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<b>Subject</b>	<b>Response to Comments from Public Exhibition</b>	<b>Project Name</b>	Kellyville/Bella Vista Station Precinct Transport Study
<b>Attention</b>	Landcom	<b>Project No.</b>	50610-6/7 IA202400
<b>From</b>	Miliss Mansour		
<b>Date</b>	22 June 2020		
<b>Copies to</b>	<Name>		

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Below provides a summary of Jacob's responses to the recent public exhibition of the traffic and transport report that was undertaken by the Department of Planning, Industry and Environment in late 2019.

The traffic and transport report has been updated to include comments received from the public exhibition and should be referred to for further detail.

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### Responses to Public Comments

Row No	Name	Precinct	Issue	Jacobs Response
1	Withheld	Bella Vista	<p>"- The infrastructure for The Bella vista precinct is not planned for.</p> <p>- The existing roads are at capacity under current context and cannot accommodate further traffic from development.</p> <p>- The current Bella Vista station car park is at capacity.</p> <p>- No traffic measures taken for the traffic in the Norwest Business Park</p> <p>- Balmoral Rd is also at capacity and will not accommodate further traffic from development</p> <p>- Recommend that that DPIE visit the Bella Vista precinct and car park during peak hour.</p> <p>- High traffic delays exiting the Bella Vista car park to access Old Windsor Road."</p>	<p>The traffic assessment report that was prepared for the two precincts included a detailed assessment of the existing traffic conditions. The report identified several intersections that are presently experiencing delays in peak periods when demand on the roads is highest. As part of this assessment the study identified the scale and impact of the traffic that would be generated by the SSDA and assessed what impacts the additional traffic will have on the existing road network in the area and advised on measures that would mitigate the impacts including:</p> <ol style="list-style-type: none"> <li>1. Strict limits on the number of car parking spaces that new developments will be allowed to provide onsite</li> <li>2. A well-connected network of pedestrian and cycling facilities to encourage greater take up of these modes to reduce need for using a car particularly for shorter distance trips</li> <li>3. Inclusion of travel green travel plans to encourage greater use of non-motorised trips</li> <li>4. Road infrastructure improvements at intersections and new access roads to ensure that the operation of the surrounding roads would not worsen as a direct result of development of the two precinct and their traffic.</li> </ol> <p>Landcom is working with TfNSW/RMS to refine the measures and road improvements proposed in order to maximise their benefits so that as well as accommodating the traffic from the SSDA, these improvements will</p>

Row No	Name	Precinct	Issue	Jacobs Response
				provide wider benefits to the community and alleviate some of the existing problems.
2	Withheld	Bella Vista	<ul style="list-style-type: none"> <li>- Lack of infrastructure in place to accommodate additional traffic from development.</li> <li>- Routinely takes 1 hour to get from Lexington Dr to Windsor Rd due to lack of time and space to access Windsor Rd from Celebration Dr.</li> <li>- The Metro has done little to improve traffic and the development proposal will compound the issues.</li> </ul>	The traffic assessment has identified the scale of traffic that would be generated by development of Bella Vista station precinct and has recommended a series of improvements to accommodate its traffic so that the road network condition would not worsen as a direct result of the development. The assessment has shown that the identified improvements would be sufficient to offset the impact and there will be no overall worsening of traffic conditions.
4	Withheld	Bella Vista	<ul style="list-style-type: none"> <li>- Traffic congestion in the area is already bad.</li> <li>- 4 light changes to get from Balmoral Rd to Glenwood (across Old Windsor Rd).</li> <li>- Parklea markets will eventually be converted to residential units and will add to congestion.</li> <li>- Encourage decision makers to drive through the area in peak time and this will get worse with the development proposal.</li> <li>- The pollution, noise, traffic and environmental stress will make the area even more unlit</li> </ul>	The traffic assessment has identified that there are existing capacity issues at several intersections on Old Windsor Road and Windsor Road in the peak hours. An objective of the assessment is to ensure that conditions will not further worsen as a direct result of development of the Bella Vista and Kellyville precinct. The NSW Government has invested heavily in providing the North-West Metro and the T-Way to cater for travel needs of residents in the area and bring about an attitudinal shift to the way we travel so that as Sydney grows public transport would become the major mode of travel across Sydney.
5	Withheld	Bella Vista	<ul style="list-style-type: none"> <li>- The roads (Miami St and Sunnyholt Rd) to access Glenwood are already heavily congested and will not cope with additional development.</li> <li>- The train stations are already full, so public transport is limited.</li> </ul>	The improvements identified as part of the development of Bella Vista precinct are aimed at accommodating traffic generated by the two precincts so that traffic condition would not worsen as a result.

Row No	Name	Precinct	Issue	Jacobs Response
			<ul style="list-style-type: none"> <li>- Our buses from the Hills have been terminated.</li> <li>- Will car spaces be provided from new residents or will residents cars line the streets?</li> <li>- Noise and disturbance associated with construction and additional population.</li> <li>- The mixed retail will mean restaurants and late evening traffic as well?</li> <li>- We couldn't sleep for 2 years due to development of the metro with repetitive noise, dirt and dust.</li> </ul>	<p>Off-street resident parking will be provided as part of the development in accordance with the parking rates that have been specified. These rates are based on benchmarking of similar use developments located within proximity of rail stations such as Norwest Station Precinct, North Ryde, Macquarie Park and Tallawong.</p> <p>Throughout the course of construction, the existing traffic capacities along the construction vehicle access routes would be maintained. Impact on access routes, parking etc during construction of the lots would be subject of construction management plan at the time of lodgement of a development application for each plot.</p> <p>The mixed-use retail within the residential and commercial lots are intended to support the local residential population and workers in the precinct.</p>
12	Larissa Rapisardi	Bella Vista	<ul style="list-style-type: none"> <li>- With the recent opening of the Metro, we have noticed an increase in traffic noise and cars using Celebration Dr as a rat-run to Balmoral Rd.</li> <li>- It has been increasingly difficult to cross from Brighton Dr to Celebration Dr to catch the Metro.</li> <li>- The proposed pedestrian access leads to the Celebration Dr and Brighton Dr intersection which is difficult to cross.</li> <li>- The location for a new 4-way intersection on Brighton Dr is questionable from a traffic safety view, but warranted for pedestrians.</li> </ul>	<p>The assessment has identified a number of measures that encourage greater use of public transport and active modes to reduce car dependency and includes recommendations to ensure traffic conditions would not worsen as a direct result of development of the two station precincts. Table A1.1 of the report provides a summary of road network improvements that have been identified to accommodate the additional traffic.</p>



Row No	Name	Precinct	Issue	Jacobs Response
			<ul style="list-style-type: none"> <li>- The pedestrian path on the creek side of Celebration Dr cannot be accommodated and would eliminate landscaping.</li> <li>- The concept proposal for no landscaping setbacks on celebration Dr is out of context for the surrounding Business Park and Residential areas and is detrimental to the opportunity for landscaping.</li> <li>- The setbacks proposed on Celebration Dr (Bella Vista Town Centre) are minimal and do not allow for landscaping or a buffer from future buildings to the creek. Building setbacks should be increased to 2-5m at ground level to accommodate landscaping</li> </ul>	

### Responses to RMS Comments

Item No	Precinct	Category	Issue	Jacobs Response
2a	Both	Public Transport Services	Page 19, Section 7.2 - Table 7.1 lists the existing bus services and peak hour frequencies of these services in the precinct. The bus routes and frequencies as recorded from 5 June 2019 have been significantly changed. The TTAR should reflect these changes.	Report amended
2b	Both	Public Transport Services	Page 20, Section 7.2 - Reference is made to the North West Night Bus. However, this is just a temporary initiative until Sydney Metro begins operating its full span of service.	Report amended
2c	Both	Public Transport Services	Page 21, Section 7.2 - The changes to bus services referred to in Section 7.2 which refer to the removal of bus routes are incorrect.	Report amended

Item No	Precinct	Category	Issue	Jacobs Response
2di	Kellyville	Public Transport Services	Page 69, Section 9.5.1.1 - Figure 9.7 has identified Wuban Ave as a "local street" as per the categorisations in Section 9.5.1.1. Wuban Street will continue to be used for bus circulation and accordingly should not be categorised as a local street.	Figure has been amended
3a	Both	Active Transport	Page 66, Section 9.4.2.1 - Measures to encourage users of the development to make sustainable travel choices, including walking, cycling, public transport and car sharing, such as the integration with rail and bus infrastructure and provision of adequate bicycle parking and end of trip facilities are required as part of the SEARs. The report notes their inclusion in Section 9.4.2.1, however they are not provided.	Section reference provided in Table 1.1 (SEARS) is incorrect. Correct section numbers have been added
3b	Both	Active Transport	Page 78, Section 10.1 - breaks down the relevant residential parking rates recommended by design guidelines and adopted in local town centres. Whilst the report mentions that bicycle parking rates should be in line with the Hills DCP 2012, further detail is not provided.	Section 10.5 bicycle parking numbers has been added
4a	Both	Traffic Modelling	The current report only provides summary of the intersection performance of the assessed scenarios	Additional SIDRA outputs will be provided in softcopy. It is not practical to attach outputs to the report due to large size. With regard to base Aimsun model calibration & validation report, section 8.4 explains how Aimsun has been used. For this project, it was calibrated to match the observed turning volumes at intersections only. It was not possible to concurrently match the travel times from the model to observed due to the high level of demand creating long queues that were causing modelled flows to drop

Item No	Precinct	Category	Issue	Jacobs Response
				below observed when attempting to match travel times. For this reason, no base year Aimsun calibration report was prepared.
4b	Both	Traffic Modelling	The model is not consistent with the Roads and Maritime Improvements proposed as part of the Memorial Avenue Upgrade for the intersection of Old Windsor Road/Memorial Avenue/Sunnyholt Road. Furthermore, some of the Jacobs recommended improvements for this intersection (i.e. additional northbound and southbound approach and departure lanes along Old Windsor Road) are already part of the Memorial Avenue Upgrade Project.	The intersection has been remodelled using the provided layout
4c		Traffic Modelling	Page 61, Table 9.7 - It is noted that the following deterioration in the Level of Service occurs at the intersection of Windsor/Old Windsor roads, yet no improvements are proposed (with Jacobs noting that there would be impacts on adjacent properties to undertake improvements). Looking at the aerial photography of this intersection, there seems to be sufficient room for the proponent to suggest / investigate improvements within the existing road reservation.	<p>The increase in number of right turners into Windsor Rd is believed to be due to the Aimsun model over sensitiveness to travel delays and less on the additional travel distance (1.2km) + 2 set of traffic lights that are not explicitly modelled.</p> <p>Traffic surveys show low utilisation of the right turn bay into Windsor Road from Old Windsor Road during peak periods and on Saturdays. Adding more capacity to this intersection would serve little purpose as drivers are unlikely to take the longer route to create a capacity issue at this intersection. Furthermore, there is little reason for Kellyville precinct traffic to use the right turn bay as it is not in route to any major destinations.</p>
4d		Traffic Modelling	Page 47, Section 9.2.1 – Table 9.1 states that the intersection of Celebration Drive and Lexington is operating at LOS B and LOS C, this statement does not reflect the true conditions on site as this intersection and	New traffic survey counts have been undertaken for the two intersections & they have been remodelled using SIDRA network.

Item No	Precinct	Category	Issue	Jacobs Response
			the intersection of Old Windsor Road and Celebration drive are operating at capacity due to the short distance between the two intersections.	
6c	Both	General Comment	Page 69, Section 9.5.1.2 – Figure 9.8 indicates a new traffic signal at the intersection of Doran Road and Decora Drive for Kellyville station precinct which is located within a close proximity to the newly constructed traffic signal at the intersection of Samantha Riley Drive and Decora Drive	Traffic signal is the preferred treatment at this intersection due to pedestrians and cyclists that would be crossing Decora Avenue between Kellyville station & Wenden Avenue via a new pedestrian/cyclist path across Elizabeth Macarthur Creek. Text added to 9.5.1.2 in the report to explain the reason.
6e		General Comment	Page 86, Section 11.1.2 - States "As part of the access needs of the Bella Vista precinct, it is proposed to provide a road connection across Balmoral Road to link the northern part of Bella Vista precinct with the southern part. This link is also required to connect the new school north of Balmoral Road with the rest of the residential developments to the south. It is proposed to be signalised to facilitate vehicle and safe pedestrian crossing between the school and the residential developments." However, page 101 indicates that Balmoral Road/Elizabeth Macarthur Link (Improvement Number 12) is an existing traffic signal.	Error in page 101 has been rectified.

### Responses to DPIE Independent Review

Item No	Precinct	Category	Issue	Jacobs Response
2	Both	General	The residential development yield (number of units) for Bella Vista described in Section 2.3.2 of the TTA (3,822 units) is inconsistent with the yield shown in Section 13 (Conclusion) of the TTA (5,474 units). Clarification and/or amendment is required.	Typo, amended
4	Both	Trip generation	Some trip generation information requires clarification / amendment: the trip generation for retail land use in 2026 (refer to Table 9.4 of the TTA) is incorrectly low based on the trip generation rates and development staging: Kellyville station precinct should be 61 vph in AM peak hour and 122 vph in PM peak hour, while Bella Vista station precinct should be 89 vph in AM peak hour and 178 vph in PM peak hour. Moreover, the trip generation for retail land use in 2036 (refer to Table 9.5 of the TTA) is also incorrectly low: Kellyville station precinct should be 243 vph in AM peak hour and 487 vph in PM peak hour, while Bella Vista station precinct should be 295 vph in AM peak hour and 592 vph in PM peak hour. It is also noted that the trip generation for commercial land use at Bella Vista in 2036 does not reflect the staging plan (refer to Table 2.5 of the TTA), which indicates that only 66,950 sqm of commercial space will be developed by 2036 out of the ultimate total 150,000 sqm, i.e. the trip generation for commercial land use at Bella Vista in 2036 is based on	Retail floor area shown in staging plan are gross floor areas. Trip rates are GLFA based. GFAs are converted to GLFA using a factor of 0.85. Note added to Table 9.4 to advise of this.

Item No	Precinct	Category	Issue	Jacobs Response
			the ultimate total 150,000 sqm to be developed by 2045.	
5	Both	Infrastructure upgrades	Future 2026 and 2036 road network / intersection operations deteriorate significantly in comparison with current 2019 conditions during both the 'background' traffic growth only scenario and the 'with station precinct developments' scenario, even with the planned / proposed infrastructure upgrades. This deterioration needs to be addressed by either increasing /improving the road infrastructure upgrades and/or reducing trip generation by increasing non-private vehicle travel to / from the two station precincts.	Addressing the background traffic growth is a matter for RMS/TfNSW. The currently committed road network improvements are insufficient to accommodate the broader future growth in population & employment in the region. The network improvements proposed in this report are intended to mitigate the impact of the development traffic only & not the background traffic. The trip generation used already include reductions to account for lower provision of parking supply proposed particularly the commercial land use to minimise the vehicle generation of the development. Also, further reductions in residential car parking supply has been recommended by RMS with the same objective of reducing the traffic impacts & shifting trips to alternative modes.
7	Both	Infrastructure upgrades	The intersection of Windsor Road / Old Windsor Road is forecast to deteriorate significantly in level of service during the AM peak period (LoS C to LoS F in 2026 and LoS D to LoS F in 2036) yet it is unclear why no improvements are proposed.	The existing utilisation of the right turn lane into Windsor Road is low based on traffic surveys undertaken by Sydney Metro on weekdays & Saturdays. The volumes forecast by the traffic model appear to be an overestimation of the attractiveness of Windsor Rd as a viable alternative. The alternative route is 1.2km longer & has 2 extra sets of traffic signals. Based on current utilisation and the fact that traffic generated by Kellyville Precinct has little reason to use this right turn lane in future, it makes little sense to add more capacity by adding a second right turn lane when there is little evidence of this right turn bay being utilised in practice.
8	Both	Parking & access	There is inconsistency between the retail parking rate shown in Table 10.3 of the TTA (50 sqm per space) and the commentary in Section 10.3 and Table 10.4 of the TTA (60 sqm per space).	Report amended based on advice provided

Item No	Precinct	Category	Issue	Jacobs Response
9	Both	Parking and Access	Visitor parking spaces show in Table 10.5 of the TTA do not align with the residential development yield (number of units). The figures in Table 10.5 would indicate 2,170 units for Kellyville and 4,570 units for Bella Vista Station Precincts, which is inconsistent with the residential development yield indicated in Section 2.3 of the TTA (1,804 units for Kellyville and 3,822 units for Bella Vista).	Parking calculations provided in Table 10.5 are for the entire precincts including other land holdings & not just for government owned land. The total number of residential units is higher when other land holdings are included.
10	Both	Parking and Access	There is limited assessment of service vehicle / loading facilities and access locations especially for the retail / commercial land uses. This includes delivery route movements, refuse collection access, etc.	Discussion has been added to the report
11	Both	Public transport	There is no provision of forecast trips for public transport use including for bus services, rail (Metro) services and taxi / ride-share services.	Future applicants will be required to assess the impacts with forecasts obtained from the relevant public agencies. However, it should be noted that the trip generate rates used in the TTA are benchmarks against rates at similar Transit Orientated Development (TOD).
12	Both	Public Transport	There has been no assessment of point-to-point services (e.g. taxis, ride-share) including either current conditions / activities or forecast trips to be generated.	These details will be covered for individual lots at the time of a future development application. The current study is at a concept master planning level.
13	Both	Public Transport	In Table 7.1 of the TTA, it is understood that the bus routes and frequencies including the North West Night Bus (as recorded from 5 June 2019) have changed significantly (as per the RMS response). These need to be updated.	Report updated

Item No	Precinct	Category	Issue	Jacobs Response
14	Both	Active transport	There is no provision of forecast trips for pedestrians and cyclists using the subject Station Precincts including for the residential, retail and commercial development components.	Future applicants will be required to assess the impacts with forecasts obtained from the relevant public agencies. However, it should be noted that the trip generate rates used in the TTA are benchmarks against rates at similar Transit Orientated Development (TOD).
17	Both	Cumulative Impacts	There has been no specific assessment of cumulative impacts although it is acknowledged that future development has been included as part of the trip matrices used for modelling in the long-term (2026 and 2036) assessment.	Cumulative impacts have been covered throughout the report. Cumulative traffic including park & ride are already included in the trip matrices that were used which included new background developments.





# Bella Vista and Kellyville Station Precincts - Concept SSD Application

Landcom

Traffic and Transport Assessment Report

1 | Rev05-V5

29 June 2020

50610-6/7



## Bella Vista and Kellyville Station Precincts - Concept SSD Application

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### Document history and status

Revision	Date	Description	By	Review	Approved
Rev04	16 Aug 19	Final report	M. Mansour	Stephen Read	
Rev05V3	10 May 20	Updated final report to include responses from public exhibition	M. Mansour	Scott Wilkinson	
Rev05V5	22 June 20	Further updates to include comments	M. Mansour	Matthew De Marco	

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## Glossary of terms and acronyms

Terms/acronym	Definition
Aimsun	A traffic modelling software, performing traditional static macroscopic modelling to more detailed dynamic mesoscopic and microscopic simulation modelling
AM peak hour	Unless otherwise stated, this refers to vehicle trips during the average peak hour in the morning peak period between 7.30am and 8.30am on a normal working weekday
Bella Vista Station Precinct	Refers to the land within the Bella Vista State Significant Precinct boundary.
EIS	Environmental Impact Statement
GFA	Gross floor area
Heavy vehicles	A heavy vehicle is classified as a Class 3 vehicle (a two-axle truck) or larger, in accordance with the Austroads Vehicle Classification System
JTW	Journey to Work
Kellyville Station Precinct	Refers to the land within the Kellyville State Significant Precinct boundary
LEP	Local Environment Plan
LGA	Local Government Area
LOS	Level of Service
Midblock	A general location on a road between two intersections
Mode	A type or method of transport movement
No Project	A model scenario that does not incorporate the proposed project
NSW	New South Wales
OSL	Office of Strategic Lands
PM peak hour	Unless otherwise stated, this refers to vehicle trips during the average peak hour in the evening peak period between 5.30pm and 6.30pm on a normal working weekday
PTPM	Public Transport Project Model A multi-modal model developed by TPA that forecasts patronage and demand related impacts of public transport projects and policies
Roads and Maritime Services	NSW Roads and Maritime Services (Currently Transport for NSW)
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SIDRA	An intersection and network modelling software used to evaluate intersection performance
MNWL	Metro North West Line
SRD	State and Regional Development

Terms/acronym	Definition
SSD	State Significant Development
SSDA	State Significant Development Application
SSI	State Significant Infrastructure
STM	Strategic Travel Model
TfNSW	Transport for New South Wales
TPA	Transport Performance and Analytics
TZ	Travel Zone. Standard geography used for a number of transport datasets in New South Wales, representing geographical areas that are used in origin- destination transport modelling
VPH	Vehicles per hour
With Project	A model scenario that incorporates the proposed project

## Executive Summary

### Introduction

As part of Metro North West Line, the Bella Vista and Kellyville Station Precincts were announced as Priority Precincts by the NSW Government in August 2014.

This Report provides an overview of the traffic and parking assessment that has been undertaken as part of the urban design masterplans developed for the Concept State Significant Development (SSD) Application for the development of the Kellyville and Bella Vista Station Precincts. Whilst the current SSD application covers development of the land owned by the NSW Government, this proposal seeks to provide a comprehensive baseline investigation for the entire two precincts, including the privately-owned lots to provide an indicative transport proposal for the entire precinct.

The Concept SSD Application sets out the concept proposal for the future development of the Kellyville and Bella Vista Station Precincts. It does not seek development consent for any physical works but only requires an evaluation of the likely impacts associated with the concept proposal, not the likely impact of any development that would be subject to a separate development application.

The Bella Vista and Kellyville Station Precincts are two (2) of the eight (8) Station Precincts identified for urban transformation in Sydney's North West by the NSW Government to provide opportunities for creation of new vibrant town centres around the new stations. A focus on place-making underpins the master planning of the Kellyville and Bella Vista Station Precincts to create sustainable and liveable communities.

The combined Kellyville and Bella Vista precincts can provide up to 8,400 new homes over the next twenty years, capped through a clause in the Hills Council Local Environmental Plan to align with the local and State infrastructure that has been planned to support the precincts' growth. The current SSD application seeks approval for 5,865 of these units proposed by Landcom. The Bella Vista Station Precinct also seeks consent for the indicative location of a future primary school.

The Bella Vista Station Precinct is planned to have a mix of residential and employment land use. The employment will be focused near Celebration Drive adjacent to the existing employment in the Norwest Business Park. Bella Vista Precinct is forecast to provide 7,170 jobs within its commercial areas and a further 410 jobs in its retail areas once completed<sup>1</sup>. Kellyville is planned to be predominately residential but with retail focused around its town centre near Samantha Riley Drive and the metro station and expected to create 290 new jobs.

### Strategic Planning Context

Sydney Metro is Australia's biggest public transport project. This new standalone railway will deliver 31 metro stations and more than 66 kilometres of new metro rail, revolutionising the way Sydney travels. The Metro North West Line opened in May 2019 between Tallawong and Chatswood with Stage two between Chatswood to Sydenham expected to be completed by 2024. When Sydney Metro is extended to the central business district (CBD) and beyond, the metro will run from Sydney's North West region under Sydney Harbour through new underground stations in the CBD and beyond to the south west.

Concurrently, Sydney Metro is working on upgrades of signals and infrastructure across the existing Sydney rail network that will increase the capacity of the train services entering the Sydney CBD from about 120 an hour today to up to 200 services beyond 2024. This represents an increase of up to 60 per cent capacity across the network to meet future demand.

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<sup>1</sup> Ethos Urban May 2019

To address the challenges of accommodating the predicted demands for housing and employment, the Planned Precincts program was developed by the NSW Government as the mechanism to deliver the goals of providing new housing and employment opportunities closer to home in new centres with good transport connections able to leverage from new major public transport infrastructure. The Bella Vista and Kellyville Station Precincts build upon the opportunities afforded by Metro North West providing mixed use Transit Orient Development (TOD) urban precincts that will comprise of new residential dwellings, retail and commercial land uses as well as community and passive and active open space recreation facilities close to public transport and regional road networks.

The Bella Vista and Kellyville Station Precincts align with several strategic plans including:

- Planned Precinct Program
- Future Transport Strategy 2056
- The Greater Sydney Region Plan – A Metropolis of Three Cities
- State Infrastructure Strategy 2018
- Sydney's Walking Future
- Sydney's Cycling Future
- Sydney's Bus Future
- North West Rail Link Corridor Strategy

### **Existing Strategic Context**

The existing land use surrounding the Bella Vista and Kellyville Station Precincts are predominately low density residential with commercial land uses concentrated to the south and southeast of Bella Vista within Norwest Business Park. With the Metro North West serving as a major catalyst for improved accessibility, there are opportunities for urban renewal to provide additional employment and residential dwellings within proximity of the new metro stations.

The existing demographics of residents in Bella Vista and Kellyville is indicative of a population that are more likely to work in white-collar professions. Traditionally, such jobs tend to be located in major centres with strong public transport connections such as the Sydney CBD, Parramatta CBD, North Sydney, and to a lesser extent the Macquarie Park and Norwest business districts.

The Journey to Work data collected in 2011 reveals a high level of car ownership in Bella Vista and Kellyville. This coupled with the existing demographics is suggestive of an area with families and children, low density development and limited access to alternative modes of transport. Introduction of the Metro North West therefore provides opportunities for mode shift away from private vehicles.

The Journey to Work data also shows the total daily number of persons travelling for employment in Bella Vista and Kellyville. The data show that these trips are predominately made by workers travelling to employment in the Norwest business park, located directly south of the Bella Vista Station Precinct. Other major employment centres in the surrounding catchment area are located at Baulkham Hills, Castle Hill and Rouse Hill. These areas provide additional employment within the North West strategic centres in the region.

### **Existing Transport Network**

Passenger services on the Metro North West Line started in May 2019 between Tallawong and Chatswood, with a driverless metro train running every four minutes in the peak periods.

In addition to the Metro North West, the North West Transitway runs beside Old Windsor Road between Rouse Hill and Beaumont Hills/Kellyville to Parramatta and the City/North Sydney and Blacktown.



The existing residential estates in Bella Vista and Kellyville have been largely designed with low permeability to discourage vehicles traversing the local road network. Consequently, they limit accessibility of pedestrians and cyclists travelling between the local network and the wider regional network. However, at a broader level, there is a good level of connectivity provided on the regional cycle network. This includes a segregated cycleway alongside the Westlink M7 and shared pedestrian and cycle paths provided on Old Windsor Road, Windsor Road, Schofields Road and Sunnyholt Road. Sydney Metro have also built a shared path under the metro viaduct.

Major roads surrounding the two Station Precincts include Old Windsor Road, Windsor Road, Samantha Riley Drive, Memorial Avenue and Sunnyholt Road. Assessment of the existing road network revealed that several signalised intersections surrounding the two precincts are already at or approaching their nominal capacities during the peak periods. Figure A1.1 shows the performance of the intersections in the AM and PM peaks in the study area.

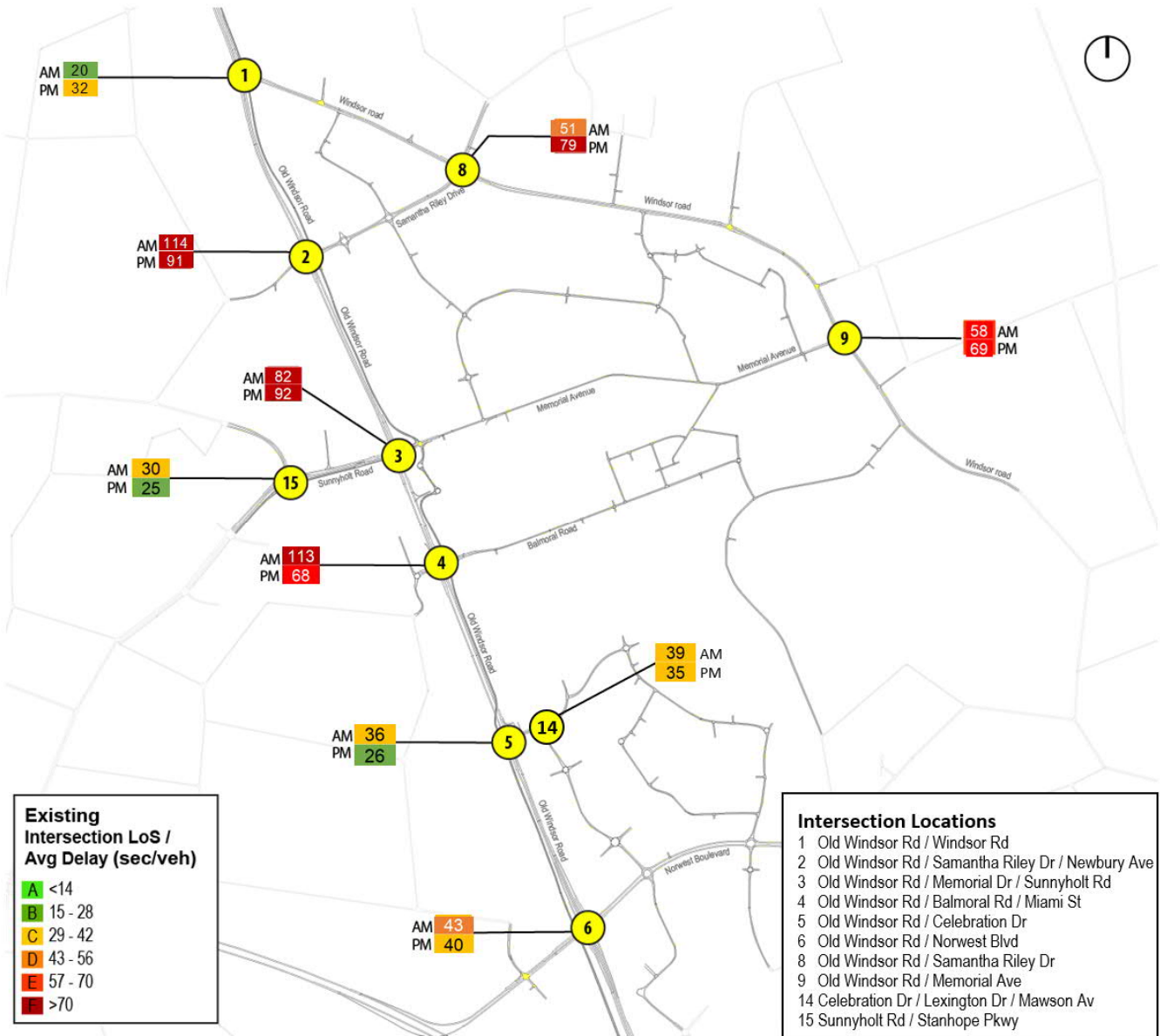


Figure A1.1: Existing Intersection Performances

### Proposal Assessment

#### Traffic:

A detailed traffic and transport assessment of the proposal has been undertaken that considers:

- Road network – assesses the immediate and wider road network through mesoscopic and intersection modelling to determine the performance of the future road network and identify any required upgrades
- Vehicle access – assesses the proposed access points throughout the two Station Precincts as well as identify the function of existing and proposed internal streets
- Public transport – assesses the bus, and metro networks, including any infrastructure and bus routes
- Active transport – assesses the pedestrian and cycling networks including footpath and shared path widths, pedestrian crossings, and access to and availability of pedestrian and cycle infrastructure
- Parking and demand management – assesses the number of parking spaces required to accommodate the proposal including on-road and off-road parking environments

The approach adopted in this assessment has been to ensure that development of the two Station Precincts would not make traffic conditions on the external roads worse than the situation without the project i.e. average vehicle delay does not deteriorate as a direct result of the project. As a result, the improvements identified in the assessment are not aimed at relieving the congestion entirely and allowing the Level of Service of the congested intersections to be D or E but to mitigate the direct impacts on the road network.

The assessment was undertaken for 2026 as an interim year and 2036 (final) assuming full development of both Station Precincts. The assessment has found that the overall transport network can be managed to cater for all demands generated by the two Station Precincts assuming the below improvements are undertaken:

- Ongoing improvement to bus service improvements to provide a network of feeder services that integrate with the new stations and T-Way
- The delivery of internal road networks that enhance walking for pedestrians both within and outside of the two precincts
- The provision of safe and dedicated cycling routes within and with connection to surrounding regional routes on Old Windsor Road, Memorial Avenue / Sunnyholt Road and local surrounding neighbourhoods
- Road network improvements as shown in Table 1.1 with their locations shown in Figure A1.1 in the previous page.

Table 1.1: Summary of Road Network Improvements

	Description	Improvement Required	
		2026	2036
<b>Old Windsor Road:</b>			
2. Samantha Riley Drive / Newbury Avenue	<ul style="list-style-type: none"> <li>i. Widen Old Windsor Road in the southbound direction over a distance of approximately 120m and 200m on the departure side of the intersection to accommodate a short third lane for through traffic;</li> <li>ii. Widen Old Windsor Road in the northbound direction over a distance of 120m on the approach and 150m on the departure side; and</li> <li>iii. Provide a second right turn lane in Newbury Ave for southbound turning traffic.</li> <li>iv. Provide a second right turn lane in Samantha Riley Drive for northbound turning traffic</li> </ul>	<div>✓</div> <div>✓</div> <div>✓</div> <div>✓</div>	<div>✓</div> <div>✓</div> <div>✓</div> <div>✓</div>
3. Memorial Avenue / Sunnyholt Road	<ul style="list-style-type: none"> <li>i. Widen Sunnyholt Road for a distance of 110m to provide a third lane for eastbound traffic heading into Memorial Avenue;</li> <li>ii. Widen Memorial Avenue for a distance of 100m along its northern boundary to accommodate the third through lane approaching from Sunnyholt Road</li> <li>iii. Add a second right turn lane in Memorial Ave</li> </ul>	<div>✓</div> <div>✓</div> <div>✓</div>	<div>✓</div> <div>✓</div> <div>✓</div>
4. Balmoral Road / Miami Street	<ul style="list-style-type: none"> <li>i. Widen the northern approach of Old Windsor Road for a distance of 180m to provide a third lane for southbound traffic continuing through the intersection for 200m on the departure side;</li> <li>ii. Widen the southern approach of Old Windsor Road for a distance of 100m to provide a third lane for southbound traffic continuing through the intersection for 200m on the departure side; and</li> <li>iii. Widen the eastern approach of Balmoral Road for a distance of 80m to provide for an additional right turn bay</li> </ul>	<div>✓</div> <div>✓</div> <div>✓</div>	<div>✓</div> <div>✓</div> <div>✓</div>
5. Celebration Drive	<ul style="list-style-type: none"> <li>i. Widen Old Windsor Road in the southbound direction for a distance of 120m to accommodate a third through lane. Widen Old Windsor Road on the departure side for a distance of 100m to accommodate the third approach lane; and</li> <li>ii. Widen Old Windsor Road in the northbound direction for a distance of 100m to provide a third lane. Widen Old Windsor Road on the departure side for a distance of 100m to accommodate the third approach lane.</li> </ul>	<div>✓</div> <div>✓</div>	<div>✓</div> <div>✓</div>
6. Norwest Boulevard	Provide a second right turn lane in Norwest Boulevard for northbound traffic turning into Old Windsor Road and modify northbound slip lane to be high angled	✓	✓

	Description	Improvement Required	
		2026	2036
<b>Memorial Avenue:</b>			
10. Arnold Ave/Severn Vale Dr (McCausland Place)	No additional improvement is required		
11. Arnold Ave / Free Settlers Drive	Widening of Memorial Ave from 2 lanes to 3 for a distance of 160m west of the intersection to accommodate additional through lanes on both sides		✓
15. <b>Sunnyholt Road</b> / Stanhope Parkway:	Widen the slip lane on Stanhope Parkway to become two lanes		✓
<b>Station Precincts:</b>			
Bridge across Elizabeth Macarthur Creek	Provide a bridge connecting the Kellyville Station Precinct to Colonial Street	✓	✓
7. Samantha Riley Drive / Decora Drive	Provide a left slip lane over length of 50m into the Kellyville precinct from the eastern approach of Samantha Riley Drive		✓
12. Balmoral Road / Elizabeth Macarthur Creek link	New links and intersection to be provided as part of this development	✓	✓
13. Mawson Avenue / Unaipon Avenue	Signalisation of the intersection as part of development of the Bella Vista precinct	✓	✓
16. Celebration Drive / Brighton Drive	Signalisation of the intersection as part of development of the Bella Vista precinct	✓	✓

Overall, the assessment has shown that with some practical improvements to the road network the proposed development of the Kellyville and Bella Vista precincts can be achieved in a sustainable way.

#### Parking Requirements:

The parking provisions of the two metro precincts have been assessed based on benchmarking of similar land use developments located within proximity of rail stations such as Norwest Station Precinct, North Ryde, Macquarie Park and Tallawong and advice provided by RMS on suitable rates for the land uses proposed. On the basis of this assessment, the proposed minimum and maximum parking rates for the residential, retail and commercial land uses are shown in Table A1.2.

Table A1.2: Proposed minimum and maximum parking rates

Land Use	Minimum	Maximum
Residential		
1-bedroom unit	0.4 space	0.6 space
2-bedroom unit	0.7 space	0.9 space
3-bedroom unit	1.2 space	1.4 space
Visitors	1 space per 10 unit	1 space per 10 units
Car Share	1 bay per 150 parking spaces	

Land Use	Minimum	Maximum
Retail	1 space per 130m <sup>2</sup>	1 space per 60m <sup>2</sup>
Commercial	1 space per 145m <sup>2</sup>	1 space per 100m <sup>2</sup>

The adoption of the minimum rates would translate to a total of 6,896 spaces being required for the two station precincts. Under the maximum parking rates, the total number of parking spaces increases to 8,953. A further 45-57 shared parking spaces is envisaged to be required. A high parking provision would not be consistent with the planning objective of providing sustainable developments around the metro stations and would result in higher volume of traffic and delays on the surrounding road network as more residents and employees be encouraged to use their cars for their daily activities in lieu of using public transport or other sustainable mode of travel.

This report has been revised following receipt of comments from the public exhibition of the proposal that took place in late 2019 including. Key changes include adoption of lower car parking rate for the residential component to mitigate the impact of additional traffic from the development, remodelling of a number of intersections in SIDRA and inclusion of a green travel plan in the report.

# 1. Introduction

## 1.1 Background

Sydney Metro is Australia's biggest public transport project. This new standalone railway will deliver 31 metro stations and more than 66 kilometres of new metro rail, revolutionising the way Sydney travels. The Metro North West Line opened in May 2019 between Tallawong and Chatswood and is currently being extended into the central business district (CBD) and beyond to be completed in 2024. It will run from Sydney's North West region under Sydney Harbour, through new underground stations in the CBD and beyond to the south west.

The opening of the Metro North West offers opportunities for increased residential and commercial densities within walking distance of the new stations and greater accessibility to employment and services across the growing North-west area of Sydney and Sydney's Global Economic Corridor, including Bella Vista and Kellyville.

Landcom, on behalf of Sydney Metro, is seeking to secure concept approval for government owned land within the Bella Vista and Kellyville Station Precinct sites located along the Metro North West corridor. The vacant land comprises NSW government-owned land and privately held lots between the metro line and Elizabeth Macarthur Creek. The privately held lots are not subject of this development application.

This report accompanies two concept State Significant Development (SSD) applications submitted to the Department of Planning and Environment (DPE) pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act). The concept SSD application is made under Section 4.22(1) of the EP&A Act for each site within the Bella Vista and Kellyville Station Precincts. The concept SSD applications will seek development consent for generally the same aspects, with the exception of the Bella Vista Station Precinct that will also seek consent for the indicative location of a future primary school. The full SSD application scope of each site is discussed in Section 2.3 of the report.

The location of the Bella Vista and Kellyville Station Precinct within the context of the Metro North West corridor is shown in Figure 1.1.

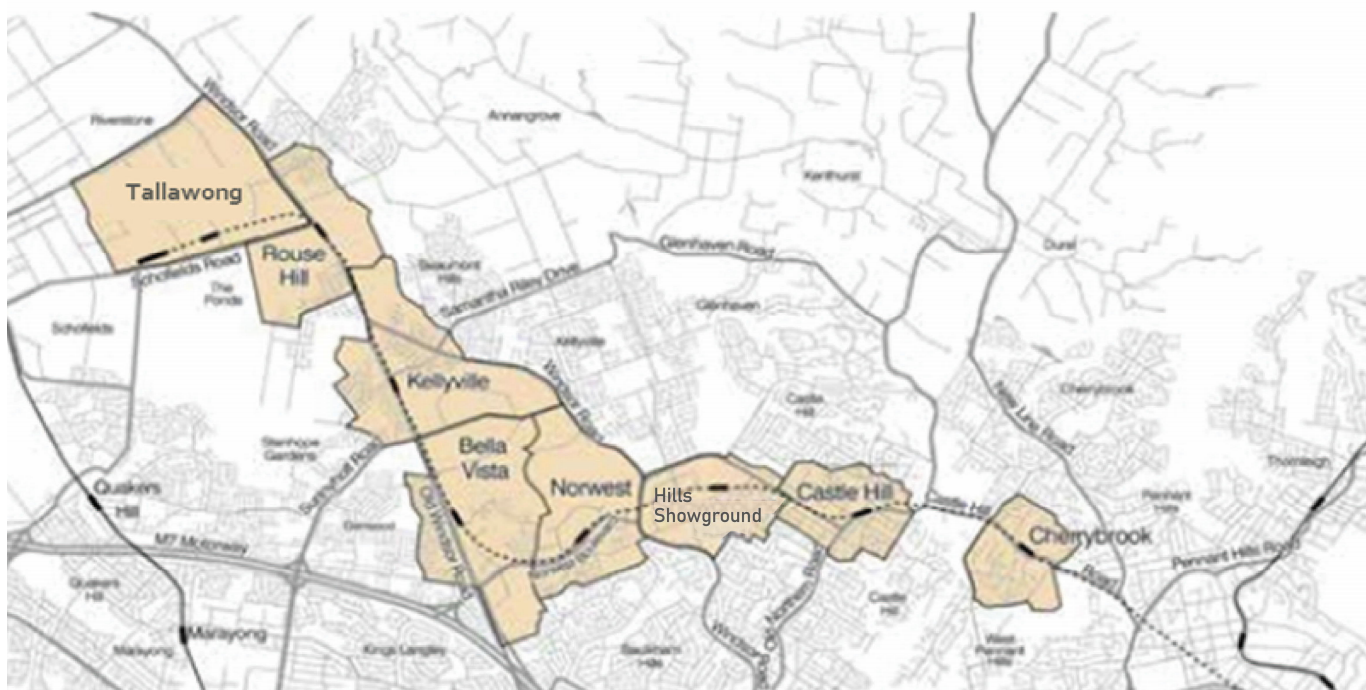


Figure 1.1: Sydney Metro North West Precincts

## 1.2 Purpose of this report

Jacobs has been engaged by Landcom to undertake a traffic and transport assessment of the planned urban renewal of the Bella Vista and Kellyville Station Precincts proposed under two concept State Significant Development (SSD) applications (for each station precinct).

The report has been prepared to outline the transport impacts and specifically respond to separate Secretary's Environmental Assessment Requirements (SEARs) issued on 11th July 2019 for the below concept SSD application sites:

- Application no. SSD10343: Sydney Metro North West – Kellyville Station Precinct Concept SSD
- Application no. SSD10344: Sydney Metro North West – Bella Vista Station Precinct Concept SSD.

The SEARs states that the Environmental Impact Statement (EIS) is to address the requirements shown in Table 1.1.



Table 1.1: SEARs Requirements

Reference*	SEARs Requirement	Where Addressed in Report
1	<p>Address the relevant provisions, goals and objectives in the following:</p> <ul style="list-style-type: none"> <li>• NSW State and Premier Priorities</li> <li>• A Metropolis of Three Cities</li> <li>• Central City District Plan</li> <li>• State Infrastructure Strategy 2018</li> <li>• Relevant Council policies, codes and guidelines (where required pursuant to relevant Local Environmental Plan)</li> <li>• Future Transport Strategy 2056</li> <li>• Guide to Traffic Generating Developments, Roads and Maritime Services</li> <li>• Towards our Greater Sydney 2056</li> <li>• Sydney's Walking Future</li> <li>• Sydney's Cycling Future</li> <li>• Sydney's Bus Future</li> <li>• Development near Rail Corridors and Busy Roads – Interim Guideline</li> </ul>	Section 4.2 and throughout report
13	<p>The EIS must include a Transport and Traffic Impact Assessment that provides, but is not limited to, the following:</p> <ul style="list-style-type: none"> <li>• The projected additional yields and traffic volumes for the whole of the Kellyville and Bella Vista Station Precincts and assess the cumulative impacts of the proposal in its developing context.</li> <li>• Accurate details of the current daily and peak hour vehicle, public transport, point to point transport services, pedestrian and bicycle movements from existing or former buildings/uses on the site using the adjacent and surrounding road network.</li> <li>• Details on any proposed cycling and pedestrian paths and shared paths and how these will interact with Old Windsor Road.</li> <li>• Forecast total daily and peak hour trips likely to be generated by the proposed development including vehicle, public transport, point to point transport services, pedestrian and bicycle trips, together with cumulative impacts of existing, proposed and approved developments in the area and any transport/traffic upgrades.</li> <li>• Detailed assessment of the existing and future performance of key intersections providing access to the site, supported by appropriate modelling and analysis to the satisfaction of RMS, TfNSW and Council.</li> <li>• Illustrate how the proposal fits within the proposed road network for the Kellyville and Bella Vista Station Precincts, including any relevant masterplan.</li> <li>• Measures to mitigate impacts of the proposed development on the operation of existing and future traffic, public transport, pedestrian and bicycle networks including any required upgrades, with consideration of any required crossing over Elizabeth Macarthur Creek.</li> </ul>	<p>Section 9.3</p> <p>Section 7</p> <p>Section 9.6.2</p> <p>Section 9.3</p> <p>Section 9</p> <p>Section 2.3</p> <p>Section 9.4</p>

Reference*	SEARs Requirement	Where Addressed in Report
	<ul style="list-style-type: none"> <li>Measures to encourage users of the development to make sustainable travel choices, including walking, cycling, public transport and car sharing, such as the integration with rail and bus infrastructure and provision of adequate bicycle parking and end of trip facilities.</li> </ul>	Sections 9.6.2, 10.4 and 10.5
	<ul style="list-style-type: none"> <li>Proposed car and bicycle parking provision including consideration of the availability of public transport and the requirements of the relevant parking codes and Australian Standards.</li> </ul>	Section 10
	<ul style="list-style-type: none"> <li>Proposed provision of bus service infrastructure and pedestrian connections to support the bus/rail interchange function of the metro station, including an assessment of the public domain surrounding the site to accommodate the future pedestrian demands safely and adequately and mitigation measures identified.</li> </ul>	Section 9.6.1
	<ul style="list-style-type: none"> <li>Proposed vehicle access arrangements, including for service and loading activities and measures to mitigate impacts to bus services and passengers interchanging between bus and rail.</li> </ul>	Section 9.5 Section 9.6
	<ul style="list-style-type: none"> <li>Describe preliminary construction traffic arrangements and management measures, including consideration of the cumulative construction traffic impacts from infrastructure works in the surrounding road/transport network.</li> </ul>	Section 12

\* Reference no. in accordance with application nos. SSD10343 (Metro North West – Kellyville Station Precinct Concept SSD) and SSD10344 (Metro North West – Bella Vista Station Precinct Concept SSD)

### 1.3 Report structure

This report is comprised of the sections outlined below. The report has been updated in response to comments received during the public exhibition of the proposal by the Department of Planning, Industry and Environment (DPIE) in late 2019.

