Meadowbank Education and Employment Precinct Schools Project
Transport and Accessibility Impact Assessment

SSD 18_9343
Prepared by GTA Consultants
For School Infrastructure NSW
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Meadowbank Education and Employment Precinct Schools Project

2 Rhodes Street, Meadowbank
Transport and Accessibility Impact Assessment

Client: Woods Bagot

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EXECUTIVE SUMMARY

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Overview

This proposal involves the redevelopment of the northern portion of the TAFE NSW Northern Sydney Institute Meadowbank Campus site, which has been acquired by the Department of Education. The site will be developed into a new kindergarten to year 12 school that can accommodate 1,000 primary students and 1,620 high school students to meet the needs of the growing inner Sydney population. The redevelopment will include new classrooms, collaborative learning spaces, open space, sports fields and associated facilities.

In accordance with Part 4 of the Environmental Planning and Assessment Act 1979, Secretary's Environmental Assessment Requirement (SEARs) were requested to guide the future development of the new Meadowbank Schools, located at 2 Rhodes Street, Meadowbank.

This Transport and Accessibility Impact Assessment report was prepared by GTA Consultants in response to the SEARs and provides an assessment of the anticipated transport implications of the proposal. A separate School Travel Plan addressing both staff and student travel has been prepared to support the proposal, drawing on a broader school travel management initiative being led by the Department of Education and providing details of travel demand management measures to minimise the impact on general traffic, parking and bus operations. The School Travel Plan includes details of location-specific initiatives and the provision of facilities to increase the non-car mode share for travel to and from the site. The Greater Sydney Commission is currently in the process of preparing a Meadowbank Education and Employment Precinct Master Plan for the broader Meadowbank Education and Employment Precinct. The masterplan is focussed on mode shift and provides actions that will enable greater pedestrian access, cycle usage and access to public transport.

Case studies of comparable schools, along with questionnaire surveys of the existing Meadowbank Primary and Marsden High schools were consolidated to ascertain an appropriate mode split for the proposed school at Meadowbank, as well as pick-up and set-down capacity requirements. Combining the survey results and School Travel Plan recommendations, mode share assumptions were developed for the proposed new school.

In February 2014, Roads and Maritime Services commissioned GTA to evaluate trip generation and parking rates for persons and vehicles from schools based upon surveys undertaken at suitable schools. Average results from these surveys were used to calculate vehicle occupancy rates for primary and secondary students.

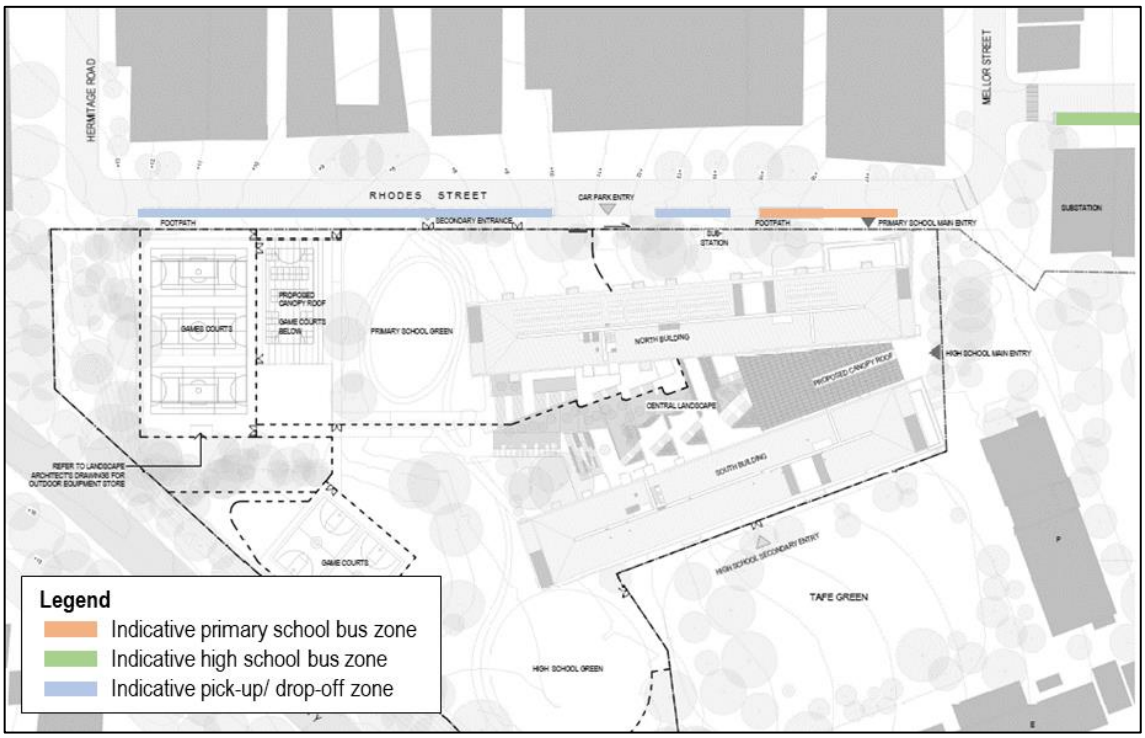
SIDRA Intersection and SIDRA Network modelling was used to assess the current operation of the surrounding road network. These results indicate that under existing traffic volumes, the intersections of Victoria Road and Bowden Street, Victoria Road and Hermitage Road and Church Street and Morrison Road are operating close to capacity for both peak hours with degree of saturation close to one. The remaining intersections assessed operate at acceptable levels of service of C or above during the AM and PM peak hours, with satisfactory delays and queue lengths. Network performance results for the forecast future 2022 (opening year) traffic volumes indicate that the additional schools traffic can be accommodated by the road network, with all intersections operating at level of service D or better, with the exception of the two access intersections along Victoria Road at Hermitage Road and Bowden Street. The detailed results indicate that some additional capacity may be required during peak school times on the Hermitage Road and Bowden Street approaches to Victoria Road. As a mitigation measure, an additional phase was introduced to clear the turning traffic at Hermitage Road and Bowden Street, which improves operation. This could also be implemented at both intersections along Victoria Road (in consultation with Roads and Maritime Services), with minimal impact on through traffic.

Forecast future 2032 traffic volumes (without the proposed schools and TAFE redevelopment) would result in Victoria Road intersections exceeding capacity. With the addition of the proposed school traffic, the intersections of Victoria Road/ Bowden Street, Victoria Road/ Hermitage Road and Church Street/ Morrison Road would further exceed capacity and the intersection of Constitution Road/ Bowden Street would be approaching capacity on the north-western approach during the AM peak hour. The additional traffic is anticipated to have an impact on the performance of Victoria Road with average delays and queues increasing. It is estimated that the schools will add in the order of 270-340 vehicles per hour during the school peak hours, whereas forecast background growth is approximately double (in the order of 530 to 600 vehicles per hour).

With Victoria Road already operating close to capacity, background traffic congestion issues would need to be addressed in order to understand any additional impact of the proposed schools in 2032. School Infrastructure would work with Roads and Maritime Services in this regard to develop/ refine potential Victoria Road upgrades that could form part of broader corridor upgrade program(s).

The proposed arrangements for pick-up and set-down (private vehicles and buses) along Rhodes Street prioritise school bus activity over private car travel to encourage bus travel and simplify the management of students travelling by bus. The kerbside uses will be managed by the schools to limit impacts on the surrounding area. Parking on the southern side of Rhodes Street would be restricted to facilitate school pick-up and set-down activity, with management from school staff (predominantly for primary school students). An overview of the proposed kerbside facilities is presented in Figure E1.

Figure E1: Overview of proposed kerbside facilities



Based on the City of Ryde Council Development Control Plan 2014, the development gives rise to an off-street parking requirement of 135 car parking spaces. The Travel Plan would be used to encourage a shift to active and public transport modes and higher private vehicle occupancy rates, minimising the parking impact of the proposal. A total of 60 spaces are proposed at school opening. It is a necessary requirement that the Travel Plan be monitored for its effective usage and success. Coupled with external regional infrastructure upgrades and policies (driven by Council and State Government), a car park requirement of 60 spaces or lower can be achieved. Ongoing review of the Travel Plan and travel patterns of staff will be required to ensure the adequacy of the proposed parking provision after the schools open.

The proposed schools development is likely to generate up to 950 pedestrians per hour (including students and staff) walking between the school and either home, a nearby stop or Meadowbank Railway Station. The majority of these pedestrian volumes are expected to/ from the south of the site, given the location of Meadowbank Railway Station. To accommodate these estimated pedestrian volumes and facilitate both bus and private car set-down/ pick-up activity, it is proposed to widen the footpaths along the southern side of Rhodes Street and Macpherson Street. In addition, pedestrian crossing facilities are proposed on Rhodes Street and Macpherson Street for safe pedestrian movement.

The existing north-south pedestrian connection through the TAFE campus will be improved by minor upgrade works (by TAFE as part of a separate approvals process), which links Meadowbank Station with the schools.

There are limited cyclist provisions surrounding the site, which is considered insufficient to support the cyclist demand associated with the proposed development, particularly given students will be the main cyclists to and from the site. With the proposed upgrades, it is recommended that shared paths are constructed along the key pedestrian and cyclist desire lines to support the broader precinct.

Meadowbank Railway Station will provide a key transport mode to support the proposed development. Under existing conditions, the rail services operating through this station are over capacity. Under the NSW Government's Future Transport Strategy, the More Trains, More Services program is targeting capacity increases and upgrades to improve peak hour crowding on rail services. The NSW Government will explore further investments in north-south transport links near Greater Parramatta to improve access and support the creation and renewal of great places, including a potential mass transit/ train link from Macquarie Park to Hurstville via Rhodes. Improvements to the capacity and reliability of the T1 Northern Line will be critical for encouraging and facilitating public transport use for the proposed development.

High-frequency bus services, including the M52, currently operate along Victoria Road. It is understood that there is sufficient capacity on these existing services to accommodate staff and high school student travel demand, noting some of these services would currently be used for access to the existing Marsden High School. Available bus stops are generally within a five-minute walk of the schools, with existing footpaths along Forsyth Street and Mellor Street providing appropriate pedestrian accessibility.

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1. INTRODUCTION

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1.1. Background

This Transport and Accessibility Impact Assessment has been prepared by GTA Consultants (GTA) on behalf of the NSW Department of Education and School Infrastructure NSW (the Applicant). It accompanies an Environmental Impact Statement (EIS) in support of State Significant Development Application (SSD 18_9343) for the new Meadowbank Education and Employment Precinct Schools Project (hereafter referred to as MEEPSP) at 2 Rhodes Street, Meadowbank (the site).

MEEPSP will cater for 1,000 primary school students and 1,620 high school students. The proposal seeks consent for:

- A multi-level, multi-purpose, integrated school building with a primary school wing and high school wing. The school building is connected by a centralised library that is embedded into the landscape. The school building contains:
    - collaborative general and specialist learning hubs, with a combination of enclosed and open spaces
    - adaptable classroom home bases
    - four level central library, with primary school library located on ground floor and high school library on levels 1 to 3
    - laboratories and workshops
    - staff workplaces
    - canteens
    - indoor gymnasium
    - multipurpose communal hall
    - outdoor learning, play and recreational areas (both covered and uncovered).
- Associated site landscaping and public domain improvements.
- An on-site car park for 60 parking spaces.
- Construction of ancillary infrastructure and utilities as required.

1.2. Purpose of this report

The purpose of this Transport and Accessibility Impact Assessment is to identify the anticipated transport implications of the proposed development.

The remainder of this report is structured as follows:

- **Section 2** provides an overview of the strategic context.
- **Section 3** presents the existing conditions of the surrounding transport network.
- **Section 4** provides an overview of the development proposal and the key transport infrastructure proposed for the site.
- **Section 5** assesses of the car parking provision and impact of the proposed development.
- **Section 6** summarises the loading arrangements for the site.
- **Section 7** provides an estimate on the number of person trips per mode of transport to the site.
- **Section 8** assesses the public and active mode transport impact and provides proposed mitigation and management measures for the existing transport network.
- **Section 9** assesses the traffic impact and provides proposed mitigation and management measures for the surrounding road network.

- **Section 10** provides a preliminary construction traffic management plan for the proposed development.
- **Section 11** presents the conclusions for the report.

A separate School Travel Plan addressing both staff and student travel has been prepared to support the proposed development. This report provides details of travel demand management measures to minimise the impact on the surrounding road network, as well as initiatives to encourage sustainable travel to and from the site to increase the non-car travel mode share.

1.3. Response to SEARs

The Transport and Accessibility Assessment is required by the SEARs for SSD 18_9343. Table 1.1 identifies the SEARs and relevant reference within this report.

Table 1.1: SEARs and relevant report reference

SEAR detail	Report reference
Accurate details of the current daily and peak hour vehicle, existing and future public transport networks and pedestrian and cycle movements provided on the road network located adjacent to the proposed development	Section 3
Details of estimated total daily and peak hour trips generated by the proposal, including vehicle, public transport, pedestrian and bicycle trips based on surveys of the existing and similar schools within the local area	Section 7 (public and active transport trips) Section 9 (vehicle trips)
The adequacy of existing public transport or any future public transport infrastructure within the vicinity of the site, pedestrian and bicycle networks and associated infrastructure to meet the likely future demand of the proposed development	Section 8
Measures to integrate the development with the existing/ future public transport network	Section 8
The impact of the development on nearby intersections, with consideration of the cumulative impacts from other approved developments in the vicinity and the need/ associated funding for, and details of, upgrades or road improvements works, if required (traffic modelling is to be undertaken using SIDRA network modelling for current and future years)	Section 9
The identification of infrastructure required to ameliorate any impacts on traffic efficiency and road safety impacts associated with the proposed development, including details on improvements required to affect intersections, school bus services along bus capable roads (i.e. minimum 3.5m wide travel lanes)	Section 8 and 9
Details of travel demand management measures to minimise the impact on general traffic and bus operations, including details of a location-specific sustainable travel plan (Green Travel Plan and specific Workplace Travel Plan) and the provision of facilities to increase the non-car mode share for travel to and from the site	Refer to separate School Travel Plan document
The proposed walking and cycling access arrangements and connections to public transport services	Section 8
The proposed access arrangements, including car and bus pick-up/ drop-off facilities and measures to mitigate any associated traffic impacts and impacts on public transport, pedestrian and bicycle networks, including pedestrian crossings and refuges and speed control devices and zones	Section 8
Proposed bicycle parking provision, including end of trip facilities, in secure, convenient, accessible areas close to main entries incorporating lighting and passive surveillance	Section 8
Proposed number of on-site car parking spaces for teaching staff and visitors and corresponding compliance with existing parking codes and justification for the level of car parking provided on-site	Section 5
An assessment of cumulative on-street parking impacts of cars and bus pick-up/ drop-off, staff parking and any other parking demands associated with the development	Section 8
An assessment of road and pedestrian safety adjacent to the proposed development and the details required road safety measures and personal safety in line with CPTED	Section 8
Emergency vehicle access, service vehicle access, delivery and loading arrangements and estimated service vehicle movements (including vehicle type and the likely arrival and departure times)	Section 6

SEAR detail	Report reference
The preparation of a preliminary Construction Traffic Management Plan to demonstrate the proposed management of the impact in relation to construction traffic addressing the following: Assessment of cumulative impacts associated with other construction activities (if any) An assessment of road safety at key intersection and locations subject to heavy vehicle construction traffic movements and high pedestrian activity Details of construction program detailing the anticipated construction duration and highlighting significant and milestone stages and events during construction process Details of anticipated peak hour and daily construction vehicle movements to and from the site Details of access arrangements of construction vehicles, construction workers to and from the site, emergency vehicles and service vehicles Details of temporary cycling and pedestrian access during construction Details of proposed construction vehicle access arrangements at all stages of construction Traffic and transport impacts during construction, including cumulative impacts associated with other construction activities and how these impacts will be mitigated for any associated traffic, pedestrians, cyclists, parking and public transport, including the preparation of a draft Construction Traffic Management Plan to demonstrate the proposed management of the traffic.	Section 10

1.4. References

In preparing this report, reference has been made to the following:

- an inspection of the site and its surrounds undertaken on 20 June 2018, during the morning peak period
- City of Ryde Council Development Control Plan (DCP) 2014
- Roads and Maritime Services (Roads and Maritime) Guide to Traffic Generating Developments October 2002
- Roads and Maritime Guide to Traffic Generating Developments – Technical Direction August 2013
- Austroads Guide to Traffic Management – Part 3: Traffic Studies and Analysis
- Roads and Maritime Schedule of Classified Roads and State and Regional Roads versions 2011/1
- Cycling Aspects of Austroads Guides 2017
- New South Wales Government Planning Guidelines for Walking and Cycling 2004
- Austroads Guide to Traffic Management Part 12: Traffic Impacts of Development 2016
- Australian Standard, Parking facilities Bicycle Parking, AS 2890. 3:2015
- Australian Standard/ New Zealand Standard, Parking Facilities, Part 1: Off-Street Car Parking AS/NZS 2890.1:2004
- Australian Standard, Parking Facilities, Part 2: Off-Street Commercial Vehicle Facilities AS 2890.2:2018
- Australian Standard/ New Zealand Standard, Parking Facilities, Part 6: Off-Street Parking for People with Disabilities AS/NZS 2890.6:2009
- traffic and car parking surveys undertaken by Matrix Traffic and Transport Data Thursday 28 February 2018 and 26 June 2018 as referenced in the context of this report
- plans for the proposed development prepared by Woods Bagot, drawing numbers MSP-WB-AR DA000-402, dated 4 June 2019
- Meadowbank School, Traffic and Transport Assessment, Draft 2, Arup, 22 February 2018
- Transport Assessment and School Travel Plan, Frank Turquoise Group, 20 December 2018
- other documents and data as referenced in this report.

