traffic demand and slow traffic speeds, hence, cycling friendly. With footpaths proposed on at least one side of all roads, active transport can be one of the most convenient modes for short-distance trips.
- Residential parking will generally be provided off-street while visitor parking demand is expected to be satisfied by on-street parking.

The Transport Study concluded that the planning proposal is at a level able to be accommodated by the existing and planned infrastructure.

APPENDIX A

SIDRA modelling output

MOVEMENT SUMMARY

 **Site: 104 [OCR_BUN_31_AM_DA (Site Folder: DA)]**

New Site

Site Category: Future Conditions 1

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance															
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed	
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] m					
						v/c	sec							km/h	
South: Old Cooma Road (s)															
2	T1	275	5.0	289	5.0	* 0.383	20.6	LOS B	9.0	65.8	0.75	0.64	0.75	49.4	
3	R2	99	2.0	104	2.0	0.153	25.8	LOS B	3.0	21.1	0.68	0.75	0.68	44.8	
Approach		374	4.2	394	4.2	0.383	22.0	LOS B	9.0	65.8	0.74	0.67	0.74	47.8	
East: Bunyip Drive															
4	L2	56	2.0	59	2.0	0.384	22.3	LOS B	9.3	66.5	0.69	0.78	0.69	46.0	
6	R2	256	2.0	269	2.0	* 0.384	22.3	LOS B	9.3	66.5	0.69	0.78	0.69	39.9	
Approach		312	2.0	328	2.0	0.384	22.3	LOS B	9.3	66.5	0.69	0.78	0.69	41.1	
North: Old Cooma Road (n)															
7	L2	103	2.0	108	2.0	0.078	8.1	LOS A	0.5	3.7	0.19	0.65	0.19	53.7	
8	T1	51	5.0	54	5.0	0.071	17.7	LOS B	1.4	10.5	0.65	0.50	0.65	52.2	
Approach		154	3.0	162	3.0	0.078	11.3	LOS A	1.4	10.5	0.34	0.60	0.34	53.2	
All Vehicles		840	3.2	884	3.2	0.384	20.1	LOS B	9.3	66.5	0.65	0.70	0.65	45.8	

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

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MOVEMENT SUMMARY

 **Site: 104 [OCR_BUN_31_PM_DA (Site Folder: DA)]**

New Site

Site Category: Future Conditions 1

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Old Cooma Road (s)														
2	T1	100	5.0	105	5.0	0.139	18.3	LOS B	2.9	21.3	0.67	0.54	0.67	51.6
3	R2	85	2.0	89	2.0	* 0.190	31.3	LOS C	2.9	20.7	0.77	0.76	0.77	41.9
Approach		185	3.6	195	3.6	0.190	24.3	LOS B	2.9	21.3	0.72	0.64	0.72	45.9
East: Bunyip Drive														
4	L2	97	2.0	102	2.0	0.339	21.9	LOS B	8.0	57.1	0.68	0.77	0.68	46.2
6	R2	178	2.0	187	2.0	* 0.339	21.8	LOS B	8.0	57.1	0.68	0.77	0.68	40.1
Approach		275	2.0	289	2.0	0.339	21.8	LOS B	8.0	57.1	0.68	0.77	0.68	42.5
North: Old Cooma Road (n)														
7	L2	341	2.0	359	2.0	0.253	8.2	LOS A	2.1	14.8	0.23	0.67	0.23	53.5
8	T1	240	5.0	253	5.0	0.334	20.1	LOS B	7.7	56.0	0.74	0.62	0.74	49.9
Approach		581	3.2	612	3.2	0.334	13.1	LOS A	7.7	56.0	0.44	0.65	0.44	52.0
All Vehicles		1041	3.0	1096	3.0	0.339	17.4	LOS B	8.0	57.1	0.55	0.68	0.55	47.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

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MOVEMENT SUMMARY

 **Site: 104 [OCR_BUN_31_AM_PP (Site Folder: PP)]**

New Site

Site Category: Future Conditions 1

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
						v/c	sec							km/h
South: Old Cooma Road (s)														
2	T1	274	5.0	288	5.0	* 0.382	20.6	LOS B	9.0	65.5	0.75	0.64	0.75	49.4
3	R2	99	2.0	104	2.0	0.153	25.8	LOS B	3.0	21.1	0.68	0.75	0.68	44.8
Approach		373	4.2	393	4.2	0.382	22.0	LOS B	9.0	65.5	0.74	0.67	0.74	47.8
East: Bunyip Drive														
4	L2	56	2.0	59	2.0	0.384	22.3	LOS B	9.3	66.5	0.69	0.78	0.69	46.0
6	R2	256	2.0	269	2.0	* 0.384	22.3	LOS B	9.3	66.5	0.69	0.78	0.69	39.9
Approach		312	2.0	328	2.0	0.384	22.3	LOS B	9.3	66.5	0.69	0.78	0.69	41.1
North: Old Cooma Road (n)														
7	L2	103	2.0	108	2.0	0.078	8.1	LOS A	0.5	3.7	0.19	0.65	0.19	53.7
8	T1	51	5.0	54	5.0	0.071	17.7	LOS B	1.4	10.5	0.65	0.50	0.65	52.2
Approach		154	3.0	162	3.0	0.078	11.3	LOS A	1.4	10.5	0.34	0.60	0.34	53.2
All Vehicles		839	3.2	883	3.2	0.384	20.1	LOS B	9.3	66.5	0.65	0.70	0.65	45.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

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MOVEMENT SUMMARY

 **Site: 104 [OCR_BUN_31_PM_PP (Site Folder: PP)]**

New Site

Site Category: Future Conditions 1

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site User-Given Cycle Time)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
						v/c	sec							km/h
South: Old Cooma Road (s)														
2	T1	100	5.0	105	5.0	0.139	18.3	LOS B	2.9	21.3	0.67	0.54	0.67	51.6
3	R2	85	2.0	89	2.0	* 0.190	31.3	LOS C	2.9	20.7	0.77	0.76	0.77	41.9
Approach		185	3.6	195	3.6	0.190	24.3	LOS B	2.9	21.3	0.72	0.64	0.72	45.9
East: Bunyip Drive														
4	L2	97	2.0	102	2.0	0.336	21.8	LOS B	8.0	56.6	0.67	0.77	0.67	46.2
6	R2	176	2.0	185	2.0	* 0.336	21.8	LOS B	8.0	56.6	0.67	0.77	0.67	40.2
Approach		273	2.0	287	2.0	0.336	21.8	LOS B	8.0	56.6	0.67	0.77	0.67	42.6
North: Old Cooma Road (n)														
7	L2	330	2.0	347	2.0	0.245	8.2	LOS A	2.0	14.2	0.23	0.67	0.23	53.5
8	T1	241	5.0	254	5.0	0.336	20.1	LOS B	7.7	56.3	0.74	0.62	0.74	49.9
Approach		571	3.3	601	3.3	0.336	13.3	LOS A	7.7	56.3	0.44	0.65	0.44	51.9
All Vehicles		1029	3.0	1083	3.0	0.336	17.5	LOS B	8.0	56.6	0.55	0.68	0.55	47.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

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