Richmond Road Widening

Traffic and Transport Impact Assessment

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Stantec Australia Pty Ltd

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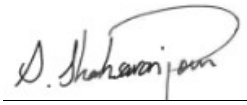
Reviewed by 

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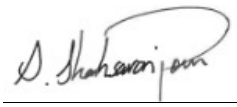
Approved by 

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1 Introduction

1.1 Background

The North West Priority Growth Area (NWPGA) has been identified by the New South Wales (NSW) Government as a key area to support urban growth in the greater Sydney region. When developed (2056 forecasts), the NWPGA will provide approximately 90,000 homes accommodating 250,000 people. A key part of the identification of the NWPGA was its proximity and connection to transport nodes including the M7 Motorway and ease of connection to the M4 Motorway, Sydney Metro and the new Western Sydney Airport.

To unlock the potential of the NWPGA, upgrades to transport infrastructure must align with current and forecasted needs, while considering forecasted population and economic growth. Richmond Road already experiences significant congestion, impacting travel times and hindering the potential for economic growth in the area. As the NWPGA continues to grow there will be increasing pressure on Richmond Road and the transport network.

As part of the NWPGA Transport Strategy, Transport for NSW (Transport) is proposing to upgrade Richmond Road between the M7 Motorway and Townson Road (the proposal). The proposal has the ultimate objectives of relieving the current corridor congestion and providing road capacity that supports growth.

1.1.1 Key features of the proposal

Transport is proposing to upgrade Richmond Road between the M7 Motorway and Townson Road (the proposal). Key features of the proposal would include:

- Upgrade of Richmond Road between the M7 Motorway and Townson Road to six lanes (three lanes in each direction). This would include:
    - road widening between the M7 Motorway and the Alderton Drive / Langford Drive intersection including a new bridge structure over Bells Creek
    - widening into the median from the Alderton Drive / Langford Drive intersection to 250 metres north of the Hollinsworth Road / Townson Road intersection.
- Building a new flyover bridge from the M7 Motorway / Rooty Hill Road North off-ramp landing on Richmond Road around 300 metres prior to Bells Creek. This would include:
    - a single lane bridge structure around 250 metres long and 8.4 metres wide for traffic heading northbound on Richmond Road
    - 170 metre embankment at the southern end of the bridge beginning at the M7 Motorway Rooty Hill Road North off-ramp, roughly five metres above the existing ground level
    - 150 metre long retaining wall located at the northern end of the bridge within the median of Richmond Road. At its highest point the retaining wall would be 8.4 metres high
    - minor re-surfacing of the existing M7 Motorway Rooty Hill Road North off-ramp where the ramp ties into the new flyover

  - no changes to existing gantry, exit lanes or lane functions on the M7 Motorway.

- Upgrades to the intersection of Richmond Road, Hollinsworth Road and Townson Road including:
  - an additional northbound through lane along Richmond Road (providing three through lanes towards Richmond)
  - an additional dedicated right turn lane from Richmond Road southbound onto Hollinsworth Road
  - a new left turn slip lane from Hollinsworth Road onto Richmond Road including a pedestrian island and crossing
  - staged pedestrian crossings across Richmond Road on the north and south sides of the intersection, with a pedestrian refuge in the median.
- Upgrades to the intersection of Richmond Road, Langford Drive and Alderton Drive including:
  - additional northbound and southbound through lanes along Richmond Road (providing three through lanes in both directions)
  - staged pedestrian crossings across Richmond Road on the north and south sides of the intersection, with a pedestrian refuge in the median.
- Upgrades to the intersection of Richmond Road, Rooty Hill Road North and the M7 Motorway ramps including:
  - two dedicated lanes on Richmond Road heading onto the M7 Motorway (southbound on-ramp)
  - two dedicated southbound through lanes on Richmond Road (towards Blacktown)
  - an additional right turn lane from Richmond Road southbound onto Rooty Hill Road North (providing two dedicated right turn lanes onto Rooty Hill Road North)
  - extension of 10 metres for the left turn lane from Richmond Road southbound onto M7 Motorway northbound on-ramp
  - relocation of the existing pedestrian crossing on Richmond Road approximately 160 metres south. This would be a new staged pedestrian crossing across Richmond Road, with a pedestrian refuge in the median at the intersection of Richmond Road and the M7 Motorway southbound on-ramp.
- Active transport provisions throughout the proposal area including:
  - moving the existing shared pedestrian and bike path on the western side of Richmond Road to be further west. This would be a four metre wide shared pedestrian and bike path on the western side of Richmond Road (between the M7 Motorway to approximately 150 metres south of the Richmond Road / Langford Drive / Alderton Drive intersection) where it would connect to the existing shared path.
- Building a new concrete bridge structure over Bells Creek for the northbound carriageway located approximately 14 metres west of the existing Bells Creek bridge. This would include:
  - a bridge structure around 29 metres long and 18 metres wide
  - three northbound travel lanes
  - a shared pedestrian and bike path on the western side, which replaces the existing boardwalk bridge next to the northbound Richmond Road carriageway.
- Retention of the five bus stops on Richmond Road between Yarramundi Drive and the Richmond Road / Hollinsworth Road / Townson Road intersection. The dedicated bus lanes at

the intersection of Richmond Road with Langford Drive / Alderton Drive and Hollinsworth Road / Townson Road are also retained.

- Drainage and water quality structures along the proposal including:
    - adjustments to the pits and pipes of the existing stormwater network
    - two gross pollutant traps to the north and south of Bells Creek
    - open flooding channel on the eastern side of Richmond Road roughly between the M7 Motorway northbound on-ramp and Bells Creek for flood mitigation purposes. The channel would be around 425 metres long and 10 metres wide and would discharge into Bells Creek.
- Roadside furniture including safety barriers, signage, line marking, lighting and fencing.
- Earthwork cutting, embankments and retaining walls to accommodate the widened road alignment, flyover bridge and open flooding channel.
- Modified formal access to four properties along the upgraded sections of Richmond Road.
- Installation of a formal driveway access to the Blacktown Native Institution property within the Rooty Hill Road North road corridor, and removal of the informal access track to the property from Richmond Road.
- Property acquisition including full acquisition of one property and partial acquisition of two properties.
- Rehabilitation of disturbed areas and landscaping.
- Establishment and use of three temporary ancillary facilities during construction.

1.1.2 Proposal location

The Richmond Road corridor is located in Sydney's north-west, connecting between Dean Park and Marsden Park, as shown in **Figure 1-1**. This study refers to three different geographical and analysis areas, as defined below:

- **Richmond Road proposal area**: The Proposal Area refers to the section of Richmond Road on which the widening, bridge works and intersection upgrades are proposed (see report **section 1.1.1**).
- **Richmond Road Corridor**: The Corridor boundary is consistent with the traffic model boundary of the Richmond Road Corridor Upgrade model and is explained in more detail in report **section 2.1.1**.
- **Study area**: For the purpose of this Traffic and Transport Assessment, a greater area has been adopted upon which to analyse the wider context of the corridor including its likely users. This report includes demographic, transport and future conditions analysis for the greater study area.

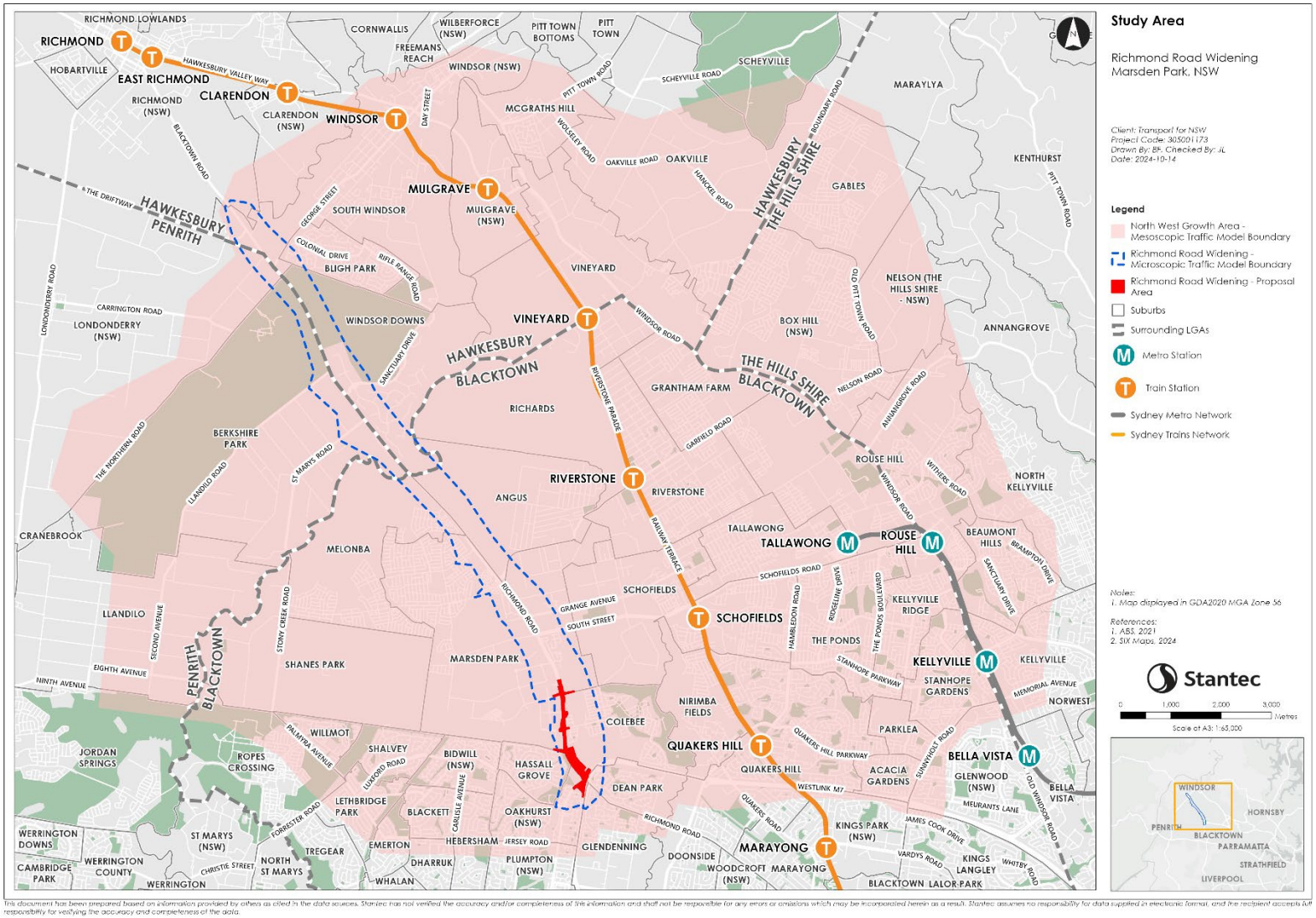

Figure 1-1: Richmond Road project proposal and traffic model boundary

1.2 Purpose of this report

This Traffic and Transport Impact Assessment (TTIA) report has been prepared by Stantec on behalf of Transport for NSW to support the design of the Richmond Road upgrade by describing the likely impacts on the traffic and transport environment for all road users.

The purpose of this report is to describe the proposal, document its likely impacts on the traffic and transport environment, including future traffic volumes, expected delays and Level of Service (LOS) with particular focus on the impact on the Richmond Road corridor, and to provide recommendations for mitigation and management measures that could be implemented.

1.3 Assessment objectives

The objectives of the Study are to:

- assess the potential impacts of the proposal based on traffic modelling outcomes
- review historical traffic growth, seasonal traffic profiles and existing and future land-use projections to inform the future traffic patterns within the Study Area
- develop a detailed traffic and transportation model for the Do Minimum and The Proposal scenarios with consideration to typical weekday traffic conditions
- analyse and optimise the traffic performance of the design including consideration for:
  - local road connectivity and intersection options
  - crash analysis
  - provision for public transport, freight, emergency vehicles, pedestrians, cyclists and other road users
- Assess the impacts of the Concept Design on traffic and transportation patterns on the adjacent road network for all categories of road users and activities that interact with the project.

1.4 Report structure

This report documents the future base model scenarios/options and the results and outcomes from the modelling assessment per the following sections:

- **Chapter 1 – Introduction**: Details the background and key features of the proposal, assessment objectives, and study area.
- **Chapter 2 – Methodology**: Provides details on the approach to modelling and assessment.
- **Chapter 3 – Strategic Context**: Provides an overview of land use and population, road network, mode share, crash data and the active and public transport network
- **Chapter 4 – Existing and Future Road and Traffic Conditions**: Outlines the land use and population, road network, mode share, crash data and the active and public transport network.
- **Chapter 5 – Future Traffic Demand**: Outlines the procedure for future year demand estimation and future traffic demand summary.
- **Chapter 6 – Existing Road Network Performance**: Outlines the assumptions and data inputs used for base model development

- **Chapter 7 – Construction Traffic Impact Assessment**: Describes the construction staging and the traffic impacts during construction.
- **Chapter 8 – Operational impacts**: Describes the future road network performance and operational impacts.
- **Chapter 9 – Management Measures**: Describes the constructional and operational management measures.
- **Chapter 10 – Conclusion**: Outlines main outcomes, results and recommendations.

2 Methodology

This section describes the approach to the traffic and transport modelling and impact assessment, including the available and assessed information and data, the modelling scenarios, and the approach to assessing the construction and operational impacts. It commences with an introduction to the TTIA study area with a description of the modelling boundary and justification.

2.1 Identification of study area

This section describes the study area defined for the proposal and the traffic modelling boundary adopted to carry out the assessment.

2.1.1 Traffic modelling boundary

The Richmond Road corridor is one of two major north-south arterial roads in the North West Priority Growth Area (NWPGA) of Greater Sydney. Significant infrastructure upgrades are planned across the region to support residential and commercial development in the NWPGA. These developments will change the volume and distribution of traffic and transport demands serviced by the proposal, as well as the road network conditions that the proposal will operate within.

The Richmond Road Corridor Upgrade project undertook traffic modelling of the NWPGA and the Richmond Road corridor. Mesoscopic traffic model was created to inform the prioritisation of road corridor projects within the NWPGA and microscopic traffic model was created to inform the staging plan for the Richmond Road corridor. The microscopic model was developed by creating a cordon of the mesoscopic model.

To better understand how the proposal would integrate with the road network surrounding the study area, the traffic model boundary for this TTIA was extended to match the microsimulation model boundary of the Richmond Road Corridor Upgrade model. The traffic model boundary extension:

- provides a better representation of the congestion and traffic demands on the Richmond Road corridor affecting the proposal's operation
- Reduces risk and improves design outcomes for the proposal by modelling interactions with interfacing projects along the Richmond Road corridor and within the broader NWPGA region.

The traffic model boundary was extended northwards along Richmond Road to the Blacktown Road / The Driftway intersection, and westwards along Rooty Hill Road North to the Rooty Hill Road North / Luxford Road intersection. **Figure 2-1** shows the study area for the proposal and the traffic model boundary.

2.1.2 Modelling boundary and route choice consideration

The model for this Traffic and Transport Impact Assessment (TTIA) was derived from a broader Mesoscopic model that includes the North West Priority Growth Area (NWPGA) of Greater Sydney. Within the NWPGA, there are two main north-south corridors: Richmond Road and Windsor Road. Additionally, there are three major existing east-west corridors: Garfield Road, Schofield Road, and George Street. All

these corridors are covered within the Mesoscopic model area. Consequently, the route choices for vehicles traveling on both the north-south and east-west arterial roads have been considered and modelled in the Mesoscopic model, and subsequently in the microscopic model.

Figure 2-1: Study area and traffic model boundary

2.2 Approach to impact assessment

The Richmond Road Widening proposal has been assessed using a microsimulation traffic model, based on the original assumption that the project is delivered across two stages: the first in 2028 and the second in 2038. This timeline was established according to the availability of funding for project delivery at that time. This section outlines the methodology for assessing the existing performance and the impact of the proposal on the transport network over six steps, detailed in the following sections:

1. Collation of background information including previous studies, automatic tube counts, classified intersection counts, census data, journey to work data, and crash data.
2. Review of existing environment including current and future land uses and population, road network characteristics and hierarchy, and current transport networks.
3. Assessment of existing road network performance.
4. Assessment of the proposal's construction activities and impacts.
5. Assessment of the proposal's impacts on the operation of the road network.
6. Identification of recommended mitigation and management measures.

2.2.1 Collation of background information

A review of relevant background information and data is used for this TTIA. This section outlines the transport models, reports and traffic and transport data reviewed, and how each of these were used in the assessment.

2.2.1.1 Transportation models and reports

A number of reports and studies informed the preparation of this TTIA. **Table 2-1** sets out each background item reviewed, and how its content was used to prepare the TTIA.

Table 2-1: Background reports and studies

Title	Year	Author	Input for the TTIA
Sydney Strategic Motorway Planning Model (SMPM) strategic model	2024	TfNSW	Strategic traffic model used to assess transport demand within and through the NWPGA, based on travel patterns from Census and land use data.
Richmond Road Corridor Upgrade NWPGA mesoscopic model	2024	Stantec	Mesoscopic traffic model used to assess transport demand within and through the Richmond Road traffic model boundary, based on strategic traffic model demands.
Construction information	2024	Stantec	Summary of the construction staging strategy of the proposal
Transport planning reports	2017	DoP	North West Priority Growth Area – Land Use and Infrastructure Implementation Plan, Department of Planning, 2017

2.2.1.2 Intersection traffic counts

Classified intersection counts (CIC) record vehicle movements for all approaches to an intersection. The number of vehicles making each turn are used in the development of the Base Model to ensure that the modelled volumes are reflective of those in reality.

Matrix Traffic and Transport Data conducted classified intersection counts on the following date and times:

- Thursday 9 March 2023
  - AM Peak: 6.00am -10.00am
  - PM Peak: 3.00pm – 7.00pm

The traffic counts recorded the following road user types at each intersection in 15-minute intervals:

- Light vehicles
- Heavy vehicles
- Cyclists.

2.2.1.3 Automatic tube counts

Automatic tube counts (ATCs) provide 24-hour traffic volume counts and are also capable of providing additional information such as vehicle classification (light vehicle, heavy vehicle, etc.) and average speed. ATC data is used to replicate key parameters relating to driver behaviour and traffic demand characteristics in the microsimulation model. Matrix Traffic and Transport Data conducted ATC surveys between Monday 6 March 2023 to Monday 27 March 2023. **Table 2-2** shows the locations where ATC survey data was collected.

Table 2-2: ATC survey locations

ID	Road	Location
1	Richmond Road	north of Rooty Hill Road North
2	Richmond Road	between Grange Avenue and Excelsior Road
3	Garfield Road West	between Robert Street and Dromana Road
4	Richmond Road	between Northbound Drive and Heritage Road
5	George Steet	between Colonial Drive and Thorley Street
6	Luxford Road	west of Dryden Avenue
7	Townson Road	between Richmond Road and Victory Road
8	Chifley Glade	south of Hollingsworth Road
9	Chifley Glade	north of Langford Drive
10	Elara Boulevard	between Richmond Road and Watkin Crescent
11	Abell Road	west of Dowse Avenue
12	Blacktown Road	between Bennet Road and The Driftway
13	South Street	west of Richmond Road

2.2.1.4 SCATS signal data

The Sydney Coordinated Adaptive Traffic System (SCATS) manages signal timings, cycle times and offsets for all signalised intersections in NSW. It also collects historical SCATS data which can be used in traffic modelling to replicate the performance of signalised intersections.

SCATS data was used to inform the signal coding within the Aimsun model. The data provides insights into the cycle time, phase time, intergreen time, coordination and offsets that were incorporated into the model. The following SCATS traffic signal information was obtained from Transport for NSW for the signalised intersections within the traffic model boundary:

- SCATS history files
- SCATS detector volumes
- TCS graphic plots
- SCATS region LX files.

Historical data for the CIC survey dates was extracted. Historical phase times were provided separately for each 15-minute interval of each survey day. **Table 2-3** shows the intersections for which SCATS signal data was provided.

Figure 2-2 provides the CIC, ATC and SCATS data locations.

Table 2-3: Signalised intersections

TCS number	Intersection
3964	Richmond Road / St Marys Road
4587	Richmond Road / Elara Boulevard
2950	Richmond Road / Garfield Road West / Abell Road
4608	Garfield Road West / access road
4558	Richmond Road / Excelsior Avenue / Pius Lane
4557	Richmond Road / South Street
4547	South Street / Fennoy Road
4556	Richmond Road / Harmony Avenue / Hawthorne Avenue
4450	Richmond Road / Hollinsworth Road
4519	Richmond Road / Alderton Drive / Langford Drive
2721	Richmond Road / M7 on- and off-ramps / Rooty Hill Road North
3874	Richmond Road / M7 on-ramp
3288	Richmond Road / Yarramundi Drive
3872	Rooty Hill Road North / M7 off-ramp
3873	Rooty Hill Road North / Pepperidge Avenue
2940	Rooty Hill Road North / Luxford Road

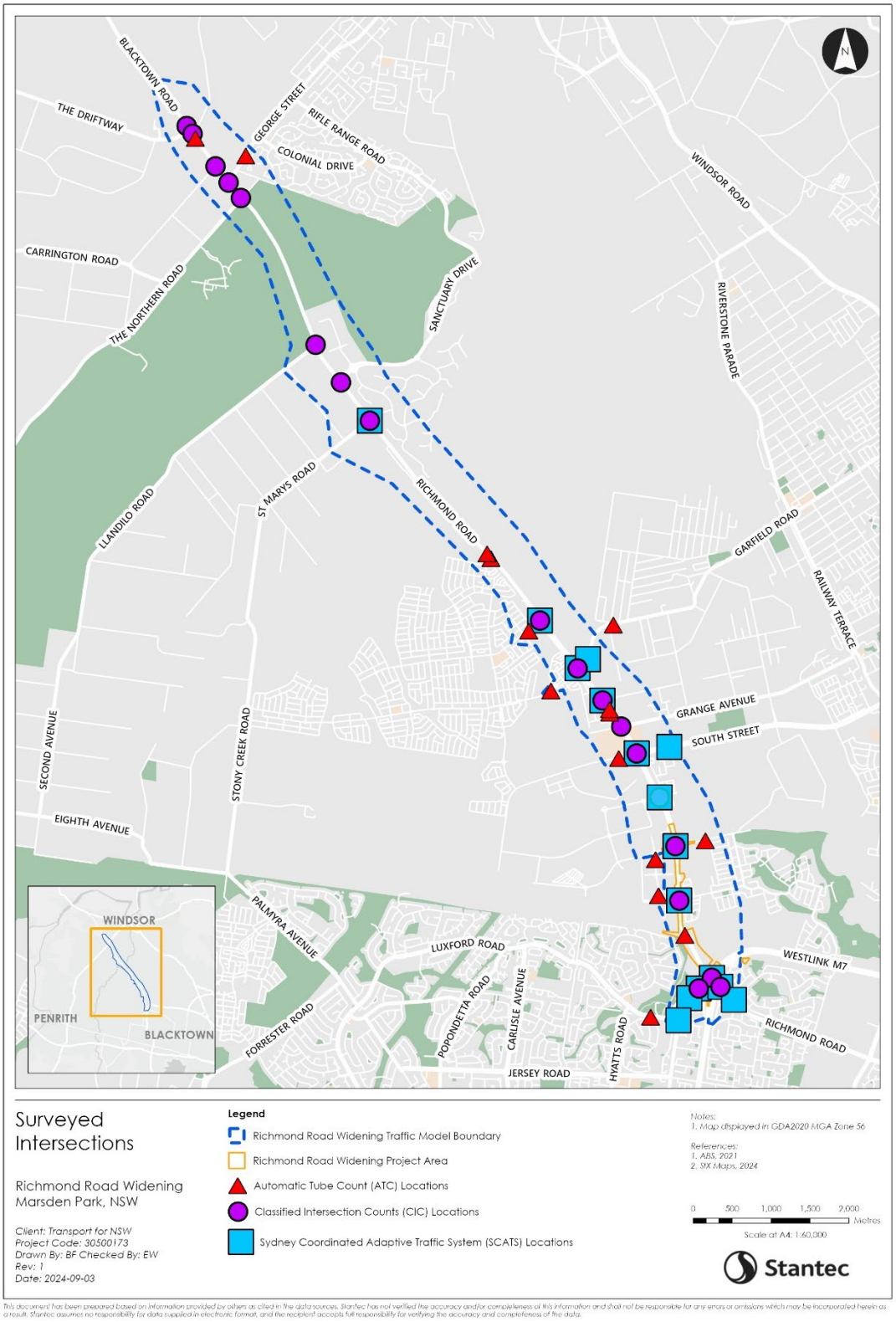

Figure 2-2: Traffic count locations

2.2.1.5 Travel time data

Travel time data records the travel time for vehicles along particular routes and/or sections of the model. The purpose of travel time data is to ensure that the model is realistically replicating delays and driver behaviour that impacts travel times along a road.

Matrix Traffic and Transport Data conducted floating car travel time surveys for the Richmond Road corridor on the following date and times:

- Thursday 9 March 2023
  - AM Peak: 7:30am - 8:30am
  - PM Peak: 4:30pm - 5:30pm

Figure 2-3 shows the travel time route.

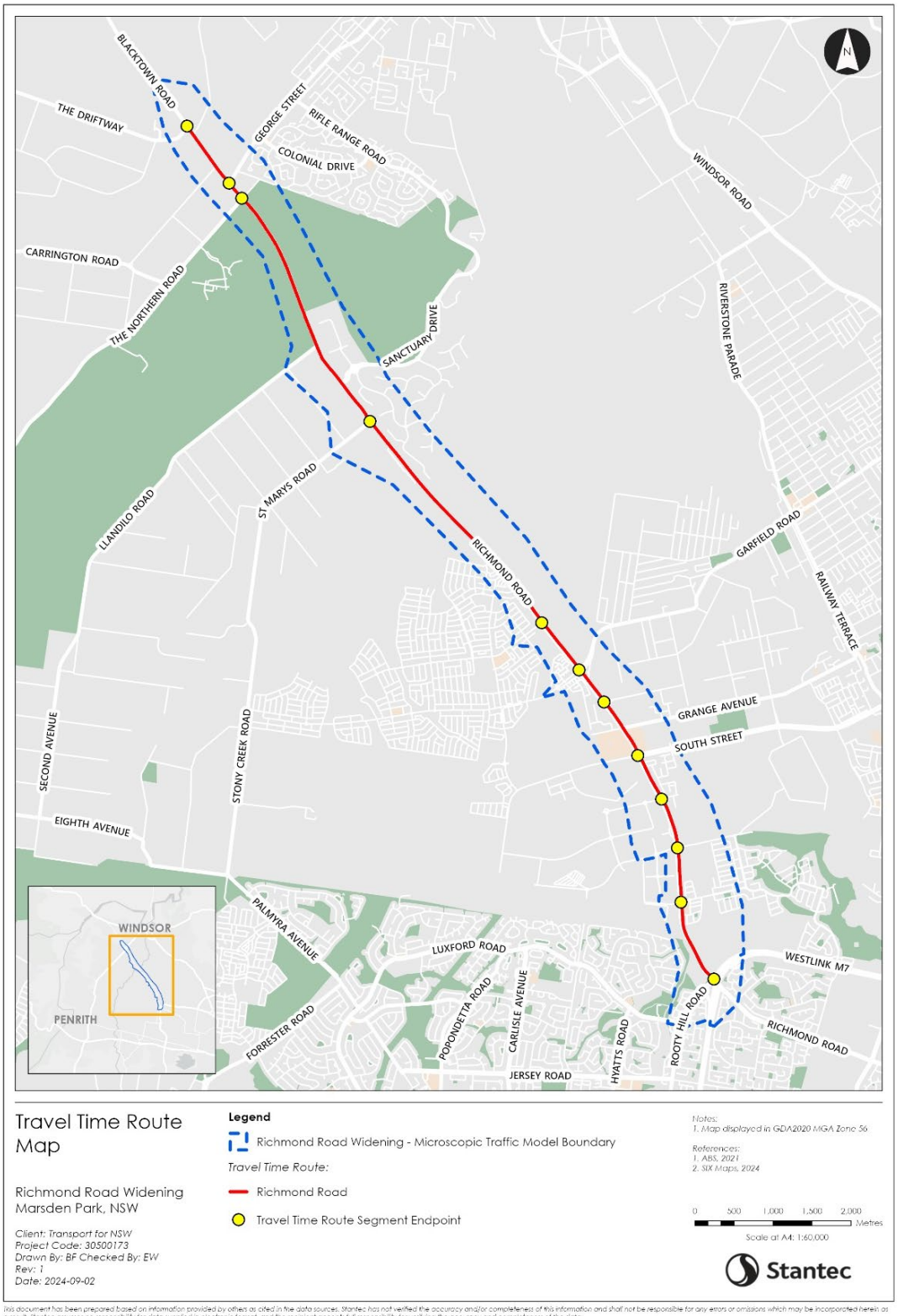

Figure 2-3: Travel time route

2.2.1.6 Transport mode share

Journey to Work (JTW) data from the Australian Bureau of Statistics (ABS) 2021 Census provides a snapshot of commuting patterns including mode share for residents and commuters in the study area. **Section 4.3** provides a summary of existing travel behaviour, including mode share.

2.2.1.7 Freight network

Transport for NSW imposes limitations on the size of heavy vehicle routes throughout the state. Freight network restrictions were extracted from the Transport for NSW Restricted Access Vehicles Map to determine the key freight routes. **Section 4.7** outlines the heavy vehicle restrictions within the study area.

2.2.1.8 Public transport network information

Public transport network information was collected from different sources listed below:

- The General Transit Feed Specification (GTFS) bus timetable feed publishes the schedule and route information of bus services operated under:
  - Sydney Metropolitan and Outer Sydney Olympic Park Major Events Bus Contracts
  - Sydney NightRide and Sydney Olympic Park Major Events Bus Contracts.

GTFS data from July 2023 was sourced from the NSW Government Open Data Portal. Bus routes and timetables in the GTFS data were extracted and used for the base model development for the AM and PM peak periods. Local bus services are operated by Busways.

2.2.1.9 Active transport network information

The active transport network was considered through review of:

- Aerial maps
- Transport for NSW Cycleway Finder.

2.2.1.10 Crash data

Crash data was obtained from Transport for NSW Centre for Road Safety portal for the five-year period from 2018 to 2022. The data was used to assess crashes within the study area and within proximity to the proposal. **Section 4.4.3** provides a summary of the crash data statistics.

2.2.2 Review of existing and future conditions

The review of the existing environment included a summary of current and future land uses and population, the road network characteristics and hierarchy, and the different transport networks including:

- private vehicle network
- freight network
- public transport
- Active transport.

2.2.3 Assessment of existing road network performance

Assessment of the existing road network performance considered network performance metrics and intersection performance metrics. Road network performance was measured using a microsimulation model developed in Aimsun. This type of model simulates individual vehicles and their interactions with each other and the road environment. Network and intersection performance were quantified using the metrics shown in **Table 2-4.**

Table 2-4: Performance metrics

Network performance metrics	Intersection performance metrics
• total traffic demand • distance and time travelled by vehicles • number of stops • average speed • unreleased demand	• total volume • average delay on each movement • level of service • queue length

Section 6 analyses the existing road network and intersection performance.

2.2.4 Assessment of the proposal's construction activities and impacts

Anticipated construction activities associated with the proposal may affect the performance of the transport network. The assessment of these impacts considered construction staging, ancillary sites, construction traffic and vehicle types, lane closures and diversions, temporary speed limit reductions, and public transport and active transport considerations.

The traffic impacts of the proposal during construction were assessed on a low-high scale based on the construction traffic as a percentage increase over the baseline daily traffic volume. For medium and high impact levels, interim mitigation and management measures have been recommended for drivers, pedestrians and cyclists where appropriate to minimise disruption during construction. **Section 7** describes the potential impacts of construction activities for the proposal.

2.2.5 Assessment of the proposal's impacts on road network operation

The Aimsun microsimulation model was used to assess the future performance of the network, with (The Proposal scenario) and without (Do Minimum scenario) the proposed Richmond Road Widening proposal. Traffic modelling was used to investigate potential operational impacts associated with the proposal at a network and intersection level.

2.2.5.1 Future traffic demand

Transport for NSW provided future year strategic traffic demand outputs from the SMPM based on Travel Zone Projections 2022 (TZP22) data. The traffic demand growth was calculated and applied to the

Richmond Road Corridor Upgrade NWPGA mesoscopic model base year demands to develop the NWPGA future year demands. A cordon was established for the Richmond Road Widening traffic model boundary in the NWPGA mesoscopic model, and the NWPGA model was run to extract the Richmond Road corridor future year demands.

The process for developing the future traffic demands is described in **Section 5**.

2.2.5.2 Future year scenarios

Two future-year models for 2028 and 2038 were developed according to the timeframes of expected completion of each stage of the proposal. The following scenarios were assessed:

- Existing Base
- Do Minimum
- The Proposal

Existing Base**:** This scenario was modelled using the existing road network infrastructure. The traffic demand for this scenario is based on data collected from traffic surveys conducted in 2023.

Do Minimum**:** The Do Minimum scenarios were modelled with “committed and funded” and “indicative” infrastructure upgrades, but without the proposal. The traffic demands for this scenario is sourced from the strategic traffic demand outputs from the SMPM.

The Proposal**:** The Proposal scenarios were modelled with “committed and funded” and “indicative” infrastructure upgrades along with the two stages of infrastructure upgrades of the proposal. The traffic demands for this scenario is sourced from the strategic traffic demand outputs from the SMPM.

Table 2-5 sets out the modelling assessments for each year. Time periods modelled for each peak are discussed in the following section.

Table 2-5: Scenarios and years assessed

Scenario	2023		2028		2038	
	AM	PM	AM	PM	AM	PM
Existing Base	✓	✓	-	-	-	-
Do Minimum	-	-	✓	✓	✓	✓
The Proposal	-	-	✓	✓	✓	✓

2.2.5.3 Modelled time periods

The traffic peak hour was determined from classified intersection counts on a typical Thursday. It was assumed that the peak hours were the two hours with the highest traffic volume recorded across all intersections in the network. The model provides an indication of the performance of the network during these busiest hours in each peak. The Aimsun model is based on the following hours:

- AM peak: 7:00am – 9:00am
- PM peak: 4:00pm – 6:00pm.

2.2.5.4 Infrastructure assumptions

TfNSW has provided a comprehensive list of network upgrades that is expected to be in place by 2028 and 2038. The list of expected network upgrades was current at the time of this report and have been categorised as “Committed and funded”, “Indicative”, and “Visionary”. For the future year modelling, only upgrades classified as “Committed and funded” and “Indicative” were considered. These core suite of upgrades, excluding the proposal infrastructure, have been included in the Do Minimum scenario.

The Richmond Road Widening proposal has been assessed in the Proposal scenario. The proposal will be implemented in two stages and will see the widening of Richmond Road to three lanes in each direction between Rooty Hill Road North and Townson Road, and the introduction of a single lane flyover exit ramp from the M7 northbound exit ramp to Richmond Road northbound.

Table 2-6 describes the infrastructure upgrades considered in the future year modelling. **Figure 2-4** shows the location of each infrastructure upgrade, and **Table 2-7** summarises the infrastructure upgrades included in each scenario. It should be noted that the list of expected network updates was current at the time of this report.

Table 2-6: Infrastructure upgrades

Sl. No	Upgrade	Description
1	Richmond Road Widening (northern section / Stage 1)	Addition of third northbound lane on Richmond Road between Alderton Drive and Townson Road, additional right turn lane from Richmond Road southbound into Hollinsworth Avenue and Langford Drive
2	Bandon Road Stage 1	Connection of new Bandon Road corridor to Richmond Road / Elara Boulevard intersection
3	Richmond Road Upgrade – Marsden Park	Extension of Charles Thomson Boulevard to meet Richmond Road at new signalised intersection, widening of Richmond Road to two lanes each way between Elara Boulevard to north of Charles Thomson Boulevard
4	Richmond Bridge Stage 1	Realignment of The Driftway to meet Richmond Road at Richmond Road / Racecourse Road intersection, upgrade of intersection to roundabout
5	Richmond Road Widening (southern section / Stage 2)	Introduction of a single lane flyover exit ramp from the M7 northbound exit ramp to Richmond Road northbound, addition of third southbound lane on Richmond Road between Alderton Drive and Rooty Hill Road North, addition of third northbound lane on Richmond Road between flyover exit and Alderton Drive, additional right turn and through lane on Richmond Road / Rooty Hill Road North north-west approach
6	Rooty Hill Road North Widening	Widening of Rooty Hill Road North to two lanes in each direction south of Luxford Road
7	Townson and Burdekin Road Upgrade Stage 1	Widening of Townson Road to two lanes in each direction, signalisation of Townson Road / Victory Road intersection

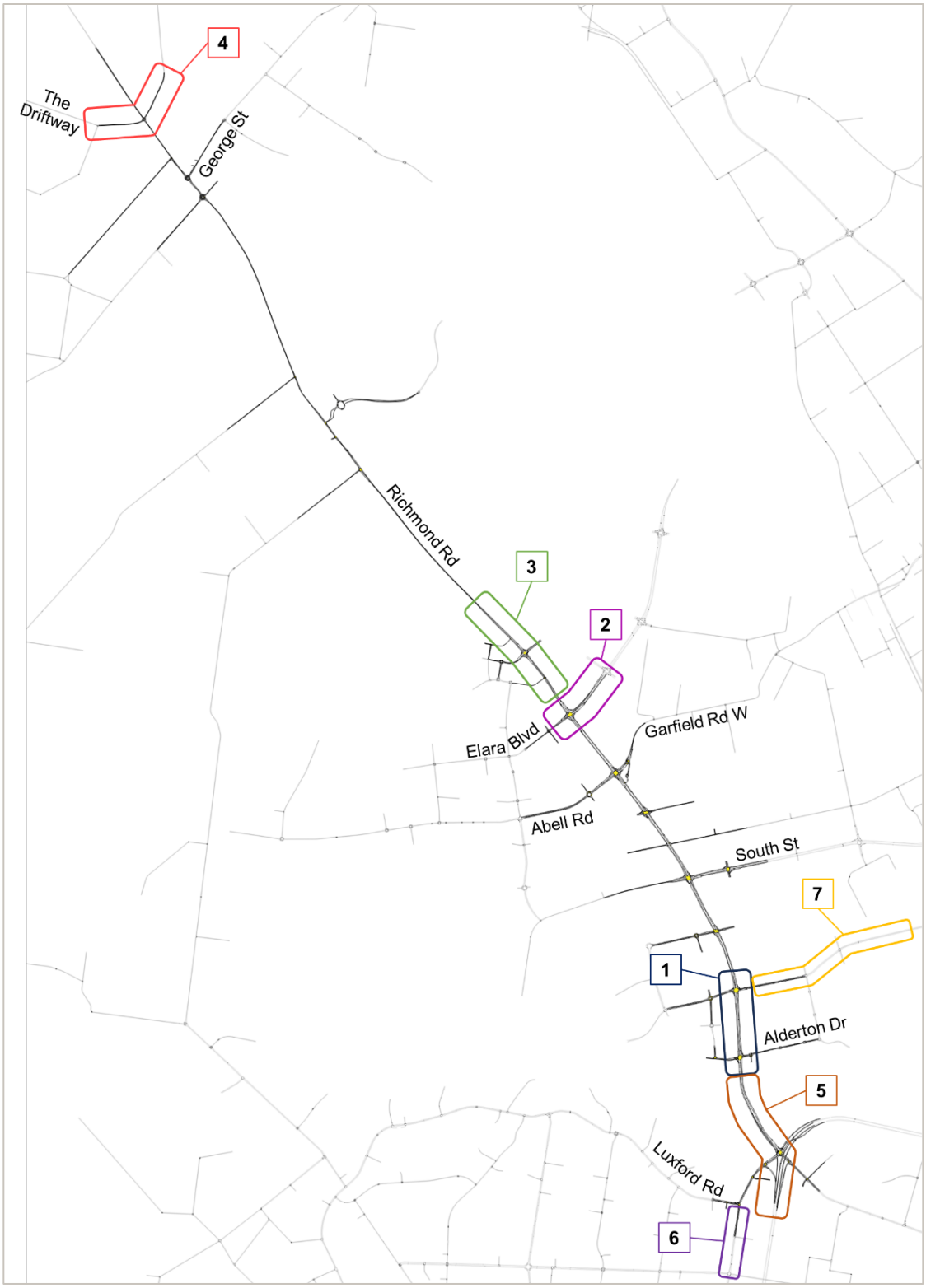

Figure 2-4: Infrastructure upgrade locations

Table 2-7: Scenario upgrade inclusion

Upgrade		Scenario			
		2028 Do Minimum	**2028 The Proposal**	**2038 Do Minimum**	**2038 The Proposal**
1	Richmond Road Widening (northern section / Stage 1)	-	✓	-	✓
2	Bandon Road Stage 1	✓	✓	✓	✓
3	Richmond Road Upgrade – Marsden Park	✓	✓	✓	✓
4	Richmond Bridge Stage 1	-	-	✓	✓
5	Richmond Road Widening (southern section / Stage 2)	-	-	-	✓
6	Rooty Hill Road North Widening	-	-	✓	✓
7	Townson and Burdekin Road Upgrade Stage 1	-	-	✓	✓

2.2.5.5 Assessment of future road network performance

Assessment of the future road network performance considered network performance metrics and intersection performance metrics. Network and intersection performance were quantified using the metrics shown in **Table 2-4.**

Section 8 analyses the future road network and intersection performance.