2. STRATEGIC CONTEXT

02

This section provides an overview of the strategic context of the proposed development, including the relevant planning strategies and opportunities.

2.1. Draft Future Transport 2056 and Supporting Plans

Reviews have been completed for the following supporting plans:

- Future Transport Strategy 2056
- Greater Sydney Services and Infrastructure Plan
- Regional NSW Services and Infrastructure Plan
- Road Safety Plan (Towards Zero).

To support the land use vision for Greater Sydney, the NSW Government developed a vision for the transport system that will enable people and goods to move conveniently around the city. It will enable people within each city to access their nearest metropolitan and strategic centre within 30 minutes by public transport, seven days a week using:

- City-shaping corridors – Major trunk road and rail public transport corridors providing higher speed and volume linkages between our cities and centres that shape locational decisions of residents and businesses.
- City-serving corridors – Higher density corridors concentrated within ~10km of metropolitan centres providing high frequency access to metropolitan cities/ centres with more frequent stopping patterns.
- Centre-serving corridors – Local corridors that support buses, walking and cycling, to connect people with their nearest centre and transport node.

Some of the key initiatives of this vision include:

- Sydney Growth Trains (part of More Trains, More Services program), which is committed within the next 10 years.
- Trial of on-demand bus services on selected local bus routes, which is committed within the next 10 years.
- Introduction of higher frequency transport services across Greater Sydney, which is under investigations between now and the next 20 years.

Within the 10-kilometre area around metropolitan centres, city-serving corridors will be able to support higher frequency, reliable on-street transport as key, city-shaping motorways will divert major traffic away from centres. This is the vision for the integrated network around the Harbour CBD where the network of new motorways, including WestConnex and Western Harbour Tunnel, will enable busy surface roads, such as Parramatta Road, Victoria Road and Military Road, to support more on-street public transport In the Central River City. This includes the investigation of strategic public transport links around Greater Parramatta to improve 30-minute access, including the prioritisation of on-road public transport and bus service improvements.

The More Trains, More Services initiative includes a service capacity upgrade program designed to transform the existing rail system using changes in technology and innovation to create integrated, automated, high capacity turn up and go services for our customers. This program aims to transform Sydney's busiest train lines over the next 10 years and beyond, through digital systems, advanced signalling and infrastructure upgrades.

Relevant to the proposed development, initiatives include exploring further investments in north-south transport links near Greater Parramatta to improve access and support the creation and renewal of great places. These include:

- Parramatta to Norwest mass transit/ train link
- mass transit/ train link Macquarie Park to Hurstville via Rhodes
- Central City strategic road corridor.

2.2. Sydney's Cycling Future

The Sydney's Cycling Future 2013 has identified schools as part of the major neighbourhood destinations where links to these destinations should be prioritised.

Transport for NSW (TfNSW) is developing a range of customer initiatives that will raise the profile of bicycle riding as a fun, healthy, easy and flexible transport option. TfNSW will provide information to customers on how to plan a safe riding route to their destination. TfNSW will also introduce initiatives to improve compliance with the bicycle related road rules when riding or driving on the road.

- Travel choices: TfNSW will support programs designed for everyday destinations to inform customers of their travel choices and provide incentives for them to ride. These programs will help ease congestion around key destinations at peak times.
- Road Safety Education Program: The Road Safety Education Program is a long-term integrated educational initiative. The program aims to increase students' road safety knowledge, understanding and skills and to develop positive road user attitudes and safe behaviours in children and adolescents. This includes safe bicycle riding. TfNSW works closely with the Department of Education, the Association of Independent Schools of NSW and the Catholic Education Commission, on the development and delivery of road safety education resources in their implementation.
- Community Bicycle and Road Safety Education facilities: TfNSW will continue to work to instil safe cycling practices into school age children. Many facilities exist for children to learn road skills and safe cycling practice away from live traffic. There are more than nine community bicycle and road safety education facilities, as well as numerous parks and off-road bicycle tracks that provide safe places for children to ride.

Support existing health programs: TfNSW will work with the Ministry of Health and the Office for Preventive Health on programs such as the Healthy Children Initiative, Active Travel to School and Healthy Workers Initiative. TfNSW will also continue to support a range of existing programs run by non-governmental organisations that encourage people to choose cycling as their transport choice.

2.3. Sydney's Walking Future

TfNSW will create a culture of walking as a viable and attractive transport choice, especially for getting to and from school.

More than 50 per cent of children live less than two kilometres from school. However, the number of children walking to school has dropped over the last four decades. Currently, 70 per cent of children between five and nine years old and 46 per cent of children between 10 and 14 years old are driven to school in Greater Sydney.

TfNSW would like to increase walking trips to school to reduce the pressure on our road network and public transport system.

The three pillars of Sydney's walking future include promoting benefits and providing information to increase walking trips to schools through programs that encourage more sustainable transport. TfNSW will encourage more people to walk during peak times to ease congestion on roads and free up capacity on public transport, particularly around schools as well as promoting the physical, emotional and social benefits of walking.

2.3.1. Road Safety Education Program

The Road Safety Education Program is a long-term integrated education initiative. The program aims to increase road safety knowledge, understanding and skills. TfNSW works closely with the Department of Education, the Association of Independent Schools of NSW and the Catholic Education Commission NSW to develop these programs. The NSW Government is committed to continuing the Road Safety Education program and encouraging more children to walk to school safely.

2.3.2. Safety around Schools Program

This program aims to reduce the number and severity of child casualties in 40 km/h school zones. Providing a safe road environment for pedestrians close to school premises is vital. TfNSW will continue to focus strongly on improving the visibility of school zones to increase driver awareness and compliance. School zones are designed to protect children on their journey to and from school. Measures include:

- dragon's teeth road markings in all school zones
- the replacement of old, damaged school zone signs with new fluorescent signs
- marked foot crossings
- raised pedestrian crossings
- pedestrian refuges and fencing
- traffic signal-controlled pedestrian crossings.

School zone flashing lights are designed to alert drivers that they are entering a 40 km/h school zone and to adjust their speed accordingly. School zone flashing lights are being rolled out across NSW as part of this program and by the end of December 2015, every school in NSW will have a set of flashing lights.

2.4. Sydney's Bus Future 2013

TfNSW has introduced more than 4,900 extra weekly bus services over the past two years, in urban growth areas, on high demand routes and as extra school services. Local services will continue to provide peak express and limited stop services, school services, local shopping services, CBD shuttles, special event access and late-night services.

2.5. Greater Sydney Commission's Draft Central City District Plan

2.5.1. Education

Schools are essential local infrastructure. The DoE estimates that an extra 270,000 students will need to be accommodated in government and non-government schools in Greater Sydney by 2036. Demand for school places will vary across Greater Sydney. The DoE's high-level *School Assets Strategic Plan Summary* coordinates planning for, and delivery of, both new and expanded schools. It encourages the joint and shared use of facilities with local governments and the private sector to develop innovative ways to provide school infrastructure. The NSW Government will spend $4.2 billion over the next four years on building and upgrading schools, including the addition of more than 1,500 new classrooms providing places for 32,000 students. Innovations such as contemporary design, flexible learning spaces and more efficient use of land will be essential responses to growth and changing demand. Shared use of facilities and increased opportunities for students to walk and cycle to school will better connect schools with local communities.

Planning for early education and childcare facilities requires innovative approaches to the use of land and floor space, including co-location with compatible uses such as primary schools and office buildings, close to transport facilities. Tertiary education and vocational training facilities together with lifelong learning opportunities allow people to gain and refine skills for employment. This supports productivity but also allows people to connect with other people in the community, supporting enhanced social cohesion.

The needs of children and young people go beyond education facilities. With families increasingly living in higher density areas, there needs to be greater importance placed on how open spaces, cultural facilities and the public realm are planned, designed and managed to include children and young people.

2.5.2. Education and Childcare

The State Environmental Planning Policy (SEPP) for Educational Establishments and Child Care Facilities 2017 makes it easier for childcare providers, schools, TAFEs and universities to build new facilities and improve existing facilities. It streamlines approval processes, recognising the need for additional educational infrastructure with a focus on good design. The accompanying Child Care Planning Guideline assists in matters such as site selection, location and building design to meet national requirements for childcare.

2.5.3. Joint and Shared Use

Joint and shared use of facilities is encouraged to make school assets available to the community outside school hours and to give schools access to community facilities. Joint use involves a school and community partner funding shared facilities, such as building and operating a sportsground with a local council. Shared use is where a school allows community use of school facilities during out-of-school hours. Each neighbourhood has facilities such as libraries, community centres, adult education, sport and recreation facilities that function to enhance and promote social connections and networks within the community. Schools are an important example of social connectors and where shared use of such facilities is achieved their function as a community hub is significantly enhanced.

2.6. Meadowbank Education and Employment Precinct Master Plan

A Preliminary Master plan is being prepared by the Greater Sydney Commission for the Meadowbank Education and Employment Precinct. The Masterplan aims to inform the State Significant Development Applications (SSDA) for the proposed new schools and TAFE NSW Meadowbank.

The Masterplan is currently at a preliminary stage. It is focussed on mode shift and aims to provide actions that will enable greater pedestrian access, cycle usage and access to public transport. As identified at the NSW government website, the masterplan aims to deliver a highly connected Precinct that complements Meadowbank's heritage and environment, and will identify:

- open spaces within the Precinct
- opportunities to locate industry and business near education facilities
- links to industry and local employment
- necessary infrastructure to support the education facilities, including public and active transport options
- ways to revitalise surrounding sites and grow productivity.

3. EXISTING CONDITIONS

03

3.1. Site Location and Local Context

The site is in Meadowbank, which is approximately 15 kilometres north west of Sydney CBD. The proposed development will occupy the northern portion of the former TAFE NSW site at 2 Rhodes Street, Meadowbank, which presently contains a series of buildings, at-grade car parking areas and open spaces. The TAFE NSW campus is bounded by Rhodes and Macpherson Streets to the northeast and See Street to the southeast and the rail corridor to the west. Meadowbank Railway Station is located opposite the southern tip of the TAFE NSW site.

The site location is illustrated in Figure 3.1. This proposed development site has a primary frontage to Rhodes Street and an area of 3.3 hectares. The site is legally described as Lot 10 in DP1232584 being part of Lot 1 in DP 837179.

Figure 3.1: Subject Site and environs

Basemap Source: Nearmap

North of the site is the Ryde Pumping Station. On the opposite side of Rhodes Street, a light industrial precinct is located to the north east of the site. East of the site there is low density residential, consisting of detached dwellings. South of the site is the Meadowbank Railway Station and The Shepherds Bay Precinct. The Shepherds Bay Precinct is currently undergoing significant redevelopment as an urban renewal project with a series of high density residential flat buildings ranging from five to 10-storeys in height. West of the site is the railway corridor. On the opposite side of the rail corridor there is a mix of low density residential and walk up style flat buildings.

3.2. Existing Road Network

This section provides an understanding of the current road network surrounding the site in terms of characteristics and operational performance.

3.2.1. Road Hierarchy

Roads are classified according to the functions they perform. The main purpose of defining a road's functional class is to provide a basis for establishing the policies which guide the management of the road according to their intended service or qualities.

In terms of functional road classification, State roads are strategically important as they form the primary network used for the movement of people and goods between regions within Sydney, and throughout the State. Roads and Maritime is responsible for funding, prioritising and carrying out works on State roads. State roads generally include roads classified as freeways, state highways, and main roads under the 1993 Roads Act, and the regulation to manage the road system is stated in the Australian Road Rules (1999).

Roads and Maritime defines 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

Arterial roads are controlled by Roads and Maritime, typically no limit in flow and designed to carry vehicles long distance between regional centres.

Sub-Arterial Roads

Sub-arterial roads are managed by either Council or Roads and Maritime under a joint agreement. Typically, their operating capacity ranges between 10,000 and 20,000 vehicles per day, and their purpose is to carry through traffic between specific areas in a sub region or provide connectivity from arterial road routes (regional links).

Collector Roads

Collector roads provide connectivity between local sites and the sub-arterial road network, and typically carry between 2,000 and 10,000 vehicles per day.

Local Roads

Local roads provide direct access to properties and the collector road system and typically carry between 500 and 4,000 vehicles per day.

3.2.2. Surrounding Road Network

Rhodes Street

Rhodes Street functions as a collector road and is aligned in an east-west direction. It is a two-way road configured with one traffic lane and one parking lane in each direction within a 11-metre wide carriageway.

Kerbside parking is permitted on both sides of the road. Rhodes Street carries around 1,100 vehicles per day in the eastbound direction and 1,400 vehicles per day in the westbound direction.

Rhodes Street is shown in Figure 3.2 and Figure 3.3.

Figure 3.2: Rhodes Street (looking east)

Figure 3.3: Rhodes Street (looking east)

Hermitage Road

Hermitage Road functions as a collector road and is aligned in a north south direction. It is a two-way road configured with one travel lane and one parking lane in each direction within a 10-metre wide carriageway. Kerbside parallel parking is permitted on both sides of the road. Hermitage Road intersects Victoria Road at a signalised intersection, permitting all turning movements.

Hermitage Road carries around 1,700 vehicles per day in the southbound direction and 1,900 vehicles per day in the northbound direction.

Hermitage Road is shown in Figure 3.4.

Victoria Road

Victoria Road is a classified State Road (Roads and Maritime controlled) and is aligned in an east-west direction. Near the site, it is a two-way road configured with three travel lanes in each direction. Kerbside parking is not permitted on both sides of the road. The road carriageway is around 20 metres wide.

Victoria Road is shown in Figure 3.5.

Bowden Street

Bowden Street functions as a collector road and is aligned in a north south direction. It is a two-way road configured with one travel lane in each direction within a 12-metre wide carriageway. Bowden Street intersects Victoria Road at a signalised intersection, permitting all turning movements.

Kerbside parking is permitted on both sides of the road, subject to a one to two-hour time restrictions during weekdays between 7:00am and 5:00pm. On the southern approach to Victoria Road, Bowden Street is subject to clearway restrictions along the western side of the road, extending back to the intersection with Macpherson Street.

Bowden Street carries around 4,200 vehicles per day in the northbound direction and 4,700 vehicles per day in the southbound direction.

Bowden Street is shown in Figure 3.6.

Macpherson Street

Macpherson Street functions as a local road and near the site is aligned in an east-west direction. It is a two-way road configured with one travel lane and one parking lane in each direction within a 10-metre wide carriageway. Kerbside parking is permitted on both sides of the road, subject to a two-hour time restriction during weekdays between 8:00am and 9:00pm.

Macpherson Street is shown in Figure 3.7.

Figure 3.4: Hermitage Road (looking south)

Figure 3.5: Victoria Road (looking east)

Figure 3.6: Bowden Street (looking north)

Figure 3.7: Macpherson Street (looking east)

Mellor Street

Mellor Street functions as a local road and near the site is aligned in a north-south direction. It is a two-way road configured with one travel lane and one parking lane in each direction within an 11-metre wide carriageway. Mellor Street provides left-in/ left-out access to Victoria Road.

Kerbside parking is permitted on both sides of the road, and is generally unrestricted, with a short section of two-hour time restriction between Mulvihill Street and Victoria Road from 8:30am to 6:00pm, Monday to Friday and from 8:30am to 12:30pm on Saturdays.

Forsyth Street

Forsyth Street functions as a local road and near the site is aligned in a north-south direction. It is a two-way road configured with one travel lane and one parking lane in each direction within an 11-metre wide carriageway. Forsyth Street provides left-in/ left-out access to Victoria Road.

Kerbside parking is permitted on both sides of the road, subject to a two-hour time restriction on the western side from 8:00am to 9:00pm, Monday to Friday (permit holders excepted). Kerbside parking on the eastern side is unrestricted.

Constitution Road

Constitution Road functions as a local road and near the site is aligned in an east-west direction. It is a two-way road configured with one travel lane in each direction within a 10-metre wide carriageway. No stopping is permitted on Constitution Road, between Railway Road and Bowden Street.