- Section 2 – Station Precinct Concept: identifies the project
- Section 3 – Strategic Opportunities: to inform the overarching principles and assessment process for design of the Station Precincts
- Section 4 – Strategic transport and planning context: outlines the previous planning work in the study area
- Section 5 and 6 – Existing Land use and Travel Behaviour: assesses the existing land use and demographic in the study area
- Section 7 – Existing Transport Network: summarises the existing conditions within the modelled area
- Section 8 – Transport Assessment Methodology: outlines the traffic modelling process undertaken for this assessment
- Section 9 – Future Road network performance: outlines the performance of the road network in the study area with and without the project
- Section 10 – Parking Assessment and travel demand management: Outlines the methodology applied in the determination of appropriate parking rates for the proposed land uses and measures to discourage driving
- Section 11 – Other Impacts: outlines the impacts on local roads, public transport and active transport
- Section 12 Construction Impacts: presents a summary of the impacts during its construction
- Section 13 – Conclusion: presents a summary of the study findings and sets out the principal conclusions for the study.

## 2. Bella Vista and Kellyville Station Precinct Concept SSD

### 2.1 Station Precinct Description

The Bella Vista and Kellyville Station Precincts form part of a network of eight Station Precincts along the corridor of the NSW Government's \$8.3 billion Metro North West. Both Station Precincts were identified by the NSW Government as Priority Precincts to support and drive the urban renewal of rural residential land into a new urban environment.

The Bella Vista and Kellyville Station Precincts are envisaged to provide for up to 7,510 and 270 new jobs<sup>2</sup> respectively and permitted to accommodate up to 8,400 new homes between both precincts over the next 25 years.

#### 2.1.1 Bella Vista Station Precinct

The Precinct stretches along the alignment of the Metro North West corridor extending for 1.4 km between Celebration Drive in the south and Memorial Avenue in the north, bounded by Old Windsor Road to the west and Elizabeth Macarthur Creek to the east Figure 2.1. The area is comprised of approximately 67.57 hectares of land, of which 50 hectares is government-owned and the remaining privately held lots earmarked for high density urban development.

Bella Vista Precinct will provide a mix of residential and employment land uses. Employment land uses will be focused near Celebration Drive, just to the north of Norwest Business Park within existing B7 Business Park zoned land and intended to provide a continuous employment spine along Lexington Drive to increase opportunities for new business activities and employment for residents in this region of Sydney.

<sup>2</sup> Ethos Urban, Economic Report, 29 May 2019



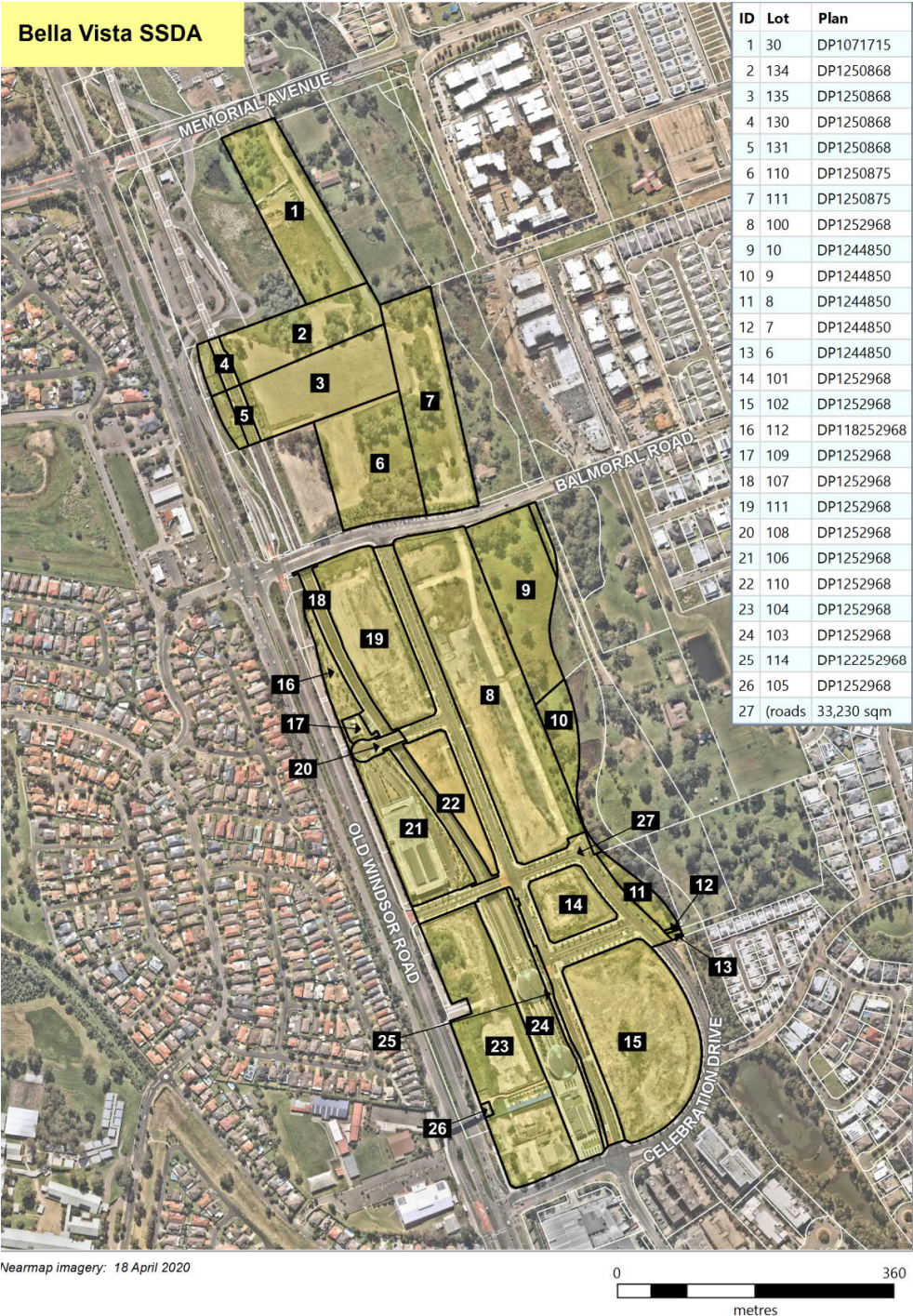


Figure 2.1: Bella Vista Station Precinct location

Source: Landcom (June 2020)

The Precinct is occupied by new road and railway infrastructure associated with former State Significant Infrastructure (SSI) project approvals, SSI 5414 and SSI 5100, including the new Bella Vista Station at the southern end of the Precinct. Other existing site activities and works associated with the SSI approvals include a multi-storey commuter car



park immediately north of the station and a construction site compound in the north of the precinct between Balmoral Road and Memorial Avenue.

## 2.1.2 Kellyville Station Precinct

The Precinct spans the alignment of the Metro North West corridor that consists of an approximate 900m stretch of government owned land, extending from Samantha Riley Drive in the north towards Memorial Avenue in the south and bounded by Old Windsor Road to the west, existing Roads and Maritime Services land to the south and Elizabeth Macarthur Creek to the east Figure 2.2.

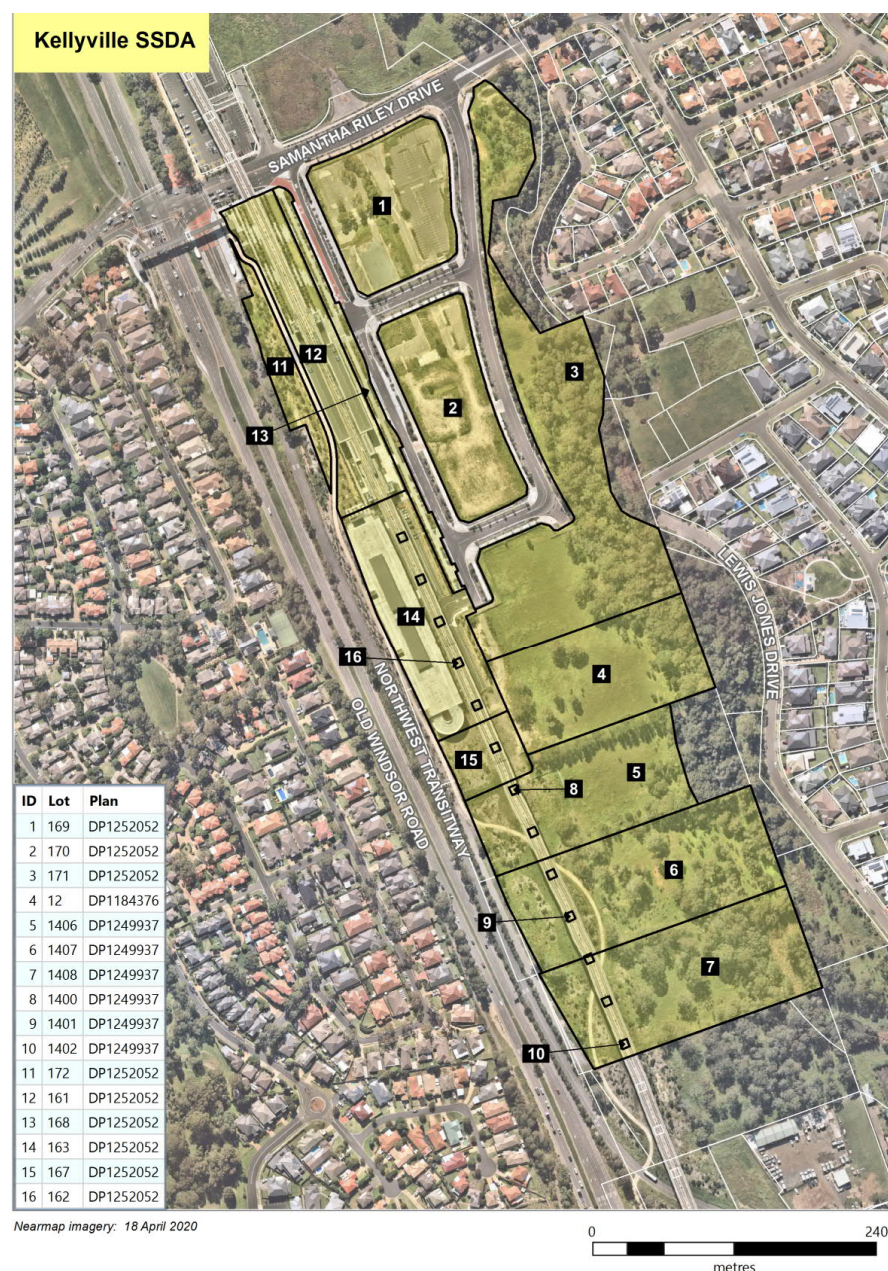


Figure 2.2: Kellyville Station Precinct location

Source: Landcom (June 2020)

Construction activities associated with the development of the Metro North West, including site compounds and car parking areas have been completed. A new local road network and multi storey commuter car park, south of Kellyville Station, service the Precinct, with access provided via a new signalised intersection at Samantha Riley Drive and Decora Drive. Provision for left-in access from Samantha Riley Drive into Guragura Street has also been made.

## 2.2 Concept SSD Site Descriptions

### 2.2.1 Bella Vista Station Precinct

The Bella Vista Station Precinct Concept SSD Application site is defined as land owned by, or under the control of, Sydney Metro. This include lands under the ownership of the Office of Strategic Lands (OSL).

The Bella Vista Station Precinct site is wholly contained within the boundary of the Bella Vista Station Precinct as defined by Schedule 2 State Significant Development Sites Map of State Environmental Planning policy (*State and Regional Development*) 2011 (SRD SEPP).

The site is made up of 26 allotments and has a total area of approximately 33.79 hectares. The legal description of the site is outlined below in Table 2.1.

Table 2.1: Bella Vista Station Precinct property description

No.	Plan No.	Lot No.	DGL/LMA/OSL	Owner	Ownership
1	104	DP1252968	DGL	Sydney Metro	Government
2	102	DP1252968	DGL	Sydney Metro	Government
3	101	DP1252968	DGL	Sydney Metro	Government
4	110	DP1252968	DGL	Sydney Metro	Government
5	111	DP1252968	DGL	Sydney Metro	Government
6	100	DP1252968	DGL	Sydney Metro	Government
7	110	DP1250875	DGL	Sydney Metro	Government
8	111	DP1250875	DGL	Sydney Metro	Government
9	135	DP1250868	DGL/LMA	Sydney Metro	Government
10	134	DP1250868	DGL/LMA	Sydney Metro	Government
11	30	DP1071715	DGL	Sydney Metro	Government
12	6	DP1244850	OSL	Planning Ministerial Corporation	Government
13	7	DP1244850	OSL	Planning Ministerial Corporation	Government
14	8	DP1244850	OSL	Planning Ministerial Corporation	Government
15	9	DP1244850	OSL	Planning Ministerial Corporation	Government
16	10	DP1244850	OSL	Planning Ministerial Corporation	Government
17	106	DP1252968	LMA	Sydney Metro	Government
18	114	DP1252968	LMA	Sydney Metro	Government
19	103	DP1252968	LMA	Sydney Metro	Government
20	107	DP1252968	LMA	Sydney Metro	Government

No.	Plan No.	Lot No.	DGL/LMA/OSL	Owner	Ownership
21	109	DP1252968	LMA	Sydney Metro	Government
22	108	DP1252968	LMA	Sydney Metro	Government
23	131	DP1252968	LMA	Sydney Metro	Government
24	130	DP1252968	LMA	Sydney Metro	Government
25	112	DP1252968	Other	Sydney Metro	Government
26	105	DP1252968	Other	Sydney Metro	Government

Source: Landcom 26 May 2020

### 2.2.2 Kellyville Station Precinct

The Kellyville Station Precinct concept SSD application site is defined as land owned by, or under the control of, Sydney Metro within the boundary of the Kellyville Station Precinct as defined by Schedule 2 State Significant Development Sites Map of the SRD SEPP.

The site is made up of 16 allotments and has a total area of approximately 18.8 hectares. The legal description of the site is outlined below in Table 2.2.

Table 2.2: Kellyville Station Precinct property description

No.	Plan No.	House No.	Street	Owner	Ownership
1	169	DP1252052	DGL	Sydney Metro	Government
2	170	DP1252052	DGL	Sydney Metro	Government
3	171	DP1252052	DGL	Sydney Metro	Government
4	12	DP1184376	DGL	Sydney Metro	Government
5	1406	DP1249937	DGL	Sydney Metro	Government
6	1407	DP1249937	DGL	Sydney Metro	Government
7	1408	DP1249937	DGL	Sydney Metro	Government
8	1402	DP1249937	LMA	Sydney Metro	Government
9	1401	DP1249937	LMA	Sydney Metro	Government
10	1400	DP1249937	LMA	Sydney Metro	Government
11	172	DP1252052	LMA	Sydney Metro	Government
12	168	DP1252052	LMA	Sydney Metro	Government
13	167	DP1252052	LMA	Sydney Metro	Government
14	162	DP1252052	LMA	Sydney Metro	Government
15	163	DP1252052	LMA	Sydney Metro	Government
16	161	DP1252052	LMA	Sydney Metro	Government

Source: Landcom 26 May 2020

## 2.3 Concept SSD Application Scope

Each concept SSD application seeks development consent for the elements outlined below. In addition, the Bella Vista Station Precinct concept SSD application also seeks consent for the indicative location of a future educational establishment for primary school students.

The concept SSD applications set out the concept proposal for future development within each Station Precinct. All development set out in each concept proposal will be subject to a separate approval pathway.

Each application is seeking to demonstrate and consider the likely impacts associated with concept proposal, not the likely impact of any development that would be subject to a separate development application.

The development consent sought for a concept development application pursuant to section 4.22(1) of the *Environmental Planning and Assessment Act 1979 (EP&A Act)* sets out the concept proposal for each Station Precinct that comprises the following components:

- 1) Land use strategy that identifies the overall allocation, quantum and location of land uses across the site including:
  - a) Residential dwellings comprising residential flat buildings and terraces;
  - b) Non-residential land uses including retail and commercial;
  - c) A new primary school (Bella Vista Station Precinct only);
  - d) Public open space including public domain and parks and
  - e) Community facilities.
- 2) Urban Design Guidelines that includes built form design principles, guidelines and controls, including maximum building heights and street wall setbacks and heights.
- 3) Allocation of maximum GFA across the site for each development block and for specific land uses.
- 4) Street hierarchy and layout, including the identification of pedestrian and vehicular movement and access arrangements and the indicative location and configuration of new streets and intersection connections to the existing road network.
- 5) Identification of criteria or thresholds for subsequent development stages to be assessed as State Significant Development pursuant to section 4.37 of the EP&A Act.

Table 2.3 shows the type and scale of developments proposed under the concept SSD application for the Kellyville and Bella Vista precincts. The development quantum provided includes a maximum yield permitted under the SSDA and a minimum yield in order to offer flexibility in future development options such that a range of housing typologies can be provided during the detailed design stage.

Table 2.3: Proposed Land Uses and Area

Precinct	Residential Yield (units)	Commercial Yield (m <sup>2</sup> GFA)	Retail Yield (m <sup>2</sup> GFA)	School (students)
Kellyville (SSD) Min-Max Yields	1,492-1,910	0	5,368-10,736	
Kellyville (other land holdings) <sup>+</sup>	367	0	0	
<b>Kellyville (Total)</b>	<b>1,859-2,277</b>	<b>0</b>	<b>5,368-10,736</b>	
Bella Vista (SSD)	2,453-3,653	118,280-151,000	11,650-15,000	1,000
Bella Vista (OSL)	106-151	0	0	



Precinct	Residential Yield (units)	Commercial Yield (m <sup>2</sup> GFA)	Retail Yield (m <sup>2</sup> GFA)	School (students)
Bella Vista (other land holdings)*	750	0	0	
<b>Bella Vista (Total)</b>	<b>3,309-4,554</b>	<b>118,280-151,000</b>	<b>11,650-15,000</b>	
<b>Total Area (SSD &amp; OSL)</b>	<b>4,051-5,714</b>	<b>118,280-151,000</b>	<b>17,018-25,736</b>	
<b>Total Overall Area</b>	<b>5,168-6,831</b>	<b>118,280-151,000</b>	<b>17,018-25,736</b>	

\* Not subject of this application

### 2.3.1 Kellyville Precinct

The concept SSD application for Kellyville is seeking approval for a maximum of 1,910 dwellings within the government owned land (SSD boundary). For the purpose of modelling of traffic impacts of a full development, a further 367 units for other land holdings located at the southern end of the precinct north of Memorial Avenue has been assumed and included in the traffic assessment. It should be noted that the SSD application is seeking approval for the 1,910 units within government owned land only. Table 2.4 shows the proposed staging for the Kellyville Station Precinct whilst Figure 2.3 shows the location of the super lots.

Table 2.4: Kellyville Staging Plan

Year	Residential (units)	Superlot	Retail (m <sup>2</sup> )	Superlot
2023	200	B		
2024	200	B		
2025	200	B/A	2523	B
2026	200	A		
2027	200	A/C		
2028	200	C/D	2523	B/A
2029	200	D		
2030	200	D/E		
2031	200	E/F	5,690	A
2032	200	F/Private land holding		
2033	200	Private land holding		
2034	77	Private land holding		
<b>Total:</b>	<b>2,277</b>		<b>10,736</b>	

Source: Landcom (Apr 2020)

The retail GFA would include a maximum of 10,736m<sup>2</sup> of floor space to be located at the northern end near Samantha Riley Drive and Kellyville Station (as shown in Figure 2.4) that would include a local supermarket with its access via Decora Drive.

Network facilities identified in Kellyville Station Precinct Urban Design Report include:

- A pedestrian bridge across Elizabeth Macarthur Creek connecting to Wenden Avenue;
- A pedestrian/cyclist footbridge across Memorial Avenue to provide a continuous pedestrian/cyclist route along the Elizabeth Macarthur bridge;
- A level pedestrian crossing of Memorial Avenue at the existing T-way signalised intersection;
- A proposed vehicular bridge crossing of Elizabeth Macarthur Creek to connect to Colonial Street/Arnold Avenue; and
- New streets as development occurs as per the Kellyville Framework Plan.

The above facilities would be in addition to those already constructed by the Sydney Metro as part of the metro support infrastructure works, which include:

- New precinct access streets linking Samantha Riley Drive with Kellyville Station and a commuter car park;
- Upgrade of Samantha Riley Drive adjacent to Kellyville Station including replacement of existing roundabout with new signalised intersection at Decora Drive;
- A commuter car park bringing the total spaces at the multi-story and at-grade car parks north and south of the metro station to 1,360 spaces; and
- Shared pedestrian/cycle path between Rouse Hill and Memorial Ave (Kellyville).

Figure 2.4 shows the proposed Kellyville Masterplan for SSD lots as proposed in this concept SSD application. It does not cover the privately-owned land to the south near Memorial Avenue.

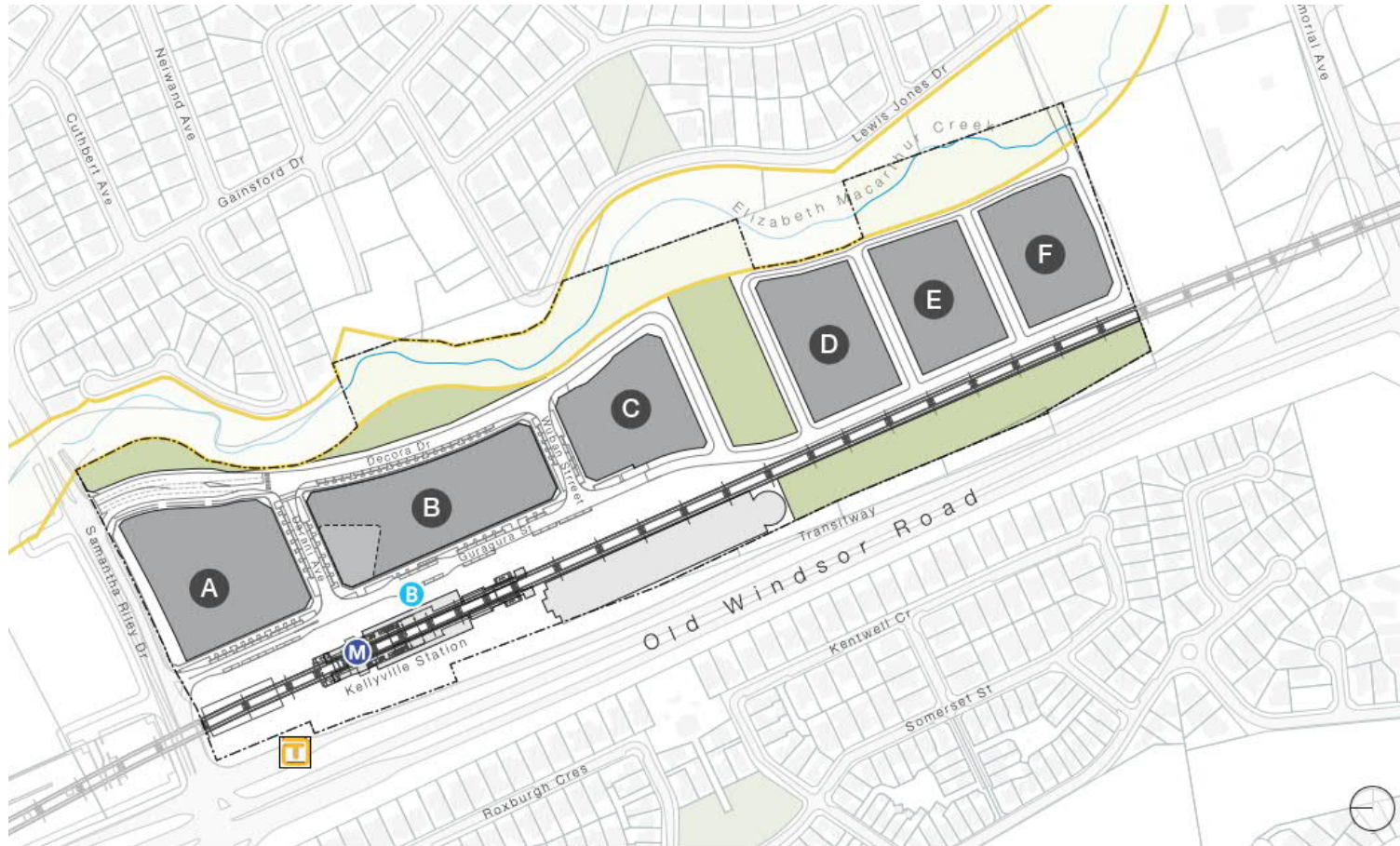


Figure 2.3: Kellyville Precinct Development Lots





Figure 2.4: Kellyville Precinct SSD Masterplan (SJB Urban)

### 2.3.2 Bella Vista Precinct

The concept SSD application for Bella Vista seeks the approval for 3,804 units within the government owned land (SSD boundary) and land holdings between Memorial Avenue and Celebration Drive.

The retail GFA would include a total of 15,000m<sup>2</sup> of floor space as mixed-use retail within residential and commercial lots to support the local residential population and workers in the precinct i.e. it is not intended as a retail destination.

The concept SSD proposes a total of 151,000m<sup>2</sup> of commercial space to be provided within the Bella Vista Station Precinct serving an extension of the existing business parks along Lexington Drive. Table 2.5 shows the Staging Plan for Bella Vista Station Precinct. Figure 2.5 shows the lot plan and indicative staging

Table 2.5: Bella Vista Staging Plan

Year	Residential (units)	Superlot	Retail (m <sup>2</sup> )	Superlot	Commercial (m <sup>2</sup> )	Superlot
2023	200	B4.0				
2024	200	B4.0				
2025	200	B4.0/A2.2				
2026	200	A2.2	3667	C2.0	14500	C2.0
2027	200	A.2./A1.0				
2028	200	A1.0/A2.1	4167	C2.0/A1.0		
2029	200	A2.1/A2.0				
2030	200	A2.0/C2.3	4166	C2.0/A1.0		
2031	200	C2.3	600	C2.2	26850	C2.2
2032	200	C2.3/B3.3				
2033	200	B3.3				
2034	200	B3.3/B3.2				
2035	200	B3.2	600	C1.2	36700	C1.2
2036	200	B3.2/B3.5				
2037	200	B3.5/B3.4/B3.1				
2038	200	B3.1/B3.0				
2039	200	B3.0/B1.1	600	C1.1	31600	C1.1
2040	200	B1.1/B1.0				
2041	200	B1.0				
2042	200	B1.0/Private	600	C1.0	25600	C1.0
2043	200	Private				
2044	200	Private				
2045	154	Private	600	C2.1/B2.0	15750	B2.0
<b>Total:</b>	<b>4,554</b>		<b>15,000</b>		<b>151,000</b>	

Source: Landcom (Apr 2020)

Bella Vista Concept SSD precinct also includes land reserved for a school that would be located between Memorial Avenue and Balmoral Road, adjacent to a new district park, with a likely enrolment for 1,000 students.

New works proposed as part of the SSD application include:

- Extension of Celebration Drive to Balmoral Road and installation of new traffic signals in Balmoral Road;
- Installation of a new set of traffic signals at the intersection of Brighton Drive/Celebration Drive as part of extension of Brighton Avenue;
- Extension of Brighton Drive to connect to Mawson Avenue (Lidwill Avenue) to provide a new link connection. Lidwill Avenue to include traffic calming measures to provide higher priority for pedestrians;
- Mawson Ave to provide vehicular access between Florey and extended Brighton Avenue i.e. Lidwill Avenue in both directions. Provision of bus lane section between the extended Brighton Drive and Celebration Drive;
- Adjustment to the existing bus lane access in Unaipon Avenue between the T-Way to reduce its length from Mawson Avenue to the new internal commercial access road (Cornforth Street);
- A left in slip lane in Celebration Drive east of the T-Way to serve as the main access to the commercial lots west of the metro station for arriving traffic; and
- Provision of new internal access roads as part of the subdivisional works and potential future pedestrian connections across the Elizabeth Macarthur Creek.

As part of the opening of the Bella Vista Station and supporting infrastructure, Sydney Metro has delivered the below infrastructure:

- Constructed Mawson Avenue between Celebration Drive and Balmoral Road to provide access via Byles Place to the new commuter car park with spaces for 800 cars.
- Construction of Unaipon Avenue between Celebration Drive and the T-way and Florey Avenue to provide access for buses and vehicles to the metro station.
- Realignment of the intersection of Balmoral Road / Miami Street / Old Windsor Road to provide direct access to the Bella Vista Precinct from Glenwood;
- Widening of Balmoral Road between Old Windsor Road and Mawson Avenue;
- Replacement of a roundabout at the intersection of Celebration Drive/Lexington Drive with a set of traffic light; and
- A new pedestrian/cycle bridge over Old Windsor Rd adjacent to Bella Vista Station.

Figure 2.6 shows the Bella Vista precinct Masterplan.



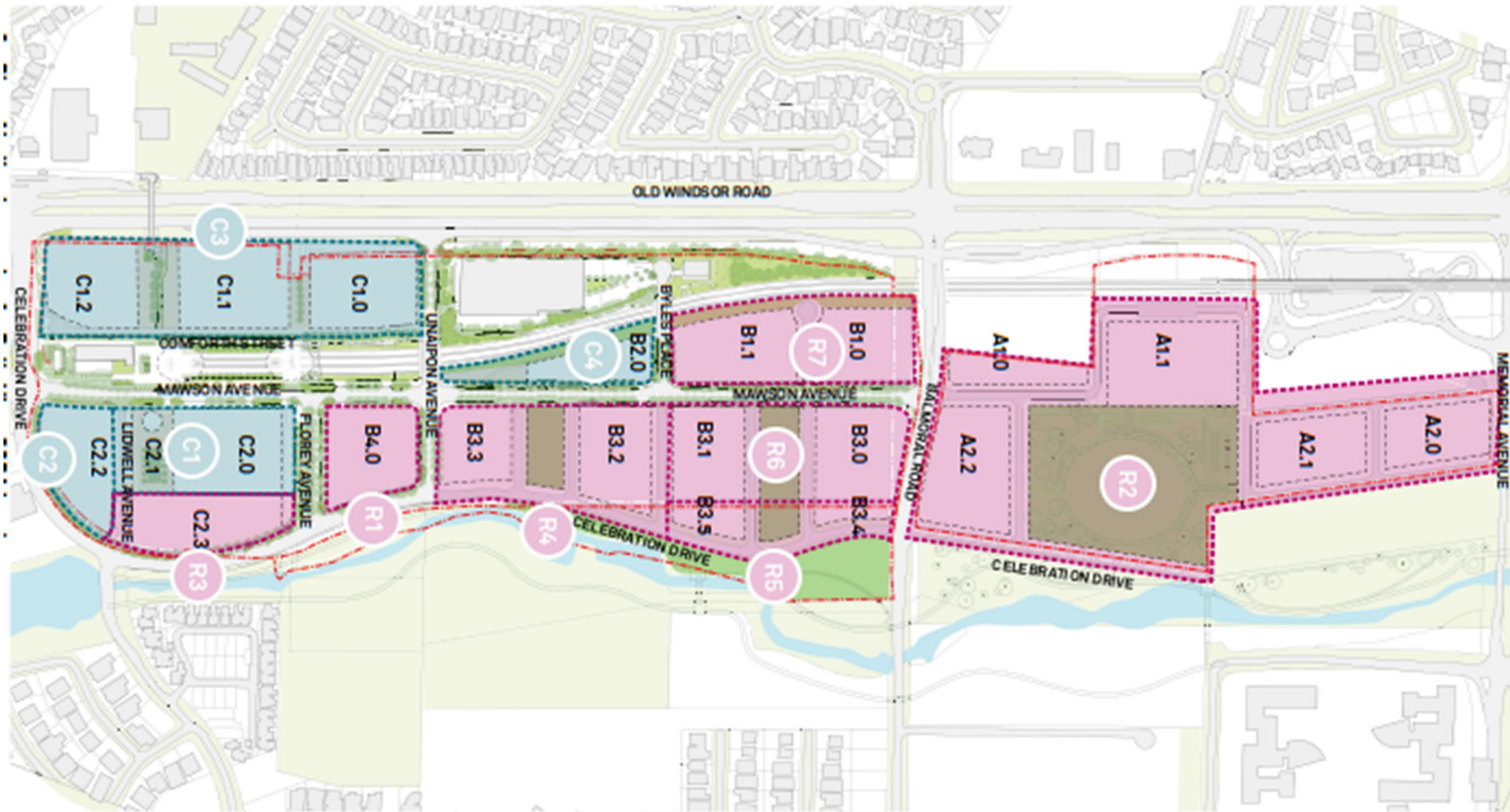


Figure 2.5: Bella Vista Lot Plan and Indicative Staging (Hassell Architects)

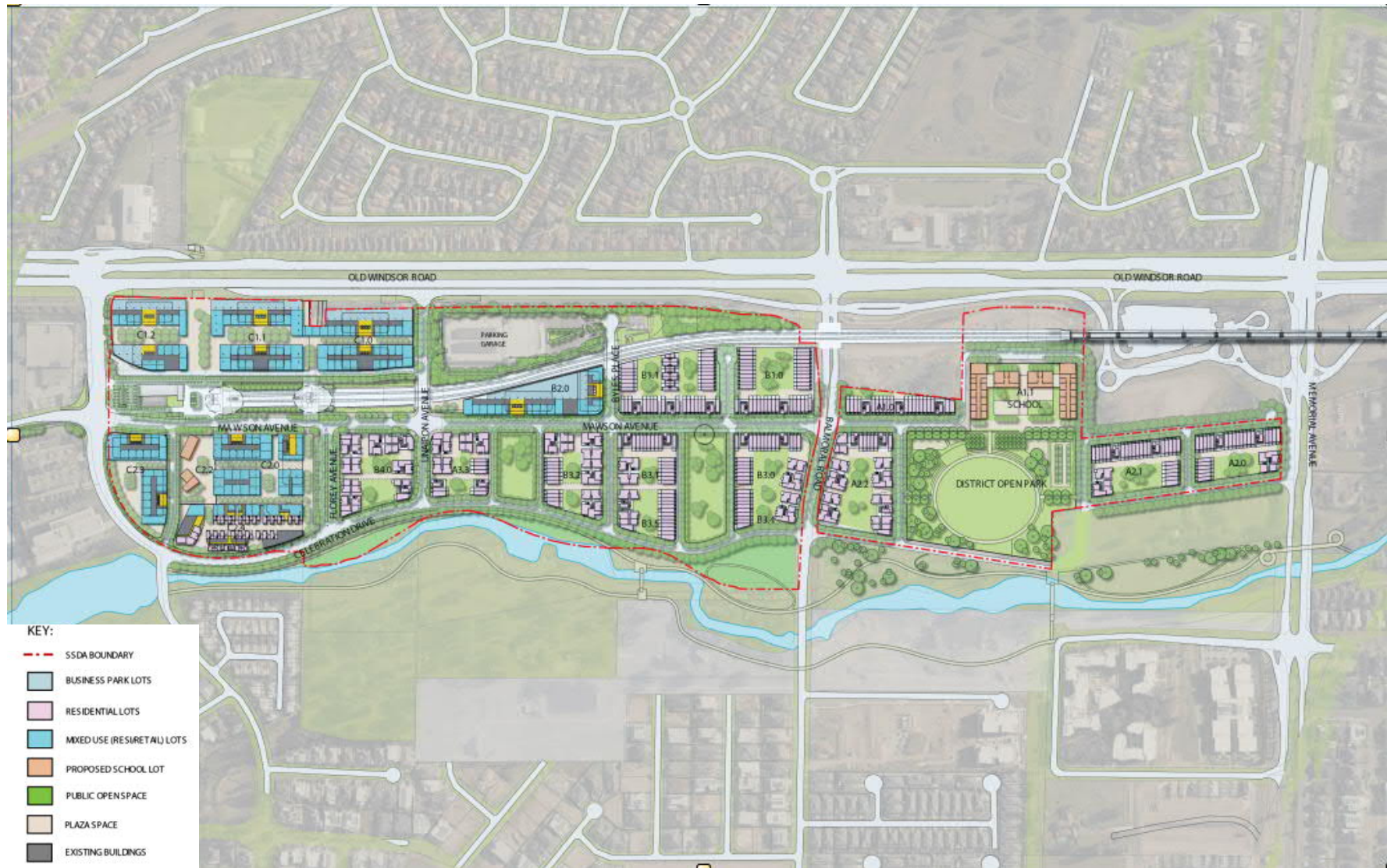


Figure 2.6 Bella Vista Masterplan (Hassell Architects)



### 3. Strategic Opportunities

A strategic analysis is able to highlight characteristics of travel behaviour and that transport network that can be built upon for the Bella Vista and Kellyville Station Precincts. Such an analysis would be able to inform the overarching principles and assessment process for the Bella Vista and Kellyville Station Precincts. They would include a discussion of the below.

#### 3.1.1 Proximity to Metro North West will provide excellent rail access

Metro North West directly improves public transport access between the Bella Vista and Kellyville Station Precinct and a range of destinations, including Norwest Business Park, Rouse Hill, Chatswood, Macquarie Park, North Sydney and Sydney CBD. It also indirectly provides improved travel times and connections with other parts of Sydney by interchanging with other public transport services at key locations. Metro North West operates over a wide span of hours, from early in the morning to late at night, seven days a week. This ensures a high Level of Service and access into and out of the Bella Vista and Kellyville Station Precincts across the whole day.

The new metro stations at Bella Vista and Kellyville are expected to reduce private vehicle use within these precincts for both residents and those travelling to this area. Given the proximity of new the high-density developments to the metro stations, there would be a significantly diminished need to use motor vehicles for most travel into and out of the Bella Vista and Kellyville Station Precinct in the future. This would result in less traffic on local streets, less added traffic on the wider road network and provide greater accessibility and mobility for residents without the need to service the significant cost of a vehicle.

#### 3.1.2 Improved public transport to local destinations

Acting as the key North West-southeast link through Bella Vista and Kellyville Station Precincts, Metro North West is identified as a catalyst for improving the local public transport network. The metro offers the opportunity of building a larger network with more frequent services (in all directions) to serve the subregion surrounding Kellyville and Bella Vista. Currently, bus services and T-way provide frequent northwest-southeast connections. Metro North West will continue to work together with the adjacent North West Transitway to service the public transport needs of this growing residential area.

#### 3.1.3 Managing Parking

Managing the number of car parking spaces within the precinct would mitigate congestion and reduce the safety and environmental footprint on the surrounding. The proximity of the precincts to public transport facilities, coupled with mixed land use that allows short trips to retail and employment offers the opportunity to activate the precincts and create more liveable precincts.

#### 3.1.4 Street network structure and traffic management to limit impacts in and around Kellyville and Bella Vista

In order to achieve good transport and land use outcomes and minimise traffic impacts within the Bella Vista and Kellyville Station Precincts, it is necessary to set a strategic framework to ensure any subsequent proposals are consistent with the future role and function of a particular street. This framework is a vital step in transport planning and is heavily influenced by the land use plans. In turn, the framework informs the land use and can create opportunities or constraints that can occur along a particular street.

The framework defines the future function of the street network on the basis of land use and transport objectives and desired outcomes for the Bella Vista and Kellyville Station Precincts. The roads within and around these precincts provide two primary functions for transport customers:

**Movement:** The ability to travel between places

**Place:** The ability to access origins and destinations of travel

An understanding of the two functions of a street are vital when the two functions are competing, such as through increased movement requirements or improved place amenity. The movement and place function of a street informs planning for the level of access across each of the transport modes. Section 9.5 provides an assessment of the road network within this framework.

## 4. Strategic Planning Context

### 4.1 Sydney Metro

Sydney Metro was identified in *Sydney's Rail Future* as an integral component of the *NSW Long Term Transport Master Plan*, a plan to transform and modernise Sydney's rail network, so it can grow with the city's population and meet the future needs of customers. In early 2018, the *Future Transport Strategy 2056* was released as an update to the *NSW Long Term Transport Master Plan* and *Sydney's Rail Future*. The Sydney Metro North West (Metro North West) was identified as a committed initiative in the *Future Transport Strategy 2056*.

The Sydney Metro program of works includes:

#### 1. North West Line

Passenger services commenced in May 2019 between Tallawong and Chatswood, with a driverless metro train every four minutes in the peak. The project was delivered on time.

#### 2. Metro City & Southwest

A new 30km line extending metro rail from Chatswood, under Sydney Harbour, through new CBD stations and southwest to Bankstown. It is due to open in 2024 with the ultimate capacity to run a metro train every two minutes each way through the centre of Sydney.

Sydney Metro City & Southwest will deliver new metro stations at Crows Nest, Victoria Cross, Barangaroo, Martin Place, Pitt Street, Waterloo and new underground metro platforms at Central Station. In addition, it will upgrade and convert all 11 stations between Sydenham and Bankstown to metro standards.

#### 3. Metro West

Sydney Metro West is a new underground railway between Greater Parramatta and Sydney. This major infrastructure investment will transform Sydney doubling the rail capacity between these two areas, linking new communities to rail services and unlocking housing supply and employment growth between the two CBDs.

Sydney Metro West will service key precincts, with stations at Westmead, Parramatta, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock, The Bays and the Sydney CBD. Potential stations at Pyrmont and Rydalmere are being investigated.

#### 4. Metro Greater West

Metro Greater West is a city shaping line that will service Greater Western Sydney and the new Western Sydney International (Nancy Bird Walton) Airport. The new metro line will become the transport spine for the Western Parkland City's growth connecting communities and travellers with the rest of Sydney's public transport system. The Australian and NSW governments are equal partners in the delivery of this new railway.

### 4.2 Alignment with transport policies and plans

The Bella Vista and Kellyville Station Precincts align with strategic plans including:

#### 4.2.1 Planned Precinct Program

The former Priority Precinct program (now referred to as Planned Precincts) was developed by the NSW Government as the mechanism to deliver the goals of *A Plan for Growing Sydney*, released in December 2014. *A Plan for Growing Sydney* established the NSW Government's vision for Sydney's future, including measures to address one of Sydney's biggest challenges in accommodating the predicted demands for housing and employment. The key objectives of the Planned Precinct program are to provide for new housing and jobs in centres with good transport connections to make it easier for people to get to and from home and work and to ensure that supporting infrastructure is provided to meet the demands generated by the planned housing and population growth.

The importance of the Station Precincts was identified in the NSW Government's *North Rail Link Corridor Strategy* (September 2013). The increased opportunities for high density residential development and the delivery of new community uses, cultural facilities and open space will support the envisaged future resident demand and worker populations.

The NSW Government-led planning reform for the Station Precincts sought to introduce site specific planning controls via an amendment to *The Hills Local Environmental Plan 2012* (THLEP) and an amendment to the SRD SEPP to support Metro North West and to facilitate the delivery of new homes and job and employment opportunities closer to home that positively leverage the new metro stations.

The Kellyville Station Precinct was envisaged to be a vibrant, green and connected community that encompassed the following:

- a range of housing, including housing choice and sizes, employment and retail services close to public transport, regional road networks and high-quality open space;
- an attractive and convenient local centre, providing shops, cafes, restaurants and a central village square;
- a high quality, pleasant network of public, green open space areas;
- improved access and connections to the new station and throughout the precinct via improved bus services, pedestrian and bicycle paths and crossings over creek corridors; and
- the management of impacts on the natural environment, including protection of remnant ecological communities in the creek corridors running through the precinct.

In December 2015, the Department published the Bella Vista and Kellyville Precinct Proposals which outlined the land use and built form controls proposed for the precincts in accordance with the Structure Plans for the *North West Rail Link Corridor Strategy*. The Planned Precinct for the Kellyville Station Precinct proposed several amendments to THLEP, including:

- zoning for a mixed-use centre around the station to facilitate a well-connected, walkable centre that provides a variety of shops, services and high-density residential development;
- areas designated as parks and open space, as well as heritage;
- building heights to transition down from Kellyville Station to stand-alone housing areas beyond, providing for a range of housing types to meet demand for greater housing choice; and
- recommended precinct specific controls for inclusion in a Development Control Plan (DCP), including environmental management and building design controls to provide high levels of amenity for residents and for people using the surrounding public domain and open space areas.

On 1 December 2017, the then Minister for Planning approved *State Environmental Planning Policy Amendment (Bella Vista and Kellyville Station Precincts) 2017*, effecting an amendment to the SRD SEPP and THLEP, which:

- amended Schedule 2 of the SRD SEPP to identify Bella Vista and Kellyville Station Precincts as sites for which specified development was declared to be State Significant Development; and
- amended THLEP by inserting new statutory controls, including a cap on the maximum number of residential dwellings on land identified within both the Bella Vista and Kellyville Station Precincts, as well as rezoning that validates the precincts can support up to 8,400 dwellings.

This SSD application is the next step in the process that seeks to develop concept masterplans and inform of the infrastructure requirements to support the above.

### 4.2.2 Future Transport Strategy 2056

The *Future Transport Strategy 2056* (March 2018) is an update of the *NSW Long Term Transport Master Plan* and is a 40-year strategy for mobility for Sydney and regional NSW. It sets out a vision, strategic directions and customer

outcomes with a focus on technology and innovation across the transport system to transform the customer experience, improve communities and boost economic performance.

The strategy supports the development of liveable communities such as the Bella Vista and Kellyville Station Precincts, where transport is vital to mobility as a 'place maker'. The project would integrate with the Metro North West network, improving the liveability and character of these precincts. This would lead to the achievement of wider benefits from investment and encourages more desirable patterns of development, fulfilling a desired outcome identified in the strategy.

#### **4.2.3 The Greater Sydney Region Plan – A Metropolis of Three Cities**

*The Greater Sydney Region Plan – A Metropolis for Three Cities* (June 2018) is built on a vision where most residents live within 30 minutes of their jobs, education and health facilities, services and great places. The Plan identifies that Sydney's population is forecast to grow to eight million people by 2056 and will be accommodated within three cities: the Western Parkland City, the Central River City and the Eastern Harbour City.

Sydney Metro responds to the transport demand that would accompany the growth envisaged in the Plan to deliver a new standalone metro railway network with 31 stations and more than 66 kilometres of new metro line. Together with signalling and infrastructure upgrades across the existing Sydney rail network, capacity of train services entering the Sydney CBD will increase from about 120 an hour today to up to 200 services beyond 2024. This represents an increase of up to 60 per cent capacity across the network to meet future travel demand. The project has been endorsed by the NSW Government as a key component of *Sydney's Rail Future: Modernising Sydney's Trains*.