2.2.6 Identification of recommended mitigation and management measures

Mitigation and management measures are recommended to address any negative impacts associated with the proposal, and to enhance the opportunities created by the proposal. **Section 9** provides a summary of the recommended mitigation and management measures.

3 Strategic context

This section provides an overview of the planning context for the area, summarising the need for the project and any key implications from federal, state and local government planning.

3.1 Federal government

3.1.1 Western Sydney City Deal, 2018

The Western Sydney City Deal is a landmark agreement among the three levels of government to collectively invest over $11 billion in urban development projects aimed at enhancing the prosperity, sustainability, and liveability of Western Sydney. This partnership unites resources from the Australian Government, NSW Government, and the eight Western Parkland City councils (with one of them being Hawkesbury Council) to create a thriving, future-oriented city that is well-connected, innovative, and liveable.

The Western Sydney City Deal aims to achieve the following:

- Realising the 30-minute city by delivering the North South Rail Link
- Respecting and building on local character through a $150 million Livability Program
- Coordinating and innovating through a Planning Partnership

The Deal incorporates a commitment to the 30-minute city initiative of the Greater Sydney Region Plan and Future Transport 2056 (Future Transport Strategy). To support this commitment, the Deal has outlined a new north-south rail link between the proposed airport and the T1 Western Line at St Marys and Schofields, which represents Stage 1 of a new rail network for the area. Future plans include an extension of the existing South West Rail Link to the airport and another north-south alignment which will extend from the airport north through the North West Priority Growth Area (NWPGA) to connect with the T1 Richmond Line at Schofields. The extension of the rail catchment within the region will improve public transport accessibility and assist in reducing the reliance on private vehicles.

The Deal also identifies significance of revitalising Windsor, South Windsor and Richmond town centres through a range of civil and public domain works. This process is aimed at improving pedestrian access, amenity and public spaces.

3.2 State government

3.2.1 North West Priority Growth Area – Land Use and Infrastructure Implementation Plan, Department of Planning, 2017

The NWPGA Land Use and Infrastructure Implementation Plan is an update to the outlines plans for Sydney's north-west and the infrastructure needed to support growth. Two key objectives for the NWPGA are:

- Create vibrant and liveable neighbourhoods
- Improve accessibility.

The Plan seeks to improve access and mobility throughout the NWPGA, connecting homes, jobs and local facilities via active and public transport and reducing the reliance on cars for local trips. An integrated transport network is proposed in the Plan to support this vision, as shown in **Figure 3-1** and **Figure 3-2**.

Key features of the proposed network include:

- upgrades to Richmond Road and Schofields Road (from Tallawong Road to Veron Road, and Veron Road to Richmond Road)
- extension of Burdekin / Townson Road and Bandon Road, as well as additional grade separated rail crossings of the existing Western Line
- preliminary corridor planning for the Outer Sydney Orbital and Bells Line of Road Castlereagh Corridor
- a future public transport corridor from Cudgegong Road Station (Rouse Hill) to Marsden Park
- a comprehensive regional pedestrian and cycle network that provides for ease of movement and connectivity to the surrounding region
- a high degree of accessibility and pleasant experiences for pedestrians when walking to and around the key centres, and to and from public transport interchanges
- direct and efficient regional connections
- dedicated cycleways connecting key destinations and areas of open space
- integrated rail, bus, bicycle and pedestrian infrastructure that can be easily accessed and used by people travelling to and from the areas
- an urban form that cultivates a pedestrian friendly environment through a scale and layout sensitive to pedestrian needs.

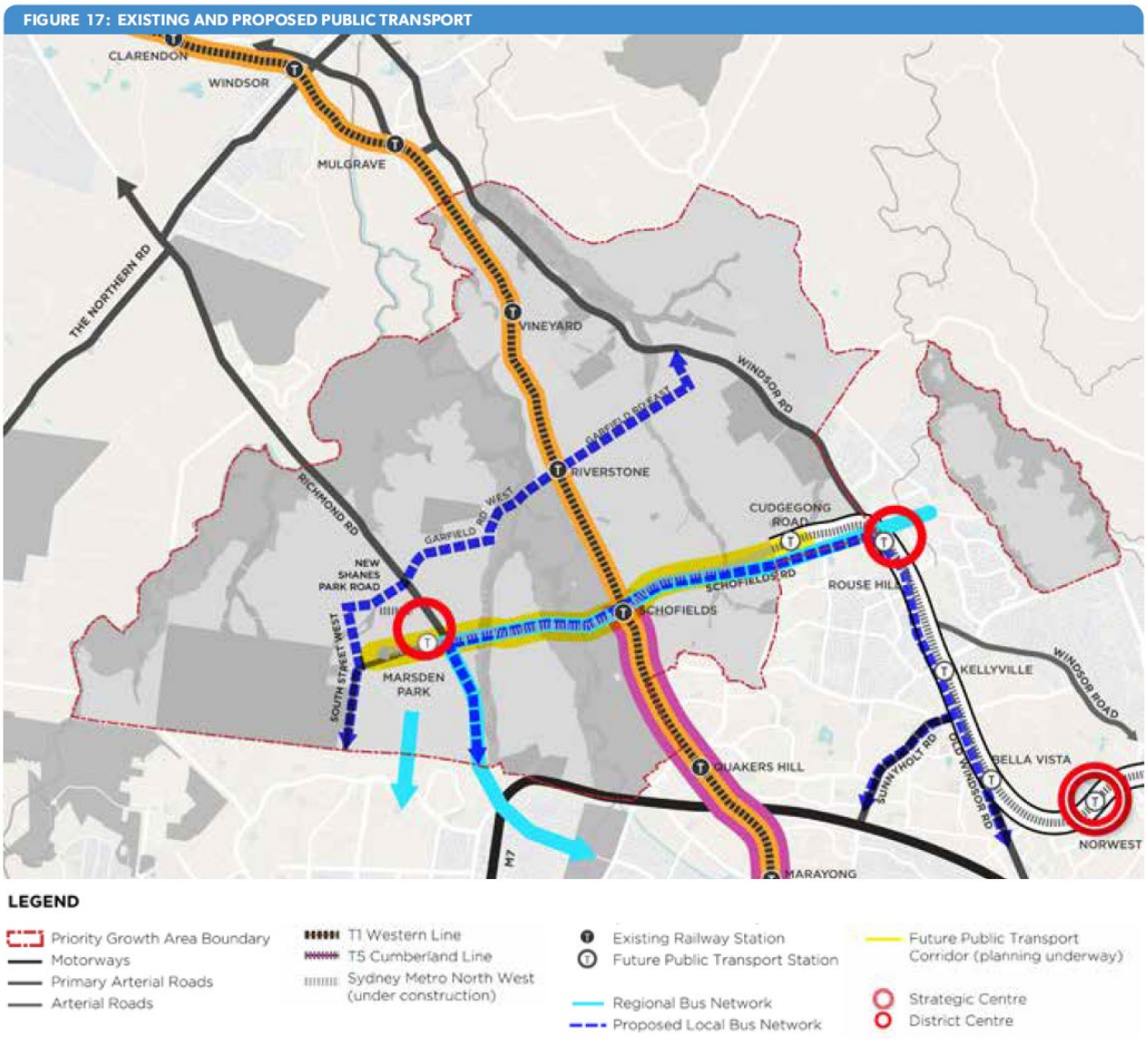

Figure 3-1: NWPGA proposed public transport network

Source: Department of Planning, 2017

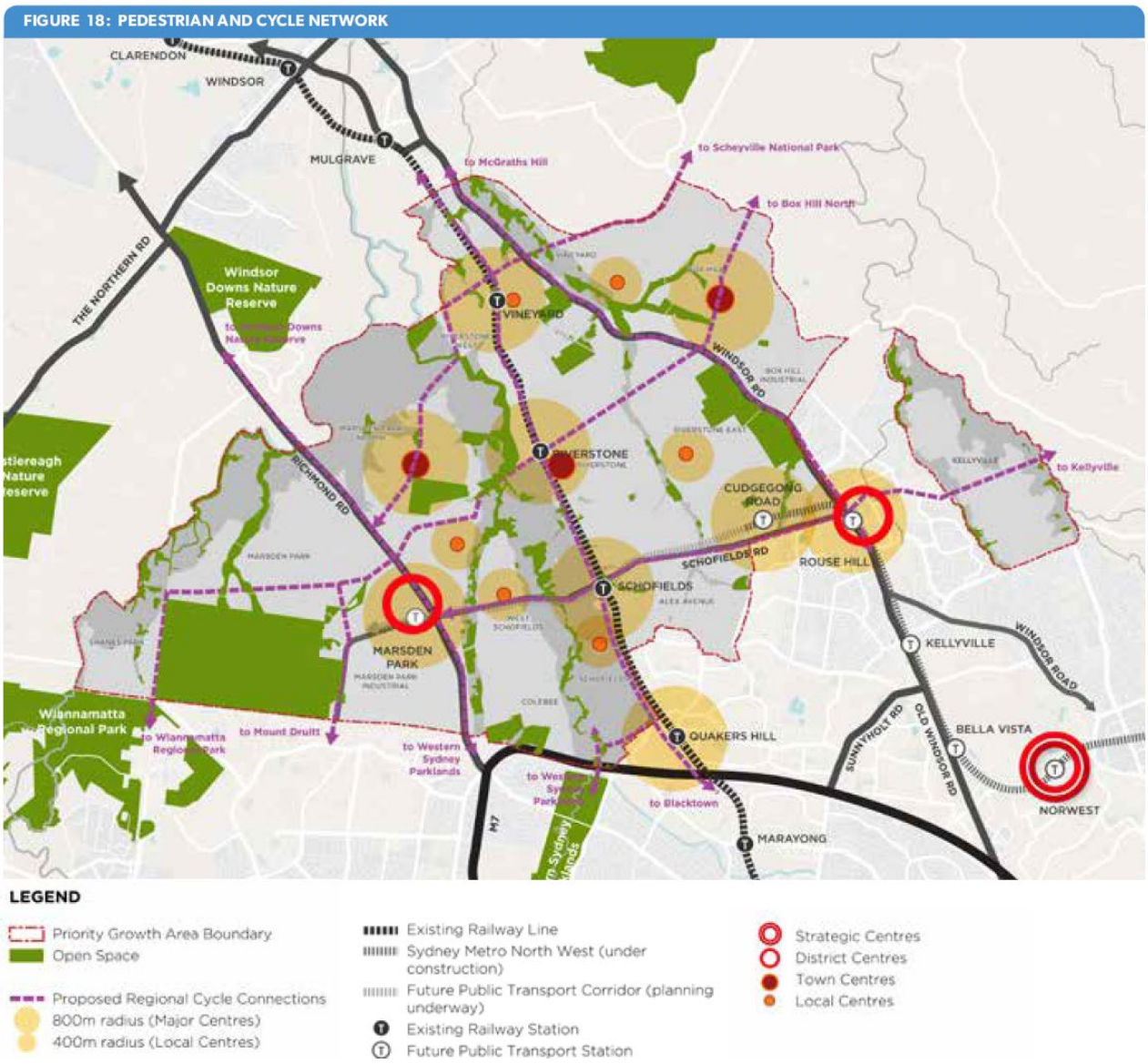

Figure 3-2: NWPGA proposed active transport network

Source: Department of Planning, 2017

3.2.2 State Environmental Planning Policy (SEPP) (Sydney Region Growth Centres), 2006

The Growth Centres SEPP is the main legal framework for managing land release and rezoning in the North West Priority Growth Area. Within the study area, five areas have been subject to rezoning under this SEPP and amendments to respective LGA's development control plans have been either made or proposed to accommodate the change in density and urban form (as shown in **Figure 3-3**). It sets out the essential planning controls for infrastructure developments around growth centres. The SEPP aims to:

- Coordinate land release for residential, employment, and other urban developments in the North West and South West Growth Centres of Sydney.
- Create vibrant, sustainable, and livable neighborhoods that promote community wellbeing and high-quality local amenities (for example, Marsden Park and Schofields).
- Ensure orderly and economical infrastructure provision in and to these growth centres.

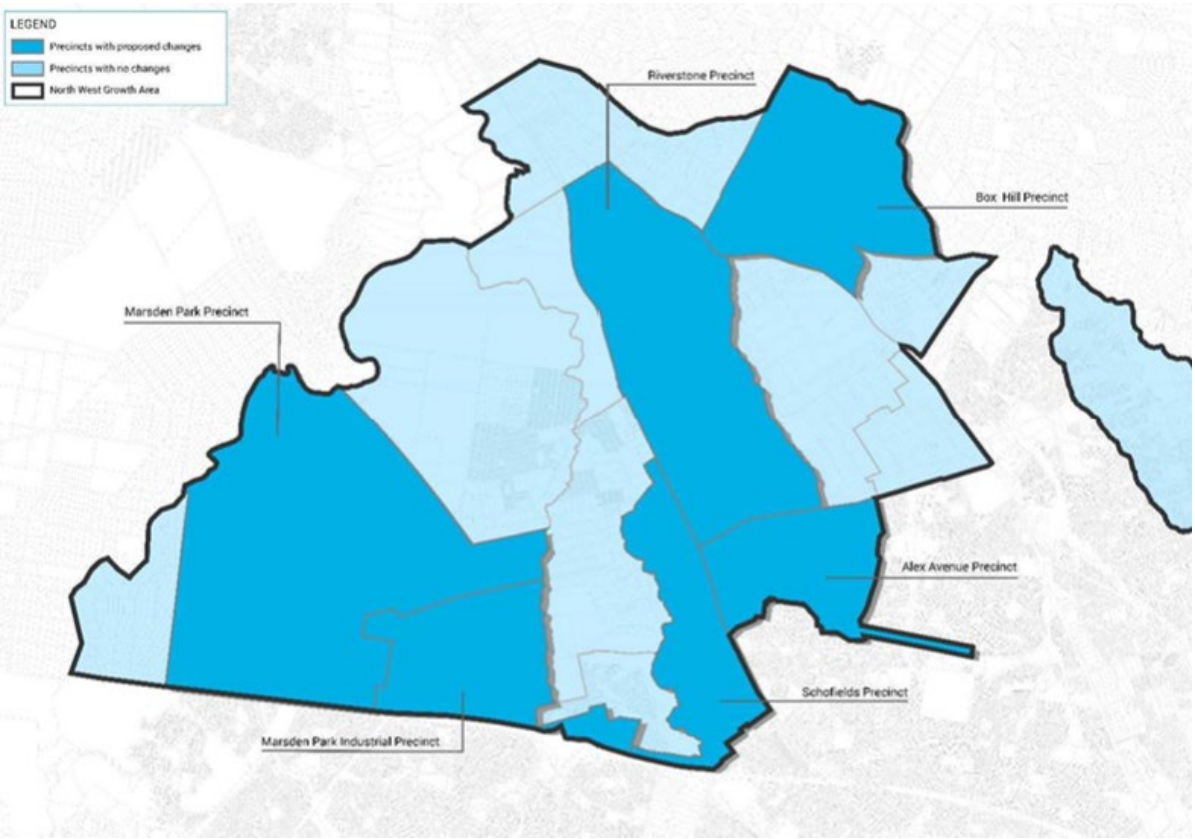

Figure 3-3: Rezoned areas under growth centres SEPP

3.2.3 Future Transport Strategy, Transport for NSW, 2022

Future Transport Strategy is the NSW State Government's vision for future mobility across Metropolitan Sydney and Regional NSW. Future Transport Strategy is the next iteration following Future Transport 2056, which was released in 2018. The document represents a major shift in social and economic change which has been brought about through the pandemic, bushfires and drought which have all happened since.

Future Transport Strategy is built around 14 strategic directions which sit under three key themes:

- Connecting our customers' whole lives
- Successful places for communities
- Enabling economic activity.

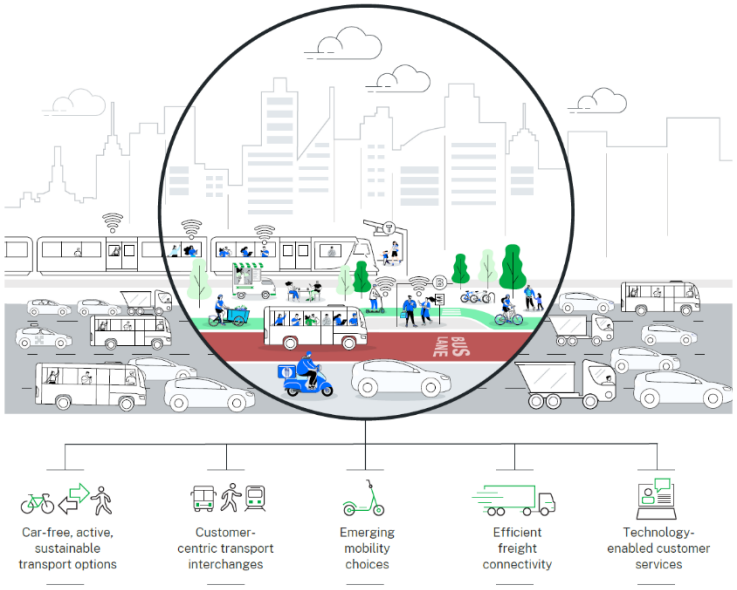

Figure 3-4: Future transport strategy at a glance

Each key theme is supported by planning priorities and actions that provide direction in achieving the theme. The priorities and actions relevant to this study are provided in **Table 3-1**.

Table 3-1: Future transport strategy planning priorities

Planning priorities	Priority actions relevant to the Study
Connectivity is improved across NSW	• Develop Strategic Cycleway Corridors for each of the six cities to provide the foundation for safe, convenient and well-connected cycleways and support councils' local cycling networks. • Connect regional cities, town centres, towns and villages. • Identify, review and amend regulations that disincentivise walking or cycling where appropriate.
Multimodal mobility supports end to-end journeys	• Provide customer-centric design for public transport interchanges • Facilitate efficient freight connectivity and access between centres.
Supporting growth through smarter planning	• Work towards transforming rail between metropolitan cities • Plan and support growth around public transport • Improve parking provision and management.
Transport infrastructure makes a tangible improvement to places	• Ensure 15-minute walking, cycling and micro-mobility networks are planned or under development within the catchment prior to new train stations, major bus stops and interchanges opening • Improve amenity of places along State Roads • Plan and build transport infrastructure that makes places more liveable.

Planning priorities	Priority actions relevant to the Study
Freight networks and supply chains are efficient and reliable	• Prioritise street space to walking, cycling and public transport where new projects provide alternative connections or bypasses for through traffic • Manage and protect employment lands, key freight and logistics land • Increase rail freight capacity and efficiency

A future road and freight rail corridor is proposed between Bradfield Airport and Newcastle / Central Coast, passing through the study area, as depicted in **Figure 3-5**. In addition, a rapid bus route is proposed between Marsden Park and Rouse Hill, crossing the Richmond Road Corridor. A future rail line is also indicated between Marsden Park and Rouse Hill.

The future indicative rapid bus and rail networks are shown in **Figure 3-5** and **Figure 3-6**.

Figure 3-5: Greater Sydney indicative future rapid bus network

Source: Future Transport Strategy, Transport for NSW

Figure 3-6: Greater Sydney indicative future rail network

Source: Future Transport Strategy, Transport for NSW

3.2.4 Greater Sydney Region Plan – A Metropolis of Three Cities, Greater Sydney Commission, 2018

The Greater Sydney Commission's (GSC) Greater Sydney Region Plan presents a vision of three cities within Greater Sydney, where most residents live within 30 minutes access of their jobs, education and health facilities, services and great places.

For Central River City, the plan has identified the strategic importance that North West Priority Growth Area holds to leverage sustainable and planned growth. Eleven precincts have been identified within NWPGA which include residential subdivisions, neighbourhood centres, employment hubs, health and education which will contribute towards increasing the city's economic prominence. This growth will attract knowledge intensive jobs to the city.

The Plan identifies the need to investigate a potential north-south train link connection from Cudgegong Road to Campbelltown-Macarthur linking Western Sydney Airport and Badgerys Creek Aerotropolis to economic nodes such as Sydney Science Park, St Marys, Marsden Park and Rouse Hill in the east, as well as Oran Park, Narellan and Campbelltown Macarthur in the south west.

3.2.5 Western City District Plan, Greater Sydney Commission, 2018

The Western City District Plan supports the Greater Sydney Region Plan developed by GSC, with a focus on the Western Parkland City over the next 20 years.

The North West Priority Growth Area has been identified as a major urban release area which will provide significant housing and employment capacity in the medium and long term. The Vineyard Precinct and other towns in the NWPGA are planned to undergo transformation under a collaborative partnership between NSW government and relevant councils.

A number of planning initiatives will shape the Western City District, influencing the NWPGA, such as:

- a North South Rail Link between Cudgegong Road and St Marys and Badgerys Creek Aerotropolis and Macarthur
- Western Sydney Airport – Badgerys Creek Aerotropolis to Parramatta train link
- Outer Sydney Orbital road and freight rail.

The City's population is predicted to grow in the number of people aged 65 or over, with an increase to 18 per cent in 2036 from 13 per cent in 2016. Walkable neighbourhoods create opportunities for older people to continue to contribute to the community and improve wellbeing.

3.2.6 Central City District Plan, Greater Sydney Commission, 2018

The Central City District Plan supports the Greater Sydney Region Plan developed by GSC, with a focus on the Central River City over the next 20 years.

The NWPGA, which includes the suburbs of Riverstone, Vineyard, Schofields, Marsden Park and Colebee has been positioned as a major land release area with Marsden Park as its strategic centre. The NWPGA

has been identified as a priority investment which will include new neighbourhoods, centres, industrial and employment hubs. Marsden Park has been considered as an emerging strategic centre and the largest employment zone in the NWPGA, which is expected to provide 10,000 jobs by 2036.

Norwest Business Park is an existing established commercial centre which is undergoing major transformation. By 2036, it will provide 53,000 jobs. Centred around Sydney Metro Northwest station at Bella Vista, it provides opportunity to transform the existing business park into transit oriented, more diverse, walkable and vibrant hub which promotes higher mixed-use densities.

Rouse Hill has been identified as a health and education precinct which will provide 11,000 jobs by 2036. This will be complemented by the presence of Sydney Metro Northwest connectivity providing access to wider network.

3.2.7 North West Growth Centre and Riverstone Corridor Traffic Study, Transport for NSW, 2014

This study was done as part of the NSW Government's overall infrastructure strategy for Sydney's north-west to focus on the provision of grade-separated road crossings across the rail line. This study looks at short-, medium- and long-term options of potential road crossings of Richmond Line. The key recommendations for NWPGA includes:

- link Westminster Street with Garfield Road West to provide an alternative route
- Schofields Road extension to Richmond Road as a four-lane road
- Bandon Road underpass on alignment A2 to Richmond Road in the west
- Consider heavy vehicle restrictions through the Riverstone town centre.

3.2.8 Road Safety Plan 2021, Transport for NSW

The Centre for Road Safety released its Draft Road Safety Plan 2021 in February 2018, following an extensive consultation process, with the aim of dramatically reducing the road toll in NSW. Regional NSW is over-represented in transport fatalities with 67 per cent of fatalities occurring on country roads. The plan is based on the Safe System approach, approaching road safety through safer roads, speeds, people and vehicles. It also provides a range of state-wide crash statistics.

The plan defined six priority areas designed to help the NSW Government reach its State Priority Target of reducing the total number of road-related deaths across the State by 30 per cent from 2008-2010 levels by 2021. These included:

- saving lives on country roads
- liveable and safe urban communities
- using the roads safely
- building a safer community culture
- new and proven vehicle technology
- building a safe future.

3.2.9 NSW Freight and Ports Plan 2018 – 2023, Transport for NSW

The Freight and Ports Plan sets the NSW Government's priorities for the sector over the five year period, and outlines a number of actions to achieve five objectives:

- economic growth
- efficiency, connectivity and access
- capacity
- safety
- sustainability.

Marsden Park and Rouse Hill have been identified as a strategic centres and freight activity precincts. M7 Motorway that passes from the southern end of the study area has been identified as a key freight corridor connecting NWPGA to south-western Sydney. Alongside this road corridor, the Marsden Park Industrial Precinct is also strategically located in close proximity to the freight rail corridor at Blacktown and Riverstone.

The main goal for NWPGA is to plan, retain and manage the industrial land in the upcoming and established urban areas to improve the efficiency of flow of freight through the north-west trade gateway.

3.3 Local government

3.3.1 Blacktown Council's Local Strategic Planning Statement (LSPS) 2040, 2020

The Blacktown Council Local Strategic Planning Statement (LSPS) sets the plan for the community's social, environmental and economic land use needs over the next 20 years to 2040.

The LSPS divides the area into 4 precincts – Blacktown, Mount Druitt, Riverstone and Marsden Park, with the vision for people to be able to access their nearest strategic centre on high-frequency public transport.

The LSPS identifies Schofields Town Centre to be revitalised through a place-based precinct planning approach centred around an important transport node. Schofields Town Centre is conveniently located on the North Shore, Northern, Western, and Cumberland train lines. It also benefits from regular bus services to Blacktown and Rouse Hill. The train journey to Parramatta CBD from Schofields takes approximately 25 minutes, making it an ideal spot for new residential and mixed-use developments.

The relevant outcomes and strategies from the Blacktown LSPS are provided in **Table 3-2**.

Table 3-2: Relevant outcomes and strategies (Blacktown LSPS 2020)

LSPS theme	Relevant planning priorities
Infrastructure and collaboration – A successful city	• Connecting our city via strategic links • Providing infrastructure which aligns with growing demands
Liveability – A vibrant, liveable city	• Undertake place-based planning in existing centres and urban renewal precincts • Striving for affordable and diverse housing supply which meets the growing demand
Productivity – A thriving, attractive city	• Creating strong and vibrant centres • Promoting increase in local employment and investment • Creating a smart, connected, productive city
Sustainability – A respected and protected natural environment	• Embracing our unique landscape setting • Respecting and protecting our natural assets • Managing our use of finite resources • Adapting to climate change and building resilience

The LSPS provides key actions for each precinct to enable a connected and sustainable city. The ones relevant to study area outlined below:

- Proposed extension of Sydney Metro from Tallawong Station to Schofields, Marsden Park and Western Sydney Airport
- Duplication of Richmond Rail line
- Support planning of Bandon Road and upgrades to Garfield Road and Burdekin Road
- Support in planning and delivery of Rouse Hill Hospital and Regional Park precincts
- Promote higher density development around Tallawong, Schofields, Quakers Hill, Riverstone and Vineyard stations
- Support higher density housing around Marsden Park Strategic Centre.

The transport connectivity infrastructure plan provided by Council in the LSPS is shown in **Figure 3-7**. No major active transport projects are proposed by Blacktown City Council within close proximity to the Study Area.

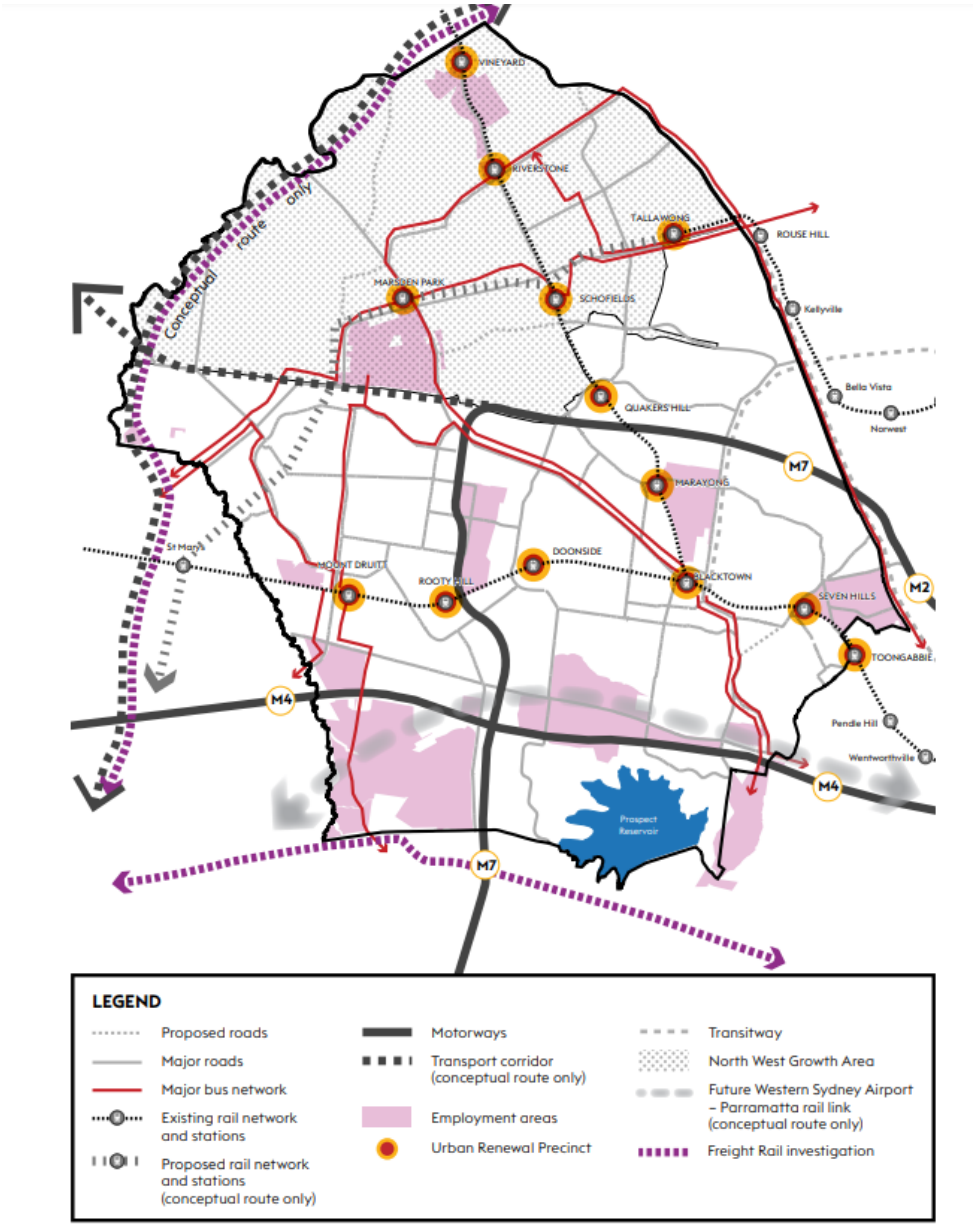

Figure 3-7: Blacktown City Council LSPS – Transport Infrastructure Plan

Source: Blacktown Council LSPS

3.3.2 Blacktown City Council Integrated Transport Management Plan (ITMP), 2013

The Blacktown City Council ITMP is a long-term strategy designed to guide the development of Blacktown's transport system over the coming decades. The ITMP is formed on basis of three strategic directions of reducing car dependency, improving public transport access and supporting sustainable travel options. Within these strategic directions, it lays out specific actions and transformational projects.

Key relevant actions from the ITMP are outlined below:

- Upgrading Schofields Road
- Plan and implement road network in the North West Growth Centre precincts
- Securing public transport corridor in Marsden Park and Mount Druitt.

3.3.3 The Hills Shire Council's (The Shire) LSPS 2036

The Hills Shire Council Local Strategic Planning Statement (LSPS) sets the plan for the community's social, environmental and economic land use needs over the next 12 years to 2036.

This LGA is located on the eastern fringes of the study area separated by Windsor Road. Amongst all of Shire's strategic centres, Rouse Hills is the only centre that forms part of the study area.

The LSPS identifies Rouse Hill strategic centre within NWPGA to be revitalised through a place-based precinct planning approach centred around an important metro transport node. Rouse Hill serves a rapidly growing region with a mix of residential, commercial, shopping and community facilities. The strategic centre also complements the new Rouse Hill Hospital Precinct.

Table 3-3: Relevant outcomes and strategies (The Shire LSPS 2019)

LSPS theme	Relevant planning priorities
Economy	• Plan for sufficient local jobs which aligns with the demand. • Plan to retain and manage industrial land • Plan and develop strategic centres to support the employment
Shaping Growth	• Undertake place-based planning in existing centres and urban renewal precincts • Plan affordable and diverse housing supply which meets the growing demand • Plan and provide social infrastructure to meet local's needs
Infrastructure	• Plan for connected and accessible public transport • Plan and build active transport network • Encourage sustainable travel choices
Environment	• Respecting and protecting our natural assets • Manage natural resources by protecting the existing zones • Plan, manage and take steps to protect the urban/rural interface in the planning process

The infrastructure plan provided by Council in the LSPS is shown in **Figure 3-8**.

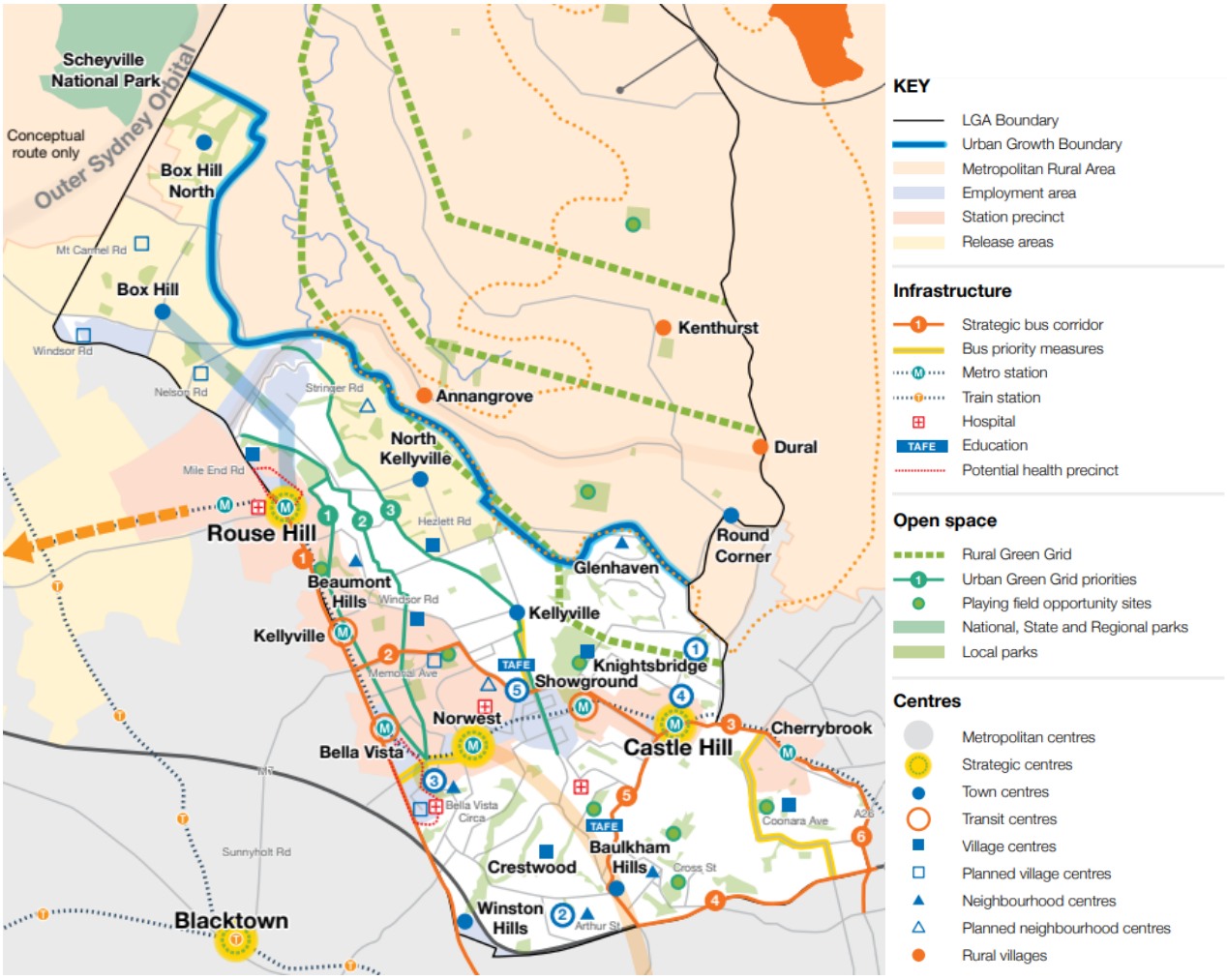

Figure 3-8: The Hills Shire LSPS – Infrastructure Plan

Source: The Hills Shire LSPS

3.3.4 Hawkesbury LSPS 2040, 2021

The Hawkesbury Local Strategic Planning Statement (LSPS) sets the plan for the community's social, environmental and economic land use needs over the next 20 years to 2040. The LSPS identifies NWPGA as a key urban release area for future development. Within the Hawkesbury LGA, Vineyard Precinct – Stage 1 has been rezoned to provide 2500 dwellings.

The LSPS identifies Vineyard Precinct within NWPGA to be revitalised through an integrated precinct planning approach, which will include adequate and timely delivery of housing around associated transport infrastructure. The LSPS also identifies Windsor and Richmond as strategic centres in alignment with the *Western City District Plan.* These centres are proposed to be support the LGA's economic development through establishing a balance between mixed-use, commercial and residential zones.

The relevant actions from the LSPS are outlined below:

- To work proactively with TfNSW to provide efficient bus-routes between Blacktown, Rouse Hill, Windsor, Richmond, St Marys and Penrith
- Provide efficient delivery of services to support the development of Vineyard Precinct Stage 1 works.

4 Existing and future road and traffic conditions

This chapter provides an overview of land use and population, road network, mode share, crash data and the active and public transport network.