See Street

See Street functions as a local road and near the site is aligned in a north-south direction. It is a two-way road configured with one travel lane and one parking lane in each direction within an 11-metre wide carriageway. Kerbside parking is permitted on both sides of the road. Parking is generally unrestricted on the eastern side, with a short section of 15-minute time restriction from 8am to 5:30pm, Monday to Friday. On the western side of See Street, the following parking restrictions apply:

- Two-hour time restriction between Macpherson Street and Stone Street, from 8:00am to 9:00pm, Monday to Friday (permit holders excepted)
- 15-minute time restriction between Stone Street and Angas Street, from 7:00am to 5:00pm, Monday to Friday.
- Two-hour time restriction between Angas Street and Constitution Road, from 8am to 9pm, Monday to Friday (permit holders excepted).

3.2.3. Surrounding Intersections

The following intersections currently exist near the site:

- Victoria Road/ Hermitage Road (signalised)
- Macpherson Street/ Rhodes Street (unsignalised)
- Macpherson Street/ See Street (unsignalised)
- Macpherson Street/ Bowden Street (unsignalised)
- Bowden Street/ Squire Street (unsignalised - roundabout)
- Bowden Street/ Victoria Road (signalised)
- Bowden Street/ Constitution Road (unsignalised - roundabout)
- Railway Road/ Bay Drive/ Bank Street (unsignalised - roundabout)
- Church Street/ Morrison Road (signalised)
- Belmore Street/ Constitution Road (signalised).

3.3. Previous Relevant Transport Studies

3.3.1. Arup Traffic and Transport Assessment

Arup prepared a Traffic and Transport Assessment (Draft 2, 22 February 2018) to support the development of the concept design of the MEEPSP. The Arup report has been reviewed and forms the key assumptions used within this study.

Traffic surveys were commissioned by Arup on Thursday 8 February 2018 between 7:00am and 9:30am and between 2:00pm and 4:30pm, and SIDRA Intersection analyses conducted at the following key intersections:

- Victoria Road/ Hermitage Road
- Macpherson Street/ Rhodes Street
- Macpherson Street/ See Street
- Macpherson Street/ Bowden Street
- Bowden Street/ Squire Street
- Bowden Street/ Victoria Road
- Bowden Street/ Constitution Road.

The SIDRA Intersection analyses were carried out for isolated intersections only for the peak periods of 8:00am – 9:00am and 2:30pm – 3:30pm. Therefore, the impact of cumulative queuing and delay was not considered as part of this assessment. The SIDRA Intersection results indicated that all intersections analysed operate at acceptable levels of service of D or better, with the intersections of Hermitage Road and Bowden Street with Victoria Road approaching capacity under existing conditions.

Case Studies

Case studies of comparable schools were carried out by Arup to ascertain an appropriate mode split for the proposed school at Meadowbank.

For the primary school case study, Lindfield Public School (with 723 students) was surveyed, indicating the following key characteristics:

- 43 per cent of students travel by private vehicle
- average car occupancy is 1.6 students per vehicle

- a length of 75 metres of kerbside outside the school is used for pick-up/ set-down, equating to about 13 kerbside spaces
- pick-up/ set-down spaces are provided at a rate of 0.018 bays per student.

For the secondary school, Chatswood High School and Chatswood Public School (combined 2,439 students) were surveyed in September 2016 to assess pick-up and set-down capacity requirements. Chatswood High School is located at a similar distance from Chatswood Railway Station as the proposed Meadowbank school is located to Meadowbank Railway Station. The key characteristics of these schools include:

- 14 per cent of students travel by private vehicle
- 15 car spaces used for drop-offs, occurring over a 15-minute period
- 30 car spaces used for pick-ups, occurring over a 30-minute period
- pick-up/ set-down spaces are required at a rate of 0.012 bays per student
- 32 per cent of students walk to/ from school (reflective of the high-density residential land use within the school's catchment)
- 35 per cent of students travel by train
- 18 per cent of students travel by bus.

3.3.2. Roads and Maritime Trip Generation Surveys for Schools

In February 2014, Roads and Maritime commissioned GTA to evaluate trip generation and parking rates for persons and vehicles at schools, based upon surveys completed at a sample of 22 schools across NSW[1].

Vehicle occupancy was surveyed in order to obtain both vehicle and person trips. The average of six relevant primary schools and seven high schools was as follows:

- Primary Students – 2 students per vehicle
- Secondary students – 1.7 students per vehicle.

The 2014 survey data was analysed to understand the relationship between peak hour and the corresponding start and finish times for each school.

The analysis indicates that the peak hour is generally from 45 minutes before to 15 minutes after the school start time and vice versa for the finish times. This analysis was used to develop the arrival and departure assumptions for students and staff in this report.

The 2014 survey data School Summary Sheet[1] indicates that peak periods are generally between 8:00 am and 9:00 am and between 2:45pm – 3:45 pm, which is consistent with the peak hours analysed in the Arup report. The same school peak hours analysed in the Arup report were adopted for this study.

3.4. Existing Road Network Operation

3.4.1. Additional Surveys

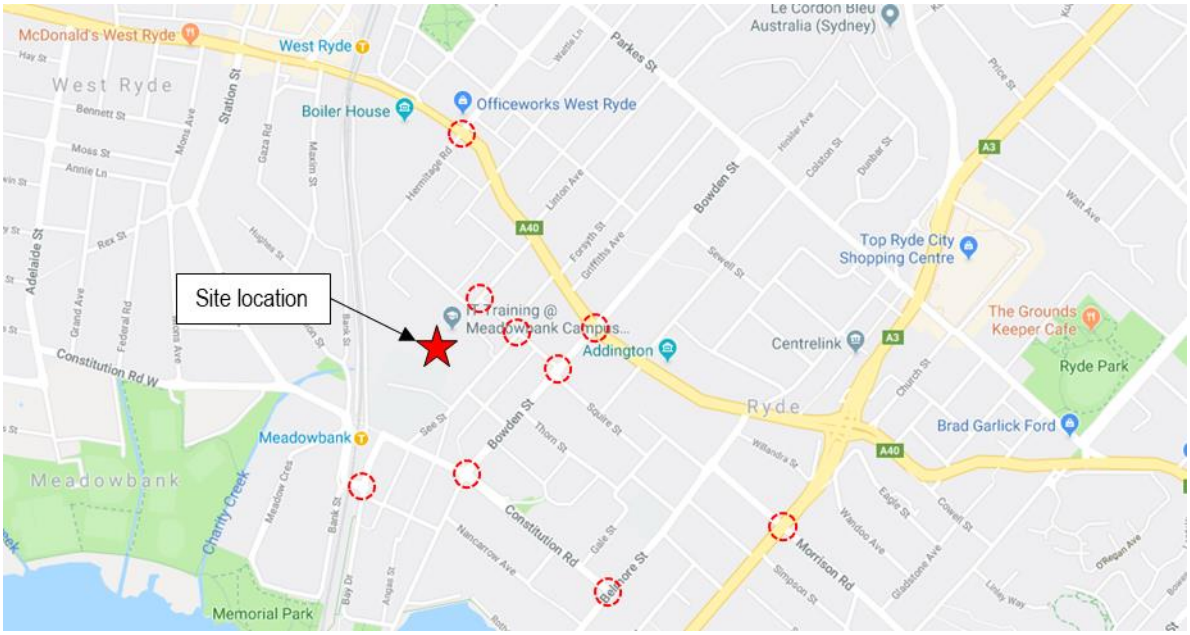
To respond to the requirements outlined in the SEARs, GTA commissioned additional traffic movement counts on Thursday 28 June 2018, between 7am and 9:30am and between 2pm and 4:30pm for three additional intersections. In addition to the intersections modelled by Arup, the following three intersections were also modelled in SIDRA Intersection:

[1] https://media.opengov.nsw.gov.au/pairtree_root/d5/02/e9/3f/c7/db/47/f8/ba/18/01/81/4d/b5/58/c9/obj/153916.pdf

- Railway Road/ Bay Drive/ Bank Street
- Church Street/ Morrison Road
- Belmore Street/ Constitution Road.

A summary of all the intersections surveyed and modelled intersections is provided in Figure 3.8, noting these are consistent with the SEARs requirements.

Figure 3.8: Location of surveyed intersections



Base image source: Google Maps

3.4.2. School Peak Hours and Traffic Volumes

Depending on specific school start and finish times, including any differences between the functioning of primary and high schools, typical school hours are generally between 8:15am to 9:15am and 2:30pm to 3:30pm. As discussed in Section 3.3.2, the AM and PM hour traffic volumes during the school peak periods of 8:00am to 9:00am and 2:30pm to 3:30pm were used for the traffic impact assessment.

The AM and PM school peak hour traffic volumes are summarised in Figure 3.9 and Figure 3.10 respectively.

Figure 3.9: Existing AM school peak hour (8:00am – 9:00am) traffic volumes

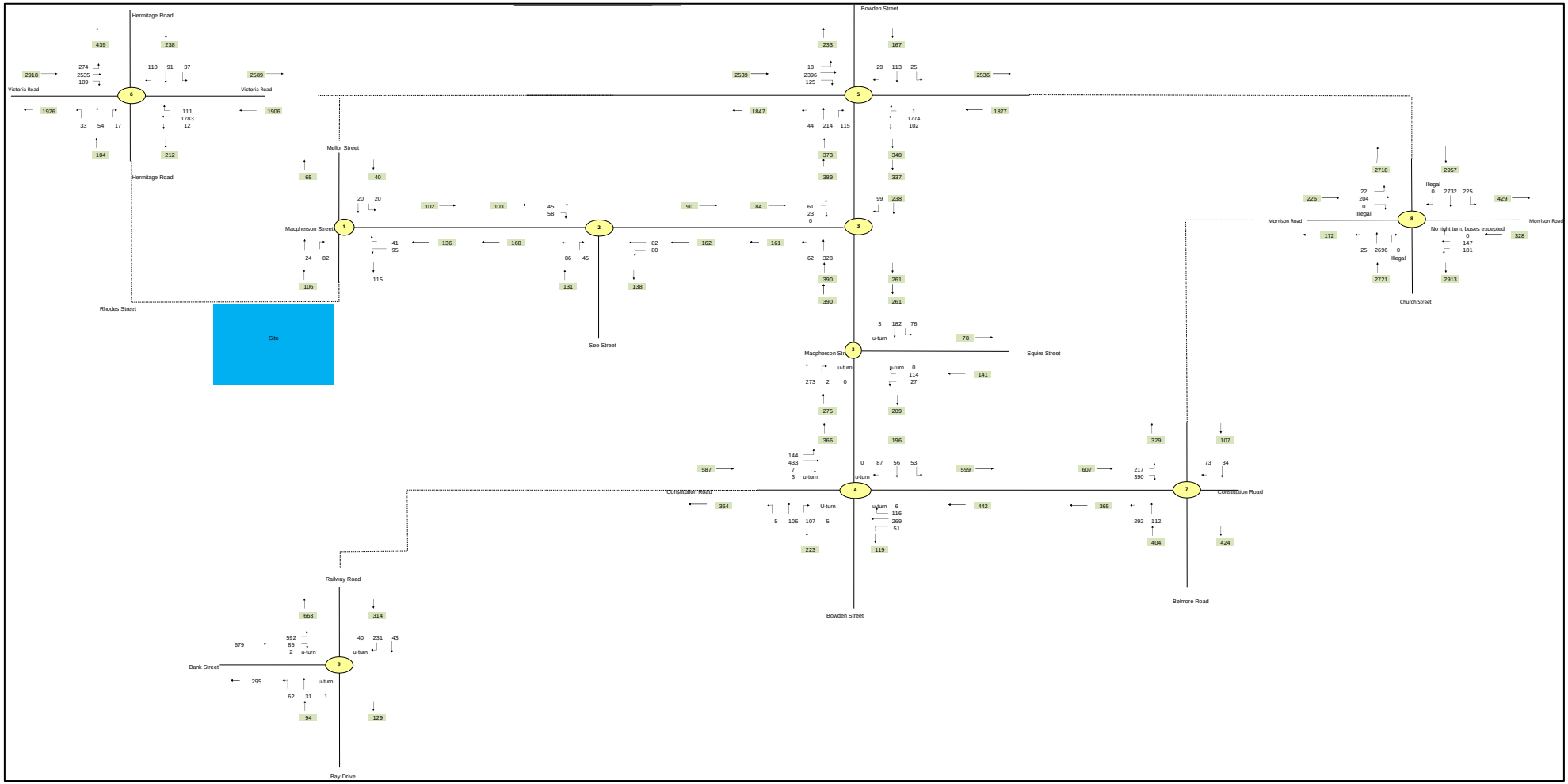
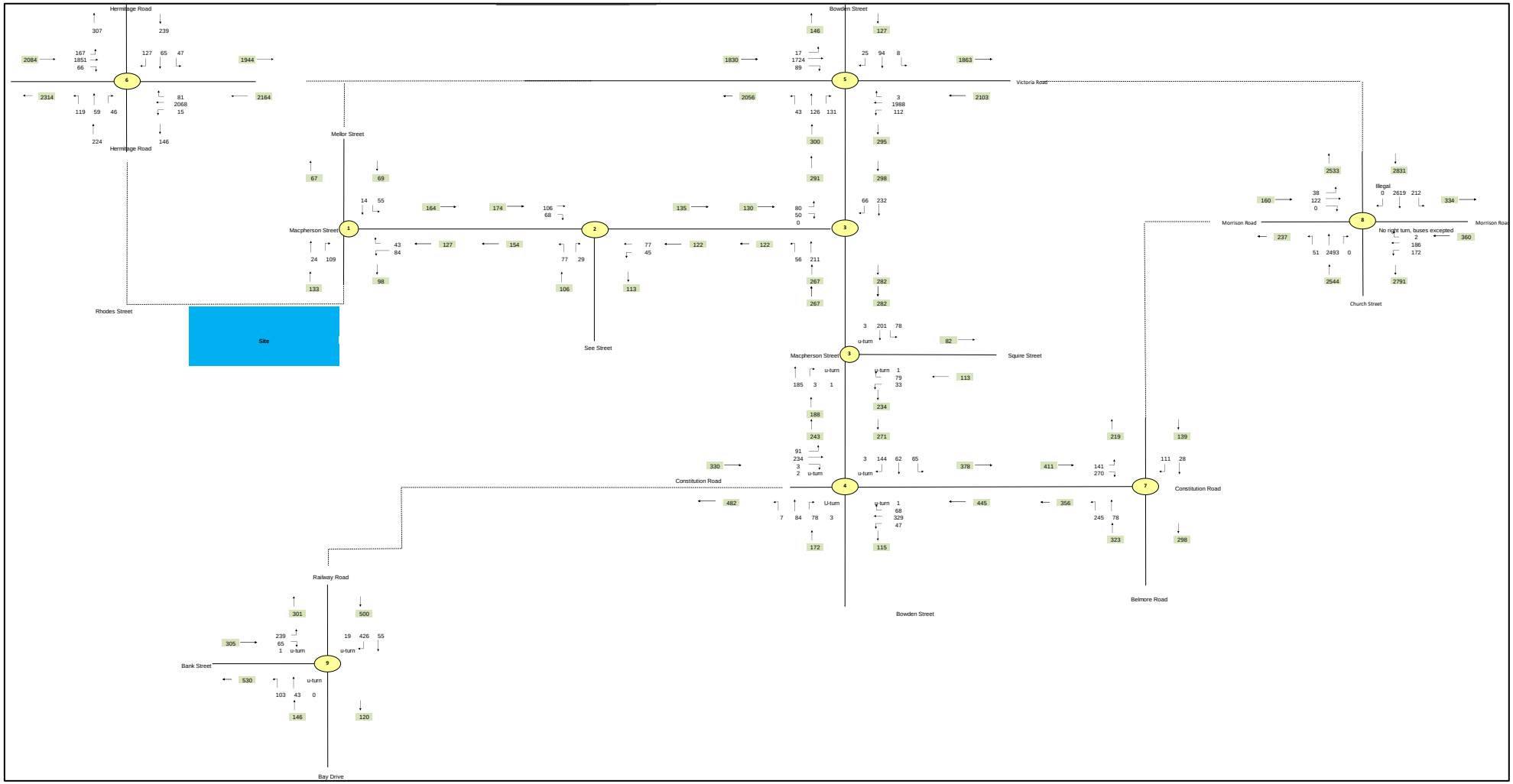


Figure 3.10: Existing PM school peak hour (2:30pm – 3:30pm) traffic volumes



3.4.3. Model Development

The operation of the key intersections within the study area has been assessed using SIDRA Intersection[2], a computer-based modelling package which calculates intersection performance.

The base models are representative of the existing road and travel conditions. Intersection survey counts were used to develop the traffic demand for the models for the following two peak hours:

- 8:00am to 9:00am
- 2:30pm to 3:30pm.

The model calibration process was carried out to ensure that models are a close representation of reality. Model calibration is presented in detail in Appendix A.

In summary to replicate existing conditions, the following default parameters were changed in the models at intersections along Victoria Road:

- *Gap acceptance factor* – this factor is used to adjust the critical gap that a vehicle may accept before making the manoeuvre. The default value is set to 1. The factor below 1 indicates that vehicles will accept shorter gaps to make their movement and a factor above 1 indicates that vehicles are more cautious and wait for comfortable gaps to make the movement.
- *Lane Utilisation Ratio* – this parameter is used to determine the reduced flow rate of an underutilised lane. For intersections with shared through and turning lanes, a shared lane maybe underutilised as there might be turning vehicles stopped in the lane. In such instances, vehicles mostly use the other lane to bypass. Such behaviour was observed at both intersections along Victoria Road at Bowden Street and Hermitage Road.