The urban renewal of the Kellyville Station Precinct, located in the *Greater Sydney Region Plan's* Central River City, will be essential to supporting the forecast population growth by delivering new housing and employment opportunities and supporting infrastructure in proximity to the new metro station. The new Kellyville Station will be a key catalyst in both driving and supporting the planned growth within the Station Precinct, providing residents and visitors access to the new Sydney Metro network, connecting to surrounding Metropolitan and strategic centres, including Central Sydney, St Leonards and Macquarie Park.

The *Central City District Plan* identifies the district as "...a place of changing built form and urban fabric" which is being driven by an unprecedented investment in public transport that is enabling the urban renewal and embellishment of a range of transit-oriented development (TOD) high density developments. The District Plan recognises the role of the new Kellyville Station and associated investment in public transport infrastructure, in unlocking capacity for increased development and supporting the urban renewal of the Station Precinct. The urban renewal of land surrounding the Kellyville Station Precinct will ensure provision is made for the delivery of high-density residential development and an associated increased housing supply, choice and affordability in proximity of improved public transport connections and supporting retail services to meet the changing needs of the growing population.

The concept SSD application will build upon the opportunities afforded by Sydney Metro through the provision of a mixed-use TOD urban precinct that comprises of new residential accommodation and retail land uses, community facilities and passive and active open space recreation facilities.

The Station Precincts are ideally positioned to positively leverage the Metro North West corridor to ensure the delivery of an attractive and vibrant centre that provides for new jobs, housing, essential services and infrastructure.

#### **4.2.4 State Infrastructure Strategy 2018**

*State Infrastructure Strategy 2018* (SIS) is a 20-year strategy that identifies and prioritises the delivery of critical public infrastructure to drive productivity and economic growth. Infrastructure NSW's assessment of the State's existing infrastructure highlighted critical deficiencies in Sydney's road capacity. The SIS identifies strategic infrastructure options to meet the challenges of growth in travel demand and substantial increases in freight volumes.

Specifically, the SIS identifies the Metro North West as a strategic urban renewal corridor required to accommodate the expected growth in housing and employment in the area. The strategy also recognises the importance in delivering a commercially feasible, high-quality urban development in Bella Vista and Kellyville, balancing housing supply against the consideration of urban design and place-making.

#### 4.2.5 Sydney's Walking Future

*Sydney's Walking Future* (December 2013) aims to connect communities to urban growth area; in particular, the Rouse Hill and Castle Hill to Norwest corridor which has been identified as an 'Activity Centre'. These centres aim to have a two-kilometre walking catchment. *Sydney's Walking Future* identifies two kilometres as the ideal length for walk-only trips. The Bella Vista and Kellyville Station Precincts are situated in between these two Activity centres.

*Sydney's Walking Future* also identifies walking as a key mode for linked trips with the Metro North West interchanges to prioritise access for people walking to and through the Bella Vista and Kellyville stations. This includes the new shared pedestrian and cycle path that runs alongside the skybridge viaduct, which is located between Rouse Hill and Bella Vista.

#### 4.2.6 Sydney's Cycling Future

*Sydney's Cycling Future* focusses on cycling network infrastructure around centres and aims for separation of bicycles, vehicles and pedestrians whenever possible.

Within the Bella Vista and Kellyville Station Precincts, the plan commits to developing a bike plan within five kilometres of the Rouse Hill and Norwest Business Park major centre. *Sydney's Cycling Future* also commits to providing secure bike parking and racks at all stations along the Metro North West corridor. It also looks at improving the local bicycle network to these interchanges as well as providing better trip planning and information to customers wanting to continue their journey by train.

#### 4.2.7 Sydney's Bus Future

*Sydney's Bus Future* outlines key challenges and opportunities to increase the attractiveness of bus usage via key actions for the NSW Government on how to improve bus service for all customers. The plan identifies a tiered service provision of buses: rapid, suburban and local.

The plan reflects coordination with the Metro North West project, by providing rapid bus route alignments to coordinate with station locations. An improved route is proposed from Rouse Hill to Hurstville via T-way, Parramatta and Bankstown with improved bus priority and pinch point reduction projects.

#### 4.2.8 North West Rail Link Corridor Strategy

*North West Rail Link Corridor Strategy*, which included Structure Plans for each Station Precinct, was finalised in 2013 to guide and coordinate future planning for the corridor. The Corridor Strategy, which included Structure Plans for the eight new Station Precincts, was prepared to integrate land use and transport planning to meet current and emerging challenges associated with future growth in the North West region.

The *North West Rail Link Corridor Strategy* identifies the potential for around 28,000 new homes and 40,000 new jobs within the Metro North West corridor.

The Bella Vista and Kellyville Station Precinct will have an important function in the metro corridor as a business and commercial 'destination' station, while also providing increased residential development opportunities. Existing employment lands will be retained and enhanced to accommodate higher density development in the future. There will also be the opportunity to integrate expanded retailing, community uses, cultural facilities and open space to cater for the increased number of workers, residents and visitors.

The *North West Rail Link Corridor Strategy* aims for the Bella Vista and Kellyville Station Precincts to evolve to become a transit oriented, predominantly residential area. A new local centre would adjoin the station to provide a new focal point for the community, including neighbourhood shops. A variety of housing types would be provided, with the tallest building closest to the station and local centre, reducing in height further beyond.

### **4.3 Transport Principles and Objectives**

The planning of the transport network for Bella Vista and Kellyville Station Precincts have been informed by a guiding set of principles. These principles seek to ensure that the future residents and workers of the Bella Vista and Kellyville Station Precincts will have the benefit of choice, not only for their travel mode, but for when and where they wish to live and travel to work. The principles build on the strategic opportunities for the precinct identified in Section 3.

#### **Principle 1: Support the development of transport networks that provide multiple options for all-day access**

Ensure that residents and workers are provided with multiple high-quality transport options to reach a variety of destination/s to live, work and play.

#### **Principle 2: Encourage access by public transport, walking and cycling to reduce car dependence**

Provide high quality public and active transport linkages and sustainable approaches to parking provision that encourages residents to live car independent lifestyles if they choose to do so.

#### **Principle 3: Support walkable urban environments**

Ensure an integrated land use and transport outcome that supports walkable streets and high-quality urban outcomes within the precinct, including active street frontages, fine-grained development pattern and a connected, permeable street network.

#### **Principle 4: Minimise impacts to state road network**

Ensure that any adverse impacts to regional connections for public transport and freight, such as Old Windsor Road and Windsor Road, are minimised where possible.

#### **Principle 5: Minimise impacts to bus network**

Ensure adverse impact on bus network transit times accessing the town centre is minimised where possible, which include the bus feeder routes, local routes, regional routes and the North West Transitway.

#### **Principle 6: Support a hierarchy of access based on time of day**

Develop and implement a hierarchy of access that prioritises access for people and goods based on time of day using the movement and place approach.



## 5. Existing Land Use and Demographics

### 5.1 Land Use

#### 5.1.1 Overview

The existing land use surrounding the Bella Vista and Kellyville Station Precincts is predominately low density residential with business park land uses concentrated to the south and southeast of the Bella Vista Station Precinct within Norwest Business Park. With the Metro North West serving as a major catalyst for improved accessibility, there are opportunities for urban renewal to provide additional jobs and residential dwellings within proximity of the new metro stations.

More detailed analysis on the land use context within the wider Bella Vista and Kellyville Statistical Areas Level 2 (SA2) catchment areas are discussed in this section. The extents of the SA2 catchment areas in relation to the Station Precinct boundaries and development application site are shown in Figure 5.1.

Note, the SA2 boundaries extends beyond the whole Bella Vista and Kellyville Station Precinct. The SA2 boundaries are defined by the Australian Bureau of Statistics (ABS) as the area that best represents a community that interacts together socially and economically. It is the smallest parcel of land for the release of ABS non-Census and Intercensal statistics<sup>3</sup>. Given this, the SA2 catchment area has been used to assess the existing land use in the surrounding area.

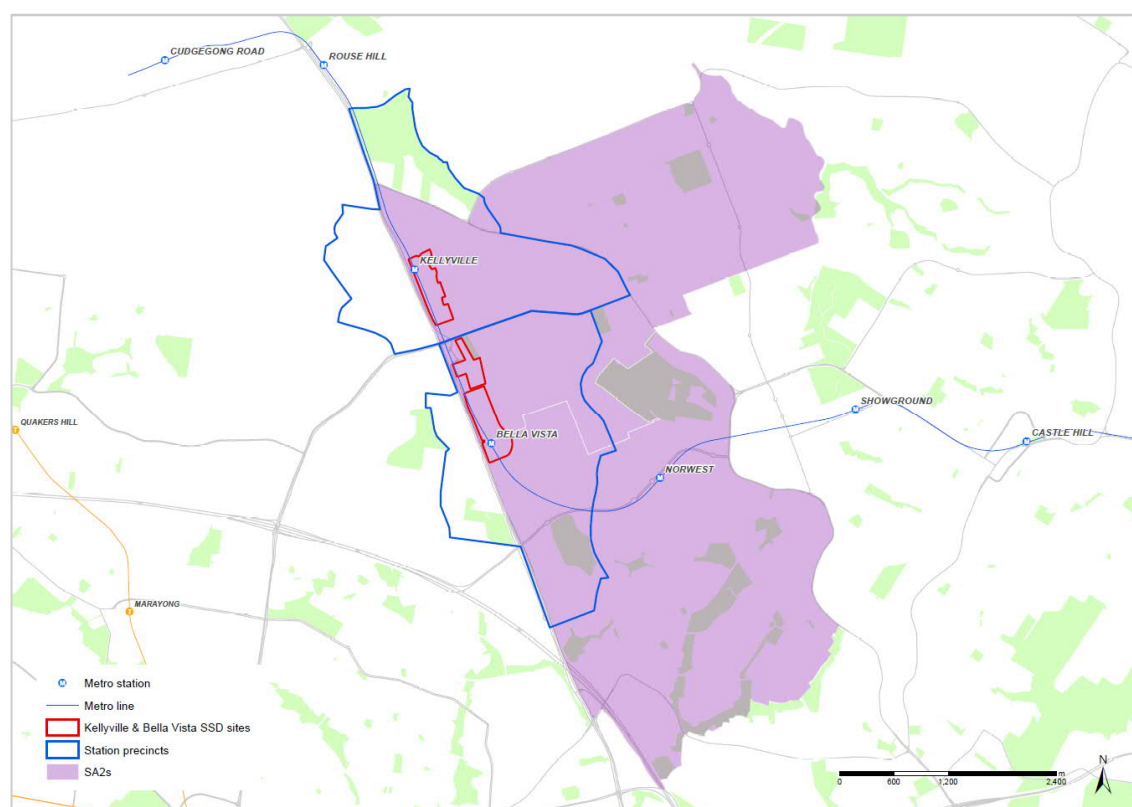


Figure 5.1: Bella Vista and Kellyville Station Precincts and SA2 boundaries

<sup>3</sup> Source:

[https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/1270.0.55.001~July%202016~Main%20Features~Statistical%20Area%20Level%2020\(SA2\)~10014](https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/1270.0.55.001~July%202016~Main%20Features~Statistical%20Area%20Level%2020(SA2)~10014)



### 5.1.2 Centres, population and employment distribution

The Bella Vista and Kellyville Station Precincts form part of the North West Metro Corridor located between Castle Hill and Rouse Hill. Castle Hill and Rouse Hill are identified as District Centres in the *Central City District Plan* and are anticipated to create new connections and economic opportunities within and around the surrounding region. The hierarchy of centres along the Sydney Metro line is illustrated in Figure 5.2.

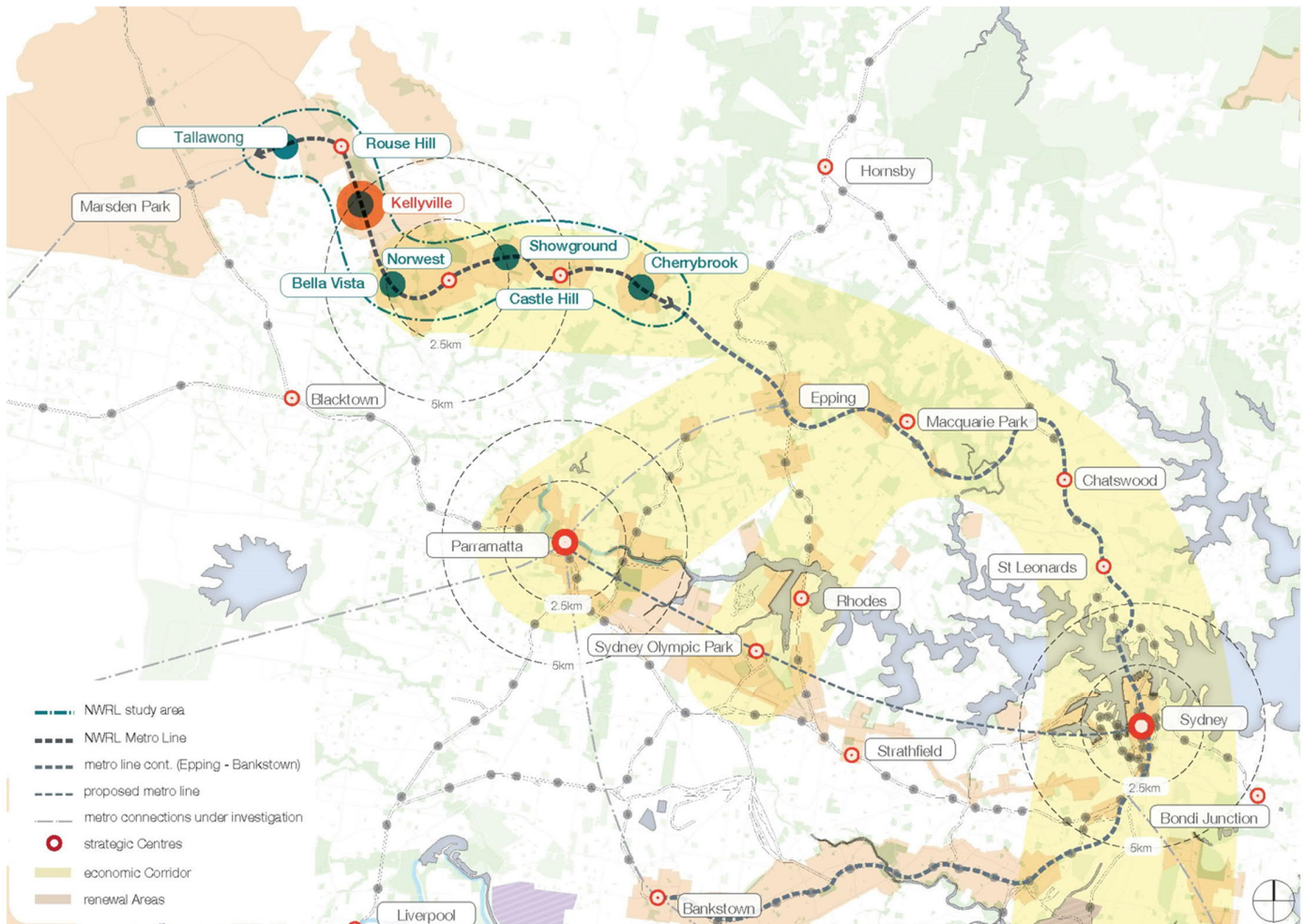


Figure 5.2: Sydney Metro - District and Strategic Centres

Along the North West Metro line, the Bella Vista (SA2) catchment covers an approximate area of 1,096 hectares with a total population of 20,066 (based on the 2016 Census data). Similarly, the Kellyville (SA2) catchment covers an approximate area of 1,064 hectares and had a population of 27,971 in 2016. The distribution and density of this population across the SA2 areas is provided in Figure 5.3 and shows low population density in Bella Vista and Kellyville, particularly in the areas that surround the metro line.

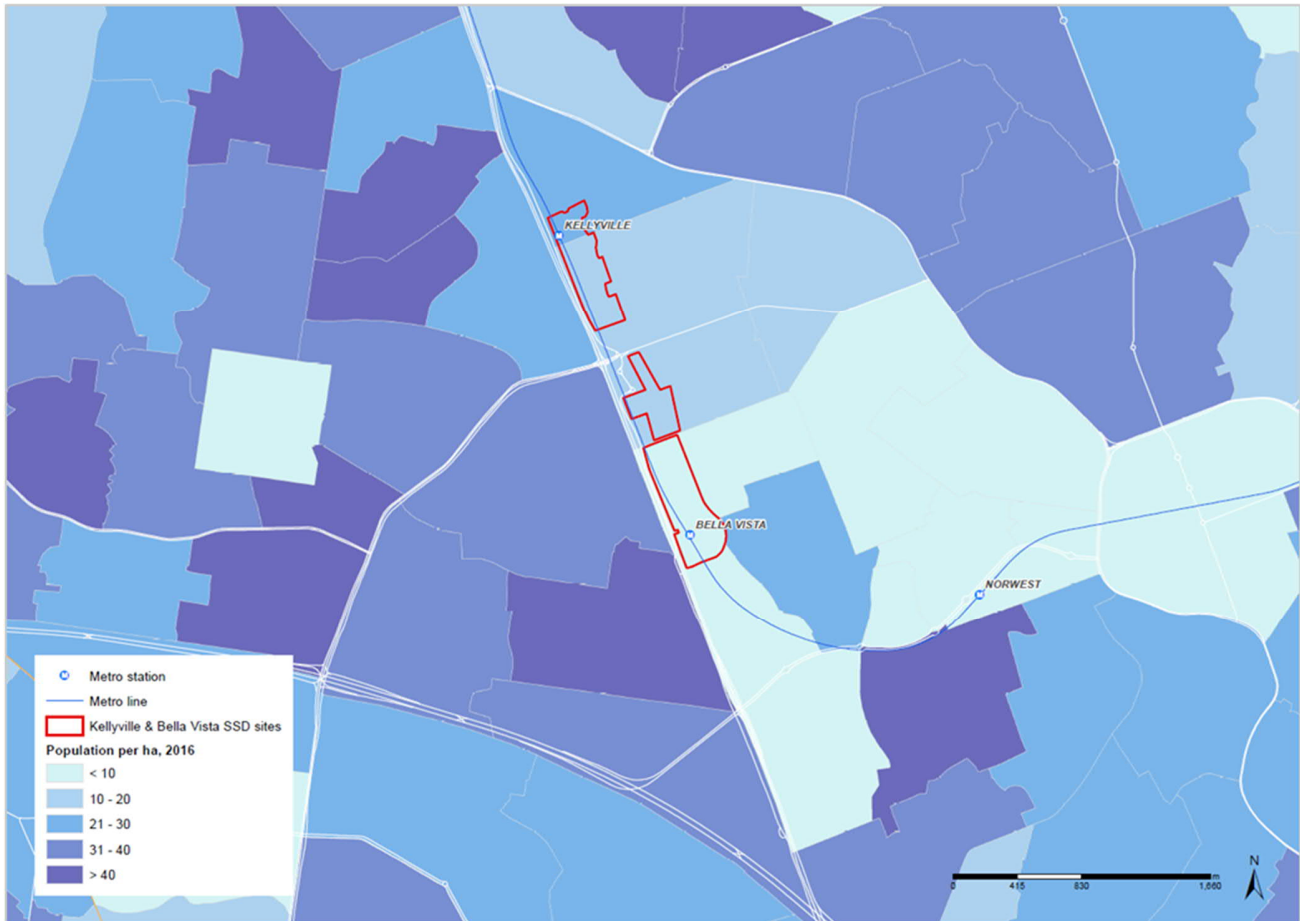


Figure 5.3: Bella Vista and Kellyville population density

Analysis of workers travelling to Bella Vista and Kellyville is based on Journey to Work (JTW) data. Due to privacy concerns the ABS is currently making changes in anonymising the 2016 JTW data. As such, the 2016 JTW data is not yet available to the public at the level of detail required for this assessment.

Based on the latest available JTW data collected in 2011 the total daily number of persons travelling for employment in the Bella Vista and Kellyville (SA2) catchment areas are 19,145 and 2,919 respectively. These trips are predominately made up of workers travelling to employment in the Norwest Business Park located directly south of the Bella Vista Station Precinct. Major employment in the surrounding catchment area is located at Baulkham Hills, Castle Hill and Rouse Hill. They provide additional employment within the North West strategic centres in the region.

The total number of proposed developments in the Bella Vista and Kellyville Station Precincts, which includes the proposed developments within the concept SSD application for both sites, are envisaged to provide up to 7,510 and 270 new jobs respectively, increasing employment opportunities in the area.

### 5.1.3 Retail, education and community facilities

Within the immediate Bella Vista and Kellyville Station Precinct the zoning caters mainly for residential with some retail, education and commercial developments near Celebration Drive in Bella Vista and Windsor Road in Kellyville. Currently, there are several retail centres within the area located within the Norwest Business Park, which contain several medium to large commercial enterprises (e.g. Resmed, Woolworths Group and Bella Vista Hotel). The concept masterplan for the SSD application will increase the total retail and commercial space by a further 14,000m<sup>2</sup> and 150,000m<sup>2</sup> for the Bella Vista Station Precinct and 10,047m<sup>2</sup> of retail space for the Kellyville Precinct. Kellyville will have no commercial land use.

The Bella Vista and Kellyville Station Precincts also have access to the broader retail and employment centres at Rouse Hill and Castle Hill (e.g. Rouse Hill Town Centre and Norwest Marketown). The introduction of the Metro North West provides for more direct access and will likely increase the frequency of public transport to commercial and retail districts from the two precincts once residential units within the two precincts are released.

The concept SSD application within the Bella Vista application site includes land reserved for a primary school of up to 1,000 student places. Selection of a suitable site for the school has been iterative with the aim of maintaining close proximity to the residential plots and open space to ensure ease of access and encourage walking to the school. Other schools, health and community related facilities within the surrounding area include the Norwest Private Hospital, Parklea Public School, John XXIII Catholic Primary School, Kellyville Public School and Bella Vista Public School. Safe access to these destinations is an important component of the design of Bella Vista and Kellyville Station Precincts to maximise their integration with surrounding areas.

### 5.1.4 Character

Based on 2016 Census data, there are approximately 2,173 and 6,676 dwellings within the Bella Vista and Kellyville (SA2) catchment areas respectively. They primarily consist of detached and semi-detached housing with small amounts of medium and high-density dwellings as shown in Table 5.1.

Table 5.1 also outlines the existing dwelling mix in the Sydney Greater Metropolitan Area (GMA) and areas where there are high and medium density developments close to rail. The delivery of housing in the Bella Vista and Kellyville Station Precincts is expected to increase the number of medium and high-density dwellings closer to the metro stations. With a greater range of housing options available to increase housing choice and variety, the precincts can be developed into compact and sustainable strategic centres.

Table 5.1: Dwelling type for Bella Vista and Kellyville (SA2, 2016)

Catchment Area (SA2)	Dwelling Type as Proportion of Total Dwelling			
	Flat or apartment	Semi-detached	Separate house	Other dwelling
<b>Baulkham Hills West - Bella Vista</b>	<b>0.03</b>	<b>0.12</b>	<b>0.85</b>	<b>0.00</b>
<b>Kellyville</b>	<b>0.02</b>	<b>0.08</b>	<b>0.90</b>	<b>0.00</b>
Macquarie Park – Marsfield	0.44	0.36	0.20	0.00
Parramatta – Rosehill	0.85	0.04	0.09	0.02
Sydney GMA	0.28	0.14	0.57	0.01

## 5.2 Demographics

This section provides an assessment of the existing population characteristics of Kellyville and Bella Vista. This assessment is based a demographics analysis undertaken by Elton Consulting on behalf of Landcom as part of their social infrastructure and open place assessment of the Kellyville and Bella Vista Station Precincts.

The data used in Elton Consulting's demographics analysis was collected from Profile id. which uses ABS data and was taken at the following levels:

- Kellyville (suburb)
- Bella Vista (suburb)
- The Hills Shire (Local government area (LGA))
- Greater Sydney

The demographic data shows that when compared to the Hills LGA and Greater Sydney:

- Bella Vista has a higher proportion of people aged 18-24 and 50-59. There is also a significantly high proportion of couples with children (62% compared to 53% in The Hills Shire and 35% in Greater Sydney). This suggests there is a high proportion of older families living in the area, perhaps with adult children living with their parents.
- Bella Vista also has a higher proportion of people aged 60-69 compared to Kellyville but is similar to The Hills Shire (11.4% and 10.6% respectively)
- Compared to Bella Vista, The Hills Shire and Greater Sydney, Kellyville has a higher proportion of people aged 5-11 and 35-49. Kellyville also has a high proportion of couples with children compared to The Hills Shire and Greater Sydney. This suggests that Kellyville has a large proportion of young couples with young children.
- Kellyville and Bella Vista both have high median weekly household incomes with a high proportion of professionals and managers.
- Bella Vista has a high proportion of university students compared with Kellyville, The Hills Shire and Greater Sydney.
- Bella Vista and Kellyville both have a high proportion of people with mortgages. However, Bella Vista has a significantly higher proportion of people who own their home outright suggesting that the Bella Vista community is more established, and that the Kellyville community has a greater number of first home buyers.
- Both Kellyville and Bella Vista have predominantly low-density housing.

These characteristics suggest that Kellyville and Bella Vista are currently relatively affluent areas with high proportions of professional employment. While both suburbs have a high proportion of couple with children households, Kellyville is made up predominantly of young couples with young children, while Bella Vista has a higher proportion of older families living in the area. There is also a high proportion of university students living in Bella Vista compared to Kellyville. Both communities are predominantly made up of low-density housing.<sup>4</sup>

Based on Elton's demographic analysis the existing population in Bella Vista and Kellyville is more likely to work in white-collar professions. Such jobs tend to be located in major centres with strong public transport connections and high non-car mode shares such as the Sydney CBD, Parramatta CBD, North Sydney and to a lesser extent the Macquarie Park and Norwest business districts. Despite this, the level of car ownership in Bella Vista and Kellyville shows a greater proportion of cars per dwellings than the Sydney GMA average (Table 5.2). Overall, the high level of car ownership in Bella Vista and Kellyville, coupled with the existing demographics, is suggestive of an area with families and children, low density development and limited access to alternative modes of transport. Introduction of the Metro North West will provide greater opportunities for mode shift away from private vehicles, however it will require strong connections via active and public transport to the metro stations.

<sup>4</sup> Source: Elton Consulting, Social infrastructure and open space assessment - Kellyville and Bella Vista Station Precincts (29 May 2019)

In the future, the Bella Vista and Kellyville precinct planning proposal will provide for greater number of high to medium density developments that will have access to mass public transport connections. Future car ownership in Bella Vista and Kellyville is expected to be at similar levels to existing rail Station Precincts such as Parramatta-Rosehill and Chatswood (East) – Artarmon, as shown in Table 5.2.

Table 5.2: Car ownership in Bella Vista and Kellyville (SA2, 2016)

2016 Census (SA2)	Baulkham Hills West - Bella Vista	Kellyville	Parramatta - Rosehill	Chatswood (East) - Artarmon	Sydney GMA
Total population	20,066	23,228	29,249	20,857	4,823,991
No. private dwellings	6,344	7,235	11,783	8,833	1,855,734
Average motor vehicles per dwelling	2.2	2.2	1	1.1	1.7



## 6. Existing Travel Behaviour

Current travel behaviours in Bella Vista and Kellyville have been benchmarked against existing rail Station Precincts and Sydney's Greater Metropolitan Area (GMA) to evaluate future travel patterns and behaviours that result from this development application.

The current mode share has been assessed using the 2016 Census data at Statistical Area Level 2 (SA2). Work related trip origin and destinations are based on the latest available Journey to Work (JTW) data, which was collected in 2011 (refer to Section 5.1.2 for further explanation on JTW data).

### 6.1.1 Mode share

Figure 6.1 shows the current mode share of workers travelling into and out of Bella Vista and Kellyville. The data represents the mode of travel for all employed people who travelled to work on census day in 2016.

Prior to the opening of Metro North West, over 70% of work trips were reported undertaken by private vehicle in Bella Vista and Kellyville. The majority of public transport mode share is in the form of bus travel which accounts for 10% of all incoming and outgoing trips. A very small amount of travel was reported undertaken by train with no more than 2% of work trips in being catered for on the heavy rail network.

Active transport (walking and cycling) accounts for a low proportion of work travel with less than 3% of trips undertaken by either walking or cycling.

Whilst not included in this data, a significant proportion (8% and 7% for Bella Vista and Kellyville respectively) of employed people did not travel to work whilst 5% of workers worked from home. Generally, across the region, the proportion of people working from home and/or not travelling to work in peak periods is likely to increase into the future. The creation of a new mixed-use town centre in conjunction with enhanced public transport services, specifically through introduction of the new Metro North West will further reduce the existing high level of car reliance and increase public transport, walking and cycling mode share.

The planning of future transport infrastructure and services in Bella Vista and Kellyville has been and will continue to be undertaken in a manner which promotes non-car modes and seeks to reduce the currently high level of car use for both incoming and outgoing trips.

An assessment of mode choice in Parramatta and Chatswood demonstrates the importance of proximity to rail as being a key factor in determining how people choose to travel. In Parramatta and Chatswood, the number of work-related trips by train are high while private vehicle usage is significantly lower than Bella Vista and Kellyville due to combination of better public transport accessibility and planning controls that regulate parking provisions for new developments and pricing policies to drive the public transport mode share higher. The existence of an already well-established bus networks in Bella Vista and Kellyville that connects to larger centres shows higher bus usage for travel to work than Parramatta and Chatswood demonstrating the willingness of residents in the area to use public transport when provided.

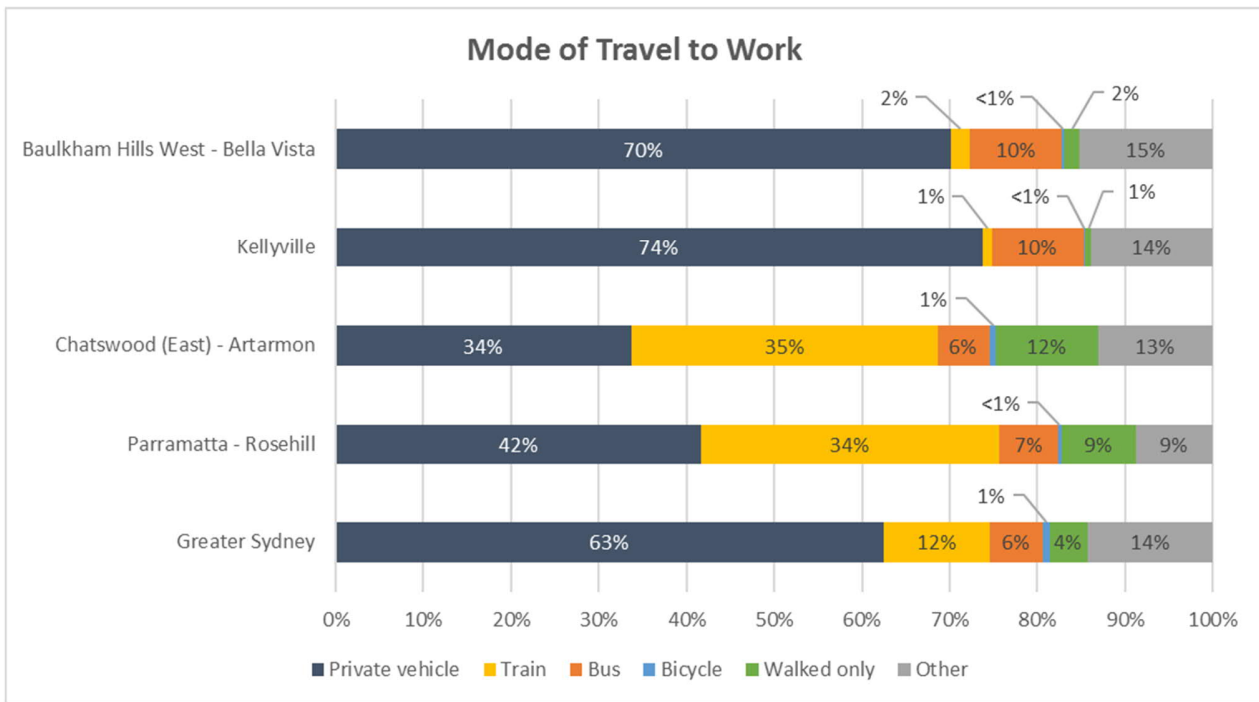


Figure 6.1: Mode of travel to work (SA2, 2016)

### 6.1.2 Workers and residents

Figure 6.2 and Figure 6.3 outline the top 10 JTW origins and destinations for people working or residing in Bella Vista and Kellyville (SA2).

For persons residing in Bella Vista and Kellyville the top three work destination are:

- 1) Baulkham Hills (West) - Bella Vista (22%)
- 2) Sydney-Haymarket - The Rocks (17%)
- 3) Castle Hill (16%)

For persons residing in Bella Vista and Kellyville the lowest proportion of work destination are:

- 1) Lalor Park - Kings Langley (5%)
- 2) Northmead (5%)
- 3) Homebush Bay-Silverwater (4%)

For persons employed in Bella Vista and Kellyville the top three places of residences are:

- 1) Kellyville (21%)
- 2) Baulkham Hills (West) - Bella Vista (16%)
- 3) Castle Hill (10%)

For persons employed in Bella Vista and Kellyville the lowest proportion for places of residences are:

- 1) Baulkham Hills (East) (6%)
- 2) Lalor Park-Kings Langley (6%)
- 3) Dural-Kenthurst-Wisemans Ferry (5%)

It is clear that work-based journeys coming into the precinct are predominantly from locations within or adjacent to the Bella Vista and Kellyville Station Precincts. Conversely, trips by residents in Bella Vista and Kellyville to their employment are more varied, short trips within the Station Precincts as well as regional trips towards the Sydney CBD and Parramatta. Note, the majority of work-related trips travelling to and from Baulkham Hills (West) - Bella Vista (SA2) are associated with employment in the Norwest Business Park.

Planning for transport infrastructure and services in the Bella Vista and Kellyville Station Precincts will therefore need to cater for both local and longer distance trips.

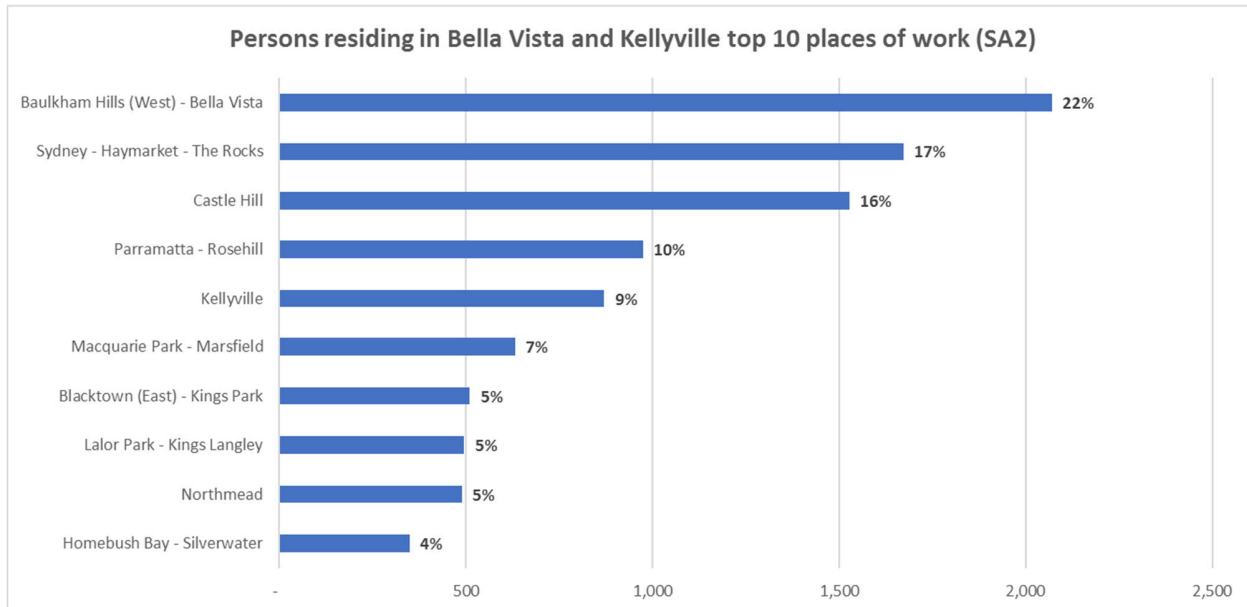


Figure 6.2: JTW top 10 destinations (SA2, 2016)



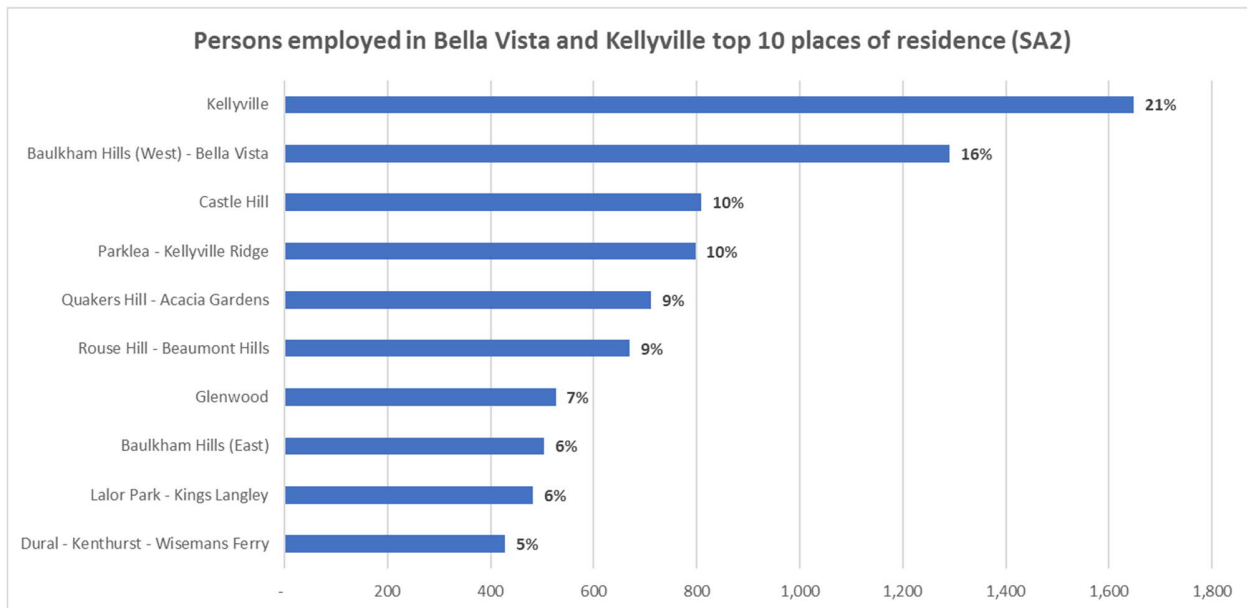


Figure 6.3: JTW top 10 destinations (SA2, 2016)

### 6.1.3 Existing trip generation

Trips currently generated by the Bella Vista and Kellyville development application site includes a small number of trips generated by the ongoing finishing works associated with the Metro North West stations at Bella Vista and Kellyville.

## 7. Existing Transport Network

### 7.1 Rail network

Passenger services on the Metro North West Line started in May 2019 between Tallawong and Chatswood with a driverless metro train every four minutes in the peak. The alignment of the Metro North West is shown below in Figure 7.1.



Figure 7.1: Sydney Metro alignment

Source: Sydney Metro

Before introduction of the Metro North West less than three percent of total residents in Bella Vista and Kellyville used trains as a mode of travel to work (refer to Section 6.1.1). No rail network existed in the surrounding area with the closest train station located over four kilometres away at Seven Hills.

The Metro North West has provided direct connections to jobs and services across the North West region, as well as indirect connections with other parts of Sydney via interchanging with other public transport services. This includes Rouse Hill, Castle Hill, Norwest, Macquarie Park, Chatswood and Sydney CBD, which make up a significant proportion of work trips travelling into and out of Bella Vista and Kellyville. With the future extension of the Metro North West to the City and Southwest additional destinations and connectivity to other locations will be feasible for residents of Bella Vista and Kellyville via public transport reducing their reliance on private transport.

## 7.2 Bus network

There is an established bus network that serves Bella Vista and Kellyville which provides access to:

- Local destinations:
  - Bella Vista and Kellyville station;
  - Norwest Business Park; and
  - Norwest private hospital.
- Regional connections:
  - Rouse Hill, Norwest and Castle Hill;
  - Blacktown, Seven Hills and Parramatta;
  - Macquarie Park, Chatswood and North Sydney; and
  - Sydney CBD.

Prior to construction of the Metro North West, the North West Transitway was the only form of mass public transport that operates in its own dedicated bus way or lane primarily along Old Windsor Road between Rouse Hill and Beaumont Hills/Kellyville to Parramatta and the City/North Sydney and Blacktown.

The bus routes and their frequency during the morning and evening peak are provided in Table 7.1. The bus corridors for every bus route that serve the surrounding area are shown in Figure 7.2. The peaks hours provided for the bus frequency were 8:00-9:00am and 5:00-6:00pm, which aligned with the general traffic morning and evening peaks hours respectively.

Table 7.1: Existing bus services and peak hour frequencies (18 March, 2020).

Route	Route name	Number of buses	
		AM peak hour frequency (8-9am)	PM peak hour frequency (5-6pm)
601	Parramatta to Rouse Hill	4	4
	Rouse Hill to Parramatta	4	4
602X	North Sydney to Bella Vista Station	-	4
	Bella Vista Station to North Sydney	4	-
603	Parramatta to Rouse Hill Station via Glenhaven	4	2
	Rouse Hill Station to Parramatta via Glenhaven	1	4
607X	City QVB to Bella Vista Station	4	6
	Bella Vista Station to City QVB	6	4
613X	City QVB to Bella Vista	-	2

Route	Route name	Number of buses	
		AM peak hour frequency (8-9am)	PM peak hour frequency (5-6pm)
	Bella Vista to City QVB	3	-
615X	City QVB to North Kellyville	-	6
	North Kellyville to City QVB	5	-
616X	City QVB to Kellyville Ridge	-	5
	Kellyville Ridge to City QVB	5	-
617	Kellyville Station to Rouse Hill Station	2	2
	Rouse Hill Station to Kellyville Station	4	2
626	Pennant Hills to Kellyville Station via Cherrybrook	2	2
	Kellyville Station to Pennant Hills via Cherrybrook	2	2
632	Pennant Hills to Rouse Hill Station via Norwest & Castle Hill	2	2
	Rouse Hill Station to Pennant Hills via Norwest & Castle Hill	2	2
651	Epping to Rouse Hill Station via Castle Hill	2	2
	Rouse Hill Station to Epping via Castle Hill	2	2
663	Parramatta to Rouse Hill Station via Kellyville Ridge	3	5
	Rouse Hill Station to Parramatta via Kellyville Ridge	4	3
664	Parramatta to Rouse Hill Station via Kellyville	6	3
	Rouse Hill Station to Parramatta via Kellyville	3	5
665	Parramatta to Rouse Hill Station	4	8
	Rouse Hill Station to Parramatta	10	4
714	Seven Hills to Norwest via West Baulkham Hills	-	2
	Norwest to Seven Hills via West Baulkham Hills	2	-
715	Seven Hills to Rouse Hill Station via Norwest & Kellyville	2	2
	Rouse Hill Station to Seven Hills via Kellyville & Norwest	2	2
730	Blacktown to Castle Hill via Glenwood & Norwest	4	3
	Castle Hill to Blacktown via Norwest & Glenwood	2	3
734	Blacktown to Riverstone via Schofields	2	2
	Riverstone to Blacktown via Schofields	2	2
735	Blacktown to Rouse Hill	2	2
	Rouse Hill to Blacktown	3	2

The Bella Vista Station Precinct is located within an 'on-demand' area where residents living within this area can organise for buses to pick them up at an agreed point near home and drop off at Norwest Station, Bella Vista Station or

Hills Showground Station. This initiative from the NSW Government was introduced on 27 May 2019 after the opening of the Metro North West and aims to make it easier for residents to travel to/from the metro stations.

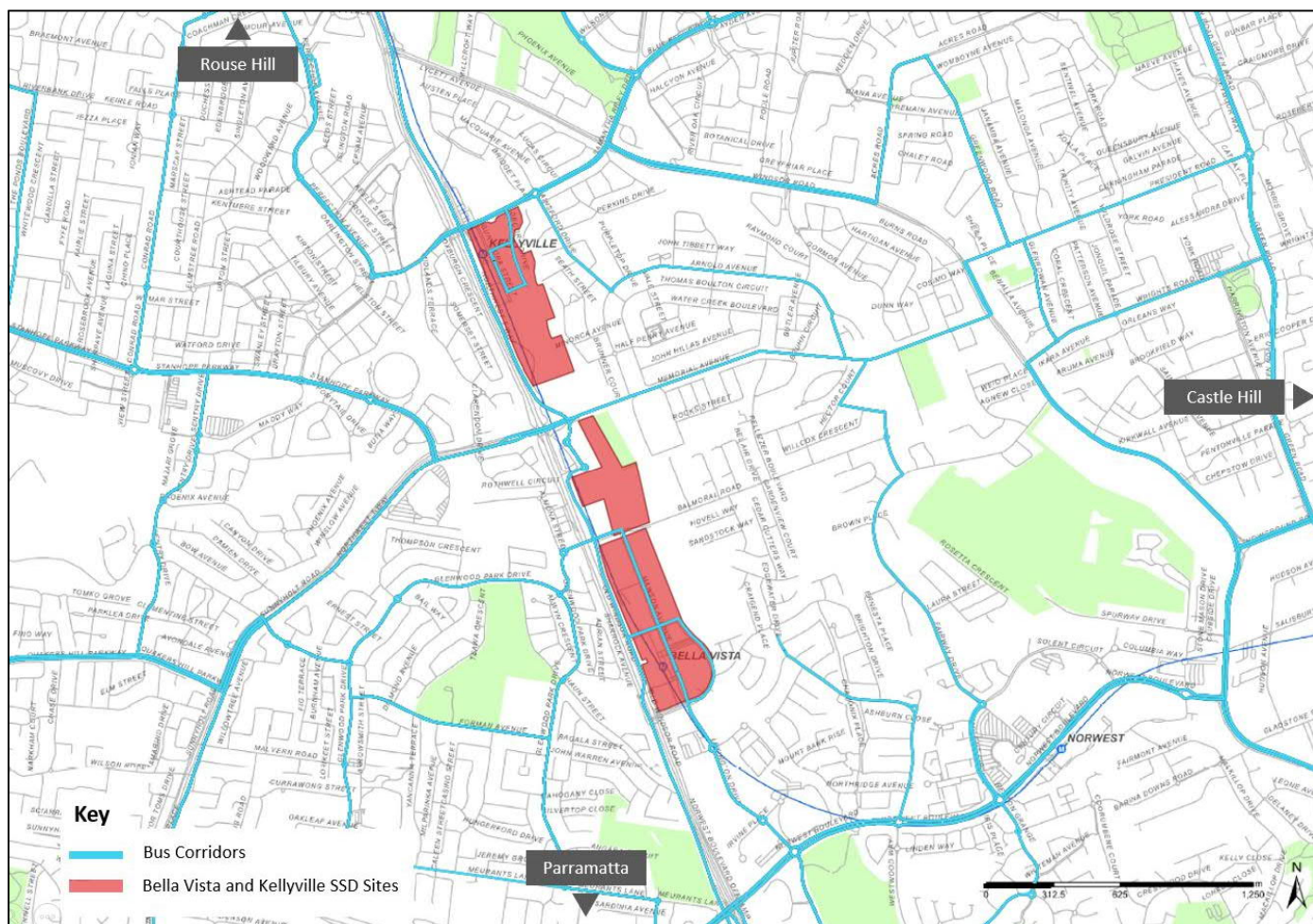


Figure 7.2: Existing bus corridors

The bus services assessed are current as of 18 March 2020 and includes changes made to bus service frequency and stopping pattern post MNWL. These changes include:

- Addition of 603 (Parramatta to Rouse Hill Station via Glenhaven)
- Addition of route 626 (Pennant Hills to Kellyville Station via Cherrybrook)
- Addition of route 632 (Pennant Hills to Rouse Hill Station via Norwest & Castle Hill)
- Addition of route 651 (Epping to Rouse Hill Station via Castle Hill)
- Addition of route 663 (Parramatta to Rouse Hill Station via Kellyville Ridge)
- Addition of route 664 (Parramatta to Rouse Hill Station via Kellyville)
- Addition of route 714 (Seven Hills to Norwest via West Baulkham Hills)
- Addition of route 730 (Blacktown to Castle Hill via Glenwood & Norwest)
- Addition of route 734 (Blacktown to Riverstone via Schofields)
- Removal of T64 (Parramatta to Rouse Hill Town Centre via Kellyville)



- Removal of T65 (Parramatta to Rouse Hill Town Centre)
- Removal of T66 (Parramatta to Rouse Hill)
- Removal of T70 (Castle Hill to Blacktown via Glenwood)
- Removal of T71 (Blacktown to Castle Hill via Stanhope Gardens)
- Removal of T74 (Riverstone to Blacktown)
- Removal of 612X (Milsons Point to Kellyville)
- Removal of 617X (City QVB to Rouse Hill Town Centre)
- Removal of 618X (City QVB to Norwest Business Park via Lane Cove Tunnel)
- Removal of 619 (Macquarie Park to Rouse Hill via Castle Hill)
- Removal of 745 (St Marys to Norwest Hospital via Stanhope Gardens)

Further changes to future bus network have been proposed and shown detailed in Section 10.