4.1 Land use

4.1.1 Existing

The study area is comprised of Blacktown, Hawkesbury, Penrith and The Hills Shire Local Government Areas (LGA). General land zoning within the study area is provided within the *Blacktown Local Environment Plan (LEP) 2015*, *the Hills LEP 2019, Penrith LEP 2010 and Hawkesbury LEP 2012.*

Key features of land use surrounding the Richmond Road Corridor include:

- To the west of the Richmond Road between Garfield Road and Heritage Road, the land is zoned as Low-Density Residential (R2)
- Commercial and industrial related land uses on both sides of Richmond Road include Light Industrial (IN2), Primary Production Small Lots (RU4), Business Development (B5).

Key land uses within proximity to the study area include:

- **Schools** – Multiple public and high schools are located within the study area, including Northbourne Public School, Marsden Park Public School, Bligh Park Public School and Hassall Grove Public School
- **Major centres** – Richmond-Windsor and Rouse Hill
- **Town centres** –Existing Schofields, Riverstone and Quakers Hill Station have small number of local shops and eateries located around them
- **Marsden Park Industrial Area** – provides various logistics and warehousing facilities, supporting regional and interstate freight activities.

Key land uses within the study area are shown in **Figure 4-1**

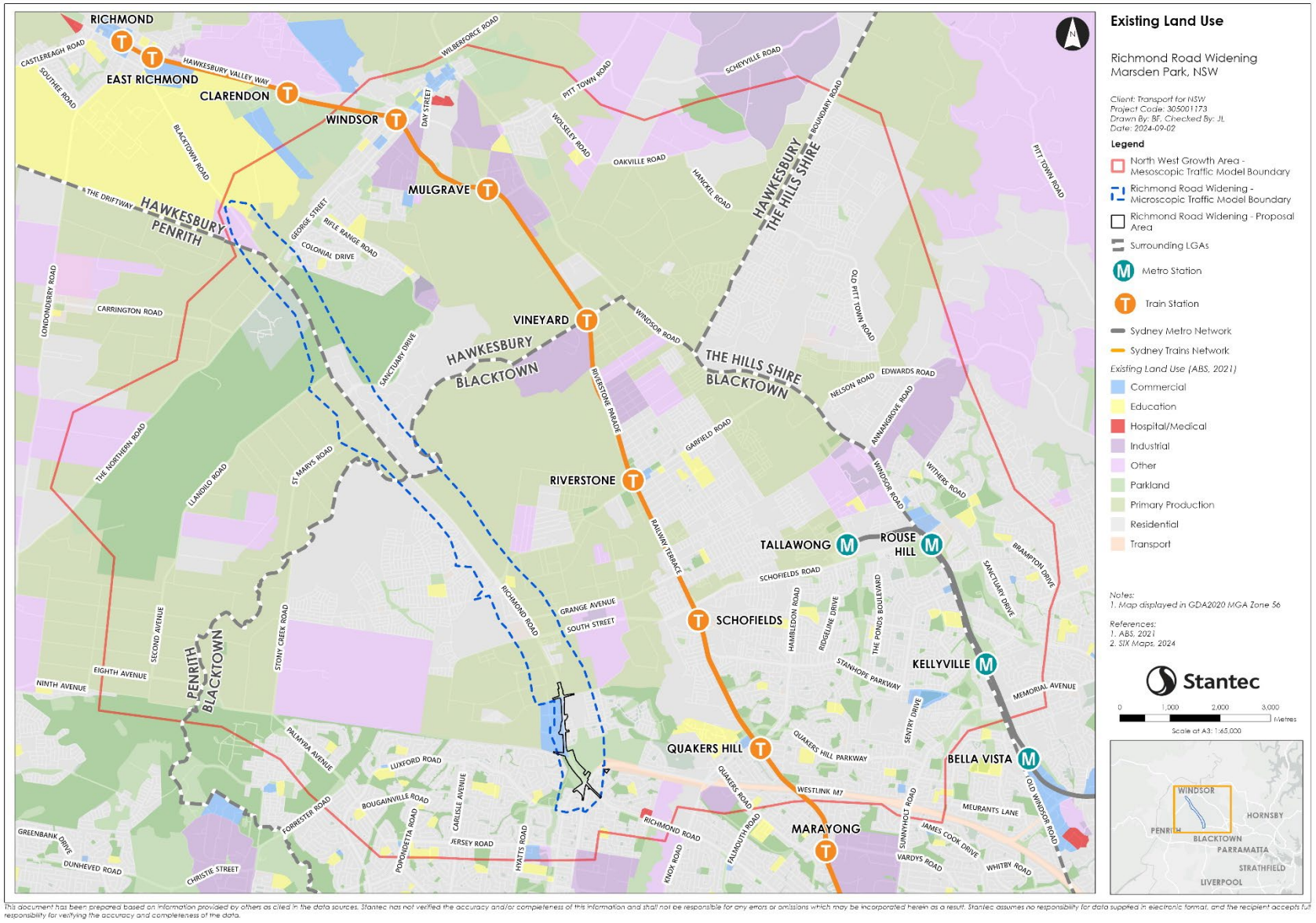

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Figure 4-1: Existing land use

4.1.2 Future

Following the release of *A Plan for Growing Sydney in December 2014*, which identified a number of significant infrastructure initiatives including the new Western Sydney Airport at Badgerys Creek, the Department of Planning and Environment developed the *North West Priority Growth Area Land Use and Infrastructure Implementation Plan (DPE, 2017)* to address key issues and existing shortcomings.

The plan has clear objectives of increasing housing and employment as well as supporting infrastructure.

4.1.2.1 Land Use

Key future land use actions include:

- Rezoning proposals for the remaining North West Priority Growth Area Precincts that have the potential to deliver more homes and jobs
- Ensure that rezonings occur in line with the availability of essential service utilities
- Work with local councils to prepare development control plans and Section 94 Contributions plans that will ensure design quality and support growth in those areas.
- Establish new density controls for residential land. The controls will set minimum and maximum residential densities for residential zoned land so that new communities are supported by adequate infrastructure and local councils can plan for the new population.

The theoretical capacity of the Priority Growth Area for new homes has increased from 70,000 to 90,000 (a population of approximately 250,000 people), and it is anticipated that around 33,000 dwellings will be delivered within the next ten years.

Key areas identified as suitable for employment land include Marsden Park (opportunity for 10,000 new jobs), Box Hill (opportunity for 16,000 new jobs) and Riverstone/ Vineyard (opportunity for 15,000 new jobs). The break down of housing and employment opportunities are shown in **Figure 4-2**.

TABLE 4. MARKET DEMAND-BASED HOUSING ESTIMATES (SOURCE: AEC GROUP, 2017)*

Local Government Area	Development Area (ha)	Potential new homes
Blacktown (including the suburbs of Marsden Park, Schofields, Colebee, Riverstone, Rouse Hill and part of Vineyard)	3,270	60,614
Hawkesbury (including part of the suburb of Vineyard)	256	2,880
The Hills (including the suburbs of Box Hill and Kellyville)	993	21,017
Total	**4,519**	**84,511**

** Projections are based on market analysis*

TABLE 5. ZONED EMPLOYMENT AREAS IN THE NORTH WEST PRIORITY GROWTH AREA[1]

Project Area	Industrial	Business Park	Jobs
Marsden Park	246.6 ha	70.6 ha	10,000
Box Hill	6.55 ha	69.18 ha and 26.93 ha (enterprise corridor)	16,000
Riverstone and Vineyard	37ha (Light Industrial) 72ha (General Industrial)	36 ha	15,000
Total	**362.15ha**	**199.71ha**	**41,000**

[1] *Table 5 uses ha to represent hectares.*

Figure 4-2: Future housing and employment demand

4.1.2.2 Active transport

- Key regional active transport corridors have been proposed on Windsor Road, Richmond Road, Bandon Road, Garfield Road and Schofields Road.
- The Department will review land that has been rezoned to improve pedestrian and cyclist facilities between key destinations and regional open spaces outside of the growth area.
- Support the implementation of the Green Grid through the Eastern Creek regional open space corridor to connect to the Western Sydney Parklands, Wianamatta Regional Park and Rouse Hill Regional Park.

4.1.2.3 Public transport

Currently the Sydney Metro North-West at Tallawong, Rouse Hill and Kellyville along with T1 Western Line at Schofields collectively offer high rail connectivity to the NWPGA. Along this line, opportunities for new development have been identified in Vineyard, Riverstone West, Riverstone, Schofields, and Marsden Park North, which all fall within the study area.

Key public transport actions include:

- Strategic land use review of the future public transport corridor between Rouse Hill and Marsden Park along Schofields Road. This project would connect the Sydney Metro Station at Rouse Hill with employment opportunities at Marsden Park, with an interchange at Schofields Station.
- High order bus routes are proposed:
  - The Box Hill to Marsden Park route would connect to Mt Druitt via Daniels Road busway,
  - The Schofields Road route would connect to Blacktown via Richmond Road and to Penrith via South Street,
  - Rouse Hill to Parramatta and Castle Hill to Blacktown via T-way are identified as separate rapid routes in Sydney's Bus Future.

4.1.2.4 Road

Richmond Road Upgrade (core area) has been identified as a key infrastructure project to be delivered, as it is the main road which provides primary north-south access through NWPGA along with M7 Motorway and Windsor Road. Connected to these, Schofields Road, Garfield Road and Bandon Road form major access links providing access to the wider local and regional road network, which are proposed to be upgraded.

Key road upgrades include:

- upgrades to Richmond Road and Schofields Road (from Tallawong road to Veron Road, and Veron Road to Richmond Road)
- extension of Burdekin / Townson Road and Bandon Road, as well as additional grade separated rail crossings of the existing Western Line
- Preliminary corridor planning for the Outer Sydney Orbital and Bells Line of Road Castlereagh Corridor.

The overall NWPGA land use plan is shown in **Figure 4-3**.

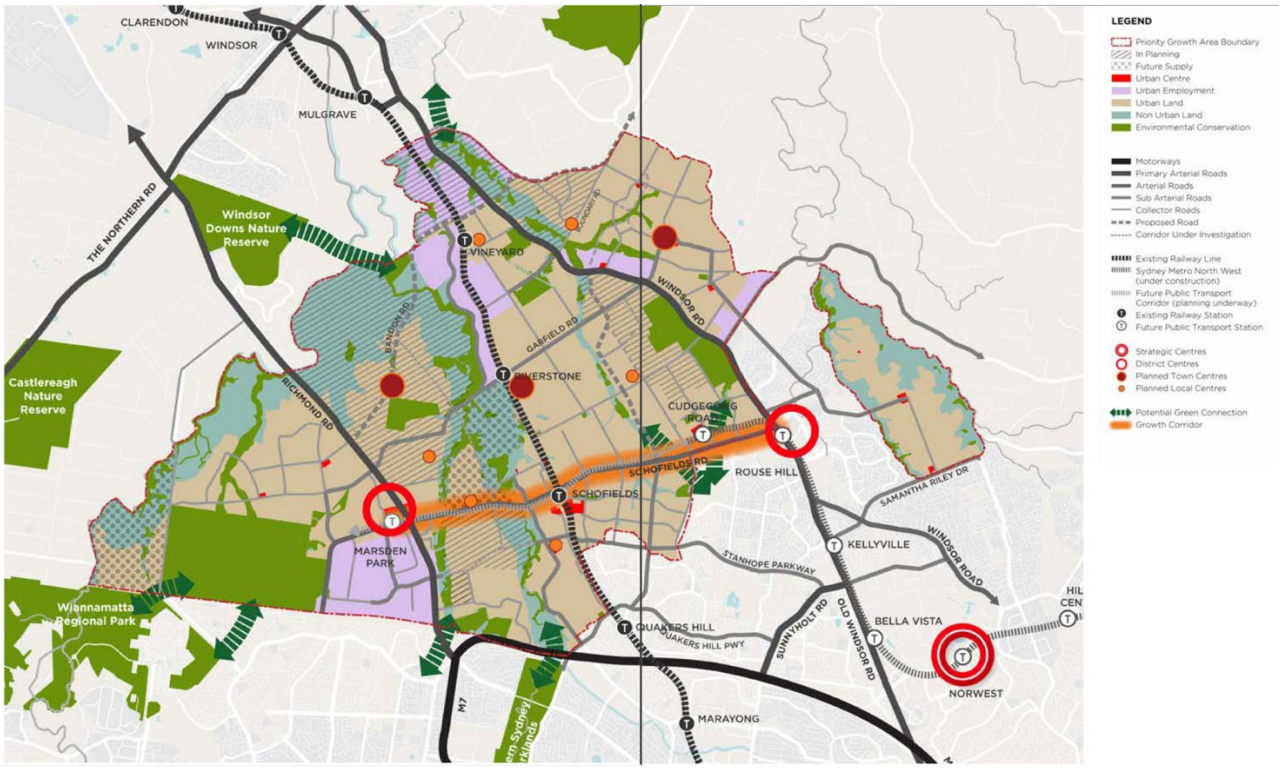

Figure 4-3: NWPGA land use plan

4.2 Population and employment

4.2.1 Existing

The study area lies within 13 SA2s. Existing population and employment details for these areas as defined by the ABS Census 2021 is outlined in **Figure 4-4**. Statistical Area 2 (SA2) areas are shown in **Figure 4-5**.

The Riverstone – Marsden Park SA2 area consistently has the highest population, employment and workforce within the study area. Other large areas of employment include Rouse Hill – Beaumont Hills and Windsor – Bligh Park. Residential areas such as Acacia Gardens have small amounts of jobs available.

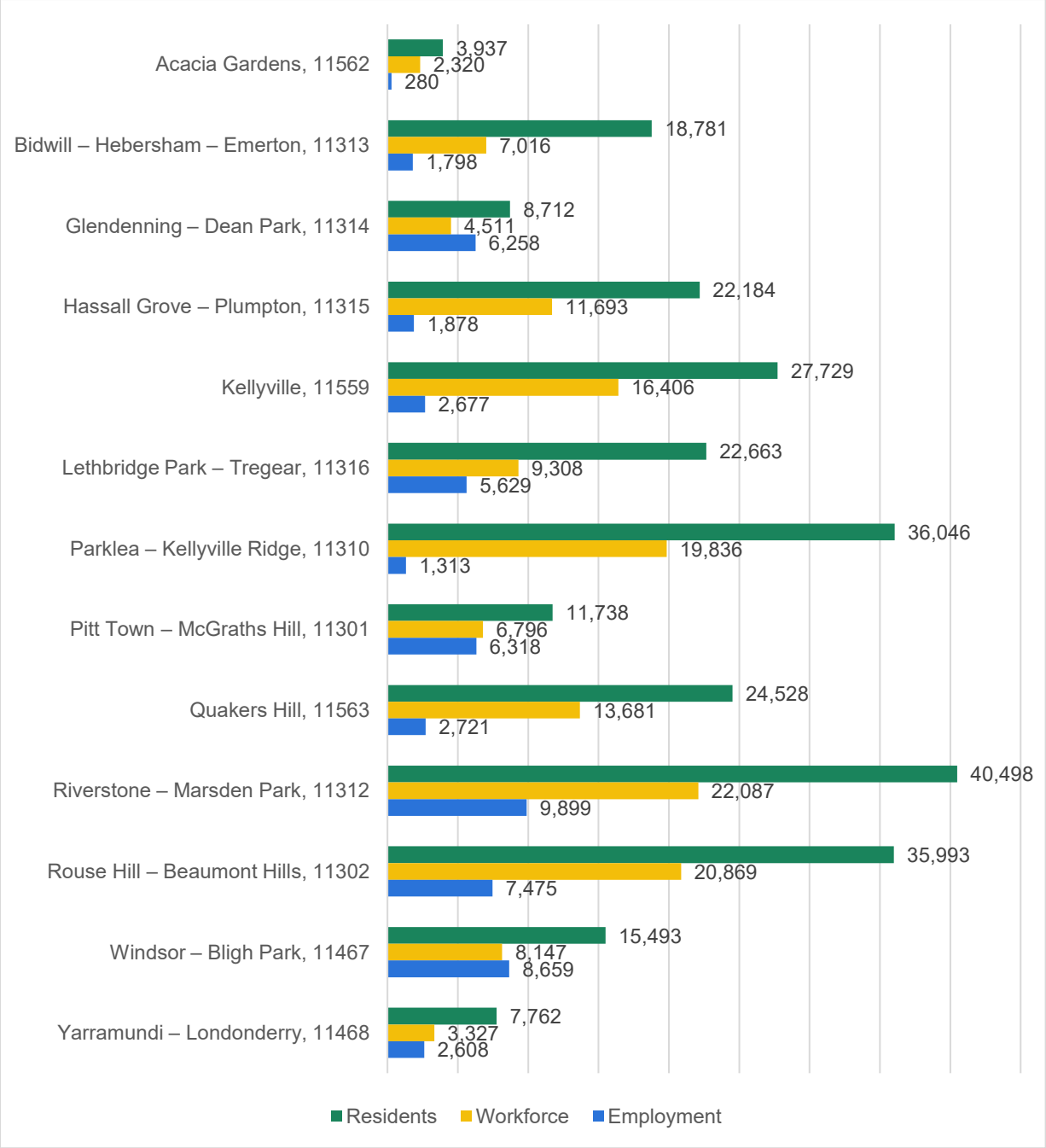

Figure 4-4: Current resident and employment information (ABS, 2021)

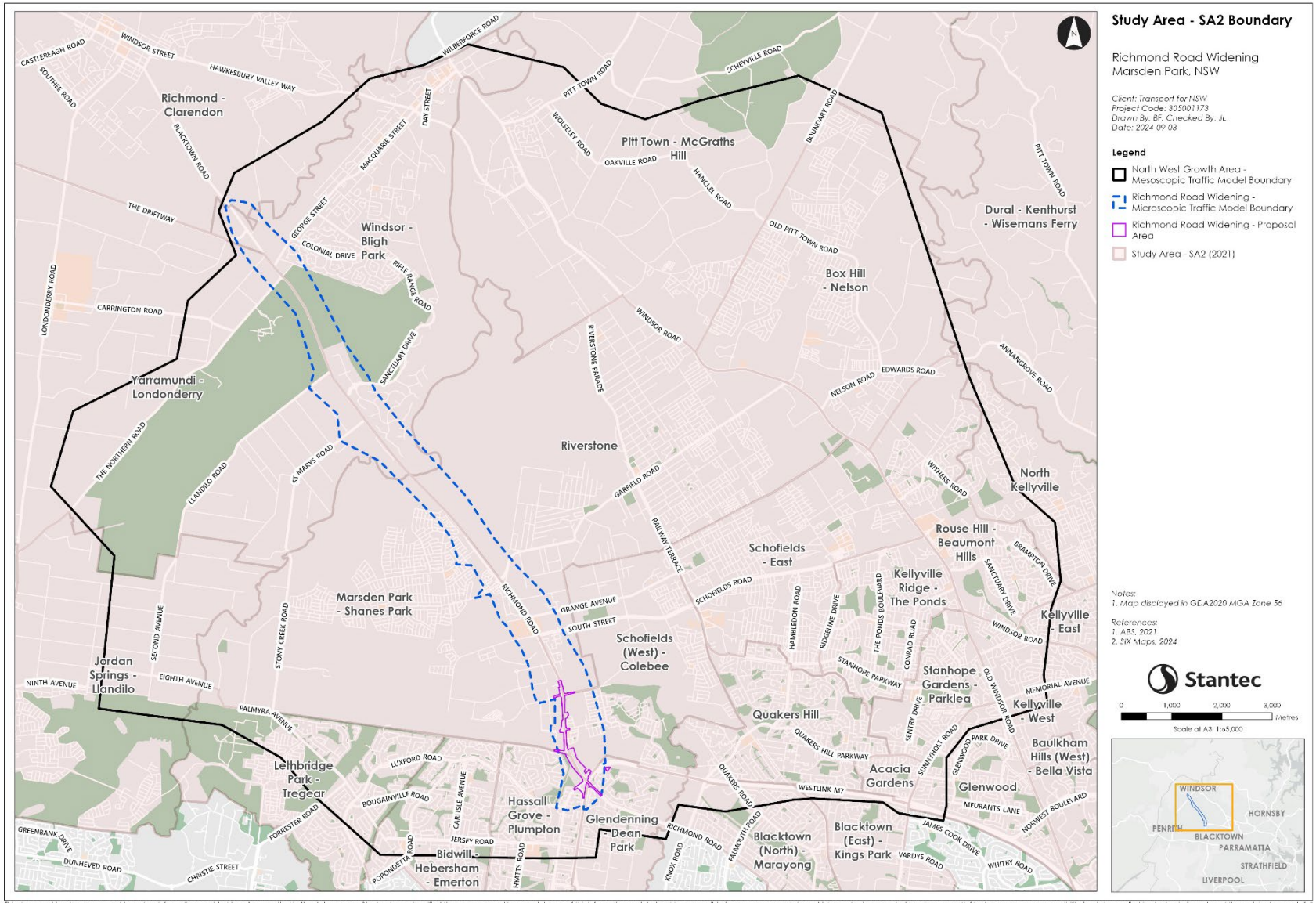

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Figure 4-5: SA2 boundaries-2021

4.2.2 Future projections

The NSW Government provides detailed population projections for various regions, including Statistical Area 2 (SA2). The Travel Zone Projection (TZP) 2022 show future projections for population, employment and workforce. These projections for forecast years of 2026, 2031, 2036 and 2041 for the estimated residential population, workforce (number of employed persons) and employment (number of jobs) are outlined in **Table 4-1**, **Table 4-2** and **Table 4-3**, and graphically represented in **Figure 4-6**, **Figure 4-8** and **Figure 4-10**.

The Riverstone – Marsden Park and Rouse Hill – Beaumont Hills SA2 areas are set for the greatest growth in population, with an increase of 75% and 76% projected between 2021 and 2031 respectively for each. Well established residential areas such as Glendenning – Dean Park and Hassall Grove – Plumpton are not set for any residential growth. Other areas are forecast for low to moderate growth.

Aligning with the population projection, the workforce projection is highest within the Riverstone – Marsden Park and Rouse Hill – Beaumont Hills SA2 areas. A decrease in employed residents is forecast within the Hassall Grove – Plumpton, Acacia Gardens and Glendenning – Dean Park SA2s, which is likely a result of residents ageing out of employment age groups.

The greatest growth in the number of jobs is forecast for the Riverstone – Marsden Park SA2, which is set to more than double in number between 2021 and 2031 (125% increase on the current 9000 jobs). This area aligns with the plans for expansion of the Marsden Park business park and industrial area. Other areas of employment growth include Kellyville, Parklea – Kellyville Ridge, Quakers Hill and Rouse Hill – Beaumont Hills.

Population, workforce and employment is summarised visually in **Figure 4-7**, **Figure 4-9** and **Figure 4-11**.

Table 4-1: Residential population projection

Statistical area 2	Estimated residential population						Change			
	2021	2023	2026	2031	2036	2041	Change between 2021 and 2031 (#)	Change between 2021 and 2031 (%)	Change between 2031 and 2041 (#)	Change between 2031 and 2041 (%)
Acacia Gardens, 11562	3,937	3,937	3,965	3,975	3,986	4,002	38	1%	27	1%
Bidwill – Hebersham – Emerton, 11313	18,781	18,791	18,857	19,060	19,317	19,643	279	1%	583	3%
Glendenning – Dean Park, 11314	8,712	8,713	8,719	8,730	8,744	8,761	18	0%	31	0%
Hassall Grove – Plumpton, 11315	22,184	22,183	22,176	22,164	22,148	22,128	-20	0%	-36	0%
Kellyville, 11559	27,729	27,779	29,624	37,862	44,048	46,102	10,133	37%	8,240	22%
Lethbridge Park – Tregear, 11316	22,663	22,671	22,773	22,960	23,196	23,497	297	1%	537	2%
Parklea – Kellyville Ridge, 11310	36,046	36,072	36,351	36,726	37,198	37,800	680	2%	1,074	3%
Pitt Town – McGraths Hill, 11301	11,738	11,809	12,188	13,557	15,522	19,226	1,819	15%	5,669	42%
Quakers Hill, 11563	24,528	24,784	24,915	25,478	25,854	26,332	950	4%	854	3%
Riverstone – Marsden Park, 11,312	40,498	42,271	52,607	70,783	91,877	115,080	30,285	75%	44,297	63%
Rouse Hill – Beaumont Hills, 11302	35,993	37,359	47,988	63,287	75,398	80,930	27,294	76%	17,643	28%
Windsor – Bligh Park, 11467	15,493	15,498	15,526	15,593	15,676	15,782	100	1%	189	1%
Yarramundi – Londonderry, 11468	7,762	7,788	7,986	8,357	8,825	9,420	595	8%	1,063	13%

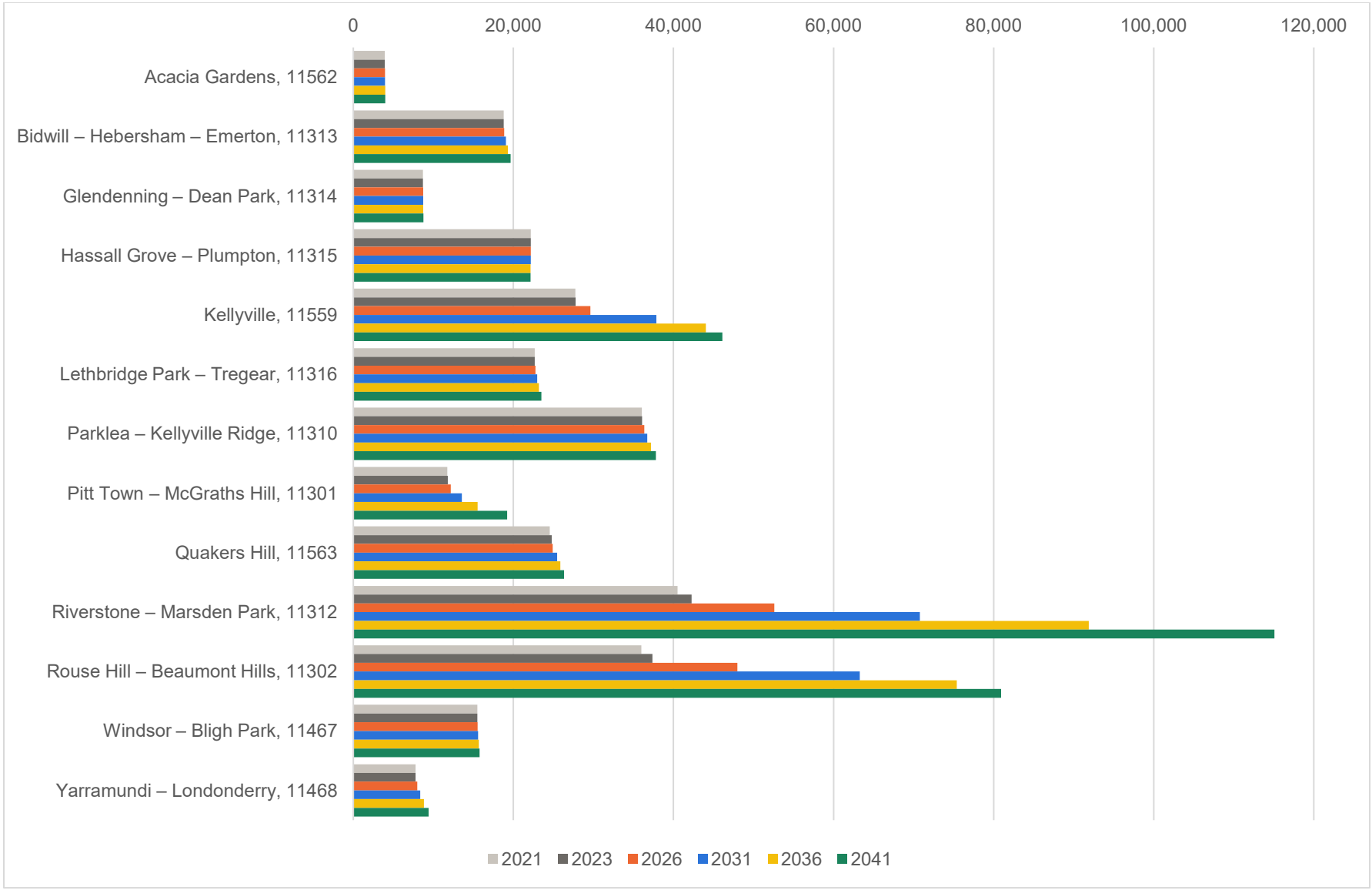

Figure 4-6: Population projections comparison

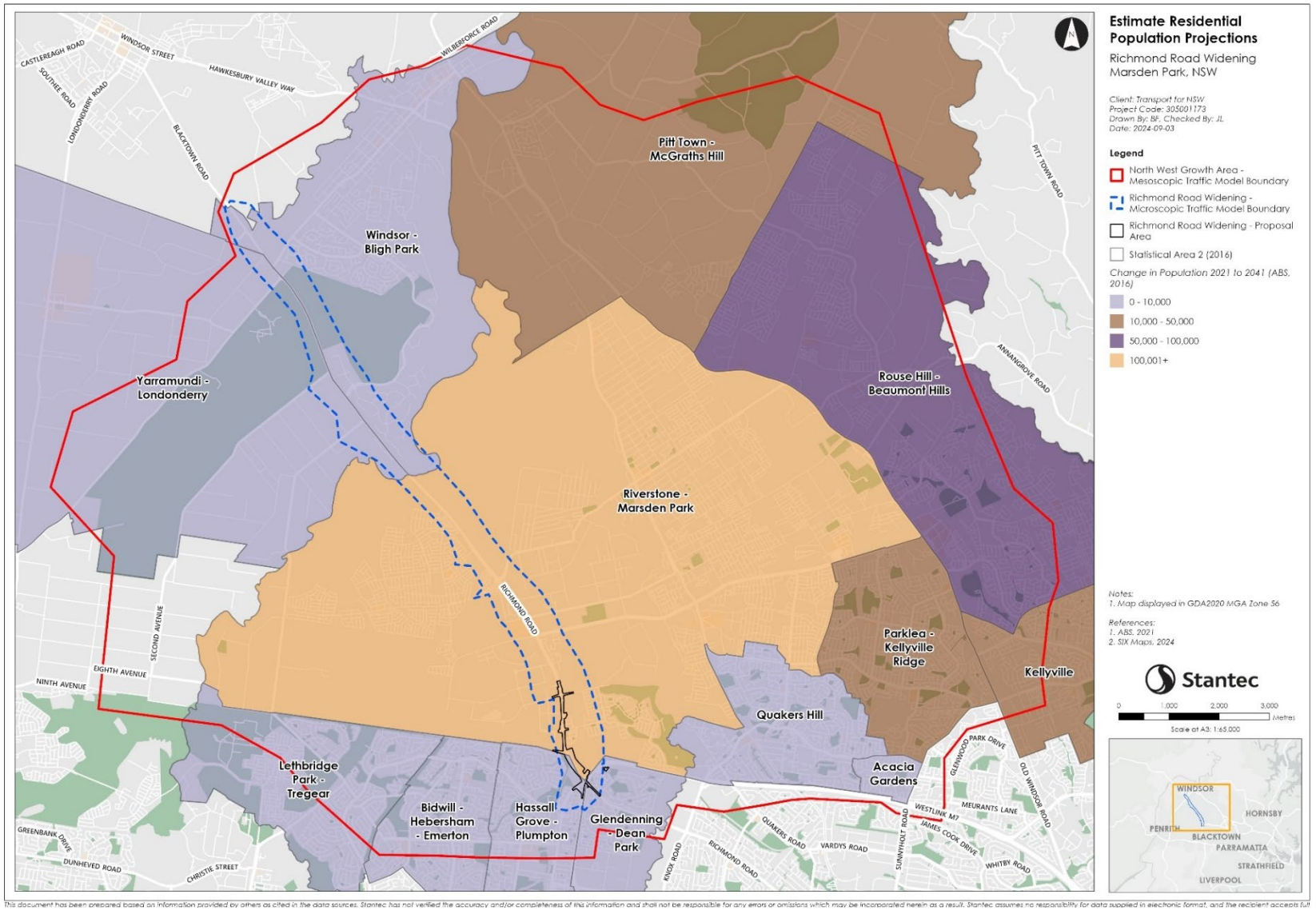

Figure 4-7: Population projections 2021-2041

Table 4-2: Workforce projection

Statistical area 2	Estimated workforce						Change			
	2021	2023	2026	2031	2036	2041	Change between 2021 and 2031 (#)	Change between 2021 and 2031 (%)	Change between 2031 and 2041 (#)	Change between 2031 and 2041 (%)
Acacia Gardens, 11562	2,320	2,351	2,369	2,355	2,343	2,332	35	2%	-23	-1%
Bidwill – Hebersham – Emerton, 11313	7,016	7,194	7,256	7,255	7,321	7,367	239	3%	112	2%
Glendenning – Dean Park, 11314	4,511	4,604	4,622	4,639	4,610	4,568	128	3%	-71	-2%
Hassall Grove – Plumpton, 11315	11,693	11,842	11,748	11,425	11,043	10,661	-268	-2%	-764	-7%
Kellyville, 11559	16,406	16,592	17,752	22,688	26,296	27,383	6,282	38%	4,695	21%
Lethbridge Park – Tregear, 11316	9,308	9,585	9,769	9,966	10,082	10,147	658	7%	181	2%
Parklea – Kellyville Ridge, 11310	19,836	20,340	20,863	21,288	21,464	21,587	1,452	7%	299	1%
Pitt Town – McGraths Hill, 11301	6,796	6,882	7,078	7,809	8,894	10,994	1,013	15%	3,185	41%
Quakers Hill, 11563	13,681	13,961	14,119	14,479	14,640	14,789	798	6%	310	2%
Riverstone – Marsden Park, 11312	22,087	23,730	30,385	41,907	54,559	67,804	19,820	90%	25,897	62%
Rouse Hill – Beaumont Hills, 11302	20,869	22,102	28,905	38,680	46,232	49,573	17,811	85%	10,893	28%
Windsor – Bligh Park, 11467	8,147	8,231	8,199	8,130	8,124	8,113	-17	0%	-17	0%
Yarramundi – Londonderry, 11468	3,327	3,415	3,499	3,619	3,807	4,068	292	9%	449	12%

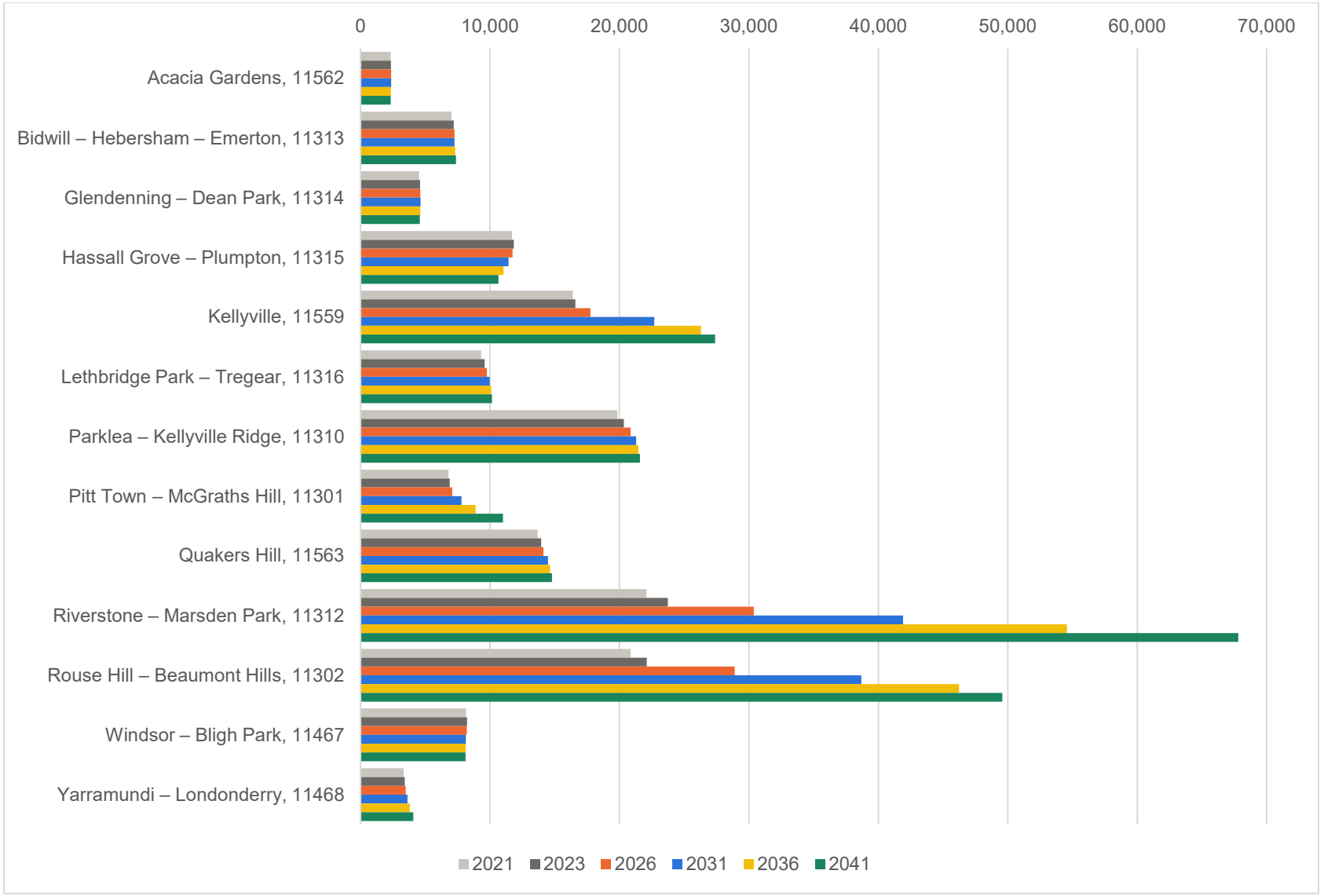

Figure 4-8: Workforce projections comparison

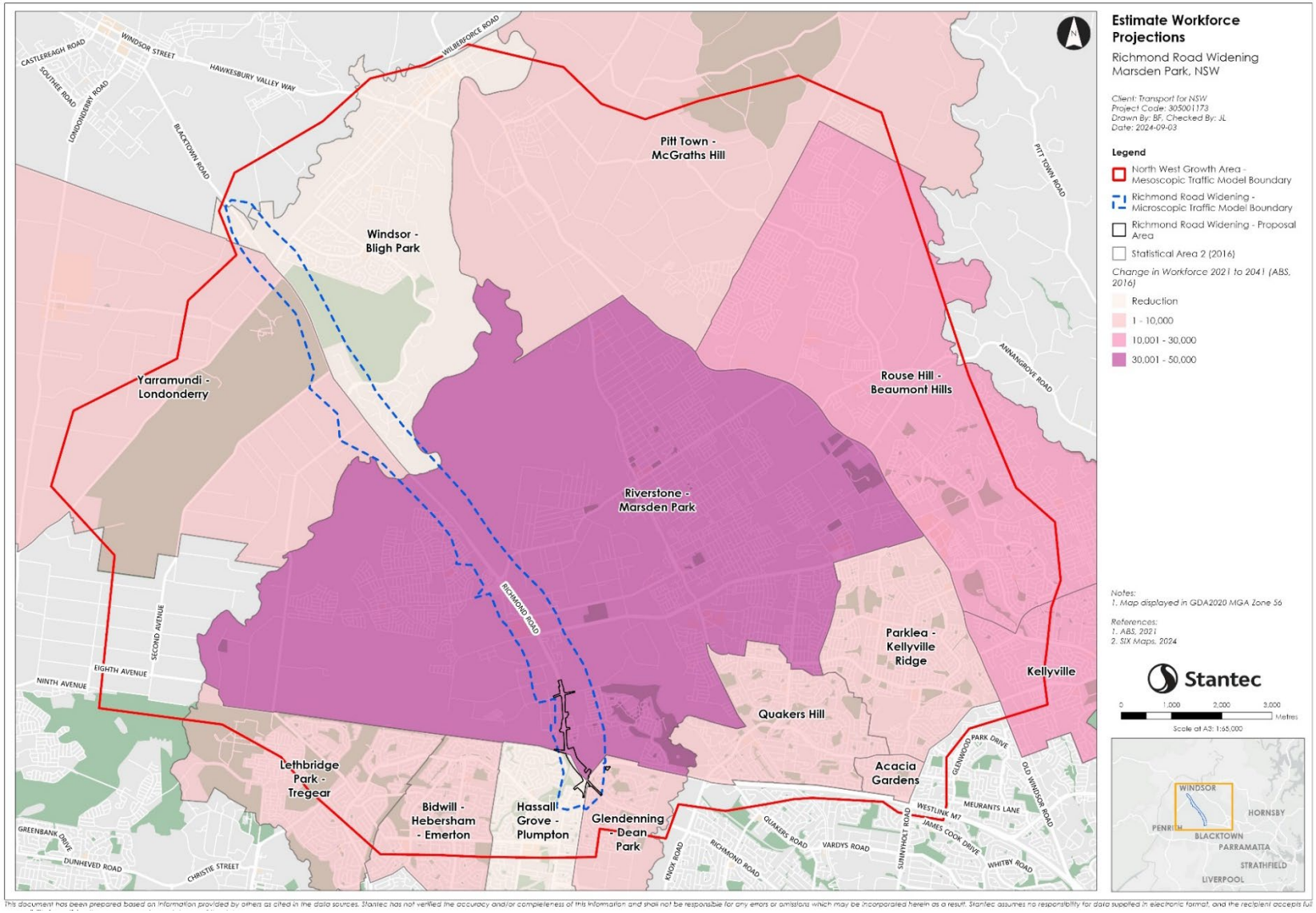

Figure 4-9: Workforce projections 2021 – 2041

Table 4-3: Employment projection

Statistical area 2	Estimated employment						Change			
	2021	2023	2026	2031	2036	2041	Change between 2021 and 2031 (#)	Change between 2021 and 2031 (%)	Change between 2031 and 2041 (#)	Change between 2031 and 2041 (%)
Acacia Gardens, 11562	280	367	394	428	498	556	148	53%	128	30%
Bidwill – Hebersham – Emerton, 11313	1,798	1,845	1,871	1,901	1,960	2,042	103	6%	141	7%
Glendenning – Dean Park, 11314	6,258	6,425	6,323	6,334	6,533	6,718	76	1%	384	6%
Hassall Grove – Plumpton, 11315	2,677	2,753	2,780	2,802	2,875	2,979	125	5%	177	6%
Kellyville, 11559	5,629	6,370	7,642	9,260	10,922	11,289	3,631	65%	2,029	22%
Lethbridge Park – Tregear, 11316	1,313	1,365	1,379	1,398	1,438	1,495	85	6%	97	7%
Parklea – Kellyville Ridge, 11310	4,120	5,034	5,241	5,562	6,343	6,982	1,442	35%	1,420	26%
Pitt Town – McGraths Hill, 11301	6,318	6,085	6,067	6,232	6,346	6,611	-86	-1%	379	6%
Quakers Hill, 11563	2,721	3,609	3,849	4,154	4,899	5,540	1,433	53%	1,386	33%
Riverstone – Marsden Park, 11312	9,899	14,436	18,498	22,253	26,959	30,582	12,354	125%	8,329	37%
Rouse Hill – Beaumont Hills, 11302	7,475	8,294	10,346	13,147	16,327	19,689	5,672	76%	6,542	50%
Windsor – Bligh Park, 11467	8,659	8,775	8,910	9,170	9,526	9,953	511	6%	783	9%
Yarramundi – Londonderry, 11468	2,608	2,648	2,664	2,719	2,815	2,894	111	4%	175	6%