Performance Criteria

The commonly used measure of intersection performance, as defined by Roads and Maritime, is vehicle delay. SIDRA Intersection determines the average delay that vehicles encounter and provides a measure of the level of service. A level of service of D or better with a degree of saturation of less than 0.85 is generally considered acceptable operation.

Table 3.1 shows the criteria that SIDRA Intersection adopts in assessing the level of service.

Table 3.1: SIDRA Intersection level of service criteria

Level of Service	Average delay per vehicle (secs/ veh)	Traffic signals, roundabout	Give way, stop sign
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Near capacity	Near capacity, accident study required
E	57 to 70	At capacity, at signals incidents will cause excessive delays	At capacity, requires other control mode
F	Greater than 70	Extra capacity required	Extreme delay, major treatment required

[2] Program used under license from Akcelik & Associates Pty Ltd.

Existing Intersection Performance

Table 3.2 and Table 3.3 presents a summary of the existing operation of the intersection. The following intersections were modelled using SIDRA Network to determine the cumulative operation of the road network:

- Victoria Road/ Hermitage Road
- Macpherson Street/ Rhodes Street
- Macpherson Street/ See Street
- Macpherson Street/ Bowden Street
- Bowden Street/ Squire Street
- Bowden Street/ Victoria Road.

The following intersections were modelled in isolation using SIDRA Intersection:

- Railway Road/ Bay Drive/ Bank Street
- Church Street/ Morrison Road
- Belmore Street/ Constitution Road.

Table 3.2: Existing Operating Conditions – AM peak

Intersection	Control	Degree of Saturation	Average delay (seconds)	95th percentile queue (metres)	Level of Service
Macpherson Street/ Mellor Street	Priority	0.06	5	1	A
Macpherson Street/ See Street	Priority	0.06	5	1	A
Macpherson Street/ Bowden Street	Priority	0.15	7	1	A
Bowden Street/ Squire Street	Roundabout	0.14	8	3	A
Constitution Road/ Bowden Street	Priority	0.37	11	7	A
Victoria Road/ Bowden Street	Signals	0.90	15	105	B
Victoria Road/ Hermitage Road	Signals	0.91	26	295	B
Bowden Street / Stone Street	Priority	0.18	32	5	C
Constitution Road/ Belmore Street	Signals	0.7	17	51	B
Church Street/ Morrison Road	Signals	1.00	17	165	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	0.26	8	5	A

Table 3.3: Existing Operating Conditions – PM peak

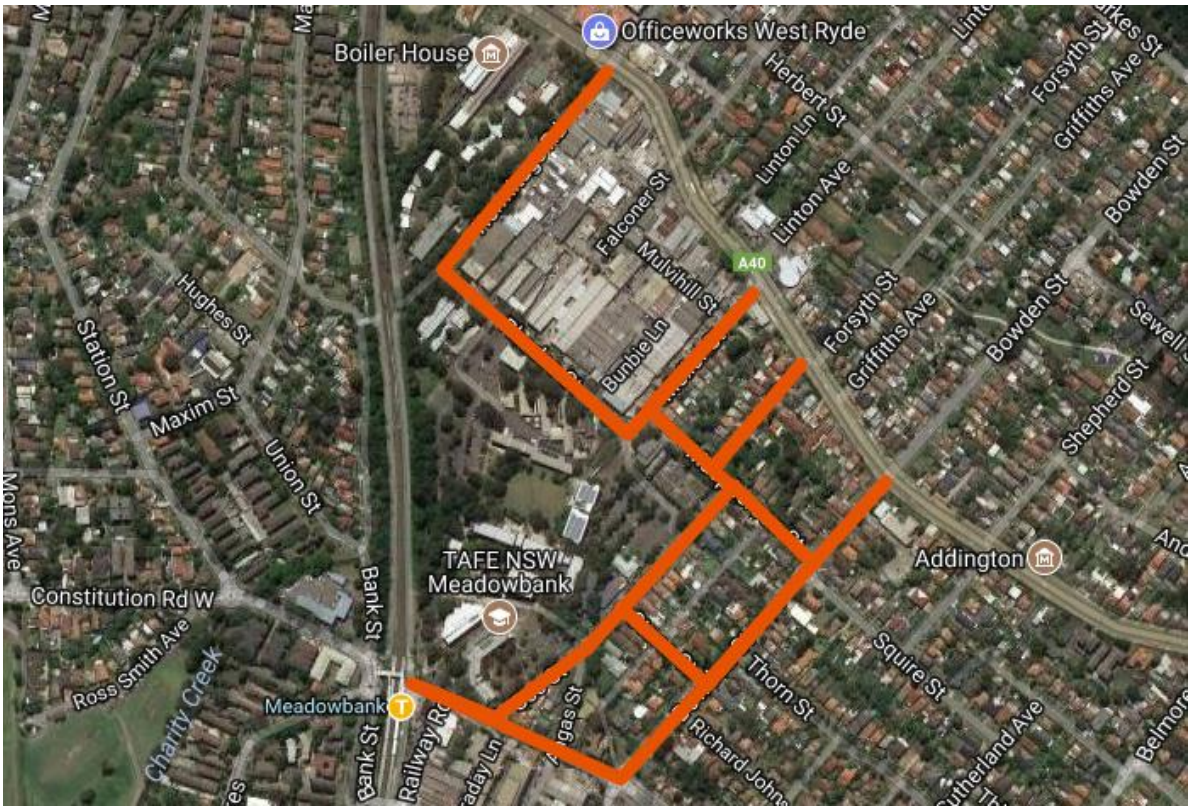
Intersection	Control	Degree of Saturation	Average delay (seconds)	95th percentile queue (metres)	Level of Service
Macpherson Street/ Mellor Street	Priority	0.06	5	1	A
Macpherson Street/ See Street	Priority	0.05	5	1	A
Macpherson Street/ Bowden Street	Priority	0.17	7	2	A
Bowden Street/ Squire Street	Roundabout	0.16	8	4	A
Constitution Road/ Bowden Street	Priority	0.26	10	5	A
Victoria Road/ Bowden Street	Signals	0.99	20	166	B
Victoria Road/ Hermitage Road	Signals	0.94	27	289	B
Bowden Street / Stone Street	Priority	0.19	29	5	C
Constitution Road/ Belmore Street	Signals	0.62	22	34	B
Church Street/ Morrison Road	Signals	0.95	15	153	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	0.39	7	8	A

All intersections assessed currently operate at a satisfactory LoS C or better with spare capacity during both AM and PM peak hours. However, intersections along some movements at intersections along Victoria Road are operating close to capacity with degree of saturation nearing one (~1.0).

3.5. Existing On-Street Parking

GTA compiled an inventory of publicly available on-street and off-street car parking within approximately 400 metres of the subject site, east of the rail corridor. The surveyed area is shown indicatively in Figure 3.11, with the parking supply summarised in Table 3.4.

Figure 3.11: On-street parking survey area



Base image source: Google Maps

Table 3.4: Existing parking supply and restrictions

Parking area	Restriction	Supply	Street total
Rhodes Street, southern side	Unrestricted	34	47
Rhodes Street, northern side	Unrestricted	13	
Hermitage Road, western side	Unrestricted	32	52
	No stopping, 3:30pm to 6:30pm, Monday to Friday	3	
Hermitage Road, eastern side	Unrestricted	17	
Mellor Street, western side	Unrestricted	15	36
	2P, 8:30am to 6pm, Monday to Friday and 8:30am to 12:30pm Saturday	2	
Mellor Street, eastern side	Unrestricted	16	
	2P	3	
Macpherson Street, southern side	Unrestricted	16	44
	Works Zone	4	
Macpherson Street, northern side	2P, 8am to 9pm, Monday to Friday (permit holders excepted)	24	
Forsyth Street, western side	2P, 8am to 9pm, Monday to Friday (permit holders excepted)	17	36
Forsyth Street, eastern side	Unrestricted	19	
See Street, western side	Unrestricted	41	84
	¼P, 8am to 5:30pm, Monday to Friday	4	

Parking area	Restriction	Supply	Street total
See Street, eastern side	2P, 8am to 9pm, Monday to Friday (permit holders excepted)	34	
	¼P, 7am to 5pm, Monday to Friday	5	
Stone Street, northern side	Unrestricted	11	20
Stone Street, southern side	2P, 8am to 9pm, Monday to Friday (permit holders excepted)	9	
Bowden Street, eastern side	Unrestricted	26	61
	1P, 7am to 5pm, Monday to Friday	2	
Bowden Street, western side	2P, 8am to 9pm, Monday to Friday (permit holders excepted)	33	

Parking demand surveys were completed within the nominated area during on Thursday 28 June 2018 from 7:00am to 5:00pm.

The parking survey results are summarised in Table 3.5.

Table 3.5: Summary of on-street parking demand surveys

Parking area	Peak demand (vehicles)									
	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm
Rhodes Street, southern side	74%	82%	91%	91%	94%	94%	88%	85%	74%	65%
Rhodes Street, northern side	85%	85%	100%	100%	100%	100%	100%	92%	85%	69%
Hermitage Road, western side	89%	91%	97%	91%	91%	91%	77%	63%	46%	37%
Hermitage Road, eastern side	71%	82%	100%	100%	100%	100%	100%	100%	88%	65%
Mellor Street, western side	76%	76%	82%	88%	82%	82%	82%	71%	65%	53%
Mellor Street, eastern side	84%	89%	89%	89%	84%	89%	84%	74%	74%	79%
Macpherson Street, southern side	76%	76%	81%	81%	76%	76%	76%	71%	57%	52%
Macpherson Street, northern side	38%	46%	50%	46%	58%	67%	63%	54%	42%	38%
Forsyth Street, western side	24%	29%	29%	24%	29%	41%	35%	35%	24%	24%
Forsyth Street, eastern side	63%	68%	68%	79%	79%	79%	68%	58%	63%	63%
See Street, western side	80%	84%	87%	89%	82%	76%	80%	80%	67%	58%
See Street, eastern side	15%	23%	44%	67%	64%	56%	49%	41%	38%	31%
Stone Street, northern side	100%	100%	100%	100%	91%	91%	91%	82%	82%	82%
Stone Street, southern side	56%	67%	78%	78%	44%	44%	44%	44%	56%	56%
Bowden Street, eastern side	82%	89%	86%	75%	79%	82%	82%	79%	79%	71%
Bowden Street, western side	30%	27%	27%	39%	42%	42%	24%	15%	21%	15%

Table 3.5 indicates that existing on-street car parking demands in the nominated area are relatively high throughout the day, particularly along the key roads (including Rhodes Street and Hermitage Road) immediately surrounding the proposed development site.

It is noted that additional parking surveys were completed as part of the Meadowbank TAFE Multi-Trades and Digital Technology Hub SSDA due to varying SEARs between the two projects. There is some variance in daily utilisation of on-street parking between the two parking surveys, as expected given they were completed on different days, however the conclusions remain the same in that unrestricted on-street parking demand on the surrounding roads near the two sites is in high demand with limited availability throughout the day.

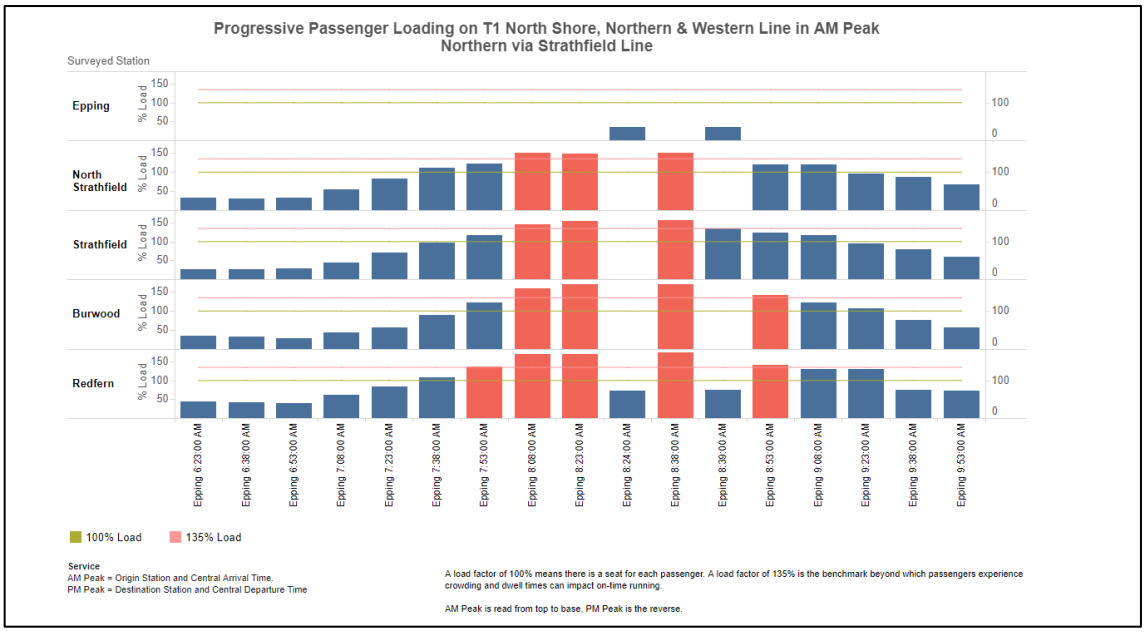
3.6. Existing Public Transport

3.6.1. Train Services

Meadowbank Railway Station and West Ryde Station are located around 700 metres south and 750 metres north from the proposed development site, respectively. Both Meadowbank and West Ryde stations are on the T1 Northern Line, with services running from Epping to Central every 30 minutes.

TfNSW has published train load data by line during the AM and PM peak periods from March 2016 surveys. Figure 3.12 illustrates the AM peak period loading, which indicates the trains passing through Meadowbank Station are exceeding capacity between 8:00am and 9:00am.

Figure 3.12: Train Loads Survey for T1 Line



Source: https://www.transport.nsw.gov.au/data-and-research/passenger-travel/train-patronage/train-loads/train-loads-by-line (access 13 July 2018)

3.6.2. Bus Services

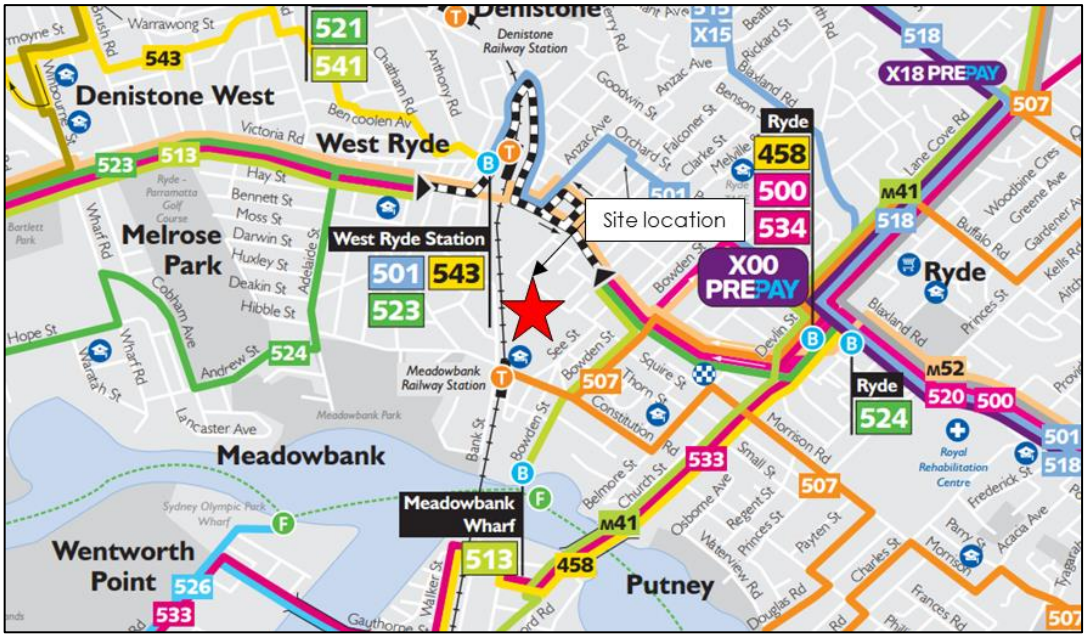
Bus route 507 operates near the site with the nearest stop located at Meadowbank Railway Station. Bus routes 520, 524, 534 and M52 operate along Victoria Road. The surrounding bus network services are detailed in Table 3.6 and shown indicatively in Figure 3.13.