### 7.3 Active transport network

The existing residential developments in Bella Vista and Kellyville have been largely designed with low permeability to discourage vehicles traversing the local road network. Consequently, they limit accessibility of pedestrians and cyclists travelling between the local network and the wider regional network. At a broader level, there is already a reasonable level of connectivity provided on the regional cycle network. This includes a segregated cycleway alongside the Westlink M7 Motorway and shared pedestrian and cycle paths provided on Old Windsor Road, Windsor Road, Schofields Road and Sunnyholt Road.

In addition, a shared pedestrian and cycle path under the elevated metro sky-train viaduct that runs between Bella Vista and Rouse Hill, was recently built by Sydney Metro. To further support the opening of the Metro North West and encourage users to adopt active transport as a mode of travel Sydney Metro has installed 30 and 55 bicycle storage facilities at Bella Vista and Kellyville stations respectively. Figure 7.3 provides a plot of the existing cycle network within the surrounding Bella Vista and Kellyville Station Precinct areas. The shown cycle routes are those identified as “off road” paths or with “low difficulty” by RMS. These end of trip facilities provide residents with good access to parks, shops, primary school and other services allowing them to walk instead of driving short distances to reach these facilities.

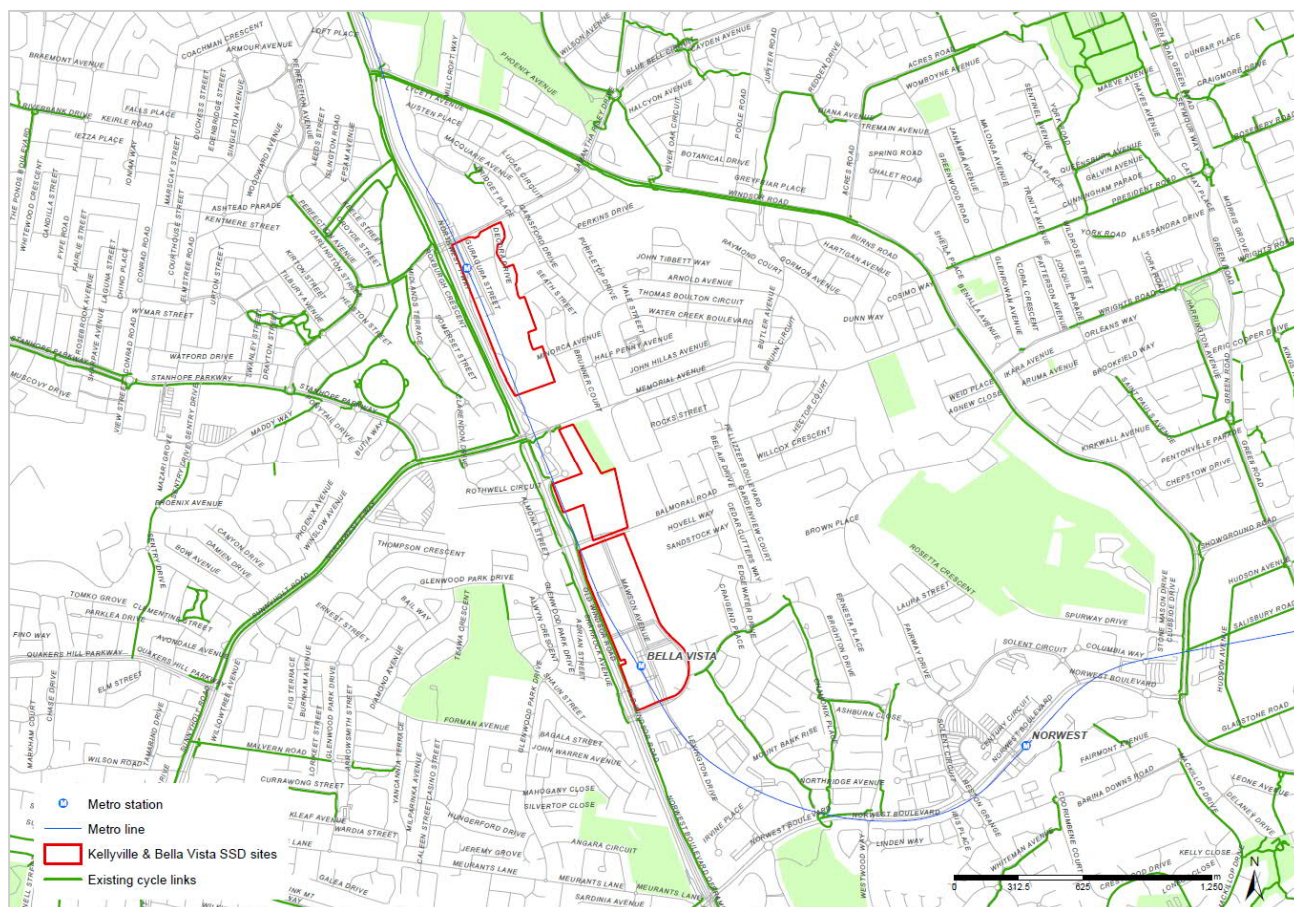


Figure 7.3: Existing cycle links within Bella Vista and Kellyville

In Kellyville, pedestrian crossings are provided at the Old Windsor Road / Samantha Riley Drive and at Old Windsor Road / Memorial Avenue / Sunnyside Road intersection.

In Bella Vista, pedestrian crossings are provided at Old Windsor Road/Balmoral Road/Miami Street on all its approaches with the exception of the eastern approach where the pedestrian crossing is provided as part of the T-way traffic signal and at the intersection of Celebration Drive and Old Windsor Road across the southern and eastern legs of the intersection, however no pedestrian crossing is provided for the northern leg of Old Windsor Road and Celebration Drive as a new pedestrian bridge is provided approximately 100m to its north. Key routes such as Norwest Boulevard do not provide ideal cycle/pedestrian environments, lacking in adequate crossings and footpath width.

Sydney Metro has advised that they have recently completed a Wayfinding Strategy for the Metro North West alignment. The key principles of that strategy include the delivery of:

- Safe, direct, clearly signposted wayfinding to and from the stations
- Make it easier to walk and cycle to and from the Sydney Metro North West Precincts
- Describe the key destinations that customers can access on the next stage of their journey
- Encourage exploration, economic growth and social inclusion through journeys of discovery.

Figure 7.4 and Figure 7.5 illustrate the existing pedestrian networks in the immediate area surrounding the Station Precincts. They show locations of pedestrian crossings and the 400m and 800m walking catchments from the metro



station locations. The walking catchments have been determined based on the distance a pedestrian would have to travel based on the connections available (i.e. footpaths and footbridges).

The number of residents living with the 400 metre and 800 metre walking catchment areas from the Bella Vista and Kellyville stations are shown below in Table 7.2. Note, the number of jobs in Bella Vista is primarily made of employment in the Norwest Business Park. In the future, the concept SDD will provide for additional housing within the 800m walking catchment of both metro stations.

Table 7.2: Population and employment within walking catchment (based on 2016 Census)

Walking Catchment	Bella Vista		Kellyville	
	400m	800m	400m	800m
2016 Population (no. residents)	61	2,170	1,909	4,161
2016 Employment (no. jobs)	10,511	10,725	98	270
2016 Workforce (no. working population)	29	1233	989	2,007

Construction works for a new pedestrian/cycle bridge across Old Windsor Road and the North West Transitway at the intersection with Samantha Riley Drive and Newbury Avenue was recently completed as part of Metro North West. This bridge allows grade separated access over Old Windsor Road to reduce travel times for residents within proximity to the new Kellyville Station and the T-way bus stop.

A second pedestrian bridge across Old Windsor Road has also been provided to link Glenwood to the Bella Vista station north of Celebration Drive. Between the new pedestrian bridge at Bella Vista Station and Glenwood residential area there is currently a stretch of one kilometre of continuous property fences and noise barriers along Old Windsor Road blocking and restricting residents' ability to walk to and from the new Bella Vista Station Precinct. To address this problem, it has been proposed to provide a new connection between the pedestrian bridge and Swansea Court in Glenwood. It would allow pedestrians and cyclist to travel between the existing residences and Bella Vista Station. Sydney Metro has been monitoring the demand for pedestrian and cyclists from Glenwood to the Bella Vista Station precinct and has already acquired a property in Swansea Court to safeguard for the future construction of a new pedestrian link between Glenwood and Old Windsor Road dependent on the outcomes of investigation works that it is being conducted. The locations of these bridges are shown in Figure 7.4 and Figure 7.5.

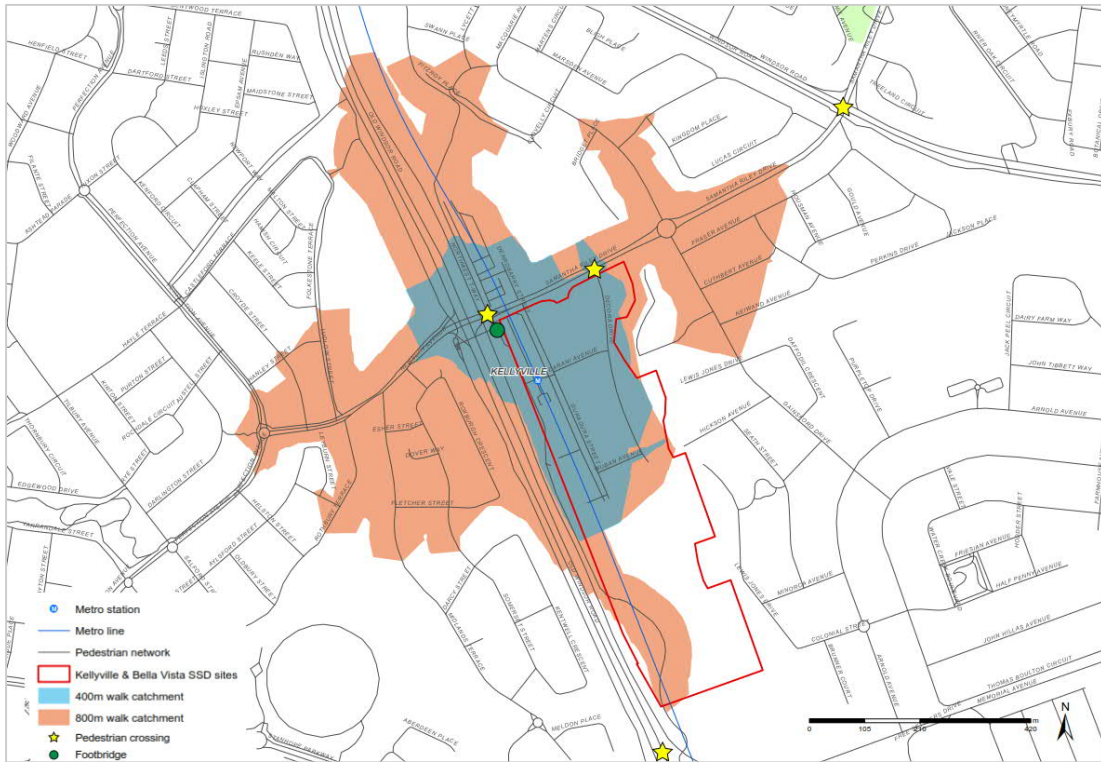


Figure 7.4: Existing Kellyville walking catchments

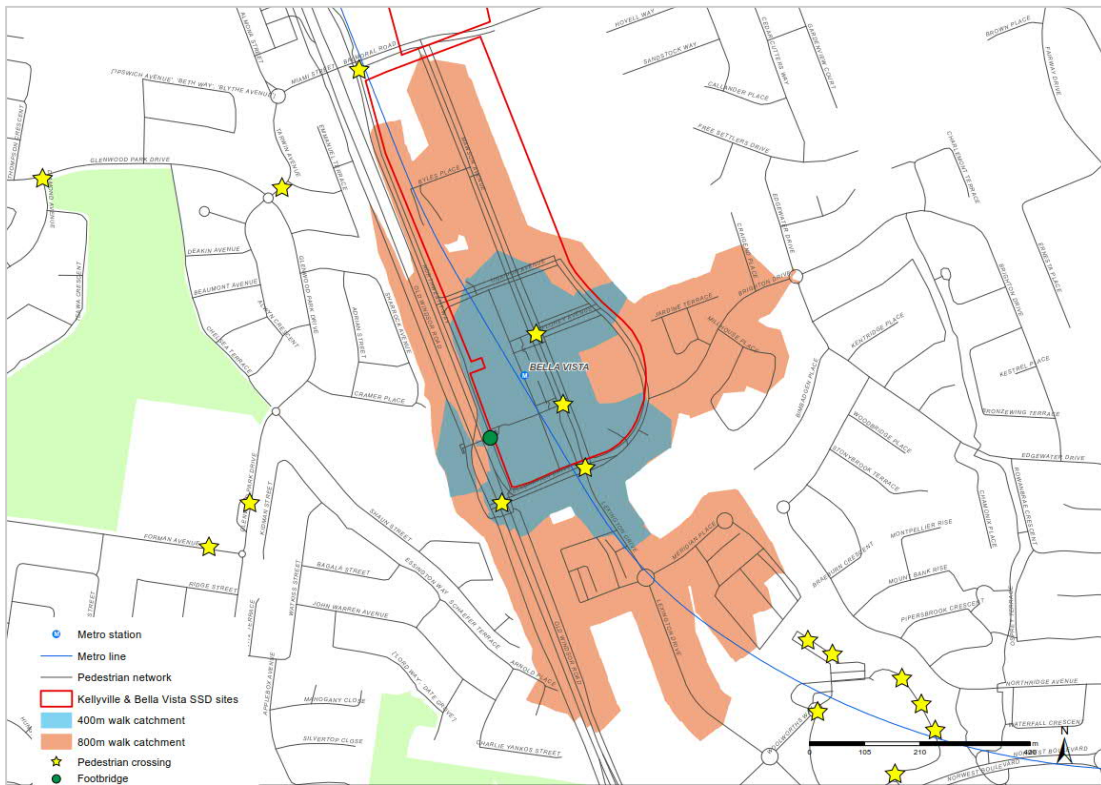


Figure 7.5: Existing Bella Vista walking catchments

Future cycling facilities will need to cater for regional connections within the Bella Vista and Kellyville Station Precincts to Rouse Hill and Norwest Business Park while also facilitating connections to local centres. This is supported through initiatives discussed in Section 11 of the report which build from the initiatives identified in the *Bella Vista Station Precinct Finalisation Plan (November 2017)* and the *Kellyville Station Precinct Finalisation Plan (November 2017)*

## 7.4 Road network

The existing road network surrounding the Bella Vista and Kellyville Station Precincts is comprised of two significant arterial roads; Old Windsor Road and Windsor Road.

Old Windsor Road (between Windsor Road and Norwest Boulevard) functions as a four/six lane 80km/h carriageway that provides direct north-south connections between Greater Parramatta and Rouse Hill. Windsor Road (between Old Windsor Road and Showground Road) is a four-lane arterial road linking Rouse Hill to Castle Hill and has a variable posted speed limit of up to 80km/h with a school zone operating outside Kellyville Public School during school periods.

Adjacent to the Bella Vista and Kellyville Station Precincts providing direct east-west connectivity between Old Windsor Road near Glenwood and Windsor Road in Castle Hill are Celebration Drive, Balmoral Road, Memorial Avenue and Samantha Riley Drive. These roads have posted speed limits that vary from 50 km/h to 70km/h. Figure 7.6 shows the State and Regional Roads within the study area.

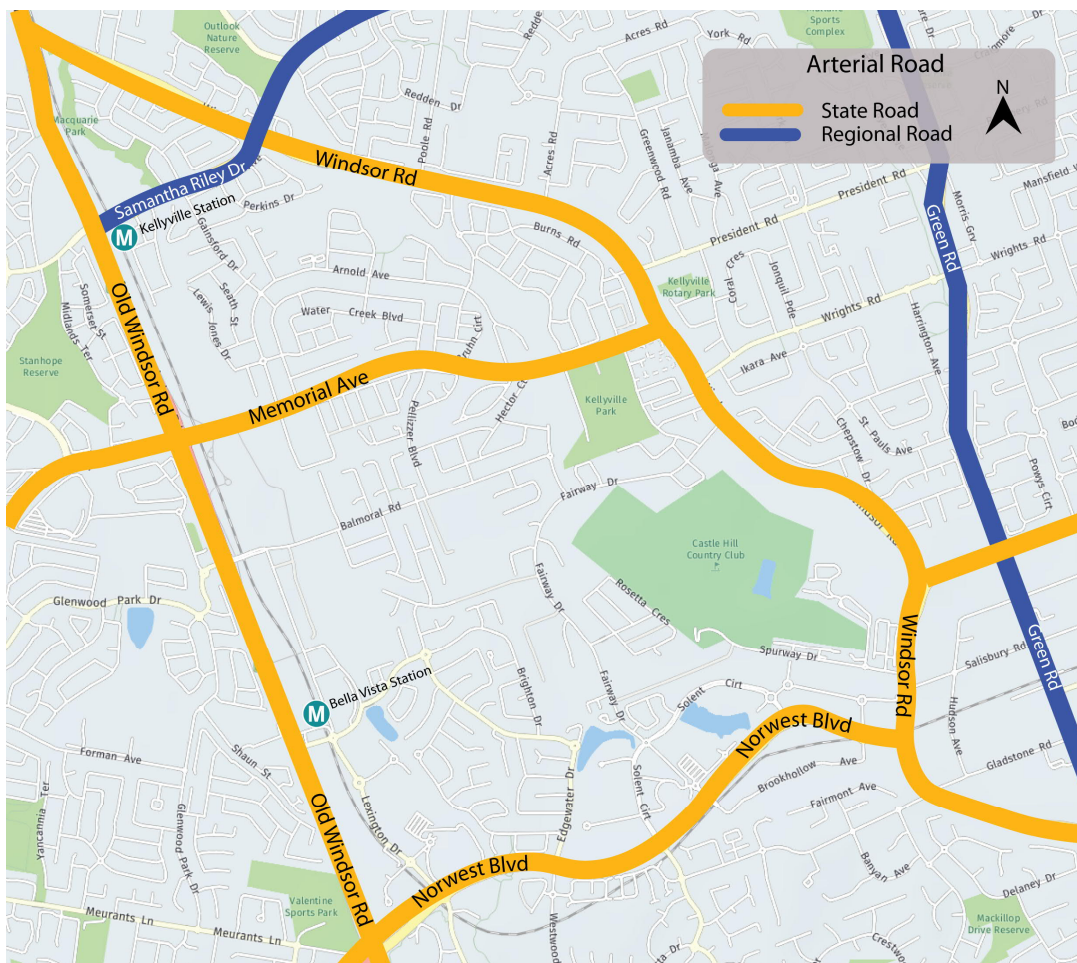


Figure 7.6: Major Roads Surrounding the Station Precincts

Table 7.3 outlines the two-way traffic volumes along these key corridors. The traffic volumes reflect those obtained from the survey counts collected in 14 February 2019. They pre-date the opening of the Metro North West which from experience with other major transport projects is likely to take several months to settle down.

Table 7.3: Existing peak hour traffic volumes - Bella Vista and Kellyville (14 February 2019)

Road	Type	Vehicles/hour (two way)	
		AM peak volumes (8:00-9:00am)	PM peak volumes (5:00-6:00pm)
Old Windsor Road (Kellyville)	Arterial	2,014	2,602
Old Windsor Road (Bella Vista)	Arterial	3,442	3,437
Windsor Road	Arterial	2,209	2,753
Celebration Drive	Collector	1,644	1,144
Balmoral Road	Collector	880	749
Memorial Avenue	Sub-arterial	1,797	1,780
Samantha Riley Drive	Sub-arterial	1,492	1,532

New local streets were recently completed within the two Station Precincts as part of the Bella Vista and Kellyville Station delivery works. Sydney Metro also undertook upgrade of external roads to support the new Station Precincts, including replacement of roundabouts with traffic signal at Samantha Riley Drive/Decora Drive and Celebration/Lexington Drive.

The internal road structure is also designed for enhanced connectivity within the Station Precincts for pedestrians and cyclists. This includes sub-features that will enable these local streets to offer high connectivity, such as wide paths, including kerb ramps, regular seating and significant planting to provide shade.

#### 7.4.1 Existing road network performance

##### 7.4.1.1 Intersection Level of Service

The assessment of the road network has been using SIDRA intersection model and based on the operational performance of the intersections surrounding the two precincts using the criteria outlined in Table 7.4 and defined in the Guide to Traffic Generating Developments (Roads and Traffic Authority 2002). The average vehicle delay used in the assessment of signalised intersections is that for all movements and that of the worst movement for priority (sign-controlled) intersections and is expressed in seconds per vehicle. It is generally accepted that the target Level of Service (LoS) for intersection performance should be D or better. However, when assessing intersection performance for parts of the road network that already experience substantial congestion over the course of the day or with future demand, achieving Level of Service D or better may not represent good value for money, or not be physically possible within the constraints of the project. In these locations, consideration needs to be given to whether achieving Level of Service D is practical within the constraints of the subject project. If not, a minimum of Level of Service E is set as a performance target for intersections that are within the scope of works of the project.



Table 7.4: Level of Service (LoS) criteria for intersections

LoS	Average delay per vehicle (seconds / vehicle)	Traffic signals and roundabouts
A	Less than 15	Good operation
B	15 to 28	Good with acceptable delays and spare capacity
C	29 to 42	Satisfactory
D	43 to 56	Operating near capacity
E	57 to 70	At capacity; at signals, incidents will cause delays Roundabouts require other control mode
F	Over 70	Extra capacity required

Source: Roads and Traffic Authority (2002) Guide to Traffic Generating Developments

#### 7.4.1.2 Current Intersection Performance

The performance of an urban road network is largely dependent on the operating performance of its intersections which are the critical capacity control points. SIDRA Intersection 8 was used to model the existing performance of the intersections. The key intersections within the study area are shown in Figure 7.7 with Table 7.5 summarising the results of the analysis. The performance of the signalised intersections in the study area were assessed using data from traffic surveys that were undertaken in February 2019 and measured against the Level of Service performance criteria shown in Table 7.4.

Table 7.5: Modelled Existing Intersection Performances and Level of Service (LoS)

Int. No.	Intersections	Existing			
		AM Peak Hour		PM Peak Hour	
		LoS	Average Delay (sec/veh)	LoS	Average Delay (sec/veh)
1	Old Windsor Rd / Windsor Rd	B	20	C	32
2	Old Windsor Rd/Samantha Riley Dr/Newbury Ave	F	114	F	91
3	Old Windsor Rd / Memorial Ave / Sunnyholt Rd	F	82	F	92
4	Old Windsor Rd / Balmoral Rd / Miami St	F	113	E	68
5	Old Windsor Rd / Celebration Dr	C	36	B	26
6	Old Windsor Rd / Norwest Blvd	D	43	C	40
8	Windsor Rd / Samantha Riley Dr	D	51	F	79
9	Windsor Rd / Memorial Ave	E	58	E	69
14	Celebration Dr / Lexington Dr / Mawson Av	C	39	C	35
15	Sunnyholt Rd / Stanhope Pkwy	C	30	B	25

The SIDRA modelling shows that majority of signalised intersections surrounding the two precincts are currently operating at capacity or are approaching their nominal capacities during the peak periods. As expected, the highest flows are in the southbound direction along Old Windsor Road and Windsor Road in the AM peak and in the northbound direction in the PM peak hour. The exceptions are the intersection of Old Windsor Road / Windsor Road and Sunnyholt

Road / Stanhope Parkway both operating at Level of Service of B/C. Both intersections are T-junctions and operate fewer phases and therefore have higher lane capacities compared to full intersections.

It is relevant to note that the opening of Sydney Metro North West is still in an early stage and likely to alter these traffic flows. This is being monitored by Sydney Metro as part of their planning condition obligations for the delivery of Metro North West.

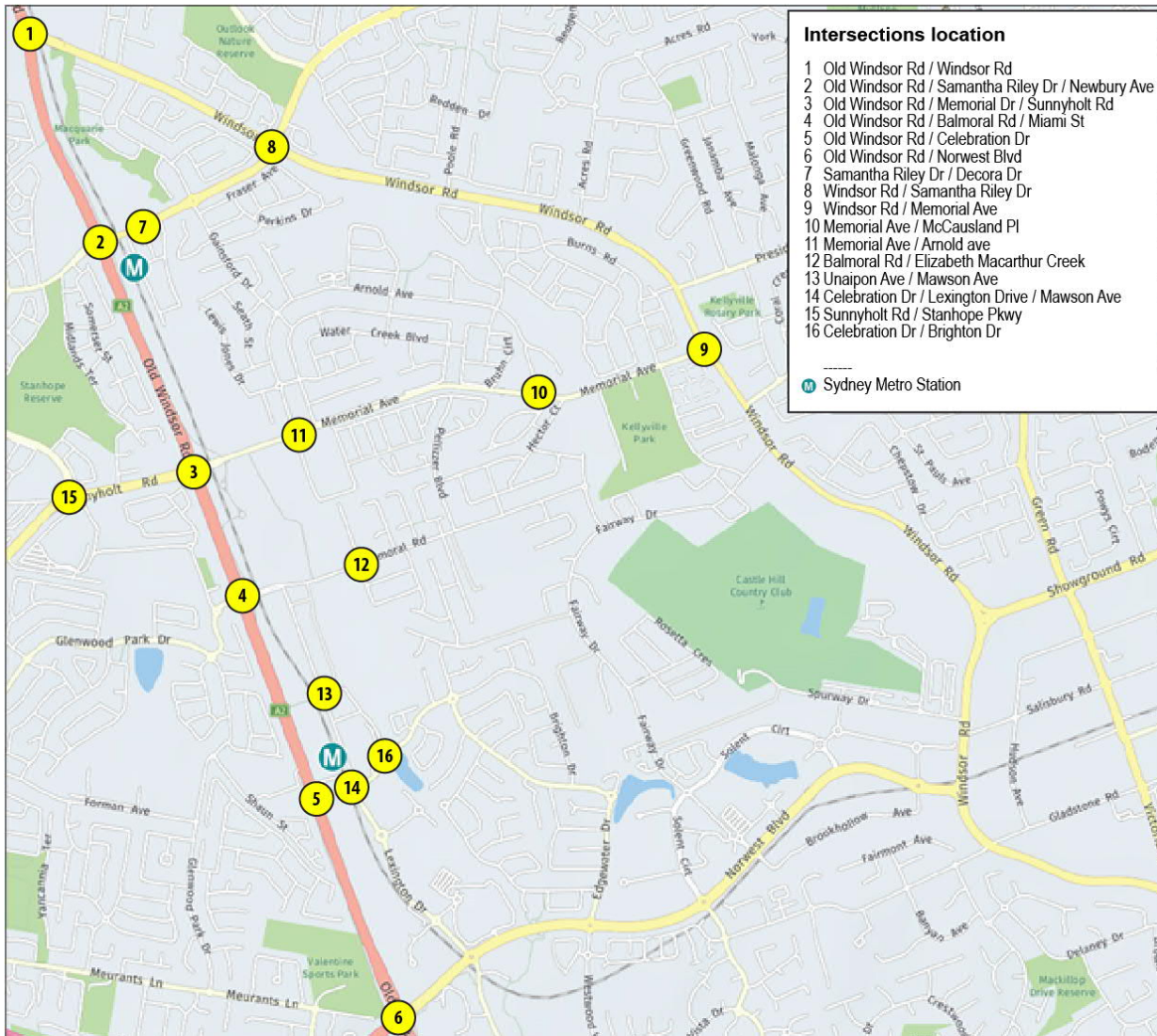


Figure 7.7: Location of Intersections Assessed

Figure 7.8 shows the existing performance of the intersections in the AM and PM peaks in the study area.

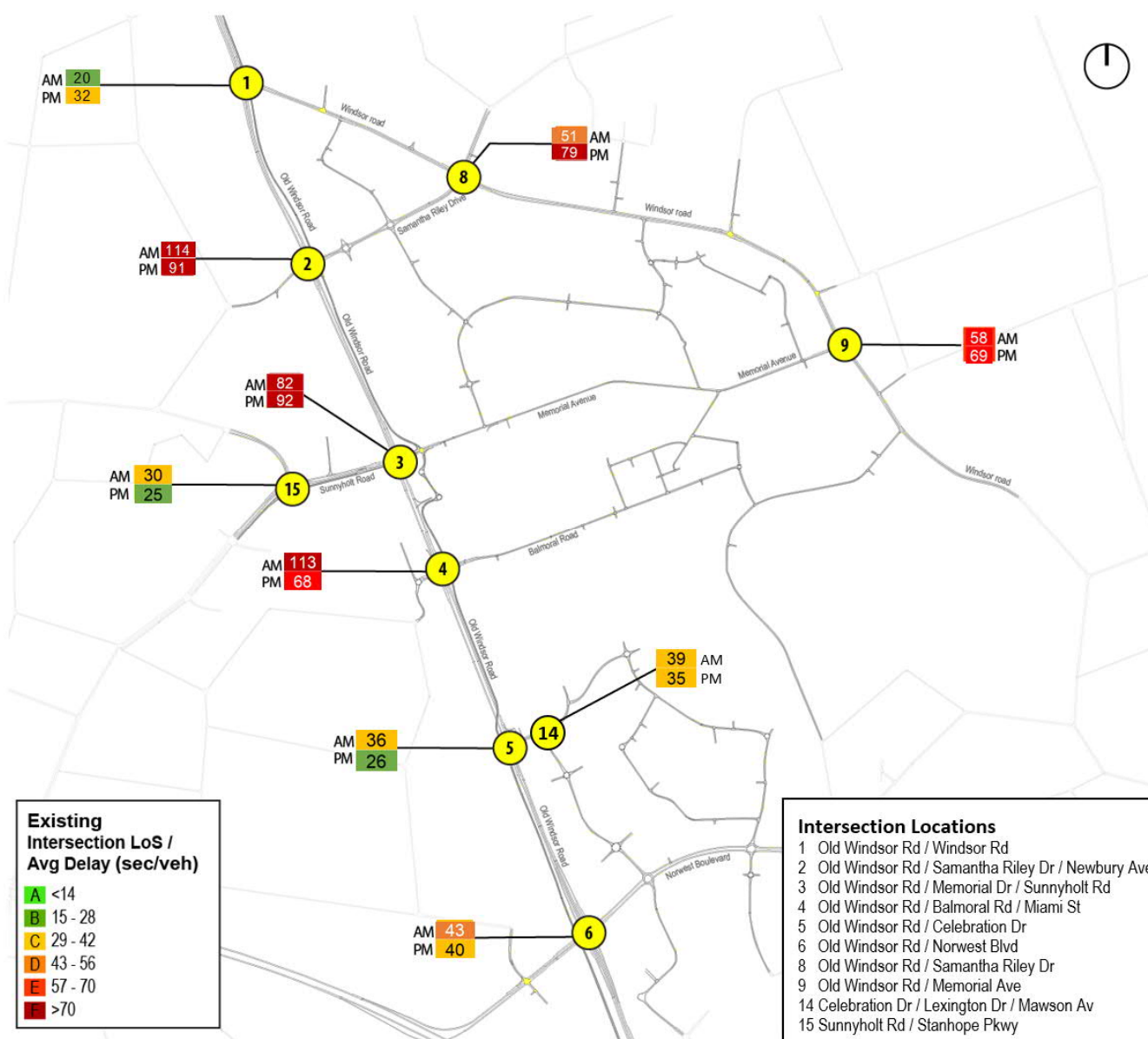


Figure 7.8: Existing Intersection Performances

### 7.4.1.3 Travel times and Travel speeds

Travel times and travel speeds provide additional means of assessing the functional performance of a road network. Whilst intersection assessment provides an indication of the performance of a single intersection, travel time is an aggregate measure of the performance of a route that considers the time to travel the links and the intersections along that route. It provides a good indication of quality of a route relative to alternatives as drivers generally select routes that are faster and minimise their travel times.



The criteria for determining the Level of Service based on average travel speeds is defined in Austroad's Guide to Traffic Management, Part 3: Traffic Studies and Analysis (2013) and is shown in Table 7.6 below.

Table 7.6: Level of service (LoS) criteria for midblock sections

Travel speed as a percentage of free-flow travel speed (%)	LOS
>85%	A
67-85%	B
50-67%	C
40-50%	D
30-40%	E
<30%	F

The surveys were undertaken along the routes shown below between 6-10am and 3-7pm in February 2019. They involved travelling at the traffic speed and recording the time to travel each section along that route in both directions of travel for each route. The travel time routes were:

- Route 1: Old Windsor Road between Windsor Road and Norwest Boulevard
- Route 2: Windsor Road between Old Windsor Road and Norwest Boulevard
- Route 3: Norwest Boulevard between Old Windsor Road and Windsor Road

#### 7.4.1.4 Old Windsor Road

Table 7.7 shows the traffic speed and Level of Service for Old Windsor Road. It is assumed that the free-flow traffic speed is the posted speed limit. The Level of Service assessment for the Old Windsor Road shows speeds as low as 13km/h between Samantha Riley Drive and Balmoral Road in the AM southbound peak direction of traffic and almost similar low speeds in the northbound direction in the PM peak. The low speeds are attributed to high demand at the intersections along Old Windsor Road. Having reached their capacities, they create a continuous queue along Old Windsor Road in the commuter peak direction of traffic i.e. southbound in the AM and northbound in the PM peak.

Table 7.7: Old Windsor Road Speed and Level of Service Assessment (LoS)

Old Windsor Rd	Average Speed (km/h) & LOS			
Southbound	AM	LOS	PM	LOS
Btw Windsor Rd:				
Samantha Riley Dr / Newbury Ave	13	F	26	E
Memorial Ave / Sunnyholt Rd	14	F	37	D
Balmoral Rd / Miami St	23	F	32	E
Celebration Dr	46	C	44	C
Norwest Blvd	71	A	70	A
	Average Speed (km/h) & LOS			
Northbound	AM	LOS	PM	LOS
Btw Norwest Blvd:				
Celebration Dr	52	C	14	F
Balmoral Rd / Miami St	45	C	14	F
Memorial Ave / Sunnyholt Rd	25	E	25	E
Samantha Riley Dr / Newbury Ave	40	D	48	C
Windsor Rd	45	C	50	C

#### 7.4.1.5 Windsor Road

Table 7.8 show current travel speeds and Level of Service for Windsor Road in the peak AM & PM hours.

Travel time surveys along Windsor Road show low speeds in the segment between Samantha Riley Drive and President Road and near Showground Road in the AM southbound direction of traffic. In the PM peak, the northbound direction of traffic experiences low speeds between Fairway Drive and Samantha Riley Drive. This is due to capacity constraints at the intersection of Memorial Avenue with Windsor Road causing queuing and stop and go operation.

Table 7.8: Windsor Road Speed and Level of Service Assessment

Windsor Rd	Average Speed (km/h) & LOS			
Southbound	AM	LOS	PM	LOS
Btw Old Windsor Rd:				
Samantha Riley Drive	36	D	40	D
Acres Road	16	F	59	B
East of Acres Rd	20	E	45	B
President Rd	17	F	18	F
Memorial Ave	34	C	49	B
Fairway Dr	41	B	59	A
Showground Rd	24	E	26	E
Norwest Blvd	48	B	55	B
	Average Speed (km/h) & LOS			
Northbound	AM	LOS	PM	LOS
Btw Norwest Blvd:				
Showground Rd	67	A	37	C
Fairway Dr	29	D	22	E
Memorial Ave	52	A	47	B
President Rd	44	B	46	B
East of Acres Rd	42	B	41	B
Acres Rd	48	B	45	B
Samantha Riley Drive	35	D	20	F
Old Windsor Rd	57	B	44	C

#### 7.4.1.6 Norwest Boulevard

Table 7.9 shows the travel speeds and Level of Service for Norwest Boulevard in the section between Old Windsor Road and Windsor Road. The speeds along Norwest Boulevard are affected by the numerous roundabouts along its length that provide access to the Norwest commercial precinct but experience heavy traffic flows in peak periods

Table 7.9: Norwest Boulevard Speed and Level of Service Assessment

Norwest Blvd	Average Speed (km/h) & LOS			
Eastbound	AM	LOS	PM	LOS
Old Windsor Rd				
Lexington Dr / Elizabeth Mac Dr	13	F	38	C
Edgewater Dr / Westwood Way	48	C	46	B
Windsor Rd	26	E	20	F
	Average Speed (km/h) & LOS			
Westbound				
Windsor Rd				
Edgewater Dr / Westwood Way	39	C	27	E
Lexington Dr / Elizabeth Mac Dr	24	E	13	F
Old Windsor Rd	25	E	19	F

Figure 7.9 and Figure 7.10 provide a graphical representation of the existing Level of Service operation of the surveyed routes.

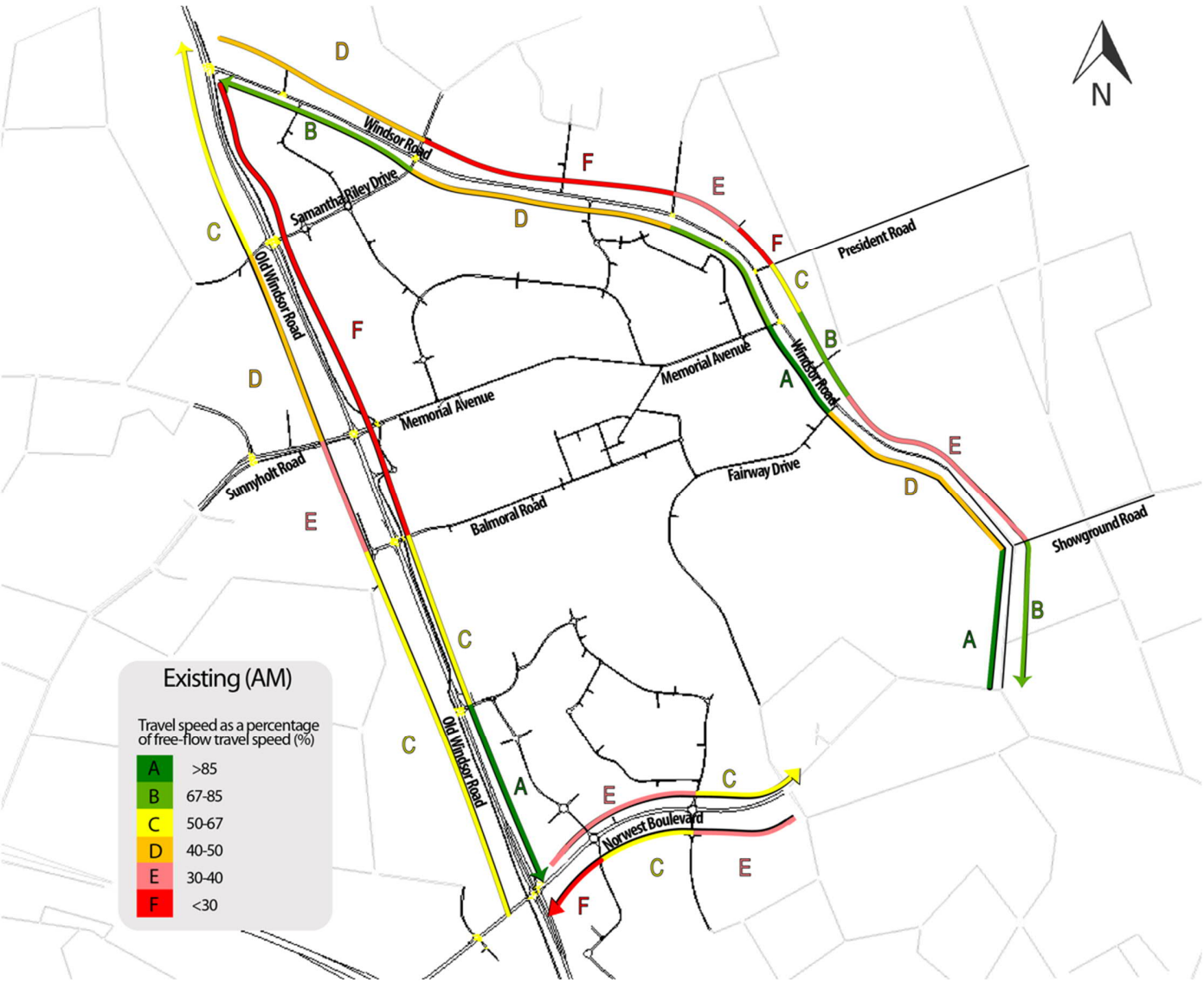


Figure 7.9: Existing AM Peak Period Travel Time Performances

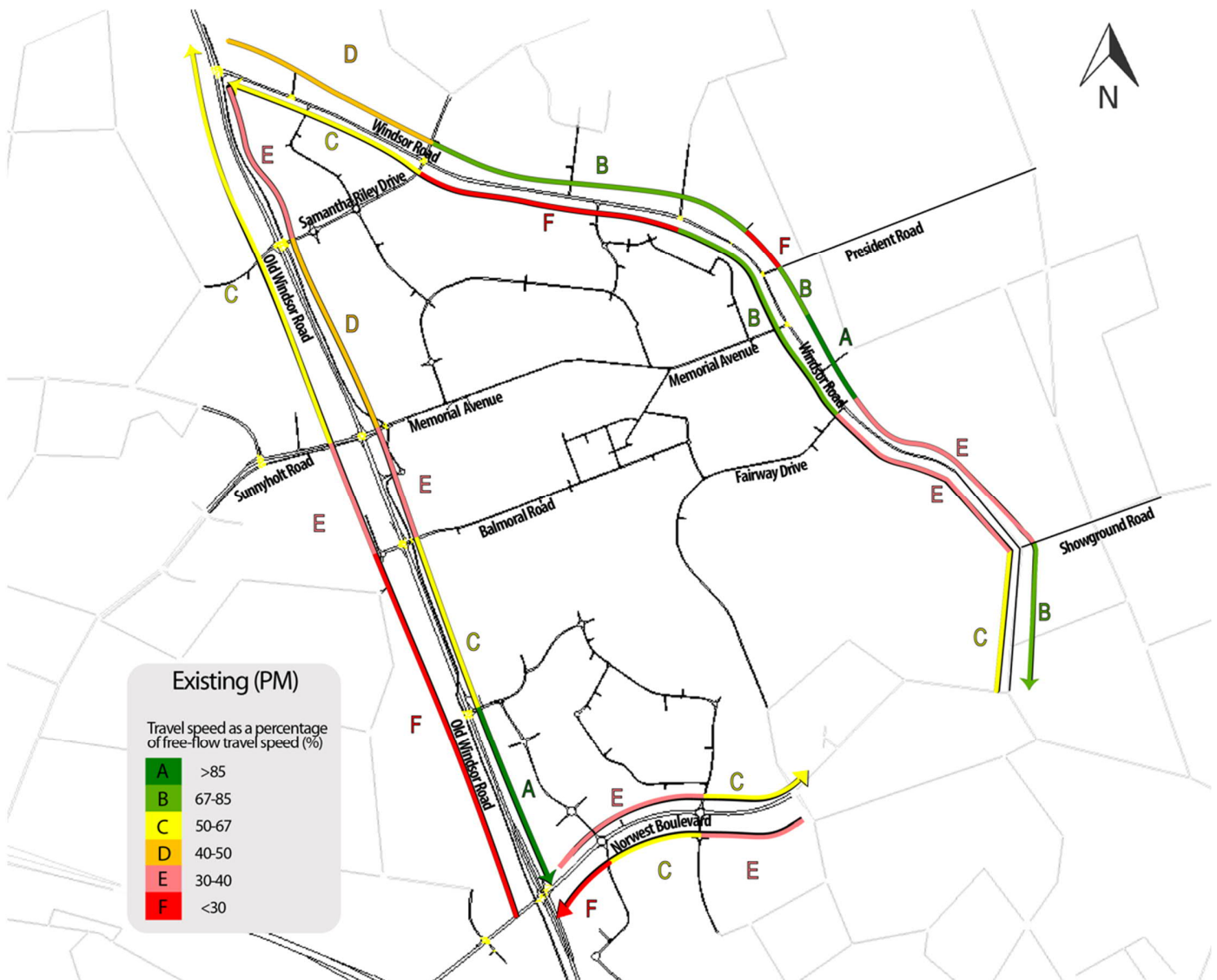


Figure 7.10: Existing PM Peak Period Travel Time Performances

## 7.5 Movement hierarchy

Transport for NSW's Movement and Place framework allows the planning and management of the road-based transport network to be undertaken with a strong appreciation of the various movement needs and place functionalities of road corridors.

The internal road network that currently exists within the Bella Vista and Kellyville SSDA sites is partially complete and would be extended to create a permeable urban street network within the two metro Precincts. The existing transport network in the vicinity of the proposed development i.e. principally the arterial roads is heavily focussed towards the facilitation of movement of people and goods. There is very limited place functionality in the existing network. As a result, a standard Movement and Place assessment of the existing road network has not been undertaken. Instead, the hierarchy of the various movement corridors has been assessed. Section 9.5 of the report includes an assessment of the



Movement and Place for the proposed internal road network as proposed under Kellyville and Bella Vista urban design frameworks.