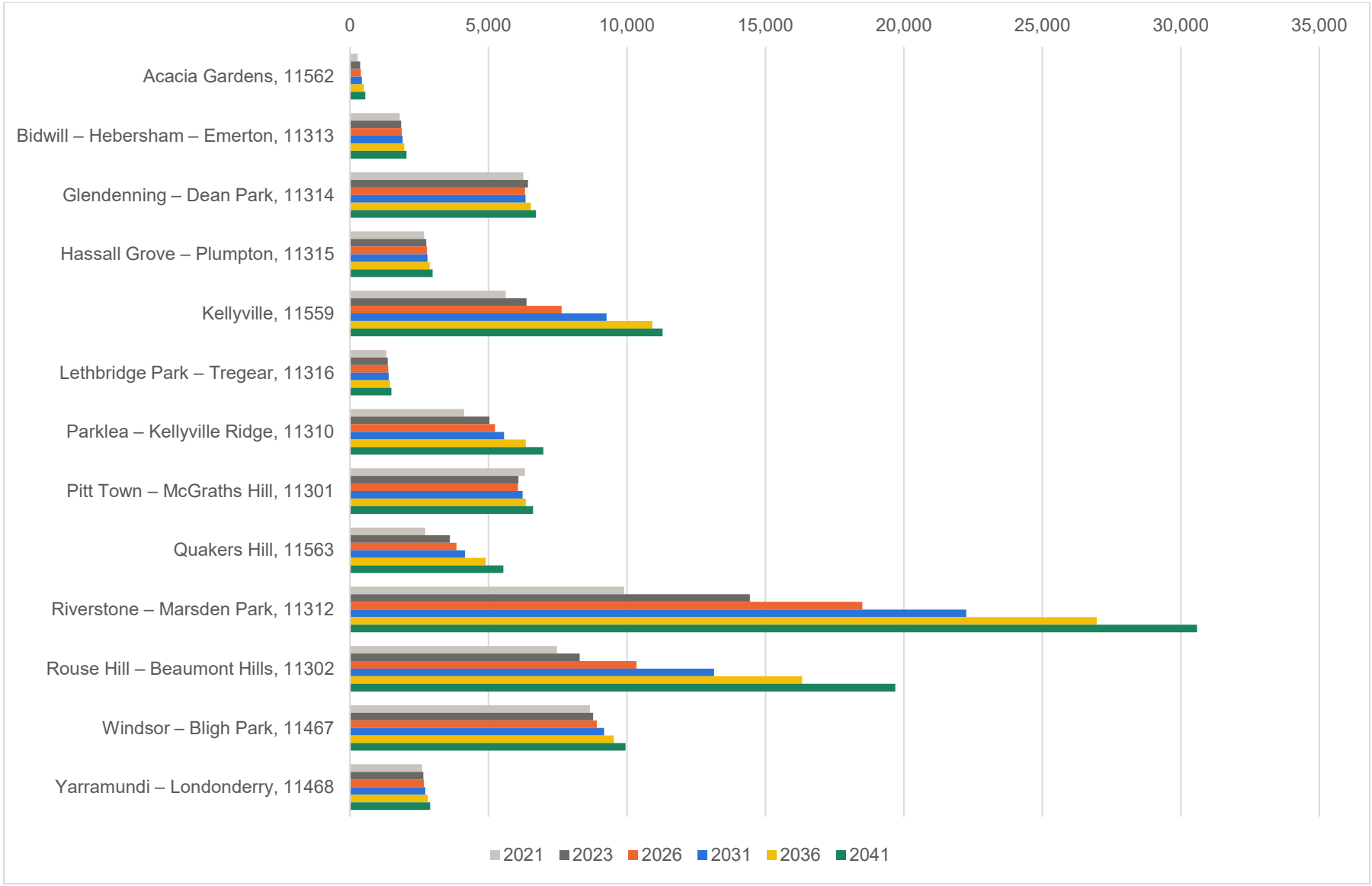

Figure 4-10: Employment projection comparison

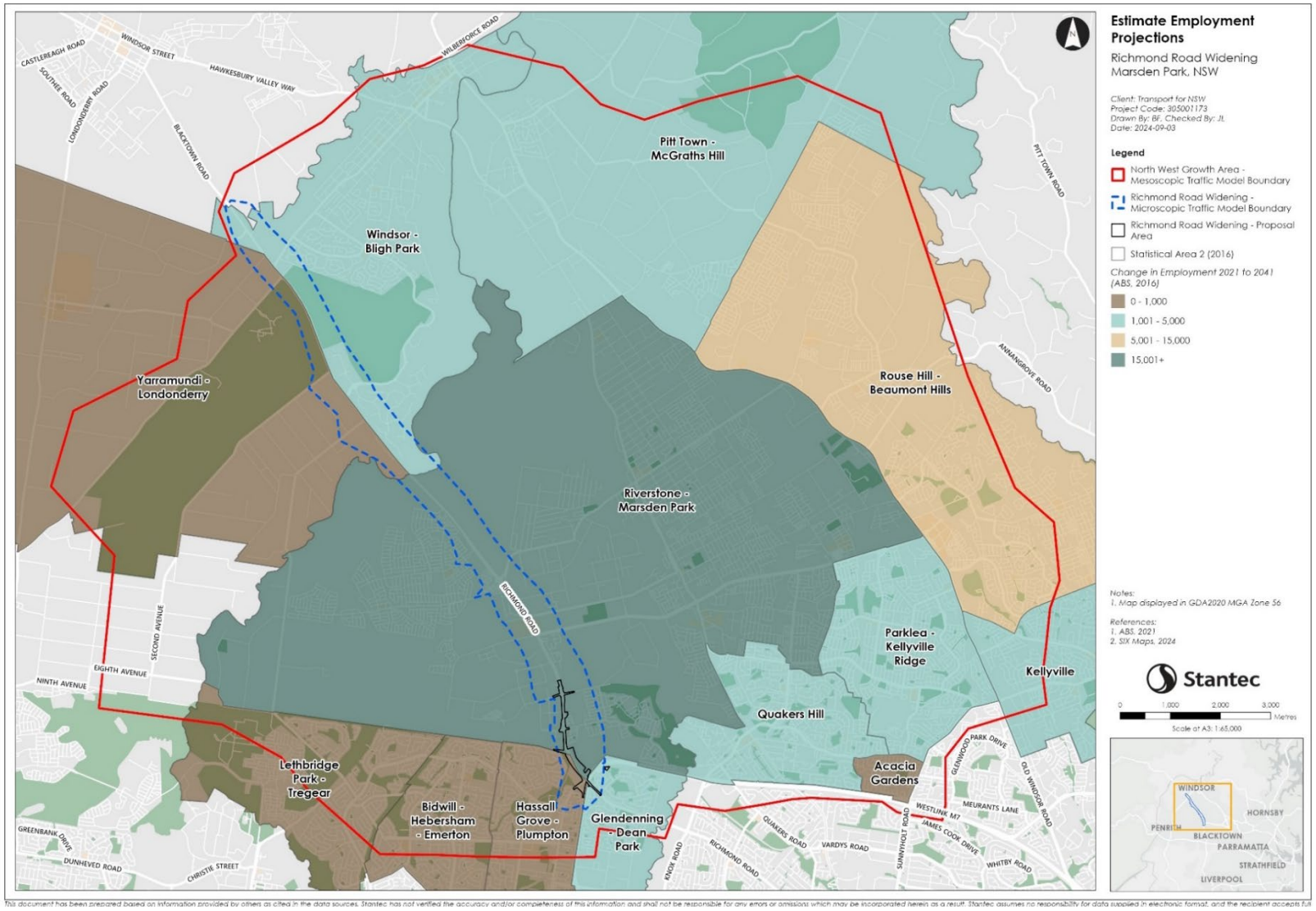

Figure 4-11: Employment projections 2021-2041

4.3 Travel behaviour

4.3.1 Trip purposes

The Household Travel Survey (HTS) is conducted by Transport for NSW and provides an indication of travel behaviour for a typical weekday for dwellings across the Sydney Greater Metropolitan Area (GMA). The survey is conducted on a sample of residents, and includes questions on their travel purposes, mode type and trip distances.

Data for the relevant SA3 areas within the study area reveals that social/ recreational represent the largest proportion of trip purposes within the area, followed by education and dropping off passengers, as shown in **Figure 4-12**.

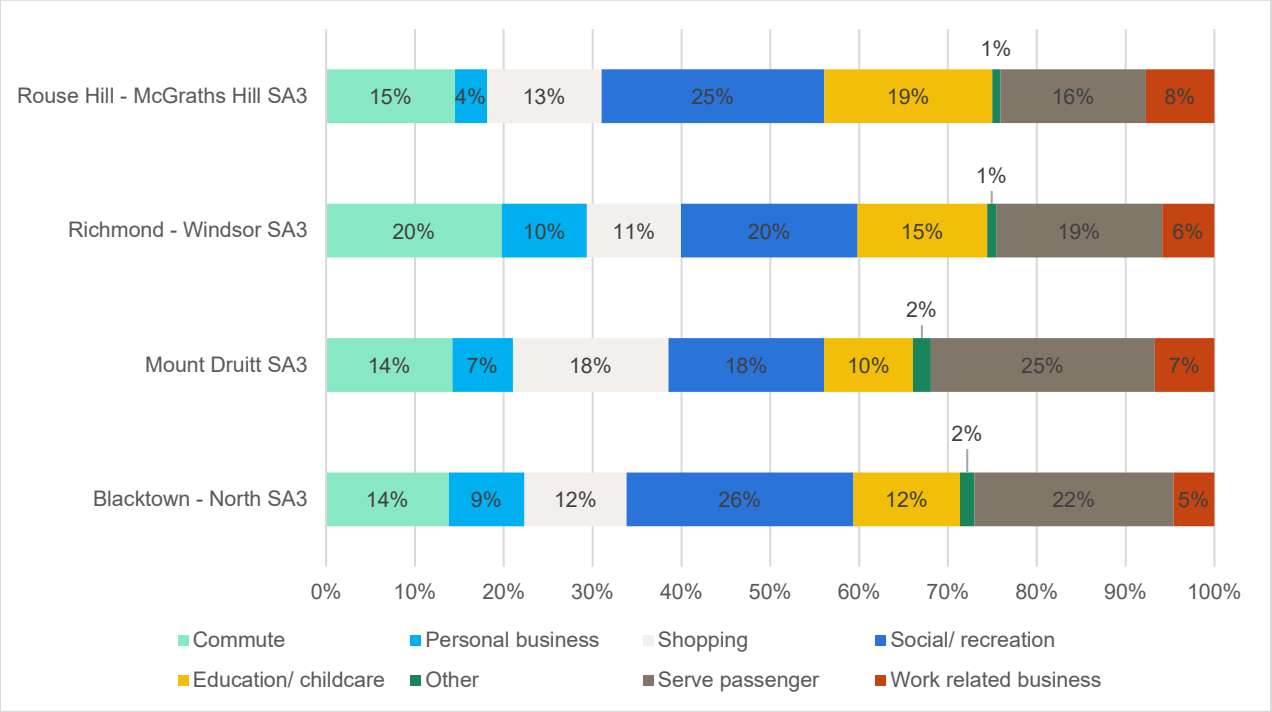

Figure 4-12: Proportion of trips per travel purpose for each SA3 area (HTS 2023)

Figure 4-13 shows the average distance travelled for each trip purpose for the selected SA3 areas within the study area. Residents consistently travelled the longest for commuting and work-related trips, at approximately 20 kilometres.

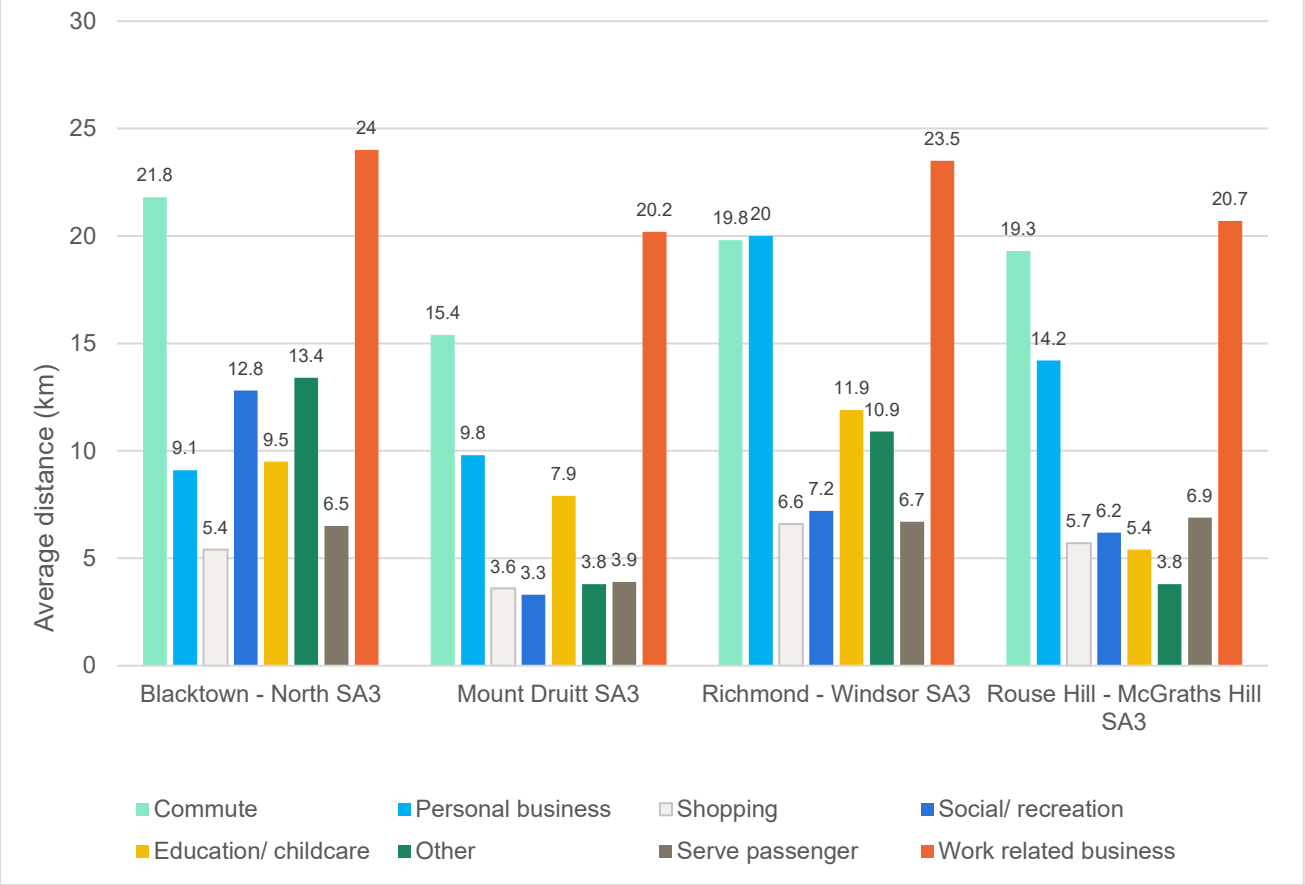

Figure 4-13: Average trip distance per trip purpose for each SA3 area (HTS 2023)

4.3.2 Mode share

The HTS reveals information relating to the mode in which people make daily trips within each SA3 area, as shown in **Figure 4-14**. Vehicle driver and vehicle passenger were consistently the most population mode choice when travelling within the study area, accounting for 82 per cent in Richmond-Windsor.

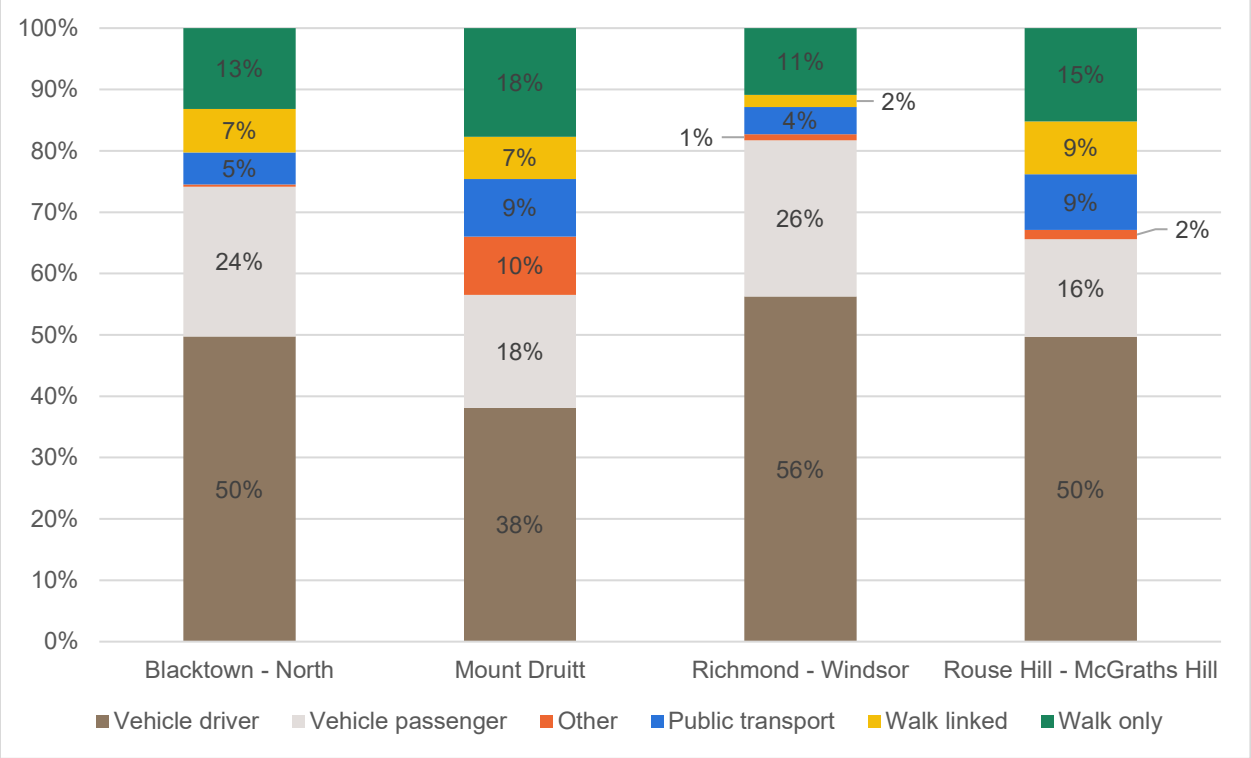

Figure 4-14: Daily trip mode share for each SA3 area (HTS 2023)

Commuting mode share trends as reported by ABS 2021 Census Data, shown in **Table 4-4**, shows that car as driver is the predominant mode choice for all the SA3s within the study area, followed by car as passenger and public transport. Walking mode share is significantly low at less than two per cent while cycling mode share is non-existent. A significant proportion of workers reported working from home during this period.

Table 4-4: Commuting mode share (ABS Census 2021)

SA3 name	Train	Bus	Ferry	Car, as driver	Car, as passenger	Truck	Motorbike/ scooter	Bicycle	Other Mode	Walked only	Worked at home	Did not go to work
Rouse Hill - McGraths Hill	2%	1%	0%	38%	2%	1%	0%	0%	0%	1%	41%	13%
Blacktown - North	4%	1%	0%	34%	2%	0%	0%	0%	0%	0%	43%	14%
Mount Druitt	5%	1%	0%	49%	5%	1%	0%	0%	1%	1%	22%	15%
Richmond - Windsor	2%	0%	0%	53%	3%	2%	0%	0%	0%	2%	23%	14%

4.3.3 Vehicle ownership

Vehicle ownership is determined from ABS Census data and shows the number of vehicles owned per household/ dwelling. This data gives an indication on private vehicle dependence for the region and likely travel patterns and mode shift that can be expected. Vehicle ownership for all the Statistical Area SA2s within the Study Area is shown in **Figure 4-15**. Few households within the study area own zero motor vehicles, with proportions generally low at 1 to 3 per cent except for Riverstone and Windsor-Bligh Park. The highest number of vehicles per household was measured in Yarramundi – Londonderry and Pitt Town – McGraths Hill.

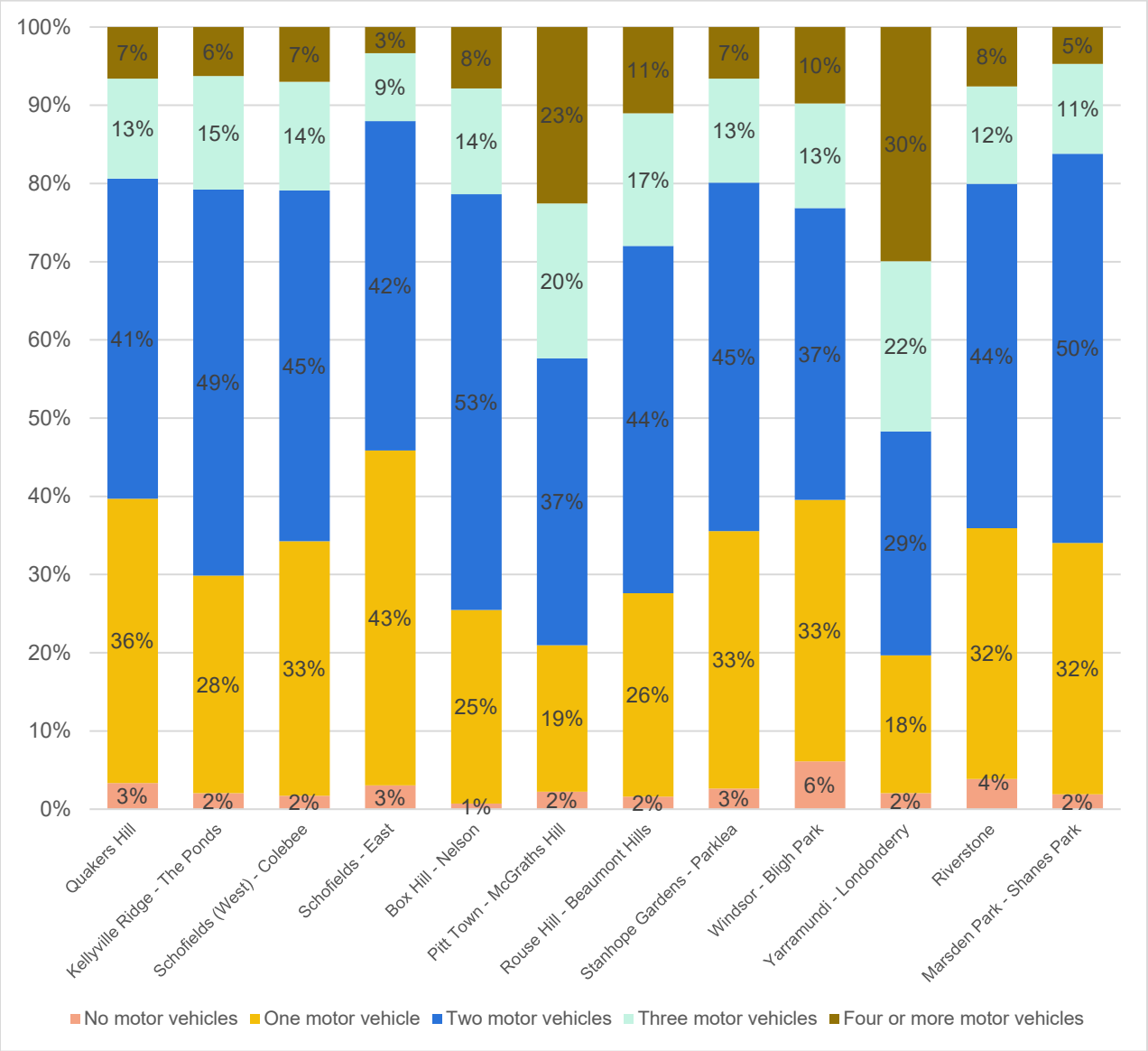

Figure 4-15: Vehicle ownership rate (ABS 2021)

4.4 Road network

4.4.1 Road classification

Roads are classified (as defined by the *Roads Act 1993*) based on their importance to the movement of people and goods within NSW (as a primary means of communication). The classification of a road allows TfNSW to exercise authority of all or part of the road. Classified roads include Main Roads, State Highways, Tourist Roads, Secondary Roads, Tollways, Freeways and Transitways.

For management purposes, TfNSW has three administrative classes of roads. These are:

- **State roads** – Major arterial links through NSW and within major urban areas. They are the principle traffic carrying roads and fully controlled by TfNSW with maintenance fully funded by TfNSW. State Roads include all Tollways, Freeways and Transitways; and all or part of a Main Road, Tourist Road or State Highway.
- **Regional roads** – Roads of secondary importance between State Roads and Local Roads which, with State Roads provide the main connections to and between smaller towns and perform a sub arterial function in major urban areas. Regional roads are the responsibility of councils for maintenance funding, though TfNSW funds some maintenance based on traffic and infrastructure. Traffic management on Regional Roads is controlled under the delegations to local government from TfNSW. Regional Roads may own all or part of a Main Road, Secondary Road, Tourist Road or State Highway; or other roads as determined by TfNSW.
- **Local roads** – The remainder of the council-controlled roads. Local Roads are the responsibility of councils for maintenance funding. TfNSW may fund some maintenance and improvements based on specific programs (e.g., urban bus routes, road safety programs). Traffic management on Local Roads is controlled under the delegations to local government from TfNSW.

4.4.2 Road hierarchy

Functional road classification involves the relative balance of the mobility and access functions. TfNSW define four levels in a typical functional road hierarchy, ranking from high mobility and low accessibility to high accessibility and low mobility. These road classes are:

- **Arterial roads** – generally controlled by TfNSW, typically no limit in flow and designed to carry vehicles long distance between regional centres.
- **Sub-arterial roads** – can be managed by either TfNSW or local council. Typically, their operating capacity ranges between 10,000 and 20,000 vehicles per day, and their aim is to carry through traffic between specific areas in a sub-region or provide connectivity from arterial road routes (regional links).
- **Collector roads** – provide connectivity between local roads and the arterial road network and typically carry between 2000 and 10,000 vehicles per day.
- **Local roads** – provide direct access to properties and the collector road system and typically carry between 500 and 4000 vehicles per day.

Table 4-5 and **Figure 4-16** outlines the road classification and hierarchy of the roads within the proposal area while **Figure 4-17** shows the existing speed limits of these roads.

Table 4-5: Road network outline

Key road	Road network classification	Functional hierarchy	Movement and connectivity	Speed limit
Richmond Road	State Road	Arterial road	Richmond Road provides north-south connection through the study area. It connects the M7 Motorway to new housing and employment areas in the North West Growth Area. Within the study area, Richmond Road is a divided two-way road generally with two lanes in each direction. Major intersections include Rooty Hill Road North, Townson Road and South Street.	80km/h
Windsor Road	State Road	Arterial road	Windsor Road provides north-south connection between the suburbs of Windsor and Parramatta. Within the study area, Windsor Road is a divided two-way road generally with two lanes in each direction. Major intersections include Schofields Road and Garfield Road.	80km/h
Garfield Road	State Road	Sub-arterial road	Garfield Road provides crucial east-west connection through study area between Windsor, Riverstone, Marsden Park. Within the study area, Windsor Road is an un-divided road generally with one lane in each direction. Major intersections include Richmond Road and Windsor Road	60km/h
The Northern Road	State Road	Collector road	The Northern Road provides east-west connection on the northern fringe of study area between Penrith and Windsor. Within the study area, The Northern Road is an un-divided road generally with one lane in each direction. Major intersections include Londonderry Road and Richmond Road	80km/h
George Street / Macquarie Street	State Road	Collector road	George street /Macquarie Street is a major route providing east-west connection between Richmond Road and Windsor.	60km/h
M7 Motorway	State Road	Arterial road	The Westlink M7 Motorway runs on the southern fringe of the study area, providing access to multiple localities in north-western Sydney. The M7 is also linked to the M5 and M31 Motorways.	100km/h
Rooty Hill Road North	State Road	Collector road	Rooty Hill Road North is a major road connecting north-south between Richmond Road near the M7 and suburbs including Rooty Hill and Plumpton. Rooty Hill Road connects to the Great Western Highway.	60 to 70km/h
South Street / Schofields Road	State Road	Collector road	South street is an east-west link which connects Richmond Road to the strategic centre of Rouse Hill via Schofields. It is a divided road with two lanes in each direction.	70km/h
St Marys Street / Stony Creek Road	Regional Road	Collector road	St Marys Road / Stony Creek Road runs north-west to southwest through the study area, providing access from Richmond Road to the suburbs of Shanes Park, Melonba and Ropes Crossing. It is an undivided two-way road with one lane in each direction.	80km/h
Llandilo Road	Regional Road	Collector road	Llandilo Road runs east-west through study area, providing access from Richmond Road to the suburb of Llandilo. It is an undivided two-way road with one lane in each direction.	80km/h

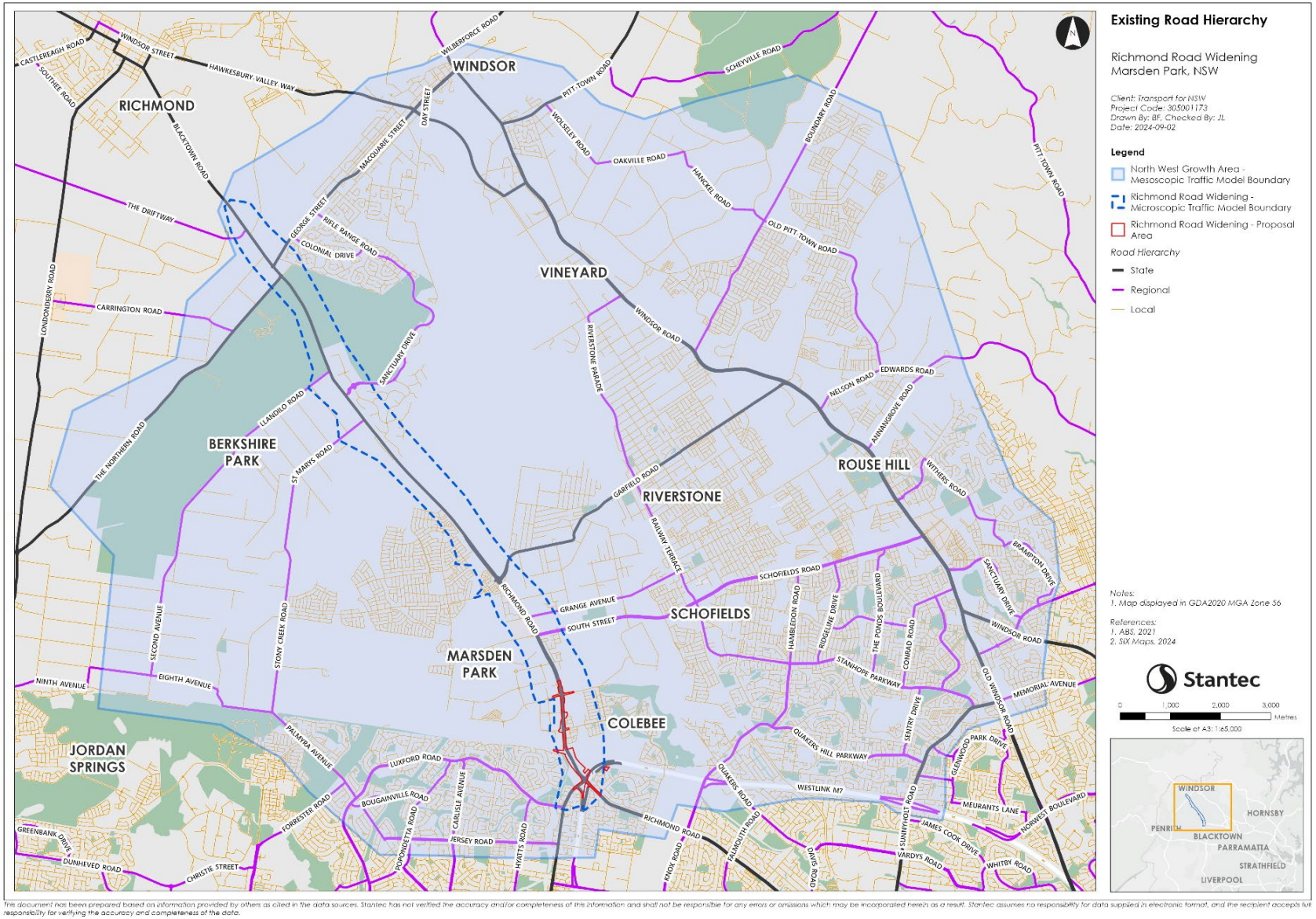

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Figure 4-16: Road network

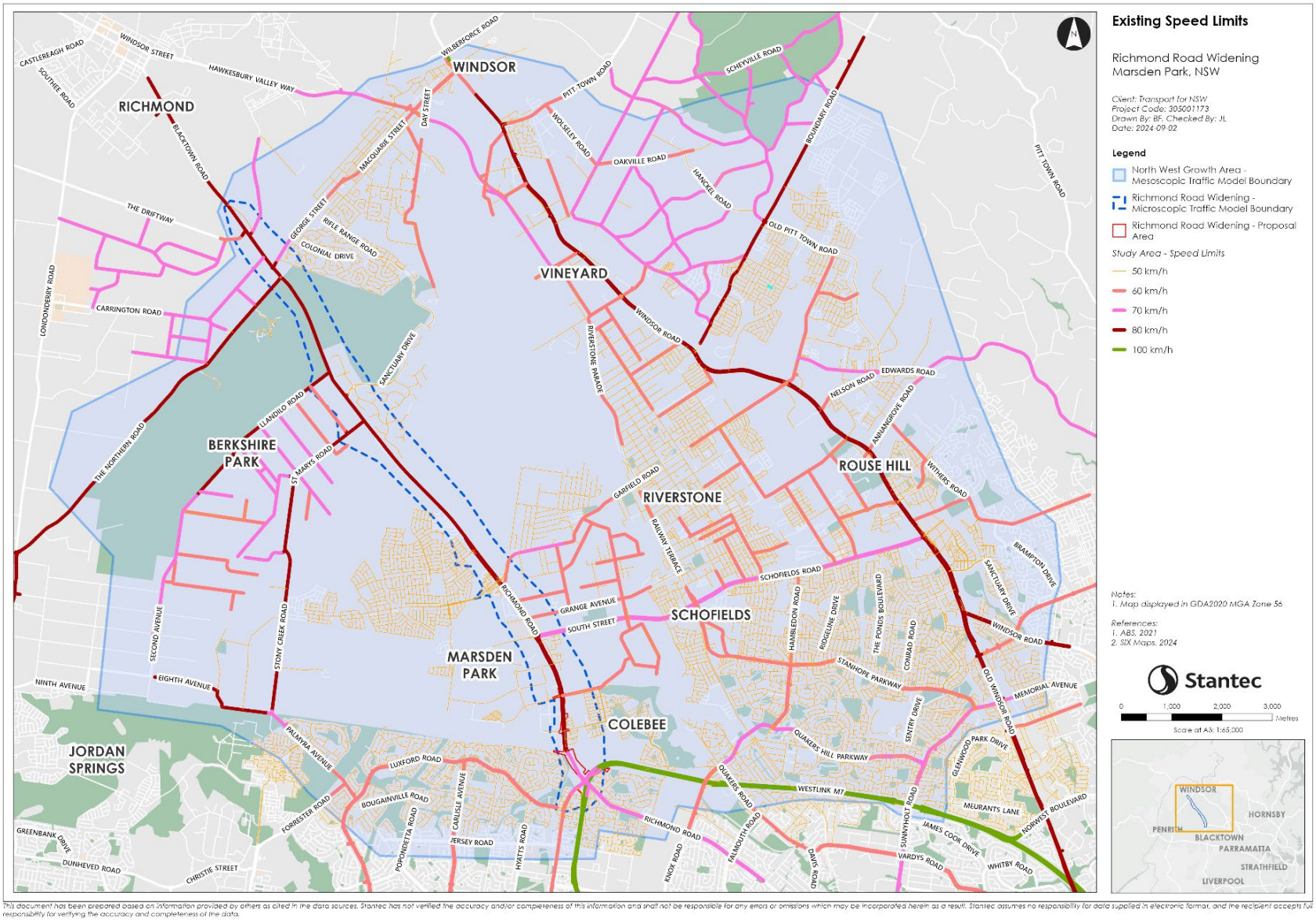

Figure 4-17: Existing speed limits

4.4.3 Crash history

Historical crash statistics were obtained from Transport for NSW for the Richmond Road corridor for the five-year period between January 2017 to December 2021. Review of the location, frequency, severity, and type of crashes is included in this section.