Table 3.6: Bus service frequency[1]

Bus route number	Description	AM/ PM peak frequency	Off-peak frequency
507	Macquarie University to City Circular Quay via Putney	30 minutes/ 20 minutes	60 minutes
520	Parramatta to City Circular Quay via West Ryde	30 minutes/ 60 minutes	Infrequent
524	Ryde to Parramatta via West Ryde	30 minutes/ 30 minutes	60 minutes
534	Ryde to Chatswood via West Ryde	30 minutes/ 30 minutes	30 minutes
M52	Parramatta to City Circular Quay (limited stops)	12 minutes/ 10 minutes	15 minutes

Note:
1. Valid from 23 July 2018, sourced from https://transportnsw.info/routes/bus, accessed 19 July 2018.

Figure 3.13: Surrounding bus network



Base image source: https://transportnsw.info/document/1697/region-guide-north-shore-west.pdf, dated 6 May 2018

3.6.3. School Student Transport Scheme

The School Student Transport Scheme provides eligible school students with free or subsidised travel from home to school. The scheme includes:

- Free travel to and from home and school on approved train, bus, ferry and light rail services during school term.
- Discounted travel on buses between home and school with a school term bus pass.
- Free travel on NSW TrainLink regional services and long-distance coach services for boarding school students.
- Subsidised travel to and from school in private vehicles in areas where there is no public transport available.

Students with a disability who are unable to travel to and from school under the School Student Transport Scheme may be eligible for assistance under the DoE Assisted School Travel Program.

3.7. Existing Pedestrian Infrastructure

Pedestrian footpaths are generally provided along all the roads surrounding the site. Footpaths are generally concrete paths with a width of 1.2 metres. The primary pedestrian link to Meadowbank Station is along Rhodes Street, Macpherson Street, See Street and Constitution Road. There is no requirement for pedestrians to cross roads along this route to access the station.

There is an existing north-south pedestrian connection through the TAFE NSW campus, which runs between Rhodes Street and Meadowbank Station.

Formal crossing points in vicinity of the site include the following pedestrian crossings:

- North eastern, north western and south western legs of the Victoria Road/ Hermitage Road intersection (signalised).
- North eastern, south eastern and south western legs of the Victoria Road/ Bowden Street intersection (signalised).

There are also various pedestrian refuges provided on surrounding roads near the site as follows:

- Squire Street, east of Bowden Street
- Bowden Street south of Squire Street
- Macpherson Street, west of Bowden Street
- See Street, north of Constitution Road.

3.8. Existing Cyclist Infrastructure

There are limited formal cyclist facilities incorporated within the transport network surrounding the site.

3.9. Crash Analysis

Historical crash data for the road network surrounding the site was sourced for the periods from 1 January 2012 to 31 December 2016 and from 1 January 2017 to 28 June 2018 (provisional data for this period only). During this period 115 crashes occurred, including:

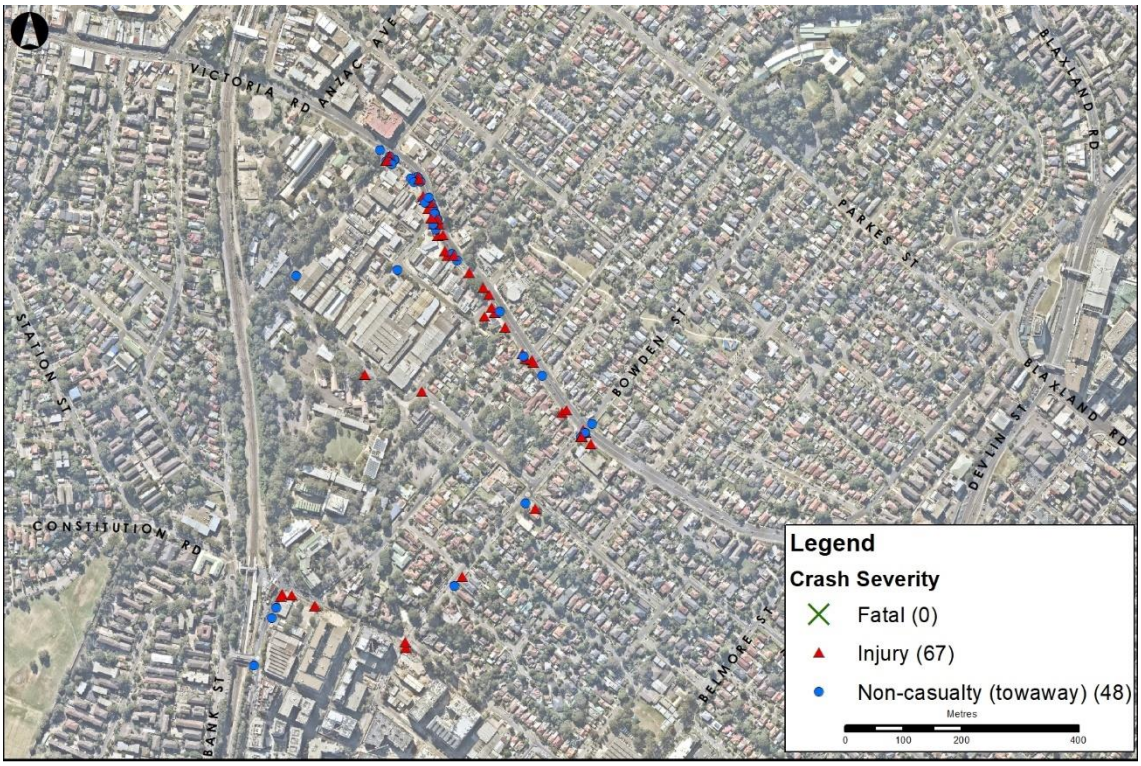
- 21 crashes resulting in serious injury
- 23 crashes resulting in moderate injury
- 21 crashes resulting in minor injury
- 2 crashes resulting in uncategorised injury
- 48 non-casualty crashes.

Of the 115 crashes that occurred, 95 crashes (82.6 per cent) occurred on Victoria Road. During the school zone period, 23 crashes (20 per cent) occurred. One crash involving a pedestrian occurred on Mellor Street, ten metres north of Macpherson Street. This crash involved a vehicle reversing out of a driveway and hitting a pedestrian, resulting in moderate injury.

One rear end crash occurred on Rhodes Street, 200 metres east of Hermitage Road.

Figure 3.14 illustrates the locations of the crashes that occurred between 1 January 2012 and 28 June 2018.

Figure 3.14: Historical crashes, 1 January 2012 to 28 June 2018



Source: TfNSW Centre for Road Safety, generated 28 June 2018.

3.10. Existing School Travel Mode Share

Mode share surveys were completed on 6 August 2018 at the existing Marsden High and Meadowbank Public schools to understand how the existing staff and students travel to the schools. The survey results are summarised in Table 3.7.

Table 3.7: Existing school mode share

Mode	Staff Mode share	Secondary student mode share	Primary student mode share
Car	75%	33%	40%
School Bus	0%	26%	0%
Public Bus	0%	2%	0%
Train	10%	3%	0%
Walk	15%	22%	60%
Cycling	0%	14%	0%
Total	**100%**	**100%**	**100%**

4. DEVELOPMENT PROPOSAL

04

4.1. Overview

The proposed development comprises a school that will ultimately cater for approximately 1,000 primary school students and 1,620 secondary school students. The design of the proposal has carefully considered the site's constraints and has sited the building specifically to address the flooding issues and protect solar access to the adjacent open space area.

The Meadowbank Schools will present as two buildings connected by outdoor terraces and access cores. The proposal will deliver state-of-the-art educational facilities, ensuring the new school can cater for the increasing population in the areas and the increasing student enrolments from Kindergarten to Year 12.

The design principles for the proposed development are:

- provide flexible, future focussed learning spaces that will enhance innovative and engaging learning and teaching practices
- maximise outdoor green space
- integrate the two schools into one campus, creating a hybridised educational precinct that shares a strong connection to the surrounding natural elements of the site.

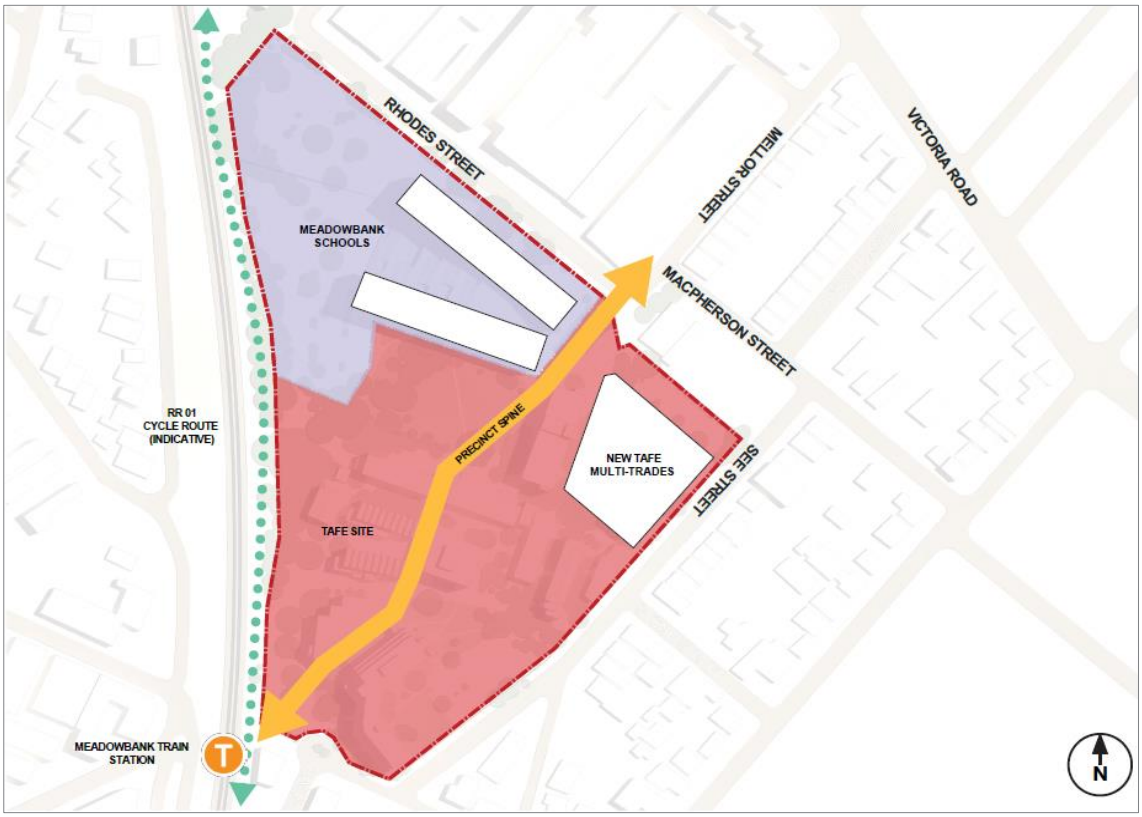
The proposal includes approximately 35,000 square metres of floor space with:

- classroom home bases
- collaborative learning spaces
- library areas
- sports hall
- new outdoor play areas and outdoor sports courts on site.

The proposed schools will assist in forming an Education and Employment Precinct being located adjacent to the TAFE NSW Meadowbank campus (which is subject to separate development proposal(s)).

The indicative site layout is illustrated in Figure 4.1. It is noted that due to existing site constraints, including flooding conditions, topography and the Sydney Trains access easement (including 60 metre train vibration clearance), the north-eastern corner of the site is the only major developable zone on site, as reflected in the indicative site layout plan.

Figure 4.1: Indicative site layout plan



Source: Woods Bagot

4.2. School Catchments

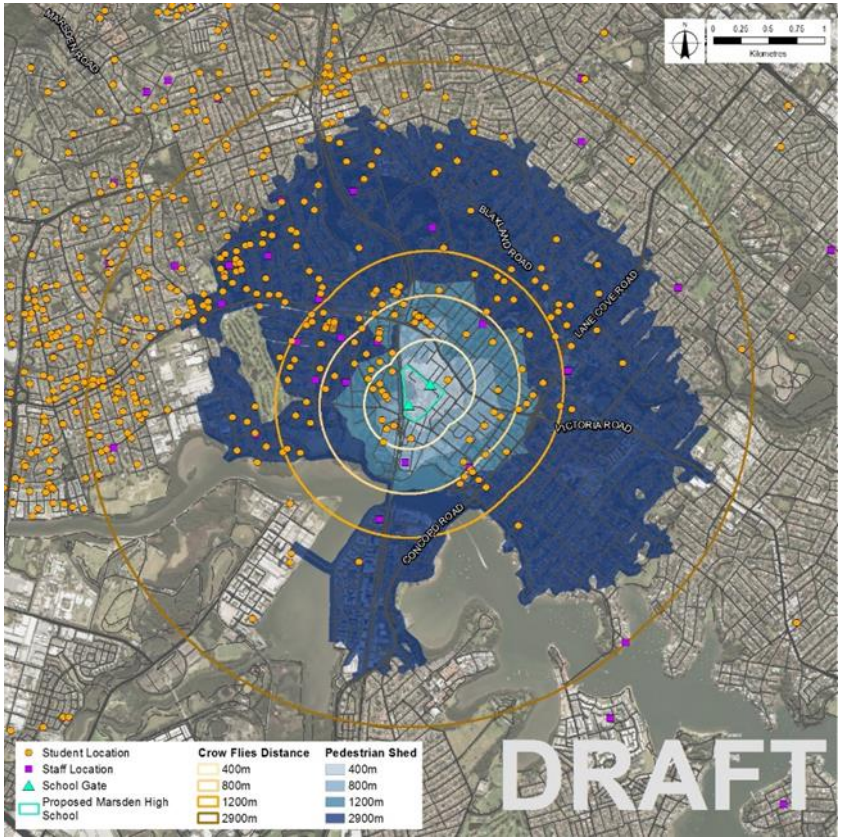
A catchment analysis was completed for the high school, identifying the 5, 10 and 15-minute walk (400m, 800m and 1.2 kilometres) and the 10, 15 and 20-minute bicycle ride (2.4, 3.6 and 4.8 kilometres) catchments. The outer orange "as the crow flies" circle and dark blue shade is the actual high school exclusion zone for the School Student Transport Scheme (SSTS) of 2.9 kilometres. The same was completed for the primary school catchment, with the dark blue shade representing the exclusion zone for the SSTS (2.3 kilometres).

The catchment analysis indicated the following:

- 20 per cent of staff, 28 per cent of secondary school students and 64 per cent of primary school students could potentially walk or ride their bikes to school.
- 27.8 per cent of staff and 52.6 per cent of students live within an 800-metre catchment of a bus route servicing proposed schools and can potentially catch a bus to reach the schools.
- 10.4 per cent of staff and 16.9 per cent of students live within an 800-metre catchment of a T9 Northern Line train station and can potentially catch a train to reach the schools.

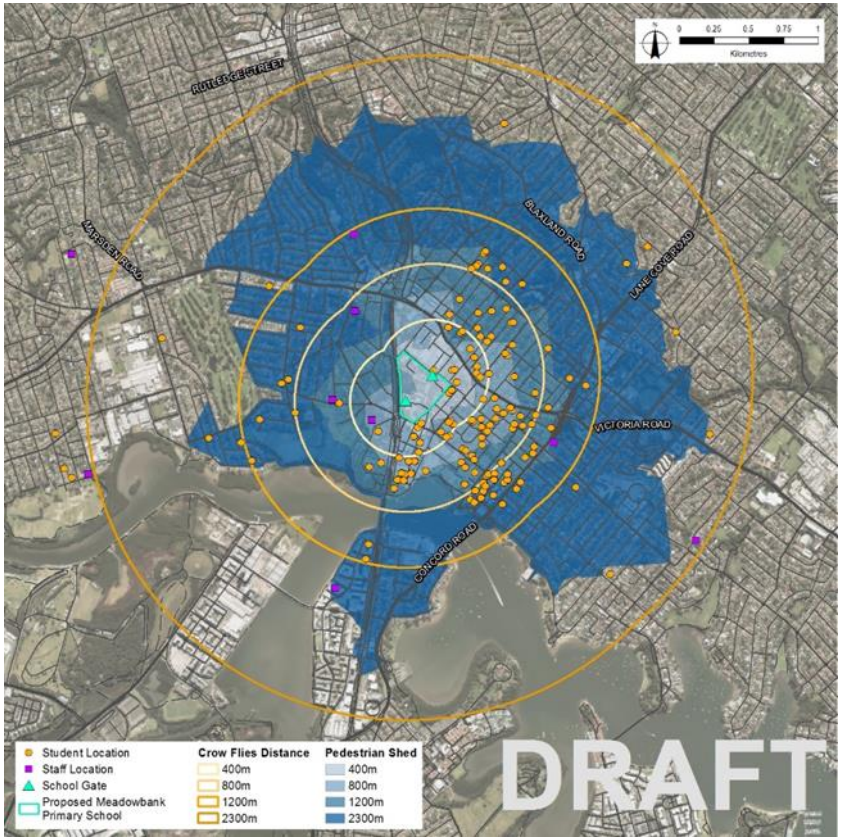
The local catchments for the secondary school and primary school are shown in Figure 4.2 and Figure 4.3 respectively.