The existing road network hierarchy is shown in Figure 7.11 and is comprised of:

- 1) Old Windsor Road: Forms the major movement corridor through the area and is classified as a primary arterial due to its significant inter-regional connectivity linking areas North West of the Precinct to the M2 Motorway and Parramatta and its large traffic carrying capacity.
- 2) Windsor Road and Showground Road: These are arterial roads that are also major movement corridor serving as connections to other arterial roads and accommodating regional trips away from the local streets.
- 3) Memorial Avenue, Sunnyholt Road and Norwest Boulevard function as sub-arterial connections and provide movement function between major roads as well as local streets within the road network.

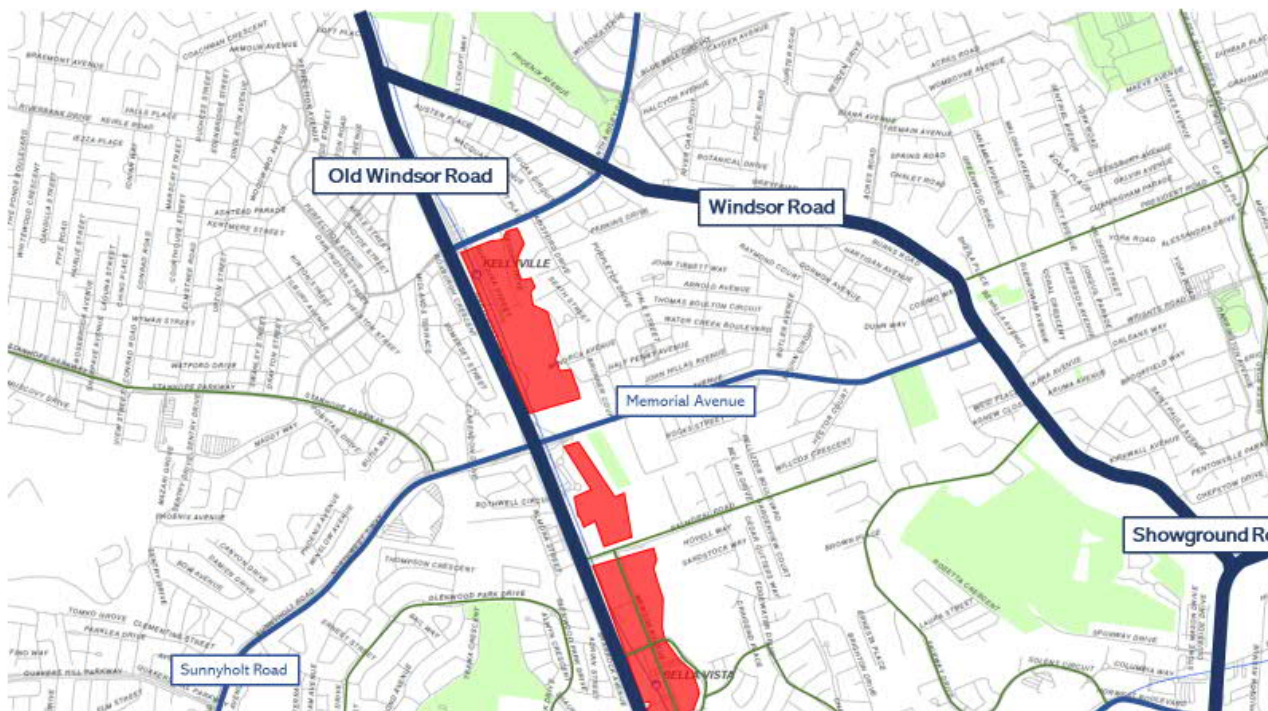


Figure 7.11: Existing road network hierarchy

## 8. Transport Assessment Methodology

This chapter documents the assessment methodology carried out in accordance with the SEARs to determine the traffic and transport impacts of the project, including impacts of construction, impacts on operation and the cumulative impacts of the project with other known and approved projects in the vicinity of the project.

### 8.1 Relevant guidelines and policies

The following guidelines were followed in carrying out this assessment:

- Guide to Traffic Management – Part 3 Traffic Studies and Analysis (Austroads 2013);
- Traffic Modelling Guidelines (Roads and Maritime Services 2013);
- Guide to Traffic Generating Developments Version 2.2 (NSW Roads and Traffic Authority 2002);
- Cycling Aspects of Austroads Guides (Austroads, 2014);
- NSW Bicycle Guidelines Version 1.2 (RTA, 2005);
- Planning Guidelines for Walking and Cycling (DIPNR, 2004); and
- NSW Sustainable Design Guidelines Version 3.0 (TfNSW, 2013).

### 8.2 Overall assessment approach

The following methodology has been adopted to identify and, where possible assess the impact of the project on the traffic and transport network:

- **Impacts on road network performance** - assessed using traffic modelling at both the strategic and operational levels to identify traffic routing and operational performance with and without the project.
- **Impacts on public transport** - assessed by determining potential impacts on the public transport performance.
- **Impacts on pedestrians and cyclists** - assessed through qualitative analysis of proposed changes to shared paths, cycle ways, footpaths and pedestrian crossings to determine impacts on pedestrian and bicycle accessibility (access to and availability of pedestrian and cycle infrastructure).
- **Impacts of construction** - assessed through the analysis of construction traffic routing and management plans, including quantitative assessment of the performance of the road, public transport, pedestrian and bicycle networks.

### 8.3 Transport Modelling Approach

Transport modelling is an important component of the methodology used to assess the quantitative impacts of the project on the road network. It involved a multi-tier transport modelling approach to carry out an assessment of the current and future performance of the impact of the project on the surrounding road network.

Figure 8.1 below provides an overview of the transport modelling methodology used in the assessment of the project and is described in the following sections.

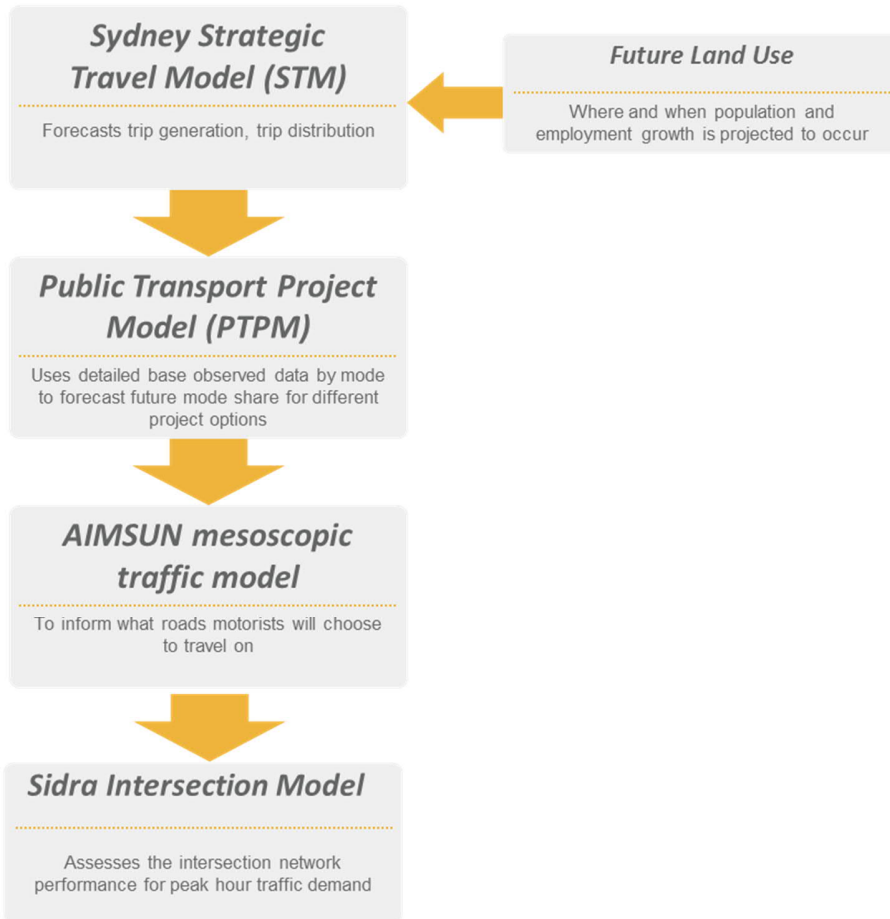


Figure 8.1: Overview of transport modelling approach

### 8.3.1 Sydney Strategic Travel Models (STM, PTPM)

The Sydney Strategic Travel Model (STM), developed and operated by Transport Planning and Analytics of Transport for NSW, is the primary source of information for region-wide travel demand and trip patterns across the Greater Sydney Metropolitan Area (GMA) which covers Sydney, Newcastle and the Illawarra. The STM is used to create trip matrices using land use and employment data that are input into the Public Transport Project Model (PTPM) to split the matrices by mode of travel and purpose and assigned to public transport and highway networks. Future year trip matrices from STM take into account endorsed NSW Government plans and policies, population and employment projections and transport infrastructure and service operation assumptions.

### 8.3.2 Mesoscopic Operational Traffic Model

While strategic modelling tools such as the STM and PTPM can be used to identify the performance of the road network, their assumptions are broad-based and assume a uniform demand profile. These tools also generally do not model intersections which are key determinants of network capacity in any detail. It is therefore necessary to undertake more detailed modelling of the operational performance of the road network for greater confidence in the accuracy of the forecast. For the assessment of this project, the North West Sydney Aimsun foundation model, developed for Transport for NSW for the purposes of testing road impacts of development associated with the Metro North West, was used. The foundation model covered a large area of Sydney's north-west which was cordoned off to create a subarea covering the study area specified by the Roads and Maritime Services. The subarea covered the Kellyville and Bella Vista precincts

with the road network within the study area updated to include the latest changes. The model was principally used to identify the travel route of vehicles based on the level of congestion and delay in the network surrounding the two precincts for the existing situation (i.e. base scenario) and under future land use and network changes both with and without the traffic generated by the two Station Precincts.

### 8.3.3 SIDRA Intersection Model

The performance of a road network is largely dependent on the operating performance of its intersections which control and determine the capacity and travel speeds with a network. For the purpose of assessment of the road network surrounding the two Station Precincts, SIDRA intersection modelling tool was used to aid with the design and evaluation of the intersections. SIDRA can be used to analyse signalised intersections (fixed-time and actuated), roundabouts and priority-controlled intersections and is able to provide estimates of capacity and performance statistics such as delays, queue length etc. by lane for all approaches to an intersection.

## 8.4 Base Model Development

The development of an operational Aimsun model for the purposes of assessment of the project involved building a base year model that closely matched the travel patterns and turning movements at signalised intersections in the road network, prior to producing future year scenarios with and without the project. The approach to the development of the base model is described in Table 8.1.

Table 8.1: Base model development details

Element	Comments
Model specification	<ul style="list-style-type: none"> <li>Model periods – extended peak periods modelled, two-hour morning and evening peak periods used in the assessment.</li> <li>Traffic composition – multimodal including cars, heavy vehicles, buses (routes and stops) and where relevant impacts of pedestrians at select key crossing locations.</li> <li>Route choice – static assignment.</li> </ul>
Supply assumptions	<ul style="list-style-type: none"> <li>Road network definition – lane configurations, lane use management, intersection control, speeds and grades.</li> <li>Traffic signal operations – based on SCATS IDM and LX data.</li> </ul>
Demand assumptions	<ul style="list-style-type: none"> <li>Traffic demand – PTPM 2 hour AM peak matrices.</li> <li>Adjustment to the PTPM demand matrices using surveyed traffic count data at intersections and midblock locations with the strategic model used to establish trip patterns as required for 2026 and 2036.</li> </ul>
Road network performance	<ul style="list-style-type: none"> <li>Estimated based on flows and turning pattern at key intersections.</li> </ul>

The standard process of setting up an operational traffic model involves calibration and validation of a base year model that matches the flows and travel times recorded from surveys. For this project, the high level of existing traffic demand and congestion in the network revealed observed travel speeds as low as 13 km/h along Old Windsor Road in the peak hours. This level of delay and slow speeds cannot be replicated in a mesoscopic model as the model is not able to accurately capture the driver behaviour in response to high delays, queue build-up and congestion that are observed along Windsor Road and Old Windsor Road. Mesoscopic models respond to congestion by assigning the excess demand to alternative routes to minimise travel times in a manner that drivers are not observed doing in reality. Instead drivers appear to wait in queues along Old Windsor Road rather look for alternative routes using the local streets that theoretically may be faster but are circuitous, less obvious and may involve longer distance to travel. Microscopic models are better suited to modelling of driver behaviour, but they tend to lock up under high traffic demand, resulting in significant drop in speeds and flows below the observed levels across the network as queues build up over time.

For this project, the Aimsun mesoscopic model was calibrated to match the observed turning volumes at specific intersections. It was not possible to concurrently match the modelled travel times to the observed times as the very high level of demand created long queues resulting in modelled flows dropping below what was observed.

To resolve this issue, future turning volumes were determined by pivoting of the observed flows in the base year model and extracting the turning flows from the mesoscopic model. The assessment of the performance of the road network due to the project was undertaken using SIDRA. This was done by first calculating the average vehicle delays and performance of the signalised intersections under the “Without Project” case for 2026 and 2036. This is a scenario which includes future background traffic growth and road network improvements without the project and then including the traffic generated by the two precincts i.e. “With the Project”. The change in average vehicle delay and degree of saturation provides a quantitative measure of the impact of the traffic generated by the two precincts. Improvements to the network were then identified with the aim of offsetting the increase in average delay due to the traffic generated by the two precincts to maintain an equivalent level of delay as that assessed in the base future scenario years of 2026 and 2036 with only background traffic growth.

The following steps were used in the development of the traffic demand:

- i. Assignment of the PTPM and generation of 2-hour morning peak hour sub-area traversal demand matrices using static assignment;
- ii. Create a single hour traversal matrix for the AM peak by factoring PTPM 2-hour matrix by 0.54. Transpose the AM matrix to create a PM peak hour matrix;
- iii. Static adjustment within Aimsun using the departure adjustment methodology to create 15-minute matrices based on modelled static assignment travel times and paths;
- iv. Manual adjustment of 15-minute matrices to account for differences in static and dynamic assignment; and
- v. Extraction of demand flows from Aimsun model for assessment using SIDRA Intersection. To avoid underestimation of traffic, demand flows include the unconstrained flow and not just the traffic that is able to pass through the upstream intersections.

## 8.5 Data sources

Data sources that were used to calibrate the base year traffic model included the following:

- Intersection turning movement surveys for 20 sites collected in February 2019. Counts covered an average weekday between the hours of 6-10am and 3-7pm;
- Travel time surveys along the main corridors of Old Windsor Road, Windsor Road and Norwest Boulevard. Travel time surveys covered an average weekday between the hours of 6-10am and 3-7pm;
- Intersection traffic volumes from Sydney Metro database; and
- SCATS traffic signal phasing plans for signalised intersections located throughout the model.

These data sources were reviewed and validated to determine the consistency of the data between intersections.

## 8.6 Geographic model extents

The extent of the study area and location of intersections to be surveyed were finalised at a meeting on 12 February 2019 with Roads and Maritime Services and Landcom representatives. As shown in Figure 8.2, the mesoscopic model area covers a region broadly defined by the following roads:

- Old Windsor Road to the southwest;
- Windsor Road to the northeast; and
- Norwest Boulevard and Fairway Drive to the southeast.



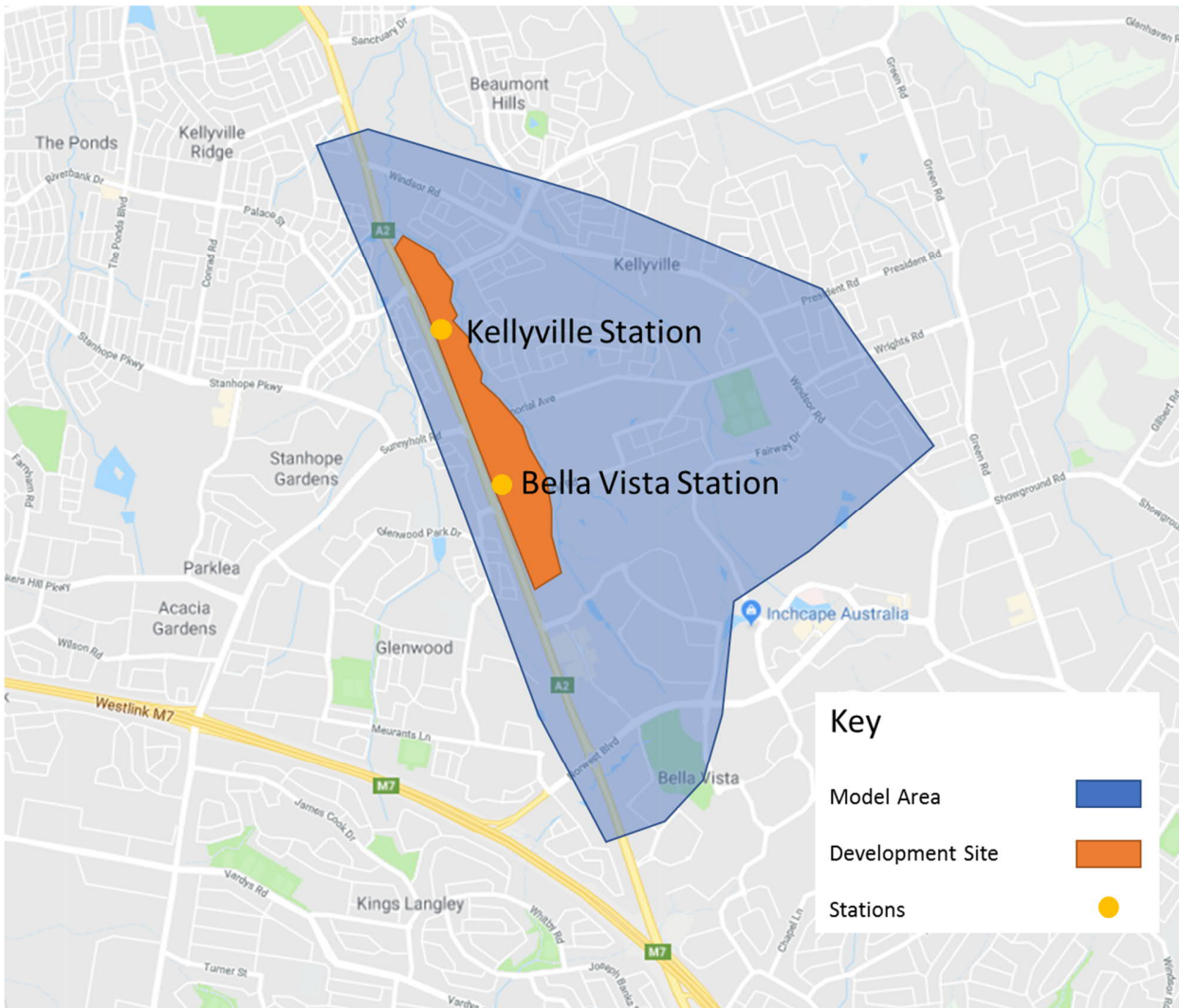


Figure 8.2: Mesoscopic Model Area

## 8.7 Planned Future Network Improvements

Approved or planned major road network upgrades within the study area include:

### Memorial Avenue

Transport for NSW will be upgrading Memorial Avenue to a four-lane road to meet the future transport needs of Sydney's north west. The upgrade will cover a 2.2-kilometre section between Old Windsor Road and Windsor Road. Funding for the work has already been secured and early works commenced in July 2019. Key features of the works include:

- Provision of a wide central median to allow for future widening to six lanes if required;
- Construction of pedestrian/cyclist paths on both sides of Memorial Avenue;



- Installation of bus priority capability at traffic lights and indented bus bays at Arnold Avenue and Severn Vale Drive intersections;
- Provision of designated turning lanes and bicycle lanes at intersections with traffic lights; and
- Introduction of a speed limit of 80km/h.

As part of Memorial Avenue upgrade, the intersection of Memorial Avenue/ Arnold Avenue / Free Settlers Drive and is to be signalised<sup>5</sup> whilst the intersection of Memorial Avenue / T-Way near Old Windsor Road is to be upgraded.

Other Transport for NSW projects in the area include:

- Investigation of improvement options for the intersection of Norwest Boulevard at Lexington Drive and Elizabeth Macarthur Drive; and
- Widening of Old Windsor Road between Norbik Drive and Seven Hills Road in Bella Vista (facing southwards) as part of NSW Government Pinch Point Program (recently completed).

Further away from the study area, the Hills Shire Council proposes to upgrade Samantha Riley Drive to four-lane sub arterial road between Foxall Road and Green Road.

## 8.8 Modelled scenarios

A summary of the scenarios modelled in the Aimsun mesoscopic model is provided in Table 8.2.

Table 8.2: Summary of modelled scenarios

Scenario	Description	2019	2026	2036
Base year	Traffic model scenario used to calibrate modelled flows against observed turning flows	x		
Without Project	Traffic model scenario without project but with the committed/announced road network improvements included		x	x
With Project	As for the Without Project but with the Kellyville and Bella Vista Station Precincts developed as proposed		x	x

The base scenario was created using the observed traffic data collected from surveys undertaken in February 2019. The model was calibrated against the observed volumes to identify parameters that were then adopted for traffic forecasting. The “Without Project” scenario assumes that the two precincts remain undeveloped. In the “Without Project”, any growth in traffic is due to general background growth in population and employment in the area. The “With Project” incorporates the background traffic growth and developments proposed by Landcom for the two precincts.

The purpose of modelling each of these scenarios is to identify the incremental change in operational performance of the road network as a result of changes in traffic demand due to background population and employment growth and the impact of the traffic generated as a result of development of the two precincts.

The staging and release plan for the development of the land around the two stations was discussed in detail in Section 2.3 of the report. For the purposes of the traffic assessment, it is assumed that the full development quantum as proposed for 2045 is realised by 2036. Table 8.3 summaries the quantum of development assumed in each 2026 and 2036 design year for the purposes of traffic assessment. It should be noted the development quantum shown includes all

<sup>5</sup> Source: <https://www.rms.nsw.gov.au/projects/sydney-west/kellyville-memorial-avenue-upgrade/index.html>

land within the two precincts i.e. SSD plus privately held lots, as the purpose is to assess the traffic impact of the full Station Precincts and not just the SSD lots that are under the current development application.

Table 8.3: Development Quantum

	Residential (units)	Retail (m <sup>2</sup> )	Commercial (m <sup>2</sup> )
<b>Kellyville:</b>			
-2026	800 (37%)	2523 (25%)	0
-2036	2,277 (100%)	10,736 (100%)	0
<b>Bella Vista:</b>			
-2026	800 (17%)	3,667 (24%)	14,500 (10%)
-2036	2,800 (61%)	13,200 (88%)	78,050 (52%)
-2045	4,554*	15,000*	151,000*

\* For assessment of traffic impacts it is assumed full development will be completed by 2036

## 8.9 Traffic and Transport Assessment

Section 9 provides the results of the assessment of the road network impacts of the development of Kellyville and Bella Vista precincts. It includes the following as part of the appraisal:

- Traffic and transport impacts for weekday peak periods for 2026 and 2036; and
- The cumulative impacts of the increase in background traffic as well as the impacts of road upgrades and the forecast levels of development within the study area.

Section 10 provides an assessment and guidance on parking code requirements that have typically been used in high density mixed used centres near train stations around Sydney and within the Hills Shire.

Section 11 provides an assessment of the impacts of the proposal on local roads and access as well as an assessment of the provisions for active transport.

## 9. Future Road Network Performance

### 9.1 Overview

This chapter provides the results of the assessment of the road network under 2026 and 2036 forecast traffic demand both with and without the project. The “Without Project” reflects the operation of the network under the assumptions that the Bella Vista and Kellyville precincts remain undeveloped i.e. greenfield, but the surrounding land use and background population and employment growth continues as planned by the NSW government for Sydney’s north-west.

The subarea demand matrices from STM and PTPM include the effect of all committed and approved major road and public transport projects for Sydney including projects described in Section 8.7. The “Without Project” scenario is a do minimum scenario which includes the planned network improvements and future demand but excludes any additional traffic generated by the development of the two precincts. The “With Project” includes the planned network improvements and future demand and additional traffic generated by the development of the two precincts. A comparison of the scenarios allows a quantitative assessment of the development’s traffic impacts to be undertaken.

### 9.2 Road Network Performance without the Project

The appraisal of road network performance without and with the project has been undertaken using Aimsun mesoscopic model and SIDRA intersection modelling software. Aimsun has been used for the purposes of assignment of traffic to the road network to identify vehicle travel routes using existing travel patterns and SIDRA for the assessment of the operational performance of the intersections. The SIDRA output is used as the basis for identifying what network improvements will be required in the future and apportionment of the impacts as a result of the development of Kellyville and Bella Vista precincts.

Transport Planning and Analytics (TPA) of Transport for New South Wales provided the demand matrices for a subarea of Kellyville/Bella Vista for 2026 and 2036 from their PTPM. The subarea included the two metro stations each represented by a separate zone. The metro station zones represent the demand generated by park and ride and kiss and ride trips to/from each and provide a representation of traffic associated with each of the two metro station activities.

TPA advised that the matrices provided do not include the Circa Commercial Precinct proposal that was submitted to the Hills Shire in 2016. The Circa development application is seeking to facilitate development of 450,000m<sup>2</sup> of commercial floor space on 25.3 hectares of land located at Norbrik Drive and Circa Boulevard, Bella Vista. Council previously raised concerns regarding the size and building height of the development which seeks to provide 24,300 jobs and 466 dwellings for senior citizens when fully developed. The application is at Gateway Determination stage with the Department of Planning and Environment. The Circa development is therefore excluded from this assessment due to the ongoing nature of the application.

#### 9.2.1 Intersection Operation

A summary of the operational performance of key intersections in 2026 without the traffic generated by the Kellyville and Bella Vista precincts is provided in Table 9.1. For comparison the existing intersection performance is shown in earlier Table 7.5.

Table 9.1: 2026 Intersection Performance (without project)

Int. No.	Intersections	Without Project 2026			
		AM Peak Hour		PM Peak Hour	
		LoS	Average Delay (sec/veh)	LoS	Average Delay (sec/veh)
1	Old Windsor Rd / Windsor Rd	C	38	F	178
2	Old Windsor Rd / Samantha Riley Dr / Newbury Ave	F	288	F	324
3	Old Windsor Rd / Memorial Ave / Sunnyholt Rd	F	195	F	171
4	Old Windsor Rd / Balmoral Rd / Miami St	F	297	F	246
5	Old Windsor Rd / Celebration Dr	F	258	F	87
6	Old Windsor Rd / Norwest Blvd	D	55	F	309
8	Windsor Rd / Samantha Riley Dr	F	195	F	192
9	Windsor Rd / Memorial Ave*	C	34	B	28
7	Samantha Riley Dr / Decora Dr	B	28	B	21
10	Memorial Ave / Arnold Ave / Severn Vale Dr*	B	26	B	23
11	Memorial Ave / Arnold Ave / Free Settlers Dr*	B	22	B	21
14	Celebration Dr / Lexington Dr / Mawson Av	C	41	D	44
15	Sunnyholt Rd / Stanhope Pkwy	C	36	E	66

\* Future layout based on RMS community update document, March 2020. <https://www.rms.nsw.gov.au/projects/01documents/kellyville-memorial-avenue-upgrade/memorial-ave-kellyville-community-update-2020-03.pdf>

The intersections of Old Windsor Rd/Celebration Drive and Celebration Drive/Lexington Drive have been modelled in SIDRA as a network. This is due to the close proximity of the two intersections and potential queue tailbacks.

The assessment shows that by 2026 almost all intersections along Old Windsor Road would perform poorly either in one or both peak hours in the morning and evening period. This is to be expected as many of the intersections on Old Windsor Road are at capacity today and their operational performance can only be expected to deteriorate further due to general traffic growth. The intersection of Memorial Avenue / Old Windsor Road would also perform poorly despite the duplication of the right turn lanes on the southern and eastern approaches of the intersection as part of Transport for NSW's planned upgrade of Memorial Avenue. The proposed upgrade would be insufficient to achieve Level of Service D, or better, at this intersection.

The intersection of Windsor Road and Samantha Riley Drive fails in both AM and PM peak periods whilst the intersection of Sunnyholt Road / Stanhope Parkway approaches capacity in the PM peak period.

The intersection Level of Service for the 2026 "Without Project" scenario is illustrated in Figure 9.1.

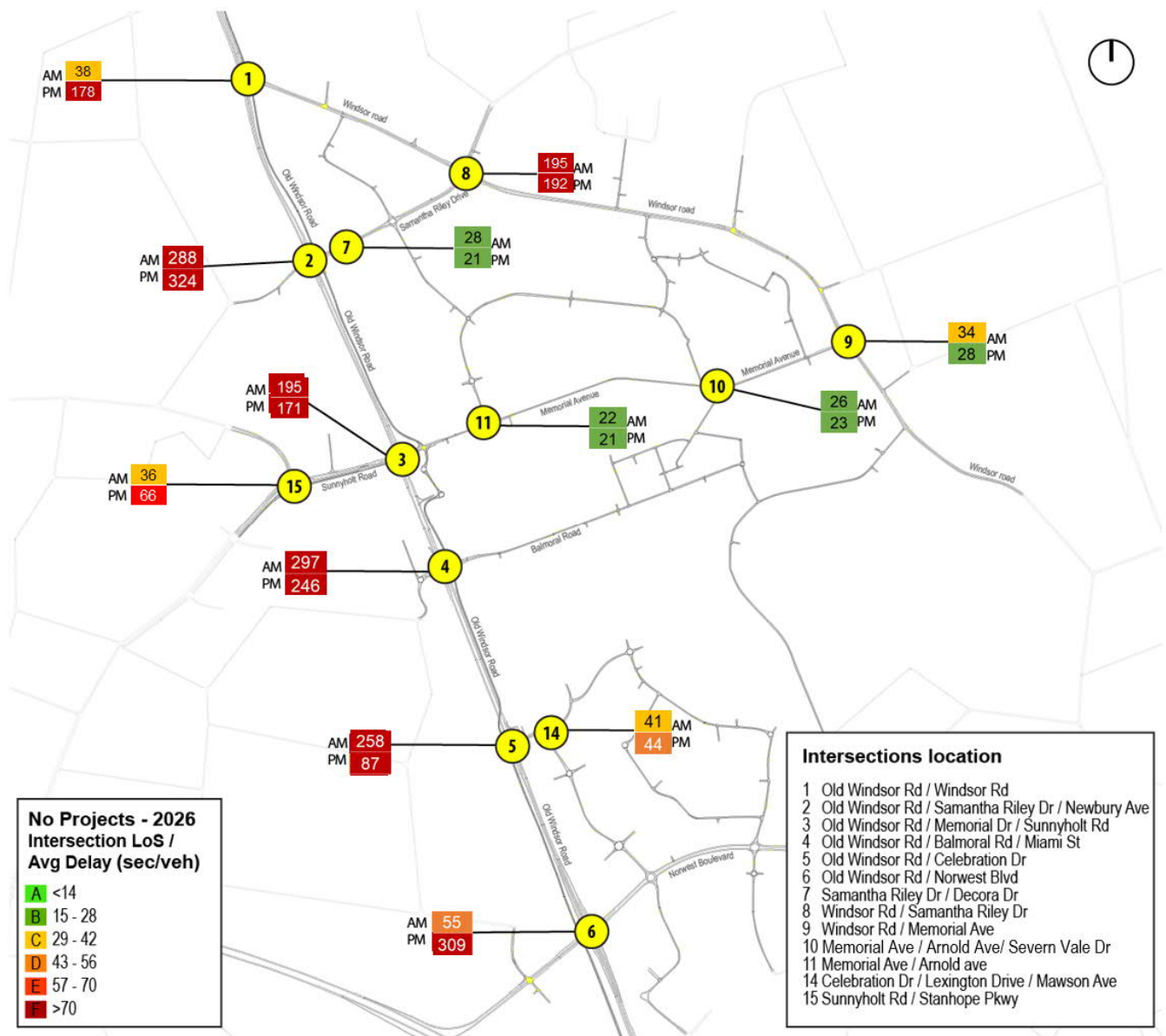


Figure 9.1: Without Project 2026 Intersection Performances

Table 9.2: 2036 Intersection Performance (without project)

Int. ID	Intersections	Without Project 2036			
		AM Peak Hour		PM Peak Hour	
		LoS	Average Delay (sec/veh)	LoS	Average Delay (sec/veh)
1	Old Windsor Rd / Windsor Rd	D	50	F	224
2	Old Windsor Rd / Samantha Riley Dr / Newbury Ave	F	317	F	356
3	Old Windsor Rd / Memorial Ave / Sunnyholt Rd	F	208	F	194
4	Old Windsor Rd / Balmoral Rd / Miami St	F	313	F	266
5	Old Windsor Rd / Celebration Dr	F	280	F	126
6	Old Windsor Rd / Norwest Blvd	F	103	F	453
8	Windsor Rd / Samantha Riley Dr	F	221	F	225
7	Samantha Riley Dr / Decora Dr	C	30	B	22
9	Windsor Rd / Memorial Ave*	C	38	B	28
10	Memorial Ave / Arnold Ave / Severn Vale Dr*	B	26	B	23
11	Memorial Ave / Arnold Ave / Free Settlers Dr*	B	23	B	22
14	Celebration Dr / Lexington Dr / Mawson Av	C	41	D	53
15	Sunnyholt Rd / Stanhope Pkwy	D	49	E	68

\* Future layout based on RMS community update document, March 2020. <https://www.rms.nsw.gov.au/projects/01documents/kellyville-memorial-avenue-upgrade/memorial-ave-kellyville-community-update-2020-03.pdf>

As shown in Table 9.2 above, the 2036 assessment shows that traffic conditions is forecast to deteriorate further on the arterial roads within the study area during both AM and PM peak periods as a result of continued growth in the background traffic as population and employment in the north west increases. The intersection of Memorial and Windsor Road is the only arterial road intersection that would perform below capacity in 2036. The intersection of Sunnyholt Road / Stanhope Parkway would be approaching its nominal capacity by 2036.

The intersection Level of Service for the 2036 "Without Project" scenario is illustrated in Figure 9.2.



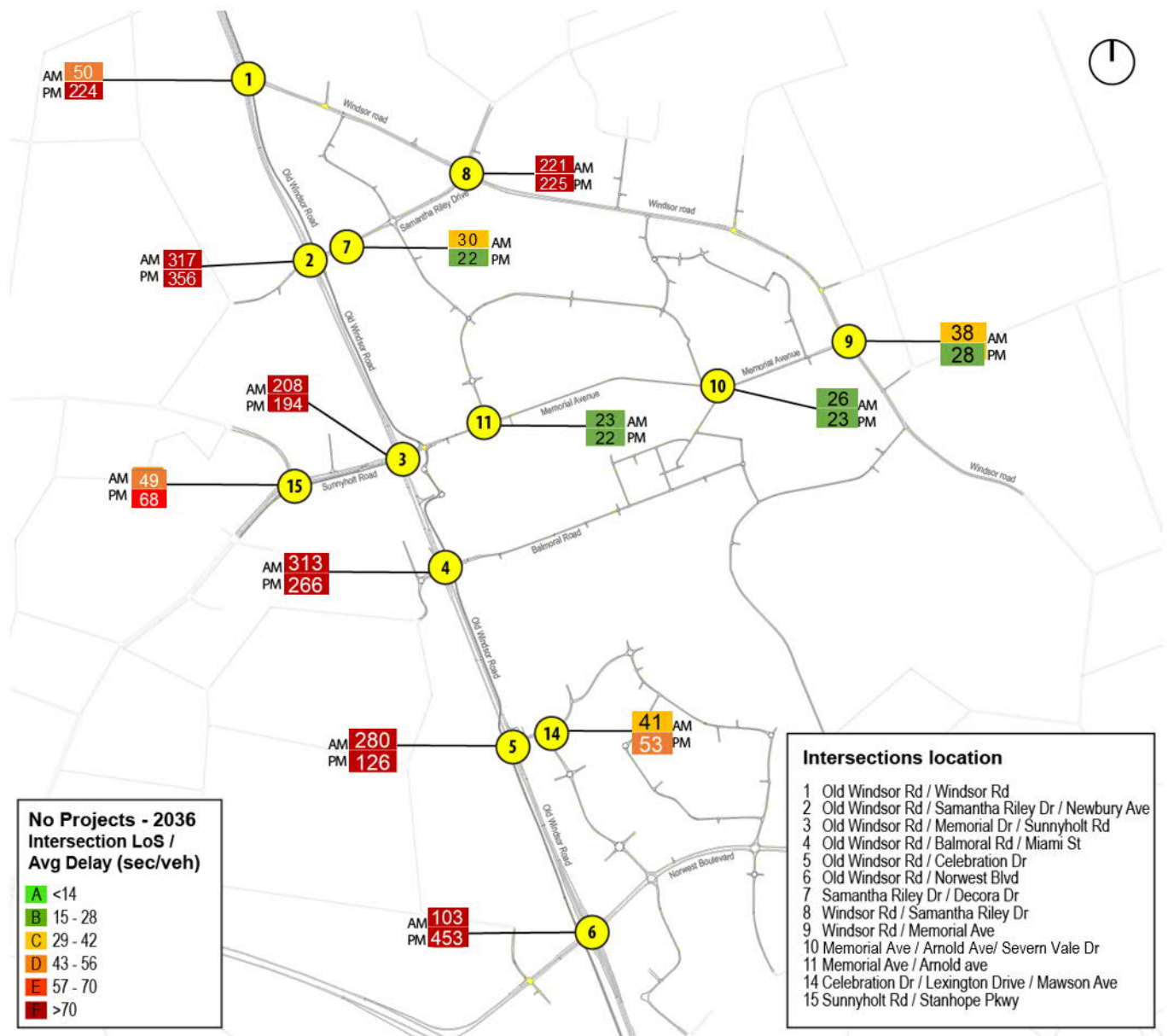


Figure 9.2: Without Project 2036 Intersection Performances

### 9.3 Road Network Performance with the Project

#### 9.3.1 Trip Generation Rates

The selection of suitable trip rates for the planned land use within the two Station Precincts needs to be cognisant of mode share changes as a result of the opening of the Metro North West. The concentration of developments around metro stations would allow residents and employees of future developments to use a wide choice of public transport that includes metro, T-way and a network of feeder bus services for travel to work. Roads and Maritime Services travel data for centres around Sydney consistently show higher utilisation of public transport, walking and cycling where centres are planned around walking distances from rail stations. A transit-oriented planning approach offers residents and workers alternative transport options and reducing the need to own or use a private vehicle for commuting or for daily activities.

#### Residential and Retail Rates

Table 9.3 below shows the trip rates that have been adopted for the estimation of the volume of traffic generated by the developments within the two precincts. The trip generation rates for the residential and retail components are those advised by Roads and Maritime Services in February 2019 and their subsequent response to the public exhibition of the environmental impact statement concerning parking rates for the residential land use. The adopted rates are based on the published Roads and Maritime Services rates but adjusted to reflect a car mode share target of 47.5% that has been identified for the two Station Precincts. Derivation of the trip generation rates are described below:

##### Residential

Average Sydney high density residential trip rates (2013 RMS Updated Technical Direction) = 0.19 AM / 0.15 PM

Average Sydney rates car mode share = 42%

Adjustment factor =  $47.5 / 42 = 1.131$

New trip rates =  $1.131 \times 0.19 = 0.22$  AM and  $1.131 \times 0.15 = 0.17$  PM

##### Retail

Average retail trip rates from RMS Small Shopping Centres surveys = 4.52 AM veh trips/100m<sup>2</sup> GLFA and 9.04 PM veh trips/100m<sup>2</sup> GLFA.

Average rates car mode share = 88.6%

Adjustment factor =  $47.5 / 88.6 = 0.536$

New trip rate =  $0.536 \times 4.52 = 2.42$  AM veh trips/100m<sup>2</sup> GLFA, and  $0.536 \times 9.04 = 4.85$  PM veh trips/100m<sup>2</sup> GLFA

##### Commercial

RMS Technical Direction rates = AM 1.6 trips/100m<sup>2</sup> and PM 1.2 trips /100m<sup>2</sup>

Average Sydney rates car mode share = 63%

RMS overall mode share for the two station precincts = 47.5%

Mode share adjustment for limited onsite car parking provision (1 space/100m<sup>2</sup>) = 1 per 4.75 employees<sup>6</sup> = 21%

Mode share Adjustment factor =  $21 / 63 = 0.33$

New trip rate =  $0.33 \times 1.6 = 0.51$  AM trips/100m<sup>2</sup> and  $0.754 \times 1.2 = 0.38$  PM trips/100m<sup>2</sup>

#### Commercial Rates

For the commercial component, the adoption of a car mode share of 47.5% assumes that nearly half of the workers employed in the Bella Vista commercial precinct will be able to drive and park their vehicles on-site. Traffic generated by this level of parking supply would have significant impact on the road network and cannot be supported from a transport planning perspective considering that the commercial buildings will be situated within the immediate vicinity of Bella Vista Station and a short walking distance to the bus services and the T-way near Old Windsor Road.

As part of a recent parking study for Landcom, a benchmarking of similar commercial centres in Sydney was undertaken for the purpose of providing guidance on suitable rates for adoption for the commercial component of the masterplan for

<sup>6</sup> 4.76 employees/100m<sup>2</sup> assuming an employee density of 21m<sup>2</sup>

the Bella Vista Station Precinct. A range of 1 space per 100 - 145m<sup>2</sup> was identified as a likely range with an initial adoption of a rate of 1 space per 100m<sup>2</sup> but potentially refined later as more information on the type of tenants and uses becomes apparent and the scale of demand for parking is better understood.

At a rate of 1 space per 100m<sup>2</sup>, only about one employee out of approximately five<sup>7</sup> will be able to park their vehicles within the precinct, so the car driver mode share of the commercial land use would be approximately 21% and less than the 47.5% car mode share target adopted for the residential and retail land uses. The trip generation rates of the commercial development within the Bella Vista Station Precinct were therefore adjusted to be consistent with the on-site parking rate proposed.

### School

The Bella Vista precinct includes a primary school that would accommodate approximately 1,000 students. The peak traffic movements associated with schools generally occur before and after the school hours of 9am - 3pm. From the traffic surveys that were undertaken, the commuter peak hours for the surrounding main roads was identified to be 7.30am - 8.30am in the morning and 5.30-6.30pm in the evening. Whilst it is possible for some school traffic to occur during the 7.30-8.30am period due to before school care services, many of these trips will be linked with the parent dropping off their children on their way to work. Direct trips originating and returning home to/from school would almost entirely occur nearer to the school start time and after the commuter peak hour. Similarly, the evening peak hour of 5.30-6.30pm is well outside of the school finish time. The arrival and departure of traffic associated with the primary school is therefore assumed not to coincide with the commuter road network and traffic associated with the school is excluded from the assessment.

### Arrival / Departure Splits

For residential traffic, the distribution of arrival and departing traffic is assumed to be 80/20 split in the peak direction of travel i.e. outbound in the AM peak and inbound in PM peak. For the retail, an even split of inbound and outbound is assumed with vehicles both arriving and departing in the same hour. For the commercial developments, a split of 90/10 is assumed in the peak direction of demand i.e. arriving in the morning and departing in the evening.

Table 9.3: Trip Generation Rates & Directional Distribution

Component	AM Trip Rate	PM Trip Rate	AM Direction Factor		PM Direction Factor	
			Inbound	Outbound	Inbound	Outbound
Residential (per dwelling)	0.22*	0.17*	0.2	0.8	0.8	0.2
Retail (per 100m <sup>2</sup> GLFA)	2.42*	4.85*	0.5	0.5	0.5	0.5
Commercial office (per 100m <sup>2</sup> )	0.51	0.38	0.9	0.1	0.1	0.9

Note: Trip generation rates advised by Roads and Maritime Services

### 9.3.2 Traffic Generation

A summary of the peak hour travel demand in the two precincts is provided in Table 9.4 for 2026. The trip generations are based on the assumed take up of development within the precincts for each 2026 and 2036 assessment year presented in Section 2.3 and the trip rates shown in Table 9.4.

<sup>7</sup> 7 4.76 employees/100m<sup>2</sup> assuming an employee density of 21m<sup>2</sup>

Table 9.4: 2026 Peak Hour Traffic Generation

	Inbound (vph)	Outbound (vph)	Total (vph)
<b>Kellyville Precinct</b>			
<b>AM Peak</b>			
Residential	35	141	176
Retail	26	26	52
Commercial	0	0	0
Total:	<b>58</b>	<b>164</b>	<b>222</b>
<b>PM Peak</b>			
Residential	109	27	136
Retail	52	52	104
Commercial	0	0	0
Total:	<b>73</b>	<b>155</b>	<b>229</b>
<b>Bella Vista Precinct</b>			
<b>AM Peak</b>			
Residential	35	141	176
Retail	38	38	76
Commercial	67	7	74
School	0	0	0
Total:	<b>140</b>	<b>186</b>	<b>326</b>
<b>PM Peak</b>			
Residential	109	27	136
Retail	76	76	152
Commercial	6	50	56
School	0	0	0
Total:	<b>191</b>	<b>153</b>	<b>344</b>

Note: Retail trip generation is calculated based on GLFA being 85% of Gross Floor Area (GFA)

The Kellyville precinct is expected to generate approximately 220 - 230 vehicles per hour (vph) in the AM and PM peak hours in 2026. The Bella Vista precinct would generate 326 - 344vph in the AM and PM peak in 2026. The peak direction of flows would be generally outbound i.e. leaving the precinct in the AM peak and inbound in the PM peak consistent with residential trip pattern for the Kellyville precinct. Bella Vista precinct would include some commercial floor space in 2026 and generate inbound trips in the morning and outbound in the evening resulting in more balanced flows.

Table 9.5 shows the ultimate trip generation of the two precincts which has been assumed to occur in 2036 despite the development of Bella Vista continuing to 2045 when it is expected to be fully built.

In 2036, the Kellyville precinct would be generating about 722vph in the AM peak and about 830vph in the PM peak. The peak direction of travel is outbound in the morning and inbound in the evening and consistent with its predominately residential character.

The Bella Vista precinct trip generation is estimated to be 2,080vph in the AM peak hour and 1,964vph in the PM peak.

Table 9.5: 2036 Peak Hour Traffic Generation

	Inbound (vph)	Outbound (vph)	Total (vph)
<b>Kellyville Precinct</b>			
<b>AM Peak</b>			
Residential	100	401	501
Retail	110	110	221
Commercial	0	0	0
Total:	<b>210</b>	<b>511</b>	<b>722</b>
<b>PM Peak</b>			
Residential	310	77	387
Retail	221	221	443
Commercial	0	0	0
Total:	<b>531</b>	<b>298</b>	<b>830</b>
<b>Bella Vista Precinct</b>			
<b>AM Peak</b>			
Residential	200	802	1002
Retail	154	154	308
Commercial	693	77	770
Total:	<b>1,047</b>	<b>1,033</b>	<b>2,080</b>
<b>PM Peak</b>			
Residential	619	155	774
Retail	308	308	616
Commercial	57	516	574
Total:	<b>984</b>	<b>979</b>	<b>1,964</b>

It is assumed that the traffic generation of the two precincts would have a similar temporal profile to the external road network occurring between 7.30am - 8.30am in the morning and 5.30pm - 6.30pm in the evening i.e. a worse-case scenario.