Transport for NSW provides definitions for assessing the severity of crashes:

- Non-casualty crash: A crash in which at least one vehicle is towed away but there are no person injuries.
- Minor crash: A crash in which at least one person is injured but there is no hospital admission or emergency department attendance.
- Moderate crash: A crash in which at least one person is admitted to hospital or attends a hospital or emergency department.
- Serious crash: A crash in which at least one person is admitted to hospital (not an ED-only admission) and is given an injury diagnosis on the same day or the day after the crash.
- Fatal crash: A crash in which at least one person dies within 30 days from injuries sustained in the crash.

Crashes are separated based on type of crash and have an associated RUM (Road User Movement) Code linked to it. The breakdown of crash RUM types across the Richmond Road Corridor are shown in **Figure 4-18**.

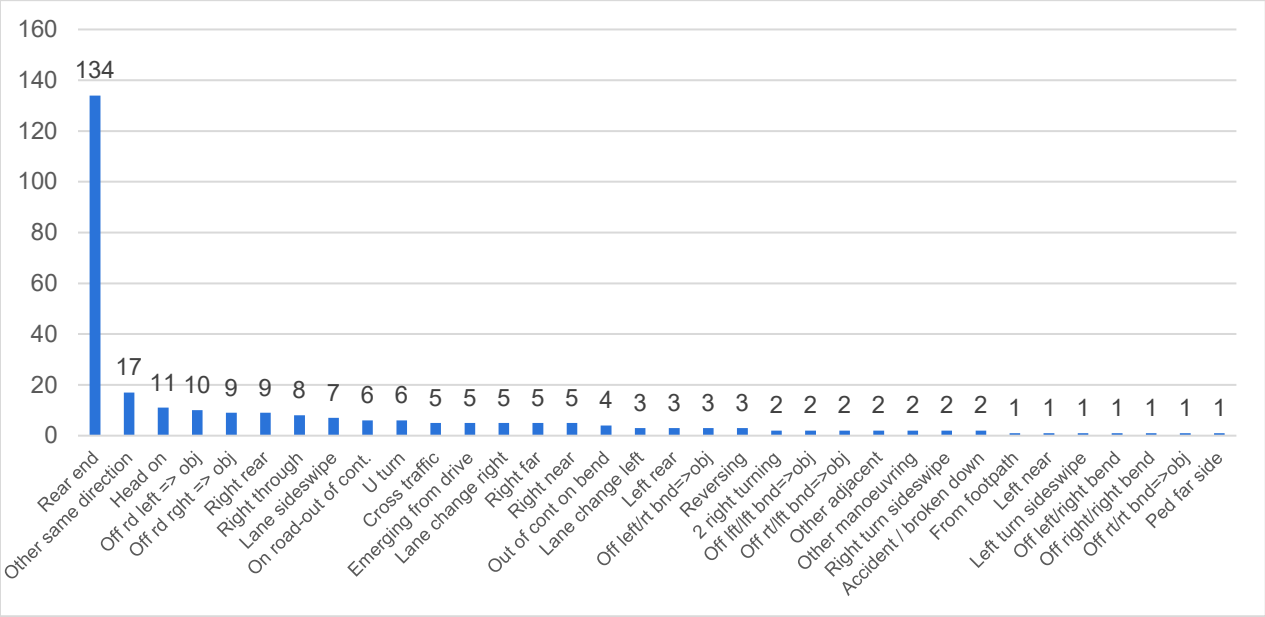

Figure 4-18: Crash RUM types across Richmond Road Corridor

During the five-year period, 279 crashes occurred on the Richmond Road Corridor, resulting in 39 serious injuries and four fatalities. A high proportion of crashes (48 per cent) were rear-end vehicle crashes. Two crashes involved cyclists (one on Blacktown Road and one on the Northern Road) and one crash resulted in a pedestrian injury (located on George Street).

Two fatal crashes involved a motorbike and large rigid vehicles and had a rear-end impact while the motorbike was turning or changing lanes. One fatal crash occurred at the Richmond Road / Llandilo Road intersection, caused by rear end collision on an 80km/h speed limit road. The breakdown of crash severity across the Richmond Road Corridor is shown in **Figure 4-19**.

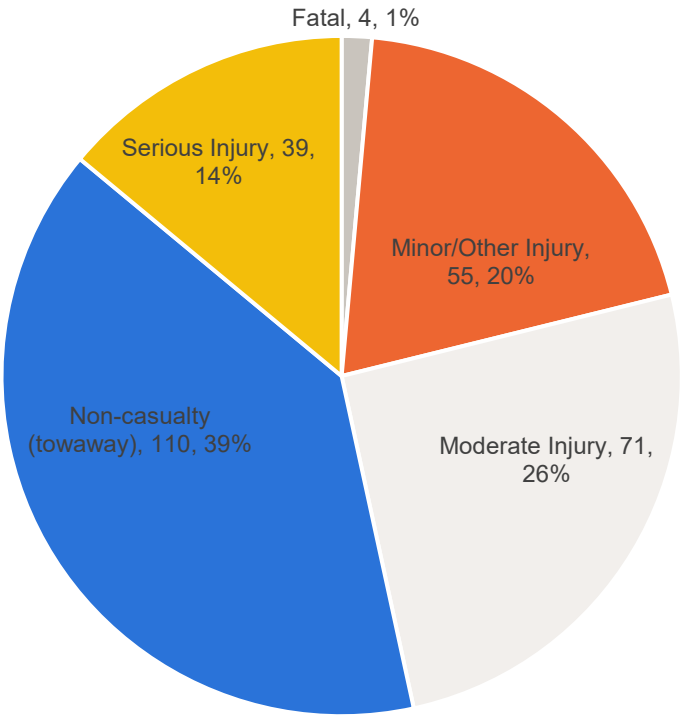

Figure 4-19: Crash severity across Richmond Road Corridor

The intersection of Richmond Road, Rooty Hill Road North and West Link M7 experienced 37 crashes in the last five years out of which majority were either minor/ other injury or non-casualty towaway. Most of the crashes at this intersection were either caused by rear-end collision or by one of the vehicles changing lanes.

In terms of the lighting and weather conditions, majority of crashes occurred during daylight. Rain and darkness did not emerge as a common factor influencing crashes on the Richmond Road Corridor.

Figure 4-20 shows historic crash locations on the Richmond Road Corridor, and the crash history is detailed in **Table 4-6**.

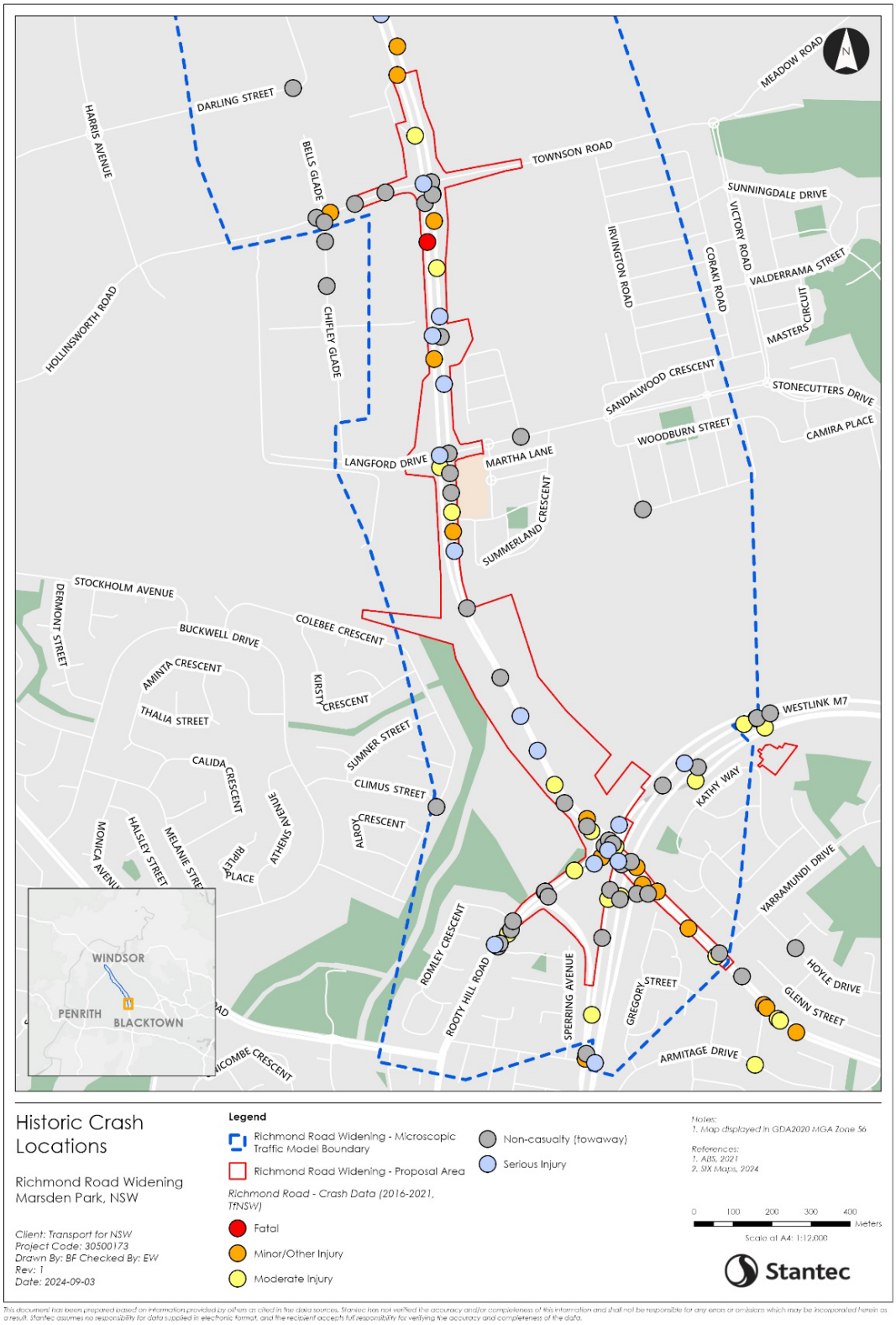

Figure 4-20: Historic crash locations

Table 4-6: Historic crashes within Richmond Road Corridor

Crash Description	Crash Severity					Total	% of Total Crashes
	Fatal	Minor Injury	Moderate Injury	Non-casualty (towaway)	Serious Injury		
Rear end	2	36	34	40	22	134	48%
Other same direction		3	3	11		17	6%
Head on	1	2	1	3	4	11	4%
Off rd left => obj			4	6		10	4%
Right rear		2	5	2		9	3%
Off rd rght => obj	1		4	4		9	3%
Right through			3	3	2	8	3%
Lane sideswipe		1		4	2	7	3%
On road-out of cont.			3	1	2	6	2%
U turn		1		3	2	6	2%
Right far		2	2	1		5	2%
Lane change right		1	1	3		5	2%
Right near		1	1	2	1	5	2%
Cross traffic		1		4		5	2%
Emerging from drive		1	2	2		5	2%
Out of cont on bend			1	2	1	4	1%
Left rear		1	1	1		3	1%
Off left/rt bnd=>obj			1	2		3	1%
Reversing		1		2		3	1%
Lane change left			2	1		3	1%
Off lft/lft bnd=>obj				2		2	1%
Off rt/lft bnd=>obj				2		2	1%
2 right turning			1	1		2	1%
Other adjacent		1		1		2	1%
Accident			1		1	2	1%
Other manoeuvring			1	1		2	1%
Right turn sideswipe				2		2	1%
Left near		1				1	0%
Off left/right bend				1		1	0%
Left turn sideswipe				1		1	0%
Off right/right bend				1		1	0%
Ped far side					1	1	0%
From footpath					1	1	0%
Off rt/rt bnd=>obj				1		1	0%
Total	**4**	**55**	**71**	**110**	**39**	**279**	**100%**

4.4.3.1 Proposal area crash history

74 out of the 279 crashes occurred within the proposal area i.e. between Townson Road and the M7 Motorway. 30 of those crashes were located in close proximity to the intersection of Richmond Road and Rooty Hill Road, consisting mainly of rear-end crashes. Other crash types included lane change left / right, lane side swipe, other same direction and out of control on bend. The RUM codes for the 79 crashes are shown in **Figure 4-21**.

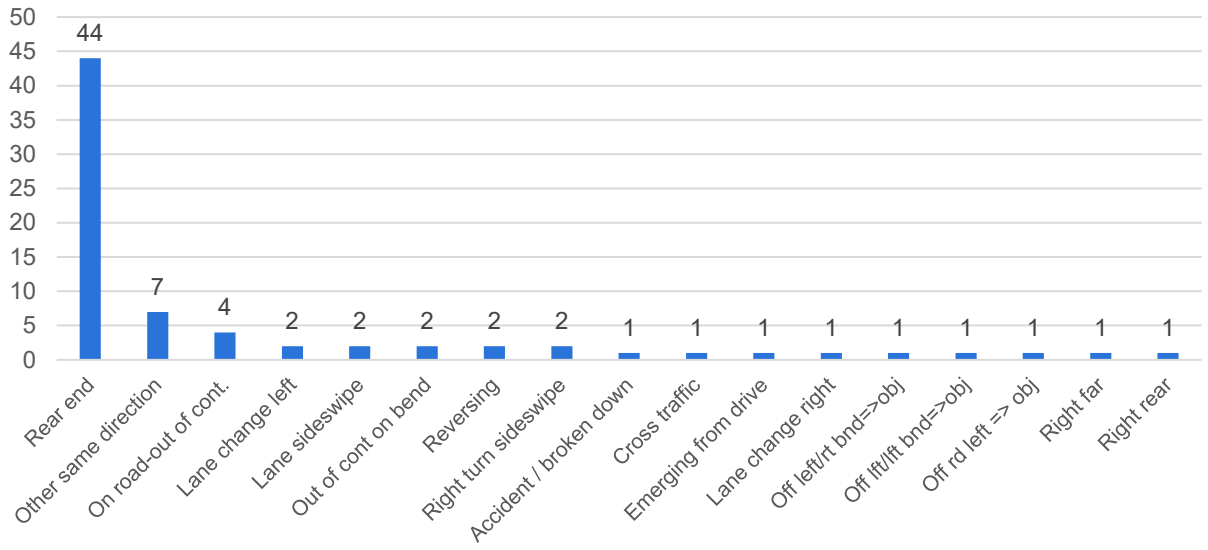

Figure 4-21: Crash Road User Movements within proposal area

One crash within the proposal area was fatal. This involved a crash on Richmond Road heading northbound towards the intersection with Townson Road in which a rear end crash occurred between a motorcyclist and a truck. 11 serious injury crashes occurred within the proposal area including three at the intersection with Rooty Hill Road. Degree of crash for the proposal area is shown in **Figure 4-22**.

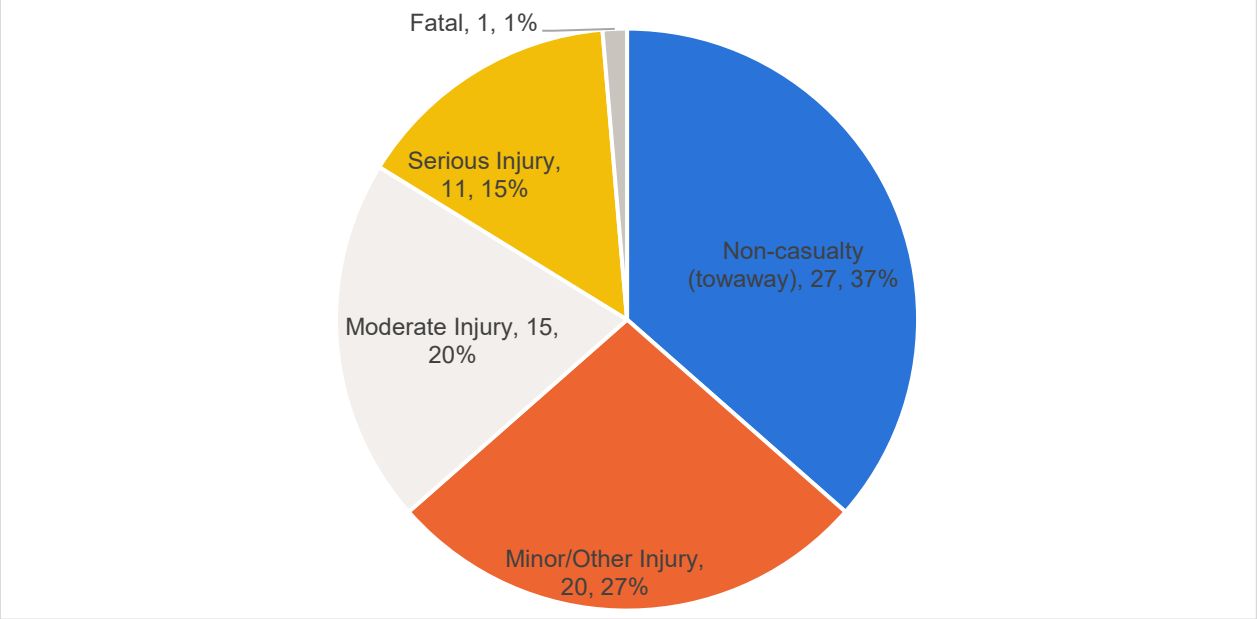

Figure 4-22: Degree of crash within proposal area

4.5 Public transport network

4.5.1 Train and metro

Six train stations fall within the study area: Windsor, Mulgrave, Vineyard, Riverstone, Schofields and Quakers Hill stations. These stations are serviced by Sydney Trains T1 North Shore and Western Line and T5 Cumberland Line. Quakers Hill, Riverstone and Schofields stations are the closest stations from Richmond Road, located over three kilometres to the east. Service frequency is outlined in **Table 4-7**.

Table 4-7: Train station service frequency

Train line	Stations serviced within study area	Major areas serviced	Frequency – weekday	Frequency – Saturday
T1 North Shore and Western Line	Windsor, Mulgrave, Vineyard, Riverstone, Schofields and Quakers Hill	Richmond-Windsor Parramatta Inner West Sydney CBD North Sydney Chatswood Hornsby	Approximately 30 minutes or greater frequency outside of peak commute times Approximately 15 minutes within peak commute times	Approximately 30 minutes or greater frequency outside of peak travel times Approximately 15 minutes within peak travel times
T5 Cumberland Line	Windsor, Mulgrave, Vineyard, Riverstone, Schofields and Quakers Hill	Richmond-Windsor Blacktown Parramatta Liverpool Leppington	30 minute frequencies from after 9pm to 12am and 4am to 7am	30 minute frequencies from after 9pm to 12am and 4am to 7am

Three Sydney Metro stations fall within the study area, namely Tallawong, Rouse Hill and Kellyville; while the Bella Vista Metro Station is situated near the south-eastern boundary of the study area. These four stations are serviced by M1 Metro Northwest, providing a high speed and frequent connection to Chatswood, Sydney CBD and Sydenham. Sydney Metro services operate at a frequency of 4 to 10 minutes depending on the time of day and day of the week, as described in **Table 4-8**.

Table 4-8: Metro service frequency

Time of day	Weekday frequency	Saturday
5:54am to 6:54am	Every 10 minutes	Every 10 minutes at all times
6:54am to 9:46am	Every 4 minutes	
9:46am to 3:15pm	Every 7 minutes	
3:15pm top 7:31pm	Every 4 minutes	
7:31pm to 1am	Every 10 minutes	

The train and metro routes are shown in **Figure 4-23**.

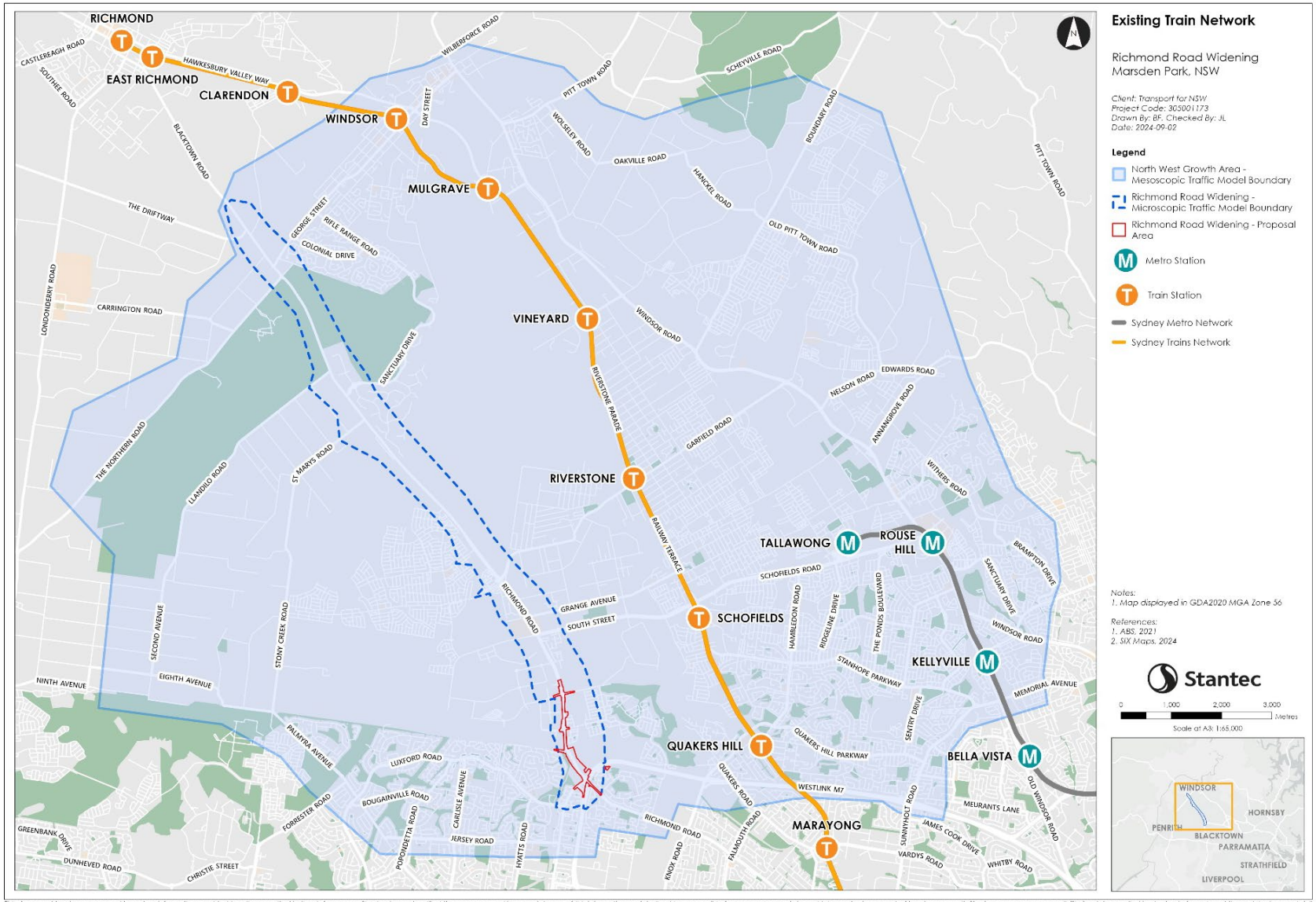

Figure 4-23: Existing train network

4.5.2 Bus

Bus services within the study area are operated by Busways. Public bus routes that service the Richmond Road Corridor are outlined in **Table 4-9**. Bus routes that service the Richmond Road Corridor are shown on **Figure 4-24**, as provided by Busways.

Table 4-9: Bus routes serving Richmond Road Corridor

Route	Route name	Frequency - Weekday	Frequency - Weekend
673	Penrith to Windsor via Cranebrook	Morning services: 7:26am, 8:13am, 9:18am, 11:48am Evening services: 4:27pm, 5:40pm	Saturday: 10:52am, 4:22pm Sunday & Public Holidays: No services
674	Mount Druitt to Windsor via Shanes Park and South Windsor	Morning services: 8:24am, 10:40am Evening services: 1:20pm, 4:38pm, 5:47pm, 8:44pm	Saturday: 8:45am Sunday & Public Holidays: 4:45pm
675A	Windsor to Richmond via RAAF Base and Bligh Park (Loop Service)	Every 30mins from 4:55am to 7:12pm	Saturday: Every 60mins from 7:21am to 6:18pm Sunday & Public Holidays: Every two hours between 9:18am to 5:18pm
675C	Windsor to Richmond via Bligh Park and RAAF Base (Loop Service)	Every 20mins from 6:45am to 11:26pm	Saturday: Every hour between 7:39am to 7:33pm Sunday & Public Holidays: Every two hours between 10:03am to 6:03pm
742	Rouse Hill Station to Marsden Park	Every 60mins from 8:06am to 6:28pm	Saturdays: Every 60mins from 9:00am to 5:00pm Sunday & Public Holidays: Every 60mins between 9:00am to 5:00pm
747	Rouse Hill Station to Mount Druitt via Riverstone and Marsden Park	Every 60mins from 6:39am to 9:28pm	Saturday: Every 60mins from 8:34am to 8:34pm Sunday & Public Holidays: Every 60mins from 8:34am to 8:34pm
748	Rouse Hill Station to Marsden Park via Schofields	Every 30mins from 5:07am to 9:56pm	Saturday: Every 30mins from 5:35am to 11:51pm Sunday & Public Holidays: Every 60mins from 7:21am to 9:51pm
750	Blacktown to Mount Druitt via Bidwill	Every 20mins from 5:09am to 12:25am	Saturday: Every 30mins from 5:35am to 9:19pm Sunday & Public Holidays: Every 30mins from 8:00am to 6:59pm
751	Blacktown to Melonba via Colebee	Every 30mins from 5:13am to 11:39am	Saturday: Every 60mins from 6:12am to 11:37pm Sunday & Public Holidays: Every 60mins from 7:12am to 11:37pm
754	Blacktown to Mount Druitt via Hassall Grove	Every 20mins from 5:09am to 12:25am	Saturday: Every 30mins from 7:21am to 11:51pm Sunday & Public Holidays: Every 60mins from 7:21am to 9:51pm

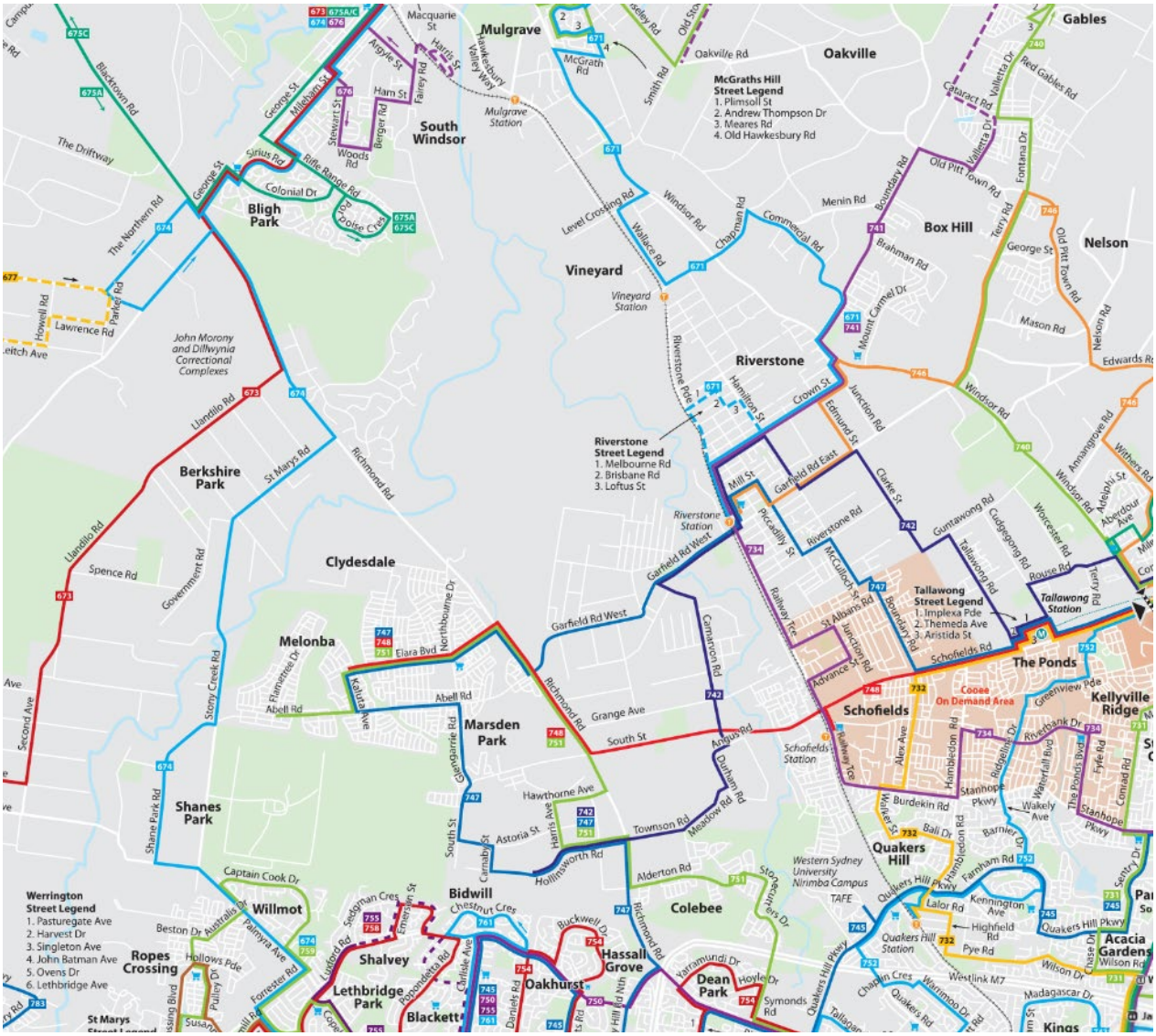

Figure 4-24: Existing bus network

Source: Busway, effective August 2024

4.6 Active transport network

Provision for signalised pedestrian crossings are limited to major intersections within the Richmond Road Corridor including at Elara Boulevard, Abell Road, Excelsior Avenue, Hawthorne Avenue, Hollinsworth Road, Langford Drive and Rooty Hill Road.

The cycling network along the Richmond Road Corridor varies in safety and separation from vehicles. A shared path is located on western side of Richmond Road between intersection with M7 motorway and Elara Boulevard. A road shoulder suitable for cycling is located on both sides of the Richmond Road between Elara Boulevard and George Street. Richmond Road is connected to the shared paths on South Street/ Schofields Road and Abell Road connecting residential areas to wider active transport network and Schofields train station.

Other major roads like The Northern Road, Blacktown Road and Windsor Road have cycling infrastructure in form of an on-road shoulder. On the remaining local roads cycling infrastructure is limited to on-road mixed traffic routes. The cycling network is shown in **Figure 4-25**.

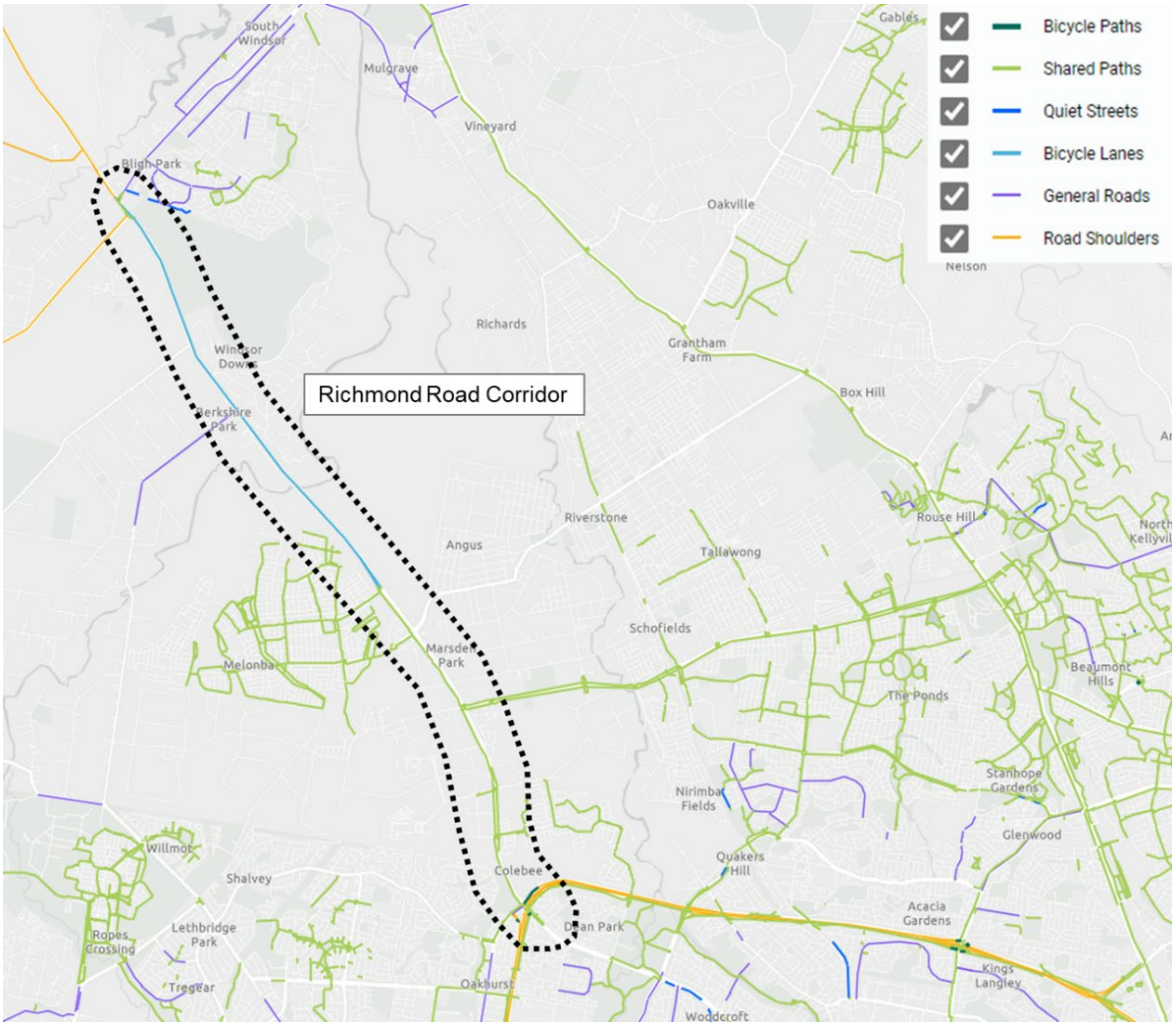

Figure 4-25: Transport for NSW cycleway finder

4.7 Freight network

In New South Wales, freight routes are categorised into primary, secondary, and tertiary routes to facilitate efficient transportation of goods as defined below:

- **Primary Freight Routes**: These are the main corridors used for heavy and long-distance freight transport. They include major highways and motorways such as the Hume Highway, Pacific Highway, and the Newell Highway.
- **Secondary Freight Routes**: These routes connect regional areas to the primary freight network. They include important regional roads that support significant freight movements but are not as heavily trafficked as primary routes.
- **Tertiary Freight Routes**: These are local roads that provide access to the primary and secondary networks. They are crucial for last-mile deliveries and local distribution.

Transport for NSW imposes limitations on heavy vehicle routes throughout the state. Three tiers of mass limits are defined based on vehicle mass and axle group category:

- **General Mass Limits (GML)**: Heavy vehicles with unrestricted access to the road system
- **Concessional Mass Limits (CML)**: Increased mass limits for eligible vehicles, require accreditation
- **Higher Mass Limits (HML)**: Highest level of mass except for vehicles requiring special permits, requires accreditation and GPS tracking to manage access and compliance.

The networks are available for rigid trucks and short combinations (up to 19 metres long) and B-Doubles that comply with the requirements contained in the Heavy Vehicle National Law (HVNL). Existing freight network within study area is shown in **Figure 4-26**.

Route restrictions for vehicle types within each mass limit are set separately by Transport for NSW. Within the study area, these restrictions include:

- Richmond Road: Approved for B-doubles up to 25/26 metres in length
- The Northern Road: Approved for use by heavy vehicles up to a 25/26 metre B-double
- Windsor Road: Approved for use by heavy vehicles up to a 25/26 metre B-double
- The Westlink M7 status is a major interstate freight route running east-west through the study area, allowing all vehicle types.

Key freight activity precincts and industrial areas within north-west Sydney are:

- Marsden Park Industrial Area located in Blacktown, which provides various logistics and warehousing facilities, supporting regional and interstate freight activities.
- Eastern Creek Industrial Area: This industrial area is strategically located near major motorways, making it a key location for distribution centres and logistics companies.
- Erskine Park: It is another critical freight activity area in north-western Sydney, which houses large-scale warehousing and distribution centres.

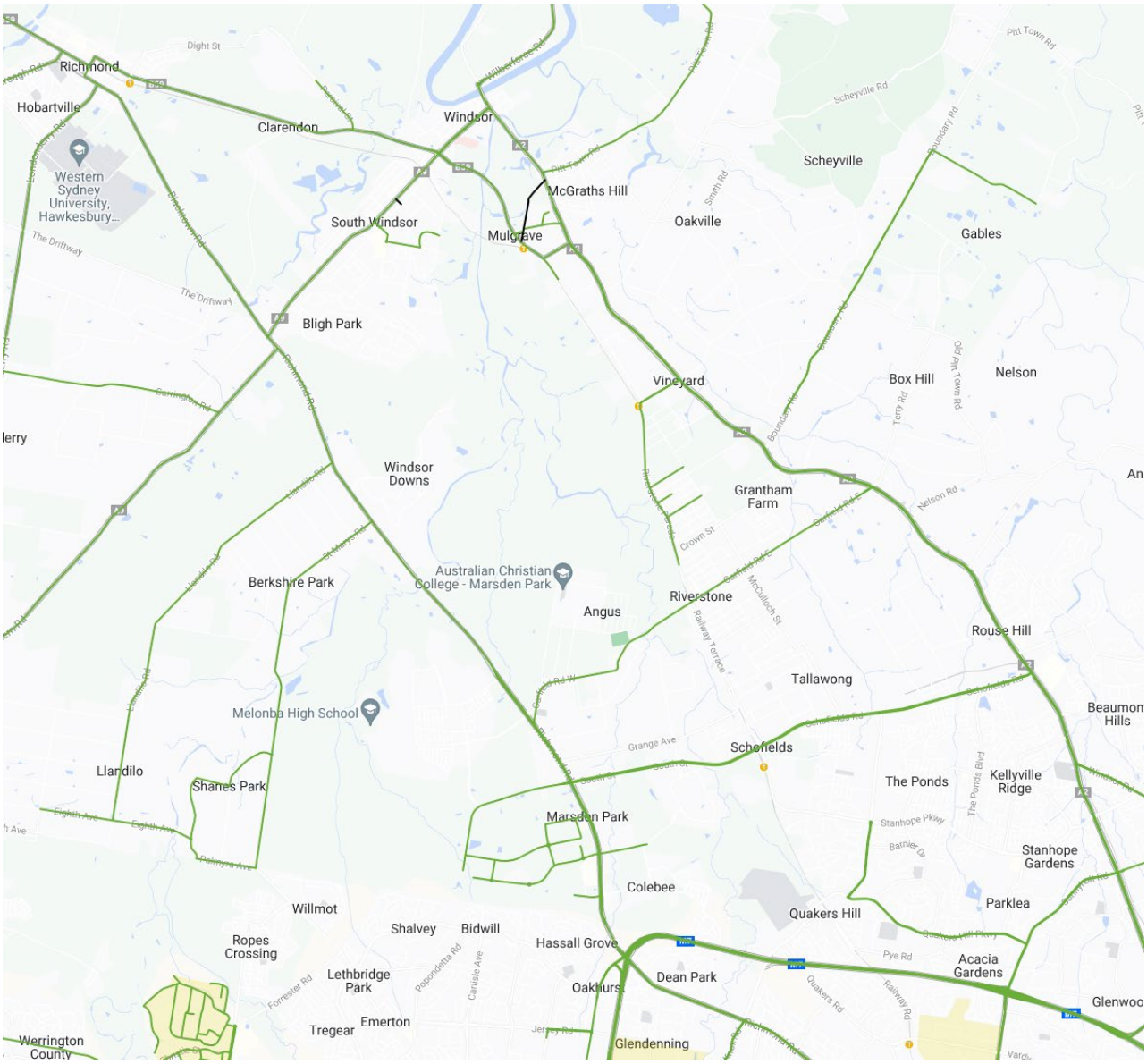

Figure 4-26: Existing freight network (B-Double permitted), restricted vehicle access map, Transport for NSW

5 Future traffic demand

This section describes the procedure for future year demand estimation. The future traffic demands were based on the following inputs:

- Demands from the Existing Base model developed using traffic survey data
- Strategic demands from the 2021, 2026, 2031 and 2041 SMPM.