Figure 4.2: Secondary school catchment



Source: Meadowbank Education Precinct Transport Assessment and School Travel Plan (Frank Turquoise Group, 2018)

Figure 4.3: Primary school catchment



4.3. Schools Hours of Operation

The schools are generally proposed to operate between the hours of 8:20am to 3:30pm, with Out of School Hours (OOSH) care for the primary school operating between 7:00am to 9:00am and 3:00pm to 6:00pm. It is noted that exact times are subject to change and will be finalised prior to the schools opening, however the transport assessment has been prepared on the basis that there are staggered start and finish times to best manage pick-up and set-down activities. Preliminary advice on the school operating hours has been provided by the Department of Education and is presented in Table 4.1 and Table 4.2.

Table 4.1: Proposed School Operation Hours-Start Times

Time	Activity	Group	No. of students at capacity (nom)
7:00am	Before school care	Primary (Years K-6)	150
7:20am	Extra-curricular	Middle (Years 7-9)	150
8:20am	First lesson	Middle (Years 7-9)	850
8:20am	Extra-curricular	Senior (Years 10-12)	150
9:00am	First lesson	Primary (Years K-6)	850
9:20am	First lesson	Senior (Years 10-12)	470

Table 4.2: Proposed School Operation Hours – Finish Times

Time	Activity	Group	No. of students at capacity (nom)
2:30pm	Final lesson	Middle (Years 7-9)	600
3:00pm	Final lesson	Primary (Years K-6)	600
3:30pm	Extra-curricular	Middle (Years 7-9)	400
3:30pm	Final lesson	Senior (Years 10-12)	220
4:00pm	Extra-curricular	Primary (Years K-6)	200
4:30pm	Extra-curricular	Senior (Years 10-12)	400
6:00pm	After school care	Primary (Years K-6)	200

It is also anticipated that staff will arrive before school starting times and leave sometime after school finishes. While some staff members may leave between the hours of 2:30pm to 3:30pm, many teachers are likely to have student departure duties, administrative tasks or responsibilities for extracurricular activities and therefore have departure times outside of the peak hours. With consideration for the above, the following assumptions have been made in regard to arrival and departure times:

- 850 primary students (approximately 85%) will arrive within the peak hours of 8:00am to 9:00am
- 1,000 secondary students (approximately 62%) will arrive within the peak hours of 8:00am to 9:00am
- Approximately 50% of staff will arrive during the school peak hours of 8:00 to 9:00 am
- 600 primary students (60%) will depart within the peak hour of 2:30pm to 3:30pm
- 600 secondary students (37%) will depart within the peak hour of 2:30pm to 3:30pm
- Just under 20% of staff will depart in the school peak hour of 2:30pm to 3:30pm.

4.4. Vehicle Access

4.4.1. General Vehicles

A single 7.5-metre-wide two-way vehicular crossover is proposed along Rhodes Street, providing access to on-site car parking and a loading area.

4.4.2. Service and Emergency Vehicles

Service vehicles will access the schools via the abovementioned vehicular crossover from Rhodes Street, with loading and waste collection to occur in a separated loading area adjacent to the basement car park access.

Appropriate emergency vehicle access arrangements will be provided in consultation with the relevant emergency services.

4.5. Car Parking

A total of 60 on-site car parking spaces are proposed for use by both staff and visitors (not including pick-up and drop-off activities) at opening year. As the school population increases post opening, the 60 spaces are proposed to be maintained or even reduced through implementation of travel planning initiatives. Ongoing monitoring of the associated Travel Plan will be required to ensure parking demand is accommodated in the on-site parking provision.

The suitability of the car parking provision and layout is discussed in detail in Section 5 of this report.

4.6. Pick-up and Set-down Activity

Formal pick-up and set-down facilities are proposed along the site frontage on the southern side of Rhodes Street. The suitability of these pick-up and set-down provisions is detailed in Section 9.6 of this report.

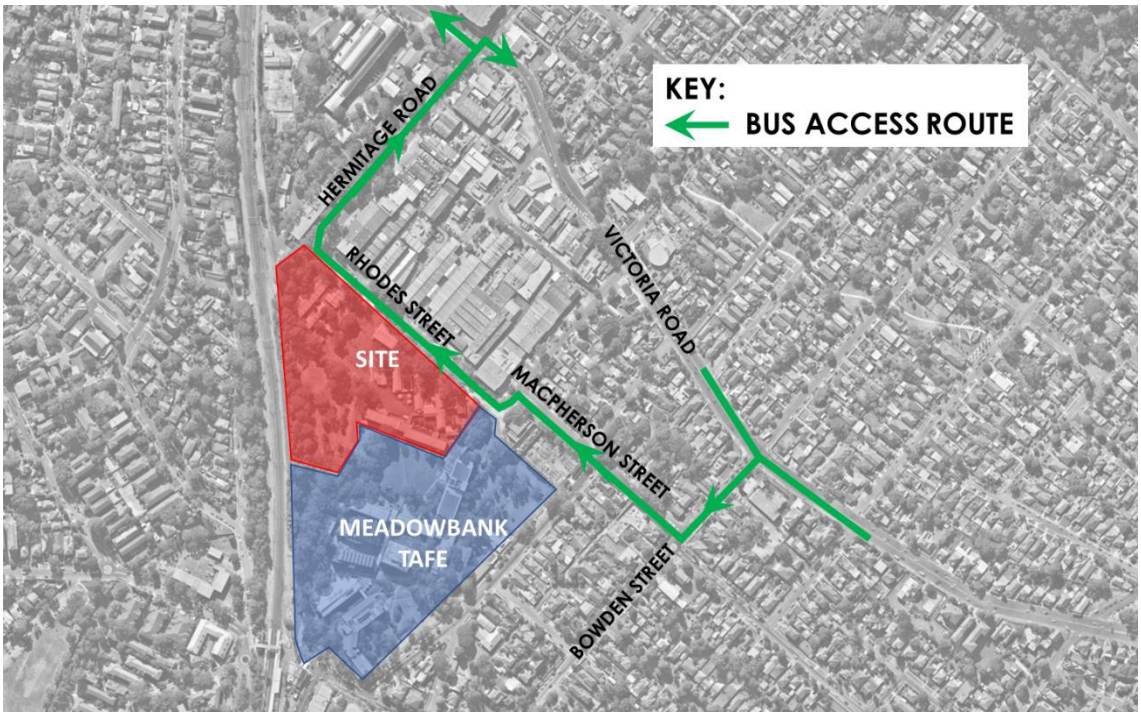
4.7. Bus Zones

The proposal includes a 20-metre bus zone along the southern side of Rhodes Street as well as a 60-metre bus zone along the southern side of Macpherson Street. Together, these bus zones would be able to accommodate up to six buses at any one time.

Based on an anticipated seven bus drop-offs generated in the peak 15-minutes (Arup, 22 February 2018), it is expected that up to seven buses would arrive and depart before and after the school operating hours, requiring a minimum of four bus bays.

Given that bus bays will be provided on the southern side of Rhodes Street and Macpherson Street only, the proposed school bus to/ from the site is shown in Figure 4.4 (subject to confirmation with TfNSW and/ or the bus operator(s)). Swept path analysis has been completed for the proposed route which confirms the route can adequately accommodate a 12.5 metre bus. The swept path analysis is included in Appendix B. It is noted that the proposed bus route (particularly Rhodes Street and Hermitage Road) is already a heavy vehicle access route for the existing industrial area.

Figure 4.4: Proposed school bus route



Basemap source: Nearmap

4.8. Pedestrian Facilities

Pedestrian access to the schools is proposed via Rhodes Street along the northern boundary of the site, with an improved north-south pedestrian connection through the TAFE campus (by TAFE as part of a separate approvals process) linking Meadowbank Station and Rhodes Street.

The suitability of the proposed pedestrian facilities is discussed in Section 8.4.2 of this report.

4.9. Bicycle Facilities

Bicycle parking is proposed for staff, students and visitors. Two showers (one male, one female) and change room facilities will be provided for staff in the basement, with high school students able to use the gym shower and changeroom facilities for end-of-trip purposes (if required).

The suitability of the bicycle provisions is discussed in Section 5.4 of this report.

4.10. Loading Facilities

A single off-street loading bay for larger vehicles would be integrated with the proposed on-site car parking. The loading bay has been designed to allow for entry and exit in a forward direction for a Heavy Rigid Vehicle (HRV) of up to 12.5 metres in length.

The suitability of the proposed loading arrangements is discussed in Section 6 of this report.

5. CAR PARKING

05

5.1. Car Parking Requirements

5.1.1. City of Ryde Council Development Control Plan

The car parking requirements for different development types are set out in the City of Ryde Council DCP 2014. A review of the car parking rates and the floor area schedule results in a DCP parking requirement for the proposed development as summarised in Table 5.1.

Table 5.1: DCP Car parking requirements

Description	Use	Size	DCP parking rate	DCP parking requirement
Educational Establishment – Primary and Secondary School	Primary School (2022)	44 staff	1 space per two employees	22 spaces
	Primary School (2032)	67 staff	1 space per two employees	34 spaces
	Secondary School (2022)	1,000 students	1 space per ten students over 17 years of age	15 spaces [1]
		100 staff	1 space per two employees	50 spaces
	Secondary School (2032)	1,620 students	1 space per ten students over 17 years of age	25 spaces [1]
		148 staff	1 space per two employees	74 spaces
			Total 2022 parking requirement	**87 spaces**
			Total 2032 parking requirement	**133 spaces**

[1] Assumption that 150 and 250 students are over the age of 17 in 2022 and 2032 respectively.

Based on the above, the proposed development is required to provide 87 car parking spaces upon opening and increasing to 133 spaces at full school capacity in circa 2032.

5.2. Adequacy of Parking Supply

It is noted that the Department of Education policy is not to provide on-site parking for senior students due the WHS risks associated with new drivers. As such, only staff parking requirements have been considered further.

Considering the anticipated travel patterns detailed in Section 7.1 and the locality of the new schools adjacent to Meadowbank Station, it has been estimated that approximately 40 per cent of staff would travel to the site by car with the remaining portion travelling by either public transport or active travel modes. Based on the anticipated 144 staff at opening year and travel planning strategies that can be managed by the school, up to 60 spaces will be required. Continual improvement of increased regional road network congestion and implementation of further travel planning initiatives is expected to maintain a parking demand of 60 spaces or lower once full staffing projections are reached. The proposed car park layout has been reviewed against the requirements of AS2890.1:2004, with the full review provided in Appendix C.

Queuing analysis based on the Guide to Traffic Management Part 2: Traffic Theory (Austroads, 2008) indicates that the 95th percentile queue for vehicles entering the site in the AM peak hour is expected to be up to one car, based on up to 41 vehicle trips in a peak hour in 2032 associated with the on-site car park (detailed further in Section 7.1 of this report).

Considering the available storage capacity between the car park and Rhodes Street, this could more than adequately be accommodated within the site and would not extend to Rhodes Street.

The monitoring and evaluation of the proposed School Travel Plan is essential at opening year and beyond to ensure staff parking demand is accommodated within the on-site parking provision. Some of the key "Day 1" initiatives or components of the travel plan are as follows:

- Delivery of the improved pedestrian connection through the TAFE campus (as part of a separate approvals process), which will provide a direct connection to Meadowbank Station.
- Regular and ongoing communication with staff regarding transport policies, programs and available sustainable transport options.
- Providing and promoting (via posters, notice boards/ electronic screens, school intranet) a transport access guide to advise staff (and students) of the surrounding public transport network and timing, as well as walking and cycling facilities connecting with the schools.
- The Liftango carpool app, incentivised by allocating dedicated carpool parking bays to participants.
- Procedure or policy for automatic enrolment of new starters and staff seeking (free) parking access in the carpool program such that they would need to 'opt out' of the registration on Day 1 or when they start.
- Discounted GoGet car share hourly rate for staff choosing sustainable transport to work.
- End of trip facilities for staff who walk, run, ride a bicycle or motorcycle (changeroom/ showers and lockers)
- Bicycle parking for staff within a secure basement area.
- Motorcycle parking spaces.

It is expected that with local and state government-led regional policies and infrastructure upgrades in place to promote active and public transport, as well as greater take-up of carpooling, the car parking requirements can be maintained at the 2022 opening level of 60 spaces (i.e. further mode shift to offset growth in staff numbers). However, policies and programs that are not directly in control of school authorities are difficult to implement and the required timeframe for the realisation of these is unknown at this stage. The travel plan includes annual monitoring requirements and the schools would need to identify further sustainable travel actions and/or initiatives should the nominated targets not be achieved.

5.3. Disabled Parking

The Building Code of Australia (BCA) requirements have been referenced to determine the necessary disabled car parking.

The BCA specifically outlines requirements for the provision of car parking for people with disabilities for schools. The layout of disabled car parking spaces must also comply with AS2890.6:2009.

The BCA requires that disabled spaces be provided at a rate of one space for every 100 car parking spaces or part thereof. Based on the proposed parking provision, at least one disabled space is required.

5.4. Bicycle Parking

The *NSW Planning Guidelines for Walking and Cycling* (Department of Infrastructure, Planning and Natural Resources, 2004) aims to assist land use planners and related professionals to improve consideration of walking and cycling in their work. The guidelines have been designed to provide a walking and cycling focus to the NSW Government's *Integrating Land Use & Transport Planning* policy package. The *Planning Guidelines for Walking and Cycling* contains suggested bicycle parking rates for different land use types.

The suggested bicycle parking provision for the schools includes:

- Staff: Five per cent, equating to 11 bicycle spaces
- Student/ visitor: 10 per cent, equating to 262 bicycle spaces.

Based on the above, it is recommended that 273 bicycle parking spaces are provided in appropriate locations, with weather protection and security for the various user groups. Bicycle parking for primary school students will be located at playground level while high school student bicycle parking will be located on the lower ground level. Bicycle parking for staff will be located within the school car park.

6. LOADING FACILITIES

06

6.1. Proposed Loading and Waste Collection Arrangements

All garbage collection and loading activities related to deliveries, courier activity and maintenance vehicles would be carried out within the proposed parking and loading areas on-site. It is noted that the loading areas would be generally used outside of the school and commuter peak hours. A single loading bay is proposed for use by service vehicles up to 12.5-metre Heavy Rigid Vehicles (HRVs). On-site car parking would be used by smaller service vehicles (e.g. vans and utes).

Vehicle movements would consist of vehicles from external organisations which support the school's operation such as:

- electrical contractors
- mechanical services
- lift technicians
- hydraulic services
- building maintenance contractors
- laboratory equipment service/ repair
- caterers
- coffee machine providers
- water cooler providers
- indoor plant hire/ maintenance
- project managers
- sales representatives.

It is expected that there would be no more than four larger service vehicle movements per day. Given the expected infrequent use of the loading area, one loading bay is considered acceptable for the proposed schools.

An overarching School Transport Plan (which includes an Operational Transport Plan, Travel Plan and a Transport Access Guide) will be prepared for the schools prior to occupation. This will detail loading dock management measures.

6.2. Vehicle Swept Path Analysis

Swept path analysis has been carried out for a 12.5-metre HRV and included in Appendix C. This analysis indicates that HRVs can enter and exit the site in a forward direction. However, any HRVs accessing the site should be restricted to outside of school arrival and departure periods, due to potential conflicts with car parking and Rhodes Street pedestrian activity.

7. ANTICIPATED TRIPS

07

7.1. Mode Share

Mode shift is the key focus of the MEEP masterplan and supports the schools' plan to reduce private car usage. Victoria Road is currently operating close to capacity for existing traffic and is expected to operate at capacity in the future. Based on the travel study conducted by Frank Turquoise group and the MEEP masterplan objectives, the following mode share assumptions have been made.

7.1.1. Forecast Staff Travel

The likely staff travel mode splits have been developed as follows:

- Staff travel to the existing schools by car is 75 per cent.
- ABS 2016 destination zone data around Meadowbank Station (which includes the vehicle-dominated industrial uses) shows that 69 per cent of local workers travel by car. This indicates that just relocating the schools would result in at least a six per cent reduction in staff travelling by car.
- The existing walking mode share to the schools is likely to remain similar (15 per cent), although there is opportunity for this to increase with the availability and diversity of dwellings in the Shepherds Bay precinct and the surrounding local area.
- Although 17 per cent of staff will be within a 10-minute bicycle catchment from the school, a lower mode share estimate of seven per cent has been adopted to take into consideration not all staff in close proximity will choose to travel to/ from the schools by bicycle.
- With the new location of the school, 55 per cent of staff will be located within an 800-metre walking catchment of direct bus and rail services.
- Assuming approximately 17 of the above 55 per cent of staff that live within an 800 metre walk to public transport choose to instead either carpool or drive alone, this equates to 60 per cent of staff travelling by sustainable modes (38 percent public transport, 15 per cent walking and 7 percent cycling) while the remaining 40 per cent of staff will travel by car.

The anticipated number of staff travelling to/ from the proposed schools via each mode is summarised in Table 7.1, with further justification of the above assumptions in accompanying School Travel Plan.

Table 7.1: Anticipated number of staff by mode

Mode	Mode share (per cent)	Anticipated number of staff	
		2022	2032
Car	40	58	86
School Bus	0	0	0
Public Bus	28	40	60
Train	10	14	22
Walk	15	22	32
Cycling	7	10	15
Total	**100**	**144**	**215**

7.1.2. Forecast Student Travel

Students attending the new schools are expected to maintain similar travel patterns to travelling to/ from the existing schools.