The demand matrices in the mesoscopic model were modified to add the above trip generations to the relevant trip zones to create new AM and PM demand matrices that combine the forecast traffic from the two precincts with the external demand that includes background traffic growth to create a "With Project" scenario. The matrices were reassigned to identify vehicle travel patterns and generate intersection turning flows within the modelled area.

## 9.4 Proposed Road Network Improvements

The assessment shows that Old Windsor Road, which serves as the main arterial access road to the two Station Precincts, already experiences congestion in the morning and evening peak hours during weekdays. By 2026 and 2036, delays and congestion are expected to worsen due to general growth in traffic as a result of additional population and employment planned for the north-west.

It is evident that the current and planned level of infrastructure is inadequate and significant investment would be required if the performance of the main roads is to be improved to a target Level of Service D or better. Achieving this Level of Service would require major network upgrades including widening and potential grade separation of some intersections with likely associated property acquisitions. These are high-cost investments that are beyond the current level of committed or planned road network improvements that has been proposed by the NSW Government or Hills Shire Council.

The approach adopted in this assessment has been to ensure that development of the two Station Precincts would not make traffic conditions on the external roads worse than the situation without the project i.e. average vehicle delay does not deteriorate as a direct result of the project. As a result, the improvements identified in this assessment are not aimed at relieving the congestion entirely and returning the Level of Service of the congested intersections to D or E but to mitigate own impacts and returning the condition on the road network to pre-development state as much as possible.

Figure 9.3 shows the intersections that have been assessed and improvements proposed at some as part of this assessment. The schedule of transport improvements and their delivery are summarised in Table 9.6 with tentative staging of each improvement shown.



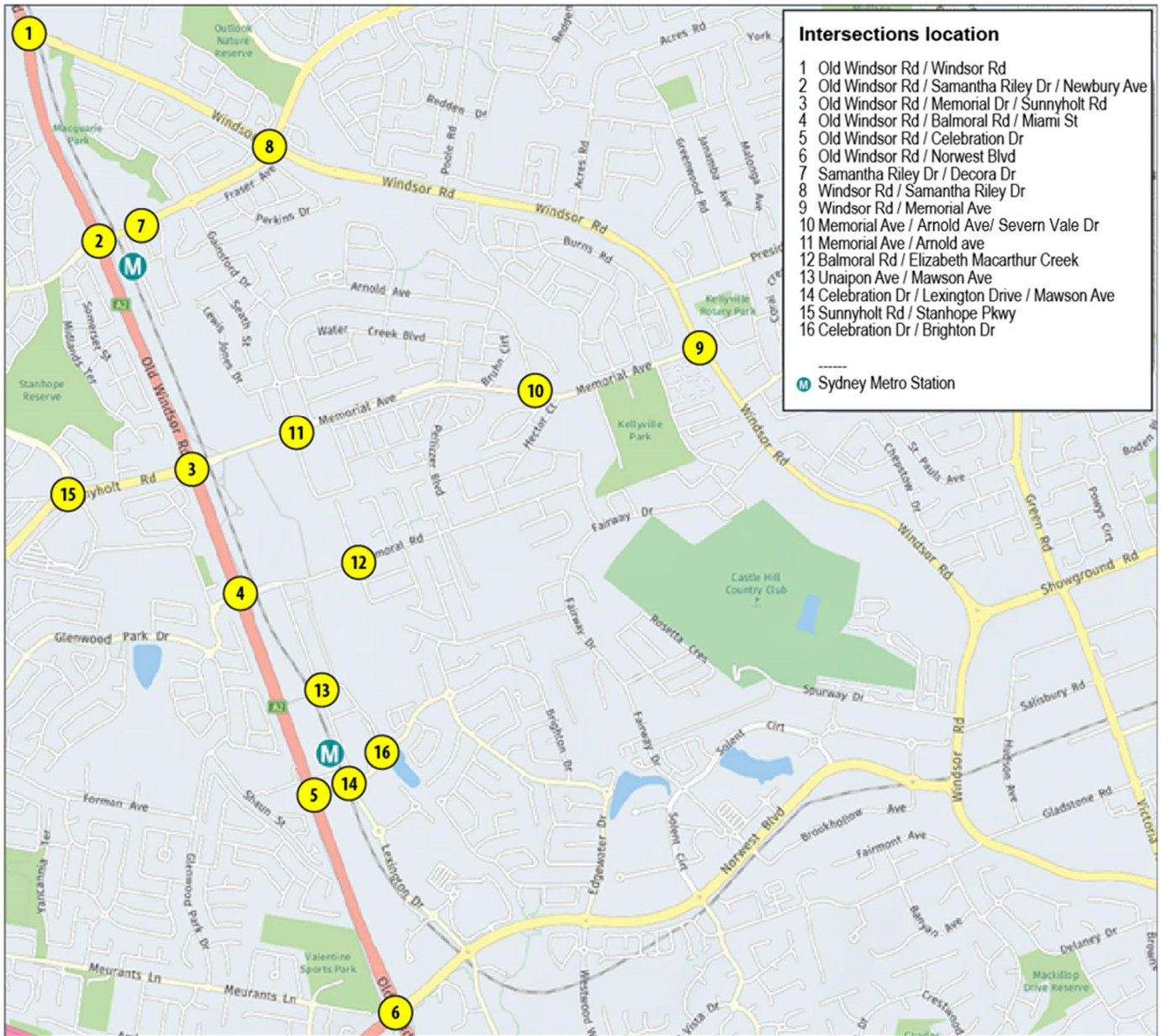


Figure 9.3: Location of Intersections

Table 9.6: Proposed Road Network Improvements

	Description	Improvement Required	
		2026	2036
<b>Old Windsor Road:</b>			
2. Samantha Riley Drive / Newbury Avenue	i. Widen Old Windsor Road in the southbound direction over a distance of approximately 120m and 200m on the departure side of the intersection to accommodate a short third lane for through traffic; ii. Widen Old Windsor Road in the northbound direction over a distance of 120m on the approach and 150m on the departure side; and iii. Provide a second right turn lane in Newbury Ave for southbound turning traffic. iv. Provide a second right turn lane in Samantha Riley Dr for northbound turning traffic	✓  ✓  ✓  ✓	✓  ✓  ✓  ✓
3. Memorial Ave / Sunnyholt Road	i. Widen Sunnyholt Road for a distance of 110m to provide a third lane for eastbound traffic heading into Memorial Avenue; ii. Widen Memorial Avenue for a distance of 100m along its northern boundary to accommodate the third through lane approaching from Sunnyholt Road. iii. Add a second right turn lane in Memorial Ave	✓  ✓  ✓	✓  ✓  ✓
4. Balmoral Road / Miami Street	i. Widen the northern approach of Old Windsor Road for a distance of 180m to provide a third lane for southbound traffic continuing through the intersection for 200m on the departure side; ii. Widen the southern approach of Old Windsor Road for a distance of 100m to provide a third lane for southbound traffic continuing through the intersection for 200m on the departure side. iii. Widen the eastern approach of Balmoral Road for a distance of 80m to provide for an additional right turn bay	✓  ✓  ✓	✓  ✓  ✓
5. Celebration Drive	i. Widen Old Windsor Road in the southbound direction for a distance of 120m to accommodate a third through lane. Widen Old Windsor Road on the departure side for a distance of 100m to accommodate the third approach lane; and ii. Widen Old Windsor Road in the northbound direction for a distance of 100m to provide a third lane. Widen Old Windsor Road on the departure side for a distance of 100m to accommodate the third approach lane.	✓  ✓	✓  ✓
6. Norwest Boulevard	Provide a second right turn lane in Norwest Boulevard for northbound traffic turning into Old Windsor Road and modify northbound slip lane to be high angled.	✓	✓

<b>Windsor Rd:</b>			
1. Old Windsor Road	No improvement proposed		
8. Samantha Riley Drive	No improvement proposed		
9. Memorial Avenue	No improvement proposed		
<b>Memorial Ave:</b>			
10. Arnold Ave/ /Severn Vale Dr. (McCausland Place)	No additional improvement is required		
11. Arnold Ave / Free Settlers Drive	Widening of Memorial Ave from 2 lanes to 3 for a distance of 160m west of the intersection to accommodate additional through lanes on both sides		✓
15. <b>Sunnyholt Road</b> / Stanhope Parkway	Widen the slip lane on Stanhope Parkway to become two lanes.		✓
<b>Station Precincts:</b>			
Bridge across Elizabeth MacArthur Creek	Provide a bridge connecting the Kellyville Station Precinct to Colonial Street.	✓	✓
7. Samantha Riley Drive / Decora Drive	Provide a left slip lane over length of 50m into the Kellyville precinct from the eastern approach of Samantha Riley Drive		✓
12. Balmoral Road/ Elizabeth Macarthur Creek link	New link and intersection as part of the development of the Bella Vista precinct	✓	✓
13. Mawson Ave / Unaipon Ave	Signalisation of the intersection		✓
14. Celebration Drive / Lexington Drive/Mawson Ave	Intersection performing acceptably, no Improvements required		
16. Celebration Drive / Brighton Drive	Signalisation of the intersection as part of development of the Bella Vista precinct	✓	✓

Appendix A includes the layout of the intersections with and without the proposed improvements.

These improvements have been identified as part of a strategic assessment of the impact of development of the two metro precincts based on quantum and release as planned by Landcom. They should be further examined through technical studies and supplemented where necessary as part of development applications for the lots within the precincts to further inform on the impact and mitigation measures that may be required on the transport network. Any development beyond the assumed yield should require further assessment to mitigate its transport impacts.

The operational performance of the intersections with the proposed improvements are shown in Figure 9.4 and Figure 9.5.

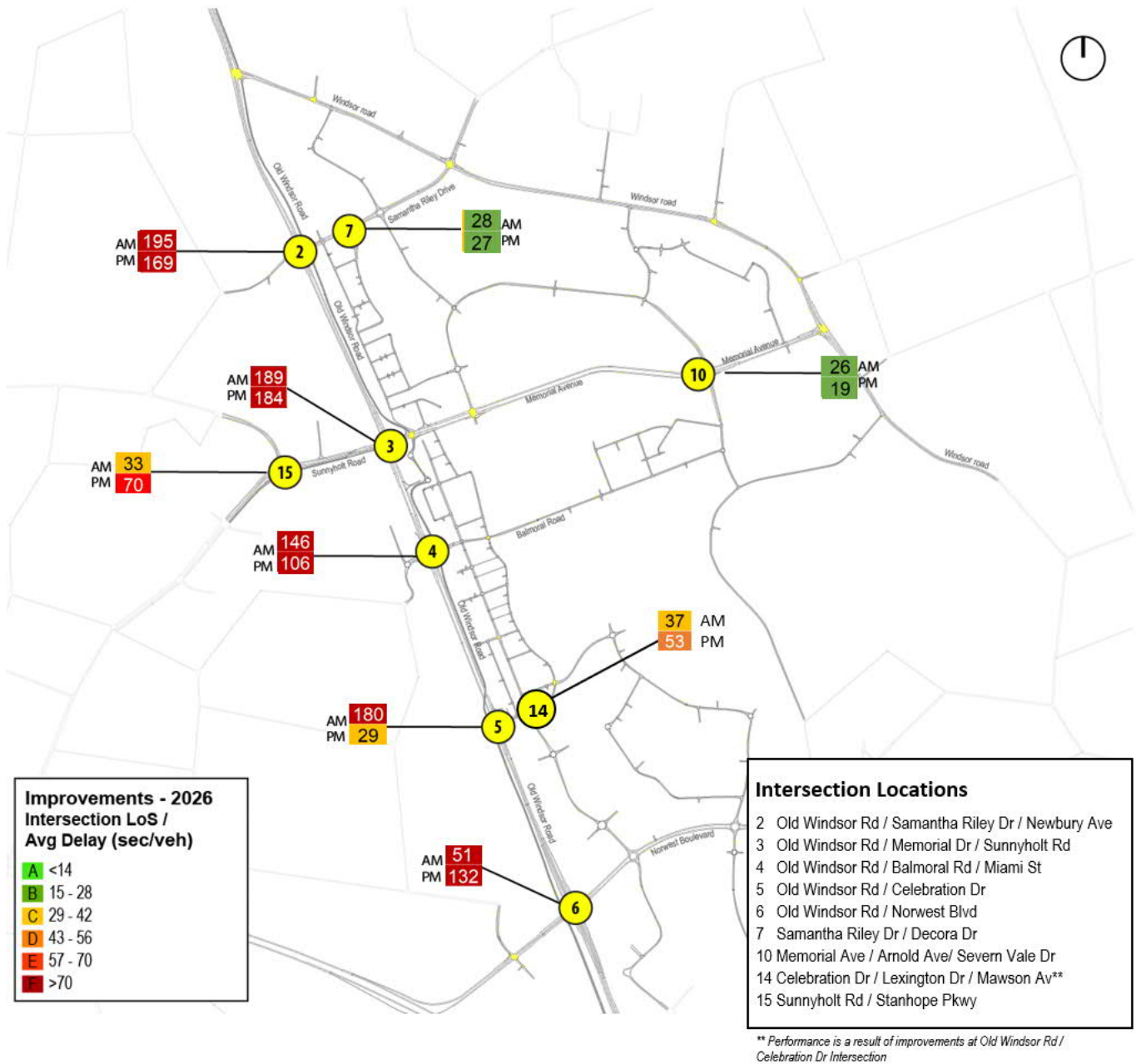


Figure 9.4: 2026 Intersection Performances – ‘With Project’ and with proposed intersection improvements



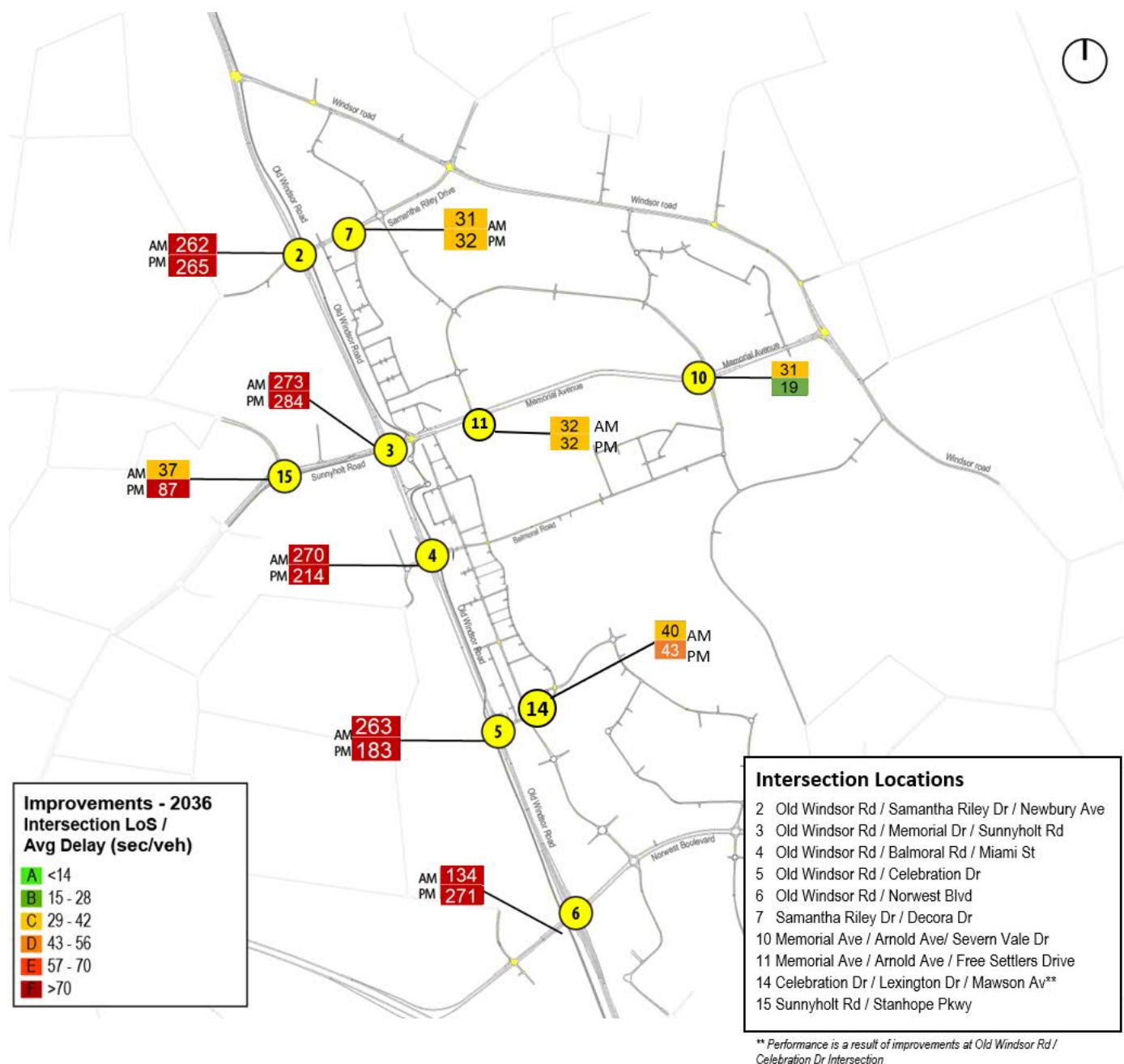


Figure 9.5: 2036 Intersection Performance – ‘With Project’ and with proposed intersection improvements

#### 9.4.1 2026 Network performance with proposed improvements

Table 9.7 to Table 9.8 shows the intersection Level of Service and average vehicle delays following the addition of the road network improvements assessed using SIDRA for 2026 scenarios. The “Without Project” and “With Project”, both with and without the proposed network improvements, are shown for the purpose of comparison of the net impacts and change in average delays across different scenarios.



Table 9.7: 2026 Intersection Delay and LoS (AM Peak)

Int. ID	Intersections	2026 AM Peak Hour					
		Without Project		With Project but no Improvements		With Project and Improvements	
		LoS	Average Delay (sec/veh)	LoS	Average Delay (sec/veh)	LoS	Average Delay (sec/veh)
1	Old Windsor Rd / Windsor Rd	C	38	F	95	Improvement not proposed	
2	Old Windsor Rd / Samantha Riley Dr / Newbury Ave	F	288	F	323	F	195
3	Old Windsor Rd / Memorial Ave/ Sunnyholt Rd	F	195	F	251	F	189
4	Old Windsor Rd / Balmoral Rd / Miami St	F	297	F	316	F	146
5	Old Windsor Rd / Celebration Dr**	F	258	F	288	F	180
6	Old Windsor Rd / Norwest Blvd	D	55	D	51	D	51
8	Windsor Rd / Samantha Riley Dr	F	195	F	174-	Improvement not proposed*	
9	Windsor Rd / Memorial Ave	C	34	C	41	Improvement not proposed*	
7	Samantha Riley Dr / Decora Dr	B	28	C	33	C	28
10	Memorial Ave / Arnold Ave / Severn Vale Dr	B	26	B	26	No Improvements required	
11	Memorial Ave / Arnold Ave / Free Settlers Drive	B	22	B	21	No Improvements required	
12	Balmoral Rd / Elizabeth Macarthur Creek Link	New intersection to be delivered by the project		New intersection to be delivered by the project		New intersection to be delivered by the project	
13	Unaipon Ave / Mawson Av	Intersection not assessed+		B	20	No Improvements required	
14	Celebration Dr / Lexington Dr / Mawson Ave**	C	41	C	37	No Improvements required	
15	Sunnyholt Rd / Stanhope Pkwy	C	36	D	43	C	33
16	Celebration Dr / Brighton Dr	Traffic signal to be delivered by the project		B	16	No further Improvements required	

\* Impact on adjacent properties to undertake improvements

+ New intersections to be delivered by the project.

- Reduction in average delay is due to traffic choosing new route(s) in the model

\*\* Uses surveyed peak hour for Old Windsor Rd / Celebration Dr intersection (06:15-07:15)

Table 9.8: 2026 Intersection Delay and LoS (PM Peak)

	Intersections	2026 PM Peak Hour					
		Without Project		With Project but no Improvements		With Project and Improvements	
		LoS	Average Delay (sec/veh)	LoS	Average Delay (sec/veh)	LoS	Average Delay (sec/veh)
1	Old Windsor Rd / Windsor Rd	F	178	F	212	Improvement not proposed	
2	Old Windsor Rd / Samantha Riley Dr / Newbury Ave	F	324	F	304	F	169
3	Old Windsor Rd / Memorial Ave / Sunnyholt Rd	F	171	F	315	F	184
4	Old Windsor Rd / Balmoral Rd / Miami St	F	246	F	219	F	106
5	Old Windsor Rd / Celebration Dr**	F	87	E	77-	C	29
6	Old Windsor Rd / Norwest Blvd	F	309	F	253	F	132
8	Windsor Rd / Samantha Riley Dr	F	192	F	129	Improvement not proposed*	
7	Samantha Riley Dr / Decora Dr	B	21	B	28	B	27
9	Windsor Rd / Memorial Ave	B	28	C	31	Improvement not proposed*	
10	Memorial Ave/ Arnold Ave / Severn Vale Dr	B	23	B	19	No Improvements required	
11	Memorial Ave / Arnold Ave / Free Settlers Drive	B	21	B	21	No Improvements required	
12	Balmoral Rd / Elizabeth Macarthur Creek Link	New intersection to be delivered by the project		New intersection to be delivered by the project		New intersection to be delivered by the project	
13	Unaipon Ave / Mawson Ave	Intersection not assessed		B	21	No Improvements required	
14	Celebration Dr / Lexington Dr / Mawson Ave**	D	44	D	52	No Improvements required	
15	Sunnyholt Rd / Stanhope Pkwy	E	66	F	72	E	70
16	Celebration Dr / Brighton Dr	Traffic signal to be delivered by the project		B	18	No Improvements required	

\* Impact on adjacent properties to undertake improvements

+ New intersections to be delivered by the project.

- Reduction in average delay is due to traffic choosing new route(s) in the model

\*\* Uses surveyed peak hour for Old Windsor Rd / Celebration Dr intersection (15:00-16:00)

#### 9.4.1.1 2026 proposed road network improvements

The 2026 intersection assessment shows the following:

- Old Windsor Road / Windsor Road: the intersection of Old Windsor Road / Windsor Road is shown to deteriorate in both the AM and PM peak period. This is due to the mesoscopic traffic model reassigning right turning traffic from Samantha Riley Drive to Old Windsor Road/Windsor Road to use Windsor Road as an alternative route to Beaumont Hills and beyond. The alternative route is 1.2km longer and includes 2 additional sets of traffic lights. Sydney Metro as part of the opening of the Metro North West has been undertaking regular traffic surveys around the metro stations. These surveys were done on different weekdays including Saturday and consistently show less than 60-70 vehicles per hour in the peak periods turning right at Windsor Road. This volume of traffic is significantly below the capacity of the existing single right turn lane in Old Windsor Road. The existing travel patterns do not show utilisation of right turn lane other than by drivers accessing the surrounding local area via Windsor Road. It is possible that with growth in background traffic the number of right turning traffic may rise in future. However, it needs to be noted that any additional right turning traffic would be due to this growth and not due to traffic from the Kellyville precinct since there is no need for the precinct traffic to use the right turn lane at Windsor Road when arriving or departing from the two precincts as it is not a route that the precinct traffic would choose to use.
- Old Windsor Road / Samantha Riley Drive / Newbury Avenue: improvements that have been proposed for this intersection would reduce the average delay to less than that experienced without the project i.e. "Without Project" scenario thus able to mitigate the impact of traffic from the two precincts.
- Sunnyholt Road / Old Windsor Road / Memorial Avenue: There will be significant reduction in average vehicle delay due to improvements that have been proposed for this intersection.
- Old Windsor Road / Balmoral Road / Miami Street: There will be significant reduction in average vehicle delay due to improvements that have been proposed for this intersection.
- Old Windsor Road / Celebration Drive: There will be significant reduction in average vehicle delay due to improvements that have been proposed for this intersection.
- Windsor Road / Samantha Riley Drive and Windsor Road / Memorial Avenue: improvements at these two locations would require part or full acquisition of adjacent properties. They are also likely to attract through traffic due to high level of traffic demand already in the area with any improvement provided by Landcom disproportionately utilised by through traffic.

The above assessments of the key intersections show that with the improvements proposed as part of development of the two precincts, the average vehicle delay at many of the assessed intersections would reduce to below the levels that they would otherwise be due to growth in general traffic by 2026. For example, the intersection of Old Windsor Rd / Samantha Riley Dr / Newbury Ave would experience an average delay of 324 seconds/veh in the PM peak as a result of general traffic growth. However, with the improvements that are proposed and despite the addition of traffic from the two Station Precincts, the average delay reduces below the pre-development level resulting in improvements in general traffic condition. A similar pattern can be observed at other intersections where the average delays following the improvements are reduced to below the level with the growth in background traffic.

For those intersections where no improvements are proposed, and the average delay is expected to increase as a result of the project, the additional delay should be considered in a network sense and offset against the intersections where level of delay improves beyond the development's impact. This should be subject of discussion with Roads and Maritime Services when considering the apportionment of responsibility and costing for the road works.

#### 9.4.2 2036 network performance with proposed improvements

Table 9.9 and Table 9.10 shows the intersection Level of Service and average vehicle delays following the addition of the road network improvements assessed using SIDRA for 2036 scenarios.

Table 9.9: 2036 Intersection Delay and LoS (AM Peak)

Int. ID	Intersections	2036 AM Peak Hour					
		Without Project		With Project but no Improvements		With Project and Improvements	
		LoS	Average Delay (sec/veh)	LoS	Average Delay (sec/veh)	LoS	Average Delay (sec/veh)
1	Old Windsor Road / Windsor Road	D	50	F	237	No Improvements proposed	
2	Old Windsor Road / Samantha Riley Drive / Newbury Avenue	F	317	F	420	F	262
3	Old Windsor Road / Memorial Avenue / Sunnyholt Road	F	208	F	416	F	273
4	Old Windsor Road / Balmoral Road / Miami Street	F	313	F	501	F	270
5	Old Windsor Road / Celebration Drive**	F	280	F	437	F	263
6	Old Windsor Road / Norwest Blvd	F	103	F	134	F	134
8	Windsor Road / Samantha Riley Drive	F	221	F	229	No Improvements proposed *	
9	Windsor Road / Memorial Avenue	C	38	F	82	No Improvements proposed *	
7	Samantha Riley Drive / Decora Drive	C	30	C	38	C	31
10	Memorial Ave / Arnold Ave / Severn Vale Dr	C	26	C	31	No Improvements proposed	
11	Memorial Avenue / Arnold Avenue / Free Settlers Drive	B	23	C	32	C	32
12	Balmoral Road / Elizabeth Macarthur Creek Link	New intersection to be delivered by the project		New intersection to be delivered by the project		New intersection to be delivered by the project	
13	Unaipon Avenue / Mawson Avenue	Intersection not assessed+		B	25	No Improvements required	
14	Celebration Drive / Lexington Drive / Mawson Avenue**	C	41	D	40	No Improvements required	
15	Sunnyholt Road / Stanhope Parkway	D	49	D	49	C	37
16	Celebration Drive / Brighton Drive	Traffic signal to be delivered by the project		B	17	No Improvements required	

\* Impact on adjacent properties to undertake improvements

+ New intersections to be delivered by the project.

- Reduction in average delay is due to traffic choosing new route(s) in the model

\*\* Uses surveyed peak hour for Old Windsor Rd / Celebration Dr intersection (06:15-07:15)

Table 9.10: 2036 Intersection Delay and LoS (PM Peak)

Int. ID	Intersections	2036 PM Peak Hour					
		Without Project		With Project but no Improvements		With Project and Improvements	
		LoS	Average Delay (sec/veh)	LoS	Average Delay (sec/veh)	LoS	Average Delay (sec/veh)
1	Old Windsor Road / Windsor Road	F	224	F	350	Improvement not proposed	
2	Old Windsor Road / Samantha Riley Drive / Newbury Avenue	F	356	F	428	F	265
3	Old Windsor Road / Memorial Avenue / Sunnyholt Road	F	194	F	460	F	284
4	Old Windsor Road / Balmoral Road / Miami Street	F	266	F	422	F	214
5	Old Windsor Road / Celebration Drive**	F	116	F	296	F	183
6	Old Windsor Road / Norwest Blvd	F	453	F	529	F	271
8	Windsor Road / Samantha Riley Drive	F	225	F	214	No Improvements proposed -	
9	Windsor Road / Memorial Avenue	B	28	C	37	No Improvements proposed	
7	Samantha Riley Drive / Decora Drive	B	22	C	35	C	32
10	Memorial Ave/ Arnold Ave / Severn Vale Dr	B	23	B	21	No Improvements proposed	
11	Memorial Avenue / Arnold Avenue / Free Settlers Drive	B	22	C	34	C	32
12	Balmoral Road / Elizabeth Macarthur Creek Link	New intersection to be delivered by the project		New intersection to be delivered by the project		New intersection to be delivered by the project	
13	Unaipon Avenue / Mawson Avenue	Intersection not assessed+		B	23	No Improvements required	
14	Celebration Drive / Lexington Drive / Mawson Avenue**	D	53	D	43	No Improvements required	
15	Sunnyholt Road / Stanhope Parkway	E	68	F	94	F	87
16	Celebration Drive / Brighton Drive	Traffic signal to be delivered by the project		B	17	No Improvements required	

\* Impact on adjacent properties to undertake improvements

+ New intersections to be delivered by the project.

- Reduction in average delay is due to traffic choosing new route(s) in the model

\*\* Uses surveyed peak hour for Old Windsor Rd / Celebration Dr intersection (15:00-16:00)

#### 9.4.2.1 2036 proposed road network improvements

The 2036 intersection assessment shows the following:

- The improvements proposed for the intersections of Old Windsor Road with Samantha Riley Drive, Memorial Avenue and Balmoral Road are able to reduce the average delays and improve the traffic conditions above what is generated by the two Station Precincts. Average delays at all intersections is reduced to below the level when only the background traffic is included in the assessment.
- The intersection of Old Windsor Road / Windsor Road is shown to deteriorate in both the AM and PM peak hours. As mentioned in section 9.4.1.1, the alternative route identified by the mesoscopic model is 1.2km longer and includes 2 additional sets of traffic lights. The current utilisation of the right turning lane shows very little traffic using this lane even in peak hours including Saturday. Any increase would be as a result of other traffic using this right turn since it is unnecessary for traffic from Kellyville precinct to use the right turn when arriving or departing from the two precincts.
- The intersection of Samantha Riley Drive with Windsor Road will experience an increase in average vehicle delays in the AM peak only. This route is used by traffic from Old Windsor Road and improvements at this intersection are likely to benefit through traffic and further increase traffic in Samantha Riley Drive which is a not an arterial road.
- The intersection of Sunnyholt Road / Stanhope Parkway operates slightly above its capacity in the PM peak in 2026 however the average delay and degree of saturation is just above the threshold and does not justify the need to improve this intersection in 2026. By 2036, the intersection would require some upgrade due to high PM traffic flows.
- Widening of Memorial Avenue: RMS is undertaking an upgrade of Memorial Avenue between Old Windsor Road to Windsor Road. As part of this upgrade, Memorial Avenue will be widened to 2 lanes each way with provision for a third lane to be provided at a future time subject to traffic demand. As part of development of the precinct, widening of the section to 3 lanes from Arnold Avenue for a distance of approximately 160m would increase traffic capacity in and improve safety of vehicles turning into and exiting a future link road from Kellyville precinct. The exact location of a future link road from the Kellyville precinct would be decided as part of development of the private land holdings on the southern part of the precinct however for the purpose of this application, the widening is identified as an improvement for implementation by 2036 when there is a greater level of development quantum within the two precincts.

The minor internal intersections generally operate satisfactorily in both peak periods and do not require any improvements.

The above assessments of the key intersections show that with the improvements that have been identified as part of development of the two precincts, the average delay and condition at many of the above intersections would improve to level better than they would be due to general growth in traffic by 2036.

## 9.5 Assessment of Internal Roads

In order to achieve good transport and land use outcomes and minimise traffic impacts, it is necessary to set a strategic framework to ensure any subsequent proposals are consistent with the future role and function of a particular street. The roads within and around the two precincts provide two primary functions for transport customers:

- Movement: The ability to travel between places
- Place: The ability to access origins and destinations of travel.

An understanding of the two functions of a street are vital when the two functions are competing, such as through increased movement requirements or improved place amenity. The movement and place function of a street informs planning for the level of access across each of the transport modes.



A place-based street management approach is proposed within the two precincts to emphasise the need for places for people in areas of high activity and maintain local traffic access. The approach is to support the high activity, mixed use and high-density urban environment of both precincts.

Key criteria used to identify movement and place functions of streets in and around the two precincts include:

- Proximity to major public transport nodes;
- Public transport function;
- Presence of active street frontages;
- Traffic volumes; and
- Regional connectivity.

### 9.5.1 Kellyville Precinct

Within the Kellyville precinct, an internal street network is proposed that extends from Samantha Riley Drive to connect the precinct with its surroundings. Internal circulation routes are designed to dissuade through traffic via a road network that weaves through the precinct activating the precinct based on its intended function.

Places for people are designed within the vicinity of the metro station, where significant activity associated with people accessing the station and related retail uses requires a place-based design approach whilst providing for movement of vehicles for residents accessing into and out of the precinct. This has been achieved by designing Decora Drive as the main access road and Guragura Street as the local access street. As shown below in Figure 9.6, the northern section of Guragura Street is within the Station Precinct that would function both as a vibrant mixed-use town centre whilst still providing movement functionality for traffic accessing the metro station. South of the station and commuter car park, the movement function of Guragura Street is designed to be less prominent with greater focus on residential amenities and a higher place function.

Decora Drive would serve as the main movement corridor through the Kellyville precinct for access to the metro commuter car park. However, it is noted that it will still fulfil its unique function situated along the Elizabeth Macarthur Creek and able to cater for pedestrian and cyclist movements along an important green corridor.

Other streets in the Kellyville precinct are predominately local east-west streets, intended to provide access to allotments for vehicles and pedestrians to walk to the green corridor at the Elizabeth Macarthur Creek. The creek forms a soft green buffer between the precinct and the existing low-rise housing estate to its east. West of the precinct, Old Windsor Road and the T-Way form a hard barrier limiting effective integration with the suburban of Stanhope Gardens. A pedestrian bridge constructed as part of the Kellyville Station provides a level of accessibility across from the northern end of Kellyville precinct and the level crossing at the Memorial Avenue intersection from its southern end.

Towards the eastern side, a planned link from the precinct to Colonial Street and Arnold Avenue would serve as a movement corridor for traffic to access Memorial Avenue.

Outside of the precinct, Old Windsor Road, Samantha Riley Drive and Memorial Avenue are the strategic movement corridors, reflecting the importance of these corridors in carrying through and regional traffic.



- SSDA boundary
- station precinct character area
- residential core character area
- memorial gateway character area

Figure 9.6 Kellyville Precinct - Place-based street management approach

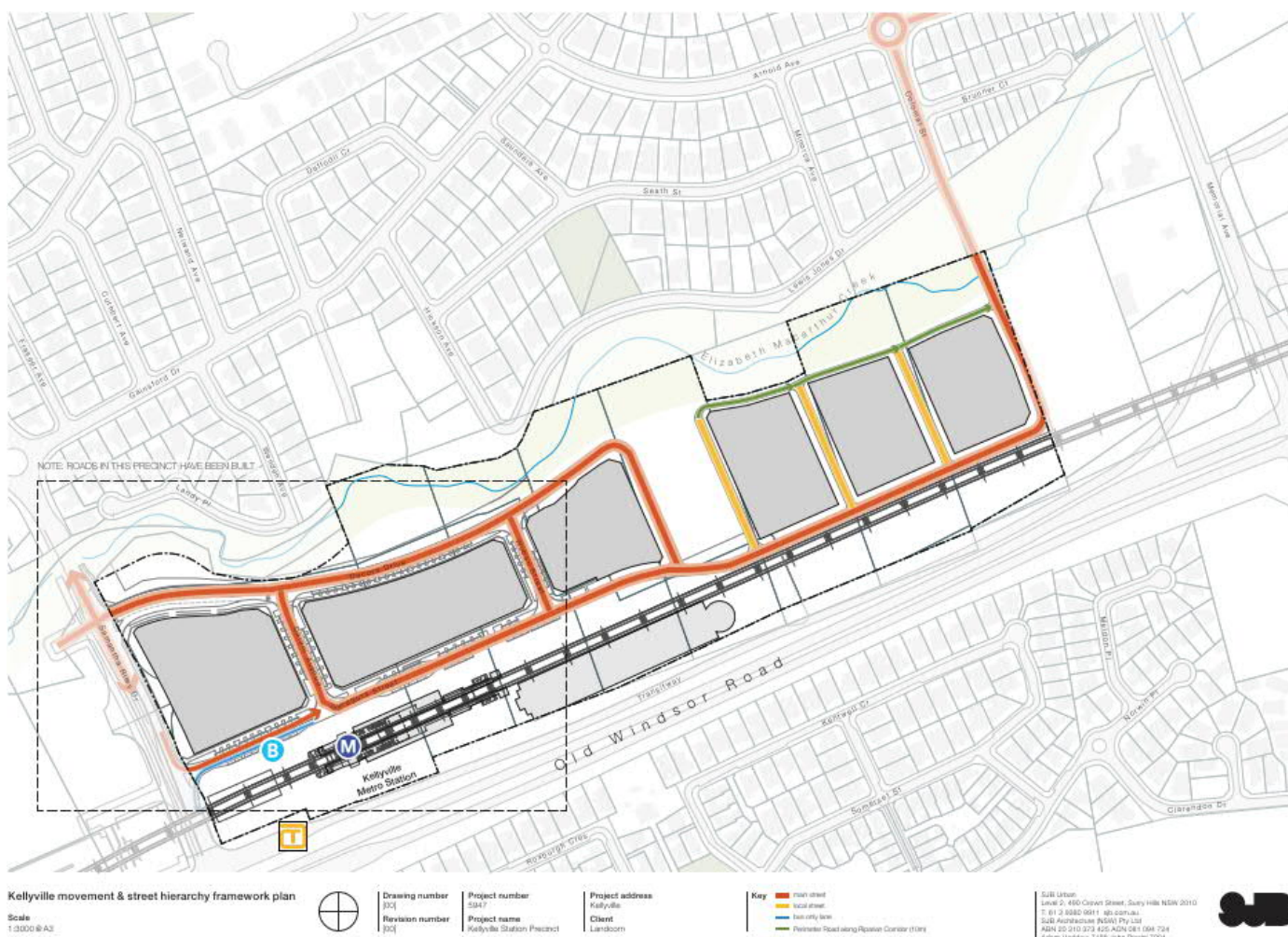


Figure 9.7 Kellyville Movement Network Plan

### 9.5.1.1 Street Typologies

A hierarchy of street typologies has been proposed that aims at providing a safe environment for pedestrians and cyclists to use. It includes the following:

- **Main streets:** 20m wide road reserves comprising of 2.5m on-street parking and 3.5m traffic lane on both sides for movement of cars and buses. Footpath width of 2.5-4m on each side to cater for pedestrians and 3.5m at the metro viaduct for shared utilisation with cyclists.
- **Local Streets:** considered as slow streets with planning focused to encourage slower vehicle speeds and put pedestrian safety first to create a safe environment for the community. This is to be achieved via a narrower carriageway width comprising a 2.5m wide parking lane where on-street is provided and 3m wide traffic lane.
- **Shared Street/Laneway (riparian):** 4m wide carriageway for one-way traffic flow and a shared 3m width cycle/pedestrian path carriageway buffered by the riparian zone along the Elizabeth Macarthur Creek.

### 9.5.1.2 Development access

In general, access to allotments is proposed via a network of local streets throughout the precinct as shown in Figure 9.8. Many of accesses are likely to be utilised by less than 100 vehicles per hour in peak periods. This level of usage is



considered appropriate for the local roads and would not lead to operational or safety issues from conflicts with other road users.

All access points should be designed in accordance with AS 2890, relevant Transport for NSW and Hills Shire Council guidelines, in terms of adequate distance between driveways and adjacent intersections. Accesses would be subject to investigation and refinement during the detailed design process for each lot at each development application stage.



Figure 9.8 Kellyville Precinct local road network

Kellyville would provide a local retail precinct with its indicative vehicle access to its car park, as shown below in Figure 9.9. Vehicle access is proposed to be via a dedicated right turn bay in Decora Drive which is set back from the signalised intersection at Samantha Riley Drive to maximise queuing space. Service vehicle access to the retail site would be via left-in/left-out arrangement with a turning table provided within the site to allow trucks to leave without reversing into Decora Drive.

A treatment option at this intersection includes signalisation of Decora Drive at the T intersection with Darani Avenue. The signalisation of this intersection would have the benefit of being located along a future pedestrian/cyclist pathway

that is to link Wenden Avenue via a new crossing of Elizabeth Macarthur creek to Kellyville Station. A signalised intersection is considered a safer option for pedestrians and cyclists compared to alternative of providing a roundabout. The intersection is 150m from Samantha Riley Drive. Queue lengths in Decora Avenue can be managed by coordinating the phasings of the intersection so that southbound arriving traffic in Decora Avenue would not need to be delayed at the traffic signal to cause queue tailbacks.

Provision of a future traffic signal at this intersection would be assessed in accordance with RMS warrant for new traffic signals.



Figure 9.9 Proposed retail access locations and Pedestrian Movements (SJB Planning)

### 9.5.1.3 Service Vehicle Access

Figure 9.10 shows service vehicle routes for the major retail site in Kellyville. Delivery vehicles approaching from the east on Samantha Riley Drive would turn left into Guragura Street and use Darani and Decora Street to access the service area. Service vehicles arriving from Old Windsor Road would use Samantha Riley Drive and right turn into Decora Drive to use Wuban Avenue/ Guragura Street/Darani Avenue to travel within the precinct to enter the servicing area. Occasional delays may occur when leaving the service area due to the proximity of the service vehicle access driveway to Samantha Riley Drive. However, these delays are not expected to be significant as most service deliveries are done outside of peak hours when there is less traffic on the network.

Service vehicle access for other developments within the Kellyville precinct would be similarly via Samantha Riley Drive and Decora Drive or Guragura Street using the internal roads to access the developments.

Provision of service access via Colonial Street/Arnold Avenue/Memorial Avenue may be an option for consideration subject to discussion with Hills Shire Council and conditions with regard to their size and time of usage.



**Figure 9.10 Service Vehicle Delivery Routes (SJB Planning)**

### 9.5.2 Bella Vista Precinct

The larger of the two precincts, the design of Bella Vista Station Precinct seeks to balance the needs of residents and the commercial lots to the south through provision of an integrated and varied network of roads that cater for local residents through a variety of active frontages, pedestrian and bike links whilst providing for transport needs of the metro travellers and employees working within the commercial domain of the precinct.

Bella Vista precinct comprises of two distinct areas. It includes the land between Memorial Avenue and Balmoral Road as an entirely residential precinct with a primary school included and between Balmoral Road and Celebration Drive comprising a mix of residential, commercial and public facilities. Connection between the two areas is catered for by extending Celebration Drive and signalling it at its intersection with Balmoral Road to act as the main north-south connection for residents, the school and for commercial traffic near the Bella Vista station, who would have the option of accessing the surrounding arterial roads via Balmoral Road instead of limited to Celebration Drive at Old Windsor Road.

Fronting the metro station, Mawson Avenue would serve as the place function for the precinct as shown in Figure 9.11. This is achieved by limiting vehicle access to left in/out movement at Balmoral Road and maintaining the bus lane at its southern end near Celebration Drive that would limit its connectivity and exposure to through traffic.

Celebration Drive will serve as the principle vehicle corridor through the precinct for commercial traffic and access to/from the metro commuter carpark. It will also serve as the main access route to the residential allotments near Balmoral Road via a network of east-west local streets designed to encourage traffic to use Celebration Drive in



preference to Mawson Avenue. Design elements of Celebration Drive would cater for pedestrian and cyclist movements by providing a suitable road cross section to leverage its proximity to the Elizabeth Macarthur Creek.

To reinforce the neighbourhood and access character of the local streets narrower carriageways are proposed to tie in the higher order roads to allotments. They would include landscaping and footpaths on both sides of the road.



Figure 9.11 Bella Vista Precinct - Place-based street management approach,

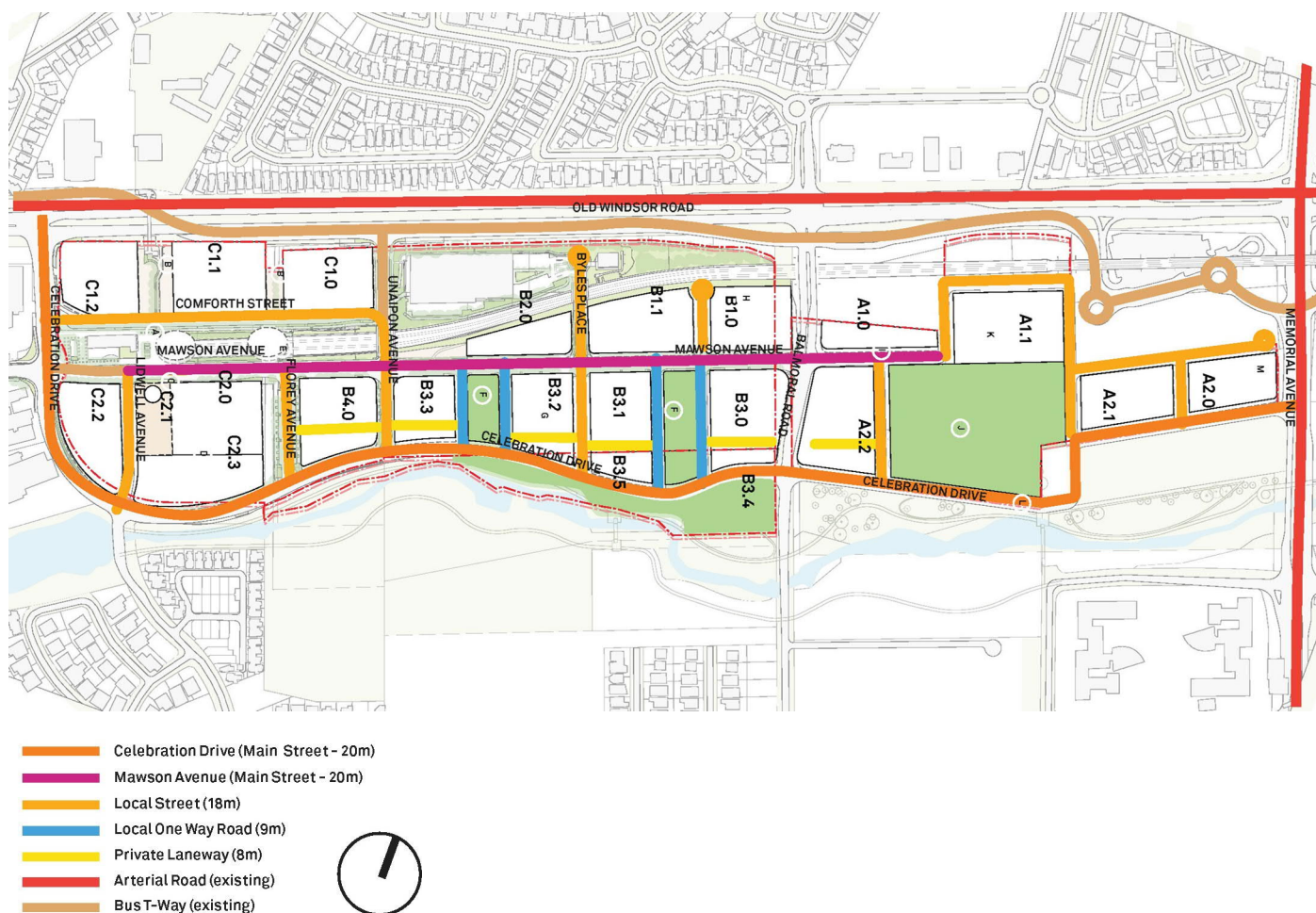


Figure 9.12 Bella Vista Movement Network Plan

### 9.5.2.1 Street Typologies

Within the precinct, an internal street network has been proposed that extends from and connects to public space, serving to connect the community. To provide this internal connectivity, a hierarchy of street typologies is proposed comprising the following:

- Mawson Street(existing): 20m wide corridor providing a single 3.5m wide lane in each direction and varying width shared footpath and verge on both sides of the road
- Celebration Drive: 20m wide main street incorporating 3.5m wide traffic lanes, 2.5m indented parking bays plus 3.5m wide footpaths on both sides.
- Local Streets: Provision of a 3m wide traffic lane and 2.5m wide indented parking bays defined as slow streets to dissuade traffic. Pedestrian footpaths of varying widths on both sides to encourage active transport
- Neighbourhood laneways: laneways serving as driveway access to parking basements but designed as shared use spaces with pedestrian priority. Each laneway would include 4.5m wide roadway and 3m wide pedestrian and landscape zone.