5.1 Strategic demands

The process for developing the Existing Base Model demands was previously described in Section 3.12 of the *Richmond Road Corridor Upgrade Base Microsimulation Traffic Model Development Report* (Stantec, November 2023).

A cordon was established for the NWPGA study area in the SMPM for 2021, 2026, 2031 and 2041 (AM and PM peak hours) which was provided by TfNSW. The cordon comprised of 49 external zones and 119 internal zones, totalling 167 zones. The external zones represent origins and destinations outside of the study area. **Figure 5-1** shows the SMPM strategic zoning structure.

The strategic zones were disaggregated to match the Aimsun model zoning structure consisting of 417 centroids.

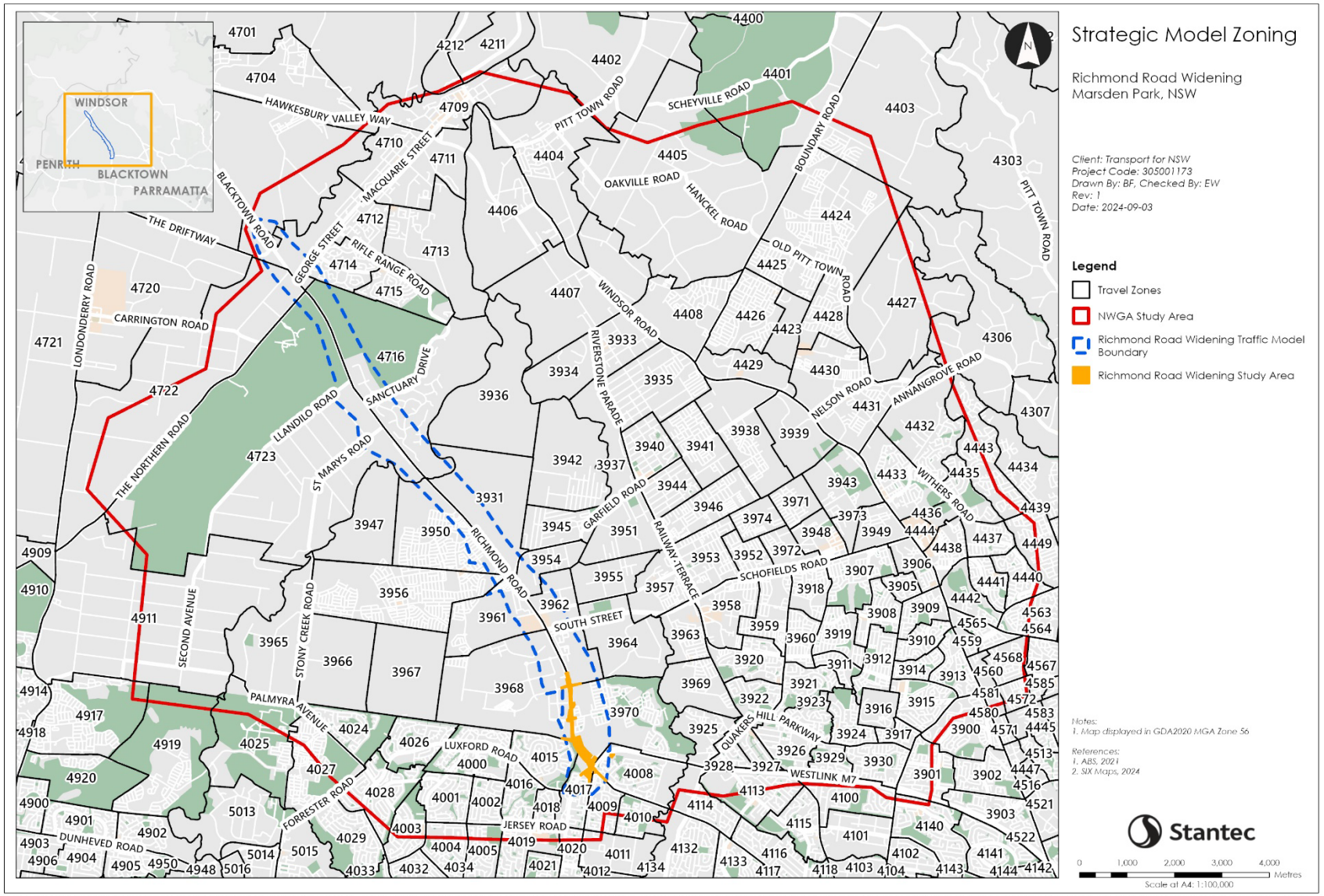

Figure 5-1: SMPM zoning structure

5.2 Future demand estimation methodology

Future year models were prepared for 2028 and 2038, Do Minimum (without proposal) and The Proposal (with proposal) scenarios. The methodology to develop the future year demands is outlined below. The below procedure was repeated for each vehicle type and peak period separately.

Mesoscopic model future demand

1. The cordon matrices were extracted from the SMPM for the years of 2021, 2026, 2031 and 2041 for the AM and PM peak periods.
2. The strategic model absolute growth (the difference between the future year and existing base year matrices) was calculated.
3. The strategic model absolute growth was added to the calibrated Base Model demand matrices.
4. The base demand traffic profile obtained from the calibrated NWPGA base model was applied to the future demand matrices calculated in step 3.

Microscopic model future demand

5. Cordon matrices were created from a dynamic traversal of the NWPGA mesoscopic model using the dynamic user equilibrium scenarios. The traversals were run for the established cordon of the Richmond Road corridor subnetwork.
6. The heavy vehicle matrices are split between rigid and articulated heavy vehicles by applying the Richmond Road base vehicle type proportions.

Figure 5-2 shows the future traffic demand estimation procedure.

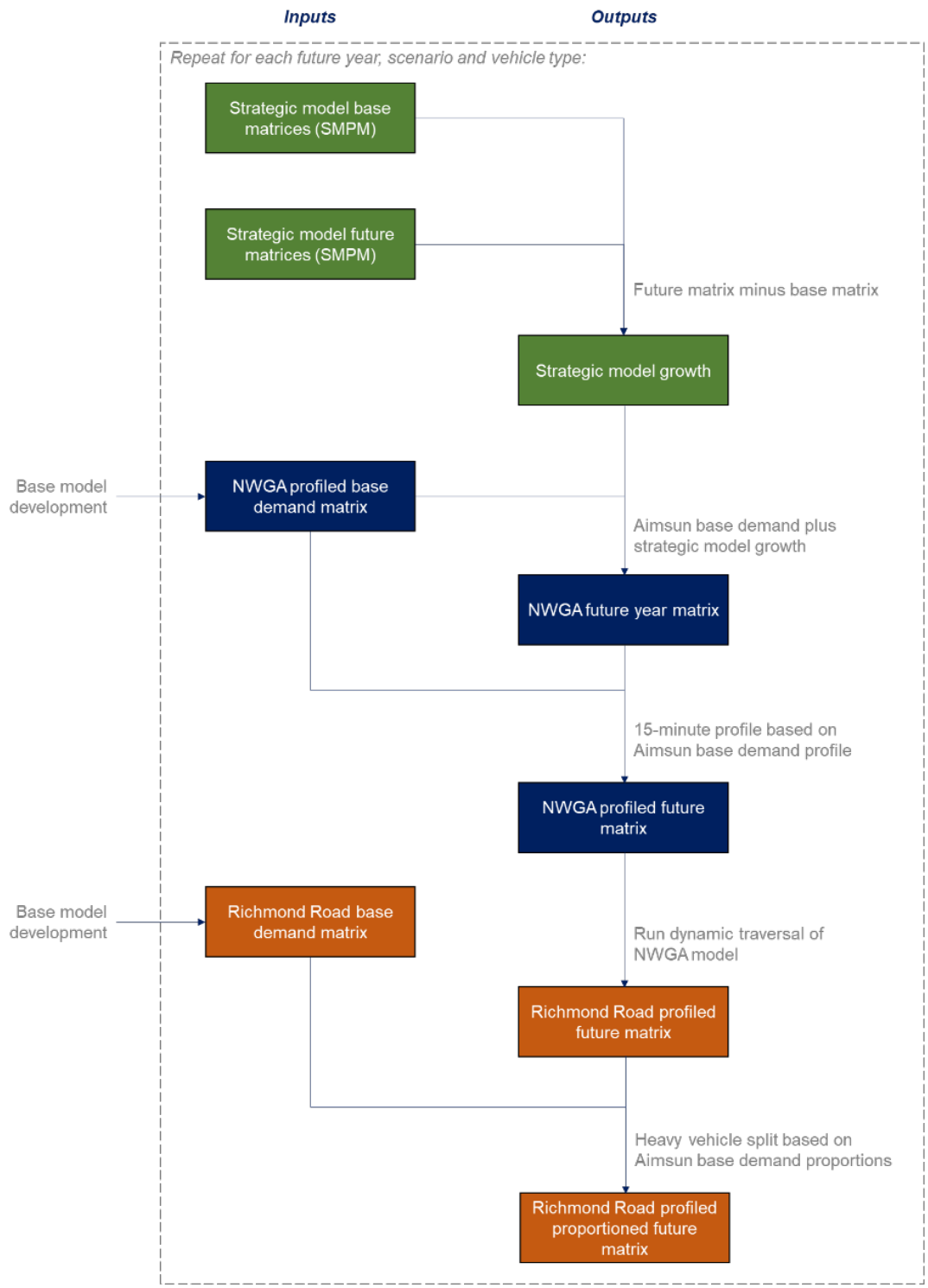

Figure 5-2: Future traffic demand estimation procedure

5.3 Demand summary

The following sections summarises the traffic demand for mesoscopic and microscopic models for all scenarios.

5.3.1 Mesoscopic traffic demand

Table 5-1 and **Figure 5-3** summarise the mesoscopic traffic demand for each modelled scenario, year and peak.

Between 2023 and 2028, traffic demand under the Do Minimum and the Proposal scenarios increases by 14,670 vehicles, or 15 per cent in the AM peak, and increases by 15,858 vehicles, or 15 per cent in the PM peak.

Between 2023 and 2038, traffic demand under the Do Minimum and the Proposal scenarios increases by 34,009 vehicles, or 35 per cent in the AM peak, and increases by 37,991 vehicles, or 36 per cent in the PM peak.

Table 5-1: Mesoscopic traffic demand summary

Year	Existing Base/ Do Minimum Traffic Demand (veh)			The Proposal Traffic Demand (veh)		
	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total
AM Peak						
2023	93,339	3,325	96,664			
2028	107,519	3,815	111,334	107,519	3,815	111,334
2028 vs 2023	+14,180 (+15%)	+490 (+15%)	+14,670 (+15%)	+14,180 (+15%)	+490 (+15%)	+14,670 (+15%)
2038	126,062	4,611	130,673	126,062	4,611	130,673
2038 vs 2023	+32,723 (+35%)	+1,286 (+39%)	+34,009 (+35%)	+32,723 (+35%)	+1,286 (+39%)	+34,009 (+35%)
PM Peak						
2023	102,521	2,326	104,847			
2028	118,012	2,693	120,705	118,012	2,693	120,705
2028 vs 2023	+15,491 (+15%)	+367 (+16%)	+15,858 (+15%)	+15,491 (+15%)	+367 (+16%)	+15,858 (+15%)
2038	139,535	3,303	142,838	139,535	3,303	142,838
2038 vs 2023	+37,014 (+36%)	+977 (+42%)	+37,991 (+36%)	+37,014 (+36%)	+977 (+42%)	+37,991 (+36%)

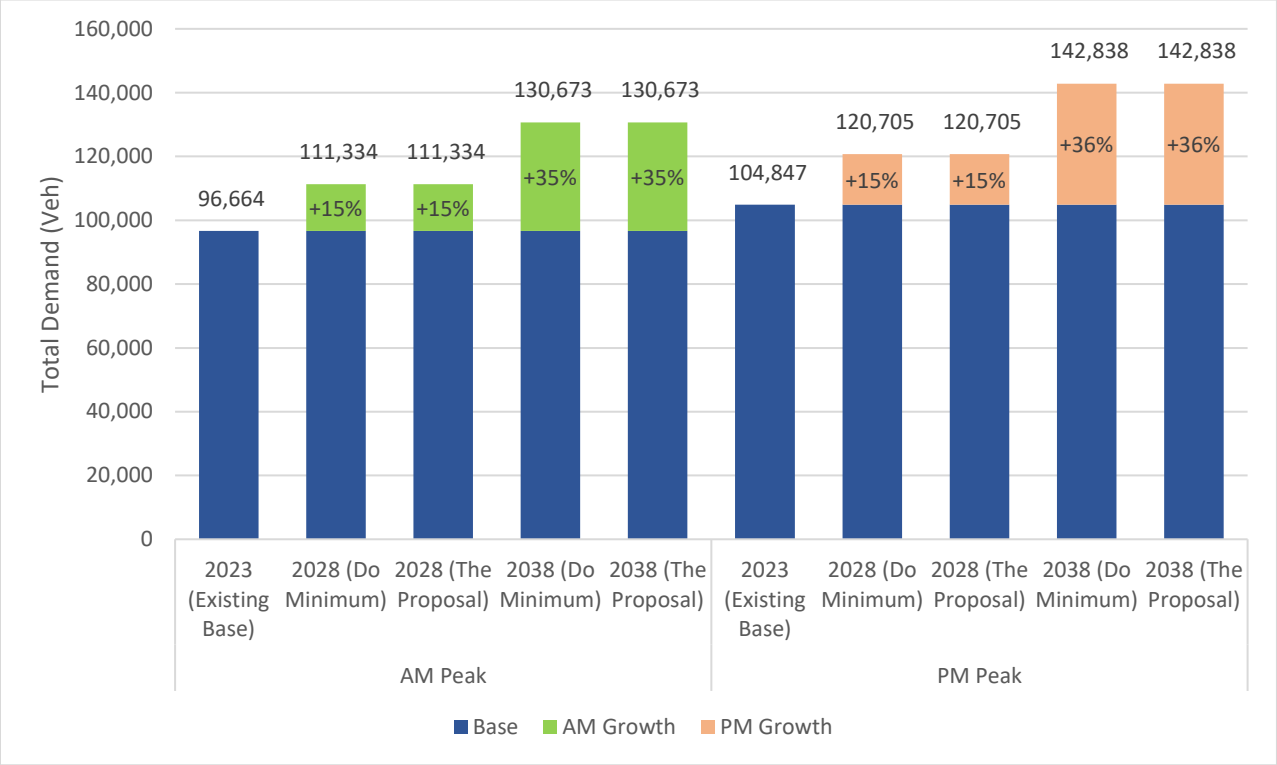

Figure 5-3: Mesoscopic traffic demand summary

5.3.2 Microscopic traffic demand

Table 5-2 and Figure 5-4 summarise the microscopic traffic demand for each modelled scenario, year and peak.

Between 2023 and 2028, traffic demand under the Do Minimum scenario increases by 1502 vehicles, or six per cent in the AM peak, and increases by 3028 vehicles, or 12 per cent in the PM peak. Under the Proposal scenario, traffic demand increases by 1809 vehicles, or seven per cent in the AM peak and increases by 2680 vehicles, or 10 per cent in the PM peak.

Between 2023 and 2038, traffic demand under the Do Minimum scenario increases by 5833 vehicles, or 23 per cent in the AM peak, and increases by 6842 vehicles, or 26 per cent in the PM peak. Under the Proposal scenario, traffic demand increases by 7978 vehicles, or 31 per cent in the AM peak and increases by 8332 vehicles, or 32 per cent in the PM peak.

Table 5-2: Microscopic traffic demand summary

Year	Existing Base/ Do Minimum Traffic Demand (veh)				The Proposal Traffic Demand (veh)			
	Light Vehicles	Heavy Vehicles		Total	Light Vehicles	Heavy Vehicles		Total
		Rigid	Articulated			Rigid	Articulated	
AM Peak								
2023	23,701	1,449	436	25,586				
2028	25,361	1,327	400	27,088	25,637	1,351	407	27,395
2028 vs 2023	+1,660 (+7%)	-122 (-8%)	-36 (-8%)	+1,502 (+6%)	+1,936 (+8%)	-98 (-7%)	-29 (-7%)	+1,809 (+7%)
2038	29,443	1,519	457	31,419	31,318	1,726	520	33,564
2038 vs 2023	+5,742 (+24%)	+70 (+5%)	+21 (+5%)	+5,833 (+23%)	+7,617 (+32%)	+277 (+19%)	+84 (+19%)	+7,978 (+31%)
PM Peak								
2023	24,730	1,103	325	26,158				
2028	27,898	994	294	29,186	27,581	970	287	28,838
2028 vs 2023	+3,168 (+13%)	-109 (-10%)	-31 (-10%)	+3,028 (+12%)	+2,851 (+12%)	-133 (-12%)	-38 (-12%)	+2,680 (+10%)
2038	31,497	1,160	343	33,000	32,877	1,244	369	34,490
2038 vs 2023	+6,767 (+27%)	+57 (+5%)	+18 (+6%)	+6,842 (+26%)	+8,147 (+33%)	+141 (+13%)	+44 (+14%)	+8,332 (+32%)

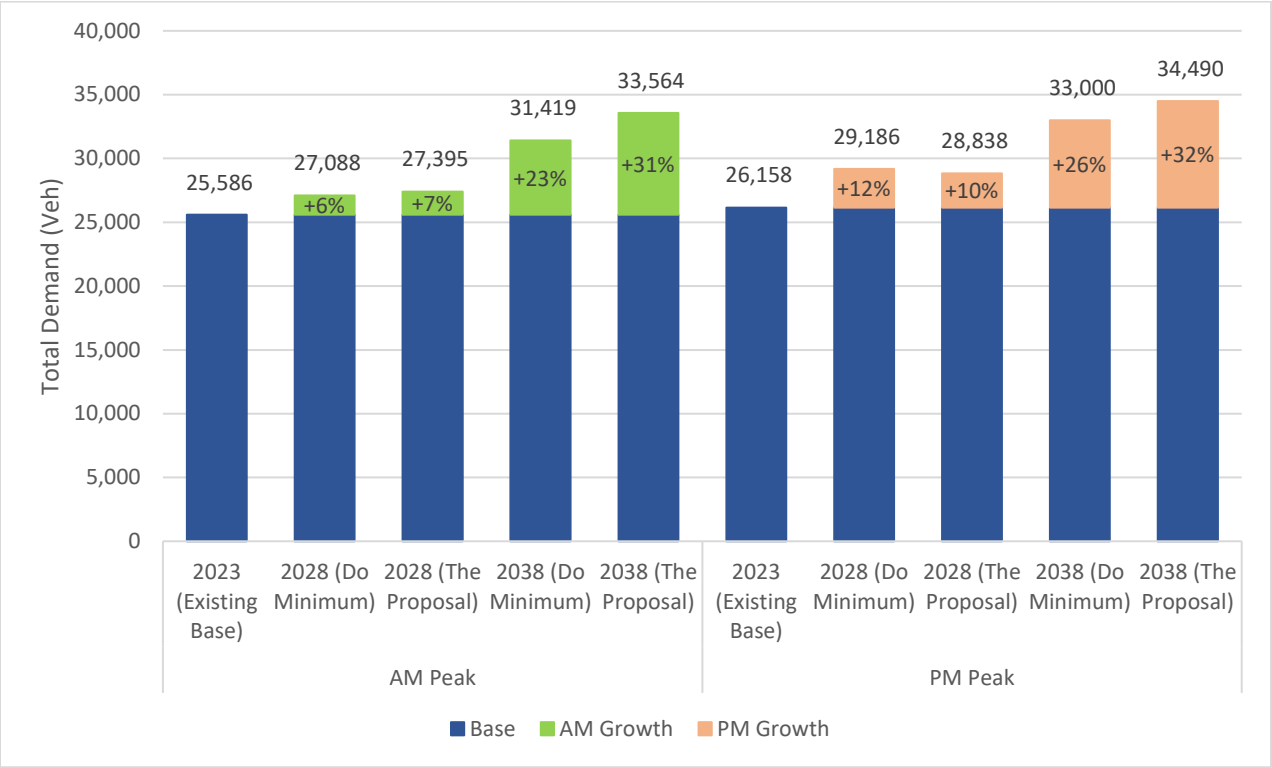

Figure 5-4: Microscopic traffic demand summary

6 Existing road network performance

This section outlines the assumptions and data inputs used for Existing Base model development. Results from the Existing Base model developed in Aimsun were used to analyse the existing road network performance. This section also details the existing network and intersection performance.

6.1 Traffic modelling of existing conditions

This section outlines the data inputs, model specifications and assumptions adopted for developing the Existing Base model.

6.1.1 Traffic model background

As described in **Section 2.1.1**, the Richmond Road Corridor Upgrade project undertook traffic modelling of the NWPGA and the Richmond Road corridor, with the aim of analysing and prioritising road projects throughout the region. As part of the project, a microsimulation model of the Richmond Road corridor and a mesoscopic model of the NWPGA were created.

The microsimulation base model for this assessment was adopted from the Richmond Road Corridor Upgrade project. The Richmond Road Corridor Upgrade model was adopted to:

- reduce risk and improve design outcomes for the proposal by modelling interactions with interfacing projects along the Richmond Road corridor and within the broader NWPGA region
- increase efficiency in the traffic modelling program by eliminating duplication of work.

The use of the Richmond Road Corridor Upgrade traffic models for this assessment was endorsed by Transport for NSW.

6.1.2 Data inputs

The Existing Base model was developed using the following inputs:

- cordon matrices from the Richmond Road Corridor Upgrade NWPGA mesoscopic model
- 2023 traffic survey data including:
  - Classified intersection counts
  - Automated tube counts
  - Travel time surveys
- traffic signal data, including historical phase times, cycle times and offsets
- public transport operations from the GTFS feed and local bus timetables.

6.1.3 Model specifications and assumptions

The Existing Base model was calibrated and validated to the network conditions observed in March 2023. The settings and parameters of note from the model are:

- Aimsun version 22.0.3 was used to develop the Existing Base model
- signalised intersections were coded using Aimsun actuation using traffic signal data, including historical timings from SCATS data and settings from the Region LX files.
- the Existing Base model was developed to represent typical weekday traffic conditions in the following peak periods:
  - AM peak: 7:00am – 9:00am
  - PM peak: 4:00pm – 6:00pm

The Existing Base model was developed in accordance with the *Traffic Modelling Guidelines* (Roads and Maritime Services, 2013). A statistical analysis of stability indicated an acceptable degree of confidence in the results. The calibration and validation results showed that the Existing Base model provided an acceptable representation of existing conditions, including:

- High network-wide calibration with over 95 per cent of turning movements having a GEH less than five, and no turn movements having a GEH greater than 10 across all peaks
- Acceptable core area calibration results with at least 75 per cent of turning movements achieving core area calibration criteria
- Sufficient representation of traffic signal operations, notwithstanding the limitations of Aimsun actuated signals in comparison to SCATS
- Modelled travel times on the Richmond Road route fit well with observed data.

The Existing Base model was reviewed and endorsed by Transport for NSW as fit for the purpose of future scenario testing. The *Richmond Road Corridor Upgrade Base Microsimulation Traffic Model Development Report* (Stantec, November 2023).

6.2 Performance metrics

This section outlines the performance metrics used for assessing the existing and future years.

6.2.1 Network performance metrics

Model operation is quantified based on a number of statistical outputs. **Table 6-1** summarises the network performance statistics reported for this study.

Table 6-1: Network performance metrics

Metric	Unit	Description
Total traffic demand	veh	The total number of vehicles that intend to enter the network in the modelled period
Vehicle kilometres travelled (VKT)	km	The distance travelled by all vehicles in the network Useful for identifying savings in road user and external costs
Vehicle hours travelled (VHT)	hrs	The total travel time of all vehicles that have completed their trips Useful for identifying network efficiency and performance, possible congestion issues and future travel time savings
Total number of stops	stops	The number of times a vehicle stops across all vehicles in the model
Average time travelled in network	sec	Average time spent in the network across all vehicles
Average number of stops	stops	Average number of stops per vehicle
Average speed	km/hr	Average speed for all vehicles in the network
Unreleased demand	veh	The number of vehicles that were unable to enter the modelled network during the modelled period as a result of queuing within the model extending to or beyond the boundary.

6.2.2 Intersection performance metrics

The following performance metrics were used in the analysis of intersections:

- Delay time: average delay experienced by vehicles at the intersection
- Level of Service (LOS): an intersection performance measure that is based on delay per vehicle
- Queue lengths: the maximum queue lengths observed on each approach to an intersection.

For signalised intersections, level of service is based on the weighted average delay of all approaches. For unsignalised intersections (priority-controlled and roundabouts), level of service is based on the maximum delay across all movements. **Table 6-2** shows the level of service categories for intersection in NSW from the *Guide to Traffic Generating Developments* (Roads and Traffic Authority, 2002).

Table 6-2: Level of service criteria for intersections

Level of service	Description	Delay
A	Good operation	Less than 14 seconds
B	Good operation, with acceptable delays and spare capacity	15 – 28 seconds
C	Satisfactory operation	29 – 42 seconds
D	Near capacity	43 – 56 seconds
E	At capacity	57 – 70 seconds
F	Capacity exceeded	More than 70 seconds

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

Intersections operating at LOS C or better are considered satisfactory. LOS D indicates that the intersection is approach capacity, and an accident study may be required. LOS E indicates that the intersection is at capacity and this level of service is generally unsuitable for unsignalised intersections. LOS F indicates that the intersection is failing and requires additional capacity.

The average delay on each approach is measured from the preceding intersection. Consequently, if the queue from one intersection spills back to the preceding intersection, this delay is captured at the second intersection and not the first. Where intersections are closely spaced, this may result in the intersection that is causing the delay appearing to perform better than other intersections nearby.

6.2.3 Travel times

Travel time data provides an indication of congestion hotspots along a particular route within a network and can also be used to compare the performance of future options.

The speed ratio was also used to understand the performance along each route. The speed ratio is calculated by dividing the average speed on a route by a posted speed limit. To assist with comparing and identifying the performance of travel time routes, Stantec has used the colour code shown in **Table 6-3** in this report.

Table 6-3: Travel time route speed ratio colour code

Speed ratio					
Less than 0.30	0.30 – 0.40	0.40 – 0.50	0.50 – 0.67	0.67 – 0.80	Greater than 0.80

6.3 Existing operational impacts

This section outlines existing traffic volumes on major roads, network performance and intersection performance. Results from the Existing Base model was used to analyse the existing road network and intersection performance.

6.3.1 Existing traffic volumes on major roads

Existing 2023 traffic volumes were determined from automatic tube count survey data along the corridor and surrounding roads in the study area.

Figure 6-1 and **Table 6-4** show the daily traffic volumes along Richmond Road and Rooty Hill Road North through the study area. Vehicles are classified according to the Austroads (1994) vehicle classes.

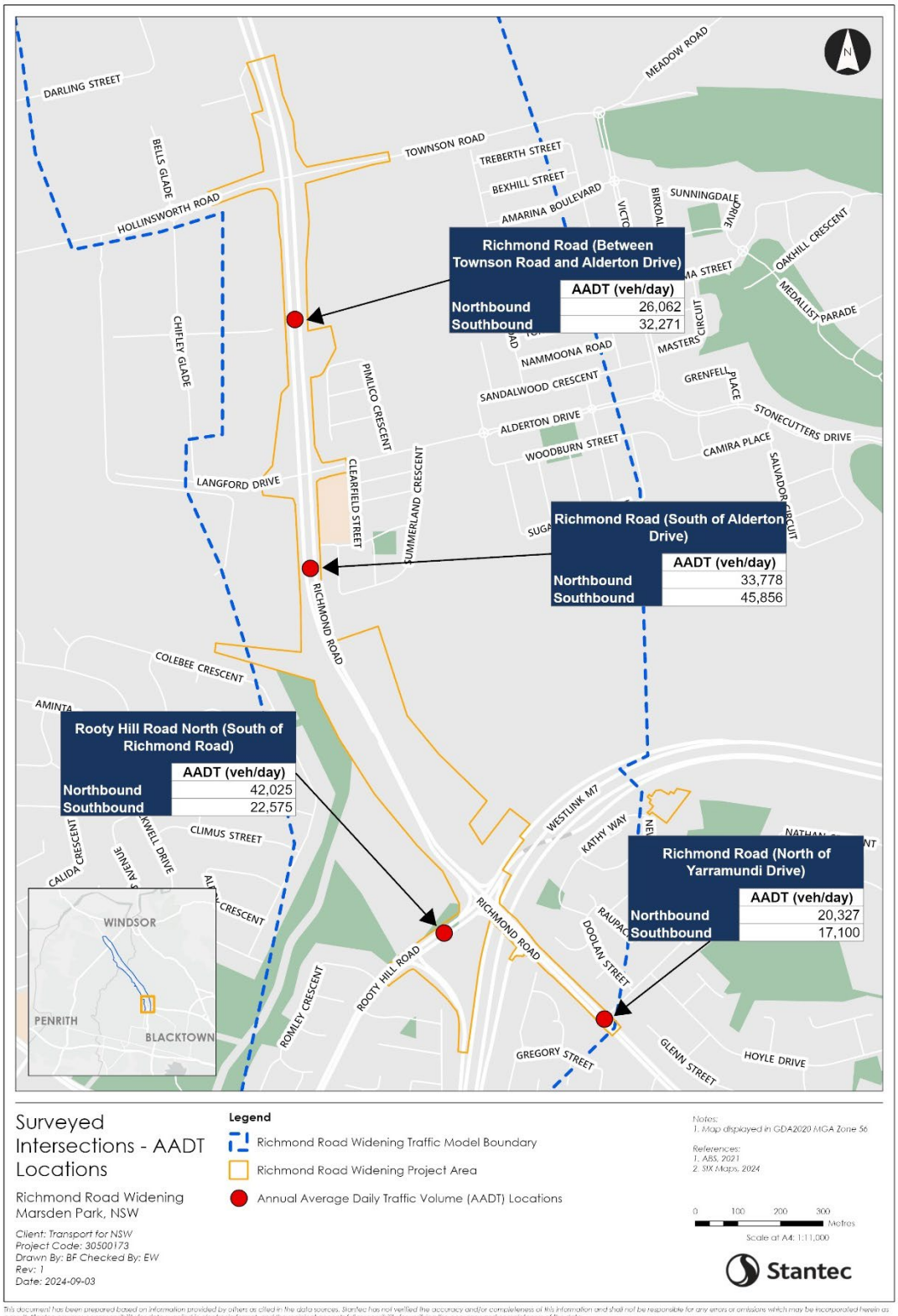

Figure 6-1: Existing traffic volumes and AADT locations

Table 6-4: Existing traffic volumes along major roads

Location	Direction	Light vehicles (Class 1-2)	Heavy vehicles (Class 3-5)	Articulated vehicles (Class 6-12)	AADT (veh/day)
Richmond Road (between Townson Road and Alderton Drive)	Northbound	23,500	1,502	1,060	26,062
	Southbound	30,094	1,426	751	32,271
Richmond Road (south of Alderton Drive)	Northbound	30,389	1,884	1,504	33,778
	Southbound	42,031	2,362	1,463	45,856
Richmond Road (North of Yarramundi Drive)	Northbound	19,422	485	420	20,327
	Southbound	16,494	365	240	17,100
Rooty Hill Road North (South of Richmond Road)	Northbound	37,823	2,423	1,779	42,025
	Southbound	21,841	413	322	22,575

6.3.2 Existing network performance

Table 6-5 summarises the Existing Base model network performance results for each peak. The following findings are noted:

- The AM peak is the more critical peak overall, with higher VHT results which corresponds to higher average travel times and vehicle delay.
- While the overall traffic demands are higher in the PM peak, overall network performance is worse in the AM peak.
- Vehicles experience more congestion in the AM peak than the PM peak, with average speed lower in the AM peak.
- The average number of stops is highest during the AM peak at 4.46 stops per vehicle.
- There are no unreleased vehicles in either the AM or PM peaks.

Table 6-5: Existing base model network performance results

Network performance metric	Unit	AM peak	PM peak
All vehicles			
Total demand	(veh)	25,586	26,158
Vehicle kilometres travelled (VKT)	(km)	108,818	112,425
Vehicle hours travelled (VHT)	(hr)	4,055	3,291
Total number of stops	(stops)	108,498	94,508
Averages per vehicle			
Average travel time in network	(sec)	600	462
Average number of stops	(stops)	4.46	3.68
Average speed	(km/hr)	26.84	34.16
Average delay	(sec)	89	58
Unreleased demand			
Unreleased demand	(veh)	0	0
Proportion of total demand	(%)	0%	0%

6.3.3 Existing intersection performance

Table 6-6 shows the Existing Base model intersection performance results for the AM and PM peaks. The two modelled hours in each peak are reported separately. The results are summarised below.

- The Richmond Road / Hollinsworth Road intersection performs at LOS F by second hour of both AM and PM peaks. In the AM peak, the intersection experiences a high delay of 186 seconds mainly due to the north approach where the queuing and delay extends to this intersection from the Richmond Road / Rooty Hill Road North / Westlink M7 ramps. In the PM peak, high volumes of northbound and southbound through traffic limit the green time available for movements from Hollinsworth Road and Townson Road, thus creating high delays.
- The Richmond Road / Alderton Drive / Langford Drive intersection operates at LOS E or worse in both peaks. The existing capacity of the road is insufficient to service the high demand southbound in the AM peak and northbound in the PM peak.
- The Richmond Road / Rooty Hill Road North / Westlink M7 ramps operate at LOS F by second hour of AM peak and experience a high delay of 175 seconds due to the high demand from Richmond Road southbound traffic exceeding the existing capacity of the road. In the PM peak the intersection operates at capacity by end of second hour.
- The Rooty Hill Road North / Westlink M7 off-ramp and Richmond Road / Westlink M7 on-ramp perform satisfactorily at LOS C or better in both peak periods, except for Rooty Hill Road North / Westlink M7 off-ramp in the second hour of the AM peak. The Rooty Hill Road North / Westlink M7 off-ramp operates near capacity at LOS D by the second hour of AM peak due to delays caused by right turning traffic from Westlink M7 off-ramp to Rooty Hill Road North.

Table 6-6: Existing base model intersection performance results

Intersection	Vol. (veh)	Delay (s)	LOS	QL (veh)	Vol. (veh)	Delay (s)	LOS	QL (veh)
	AM Peak							
	7:00am-8:00am				8:00am-9:00am			
Richmond Road / Hollinsworth Road	3865	50.7	D	28	3815	186.2	F	27
Richmond Road / Alderton Drive / Langford Drive	4666	105.9	F	75	4580	209.4	F	53
Richmond Road / Rooty Hill Road North / Westlink M7 ramps	5678	87.9	F	26	5404	175.3	F	62
Rooty Hill Road North / Westlink M7 off-ramp	3151	30.6	C	17	3091	48.3	D	21
Richmond Road / Westlink M7 on-ramp	2941	18.6	B	20	2758	33.9	C	17
	PM Peak							
	4:00pm-5:00pm				5:00pm-6:00pm			
Richmond Road / Hollinsworth Road	4042	96.7	F	44	4192	90.7	F	40
Richmond Road / Alderton Drive / Langford Drive	4953	58.7	E	34	5106	87.4	F	53
Richmond Road / Rooty Hill Road North / Westlink M7 ramps	5794	54.1	D	24	6113	63.9	E	35
Rooty Hill Road North / Westlink M7 off-ramp	3329	29.3	C	19	3476	24.0	B	34
Richmond Road / Westlink M7 on-ramp	2569	23.0	B	21	2771	22.0	B	28

6.3.4 Existing travel times

Table 6-7 shows the existing travel time in each direction on the Richmond Road travel time route in each peak. The results indicate that:

- Average speeds are low along Richmond Road southbound route in the AM peak and Richmond Road northbound route in the PM peak.
- Travel times and average speeds southbound on Richmond Road are slowest during the AM peak. Capacity limitations caused by the two-lane Richmond Road carriageway result in average travel times of over seven minutes between Hollinsworth Road and Alderton Drive, and average travel times of over four minutes between Alderton Drive and Rooty Hill Road North. The average speed along these sections is also significantly low.

- Travel times and average speeds northbound on Richmond Road are slowest during the PM peak. Delays originating from the Richmond Road / The Northern Road and Richmond Road / George Street roundabouts result in average travel times of over seven minutes between St Marys Road and the Northern Road.

Table 6-7: Existing base model travel time results

Route	Section	Travel time (mm:ss)		Average speed (km/hr)	
		AM (7:30am-8:30am)	PM (4:30pm-5:30pm)	AM (7:30am-8:30am)	PM (4:30pm-5:30pm)
Richmond Road northbound	Alderton Drive	01:28	02:53	44.0	22.4
	Hollinsworth Road	01:05	01:59	36.8	20.0
	Hawthorne Avenue	01:04	01:05	34.9	34.5
	South Street	00:53	00:54	39.3	39.0
	Excelsior Avenue	00:44	00:47	63.4	59.9
	Garfield Road West	00:48	01:01	35.1	27.8
	Elara Boulevard	00:51	01:37	52.2	27.5
	St Marys Road	03:42	05:38	54.4	35.7
	The Northern Road	03:46	07:37	52.6	25.9
	George Street	00:18	00:18	41.3	42.5
	The Driftway	00:55	00:51	57.4	61.8
	Total	**15:35**	**24:40**	**48.8**	**30.8**
Richmond Road southbound	George Street	01:03	01:15	49.9	42.0
	The Northern Road	00:16	00:15	49.5	50.5
	St Marys Road	03:32	03:14	55.9	61.0
	Elara Boulevard	03:26	03:14	58.6	62.2
	Garfield Road West	01:53	01:14	23.3	35.8
	Excelsior Avenue	00:33	00:32	52.4	55.2
	South Street	01:26	01:12	32.6	38.9
	Hawthorne Avenue	03:05	00:49	11.3	42.9
	Hollinsworth Road	04:45	01:32	7.9	24.4
	Alderton Drive	07:13	01:51	5.5	21.5
	Rooty Hill Road North	04:49	03:20	13.3	19.2
	Total	**32:00**	**18:27**	**23.7**	**41.2**

7 Construction traffic impact assessment

This section outlines the construction staging plan, ancillary sites, construction traffic generation and associated assumptions and the impacts on road network and road users during construction of the proposal.