For high school students, a 10 per cent reduction is expected in car travel, while travel by train is expected to increase by the same amount (to 13 per cent). This is considered appropriate, with catchment analysis showing that approximately 17 per cent of students live within an 800-metre walking catchment to train services. It is noted that some of these students will not be eligible for the SSTS however students are still likely to use public transport if this is the most convenient/ efficient mode of transport to the site for them (particularly students living close to West Ryde Station). That said, much of the high school catchment to the northwest of Victoria Road will be eligible for the SSTS, including students that are not currently eligible with the existing Marsden High School location.

It is also estimated that there will be an approximately 10 per cent reduction in car travel related to the primary school, with travel by bicycle expected to increase. This is given that 10 per cent of primary school students live within a 10-minute bicycle catchment from the new schools.

The anticipated number of secondary students and primary students travelling to/ from the proposed schools via each mode is summarised in Table 7.2 and Table 7.3 respectively.

Table 7.2: Anticipated number of secondary students by mode

Mode	Mode share and % change from existing	Anticipated number of secondary students	
		2022	2032
Car	23% (-10%)	230	373
School Bus	26% (same)	260	421
Public Bus	3% (+1%)	30	49
Train	13% (+10%)	130	211
Walk	22% (same)	220	356
Cycling	13% (-1%)	130	210
Total	**100%**	**1,000**	**1,620**

Table 7.3: Anticipated number of primary students by mode

Mode	Mode share and % change from existing	Anticipated number of primary students	
		2022	2032
Car	30% (-10%)	195	300
School Bus	0% (same)	0	0
Public Bus	0% (same)	0	0
Train	0% (same)	0	0
Walk	60% (same)	390	600
Cycling	10% (+10%)	65	100
Total	100%	**650**	**1,000**

7.2. Operational Assumptions

In estimating the anticipated number of peak hour and daily trips for each mode, the following assumptions were used (based on current schools planning):

- Approximately 50% of staff will arrive in the school peak hour of 8:00am to 9:00am. Access to the on-site car park will be restricted during peak hours to avoid vehicles accessing the on-site car parking conflicting with the pick-up and drop-off activity on Rhodes Street. This management arrangement will be detailed in the overarching School Transport Plan to be completed prior to occupation.
- Based on the school hours of operation presented in Section 4.3, it is assumed that at capacity (2032):
    - 850 primary students (85%) will arrive within the peak hour of 8:00am to 9:00am
    - 1000 secondary students (62%) will arrive within the peak hour of 8:00am to 9:00am
    - 600 primary students (60%) will depart within the peak hour of 2:30pm to 3:30pm
    - 600 secondary students (37%) will depart within the peak hour of 2:30pm to 3:30pm
    - for simplicity, it has been assumed that the number of trips assumed within the peak hour are able to arrive and depart within the hour.
- a vehicle occupancy of two students per car has been assumed for primary students and 1.7 for secondary students as discussed in Section 3.3.2
- a vehicle occupancy of one person per vehicle has been conservatively used for staff.

The adopted mode share changes take into consideration the change in locality of the schools to be next to Meadowbank Station.

It should be noted that the existing Meadowbank Primary School is in the same vicinity as the proposed new school, therefore it is anticipated that some of the car trips generated by the existing school will be redistributed to the new site at the year of opening. Therefore, these trips are assumed to be part of the existing network and hence the additional trip generation for cars in the peak hour is based on net increase in primary school students.

7.3. Anticipated Trips by Mode

Based on the anticipated travel patterns detailed in Section 7.2, the peak hour and daily person trips for each mode has been summarised in Table 7.4 to Table 7.6 for opening year (2022) and ultimate year (2032). Using the occupancy assumptions, the person trips were converted into vehicle trips.

Table 7.4: Anticipated total staff associated trips by mode

Mode	Mode share	Anticipated number of people		Anticipated number of person trips during peak hour				Anticipated number of person trips per day	
				2022		2032			
		2022	2032	AM	PM	AM	PM	2022	2032
Car	40%	58	86	28	10	41	15	115	172
School Bus	0%	0	0	0	0	0	0	0	0
Public Bus	28%	40	60	20	7	29	10	81	120
Train	10%	14	22	7	3	10	4	29	44
Walk	15%	22	32	11	4	16	6	43	64
Cycling	7%	10	15	5	2	7	3	20	30
Total	**100%**	**144**	**215**	**70**	**25**	**104**	**37**	**288**	**430**

Table 7.5: Anticipated total secondary school student associated trips by mode

Mode	Mode share	Anticipated number of students		Anticipated number of person trips during peak hour				Anticipated number of person trips per day	
				2022		2032			
		2022	2032	AM	PM	AM	PM	2022	2032
Car	23%	230	372	142	85	230	138	460	744
School Bus	26%	260	421	160	96	260	156	520	842
Public Bus	3%	30	49	19	11	30	18	60	98
Train	13%	130	211	80	48	130	78	260	422
Walk	22%	220	356	136	82	220	132	440	712
Cycling	13%	130	211	80	48	130	78	260	422
Total	**100%**	**1,000**	**1,620**	**617**	**370**	**1,000**	**600**	**2,000**	**3,240**

Table 7.6: Anticipated total primary school student associated trips by mode

Mode	Mode share	Anticipated number of students		Anticipated number of person trips during peak hour				Anticipated number of person trips per day	
				2022		2032			
		2022	2032	AM	PM	AM	PM	2022	2032
Car	30%	195	300	166	117	255	180	390	600
School Bus	0%	0	0	0	0	0	0	0	0
Public Bus	0%	0	0	0	0	0	0	0	0
Train	0%	0	0	0	0	0	0	0	0
Walk	60%	390	600	332	234	510	360	780	1200
Cycling	10%	65	100	55	39	85	60	130	200
Total	**100%**	**650**	**1000**	**553**	**390**	**850**	**600**	**1300**	**2000**

As discussed in Section 6.2, the existing Meadowbank Primary School (472 primary students) is in the same vicinity as the proposed new school, therefore it is anticipated that the majority of car trips generated by the existing school will be redistributed to the new site at the year of opening. Therefore, new vehicle trips on the surrounding road network are only related to the future additional number of primary students. The total number of additional anticipated car trips (one-way) for opening and ultimate years and for both peak hours are provided in Table 7.7.

Table 7.7: Anticipated additional car trips generated by new schools (one-way trips)

Year	Peak Hour	Staff		Secondary Students		Primary Students	
		Occupancy	Car trips	Occupancy	Car trips	Occupancy	Car trips
2022	AM	1	28	1.7	84	2.0	12
	PM	1	10	1.7	51	2.0	60
2032	AM	1	41	1.7	136	2.0	58
	PM	1	15	1.7	82	2.0	92

It has been assumed that all primary and secondary school students arriving by car will be dropped off. Therefore, for traffic impact assessment in SIDRA, the two-way trips have been used. For example, 12 one-way car trips (inbound) are estimated for primary students in the AM peak. However, this represents 24 trips on the network for intersection turning movement purposes (12 inbound and 12 outbound).

8. PUBLIC AND ACTIVE MODE TRANSPORT ASSESSMENT

08

8.1. Pedestrian Access

As mentioned previously, pedestrian access to the schools is proposed via Rhodes Street along the northern boundary of the site.

Figure 8.1 illustrates the key pedestrian routes for the school, noting that the existing north-south pedestrian connection through the TAFE campus will be improved by minor upgrade works (by TAFE as part of a separate approvals process) as highlighted in orange.

Figure 8.1: Key pedestrian access routes

Source: Woods Bagot

Based on the student mode splits assumed for this study, using the survey information from comparable schools, the proposed school development is likely to generate the pedestrian volumes including students and staff indicated in Table 8.1 to Table 8.3.

Table 8.1: Walk only trips

Peak Hour	School Staff	Primary School Students	High School Students	Total
AM	16	510	220	**746**
PM	6	360	132	**498**

Table 8.2: Walk to Meadowbank Railway Station trips

Peak Hour	School Staff	Primary School Students	High School Students	Total
AM	10	0	130	**140**
PM	4	0	78	**82**

Table 8.3: Walk to Victoria Road bus stop trips

Peak Hour	School Staff	Primary School Students	High School Students	Total
AM	30	0	30	**60**
PM	10	0	18	**28**

The peak directional split assumed for the walk only trips, based on the preliminary school catchments is as follows:

- Primary school:
  - To/ from north of the site: 20 per cent
  - To/ from south of the site: 80 per cent.
- Secondary school:
  - To/ from north of the site: 50 per cent
  - To/ from south of the site: 50 per cent.
- Staff:
  - To/ from north of the site: 50 per cent
  - To/ from south of the site: 50 per cent.

Based on the mode split and directional split, assuming all pedestrians arrive/ leave the site at the same time, Table 8.4 provides an estimate of the total pedestrian volumes likely to be generated by the proposed development. In reality, the timetabling of the proposed schools would be staggered to distribute trips entering and leaving the school more evenly, minimising impact on the surrounding transport network.

Table 8.4: Peak pedestrian movements by direction

User	Peak pedestrian volume	to/ from north of site		to/ from south of site	
		AM	PM	AM	PM
Primary	Walk only	102	72	408	288
	Walk and train	0	0	0	0
	Walk and public bus	0	0	0	0
Secondary	Walk only	110	66	110	66
	Walk and train	0	0	130	78
	Walk and public bus	30	18	0	0
Staff	Walk only	8	3	8	3
	Walk and train	0	0	10	4
	Walk and public bus	30	10	0	0
Total pedestrians		**280**	**169**	**666**	**439**

A greater proportion of pedestrian movements will be to/ from the south of the site, given the location of Meadowbank Railway Station and the local primary school catchment, with a total of about 670 pedestrian movements during any peak hour.

8.2. Cyclist Access

Based on the analysis in Section 7, it is anticipated there would be approximately 220 bicycle trips per hour in the peak period, and 650 trips per day.

There are limited cyclist provisions surrounding the site, which is considered insufficient to support the cyclist demand associated with the proposed development, particularly given students will be the main cyclists to and from the site.

It is recommended that the Department of Education continues to work with City of Ryde Council and Transport for NSW to deliver:

- A continuation of the existing Hermitage Road shared path from the Sydney Water driveway to the Rhodes Street site access.
- Regional Route 01 along the rail corridor, as documented in the local bike plan.
- Local Route 14 along Parkes Street (north of Victoria Road), as documented in the local bike plan.

8.3. Public Transport Access

Meadowbank Railway Station will provide a key transport mode to support the proposed schools. Under existing conditions, the rail services operating through this station are over capacity, particularly during the morning peak period. The NSW Government's More Trains, More Services program is targeting capacity increases and upgrades to improve peak hour crowding on rail services. The NSW Government will explore further investments in north-south transport links near Greater Parramatta to improve access and support the creation and renewal of local centres, including a potential mass transit/ train link from Macquarie Park to Hurstville via Rhodes.

Based on the analysis and assumptions presented in Section 7, the anticipated peak hourly and daily train and bus trips are detailed in Table 8.5.

Table 8.5: Peak public transport trips

User	Peak pedestrian volume	Trips per hour		Off-Peak Trips	Trips per day
		AM	PM		
Primary	Train	0	0	0	0
	Public bus	0	0	0	0
Secondary	Train	130	78	214	422
	Public bus	30	18	50	98
Staff	Train	10	4	30	44
	Public bus	29	10	81	120
Total		**199**	**110**	**375**	**684**

Improvements to the capacity and reliability of the T1 Northern Line will be critical for encouraging and facilitating public transport use for the proposed schools, noting that the Sydney Metro CBD and Southwest currently under construction is expected to relieve some pressures on the T1 Northern Line. On the basis of the above it is expected that sufficient rail capacity will be available to service the requirements of the schools.

As noted in Section 3.6.2, high-frequency bus services, including the M52, operate along Victoria Road. It is understood that there is sufficient capacity on these existing services to accommodate staff and high school student travel demand, noting some of these services would currently be used for access to the existing Marsden High School. Available bus stops are generally within a five-minute walk of the schools, with existing footpaths along Forsyth Street, Mellor Street and Hermitage Road providing appropriate pedestrian accessibility.

8.4. Mitigation and Management Resources

8.4.1. School Bus Facilities and Routes

It is recommended that school bus services are implemented to service the proposed schools, providing services from the principal catchment areas.

Based on the analysis in Section 7 the anticipated peak hourly and daily school bus trips are detailed in Table 8.6.

Table 8.6: School bus trips

School	Peak students per hour		Off-Peak Trips	Students per day
	AM	PM		
Primary	0	0	0	0
Secondary	260	156	426	842

Based on a bus capacity of 50 people per bus and assuming each bus is 100 per cent occupied, this presents a demand of between 8 and 9 school buses. It is noted that Table 8.3 is based on existing surveys of the Meadowbank Primary and Marsden High schools, with no school buses currently servicing the primary school therefore resulting in zero bus trips. Notwithstanding, allowance has been made in the design for a primary school bus zone should services be provided for the new school.

A strategic assessment and swept path analysis of the proposed bus routes indicate that the following local road improvements are required:

- Widening of Rhodes Street to allow for bus access and kerbside stops.
- Widening of the horizontal curve between Rhodes Street and Hermitage Road to allow for the required swept path envelope.
- Widening of Macpherson Street to allow for bus access and kerbside stops.
- Lengthening of the Bowden Street right turn bay into Macpherson Street to store a bus adequately.
- Delineation of parking lanes along Rhodes Street to define allocation and minimise the risk of collisions.

8.4.2. Pedestrian and Cyclist Facilities

To accommodate these estimated pedestrian volumes and facilitate both bus and private car set-down/ pick-up activity, it is proposed to widen the footpaths along the southern side of Rhodes Street, Macpherson Street. In addition, pedestrian crossing facilities are proposed on Rhodes Street and Macpherson Street for safe pedestrian movement.

The existing footpath on the eastern (residential) side of Mellor Street provides a direct connection between the schools and Victoria Road, without the need to directly interface with the existing employment area (and associated driveways/ vehicle hazards).

The proposed school crossing is the best available location when considering set-out and sight line requirements. Previous options considered moving the crossing further west, however this would impact the proposed bus zones on Rhodes Street and reduce the pick-up and drop-off zone capacity, while also not aligning with the school entrances and likely desire lines. A sight line assessment has been completed for the proposed pedestrian crossing and is shown in Appendix D. This demonstrates that adequate sight lines would be available for a 40-kilometre-per-hour School Zone design speed, assuming minor landscaping adjustments to the southeast corner of the 21 Mellor Street property (which could be managed by a maintenance agreement between the schools and the respective property owner, or alternate landscaping on the property). It is noted, however, that the 90-degree bend between Rhodes Street and Mellor Street could not be negotiated safely by a vehicle at 40 kilometres per hour. Additional sight line assessments have been completed at 30 and 20 kilometres per hour, demonstrating adequate sight lines would be available with no changes to the existing road environment required for these speeds.

Figure 8.2 illustrates the indicative locations of these proposed pedestrian crossings. Liaison with City of Ryde Council will be required for the proposed works within the public domain.

Figure 8.2: Proposed pedestrian crossing facilities

Basemap source: Nearmap

9. ROAD NETWORK ASSESSMENT

09

9.1. Modelling Approach

This section provides details of the traffic modelling approach used to assess the impacts of the proposed development on the existing infrastructure

9.1.1. Modelling Approach

SIDRA Network was used to model the intersections surrounding the site, with isolated intersection models used to assess the operation of the following intersections:

- Railway Road/ Bay Drive/ Bank Street
- Church Street/ Morrison Road
- Belmore Street/ Constitution Road.

9.1.2. Modelling Scenarios

It is noted that 2021 and 2031 are typical future modelling years for which background traffic forecasts are available. As such, the anticipated schools traffic in the opening year of 2022 and the 10-year planning horizon of 2032 have been added to 2021 and 2031 background traffic forecasts (to avoid minor interpolation) and modelled/ discussed below accordingly.

The models have been developed for the following scenarios:

- **Base** - existing conditions
- **Future Base** – future (2022 and 2032) conditions with background growth
- **Future with Development** – future (2022, 2032) conditions with background growth, school traffic and TAFE traffic.

A comparison between Future Base and Future with Development scenario will provide the potential impacts of the proposed development. Future models have been developed for opening year (2022) and ultimate year (2032) when it is anticipated that the school will reach its maximum capacity.

Base

This scenario models the existing conditions. The modelled network layout and layout of the three individual intersections are presented in Figure 9.1 to Figure 9.4.