### 9.5.2.2 Development access

Access to developments would be via a network of local streets throughout the precinct as shown in Figure 9.13. Access to developments via Mawson Avenue will be discouraged to maintain its place-based function within the road hierarchy.

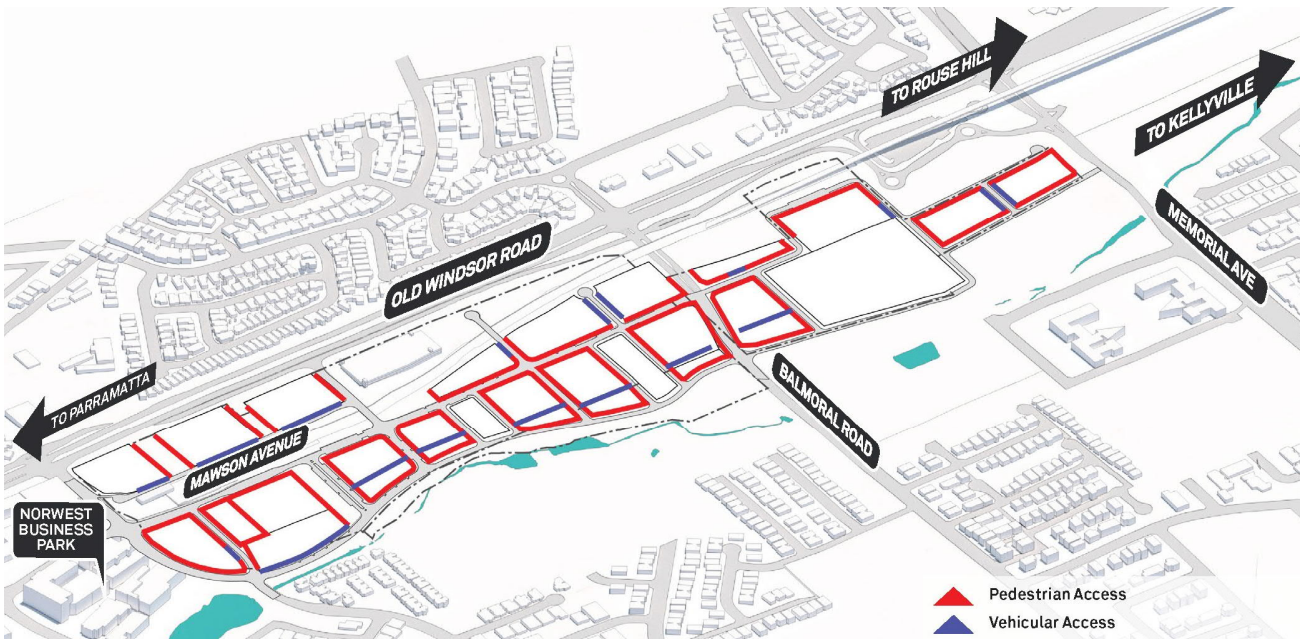


Figure 9.13 Indicative access locations

Celebration Drive may include driveway access points to allotments where access via a local street is not feasible due to the gradient of the site. All access points would be designed in accordance with AS2890, relevant Transport for NSW and Hills Shire guidelines, with focus on adequate distance between driveways and adjacent intersections. These designs would be subject to further refinement during the detailed design process for each lot at the development application stage.

### 9.5.2.3 Emergency vehicle access

All streets have been designed to allow emergency vehicle access, including the Mawson Avenue bus lane section. Detailed design of the internal street network intersections and vehicle access locations would need to consider the needs of emergency service vehicles to ensure safe and easy access to all areas of the site.

### 9.5.2.4 Service vehicle access

Service vehicle access from Old Windsor Road to Bella Vista precinct would be either via Celebration Drive or Balmoral Road that allow entry and exit from the precinct. Service vehicles would also be able to access Bella Vista via Memorial Avenue using the proposed signalised intersection at Arnold Avenue and Free Settlers Drive. The configuration of this intersection includes a right turn bay in Memorial Avenue which should allow service vehicles to enter and leave Free Settlers Drive.

## 9.6 Implementation plan and strategy

### 9.6.1 Public transport

High public transport usage would form the foundation of a successful transport outcome for the two metro precincts. The existing and planned future public transport ensures that the majority of trips can be efficiently made through the use of sustainable public transport modes.

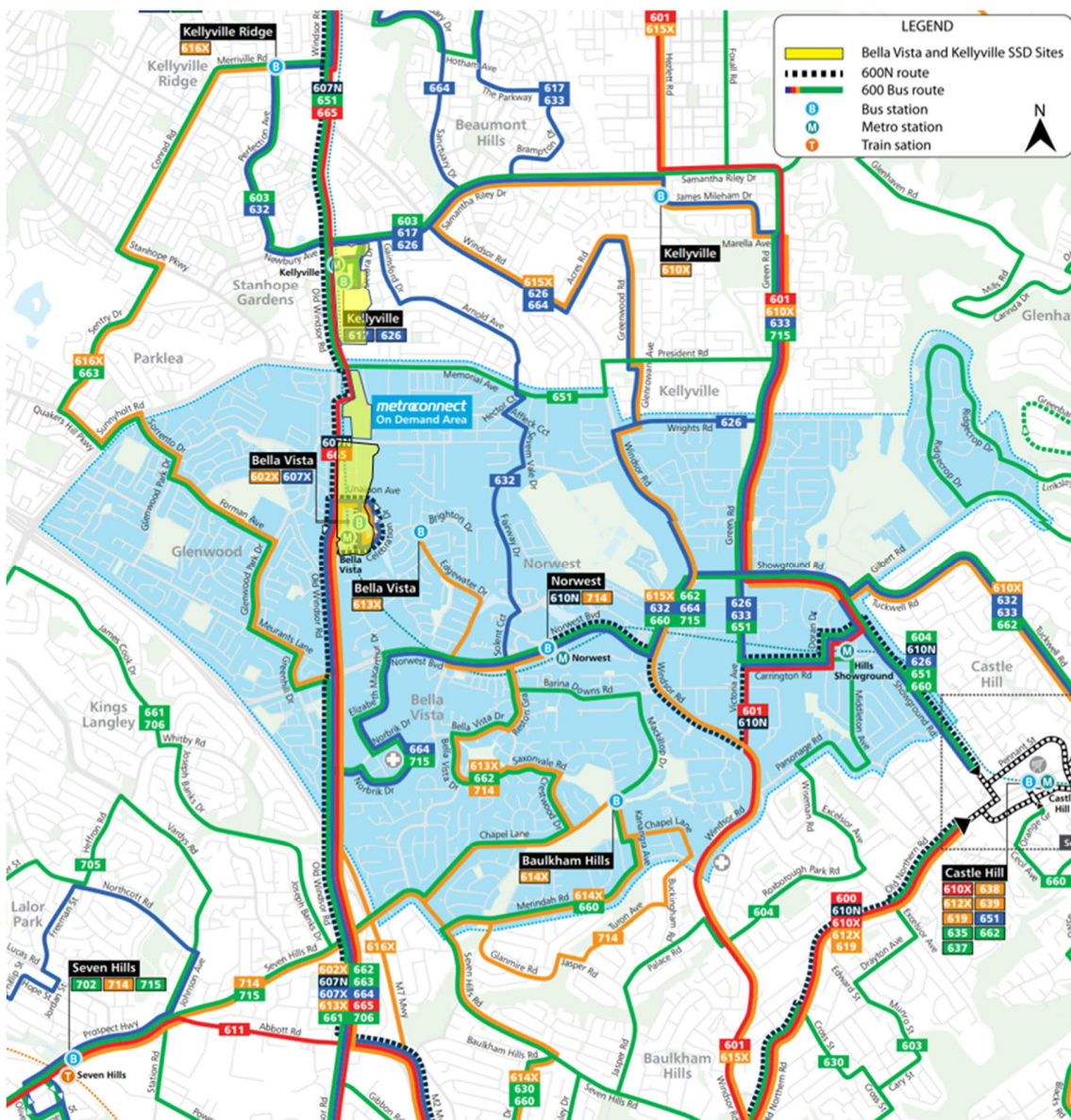


## Rail

The introduction of Metro North West Line has offered rail coverage to an area of Sydney previously reliant on car as main mode of travel for all trip purposes. When Sydney Metro is extended into the central business district (CBD) and beyond by 2024, the metro rail will run from Sydney's North West region to the south west via CBD with an ultimate capacity of a metro train every two minutes in each direction and a target capacity of about 40,000 customers per hour. The increased coverage and available capacity would ensure that rail would become the back-bone to meet the transport needs of future developments in the north-west region.

## Buses

Figure 9.14 shows the latest services and routes of buses serving the two metro stations.



Source: [https://transportnsw.info/document/4237/hillsbus\\_network\\_map\\_20190728.pdf](https://transportnsw.info/document/4237/hillsbus_network_map_20190728.pdf)

Figure 9.14 Existing Bus Routes

Public transport improvement measures proposed under the Kellyville and Bella Vista Urban Design Reports include:

- Design provision would permit bus access from Kellyville Station to Arnold Avenue via Colonial St to offer better connections to the station from the surrounding roads for existing and new residents.
- Unaipon Avenue: The existing 'bus lane' section on Unaipon Avenue from the T-Way allows a direct route to the Bella Vista Station by allowing buses to avoid the local street network improving their reliability;
- Mawson Avenue: provision of a 'bus lane' section between the extended Brighton Avenue and Celebration Drive along Mawson Avenue would provide reliable access for buses at the Bella Vista station to join Celebration Drive;
- The upgrade of Memorial Avenue by Transport for NSW would include the installation of bus priority measures at traffic signals and indented bus bays at the Arnold Avenue and Severn Vale Drive intersections.

The road improvements identified under this assessment for intersections on Old Windsor Road would not impact bus services as the services run on the T-Way or bus lanes and are mostly unaffected by general traffic conditions.

The high-density nature of the two precincts and control of on-site parking supply would support the provision of high frequency bus services as the residential, commercial and retail developments would generate demand for travel throughout the day which would support the running of frequent bus services.

### 9.6.2 Walking and Cycling

#### Walking

The design of the internal streets and connections within the precincts have been undertaken with pedestrian safety, amenity and efficiency as a priority. Within the Kellyville and Bella Vista precincts, Guragura Street and Mawson Street form the main north-south pedestrian 'spine' through the provision of 20m wide corridors. These corridors would serve to attract pedestrian activities of all levels of mobility and undertaking trips of varied purposes.

The riparian corridor along the Elizabeth Macarthur Creek corridor will allow recreational walking and cycling with permeability to existing neighbourhoods to the east via new bridge connections at Wenden Avenue and Colonial Street and to the west via the recently constructed bridge at Kellyville Station to Stanhope Gardens and further south at Bella Vista Station near Emmanuel Baptist Church across Old Windsor Road. These connections are in addition to level crossings at the signalised intersections to ensure that all walking trips are direct and legible and encourage walking to and from the Station Precincts. The proposed linear path along the Elizabeth Macarthur Creek will provide a continuous pedestrian and cyclist track through Kellyville and Bella Vista connecting the two precincts with each other as well as to outside at Samantha Riley Drive and Celebration Drive.

The masterplans for the two Station Precincts provide opportunities for future pedestrian bridge connections over Elizabeth Macarthur Creek from the Kellyville Station Precinct to Saunders Avenue and from the district open space in Bella Vista to Free Settler's Drive at a number of locations. These will not be delivered as part of the current SSDA.

#### Cycling

The street typologies along the metro line and Elizabeth Macarthur Creek corridor in Kellyville and Bella Vista include provision of off-street bicycle lanes that internally connect the developments within the precincts to the metro stations and to the outside of the precincts via a network of bridges and signalised intersections.

Within the Kellyville precinct, the proposed foot bridges at Wenden Avenue and Memorial Avenue, vehicle bridge at Colonial Street and the existing footbridge across Old Windsor Road to Stanhope Gardens provide a network of connections to the external neighbourhoods for safe cycling. The traffic signals at the external intersections would include provision of pedestrian push buttons allowing cyclists to safely cross the arterial roads at Samantha Riley Drive and Memorial Avenue.

Similarly, within the Bella Vista precinct, Mawson Street forms the north-south route through the precinct however it is not intended to support the main traffic flow through the precinct which would be redirected to Celebration Drive when



extended. Access between individual development sites and the regional cycle network will be provided via a network of shared and slow streets providing safe cycling connections within the precinct and to the regional bike route along Old Windsor Road via the existing footbridge across Old Windsor Road and/or signalised intersections at Memorial Avenue and Celebration Drive.

Planned Transport for NSW upgrades of Memorial Avenue would include provision of pedestrian/cyclist path on both sides of Memorial Avenue which will greatly improve the safety and connectivity to and from the Bella Vista precinct.

## 10. Parking Assessment

Both locally and internationally, parking supply restrictions are increasingly used to discourage car trips, particularly near transport hubs where alternative public transport is available and there is also a greater mix of land use and densities that encourage active transport for short trips.

Policies that aim to limit commuter parking have been found to be effective when implemented as part of a portfolio of strategies that include improved public transport alternatives when combined with any change in parking supply or pricing provision. Both local and international experience has shown that reducing access to free workplace parking over time acts as an effective behavioural change mechanism and reduces the expectation of private vehicle use for commuting trips. Oversupply of car parking and private car dependency can result in lower economic output, health and environmental outcomes in centres.

A series of parking assessments for the Norwest, Kellyville and Bella Vista Station Precincts were recently undertaken for Landcom to inform on an appropriate rate of parking supply that should be considered at the new Station Precincts in view of the transit-orient nature of the sites and their future land use density and mixes.

The study undertaken for Landcom included a benchmarking of residential/commercial centres near stations around Sydney to identify a range of parking rates that have been adopted or under consideration at these centres. It is included in Appendix B of the report with extracts from their memorandum used below for discussion of parking requirements of the two precincts.

The following assessment is intended to provide guidance on parking code requirements to help determine more appropriate parking provision rates for the Kellyville and Bella Vista Station Precincts.

### 10.1 Residential Car Parking Rates

Table 10.1 provides a summary of relevant residential parking rates that have been adopted or are under consideration at various centres as well as those recommended in design guidelines. Benchmarking for residential parking rates has been based on sites that are high density and close to public transport. Centres that are closest to the Kellyville and Bella Vista Station Precincts that are also served by Metro North West are North Ryde, Macquarie Park and Tallawong. Of these, Tallawong is located further from Epping, Chatswood and Sydney CBD than Kellyville and Bella Vista.

Table 10.1 Benchmark review of relevant residential parking rates

Precinct/Area	Benchmark Type	Benchmark status	1 Bed Unit	2 Bed Unit	3 Bed Unit	Visitor rate
Hills Shire (outside Centres)	General DCP	Adopted	1.0	2.0	2.0	0.4
Rouse Hill Regional Centre	Centre-specific	Adopted	1.0	1.0	2.0	0.2
Wolli Creek	Centre-specific	Adopted	1.0	2.0	2.0	0.1
Hills Shire (Centres)	Centre specific	Adopted	1.0	1.5	2.0	0.4
Parramatta	General DCP	Adopted	1.0	1.2	2.0	0.2
Blacktown Growth Centre Precincts	Centre-specific	Adopted	1.0	1.0	1.5	0.2
Bella Vista Precinct (2015 Planning report)	Sydney Metro precinct	Draft	1.0	1.0	1.5	0.2
Kellyville Precinct (2015 Planning)	Sydney Metro precinct	Draft	1.0	1.0	1.5	0.2
Liverpool City Centre	Centre-specific	Adopted	1.0	1.0	1.5	0.1
Willoughby (railway precincts)	Centre-specific	Adopted	1.0	1.0	1.2	0.3
Hills Showground Precinct	Sydney Metro precinct	Adopted	1.0	1.0	1.0	0.2
Hornsby (<800m of station)	Centre-specific	Adopted	0.8	1.0	1.5	0.1
Epping Town Centre	Centre-specific	Adopted	0.8	1.0	1.5	0.1
RMS Guidelines for Metro Sub- Regional CBD Centres	General guidelines	Adopted	0.6	0.9	1.4	0.2
Apartment Design Guide*	General guidelines	Adopted	0.6	0.9	1.4	0.2
North Ryde Station Precinct	Sydney Metro	Adopted	0.6	0.9	1.4	0.1
Tallawong Station Precinct	Sydney Metro precinct	Adopted	0.6	0.9	1.4	0.1
RMS Guidelines for Metro Regional CBD Centres	General Guidelines	Adopted	0.4	0.7	1.2	0.1

Source: Kellyville &amp; Bella Vista Parking Rates Review, SCT Consulting (15 July 2019)

\* Apartment Design Guide NSW Planning &amp; Environment, July 2015

## The Hills Shire Council

Parking rates by Hills Shire Council are the minimum parking rates that new developments are required to provide and apply generally across the Hills Shire LGA. These rates do not take into account the transit-oriented nature of centres near railway stations. As a result, Council's DCP parking rates are not considered appropriate for metro station precincts as they will result in a significant over provision of on-site parking supply with associated infrastructure cost, road network and amenity impacts.

## Roads and Maritime Services Rates

In response to the public exhibition of the environmental impact statement for the two precincts, Roads and Maritime Services suggested adoption of lower parking rates for the residential to achieve the target mode share of 47.5% car usage consistent with transit-oriented nature of the precincts to encourage greater utilisation of public and active transport modes. The rates advised by RMS are shown below:

### Residential

0.4 spaces per 1-bedroom unit.

0.7 spaces per 2-bedroom unit.

1.20 spaces per 3-bedroom unit.

1space per 10 units (visitor parking)

## Department of Planning Industry and Environment

In 2015, the Department of Planning and Environment (DPIE) released a document "Apartment Design Guide" as good practice for design of new apartment buildings. The design guide does not specify its own parking rates. Instead, it recommends the use of the lower of the Roads and Maritime Services Guide to Traffic Generating Developments or the Council DCP for sites that are within 800 metres of a railway station or light rail stop in the Sydney metropolitan area. In this case, the Roads and Maritime Services rates are lower than Hills Shire rates and under the DPE design guide they can be adopted as the parking rates for the residential buildings within the Kellyville and Bella Vista Station Precincts.

The Department of Planning Industry and Environment has recommended the rates advised by RMS to be adopted as the new 'Minimum'.

## 10.2 Commercial Car Parking Rate

Table 10.2 shows a comparison of relevant commercial parking rates considered in other centres around Sydney.

Table 10.2 Benchmark review of relevant commercial (office) parking rates

Precinct/Area	Benchmark Type	Benchmark status	Year adopted/completed	Office rate (m <sup>2</sup> GFA per space)
Hills Shire (Outside Centres)	General DCP	Adopted	2012	25
Rouse Hill Regional centre	Centre-specific	Adopted	2012	25
RMS Guidelines for Metro Sub-Regional CBD Centres	General guidelines	Adopted	2002	40
RMS Guidelines for Metro Regional CBD Centres	General guidelines	Adopted	2002	40

Precinct/Area	Benchmark Type	Benchmark status	Year adopted/completed	Office rate (m <sup>2</sup> GFA per space)
Hills Shire (Centres)	Centre- specific	Adopted	2012	40
Blacktown Growth Centre Precincts	Centre-specific	Adopted	2018	40
Hornsby (<800m of station)	Centre-specific	Adopted	2013	48
Parramatta	General DCP	Adopted	2011	50
Epping Town Centre	Centre-Specific	Adopted	2011	70
Tallawong Station Precinct	Sydney Metro precinct	Adopted	2019	70
Bella Vista Precinct	Sydney Metro precinct	Draft	-	80
Kellyville Precinct	Sydney Metro precinct	Draft	-	80
Northwest Station Precinct (Council suggested)	Sydney Metro precinct	Draft	-	80
North Ryde Station Precinct	Sydney Metro precinct	Adopted	2013	90
Macquarie Park Corridor Precincts	Sydney Metro precinct	Adopted	2014	100
Liverpool City Centre	Centre- Specific	Adopted	2008	100
Westmead	Centre- Specific	Adopted	2011	100
Willoughby (railway precincts)	Centre- Specific	Adopted	2006	110
Green Square	Centre- Specific	Adopted	2012	125
Norwest Station Precinct (Landcom proposed)	Sydney Metro precinct	Recommendation	-	145
Rhodes East	Centre – Specific	Draft	-	150
Occupied building: Eclipse (60 Station St, Parramatta)	Development - specific	Completed	2012	178
North Sydney	Centre-specific	Adopted	2013	400

Source: Kellyville & Bella Vista Parking Rates Review, SCT Consulting (15 July 2019)

The Roads and Maritime Services parking rate of 1 space per 40m<sup>2</sup> for commercial is derived from surveys of commercial buildings and assumes a mean peak hour mode split for cars of 0.62 and a mean peak hour car occupancy of 1.19, i.e. 52% car drivers.

The Hills Shire rate of 1 space per 25m<sup>2</sup> is likely to be based on the same set of assumptions as Roads and Maritime Services but applying a lower public transport mode split to account for sparse public transport provision in the Hills Shire making employees reliant on their private vehicles for travel to work. A recent Hills Shire Local Planning Panel



Report (15 May 2019) recommended a commercial parking rate of 1 space per 80m<sup>2</sup> for the new Station Precincts, based on analysis of 2011 Census Journey to Work data. However, it is understood council's planning report indicated that a lower rate of car parking may be considered if it can be justified on traffic grounds.

On the basis of the above benchmarking, a similar parking rate of 1 space per 145m<sup>2</sup>, as that proposed in the Traffic and Transport Study for the Norwest Station Precinct has been proposed for consideration as a minimum for the two precincts on the basis that the two sites are located adjacent to metro stations with access to bus services. However, a more cautious approach recommended is the adoption of a higher parking rate of 1 space per 100m<sup>2</sup> similar to rates for Macquarie Park, North Ryde and other rail-connected centres across Sydney but with the aim of refining the rate as each masterplan develops and more information on type and scale of uses emerge.

### 10.3 Retail Car Parking Rate

Table 10.3 provides a summary of benchmarking of retail parking rates around centres in Sydney.

Table 10.3 Benchmark review of relevant retail parking rates

Precinct/Area	Benchmark Type	Benchmark status	Year adopted	Retail rate (m <sup>2</sup> GFA per space)
RMS Guidelines for Metro Sub-Regional CBD Centre	General Guidelines	Adopted	2002	16
RMS Guidelines for Metro Regional CBD Centres	General Guidelines	Adopted	2002	16
Hills Shire (outside centre)	General DCP	Adopted	2012	19
Rouse Hill Regional Centre	Centre - specific	Adopted	2012	19
Hills Shire (Centres)	Centre – specific	Adopted	2012	19
Blacktown Growth Centre Precincts	Centre – specific	Adopted	2018	22
Macquarie Park Corridor Precincts	Sydney Metro precinct	Adopted	2014	25
Willoughby (rail precincts)	Centre – specific	Adopted	2006	25
Hornsby (<800m of station)	Centre – specific	Adopted	2013	29
Parramatta	General DCP	Adopted	2011	30
Bella Vista Precinct	Sydney Metro precinct	Draft	-	50*
Kellyville Precinct	Sydney Metro precinct	Draft	-	50*
Epping Town Centre	Centre-specific	Adopted	2011	60
Tallawong Station Precinct	Sydney Metro precinct	Adopted	2019	60

Precinct/Area	Benchmark Type	Benchmark status	Year adopted	Retail rate (m <sup>2</sup> GFA per space)
North Ryde Station Precinct	Sydney Metro precinct	Adopted	2013	100
Liverpool City Centre	Centre-specific	Adopted	2008	100
North Sydney	Centre-specific	Adopted	2013	100
Norwest Station Precinct	Sydney Metro precinct	Draft	-	130

Source: Kellyville & Bella Vista Parking Rates Review, SCT Consulting (15 July 2019)

Note: Retail rate of 50m<sup>2</sup> from Table 5 of Kellyville Station Precinct Proposed Development Control Plan Amendments - the Hills, Dec 2015

A retail parking rate of 1 per 130m<sup>2</sup>, similar to the Norwest is proposed for Kellyville and Bella Vista due to similarities in terms of being surrounded by commercial and high-density residential developments and ability to walk to the local retail outlets rather than drive and require a parking space. The relatively small-scale retail GFA, mainly within the walking domain of the metro stations, makes them suitable for convenience store retail type of operations that rely on passing foot traffic for trade such as Woolworths Metro or Coles Express. For wider and larger shopping, customers are likely to travel to the existing retail centres nearby such as Stanhope Village, Rouse Hill and Castle Hill.

## 10.4 Summary of Car Parking Rates

Table 10.4 below provides a summary of the parking rates that are proposed for the two Station Precincts based on benchmarking and assessment of future needs of the developments within the two Station Precincts.

Table 10.4: Proposed Parking Rates

Land Use	Minimum	Maximum
Residential		
1-bedroom unit	0.4 space	0.6 space
2-bedroom unit	0.7 space	0.9 space
3-bedroom unit	1.2 space	1.4 space
Visitors	0.1 space per unit	0.1 space per unit
Retail	1 space per 130m <sup>2</sup>	1 space per 60m <sup>2</sup>
Commercial	1 space per 145m <sup>2</sup>	1 space per 100m <sup>2</sup>
Car share	1 bay per 150 parking spaces	

The minimum parking rates shown in Table 10.4 for the residential land use are consistent with rates advised by Roads and Maritime Services. For transit-oriented developments such as Kellyville and Bella Vista, the walking proximity of lots to the two metro stations, T-way, feeder bus services and amenities offered by high density developments and land use mix would invariably act to reduce the need to own a car or to make a car-based trip.

Application of the above minimum and maximum parking rates would result in the number of car parking spaces shown in Table 10.5 being required. The SSDA is not proposing a unit mix at the current master planning stage however, for the purpose of estimation of the parking supply an assumption of unit mix has been made as following:

15% - 1 bed  
70% - 2 bed  
15% - 3 bed

Table 10.5: Indicative Parking Requirements for the Kellyville and Bella Vista developments

Land Use	Minimum Rates	Maximum Rates
<b>Kellyville:</b>		
Residential	1,662 (residents) 227 (visitors)	2,118 (residents) 227 (visitors)
Retail	83	179
Commercial	0	0
Total:	1,972	2,524
<b>Bella Vista:</b>		
Residential	3,434 (residents) 470 (visitors)	4,376 (residents) 470 (visitors)
Retail	115	250
Commercial	1,041	1,510
Total:	5,060	6,606
Total (Kellyville and Bella Vista)	7,032	9,130

Note: Total area inclusive of other land holdings. Parking calculations are based on maximum development yield scenario

The adoption of the minimum rates would translate to a total of 7,032 spaces being required for the two Station Precincts. Under the maximum parking rates, the number of parking spaces increases to 9,130 for both precincts. Under both scenarios the required number of parking spaces are below the 13,266 spaces required for the residential units and a further 4,464 spaces for the retail and commercial components i.e. 17,730 total spaces that would be required under Hills Shire Council DCP parking rates. As previously discussed, Council parking rates do not take into account the transit-oriented nature of this development and close proximity to the metro station. A high parking provision would be inconsistent with the planning objectives and result in significantly higher volume of traffic on the surrounding road network with associated congestion, delays and amenity and safety impacts.

## 10.5 Bicycle Parking

Provisions would be made to provide bike parking for residential, retail and commercial land uses in accordance with the rates recommended in the environmental impact assessment undertaken as part of this project. Table 10.6 below shows the minimum bicycle parking rates recommended for the land uses proposed at each station precinct.

Bicycle parking rates to be adopted as follows.

Table 10.6 Proposed Bicycle Parking Rates

Land use	Minimum Rate
Residential	1 space per 3 units (residents) 1 space per 12 units (visitors)
Retail	
- Supermarket	1 space per 750m <sup>2</sup> (employees) & 1 space per 1,000m <sup>2</sup> (visitors)
- Speciality shops	1 space per 300m <sup>2</sup>
- Neighbourhood shops	8 spaces minimum
Commercial	1 space per 150m <sup>2</sup> for employees 1 space per 750m <sup>2</sup> for visitors
Open space/Parks	16 spaces
Community facilities	6 spaces

The indicative number of bicycle spaces using the above rates and based on the number of dwellings and gross floor areas proposed are as shown in Table 10.7.

Table 10.7: Indicative Number of Bicycle Space Requirements (Maximum Yield)

Land Use	Residents/Employees	Shoppers/visitors
<b>Kellyville:</b>		
Residential	759 190 (visitors)	
Retail	14	11
<b>Bella Vista:</b>		
Residential	1,568 392 (visitors)	
Retail	50	
Commercial	1,007	201

Note: Inclusive of other land holdings

Future development applications for each lot would need to support development, delivery and monitoring of travel demand management plans to ensure adherence to design principles in accordance with the recommended rates. Such would need to include location of bicycle parking spaces, storage and end facilities to be compliant with Hills Shire DCP, Part 14 - Austroad and Australian Standards AS 2890.3.

## Car Share Parking

Car share is a recent parking management option that is being increasingly considered for developments in Sydney as part of a travel demand management plan to reduce the number of parking spaces required in new developments. Appendix B includes a review of DCPs and guidelines from other locations in Sydney that identifies reasonable number of car share spaces that could be considered for the two Station Precincts.

A ratio of 1 per 150 car spaces for both residential and commercial developments for both precincts are proposed. Application of these rates to minimum and maximum number of spaces as provided in Table 10.5 would net the below number of spaces being required:

Table 10.8: Indicative Number of Car Share Spaces

Land use	Kellyville	Bella Vista
Residential	11-14	23-29
Commercial	0	7-10

## 10.6 Travel Demand Management

Travel plan also known as green travel plan are a subset of travel demand management measures. They aim to support and encourage 'voluntary' change in travel behaviour to:

- Reduce the amount of travel needed
- Reduce the dependence on private vehicle usage
- Encourage or support sustainable transport modes such as public transport, walking and cycling.

Travel plans generally include a package of several relatively small-scale i.e. 'soft' measures that are put in place by employers or building managers before occupying a new or existing development to encourage staff and residents to consider healthier and more sustainable alternatives to driving. For travel plans to be successful in reducing vehicular travel demand, they should be developed in a tailored manner that respects the specific needs of each particular location /organisation through a mix of education, information and marketing approaches.

Travel plans may be targeted at the wider community, at households, workplaces or educational institutions. Application of green travel plans to residential developments is generally less common, but the same principles may be applied by developers to reduce the impacts of the development.

Table 10.9 lists travel demand measures that can be adopted and implemented for different target groups.

Table 10.9 Travel Demand Management Measures

Target Group	Possible Measures
Community based initiatives	<ul style="list-style-type: none"> <li>- Transport noticeboards for PT/walking/cycling to make residents and visitors aware of alternative transport choices and costs</li> <li>- Living neighbourhoods</li> <li>- Ride share matching service</li> <li>- Car sharing schemes</li> <li>- Addressing fear of personal insecurity when using active modes</li> </ul>



	<ul style="list-style-type: none"> <li>- Free or subsidised Opal cards with prepaid credit for initial occupation of dwellings or new employees to encourage them to try public transport from the first day</li> </ul>
Household-based initiatives	<ul style="list-style-type: none"> <li>- Personalised marketing</li> <li>- Travel blending</li> <li>- Home shopping</li> <li>- E-commerce</li> <li>- Safe bicycle parking spaces</li> </ul>
Workplace travel plans	<ul style="list-style-type: none"> <li>- Flexible work hours, tele-working</li> <li>- Guaranteed ride home programmes</li> <li>- Parking charges</li> <li>- Shuttle bus services</li> <li>- Ride sharing</li> <li>- Bicycle lockers</li> <li>- Discounts for walking shoes or cycling gear</li> <li>- Free cycle maintenance</li> <li>- Discounted public transport tickets</li> </ul>
School travel plans	<ul style="list-style-type: none"> <li>- Education and training for location of off-road walking routes to school, safe street crossing behaviour</li> <li>- Establishing non-motorised alternatives (walking, school buses, trains)</li> <li>- Safe new pedestrian crossings, covered shelter facilities near crossings</li> </ul>
Community based initiatives	<ul style="list-style-type: none"> <li>- Transport noticeboards for PT/walking/cycling to make residents and visitors aware of alternative transport choices and costs</li> <li>- Living neighbourhoods</li> <li>- Ride share matching service</li> <li>- Car sharing schemes</li> <li>- Addressing fear of personal insecurity when using active modes</li> <li>- Free or subsidised Opal cards with prepaid credit for initial occupation of dwellings or new employees to encourage them to try public transport from the first day</li> </ul>

Source: Compiled from information in M5 Australian Transport Assessment and Planning Guidelines (2016), Transport and Infrastructure Council

Travel plans are commonly delivered as package of measures rather than single measures. They draw upon several of the above measures that may also include small scale infrastructure improvement or service changes.

For Travel plans to succeed, they require measurable targets and a commitment by the organisation preparing the travel plan(s) to implement the actions and review their effectiveness on a regular basis. In the case of the two precincts, developers should be required to develop and submit travel plans at the time of submitting their development proposal. Such plan would need to outline and demonstrate tangible measures intended to be put in place, their effectiveness and ongoing monitoring plan.

#### 10.6.1 Green travel plan target

A green travel plan should have stated targets. One of the key measurable targets would be what impact the measures would have on mode shares. Current mode share for Baulkham Hills West- Bella Vista SA2 indicate a 70% private vehicle usage. However, this applies to a wider geographical area and predates the opening of Metro North West. For the Bella Vista Kellyville Station Precincts, the target car mode share has been set at 47.5% with the remaining trips via other modes. Travel plans submitted as part of future developments should be required to demonstrate how the measures proposed would help to achieve this target.

## Proposed actions

To achieve the objective of reducing car driver mode share and promoting sustainable alternatives, a range of actions listed in Table 10.9 could be adopted for implementation. Some of these measures are described in further detail below as a guide on development of such plans. Such details and measures should be sought at the time of the submission of development applications.

### Action – Community/Workplace Shuttle bus services

The Metro North West and T-Way mainly serve trips to/from east and Parramatta CBD. This is due to the North-West alignments of the metro and the T-way that seek to directly connect Kellyville and Bella Vista to the main regional centres. Journey to work data (2016) shows a high number of persons employed in Bella Vista and Kellyville originating from the surrounding residential suburbs of The Ponds, Stanhope Gardens, Kellyville and Baulkham Hills. Whilst some travellers may have access to local feeder bus services, many of the existing bus services run on collector and major roads and are not within reasonable walking distance of many of dwellings in these suburbs or require transfer between two or more services to reach their workplace in Kellyville/Bella Vista.

Provision of shuttle bus services between future Bella Vista employment sites and these suburbs would widen the area that public transport can efficiently serve and would offer employees living in these areas greater availability to reach their workplace directly. Such shuttle services would typically cover a distance of approximately 5-6km each way between these suburbs and the station precinct and can allow for reasonable frequency of services to operate in the peak commuter period. Alternatively, the shuttle services could be part of ‘guaranteed ride home programmes’ for employees after hours when local bus services are less frequent.

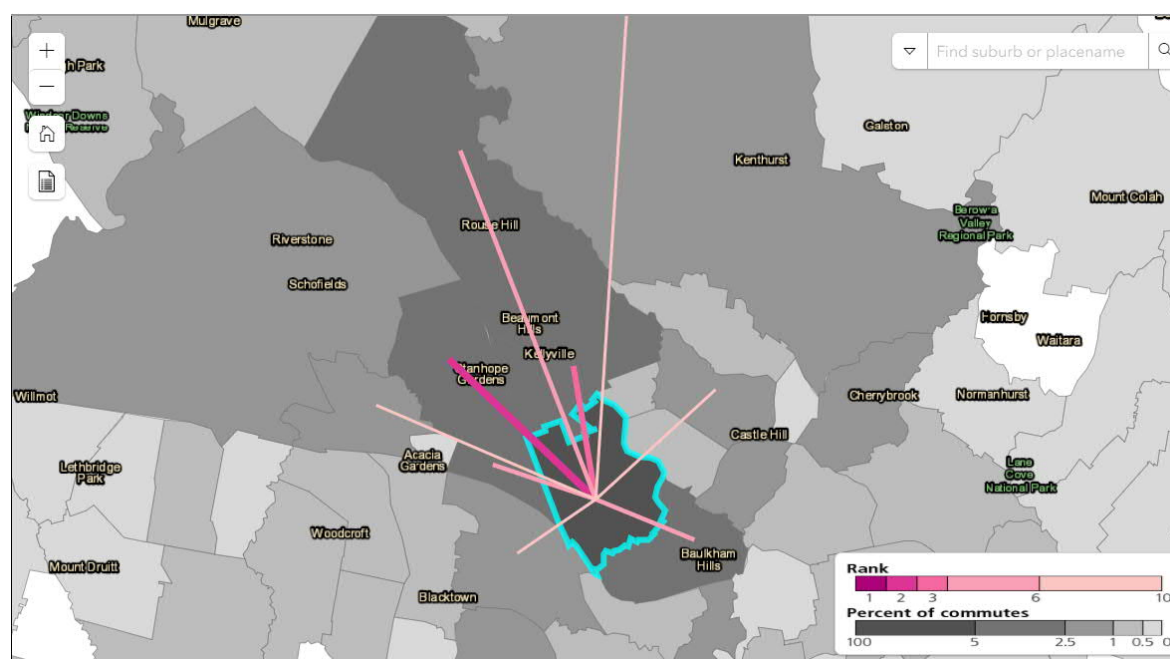


Figure 10.1 Origin of Employees Traveling to Work (Bella Vista)

### Action – Expanded service to Blacktown

A shuttle bus service from the Bella Vista employment centre to the Blacktown station would significantly improve access from the greater Sydney region via T1 rail line to the Bella Vista employment centre. This would expand the reach of public transport from other parts of Sydney allowing employees who are able to use the Sydney rail network to travel and

alight at Blacktown Station and transfer to a direct work shuttle service instead of transfer to one or several other bus services with longer wait and journey times.

### Action – Walking

Many journeys into and around the two station precincts would involve walking. Therefore, creating high-quality pedestrian environments would be key to shaping liveable and activated precincts.

The proposed concept includes measures that enhance walkability via an extensive pathway network both internally as well as improved connections to walking and cycling networks surrounding the site at a local and district level. Provision of walkways from future developments should aim to provide integrated, safe and where possible covered and well lit connections to local bus stops, and metro and T-way.

### Action – Bicycle network improvements

Cycling to either work or the metro stations increases the number of people who can reach their destination within ideal 30 minutes journey time. Provision of a connected cycling access would help to reduce congestion by attracting people who are able to cycle to choose cycling as an everyday transport mode. Lack of access to safe cycling paths has been stated as a key barrier by 70 per cent of NSW customers who expressed they would cycle more for short trips if they feel safer and more confident.

To achieve these benefits, there needs to be a continued focus on promoting cycling as an option through making sure new developments not only consider minimising impacts on cycle routes during construction but also provide facilities for cyclists on completion. Developers can provide properly designed bicycle parking in accessible areas to cyclists that would be secure from theft. Developments should provide bicycle parking spaces in accordance with requirements specified in Section 10.5 of this report. The spaces should not be clustered together to one or two locations but rather distributed around the development for easy of reach and less clutter.

### Action – Provision of Opal Card

To set residents and employees behaviour and impressions from the first day a complimentary or discounted Opal card could be provided to new residents and employees. This would incentivise residents and employees to try the public transport network soon after they move into the area thus influencing their mode preferences in future.

### Action – Car share

There are currently “no car” share ‘pods’ available within walking distance of either of the two precincts. Car share usage (number of trips per car share bay) increases when car share cars are located in a dedicated on-street parking space or in public places. Car share members generally walk approximately 50 to 100 metres to a car share pod, highlighting the need to locate car share pods within close proximity to users.

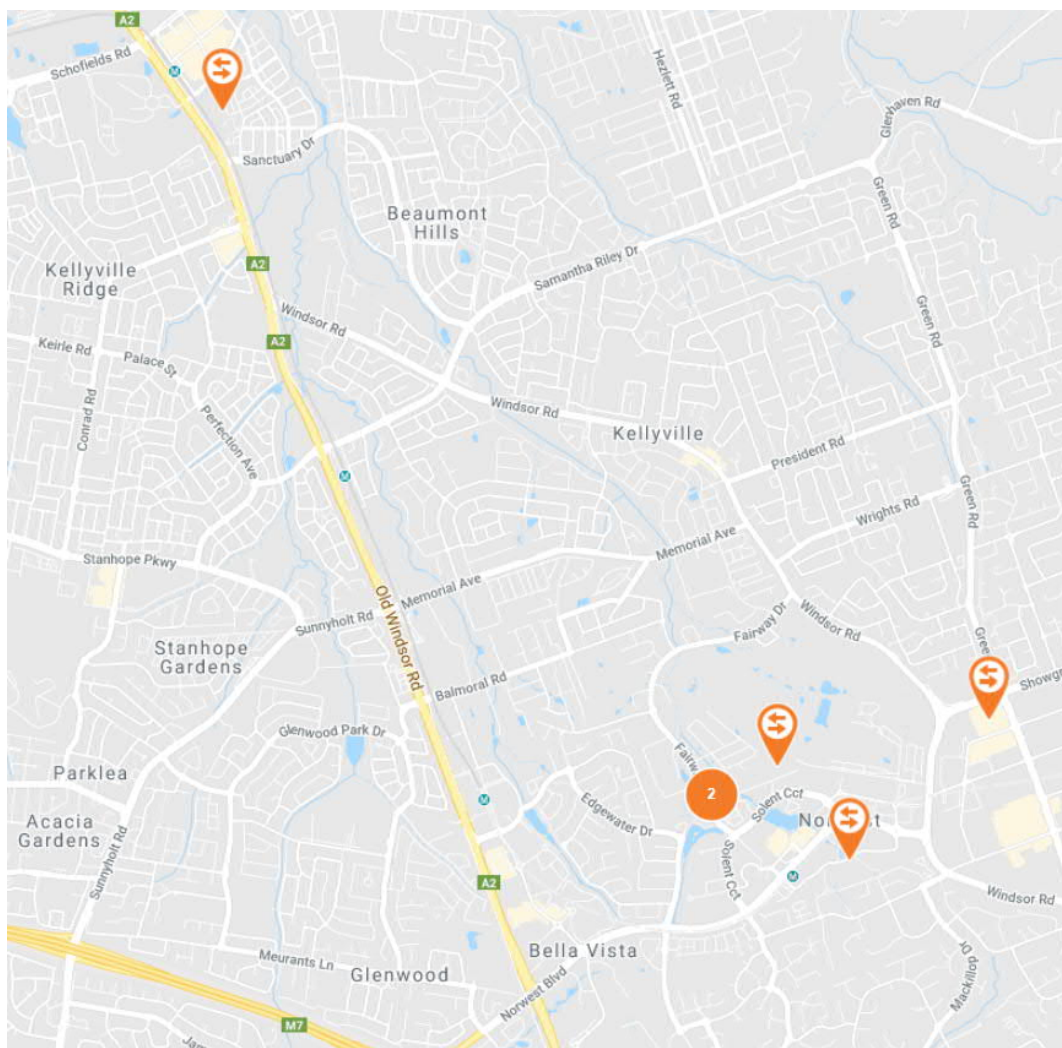


Figure 10.2 Existing Car Share Locations

#### Action –School Trips

Amenity measures at street crossing would encourage parents to walk their children to school instead of drive. Such measures could include weather shelters that would protect parents and their children from rain or sun whilst waiting to cross roads for example at Balmoral Road and Memorial Avenue signalised intersections.

#### 10.6.2 Mode share change

As stated earlier, travel plans are commonly delivered as package of measures rather than single. They are regarded as 'soft' measures aimed at bringing about a gradual behavioural change.

The Australian Transport Assessment and Planning Guidelines, M5 Travel Behaviour Change (August 2016) provides some guidance on the mode share change that could be achieved by 'Travel Behaviour Change' using a combination of measures that combined help to reduce dependence on private vehicles.

Table 10.10 shows the amount of diversion in response to travel demand management measures. From car as driver is relatively modest at 3.1% for residents whilst for workplaces diversion it can be as high as 12.9%. The high car driver mode shift response is due to implementation of a number of measures that may include parking supply and pricing management to actively deter employees from driving. For all cases, public transport is the preferred alternative whilst cycling the least.

Table 10.10: Mode share diversion

	Car as Driver	Car as passenger	Public Transport	Cycling	Walking
Household Programs (standard)	-3.1%	-0.5%	1.4%	0.9%	1.3%
Workplace*	0 - 12.9%	0 - 3.3%	0 - 7.4%	0 - 1.0%	0 - 1.2%
School	-9.0%	0.5%	2.0%	2.0%	6.5%

\* Assumes with improvements to public transport

Source: Table 2 Transport and Infrastructure Council, Australian Transport Assessment and Planning Guidelines (2016)

The advice provided in this section is intended as a guide to inform range of actions that a future travel plan could include to encourage greater take up of alternative travel modes as means of reducing car mode shares further. It is likely that some of the initiatives adopted for developments at these two station precincts could also benefit the surrounding developments through greater integration and better connections of new and existing facilities e.g. walk and cycling that would help to promote sustainable transport in the greater area.