7.1 Construction summary

Construction for the proposal would be required for following components:

- M7 Richmond Road Exit Ramp (flyover bridge)
- M7 Motorway Exit Ramp (after toll gantry and before flyover, existing ramp to Rooty Hill Road North)
- Richmond Road (southern section - CH0 to CH900)
- Richmond Road (northern section - CH900 to CH2334)
- Richmond Road / Hollinsworth Road / Townson Road intersection

Table 7-1 outlines the proposed design criteria for each component.

Construction traffic, consisting of both light and heavy vehicles, would access the site via ancillary sites described in **Section 7.3.**

Table 7-1: Proposed design criteria

Design element	Design criteria					
	M7 Richmond Road Exit Ramp (Flyover Bridge)	**M7 Motorway Exit Ramp (after toll gantry and before flyover)**	**Richmond Road (CH0 to CH900 (South of Bells Creek))**	**Richmond Road (CH900 to CH2334 (North of Bells Creek))**	**Hollinsworth Road**	**Townson Road**
Posted speed	60km/h	60km/h	70km/h	80km/h	50km/h	60km/h
Design speed	70km/h	70km/h	80km/h	90km/h	60km/h	70km/h
Lane width	3.5m and curve widening as required	3.5m (minimum)	3.5m	3.5m	3.5m	3.5m
Median width	Nil	Nil	1.8m minimum adjacent to right turn lanes	1.8m minimum adjacent to right turn lanes	1.5m minimum adjacent to right turn lanes	1.5m minimum adjacent to right turn lanes
Left turn auxiliary lane width	Nil	3.5m (minimum)	Nil	3.5m (minimum)	3.5m	3.5m
Right turn auxiliary lane width	Nil	3.5m (minimum)	Nil	3.5m (minimum)	3.3m	3.3m
Nearside (outside) shoulder width	Nil	2.5m (minimum), 3m minimum adjacent to barriers	2.0m (minimum)	2.0m (minimum)	As existing	As existing
Offside (median) shoulder width	Nil	1.0m	1.2m	1.2m	As existing	As existing
Minimum median width for staged pedestrian crossings	Nil	Nil	Nil	Nil	3.6m	3.6m
Carriageway	1 northbound lane	3 northbound lanes (2 right turn lanes and 1 left turn lane)	3 lanes northbound and 3 lanes southbound	3 lanes northbound and 3 lanes southbound	2 westbound lanes and 4 eastbound lanes (1 left turn slip lane, 1 through lane and 2 right turn lanes)	As existing
Design Vehicle for turning movement	Nil	26m B-double	26m B-double	26m B-double	26m B-double	26m B-double
Minimum stopping sight distance	161	161	240	355	98	161

7.2 Construction staging

Table 7-2 presents the summary of construction staging plan and the works to be undertaken during each stage of construction. The works are proposed to be undertaken as day and night works. The night works is proposed to be undertaken 5 nights a week.

Table 7-2: Construction staging plan

Stage	Sub-stage	Works to be undertaken	Traffic lanes
1 (Northern Section)	1A	Under construction: • Excavation and construction of median on Richmond Road • High entry left turn slip lane from Hollinsworth Road to Richmond Road northbound from the edge of existing pavement.	• Southern section traffic as per existing configuration • Existing Richmond Road shifted towards the nearside kerb to facilitate median construction and night closures where required • Existing Hollinsworth Road • Existing Townson Road
	1B	Under construction: • High entry left turn slip lane from Hollinsworth Road to Richmond Road northbound tie-in finalisation. Night works construction: • MC10 Richmond Road mill and resheet between Alderton Drive / Langford Drive to Hollinsworth Road / Townson Road, only on the northbound section of the road. • MC10 Richmond Road mill and resheet northbound north of Hollinsworth Road / Townson Road.	• Southern section traffic per existing configuration • Existing Richmond Road • Existing Hollinsworth Road • Existing Townson Road
	1C	Night works construction: • Alderton Drive / Langford Drive intersection mill and resheeting. • MC20 Richmond Road mill and resheet between Alderton Drive / Langford Drive to Hollinsworth Road / Townson Road, only on the southbound section of the road. • Finalisation of Hollinsworth Road high entry left turn slip lane onto Richmond Road northbound.	• Southern section traffic per existing configuration. • Hollinsworth Road lanes modified to facilitate pavement construction. • Existing Townson Road
	1D	Night works construction: • Finalisation of any remaining mill and resheeting, pavement markings, road furniture, footpaths etc., Richmond Road.	• Southern section traffic per existing configuration. • All live traffic on ultimate Richmond Road. • Hollinsworth Road high entry left turn slip lane opened.

Stage	Sub-stage	Works to be undertaken	Traffic lanes
2 (Southern Section)	2A	Under construction: • MC20 Richmond Road ultimate design between Rooty Hill Road North / Richmond Road and Plumpton Sewage Pumping Station SP0394. • Construction of the flyover southern embankment and site establishment for Bridge construction in future stages. • Earthworks and Bells Creek Bridge on proposed Richmond Road Northbound to be constructed to allow for the installation of proposed utilities from CH300-CH1200 (MC10) Bridge construction: • MC10 northbound Bells Creek bridge.	• Existing Richmond Road northbound • Existing Richmond Road southbound to be narrowed to where lane widths have been narrowed and lane configuration modified to facilitate construction of the future southbound lanes. Lane widths have been modified to existing conditions or 3.2m minimum. • Northern section works opened.
	2B	Under construction: • MC10 northbound Richmond Road from Bells Creek to Alderton Drive to allow for future switch from constructed MC10 Richmond Road and existing Richmond Road just south of Alderton Drive. Bridge construction: • MC70 Rooty Hill Road North Flyover including retaining walls and tie-in.	• Richmond Road northbound and southbound shifted to the proposed Richmond Road southbound lanes as temporary traffic alignment. Shift all live traffic onto proposed southbound carriageway till Bells Creek bridge ~500m. • Rooty Hill Road North / Richmond Road intersection adjusted for temporary contraflow. • Northern section works opened.
	2C	Under construction: • MC70 Rooty Hill Road North Flyover and northern embankment tie-in. • MC10 Richmond Road northbound between Rooty Hill Road North and Bells Creek bridge.	• Richmond Road northbound and southbound shifted to the proposed Richmond Road southbound lanes temporary traffic alignment. Shift all live traffic onto proposed southbound carriageway till Bells Creek bridge ~500m. • Rooty Hill Road North / Richmond Road intersection adjusted for temporary contraflow. • Northern section works opened.
	2D	Under construction: • MC10 and MC80 West Link M7 off-ramp verge construction. • MC20 verge construction Bells Creek to Alderton Drive. • MC10 Median construction from Bells Creek to Alderton Drive. Night works construction: • Realigned pedestrian islands at Rooty Hill Road North / Richmond Road intersection.	• Rooty Hill Road North flyover closed • All live traffic on ultimate Richmond Road. • Northern section works opened.

Stage	Sub-stage	Works to be undertaken	Traffic lanes
		• MC20 southbound Richmond Road between Bells Creek and Alderton Drive / Langford Drive. • All proposed TCS, ITS, safety barriers, reflective tags, relocated and new signage, fences and other miscellaneous road furniture.	

Stage 1 construction works in the northern section are primarily taking place at night or outside the time periods considered for traffic modelling. As a result, these works are expected to have minimal to no impact on traffic. Additionally, since northern section does not involve changes to the existing traffic lane arrangements, it has not been included in the modelling.

Traffic modelling has been conducted to assess the impacts of Stage 2 construction works in the southern section. Southern section has been divided into four sub-stages: 2A, 2B, 2C, and 2D. Stages 2A, 2B, and 2C involve modifications to lane configurations to facilitate construction, including adjustments to the Rooty Hill Road North / Richmond Road intersection for temporary traffic alignments. Stage 2D works, however, will take place at night and are not expected to impact traffic operation. Any switches required between each substage to be undertaken where possible under weekend night works to mitigate any overrun risks into the weekdays.

7.3 Ancillary sites

Ancillary sites would be established during construction to provide:

- site compound that incorporates site offices, car parking, sheds, workshops and storage
- plant laydown areas
- vehicle turning bays
- area for delivery of imported material including engineered fill, concrete and asphalt
- stockpile material for material, spoil and mulch.

The recommended ancillary sites were selected based on areas that would maximise the use of existing infrastructure, would provide ease of access, and are on vacant land. The recommended ancillary sites include:

- piece of land between M7 off-ramp and Rooty Hill Road North
- area on western side of Richmond Road near MC10 CH950 (Lot 1 DP792478)
- piece of land east of Newnham Street and south of M7 Cycleway.

Table 7-3 presents the ancillary site context and potential uses. **Figure 7-1** shows the ancillary site locations.

Table 7-3: Ancillary sites

Ancillary site context	Potential uses
Piece of land between M7 off-ramp and Rooty Hill Road North	The site could accommodate: • Site compound that incorporates site offices, sheds, workshops and storage • Employee parking • Plant laydown area • Area for delivery of imported material • Stockpile for material, spoil and mulch
Area on western side of Richmond Road near MC10 CH950 (Lot 1 DP792478)	The site could accommodate: • Site compound that incorporates site offices, sheds, workshops and storage • Employee parking • Plant laydown area • Area for delivery of imported material • Stockpile for material, spoil and mulch
Piece of land east of Newnham Street and south of M7 Cycleway	The site could accommodate: • Site compound that incorporates site offices, sheds, workshops and storage • Employee parking

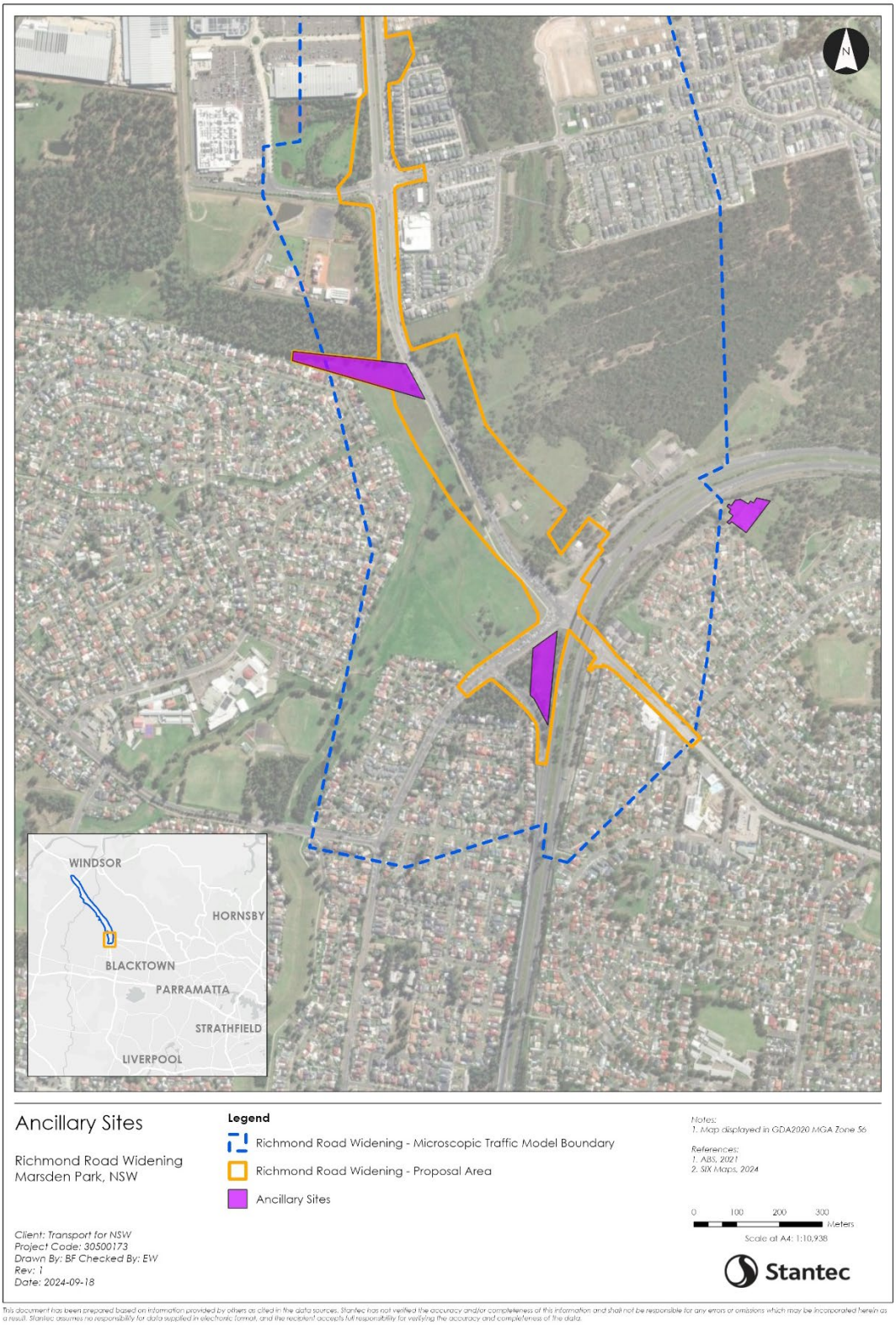

Figure 7-1: Ancillary site locations

7.4 Construction traffic

This section outlines the vehicle trip generation and assumptions associated with construction of the proposal.

7.4.1 Vehicle trip purposes

Construction of the proposal is expected to generate both light and heavy vehicle movements. Vehicle movements associated with construction would include:

- delivery of construction materials (heavy vehicles)
- spoil removal (heavy vehicles)
- importation of fill material for earthworks (heavy vehicles)
- delivery and removal of construction equipment and machinery (heavy vehicles)
- workers travelling to, from and within the proposal's construction boundary (light vehicles).

Access to the site for construction vehicles would be via the Richmond Road or via M7 motorway.

7.4.2 Construction traffic generation

The intensity of construction related traffic would vary throughout the construction period, depending on specific requirements of each activity. The most intensive periods for traffic impacts would be the earthworks and road pavement stages. **Table 7-4** outlines the expected traffic generation for these activities.

Table 7-4: Construction traffic generation

Construction activity	Timing	Quantity	Truck capacity	Number of total trips (one way)	Number of daily trips (two way)*
Earthworks					
Imported fill	Earthwork phase (~ 9 months)	~ 99183 m^3	25 m^3	8000	26
Earthworks hauling		~ 36500 m^3	25 m^3	3000	26
Delivery of equipment			Varies	80	1
Road Construction					
Concrete	Road construction phase (~ 11 months)	~3776 m^3	8 m^3	1200	21
Sealed bitumen		~ 317 m^3	10 m^3	200	10
Heavily bound base		~1100 m^3	25 m^3	200	26
Asphalt		~ 37959 m^3	10 m^3	7600	21
Delivery of equipment			Varies	60	1
Workforce					
Workers arriving / leaving site	Every work day	N/A	N/A	82500	60

**Daily trips are assumed to be split evenly between the AM and PM peak periods.*

7.4.3 Assumptions

All vehicles would be heavy vehicles except for construction workers arriving / leaving site. The majority of deliveries to the site are assumed to come from surrounding regions via M7 Motorway.

Workforce trips have been assumed to be based on population distribution, according to the 2016 Census data, for the catchment within one-hour drive of the proposal site. This extends north to Richmond, Riverstone, Box Hill, Oakville, and Windsor.

Following assumptions were adopted for the distribution of construction traffic:

- Site access points are assumed to function as either left-in/ left-out or right-in/ right-out. Specifically, access to construction site between the M7 off-ramp and Rooty Hill Road North is assumed to be right-in/ right-out, while all other sites are assumed to use left-in/ left-out access points.
- The daily trips provided in **Table 7-4** are assumed to take place wholly in the AM and PM peak periods and are split evenly at 50% in each peak.
- Light vehicle traffic proportions to and from the construction site is assumed to be 80 per cent inbound and 20 per cent outbound during the AM peak, and 20 per cent inbound and 80 per cent outbound during the PM peak.
- Heavy vehicle traffic to and from construction sites is assumed to be evenly split at 50 per cent each way, in both peaks.
- Construction traffic entering from the M7 motorway or Richmond Road is assumed to return to the M7 motorway or Richmond Road.

7.5 Construction impacts

This section presents the results of traffic modelling undertaken for the peak construction with and without construction of the project.

7.5.1 Construction scenarios

Two construction scenarios were developed in accordance with the proposed modifications to the existing road geometry, as outlined in **Section 7.2**. These scenarios were analysed to evaluate their potential impacts and feasibility. The scenarios considered for assessment are as follows:

- 2028 The Proposal (Stage 1)
- Construction Scenario 1 (Stage 2A)
- Construction Scenario 2 (Stage 2B and 2C)

2028 The Proposal (Stage 1): This scenario was modelled with “committed and funded” and “indicative” infrastructure upgrades, and the northern section of the proposal. It serves as the baseline for comparison with the proposed construction scenarios.

Construction Scenario 1 (Stage 2A): This scenario involves modifications to existing Richmond Road southbound lane configurations to facilitate the construction of future southbound lanes. The northbound lane configuration remains unaltered.

Construction Scenario 2 (Stage 2B and 2C): This scenario involves shifting the northbound and southbound lane configurations to the southbound lanes of the proposed Richmond Road as part of a temporary traffic alignment. It also includes adjustments to the Rooty Hill Road North / Richmond Road intersection for temporary contraflow.

The infrastructure layouts for the construction scenarios are shown in **Figure 7-2** below.

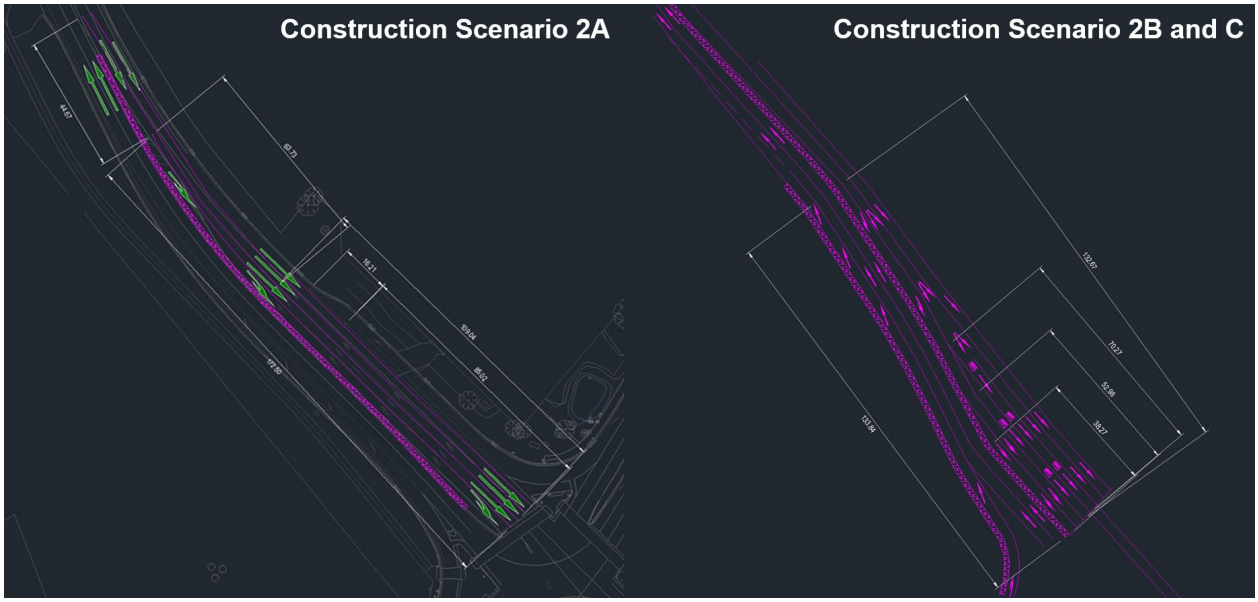

Figure 7-2: Richmond Road construction scenario layouts

7.5.2 Traffic volume impacts

The construction traffic impact is assessed according to the percentage increase in traffic caused during the construction phase relative to the baseline volume. The following thresholds were adopted for the construction traffic impact assessment:

- **Low impact**: Less than five per cent increase during construction
- **Medium impact**: Five to 20 per cent increase during construction
- **High impact**: Greater than 20 per cent increase during construction.

Table 7-5 summarises the increase in traffic volumes on key roads affected by the construction of the proposal, in comparison to the Proposal traffic volumes in 2028. The 2028 Proposal traffic volumes were interpolated from the 2026 and 2031 SMPM modelled volumes. Increase in traffic on other roads was negligible as truck traffic was assumed to follow pre-defined routes.

Table 7-5: Construction traffic impacts on traffic volumes (2028)

Location	2028 The Proposal Daily Traffic (veh/day)	Construction Daily Traffic (veh/day)	Increase during construction (veh/day)	Impact Level
Richmond Road (between Townson Road and Alderton Drive)	67,642	192	0.3%	Low
Richmond Road (south of Alderton Drive)	90,361	192	0.2%	Low
Richmond Road (north of Yarramundi Drive)	41,494	192	0.5%	Low
Rooty Hill Road North (south of Richmond Road)	69,612	192	0.3%	Low

The impact of construction traffic on Richmond Road is expected to be low as the road already handles a significant amount of traffic and an increase of 192 vehicles per day is not considered to be detrimental to the operation or safety of the road.

7.5.3 Intersection performance

Traffic modelling has been undertaken in the Aimsun microsimulation model (for the core study area only) to determine the relative impacts of construction traffic at key intersections when compared to conditions without construction of the project. This was undertaken by adding heavy vehicle and light vehicle construction traffic generation to each of the construction ancillary facilities and work sites during the morning and evening peak hours.

Intersection performance for the 2028 The Proposal scenario with and without construction traffic is summarised in following sections for the morning and evening peak hours.

7.5.3.1 Intersection performance with construction (Stage 2A)

Table 7-6 outlines the intersection performance results for the 2028 Construction Stage 2A and 2028 The Proposal scenarios. The following observations have been made:

- In the AM peak, all intersections operate at the same Level of Service (LOS) in the construction scenario as in the Proposal scenario. However, the delay increases by 30 seconds at the Richmond Road / Rooty Hill Road North / Westlink M7 ramps intersection, indicating that while construction staging does not significantly worsen performance, some intersections experience increased delays due to construction.
- In the first hour of the PM peak, all intersections perform slightly worse as a result of additional construction traffic. This is further exacerbated in the second hour where the additional traffic has resulted in higher congestion along Richmond Road southbound, north of Alderton Drive resulting in less vehicles reaching the northern approach of the Richmond Road / Rooty Hill Road North / Westlink M7 ramps intersection. This results in a better performance for this intersection as more green time is allocated for other approaches.

Table 7-6: 2028 intersection performance with construction stage 2A

Intersection	2028 Construction Stage 2A								2028 The Proposal (Stage 1)							
	Vol. (veh)	Delay (s)	LOS	QL (veh)	Vol. (veh)	Delay (s)	LOS	QL (veh)	Vol. (veh)	Delay (s)	LOS	QL (veh)	Vol. (veh)	Delay (s)	LOS	QL (veh)
	AM peak															
	7:00am-8:00am				**8:00am-9:00am**				**7:00am-8:00am**				**8:00am-9:00am**			
Richmond Road / Hollinsworth Road	4337	25.6	B	20	4306	124.3	F	72	4329	25.4	B	17	4294	122.7	F	41
Richmond Road / Alderton Drive / Langford Drive	5071	69	E	54	5449	166	F	59	5015	68.4	E	42	5194	171.6	F	66
Richmond Road / Rooty Hill Road North / Westlink M7 ramps	5934	52.5	D	48	6178	101.6	F	81	5909	43.9	D	33	6195	77.9	F	38
Rooty Hill Road North / Westlink M7 off-ramp	3290	55.7	D	42	3466	84.9	F	41	3300	50.5	D	45	3472	83.1	F	44
Richmond Road / Westlink M7 on-ramp	2856	15.8	B	16	2961	38.7	C	37	2833	15.5	B	24	2956	30.8	C	30
	PM peak															
	4:00pm-5:00pm				**5:00pm-6:00pm**				**4:00pm-5:00pm**				**5:00pm-6:00pm**			
Richmond Road / Hollinsworth Road	4619	47.1	D	18	5037	69.4	E	46	4635	45.3	D	25	4817	64.9	E	66
Richmond Road / Alderton Drive / Langford Drive	5503	78.6	F	40	5683	170.1	F	64	5552	59.2	E	66	5777	166.0	F	62
Richmond Road / Rooty Hill Road North / Westlink M7 ramps	6091	55.4	D	45	6225	53.2	D	43	6095	49.2	D	43	6285	72.3	F	40
Rooty Hill Road North / Westlink M7 off-ramp	3126	85.0	F	26	3414	83.9	F	24	3168	77.9	F	42	3498	79.7	F	33
Richmond Road / Westlink M7 on-ramp	2573	42.4	D	35	2674	78.0	F	41	2528	31.3	C	34	2727	73.2	F	41

7.5.3.2 Intersection performance with construction (Stage 2B and 2C)

Table 7-7 outlines the intersection performance results for the 2028 Construction Stage 2B and 2C and 2028 The Proposal scenarios. The following observations have been made:

- There is no change in LOS between the Construction Stage 2B and 2C scenario and 2028 The Proposal scenarios for the Richmond Road / Hollinsworth Road and the Richmond Road / Alderton Drive / Langford Drive intersections during both AM and PM peaks.
- The Richmond Road / Rooty Hill Road North / Westlink M7 ramp intersection improves to LOS D in the AM peak and LOS E in the PM peak in the Construction Stage 2B and 2C scenario, compared to LOS F in 2028 The Proposal scenario. This improvement is due to the addition of an auxiliary right-turn lane in the southbound direction, which reduces the delay for vehicles turning right from Richmond Road to Rooty Hill Road North.
- The Rooty Hill Road North / Westlink M7 off-ramp intersection operates at LOS F in both AM and PM peaks, in the Construction Stage 2B and 2C scenario, which is same as the 2028 The Proposal scenario.
- In the AM peak, the Richmond Road / Westlink M7 on-ramp performance improves to LOS B in the Construction Stage 2B and 2C scenario, compared to LOS C in 2028 The Proposal scenario while the LOS remains same at LOS F in the PM peak. The improvement in AM peak is attributed to the addition of an auxiliary right turn lane in the southbound direction at the Richmond Road / Rooty Hill Road North / Westlink M7 ramp intersection, which provides additional throughput. As a result, more green time can be allocated to the opposing northbound through movement, improving the performance of Richmond Road / Westlink M7 on-ramp intersection.

Table 7-7: 2028 intersection performance with construction stage 2B and 2C

Intersection	2028 Construction Stage 2B and 2C								2028 The Proposal (Stage 1)							
	Vol. (veh)	Delay (s)	LOS	QL (veh)	Vol. (veh)	Delay (s)	LOS	QL (veh)	Vol. (veh)	Delay (s)	LOS	QL (veh)	Vol. (veh)	Delay (s)	LOS	QL (veh)
	AM peak															
	7:00am-8:00am				8:00am-9:00am				7:00am-8:00am				8:00am-9:00am			
Richmond Road / Hollinsworth Road	4317	25.8	B	20	4336	122.3	F	72	4329	25.4	B	17	4294	122.7	F	41
Richmond Road / Alderton Drive / Langford Drive	5046	71.5	F	56	5483	163.6	F	59	5015	68.4	E	42	5194	171.6	F	66
Richmond Road / Rooty Hill Road North / Westlink M7 ramps	5983	40.2	C	40	6241	46.7	D	37	5909	43.9	D	33	6195	77.9	F	38
Rooty Hill Road North / Westlink M7 off-ramp	3320	55.3	D	44	3501	76.1	F	42	3300	50.5	D	45	3472	83.1	F	44
Richmond Road / Westlink M7 on-ramp	2870	16.8	B	16	2996	27.6	B	35	2833	15.5	B	24	2956	30.8	C	30

Intersection	2028 Construction Stage 2B and 2C								2028 The Proposal (Stage 1)							
	Vol. (veh)	Delay (s)	LOS	QL (veh)	Vol. (veh)	Delay (s)	LOS	QL (veh)	Vol. (veh)	Delay (s)	LOS	QL (veh)	Vol. (veh)	Delay (s)	LOS	QL (veh)
	PM peak															
	4:00pm-5:00pm				5:00pm-6:00pm				4:00pm-5:00pm				5:00pm-6:00pm			
Richmond Road / Hollinsworth Road	4622	48.0	D	18	5153	59.6	E	49	4635	45.3	D	25	4817	64.9	E	66
Richmond Road / Alderton Drive / Langford Drive	5568	58.9	E	38	5843	146.6	F	65	5552	59.2	E	66	5777	166.0	F	62
Richmond Road / Rooty Hill Road North / Westlink M7 ramps	6181	48.9	D	47	6340	64.5	E	43	6095	49.2	D	43	6285	72.3	F	40
Rooty Hill Road North / Westlink M7 off-ramp	3181	83.5	F	29	3399	87.5	F	25	3168	77.9	F	42	3498	79.7	F	33
Richmond Road / Westlink M7 on-ramp	2604	29.8	C	35	2832	70.7	F	40	2528	31.3	C	34	2727	73.2	F	41

7.5.4 Construction worker parking and impact on on-street parking

Parking for construction personnel would be provided at all ancillary facilities. It is not expected that surplus parking demand from construction activities would reduce the availability of surrounding public parking as there is currently limited or no on-street parking in the core study area.

The overall impact on parking would be low.

7.5.5 Impact on pedestrians and cyclists

All pedestrian and cyclist facilities are maintained during construction. A realigned path would be constructed on the western side of Richmond Road and opened to sensitive road users prior to decommissioning the existing path to maintain access along the length of the facility. Safety barriers would separate users from the construction zone during construction of the new path and the decommissioning of the old path to provide safe passage during the realignment works. At tie in locations any potential temporary disruptions (e.g. with final surfacing) would be managed to ensure users would be able to continue their journey.

The overall impact on pedestrian and cyclists would be low.

8 Operational impacts

The Richmond Road Widening proposal has been assessed using the microsimulation traffic model in accordance with the original assumption that the project is delivered across two stages – the first in 2028 and the second in 2038. This was based on the project delivery funding availability at the time. The following sections analyse the proposal's impacts on the future road network.

8.1 2028 operational impacts

This section outlines the traffic volumes on major roads and operational results for the Do Minimum and The Proposal scenarios for the future year 2028. The project's impacts on overall traffic within the study area will similarly impact light vehicles, heavy vehicles, and public transportation, as these vehicle categories share the same roadway infrastructure.

8.1.1 2028 traffic volumes on major roads

Traffic volumes for 2028 were extracted from the Aimsun static traffic assignment so that the AADT values are not underestimated due to congested segments under a dynamic model.

Table 8-1 and **Table 8-2** show the daily traffic volumes along Richmond Road and Rooty Hill Road North through the study area in the 2028 Do Minimum and The Proposal scenarios. Vehicles are classified according to the Austroads (1994) vehicle classes.

Table 8-1: Traffic volumes along major roads - 2028 Do Minimum

Location	Direction	Light vehicles (Class 1-2)	Heavy vehicles (Class 3-5)	Articulated vehicles (Class 6-12)	AADT (veh/day)
Richmond Road (between Townson Road and Alderton Drive)	Northbound	30,051	1,599	1,128	32,778
	Southbound	32,722	1,540	811	35,073
Richmond Road (south of Alderton Drive)	Northbound	37,100	1,726	1,378	40,204
	Southbound	45,993	2,270	1,405	49,668
Richmond Road (north of Yarramundi Drive)	Northbound	22,084	352	304	22,739
	Southbound	17,788	587	386	18,760
Rooty Hill Road North (south of Richmond Road)	Northbound	40,057	2,582	1,896	44,536
	Southbound	24,440	436	340	25,215

Table 8-2: Traffic volumes along major roads - 2028 The Proposal

Location	Direction	Light vehicles (Class 1-2)	Heavy vehicles (Class 3-5)	Articulated vehicles (Class 6-12)	AADT (veh/day)
Richmond Road (between Townson Road and Alderton Drive)	Northbound	29,898	1,599	1,128	32,625
	Southbound	32,533	1,628	857	35,017
Richmond Road (south of Alderton Drive)	Northbound	36,991	1,726	1,378	40,095
	Southbound	46,448	2,358	1,460	50,266
Richmond Road (north of Yarramundi Drive)	Northbound	22,079	352	304	22,734
	Southbound	17,788	587	386	18,760
Rooty Hill Road North (south of Richmond Road)	Northbound	39,933	2,574	1,890	44,397
	Southbound	24,440	436	340	25,215

8.1.2 2028 network performance

Table 8-3 shows the network performance results for the 2028 Do Minimum and 2028 The Proposal scenarios. The results indicate that:

- VKT increases and VHT decreases in both peaks in the Proposal scenario compared to Do Minimum scenario, indicating that road users experience a reduction in congestion in the network.
- Average travel times and the average number of stops decrease, and average speeds increase in the Proposal scenario in both AM and PM peaks indicating a reduction in congestion.
- In the AM peak, unreleased demand increases by 89 vehicles in the Proposal scenario, when compared to the Do Minimum scenario.
  - In the Proposal scenario, the number of unreleased vehicles reduces at the M7 off-ramp, Luxford Road and Clearfield Street entrances to the model, as the Richmond Road Widening Stage 1 upgrades increase northbound capacity.
  - However, these northbound vehicles then increase traffic volumes on the Richmond Road south approach to Richmond Road / Llandilo Road. This reduces opportunities for vehicles to turn into and out of Llandilo Road. As a result, queuing increases on Llandilo Road and Richmond Road southbound, increasing unreleased vehicles at the Llandilo Road and George Street entrances to the model.
- In the PM peak, unreleased demand decreases by 36 per cent in the Proposal scenario, when compared to the Do Minimum scenario.
  - In the Proposal scenario, the number of unreleased vehicles reduces at the M7 off-ramp, Luxford Road and Clearfield Street entrances to the model, as the Richmond Road Widening Stage 1 upgrades increase northbound capacity.

Table 8-3: 2028 network performance results

Network performance metric	Unit	2028 Do Minimum		2028 The Proposal		The Proposal compared to Do Minimum	
		AM peak	PM peak	AM peak	PM peak	AM peak	PM peak
All vehicles							
Total demand	(veh)	27,088	29,186	27,395	28,838	+307 (+1.1%)	-348 (-1.2%)
Vehicle kilometres travelled (VKT)	(km)	111,249	116,852	113,122	117,650	+1,873 (+1.7%)	+798 (+0.7%)
Vehicle hours travelled (VHT)	(hr)	4,542	4,614	4,298	4,348	-244 (-5.4%)	-266 (-5.8%)
Total number of stops	(stops)	114,406	111,737	104,950	106,200	-9,456 (-8.3%)	-5,537 (-5.0%)
Averages per vehicle							
Average travel time in network	(sec)	655	627	609	587	-46 (-7%)	-40 (-6.4%)
Average number of stops	(stops)	4.59	4.22	4.13	3.98	-0.46 (-10%)	-0.24 (-5.7%)
Average speed	(km/hr)	24	25	26	27	+2 (+8.3%)	+2 (+8.0%)
Unreleased demand							
Unreleased demand	(veh)	430	953	519	603	+89 (+20.7%)	-350 (-36.7%)
Proportion of total demand	(%)	2%	3%	2%	2%		

8.1.3 2028 intersection performance

Table 8-4 outlines the intersection performance results for the 2028 Do Minimum and 2028 The Proposal scenarios. The two modelled hours in each peak are reported separately.

AM peak:

- All intersections across Do Minimum and The Proposal scenarios except for Richmond Road / Westlink M7 on-ramp operate at LOS F by the second hour of the AM peak.
- In both scenarios, Richmond Road / Hollinsworth Road intersection performs at LOS C or better in the first hour but fails by end of second hour due to delays at north and west approaches. High volumes of northbound and southbound through traffic limit the green time available for movements from Hollinsworth Road thus creating high delays. However, the delays have reduced in the Proposal scenario compared to Do Minimum scenario due to the additional capacity introduced by the Richmond Road Stage 1 upgrade.

- Most of the approaches of Richmond Road / Alderton Drive / Langford Drive intersection in the Do Minimum scenario, performs at LOS F by the second hour of AM peak. While in the Proposal scenario, the additional lanes on Richmond Road increased the throughput at the intersection and reduced the delay on the south approach of the intersection thus improving the performance.
- The Richmond Road / Rooty Hill Road North / Westlink M7 ramp intersection and the Rooty Hill Road North / Westlink M7 off-ramp intersection exceed capacity and operate at LOS F by second hour of AM peak in both Do Minimum and The Proposal scenarios. This is because the intersection has insufficient capacity to service high volumes from Richmond Road and Rooty Hill Road North.

PM peak:

- All intersections across Do Minimum and The Proposal scenarios except for Richmond Road / Hollinsworth Road operate at LOS F by the second hour of the PM peak.
- In the Do Minimum scenario, the Richmond Road / Hollinsworth Road intersection performs at LOS F for both hours of the PM peak as the intersection has insufficient capacity to accommodate high traffic at the north and south approach. However, in the Proposal scenario, the intersection performs better at LOS D in the first hour and LOS E in the second hour due to the additional capacity introduced by the Richmond Road Stage 1 upgrade.
- All other intersections maintain the same Level of Service (LOS) in both the Do Minimum and The Proposal scenarios during the first and second hours, with the intersections reaching LOS F by the second hour. This is because the intersections have insufficient capacity to service the high traffic volumes on the Richmond Road.