## 11. Other Impacts

### 11.1 Local roads and access

#### 11.1.1 Road Bridge Across Elizabeth Macarthur Creek / Colonial Street

The urban design framework for Kellyville Station Precinct includes provision of a future connection between the Kellyville Station Precinct to Colonial Street via a new bridge across Elizabeth Macarthur Creek. The new bridge is to provide a vehicle and pedestrian connection between the Kellyville Station Precinct to Memorial Avenue via Colonial Street and Arnold Avenue where Arnold Avenue is planned to be signalised at its intersection with Memorial Avenue as part of Roads and Maritime Services upgrade of this road to improve safety and connectivity for local residents. An assessment of traffic volume likely to use the bridge across the Elizabeth Macarthur bridge was undertaken to identify whether the quantum of trip generated by future developments within the Kellyville precinct would necessitate the need for the bridge to be constructed in the earlier years of the project.

A connection to Colonial Street from Kellyville precinct would provide a second access point to/from the Kellyville precinct and allow traffic to arrive/depart via Memorial Avenue. In the absence of this connection, traffic within the precinct would be restricted to a single point of entry and exit via Samantha Riley Drive.

The assignment of traffic was undertaken using the mesoscopic model by including the link and allowing the model to assign trips to links within the internal road network.

Table 11.1 shows the expected traffic volumes using this bridge in the AM and PM peak hours in 2026. The assessment shows that in 2026 the link would have a two-way flow of almost 300 vehicles in the AM peak hour and 184 vehicles in the PM peak. Using these peak hour volumes, the daily utilisation is estimated to average about 2,400 vehicles per day. This falls within the range of a collector road based on Roads and Traffic Authority Guide to Traffic Generating Developments which specifies volume of up to 2,000 veh/day for local streets and above this level for collector roads.

In the absence of a connection to Memorial Avenue, the above traffic would be arriving and departing via Samantha Riley Drive adding more traffic to its intersection with Old Windsor Road which operationally experiences high volume of traffic both at present and in future.

Table 11.1: Elizabeth Macarthur/Colonial Street Bridge Traffic Volumes

Elizabeth Macarthur Bridge Flows	2026 AM (vph)	2026 PM (vph)
<b>Westbound</b>	125	27
<b>Eastbound</b>	175	157
<b>Total</b>	299	184

In addition to its traffic function, the bridge would serve as a connection for pedestrians and cyclists from the surrounding residential neighbourhood to the Kellyville Station.

Given the access function and lesser volume of traffic that would use Samantha Riley Drive in its absence, this connection should be considered for implementation by 2026.

It should be noted that the connection and the bridge is not proposed as part of this application but facilitated by it. Approval for this would be subject to a separate approval process.

### 11.1.2 Intersection Balmoral Road / Elizabeth Macarthur Link

As part of the access needs of the Bella Vista precinct, it is proposed to provide a road connection across Balmoral Road to link the northern part of Bella Vista precinct with the southern part. This link is would connect the northern part of the precinct with the rest of the residential developments to the south. The intersection of the new link road and Balmoral Road is proposed to be signalised to facilitate safe crossing for primary school students and their parents between the school on the south and the residential developments to the northern side of Balmoral Road.

The traffic model was used to identify the flow and origin and destination of vehicles using the link in the AM peak when southbound flows on Old Windsor Road are highest and drivers could be attracted to the internal road network as a way of bypassing Old Windsor Road.

Figure 11.1 shows the flow of vehicles from Memorial Avenue entering the Bella Vista precinct via the new link. The thickness of the band represents the volume of traffic along each link. The assessment shows that traffic entering via Balmoral Road is predominately bound for developments within the Bella Vista precinct and there is little traffic continuing southbound and using the internal roads as a bypass of Old Windsor Road.

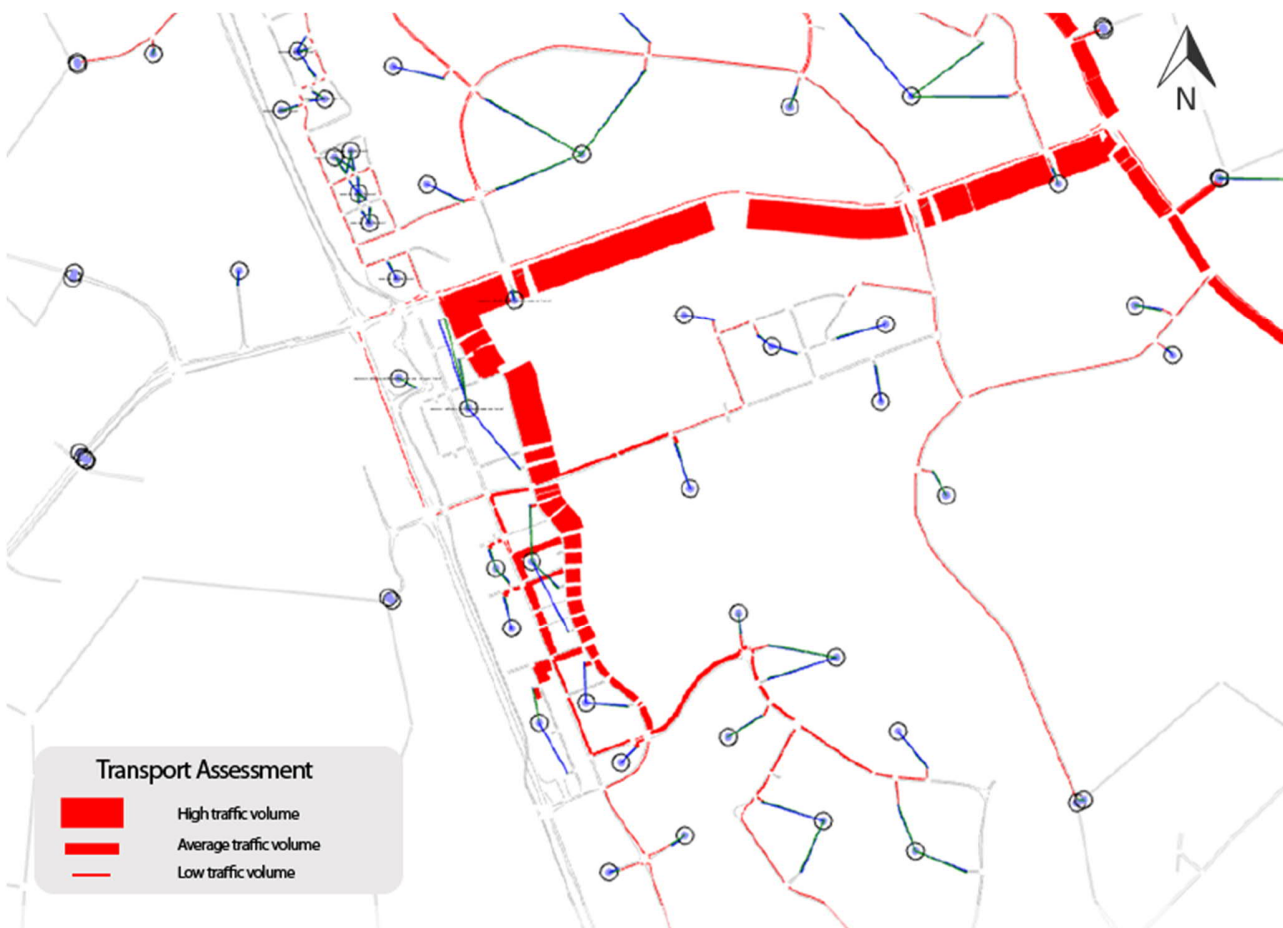


Figure 11.1: Elizabeth Macarthur Link Utilisation (AM Peak)

## **11.2 On-Street Parking**

As part of an overall package of policy measures, on-street car parking both within and outside of the precincts would need to be assessed to ensure that parking is available for local businesses and any excess demand from commercial and retail developments would not spill on to existing residential streets and adversely affect the amenity of the residents due to increase traffic or on-street parking. Parking control measures in consultation with the local residents would be able to address this issue if on-street parking emerges as an issue.

To avoid the commuter car parks at Kellyville and Bella Vista stations being used by employees of the commercial precinct in Bella Vista and Norwest for parking, it is advised that measures be put in place to discourage employees driving from home, parking in the two car parks and walk to work.

## **11.3 Road safety**

The design of the improvements recommended in this assessment would be undertaken in accordance with Roads and Maritime Services geometric standards for main roads and Hills Shire Council's for local roads. The length of approach and departure lanes, short lanes and right turning bays would be in accordance with these standards to maintain road safety standards on all new works. All modifications to the road network should be designed appropriately and be subject to Road safety Audit at all stages of design and post construction.

## **11.4 Freight transport**

The project would have no direct impact on freight movements. The improvements proposed for Old Windsor Road would result in improvements for general traffic by providing additional capacity that should also improve the reliability and travel times for any freight traffic using Old Windsor Road.

## 12. Construction Impacts

The current SSD is not proposing any construction as part of the current concept plan and SSD application. It involves subdivision of the land only.

The road network and infrastructure supporting the two metro stations was recently completed and further work would be associated with development and staged release of land under the Concept Plan proposed by Landcom. It includes the release of 200 residential units in each precinct starting in 2023 and continuing to 2033 for Kellyville and for Bella Vista completion by 2045. These are tentative dates and largely driven by market take up for residential and commercial space in Sydney and demand in the region in particular.

Within the internal road network, construction activities can take place during extended hours of the day and on weekends. Nearer to residential and noise sensitive sites, it is expected that the majority of construction work would take place during daytime in accordance with the recommended standard hours for construction work set by the NSW Interim Construction Noise Guidelines 2009, which are:

- Monday to Friday 7am to 6pm, excluding public holidays; and
- Saturday 8am to 1pm.

Throughout the course of construction, the existing traffic capacities along the construction vehicle access routes would be maintained as the scale of the development and associated construction activities would take place over several years in stages as each lot is developed. It is therefore unlikely to generate enough traffic to affect the operational performance of Samantha Riley Drive, Memorial Ave, Balmoral and Celebration Drive.

Potential work activities that could cause disruption to traffic flow would be those related to intersection improvements proposed as part of road network improvements identified in Section 9.4 of this report for Old Windsor Road. At these locations, it may be necessary to close adjacent lanes during some activities. The major activities are expected to be done outside of peak periods to minimise traffic disruptions. Activities that can be undertaken outside standard construction hours would generally include:

- Pavement construction, including asphaltting;
- Intersection tie ins with side roads;
- Lifting and erection of roadside elements;
- Line marking;
- Any emergency works.

These activities would need to ensure that there would be minimal disruption to road users, including residents in the study area.

Impact on access routes, parking etc during construction of the lots need to be managed and should be subject of construction management plan at the time of lodgement of a development application for each plot.

### 12.1 Impacts on existing developments

Due to the incremental development of lots within the two precincts, construction activities are expected to affect properties within the two precincts only. This could be either through the loss of or changes to existing access arrangements due to any diversions. Submission of traffic management plans as part of development applications approved by Roads and Maritime Services or Council would ensure continuity of access and mitigation measures to minimise impacts during construction.

## 13. Conclusion

The assessment undertaken in this report for the Kellyville and Bella Vista precincts that forms part of the SSD application addresses all the key requirements set out in the SEARS and submissions from agencies. It presents a clear assessment of the impact of the traffic precinct and the design thinking that underpins the masterplan in terms of land use, open space access and streets. The masterplan also sets out the broad parameters that will inform future built form proposals and will deliver:

### Development:

#### Kellyville Station Precinct (SSD):

- A predominately residential precinct including up to 10,736m<sup>2</sup> of retail floorspace inclusive of a supermarket and a grocer
- A station square precinct
- 2.45ha of open space and additional public plaza space
- Up to 1,910 residential units (152,772m<sup>2</sup>)

#### Bella Vista Station Precinct (SSD):

- Mixed use including up to a maximum of 3,804 residential units, 15,000m<sup>2</sup> retail and 151,000m<sup>2</sup> of commercial space
- A station square precinct
- 4.71ha of open space within the site and additional public plaza space.

Once approved, the master plans together with the development guidelines, will be used as the basis for assessing designs and proposals in the next stage of the development process.

### Traffic:

The assessment shows that Old Windsor Road, which is the nearest arterial access road to the two precincts, already experiences high traffic demand and delay in the morning and evening weekday peak hours. By 2026 and 2036, delays and congestion are expected to worsen due to general background growth in traffic as a result of additional population and employment in the region.

It is evident that the current and planned level of road infrastructure is inadequate and significant investment would be required if the performance of the main roads is to be improved to a target Level of Service D or better. Achieving this Level of Service would require greater investment and major improvements at intersections with likely associated property acquisitions. These are beyond the current level of committed road network improvements that are proposed by the NSW Government or Hills Shire Council.

The Metro North West Line and its extension from Chatswood, under Sydney Harbour, through new CBD stations to Bankstown is expected to change the travel behaviour further as more people in the area become accustomed to using public transport for daily commuting in a region with high car ownership and used to driving for almost all purposes. This is expected to allow some of the travel demand not met by the road network to be absorbed by the rail network.

The approach adopted in this assessment has been to ensure that development of the two Station Precincts would not make traffic conditions on the surrounding roads worse than the situation without the project i.e. average vehicle delays do not deteriorate as a direct result of the project. As a result, the improvements identified in the assessment are not aimed at relieving the existing congestion entirely and allowing the Level of Service of the congested intersections to be D or E but to mitigate the direct impacts of this development on the road network.



The assessment of the key intersections shows that with the intersection improvements proposed, the average vehicle delay at several intersections would reduce to below the levels than would have resulted with the growth in just the background traffic by 2026 and 2036, even with the addition of the development traffic from the precincts. This outcome should be taken into consideration in the overall assessment where such improvements should be used to offset the increase in delays at other intersections where no improvements are proposed and there are increases in average delay due to this development.

The introduction of Sydney Metro has offered rail coverage to an area of Sydney previously reliant on car as the main mode of travel for all trip purposes. The metro line has a target capacity of 40,000 customers per hour in one direction (Sydney Metro Info). Stage 2 of the metro project would extend the metro coverage to North Sydney, CBD and along the south-west to Bankstown by 2024. This additional coverage and capacity ensure that rail would become the back-bone to meet the transport needs of future developments in the North West region which Sydney Metro as the landowner for the SSDA is committed to provide.

#### **Buses:**

Key bus improvements to serve the future needs have been progressively implemented as part of network improvements to support Metro North West. The NSW government has implemented changes to the bus services as part of the opening of the Metro North West line. The opening of the Kellyville and Bella Vista Stations are still at their early stage and it is likely that service frequencies of the buses at the two stations would be regularly adjusted in response to the rising demand for travel using the Metro.

#### **Internal:**

The design of the internal streets and connections within the precincts have been undertaken with pedestrian safety, amenity and efficiency as a priority. Within the Kellyville and Bella Vista precincts, Guragura and Mawson Street would respectively form the main north-south pedestrian 'spine' through the precincts. These corridors would serve to attract pedestrian activities of all levels of mobility and undertaking trips of varied purposes.

The riparian corridor along the Elizabeth Macarthur Creek corridor will allow for recreational walking and cycling with permeability to existing neighbourhoods to the east via new bridge connections at Wenden Avenue and Colonial Street and to the west via the recently constructed bridge at Kellyville Station to Stanhope Gardens and further south at Bella Vista Station near Emmanuel Baptist Church across Old Windsor Road. These connections would be in addition to level crossings which would be possible at the signalised intersections ensuring that all walking trips are direct and legible and will enable a high level of active transport within the precinct.

The street typologies along the metro line and Elizabeth Macarthur Creek corridor in Kellyville and Bella Vista include the provision of off-street bicycle lanes that internally connect the developments within the precincts to the metro stations and to the outside of the precincts via a network of bridges and signalised intersections.

#### **Parking:**

The parking provisions of the two metro Precincts have been assessed based on benchmarking of similar land use developments that are located within proximity of rail stations. On the basis of this assessment, the proposed minimum and maximum parking rates for the residential, retail and commercial land uses are shown below in Table 13.1.

Table 13.1: Proposed minimum and maximum parking rates

Land Use	Minimum	Maximum
Residential		
1-bedroom unit	0.4 space	0.6 space
2-bedroom unit	0.7 space	0.9 space
3-bedroom unit	1.2 space	1.4 space

Land Use	Minimum	Maximum
Visitors	1 space per 10 units	1 space per 10 units
Car Share	1 bay per 150 parking spaces	
Retail	1 space per 130m <sup>2</sup>	1 space per 60m <sup>2</sup>
Commercial	1 space per 145m <sup>2</sup>	1 space per 100m <sup>2</sup>

For transit-oriented developments such as the Kellyville and Bella Vista Station Precincts that are located within walking proximity to: the metro stations; T-way, feeder bus services; and, amenities offered by high density developments, the application of the above parking rates would ensure that public transport and walking and cycling would form the main mode of travel for residents and employees.

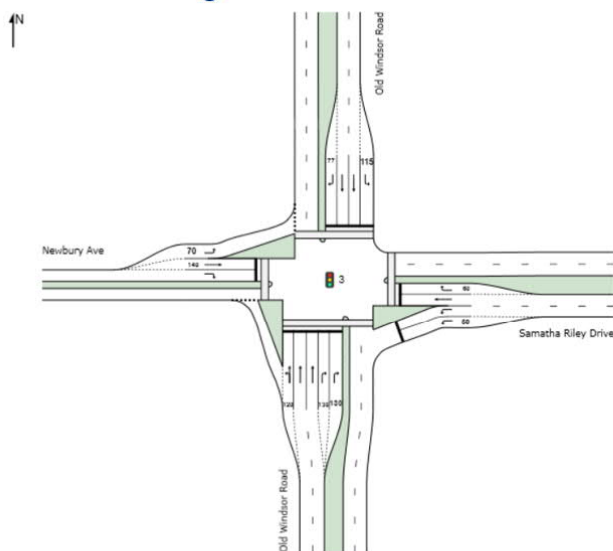
Under both scenarios, the required number of parking spaces are below the 17,876 spaces required under Hills Shire Council DCP parking rates. As previously discussed in the body of the report, Council parking rates do not take into account the transit-oriented nature of this development and the parking provision if implemented would significantly increase traffic and delays on the surrounding roads.

Overall, the assessment has shown that with some practical improvements to the road network the development of the Kellyville and Bella Vista Station Precincts can be achieved in a sustainable way.

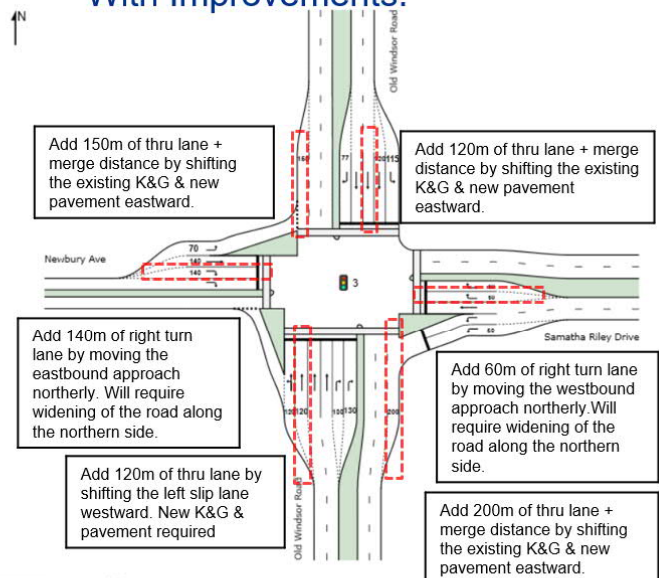
## Appendix A. Proposed Intersection Improvements

### OLD WINDSOR RD / SAMANTHA RILEY DR / NEWBURY AVE

Existing:



With Improvements:



INTERSECTION

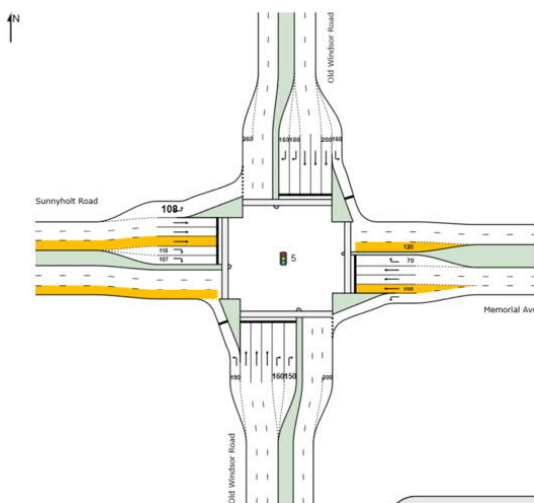
2

**Note:**

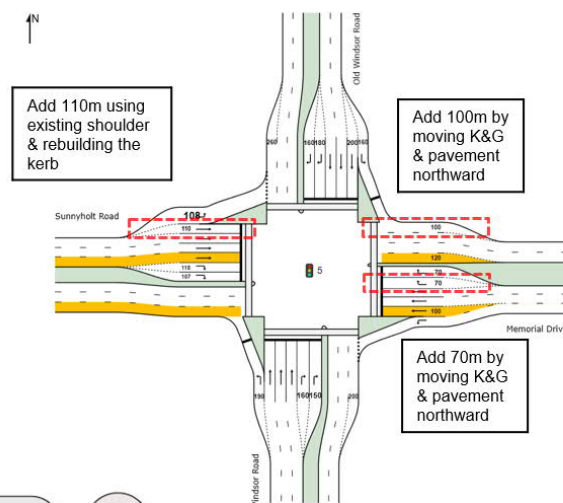
- The distances shown are lane length only. The below taper distances would need to be added:
  - i. Departure through lanes: An additional 130m of tapering
  - ii. Approach through lanes: An additional 80m of tapering before lane starts
  - iii. Right turn lanes to use same taper length as existing

## OLD WINDSOR RD / MEMORIAL AVE / SUNNYHOLT RD

**RMS:**



**JACOBS:**



INTERSECTION

3

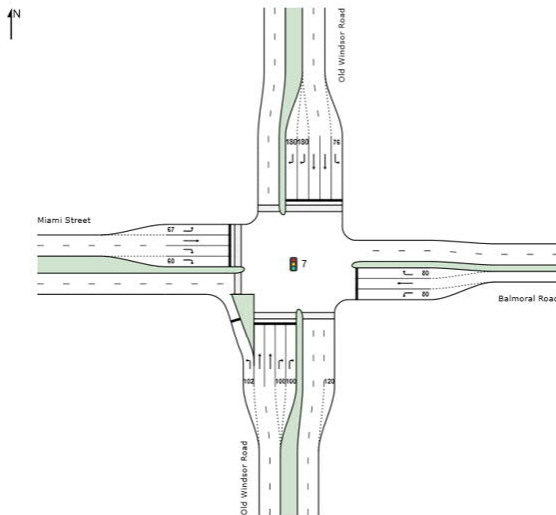
**Note:**

- The distances shown are lane length only. The below taper distances would need to be added:

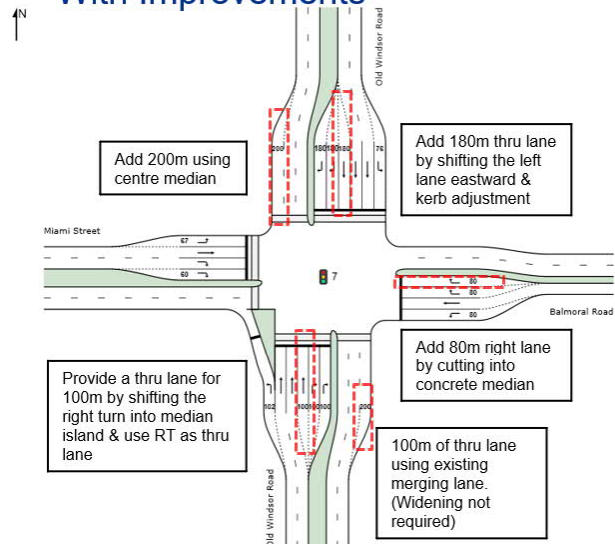
- Departure through lanes: An additional 130m of tapering
- Approach through lanes: An additional 80m of tapering before lane starts
- Right turn lanes to use same taper length as existing

## OLD WINDSOR RD / BALMORAL RD / MIAMI ST

### Existing:



### With Improvements



INTERSECTION

4

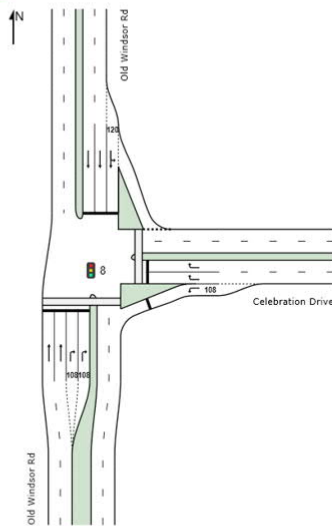
#### Note:

- The distances shown are lane length only. The below taper distances would need to be added:
  - i. Departure through lanes: An additional 130m of tapering
  - ii. Approach through lanes: An additional 80m of tapering before lane starts
  - iii. Right turn lanes to use same taper length as existing

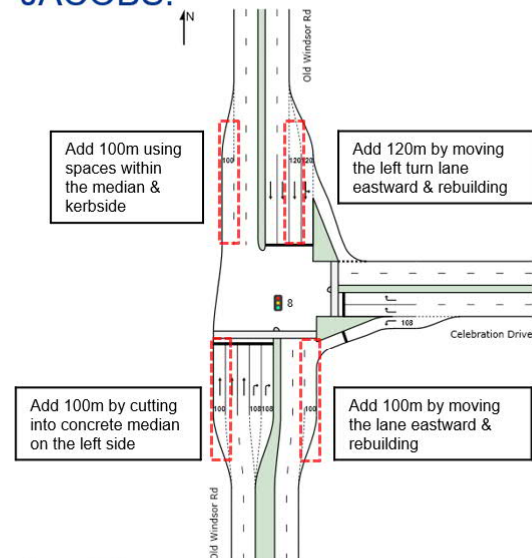


## OLD WINDSOR RD / CELEBRATION DR

Existing:



JACOBS:



INTERSECTION

5

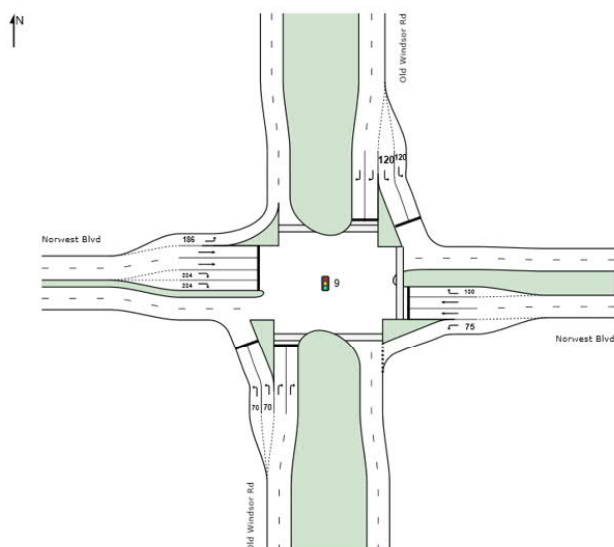
**Note:**

- The distances shown are lane length only. The below taper distances would need to be added:

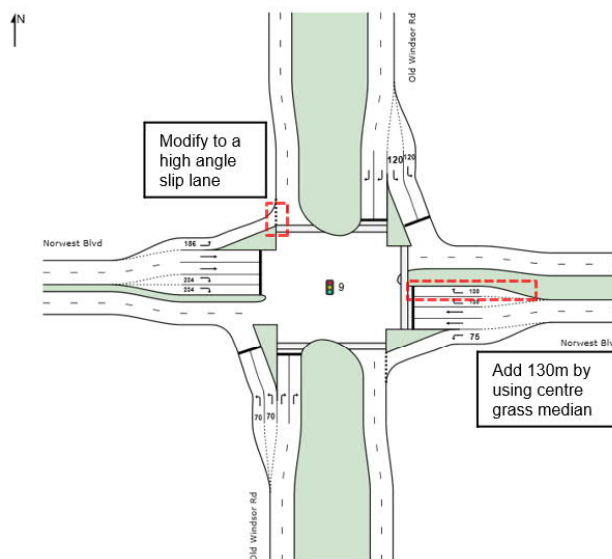
- Departure through lanes: An additional 130m of tapering
- Approach through lanes: An additional 80m of tapering before lane starts
- Right turn lanes to use same taper length as existing

## OLD WINDSOR RD / NORWEST BLVD

Existing:



JACOBS:



INTERSECTION

6

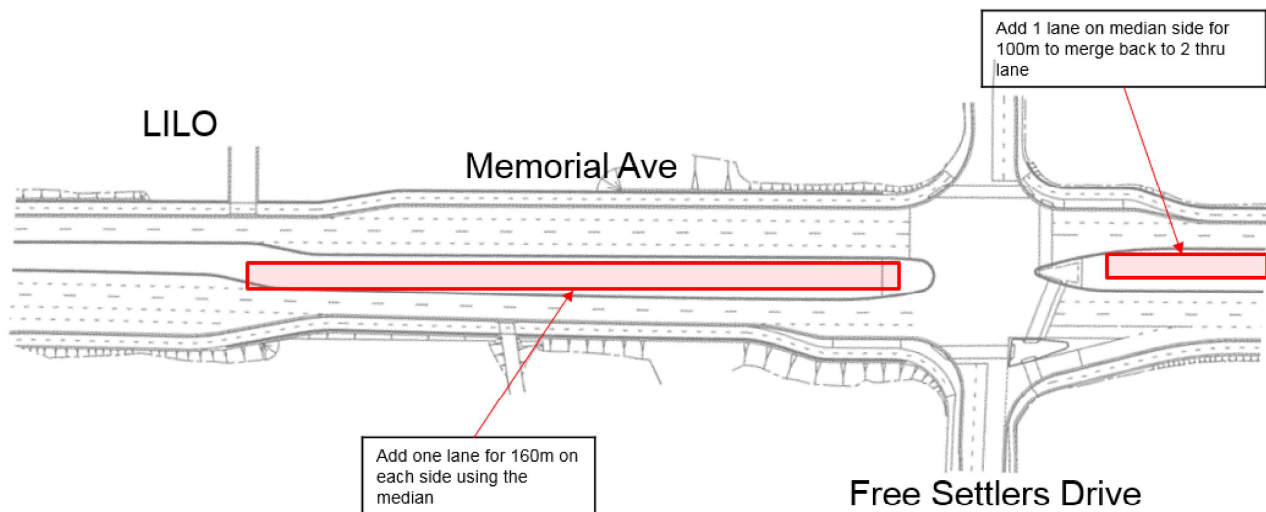
**Note:**

- The distances shown are lane length only. The below taper distances would need to be added:

- Departure through lanes: An additional 130m of tapering
- Approach through lanes: An additional 80m of tapering
- Right turn lanes to use same taper length as existing

## WIDENING OF MEMORIAL AVENUE TO 3 LANES EACH DIRECTION

RMS:

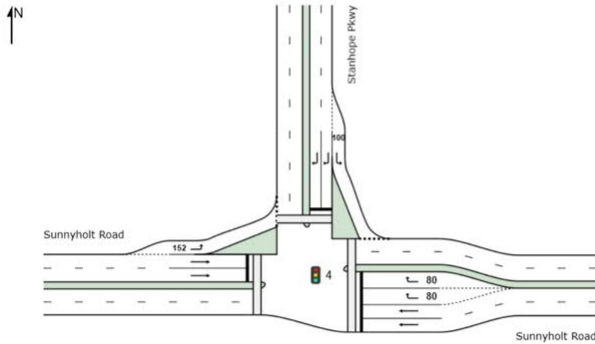


**Note:**

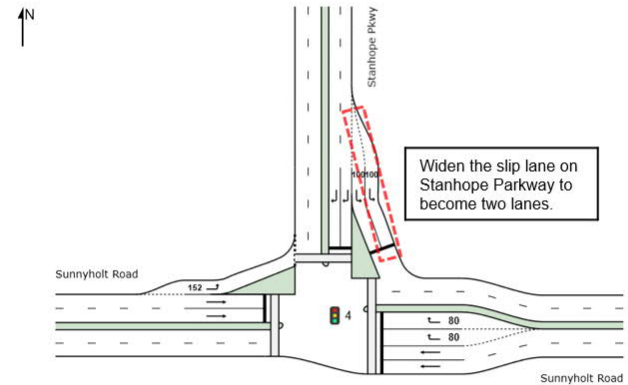
- All departure lanes have an additional 130m of tapering
- All approach lanes have an additional 80m of tapering

## SUNNYHOLT RD / STANHOPE PKWY

Existing:



Proposed:

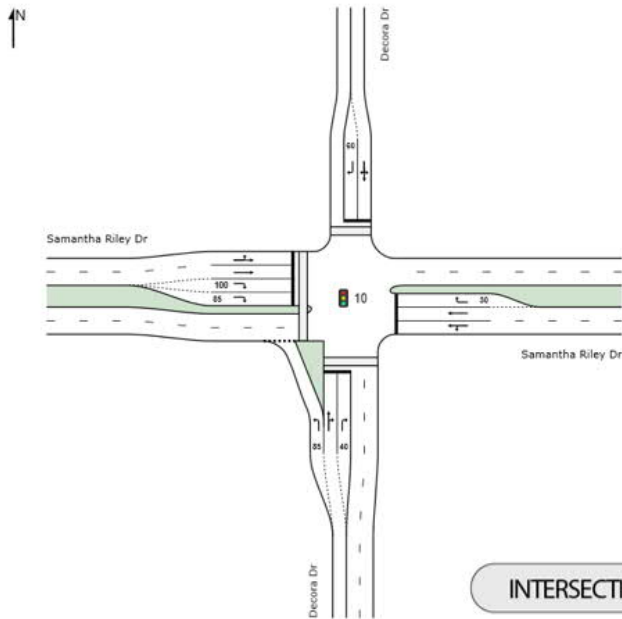


INTERSECTION

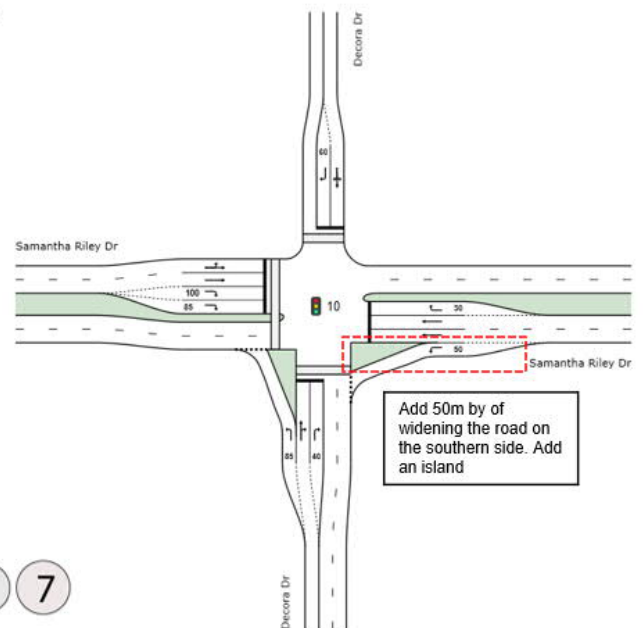
15

## SAMANTHA RILEY RD / DECORA DR

Future Layout:



Jacobs:



**Note:**

- All departure lanes have an additional 130m of tapering
- All approach lanes have an additional 80m of tapering



## **Appendix B. Landcom Parking Technical Memorandum**

## Technical Memorandum

Quality Information	
<b>Project:</b>	Kellyville and Bella Vista Station Precinct Concept Proposals
<b>Project Number:</b>	SCT_00111
<b>Document Name:</b>	Post-Exhibition Response to Submission (RtS) – confirmation of parking rates
<b>Date:</b>	22 April 2020
<b>Prepared:</b>	Andy Yung, Director
<b>Reviewed:</b>	Jonathan Busch, Associate Director
<b>Authorised:</b>	Andy Yung, Director

### Background

As part of the Sydney Metro North West project, the Bella Vista and Kellyville Station Precincts were announced as Priority Precincts by the NSW Government in August 2014. The Bella Vista and Kellyville Station Precincts are two of the eight Station Precincts along the Sydney Metro Northwest corridor and identified for urban transformation in Sydney's northwest by the NSW Government to provide opportunities for creation of new vibrant town centres around the new stations. A focus on place-making underpins the master planning of the Kellyville and Bella Vista Station Precincts to create sustainable and liveable communities.

Landcom submitted a Concept State Significant Development (SSD) Application for the development of the Kellyville and Bella Vista Station Precincts. The Concept SSD Application sets out the concept proposal for the future development of the Kellyville and Bella Vista Station Precincts. It does not seek development consent for any physical works but only requires an evaluation of the likely impacts associated with the concept proposal, not the likely impact of any development that would be subject to a separate development application.

The combined Kellyville and Bella Vista precincts can provide up to 8,400 new homes over the next twenty years, capped through a clause in the Hills Council Local Environmental Plan to align with the local and State infrastructure that has been planned to support the precincts' growth. The current SSD application seeks approval for 5,715 of these units proposed by Landcom. The Bella Vista Station Precinct also seeks consent for the indicative location of a future primary school.

The Bella Vista Station Precinct is planned to have a mix of residential and employment land use. The employment will be focused near Celebration Drive adjacent to the existing employment in the Norwest Business Park. Bella Vista Precinct is forecast to provide 7,130 jobs within its commercial areas and a further 380 jobs in its retail areas once completed. Kellyville is planned to be predominately residential but with retail focused around its town centre near Samantha Riley Drive and the metro station and expected to create 270 new jobs.

Car parking comments raised during the submissions period include the following by Roads and Maritime Services (now Transport for NSW) and The Hills Shire Council:

**Table 1 Agency comments**

Agency	Roads and Maritime	The Hills Shire Council
<b>Comment</b>	In order to facilitate the Kellyville and Bella Vista Station Precinct Rezoning Transport Plan's target mode share of 47.5% car usage it is recommended that the Residential Parking Rates be amended as follows: 0.4 spaces per 1 bedroom unit. 0.7 spaces per 2 bedroom unit. 1.20 spaces per 3 bedroom unit. 1space per 10 units (visitor parking)	Concern is raised with respect to the proposed parking rates (0.6 – 1.4 spaces per unit, 1 visitor space per 10 units and 1 space per 145m <sup>2</sup> of commercial gross floor area). It is recommended that parking rates for residential flat buildings be included within the Urban Design Guidelines which are consistent with Council's housing diversity provision (1 space per apartment and 1 visitor space per 5 apartments). It is further recommended that parking rates be considered for commercial uses which are more in line with current requirements within the Shire (Council's current 'Commercial Centres' rate is 1 space per 40m <sup>2</sup> ).

Source: Roads and Maritime and Hills Shire Council

It is noted that it would not be possible to satisfy both comments.

Landcom has reviewed all the submissions to the SSDA and this technical memo confirms and justifies the parking rates recommended for Bella Vista and Kellyville Station Precincts.

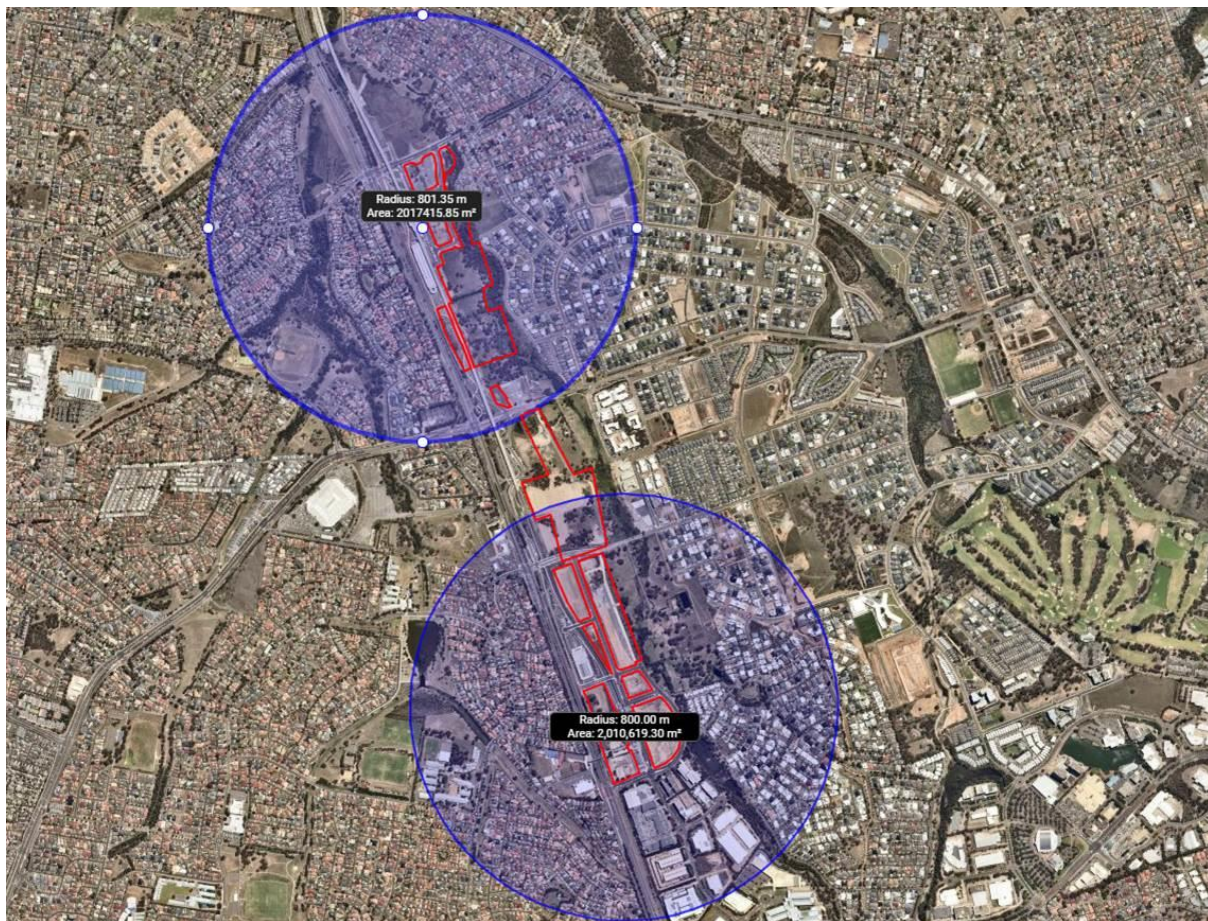
## Recommended parking rates

Landcom and Sydney Metro are working in collaboration to develop walkable, attractive, mixed use places around the SMNW stations. The majority of both Bella Vista and Kellyville Station Precincts are within 800m of the respective Metro Stations (as shown in **Figure 1**), with 800m considered as an industry accepted 10-minute walking catchment for public transport patrons. In fact, research by Sydney University<sup>1</sup> indicates that travel lengths even up to 1km attract a similar (70%) proportion of walking trips. This would mean the entire Bella Vista and Kellyville Station Precincts are covered with the station catchments.

The SSDA would facilitate development which supports best practice transit-oriented development principles, by providing increased residential and employment density in proximity to two Metro stations, the T-way and large number of feeder bus services that provides residents and employees with greater access to public transport and employment options, while promoting the use of sustainable travel options.

Future residents and employees of the Precincts would benefit from the increased network coverage, train frequency, journey-time reliability and improved customer offering of Sydney Metro, significantly reduce their reliance on private vehicle usage. SMNW has been shown to encourage rail network usage and increase journey to work trips by non-car modes. The Metro patronage published by Transport for New South Wales has risen to a total monthly trip of 2,207,000<sup>2</sup> in October 2019, indicated a typical weekday patronage over 74,000.

**Figure 1: 800m walking catchment of Kellyville and Bella Vista Metro Stations**



Source: Landcom, 2020

<sup>1</sup> Explaining walking distance to public transport: the dominance of public transport supply World Symposium on Transport and Land Use Research, 28-30 July 2011

<sup>2</sup> <https://www.transport.nsw.gov.au/data-and-research/passenger-travel/metro-patronage/metro-patronage-top-level-chart>

As a result of the feedback / comments received for the proposed parking provision, it is recommended that the following rates are adopted for both Bella Vista and Kellyville Station Precincts as highlighted in **Table 2**.

**Table 2: Recommended parking rates for Bella Vista and Kellyville Station Precincts**

Land uses		SSDA	
		Minimum	Maximum
Residential	1-bedroom	0.4	0.6
	2-bedroom	0.7	0.9
	3-bedroom	1.2	1.4
	Visitor	0.1	0.1
Retail		1 space per 130m <sup>2</sup>	1 space per 60m <sup>2</sup>
Commercial		1 space per 145m <sup>2</sup>	1 space per 100m <sup>2</sup>
Car share		1 bay per 150 parking spaces	

These rates address the Roads and Maritime comment but not the Council request made in the submission.

As a principle, Landcom is committed to reduced car parking provision for both Bella Vista and Kellyville Station Precincts to facilitate:

- An exemplar transit-oriented development (maximising the benefits of fast frequent metro connections with services every 4 minutes in the peak and 10 minutes in off-peak);
- A town centre not dominated by cars;
- Activation and life on the street; and
- A reduction in the congestion of precinct roads.

The recommended parking rates for retail and commercial development remain the same as those suggested in the SSDA Traffic and Transport Assessment Report (Jacobs, 2019).

On the other hand, the parking rates for residential development is recommended to be further reduced as shown in **Table 2** as the minimum range, in order to ensure car ownership can be reduced and traffic impacts can be further managed in both of these Precincts where they are within safe walking distance to two Metro stations and other sustainable transport options.

## Alignment with Hills Future 2036 – Local Strategic Planning Statement (LSPS)

Despite Council's request made in the submission, The Hills Shire Council in its suite of LSPS documents state that:

*Managing travel behaviour through control of parking cost and availability is one keyway in which Council can influence peoples travel choices and effect meaningful mode shift. This doesn't mean that car users are penalised for their travel choices, rather that the environment is managed in such a way that encourages more alternative travel choices by making them convenient and attractive while still ensuring that private vehicle travel is accommodated and supported appropriately.*

**Opportunities exist for reconsideration of existing car parking rates for residential and commercial developments in close proximity to public transport, where car ownership levels are typically lower. Reducing parking opportunities at both origin and destination will influence travel choices.**

*Car sharing is a convenient, affordable and sustainable transport option for residents and businesses located in close proximity to public transport. Car sharing enables more sustainable travel habits and helps keep businesses and residents connected. It is an efficient use of parking space, allowing a single vehicle to be used by a large number of people. This reduces congestion and the competition for parking spaces, which ultimately benefits all road users.*

*Encouraging car sharing in high density residential and commercial areas within close proximity to transport hubs may be supported through targeted development controls. These could include:*

- *Reduced car parking rates for developments incorporating shared parking facilities in station precincts;*
- *Requirements for dedicated car sharing spaces for new developments; or*



- *Provision of dedicated on-street parking for shared vehicles.*

The recommended parking rates for both Bella Vista and Kellyville Station Precincts fully align with Council's initiatives to reduce car ownership and reduce congestion.