Table 8-4: 2028 intersection performance results

Intersection	2028 Do Minimum								2028 The Proposal							
	Vol. (veh)	Delay (s)	LOS	QL (veh)	Vol. (veh)	Delay (s)	LOS	QL (veh)	Vol. (veh)	Delay (s)	LOS	QL (veh)	Vol. (veh)	Delay (s)	LOS	QL (veh)
	AM peak															
	7:00am-8:00am				8:00am-9:00am				7:00am-8:00am				8:00am-9:00am			
Richmond Road / Hollinsworth Road	4229	32.8	C	26	4050	220.0	F	72	4329	25.4	B	17	4294	122.7	F	41
Richmond Road / Alderton Drive / Langford Drive	4807	127.7	F	69	5188	238.8	F	79	5015	68.4	E	42	5194	171.6	F	66
Richmond Road / Rooty Hill Road North / Westlink M7 ramps	5801	45.7	D	36	6045	71.0	F	39	5909	43.9	D	33	6195	77.9	F	38
Rooty Hill Road North / Westlink M7 off-ramp	3180	56.2	E	45	3405	106.6	F	45	3300	50.5	D	45	3472	83.1	F	44
Richmond Road / Westlink M7 on-ramp	2805	16.1	B	26	2897	26.9	B	31	2833	15.5	B	24	2956	30.8	C	30

Intersection	2028 Do Minimum								2028 The Proposal							
	Vol. (veh)	Delay (s)	LOS	QL (veh)	Vol. (veh)	Delay (s)	LOS	QL (veh)	Vol. (veh)	Delay (s)	LOS	QL (veh)	Vol. (veh)	Delay (s)	LOS	QL (veh)
	PM peak															
	4:00pm-5:00pm				5:00pm-6:00pm				4:00pm-5:00pm				5:00pm-6:00pm			
Richmond Road / Hollinsworth Road	4541	72.7	F	31	4649	134.8	F	71	4635	45.3	D	25	4817	64.9	E	66
Richmond Road / Alderton Drive / Langford Drive	5505	62.0	E	71	5530	202.8	F	82	5552	59.2	E	66	5777	166.0	F	62
Richmond Road / Rooty Hill Road North / Westlink M7 ramps	6157	51.4	D	42	6198	78.3	F	39	6095	49.2	D	43	6285	72.3	F	40
Rooty Hill Road North / Westlink M7 off-ramp	3191	80.4	F	45	3348	90.1	F	46	3168	77.9	F	42	3498	79.7	F	33
Richmond Road / Westlink M7 on-ramp	2557	31.6	C	36	2734	73.8	F	42	2528	31.3	C	34	2727	73.2	F	41

8.1.4 2028 travel times

Table 8-5 shows the travel times on Richmond Road for 2028 Do Minimum and 2028 The Proposal scenarios. The results indicate that:

- Under the Proposal scenario in the AM peak, travel times on Richmond Road northbound decrease by over two minutes when compared to the Do Minimum scenario.
  - In the Do Minimum scenario, the capacity limitations caused by the two-lane Richmond Road carriageway at Richmond Road / Langford Drive / Alderton Drive result in queuing and delay between Rooty Hill Road North and Alderton Drive.
  - The Richmond Road Widening Stage 1 upgrades introduce an additional northbound lane from before Alderton Drive to Townson Road. The upgrade reduces travel time by almost two minutes between Rooty Hill Road North and Alderton Drive in the Proposal scenario.
- Under the Proposal scenario in the PM peak, travel times on Richmond Road northbound decrease by 24 seconds when compared to the Do Minimum scenario.
  - Similar to the AM peak, the additional northbound lane on Richmond Road reduces travel times. Travel times between Rooty Hill Road North and Hollinsworth Road are two minutes lower in the Proposal scenario.
- The travel time in the AM peak for Richmond Road southbound under the Proposal scenario decreases by almost two minutes when compared to the Do Minimum scenario.
  - Signal optimisations enabled by the Richmond Road Widening Stage 1 upgrades result in reduced travel time south of Hawthorne Avenue.
- The travel time during the PM peak for Richmond Road southbound under the Proposal scenario decreases by over one minute when compared to the Do Minimum scenario.
  - Signal optimisations enabled by the Richmond Road Widening Stage 1 upgrades result in reduced travel time south of Hawthorne Avenue.

Table 8-5: 2028 travel time results

Route	Section	Travel time (mm:ss)						Average speed (km/hr)			
		2028 Do Minimum		2028 The Proposal		The Proposal Compared to Do Minimum		2028 Do Minimum		2028 The Proposal	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Richmond Road northbound	Alderton Drive	03:47	02:19	01:50	01:43	-1:57 (-51%)	-0:37 (-26%)	17.1	27.8	35.1	37.6
	Hollinsworth Road	00:59	02:18	00:44	00:53	-0:15 (-26%)	-1:26 (-62%)	40.5	17.2	54.1	44.8
	Hawthorne Avenue	01:11	00:44	01:13	00:50	+0:03 (+3%)	+0:05 (+13%)	31.7	50.8	30.5	44.9
	South Street	00:59	01:04	01:00	01:05	+0:01 (+1%)	+0:01 (+1%)	35.5	32.4	35.1	32.1
	Excelsior Avenue	00:47	00:51	00:46	00:49	-0:01 (-3%)	-0:02 (-3%)	59.2	54.8	61.0	56.6

Route	Section	Travel time (mm:ss)						Average speed (km/hr)			
		2028 Do Minimum		2028 The Proposal		The Proposal Compared to Do Minimum		2028 Do Minimum		2028 The Proposal	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
	Garfield Road West	01:32	01:07	01:07	01:04	-0:25 (-27%)	-0:03 (-5%)	18.4	25.3	25.2	26.6
	Elara Boulevard	00:53	01:00	00:53	01:00	-0:00 (-1%)	+0:01 (+1%)	49.7	44.6	50.1	44.1
	St Marys Road	03:41	03:42	03:43	03:43	+0:02 (+1%)	+0:02 (+1%)	54.6	54.4	54.3	54.1
	The Northern Road	04:03	05:44	03:50	07:19	-0:13 (-5%)	+1:35 (+28%)	48.8	34.5	51.5	27.0
	George Street	00:18	00:18	00:17	00:18	-0:00 (-2%)	-0:01 (-3%)	42.7	41.3	43.7	42.6
	The Driftway	00:51	00:49	00:51	00:50	+0:00 (+0%)	+0:01 (+1%)	62.3	64.1	62.0	63.3
	Total	**19:01**	**19:58**	**16:14**	**19:33**	**-2:47 (-15%)**	**-0:24 (-2%)**	**40.0**	**38.1**	**46.8**	**38.8**
Richmond Road southbound	George Street	02:18	01:33	03:51	01:25	+1:33 (+68%)	-0:08 (-9%)	22.8	33.8	13.6	37.1
	The Northern Road	00:36	00:16	00:29	00:16	-0:07 (-19%)	0:00 (0%)	21.3	48.0	26.3	48.0
	St Marys Road	08:22	03:22	07:38	03:19	-0:44 (-9%)	-0:02 (-1%)	23.6	58.8	25.9	59.5
	Elara Boulevard	03:20	03:25	03:21	03:28	+0:01 (+1%)	+0:03 (+1%)	60.4	58.8	60.1	58.0
	Garfield Road West	02:40	01:16	03:15	01:19	+0:35 (+22%)	+0:02 (+3%)	16.5	34.5	13.5	33.6
	Excelsior Avenue	00:31	00:35	00:31	00:33	0:00 (0%)	-0:03 (-8%)	55.7	49.6	55.7	53.7
	South Street	01:17	01:53	01:22	01:46	+0:06 (+8%)	-0:07 (-7%)	36.5	24.7	33.9	26.5
	Hawthorne Avenue	01:44	01:02	01:09	01:00	-0:35 (-34%)	-0:02 (-3%)	20.1	34.0	30.3	35.1
	Hollinsworth Road	03:51	01:31	02:06	01:13	-1:45 (-46%)	-0:18 (-20%)	9.7	24.5	17.4	29.8
	Alderton Drive	06:08	03:57	05:10	03:41	-0:58 (-16%)	-0:16 (-7%)	6.5	10.0	7.7	10.7
	Rooty Hill Road North	02:37	01:57	02:45	01:44	+0:08 (+5%)	-0:13 (-11%)	24.4	32.8	23.3	37.0
	Total	**33:25**	**20:48**	**31:37**	**19:43**	**-1:48 (-5%)**	**-1:06 (-5%)**	**22.7**	**36.5**	**24.0**	**38.5**

8.2 2038 operational impacts

This section outlines the traffic volumes on major roads and operational results for the 2038 Do Minimum and 2038 The Proposal scenarios. The project's impacts on overall traffic within the study area will similarly impact light vehicles, heavy vehicles, and public transportation, as these vehicle categories share the same roadway infrastructure.

8.2.1 2038 traffic volumes on major roads

Traffic volumes for 2038 were extracted from the Aimsun static traffic assignment so that the AADT values are not underestimated due to congested segments under a dynamic model.

Table 8-6 and **Table 8-7** show the daily traffic volumes along Richmond Road and Rooty Hill Road North through the study area in the 2038 Do Minimum and The Proposal scenarios. Vehicles are classified according to the Austroads (1994) vehicle classes.

Table 8-6: Traffic volumes along major roads - 2038 Do Minimum

Location	Direction	Light vehicles (Class 1-2)	Heavy vehicles (Class 3-5)	Articulated vehicles (Class 6-12)	AADT (veh/day)
Richmond Road (between Townson Road and Alderton Drive)	Northbound	36,897	2,008	1,417	40,322
	Southbound	41,486	1,848	973	44,307
Richmond Road (south of Alderton Drive)	Northbound	42,401	2,076	1,657	46,133
	Southbound	54,673	2,682	1,661	59,016
Richmond Road (North of Yarramundi Drive)	Northbound	26,106	554	479	27,139
	Southbound	20,225	633	416	21,274
Rooty Hill Road North (South of Richmond Road)	Northbound	41,209	2,674	1,963	45,847
	Southbound	29,328	609	475	30,413

Table 8-7: Traffic volumes along major roads - 2038 The Proposal

Location	Direction	Light vehicles (Class 1-2)	Heavy vehicles (Class 3-5)	Articulated vehicles (Class 6-12)	AADT (veh/day)
Richmond Road (between Townson Road and Alderton Drive)	Northbound	40,907	2,356	1,662	44,924
	Southbound	48,263	2,300	1,211	51,774
Richmond Road (south of Alderton Drive)	Northbound	46,751	2,415	1,928	51,095
	Southbound	60,381	3,244	2,009	65,633

Location	Direction	Light vehicles (Class 1-2)	Heavy vehicles (Class 3-5)	Articulated vehicles (Class 6-12)	AADT (veh/day)
Richmond Road (North of Yarramundi Drive)	Northbound	26,166	559	484	27,209
	Southbound	20,484	666	438	21,588
Rooty Hill Road North (South of Richmond Road)	Northbound	30,689	905	664	32,257
	Southbound	29,885	617	481	30,983

It can be noted that there is significant decrease in the AADT on Rooty Hill Road North (South of Richmond Road). This is due to the introduction of M7 flyover exit ramp alleviating some traffic on the Rooty Hill Road.

8.2.2 2038 network performance

Table 8-8 shows the network performance results for the 2038 Do Minimum and 2038 The Proposal scenarios. The results indicate that:

- In the Proposal scenario, total demand increases by 6.8 per cent in the AM peak and 4.5 per cent in the PM peak when compared to the Do Minimum scenario
  - The Richmond Road Widening upgrades increase network throughput, allowing more traffic to enter the traffic model boundary within the AM and PM peaks.
- VKT increases and VHT decreases in both peaks in the Proposal scenario, indicating that road users experience a reduction in congestion in the network.
- The total number of stops increases in both peaks in the Proposal scenario due to the increase in total demand.
- Average travel times and the average number of stops decrease, and average speeds increase in the Proposal scenario in both the AM and PM peaks indicating reduction in congestion.
- Unreleased demand decreases by 11 per cent in the AM peak and 52 per cent in the PM peak in the Proposal scenario, as the Richmond Road Widening upgrades increase network capacity.

Table 8-8: 2038 network performance results

Network performance metric	Unit	2038 Do Minimum		2038 The Proposal		The Proposal Compared to Do Minimum	
		AM peak	PM peak	AM peak	PM peak	AM peak	PM peak
All vehicles							
Total demand	(veh)	31,419	33,000	33,564	34,490	+2145 (+6.8%)	+1490 (+4.5%)
Vehicle kilometres travelled (VKT)	(km)	108,261	112,516	122,028	127,162	+13,767 (+12.7%)	+14,646 (+13.0%)
Vehicle hours travelled (VHT)	(hr)	6,410	7,355	6,239	6,072	-171 (-2.7%)	-1283 (-17.4%)
Total number of stops	(stops)	152,003	151,578	161,126	155,446	+9,123 (+6%)	+3,868 (+2.6%)

Network performance metric	Unit	2038 Do Minimum		2038 The Proposal		The Proposal Compared to Do Minimum	
		AM peak	PM peak	AM peak	PM peak	AM peak	PM peak
Averages per vehicle							
Average travel time in network	(sec)	911	1,016	801	733	-110 (-12.1%)	-283 (-27.9%)
Average number of stops	(stops)	6	5.8	5.7	5.2	-0.3 (-5%)	-0.6 (-10.3%)
Average speed	(km/hr)	17	15	20	21	+3 (+17.6%)	+6 (+40%)
Unreleased demand							
Unreleased demand	(veh)	3,270	3,497	2,904	1,693	-366 (-11.2%)	-1,804 (-51.6%)
Proportion of total demand	(%)	10%	11%	9%	5%		

8.2.3 2038 intersection performance

Table 8-9 outlines the intersection performance results for the 2038 Do Minimum and 2038 The Proposal scenarios. The two modelled hours in each peak are reported separately.

AM peak:

- All intersections in the Do Minimum scenario operates at LOS F by the second hour. In the Proposal scenario, all intersections operate at LOS E or worse by the second hour.
- In the Do Minimum scenario, the Richmond Road / Hollinsworth Road intersection operates at LOS F by the second hour of AM peak due to capacity constraints from the two-lane carriageway on Richmond Road. In the Proposal scenario, the Stage 1 and 2 upgrades to Richmond Road increase capacity for through traffic, allowing the intersection to handle more traffic with reduced delays compared to the Do Minimum scenario.
- At the Richmond Road / Alderton Drive / Langford Drive intersection in the Do Minimum and the Proposal scenario for both hours of the AM peak the intersection performs at LOS F due to high traffic demand approaching the intersection. However, in the Proposal scenario, despite accommodating a higher traffic volume, the intersection operates at reduced delay when compared to the Do Minimum scenario, attributed to the additional capacity introduced by the Richmond Road upgrades.
- The Richmond Road / Westlink M7 on-ramp intersection and the Richmond Road / Rooty Hill Road North / Westlink M7 ramp intersection improves from LOS F to LOS E in the Proposal scenario compared to the Do Minimum scenario. In the Do Minimum scenario, the two-lane carriageway is insufficient to accommodate the high traffic demand. The introduction of additional lanes northbound and southbound, the M7 flyover exit ramp and the Richmond Road / Rooty Hill Road North intersection reconfiguration in the Proposal scenario supports the improved performance.
- Rooty Hill Road North / Westlink M7 off-ramp performs at LOS F in the first and second hour in the Do Minimum scenario due to the queue spillback from the Richmond Road. In the Proposal scenario the intersection operates at LOS A in the first hour due to the new M7 flyover exit ramp alleviating some

traffic. However, it deteriorates to LOS F by second hour. This is due to the capacity limitations caused by the single left turn lane from Rooty Hill Road North to Richmond Road and the queue spill back from Richmond Road causing high delays in the second hour.

PM peak:

- All intersections operate at LOS F in the second hour of the PM peak in both scenarios except for Rooty Hill Road North / Westlink M7 off-ramp, which operates at LOS D in the Proposal scenario.
- The Rooty Hill Road North / Westlink M7 off-ramp intersection operates at LOS F for both hours in the Do Minimum scenario. While in the Proposal scenario it performs at LOS A in the first hour and LOS D in the second hour. Vehicles from Westlink M7 heading onto Richmond Road northbound can use the M7 flyover exit ramp in the Proposal scenario which eased congestion and queuing of left turning vehicles onto Richmond Road from Rooty Hill Road.
- For all other intersections it can be observed that the volume of traffic carried by the intersections are high in the PM peak. In the Do Minimum scenario, the two-lane carriageway is insufficient to handle the high traffic volume pushing the intersection performance to LOS F. In the Proposal scenario, these intersections also operate at LOS F but accommodate higher traffic volumes compared to the Do Minimum scenario. This improvement is attributed to the Richmond Road upgrade, which enhances capacity through additional lanes and the new M7 flyover exit ramp, allowing the carriageway to accommodate more traffic with reduced delays.

Table 8-9: 2038 intersection performance results

Intersection	2038 Do Minimum								2038 The Proposal							
	Vol. (veh)	Delay (s)	LOS	QL (veh)	Vol. (veh)	Delay (s)	LOS	QL (veh)	Vol. (veh)	Delay (s)	LOS	QL (veh)	Vol. (veh)	Delay (s)	LOS	QL (veh)
	AM peak															
	7:00am-8:00am				8:00am-9:00am				7:00am-8:00am				8:00am-9:00am			
Richmond Road / Hollinsworth Road	4442	67.2	E	73	4459	277.1	F	120	5813	42.8	D	24	6166	154.7	F	47
Richmond Road / Alderton Drive / Langford Drive	4989	188.3	F	76	5168	263.4	F	82	6276	107.0	F	37	6470	186.6	F	58
Richmond Road / Rooty Hill Road North / Westlink M7 ramps	5733	55.5	D	36	5797	106.8	F	69	6101	48.0	D	22	6266	60.7	E	26
Rooty Hill Road North / Westlink M7 off-ramp	2815	107.3	F	46	3120	136.5	F	46	2909	10.9	A	8	2966	87.5	F	6
Richmond Road / Westlink M7 on-ramp	2781	50.0	D	38	2682	76.8	F	40	3149	23.1	B	37	3144	68.9	E	41

Intersection	2038 Do Minimum								2038 The Proposal							
	Vol. (veh)	Delay (s)	LOS	QL (veh)	Vol. (veh)	Delay (s)	LOS	QL (veh)	Vol. (veh)	Delay (s)	LOS	QL (veh)	Vol. (veh)	Delay (s)	LOS	QL (veh)
	PM peak															
	4:00pm-5:00pm				5:00pm-6:00pm				4:00pm-5:00pm				5:00pm-6:00pm			
Richmond Road / Hollinsworth Road	5010	137.9	F	70	4802	288.7	F	123	6253	83.3	F	23	7029	162.8	F	97
Richmond Road / Alderton Drive / Langford Drive	5244	179.9	F	98	5549	270.3	F	99	6640	65.4	E	94	6894	189.3	F	110
Richmond Road / Rooty Hill Road North / Westlink M7 ramps	5773	82.9	F	58	5804	112.9	F	53	6204	47.3	D	20	6269	91.2	F	58
Rooty Hill Road North / Westlink M7 off-ramp	2687	135.8	F	47	2744	167.4	F	47	2825	8.6	A	8	2926	44.0	D	11
Richmond Road / Westlink M7 on-ramp	2606	64.6	E	40	2590	79.8	F	41	2991	49.0	D	41	3021	70.0	F	40

8.2.4 2038 travel times

Table 8-10 shows the travel times on Richmond Road for the 2038 Do Minimum and 2038 The Proposal scenarios. The results indicate that:

- Under the Proposal scenario in the AM peak, travel times on Richmond Road northbound increase by seven minutes when compared to the Do Minimum scenario.
  - In the Do Minimum scenario, capacity limitations caused by the single left turn lane from Rooty Hill Road North to Richmond Road northbound result in a large number of vehicles being unable to enter Richmond Road northbound.
  - The introduction of the M7 flyover exit ramp and the Richmond Road / Rooty Hill Road North intersection reconfiguration in the Proposal scenario allows more vehicles to enter Richmond Road northbound.
  - The increased traffic volume results in increased travel times along the route, especially between Rooty Hill Road North and South Street, where queues for the right turn into South Street exceed the length of the right turn short lanes and block the main carriageway.
- Under the Do Minimum scenario in the PM peak, travel times on Richmond Road northbound increase by over one minute when compared to the Proposal scenario.
  - As in the AM peak, the Richmond Road Widening upgrades allow more vehicles to enter Richmond Road northbound. The upgrades reduce travel time by one minute between Rooty Hill Road North and Hollinsworth Avenue when compared to Do Minimum.
  - However, the increased traffic results in more merge-related congestion between Hollinsworth Avenue and Hawthorne Avenue, where the carriageway narrows back to two through lanes. This results in an overall increase in travel time.
- Under the Proposal scenario in the AM peak, travel times on Richmond Road southbound decrease by seventeen minutes when compared to the Do Minimum scenario.
  - Travel times between The Northern Road and St Marys Road increase by over one minute in the Proposal scenario. Delay on the right turn into Llandilo Road increases due to increased Richmond Road northbound traffic, as the vehicles have reduced opportunity to turn into and out of Llandilo Road. As a result, queuing increases on Llandilo Road and Richmond Road southbound increasing the travel time.
  - However, travel times between Elara Boulevard and Rooty Hill Road North are over 18 minutes lower in the Proposal scenario. The widened Richmond Road carriageway increases capacity and reduces queuing and delay.
- Under the Proposal scenario in the PM peak, travel times on Richmond Road southbound decrease by over seven minutes when compared to the Do Minimum scenario.
  - Travel times between The Driftway and George Street, and between The Northern Road and St Marys Road increase due to increased conflicting movements on Richmond Road northbound traffic as explained above.
  - However, travel times between Elara Boulevard and Rooty Hill Road North are over nine minutes lower in the Proposal scenario. The widened Richmond Road carriageway increases capacity and reduces queuing and delay.

Table 8-10: 2038 travel time results

Route	Section	Travel time (mm:ss)						Average speed (km/hr)			
		2038 Do Minimum		2038 The Proposal		The Proposal Compared to Do Minimum		2038 Do Minimum		2038 The Proposal	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Richmond Road northbound	Alderton Drive	04:55	04:20	06:00	03:36	+1:05 (+22%)	-0:44 (-17%)	13.1	14.9	10.8	18.0
	Hollinsworth Road	01:15	04:21	03:22	04:05	+2:08 (+171%)	-0:16 (-6%)	32.0	9.1	11.7	9.7
	Hawthorne Avenue	01:19	00:45	03:20	03:05	+2:01 (+153%)	+2:20 (+310%)	28.4	49.7	11.2	12.0
	South Street	01:03	00:54	02:19	01:09	+1:16 (+120%)	+0:16 (+30%)	33.2	39.0	15.1	30.1
	Excelsior Avenue	00:47	00:49	00:48	00:50	+0:01 (+2%)	+0:01 (+2%)	59.3	57.0	58.3	56.0
	Garfield Road West	00:56	00:55	01:16	00:57	+0:20 (+35%)	+0:02 (+3%)	30.2	30.7	22.5	29.9
	Elara Boulevard	00:53	00:57	00:58	00:59	+0:04 (+8%)	+0:03 (+4%)	49.7	46.8	46.0	45.1
	St Marys Road	03:31	03:48	03:45	03:43	+0:14 (+6%)	-0:05 (-2%)	57.1	52.9	53.7	54.1
	The Northern Rd	03:35	03:59	03:44	04:04	+0:10 (+5%)	+0:05 (+2%)	55.2	49.7	52.8	48.6
	George Street	00:20	00:19	00:20	00:20	+0:01 (+3%)	+0:01 (+4%)	38.5	39.0	37.3	37.5
	The Driftway	00:51	00:51	00:52	00:51	+0:01 (+2%)	+0:00 (+0%)	62.6	61.9	61.1	61.8
	Total	**19:25**	**21:59**	**26:43**	**23:40**	**+7:18 (+38%)**	**+1:41 (+8%)**	**39.2**	**34.6**	**28.4**	**32.1**
Richmond Road southbound	George Street	06:39	05:22	06:43	07:06	+0:03 (+1%)	+1:44 (+32%)	7.9	9.8	7.8	7.4
	The Northern Rd	00:16	00:15	00:18	00:16	+0:02 (+12%)	+0:00 (+1%)	47.4	50.0	42.2	49.3
	St Marys Road	05:11	03:23	06:27	03:53	+1:15 (+24%)	+0:29 (+15%)	38.1	58.3	30.7	50.9
	Elara Boulevard	03:23	03:28	03:25	03:21	+0:03 (+1%)	-0:06 (-3%)	59.5	58.2	58.9	60.0
	Garfield Road West	02:56	02:11	02:19	01:21	-0:38 (-21%)	-0:51 (-39%)	15.0	20.1	19.0	32.8
	Excelsior Avenue	01:44	01:44	00:35	01:11	-1:09 (-66%)	-0:34 (-32%)	16.7	16.7	49.7	24.7
	South Street	06:36	07:26	02:52	06:40	-3:44 (-57%)	-0:46 (-10%)	7.1	6.3	16.3	7.0

Route	Section	Travel time (mm:ss)						Average speed (km/hr)			
		2038 Do Minimum		2038 The Proposal		The Proposal Compared to Do Minimum		2038 Do Minimum		2038 The Proposal	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
	Hawthorne Avenue	06:15	03:49	03:06	02:06	-3:09 (-50%)	-1:44 (-45%)	5.6	9.2	11.3	16.7
	Hollinsworth Road	06:20	03:31	01:28	02:00	-4:53 (-77%)	-1:30 (-43%)	5.9	10.6	25.0	18.2
	Alderton Drive	07:18	06:30	03:07	02:27	-4:10 (-57%)	-4:03 (-62%)	5.4	6.1	12.6	16.2
	Rooty Hill Road North	02:44	02:02	01:40	01:25	-1:04 (-39%)	-0:37 (-30%)	23.4	31.4	38.4	45.2
	Total	**49:23**	**39:42**	**32:00**	**31:44**	**-17:24 (-35%)**	**-7:58 (-20%)**	**15.4**	**19.1**	**23.7**	**23.9**

8.3 Active transport

As part of the proposal, the following existing long crossings would be replaced with staged pedestrian crossings at the following locations:

- either side of the Richmond Road / Alderton Drive / Langford Drive intersections
- either side of the Richmond Road / Hollinsworth Road / Townson Road intersections.

The existing northern pedestrian on Richmond Road at the intersection of Rooty Hill Road North / M7 northbound on-ramp would be relocated around 160 metres south to the intersection to the Richmond Road / M7 southbound on-ramp intersection. The new staged crossings would be signalised and allow pedestrians to cross one carriageway before stopping in the median, and then crossing the second carriageway, improving accessibility. A pedestrian refuge and fencing would be provided in the median to ensure pedestrian safety.

Proposed changes to the existing pedestrian and cyclist facilities, either as footpaths or shared paths, on Richmond Road are as follows:

- The shared paths on the southern and northern sides of Richmond Road between Yarramundi Drive and the intersection with Rooty Hill Road North / M7 northbound on-ramp would be retained.
- A new four-metre-wide shared path on the western side of the Richmond Road between Rooty Hill Road North / M7 southbound on-ramp and Alderton Drive / Langford Drive intersections. The new shared path would provide the same connectivity as the existing shared path. A small section of the existing footpath on the eastern side of Richmond Road to the south of the Alderton Drive / Langford Drive intersection would be retained.

All pedestrians and cycling facilities on Richmond Road north of the Alderton Drive / Langford Drive intersection would be retained as per the existing configuration.

9 Management measures

This section provides the summary of impacts identified throughout this report and the constructional and operational management measures.

9.1 Summary of impacts

The section provides a summary of the impacts identified throughout this report.

9.1.1 Summary of construction impacts

Table 9-1 summarises the identified construction impacts, with further details described in **Section 7.5**.

Table 9-1: Summary of construction impacts

Item	Location	Impact Level
Volume	Richmond Road (between Townson Road and Alderton Drive)	Volume increases only by 0.3 % with the addition of construction traffic, which is expected to have a low impact.
	Richmond Road (south of Alderton Drive)	Volume increases only by 0.2 % with the addition of construction traffic, which is expected to have a low impact.
	Richmond Road (north of Yarramundi Drive)	Volume increases only by 0.5 % with the addition of construction traffic, which is expected to have a low impact.
	Rooty Hill Road North (south of Richmond Road)	Volume increases only by 0.3 % with the addition of construction traffic, which is expected to have a low impact.
Level of Service	Richmond Road / Hollinsworth Road	LOS remains comparable with the Proposal scenario in the AM and PM peaks, indicating that construction traffic has not worsened the performance.
	Richmond Road / Alderton Drive / Langford Drive	LOS remains comparable with the Proposal scenario in the AM and PM peaks, indicating that construction traffic has not worsened the performance.
	Richmond Road / Rooty Hill Road North / Westlink M7 ramps	Construction Stage 2A: LOS remains comparable in the AM peak while improves to LOS D in the PM peak due to upstream congestion as a result of construction traffic. Construction Stage 2B and 2C: LOS improves from LOS F to LOS D in the AM peak and to LOS E in

Item	Location	Impact Level
		the PM peak due to the addition of auxiliary right turn lane.
	Rooty Hill Road North / Westlink M7 off-ramp	LOS remains comparable with the Proposal scenario in the AM and PM peaks, indicating that construction traffic has not worsened the performance.
	Richmond Road / Westlink M7 on-ramp	Construction Stage 2A: LOS remains comparable with the Proposal scenario. Construction Stage 2B and 2C: LOS improves to LOS B in the AM peak while remains the same in the PM peak.
On street parking	Parking for construction personnel would be provided at all ancillary facility	The impact on on-street parking would be low.
Active Transport	All pedestrian and cyclist facilities are maintained during construction	The overall impact on pedestrian and cyclists would be low.

9.1.2 Summary of operational impacts

Table 9-2 summarises the proposal's identified operational impacts and details of the operational impacts are described in **Section 8**.

Table 9-2: Summary of operational impacts

Item	Location/ detail	Impact
Volume	Richmond Road (between Townson Road and Alderton Drive)	Traffic volume increases in the Proposal scenario compared to Do Minimum
	Richmond Road (south of Alderton Drive)	Traffic volume increases in the Proposal scenario compared to Do Minimum
	Richmond Road (north of Yarramundi Drive)	Traffic volume increases in the Proposal scenario compared to Do Minimum
	Rooty Hill Road North (south of Richmond Road)	Traffic volume decreases in the Proposal scenario compared to Do Minimum due to the introduction of M7 flyover exit ramp alleviating some traffic on the Rooty Hill Road
Network Performance	Total demand	Total demand increases in the Proposal scenario
	VKT and VHT	VKT increases and VHT decreases with the proposal indicating a reduction in congestion
	Unreleased demand	Unreleased demand decreases in the Proposal scenario
	Average travel times and average number of stops	Average travel time and average number of stops decrease in the Proposal scenario indicating reduction in congestion
Intersection Performance	Richmond Road / Hollinsworth Road	LOS remains comparable for all peaks with a reduction in queuing and delay with the proposal
	Richmond Road / Alderton Drive / Langford Drive	LOS remains comparable for all peaks with a reduction in queuing and delay with the proposal

Item	Location/ detail	Impact
	Richmond Road / Rooty Hill Road North / Westlink M7 ramps	LOS remains comparable for all peaks with reductions in queuing and delay with the proposal, except for a slight improvement from LOS F to LOS E in the AM peak in 2038.
	Rooty Hill Road North / Westlink M7 off-ramp	LOS remains comparable for all peaks with reductions in queuing and delay with the proposal, except for a significant improvement in the PM peak, where the LOS improves from F to D in 2038. This is due to the proposed M7 flyover, which alleviates some traffic on Rooty Hill Road, reducing queuing
	Richmond Road / Westlink M7 on-ramp	LOS remains comparable for all peaks with reductions in queuing and delay with the proposal, except for a slight improvement from LOS F to LOS E in the AM peak in 2038.
Active Transport	Staged crossings at Townson Road / Richmond Road and Alderton Drive / Richmond Road	The overall impact on active transport would be low
	Relocated crossing at Rooty Hill Road North / Richmond Road	The overall impact on active transport would be low
	Shared path facilities are maintained in the Proposal scenario	The overall impact on active transport would be low
Public Transport	All public transport facilities are maintained in the Proposal scenario	The overall impact on public transport would be low

9.2 Recommended construction management measures

The recommended construction management measures are proposed to minimise construction activity impacts.

9.2.1 Plans, audits and licences

The following plans are recommended, along with road safety audits and road occupancy licences:

- Preparation of a Traffic Management Plan (TMP). The TMP should be prepared in accordance with QA Specification G10: Traffic Management (Roads and Maritime Services, 2019) and implemented for road traffic during construction, including:
  - confirmation of haulage routes
  - confirmation of workforce parking areas
  - measures to maintain access to local road and properties
  - site specific traffic control measures (including signage) to manage and regulate traffic movement
  - measures to manage and divert pedestrian and cyclist access
  - requirements and methods to consult and inform the local community of impacts on the local road network
  - access to ancillary sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads

  - Ancillary sites will require a vehicle management / movement plan due to the proximity of these sites to major movement corridors and high posted speed limits.
  - a response plan for any construction road traffic incident
  - consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic
  - TMPs should also include traffic assessments to support any works which may temporarily reduce capacity, changes to the intended schedule of works or any other interruptions to general operation.
  - monitoring, review and amendment mechanisms.
- Preparation of Traffic Guidance Scheme (TGS)). The TGSs should be prepared by suitably qualified personnel for the construction area and progressively updated as the works progress
- Road safety audits (RSA) of the TMP should be undertaken prior to construction
- A Road Occupancy License (ROL) should be obtained prior to road or lane closures.

The developed TMP, TGSs, and ROLs should include the more detailed recommendations set out in the following sections for different road users and construction activities.

9.2.2 Management of motorists and public transport users

During construction of the project, some temporary delays to motorists and public transport users are expected. Consideration of traffic management strategies by the nominated contractor is recommended to minimise disruptions. The following measures are recommended:

- Minimise road space occupied by the works in terms of time, width and length; road capacity should not be reduced unnecessarily, and sufficient capacity should be provided to accommodate expected traffic volumes.
- Detailed site investigations should be undertaken to avoid any unforeseen problems that may increase traffic delays.
- All work activities should be sufficiently planned to ensure road occupancies are not implemented at times of peak traffic volumes.
- Road occupancies should be coordinated with transport operators regarding schedules and dimension loads.
- The ability to stop work and clear travel lanes to allow traffic flows to return to normal free-flow conditions should be maintained.
  Road users including public transport, local communities and the freight industry should be provided with timely, accurate, relevant and accessible information about changed traffic arrangements and delays resulting from construction activities.
- Road occupancies should allow for and accommodate all road users ranging in size from oversized heavy vehicles, buses, pedestrians and cyclists.
  The contractor should ensure that free flow traffic is not delayed in any direction at any single road occupancy for longer than 5 minutes.
- Queues caused by road occupancies measured along a single lane in any direction should not exceed 250 metres in length.
- Road occupancies involving the closure of any shoulder or auxiliary lane should always provide a minimum of one travel lane in each direction through period of occupancy.
- Detour signage would be installed at appropriate locations to inform drivers of road closures.
- Contractors should undertake daily travel time surveys through the project to monitor and verify delays caused by project works an ensure traffic delay criteria is satisfied.

- Contractors should conduct a Road Safety Audit after the implementation of any traffic switches, with the intention to address any identified issues and regularly monitor the implemented arrangements. This will involve consultation with all relevant stakeholders to identify issues.

9.2.3 Management of pedestrians

The impact of construction on pedestrians is expected to be low as there are no footpaths or walkways within the construction boundary. Nevertheless, pedestrian access through the construction boundary should be closed off by the nominated contractor at all times during construction and maintenance works. A site-specific TMP should be developed to outline signage delineation required. The following should be considered during planning of road construction works:

- number of pedestrians
- origin and destination points of the pedestrians and their desired travel path
- needs of vulnerable pedestrians, such as young children, the elderly, people with a disability, vision impairment or hearing impairment and people with prams or trolleys
- proximity of pedestrian generation developments.

The following measures are recommended:

- all footpaths for construction workers within the works areas should be clearly delineated, signed and fenced to prevent access to work areas and sufficiently separated from vehicular traffic
- pedestrians should be segregated from live traffic by safety barriers where required
- appropriate pedestrians detour signage should be provided to guide / direct pedestrians where detours are available.

9.2.4 Management of cyclists

On-road cyclist access on the Richmond Road through the construction boundary would be retained during construction. During construction, a road shoulder should be maintained for cyclists. If this is not possible during certain construction tasks, the speed limit should be reduced to maintain cyclist safety. The site-specific TMP should outline any signage or delineation required for the specific work areas. The following should be considered during planning:

- number of cyclists and type of cycling activity
- origin and destination points of the cyclists and the connectivity of routes
- proximity of cyclist-generating developments
- travelling speed of cyclists
- interactions between cyclists and other road users
- mountain bike trials which closed during construction activities should be fenced off and signed to re-direct users to turn back or go around the construction boundary.

9.2.5 Management of heavy vehicles

Heavy vehicle access, including for oversized vehicles, should be maintained by the nominated contractor at all times during construction. The following should be considered during planning:

- consideration should be given to the movement of heavy vehicles and over-dimension loads when preparing temporary works drawings and traffic control plans
- traffic controllers should coordinate the movement of heavy vehicles through the work site

- major freight movements should be undertaken at night to minimise disruptions:
  - any disruptions should be communicated to the relevant stakeholders.

9.2.6 Traffic control devices

Traffic control devises used on the project should be in accordance with Transport for NSW and relevant Australian Standards. The development of temporary signposting schemes associated with the traffic staging arrangements should be undertaken to meet the requirements as stipulated in the Transport for NSW specification. The following devices should be considered:

- safety barriers to protect the work areas and pedestrian areas from traffic (selected from the list of approved safety barrier products accepted by Transport for NSW)
- pavement markings and signs used in the temporary works
- portable variable message signs
- radar activated speed signs
- temporary traffic signals
- anti-gawking screens.

9.2.7 Construction access points

The most hazardous movement for construction vehicles occurs when the vehicle is entering or exiting the construction site. The following should be considered in the planning of construction access points:

- minimise the number of access points
- new construction access points should not adversely impact on any existing intersections, traffic facilities or traffic generation developments
- security fences and gates at access points should be indented to enable vehicles to park clear of the adjacent travel lanes
- access points should be constructed of a suitable all-weather surface that prevents debris from being tracked onto the adjacent travel lanes
- access points should be clearly visible to approaching traffic and signposted accordingly
- the use of temporary traffic control should be considered to facilitate short-term major haulage operations and the movement of oversized vehicles where required.

Each site access should be detailed in a site-specific TGS, which would show the exact entry and exit points for the works vehicles, associated temporary signage, and delineation.

9.3 Recommended operational management measures

While the proposal will maintain the operation of the broader traffic and transport network, additional operational management measures are suggested to further contribute towards achieving the proposal objectives and efficient connection along the Richmond Road corridor, taking pressure off Richmond Road and Rooty Hill Road North intersection, relieving congestion along Richmond Road, and supporting future growth. These management measures are to:

- develop a signage strategy to inform drivers of road network changes and provide directions
- provide additional northbound and southbound through lanes on Richmond Road to the north outside of the Proposal

- provide more capacity for left turn vehicles from Rooty Hill Road North into the Richmond Road.

Due to the presence of queuing along Richmond Road, which extends back into the proposal area as a result of bottlenecks outside of the proposal, the intersection within our proposal area may require additional mitigation measures once these bottlenecks are alleviated.

10 Conclusion

Transport for NSW is proposing to upgrade Richmond Road to six lanes between Rooty Hill Road North and Townson Road. The proposal would include building a new flyover bridge from the M7 Motorway Rooty Hill Road North off-ramp to Richmond Road northbound allowing uninterrupted flow of traffic.

The proposal would aim at improving access to and exits from the M7 Motorway and Rooty Hill Road North with the ultimate objectives of relieving the current corridor congestion and providing road capacity that supports growth.

Future year models were prepared for 2028 and 2038, Do Minimum (without proposal) and The Proposal (with proposal) scenarios. The modelling results suggested that the Richmond Road Widening upgrades increase network throughput, allowing the corridor to carry more traffic with less delays compared to the Do Minimum scenario. The decrease in VHT, average travel times and average number of stops and an increase in average speed in the Proposal scenario compared to the Do Minimum scenario indicates that the road users experience a reduction in congestion with the introduction of upgrades.

The proposal would either maintain or improve intersection performance in future (2028 and 2038) years. Most importantly, the proposal brings in additional capacity along the Richmond Road corridor, thus providing opportunity to avoid delays for road users in the future years.

During different stages of construction of proposal, temporary traffic arrangements are made to ensure the traffic along Richmond Road is not highly impacted. The impact of construction traffic on Richmond Road and M7 are considered to be minor and therefore, mitigation measures beyond the usual road work measures are not expected to be required. Access to pedestrians, cyclists and bike trail users should be restricted and diversions put in place to guide these users around the construction boundary.

While the proposal will maintain the operation of the broader traffic and transport network, additional operational management measures are suggested to further contribute towards achieving the proposal objectives and efficient connection along the Richmond Road corridor, taking pressure off Richmond Road and Rooty Hill Road intersection, relieving congestion along Richmond Road, and support future growth.

Stantec

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