Figure 9.1: Existing intersection layouts - SIDRA Network

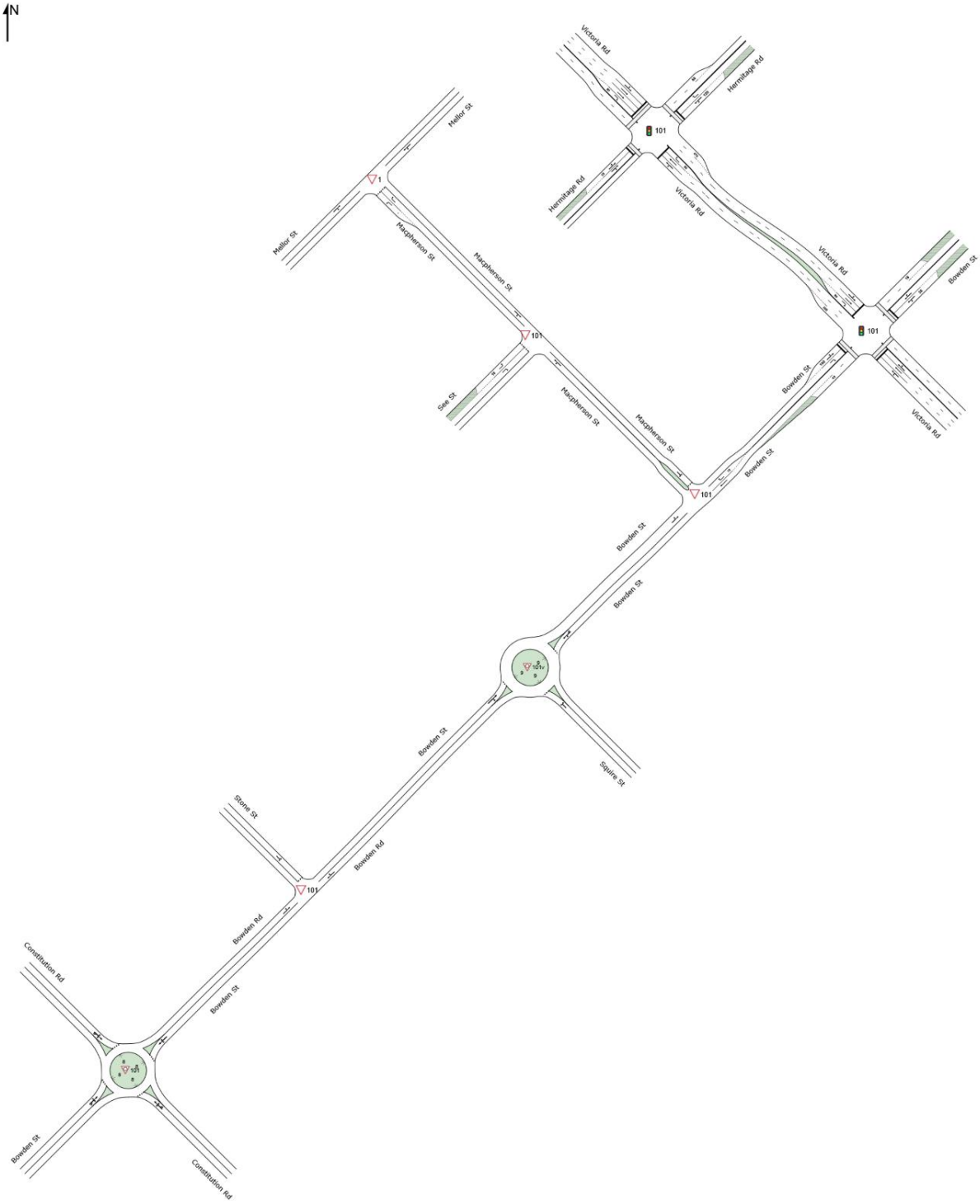


Figure 9.2: Existing intersection layout at Railway Road/ Bay Drive/ Bank Street

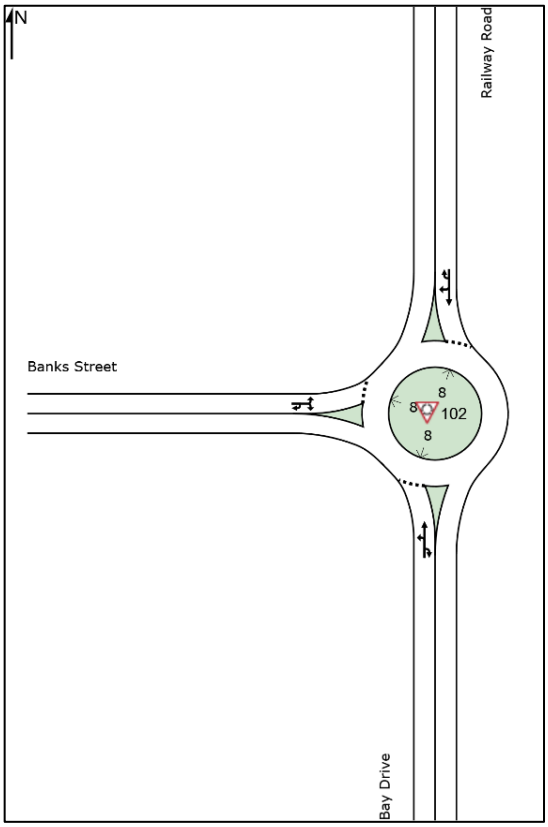


Figure 9.3: Existing intersection layout at Belmore Street/ Constitution Road

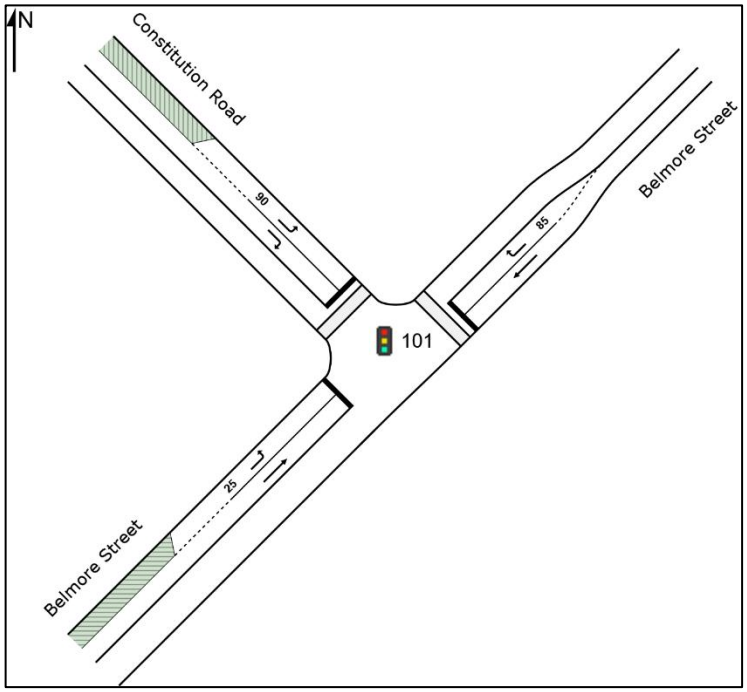
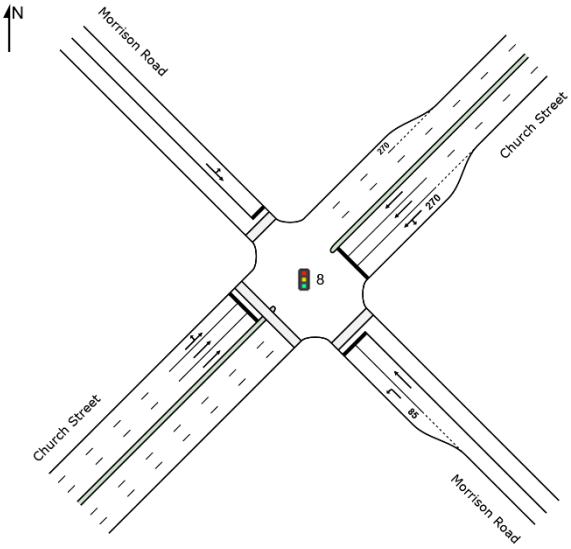


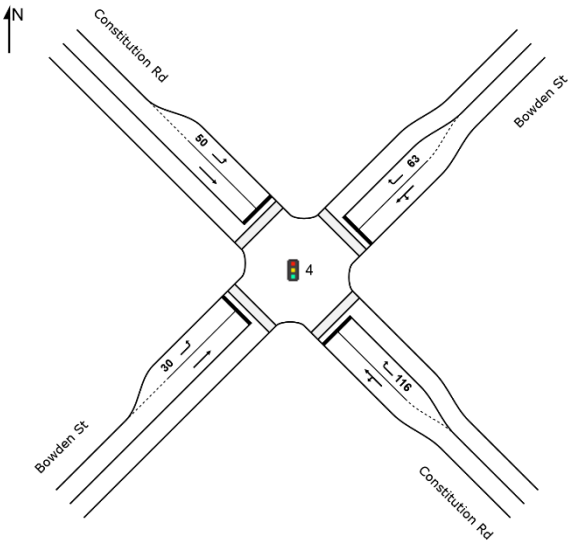
Figure 9.4: Existing intersection layout at Church Street/ Morrison Road



Future Base

This scenario models the 2022 and 2032 traffic conditions with background growth only. The layout at each intersection is assumed to be the same as existing layouts except at Constitution Road/ Bowden Street. This priority intersection is proposed to be upgraded to a signalised intersection (by others) as part of the Shepherds Bay development as confirmed by City of Ryde Council as being a consent condition and in the meeting minutes in Appendix E. The proposed signalised layout at this intersection is presented in Figure 9.5.

Figure 9.5: Proposed intersection layout at Constitution Road/ Bowden Street



Future with Development

This scenario models the 2022 and 2032 traffic conditions including background growth and the additional traffic generated by the new schools. The layout of all intersections as per the Future Base scenario.

9.1.3. Modelling Assumptions

In addition to the trip generation and mode share assumptions outlined in Section 7, the following assumptions have been made for the impact assessment:

- Bowden Street and Hermitage Road are the two key access points to/ from Victoria Road due to these intersections being the closest signalised intersections to the site allowing for all movements to/ from Victoria Road. Therefore, the majority of the traffic would arrive and depart via these two roads. In reality, some vehicles would use alternative roads such as Mellor Street, Falconer Street and Belmore Street. The approach taken is robust yet conservative and provides a good indication of the impacts on the existing infrastructure.
- Future years 2022 (opening year) and 2032 (10 years after school opening) has been assessed. The background growth for ~~year~~ both future years have been extracted from the STFM (Strategic Traffic Forecasting Model), maintained and developed by Roads and Maritime.
- It is understood that Shepherds Bay development[3] has been approved and will directly impact the study area. It is assumed that this development and any other such developments in the vicinity of the study area have been included in the STFM models. Therefore, background growth from the STFM model should include all approved projects in the study area.
- Only peak hour assessment has been carried out in SIDRA, with AM peak hour being 8am to 9am and PM peak hour being 2:30pm to 3:30pm. These correspond to the school peak hours.

9.1.4. Model Limitations

It should be noted that, like any other modelling tool, SIDRA has certain limitations, especially in a network environment where care needs to be given to coordination of signals, phase times, offsets and the actual traffic volume. For highly congested networks operating over capacity (such as Victoria Road), delays can increase at an exponential level with a minor increase in traffic. As such, the results produced by the SIDRA assessment should only be used for relative comparison purposes which is encompassed in the scope of this study. Fit for study purpose models were developed by calibrating the models to existing conditions. This is discussed in detail in Section 3.4.3 and calibration details are provided in Appendix A.

9.2. Schools Traffic Generation

The anticipated traffic generation of the proposed school has been derived based on the future mode shares and trip generation assumptions as discussed in Section 7.

The peak hour traffic generation has been calculated and summarised in Table 9.1 and used for the SIDRA assessment.

Table 9.1: Peak hour additional traffic generation - Schools

Period	Vehicle movements per hour		
	In	Out	Total
AM peak	236	194	430
PM peak	189	174	363

[3] https://majorprojects.accelo.com/public/093d6af2dcbbf94152db9c0007aab829/MP09_0216%20MOD3_%20Shepherds%20Bay%20IPC%20Statement%20of%20Reasons%20for%20Decision.pdf

9.3. TAFE Redevelopment Traffic Generation

GTA has separately assessed the anticipated trip generation for the new Meadowbank TAFE Multi-Trades and Digital Hub. In estimating the future trip generation, the existing typical arrival and departure profile of staff and students was used (detailed survey data), in conjunction with travel mode share surveys. Table 9.2 sets out the anticipated increase in private vehicle trips.

Table 9.2: Additional vehicle trips - TAFE

User	2022			2032		
	AM peak hour	PM peak hour	Daily trips*	AM peak hour	PM peak hour	Daily trips*
Staff	16	15	70	27	24	107
Student	45	40	192	76	67	305
Total	**61**	**55**	**262**	**103**	**91**	**412**

*Daily trips include peak and off-peak trips

9.4. Distribution and Assignment

The directional distribution and assignment of traffic generated by the proposed development will be influenced by a number of factors, including the:

1. configuration of the arterial road network in the immediate vicinity of the site
2. existing operation of intersections providing access between the local and arterial road network
3. distribution of households near the site and the proposed school catchment areas
4. likely distribution of employees' residences in relation to the site
5. configuration of access points to the site.

Based on the above, Figure 9.6 and Figure 9.7 have been prepared to show the estimated increase in turning movements near the site once the full student and staff population of both schools is achieved (i.e. 2032).

Figure 9.6: AM peak hour additional site generated traffic volumes

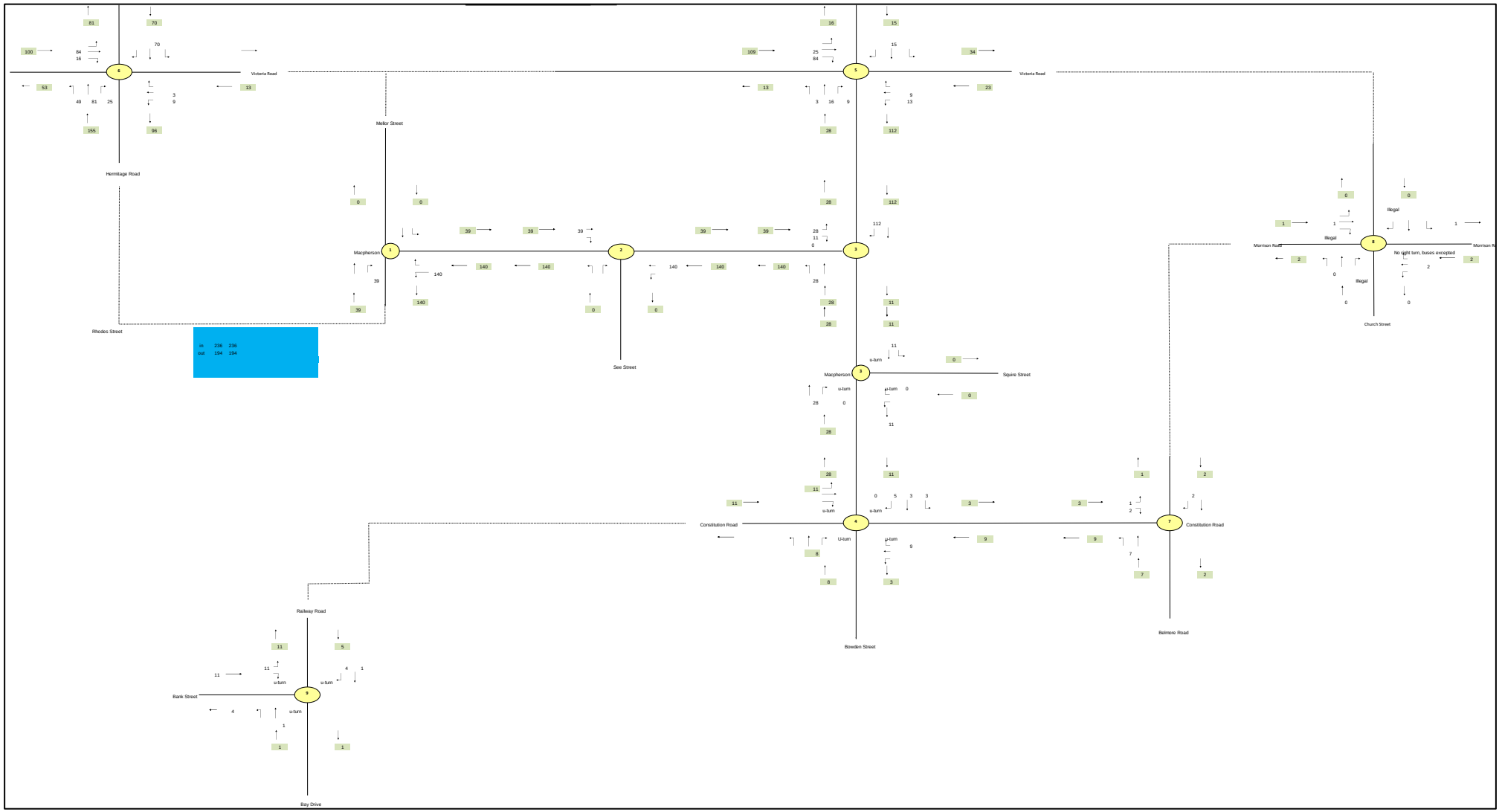
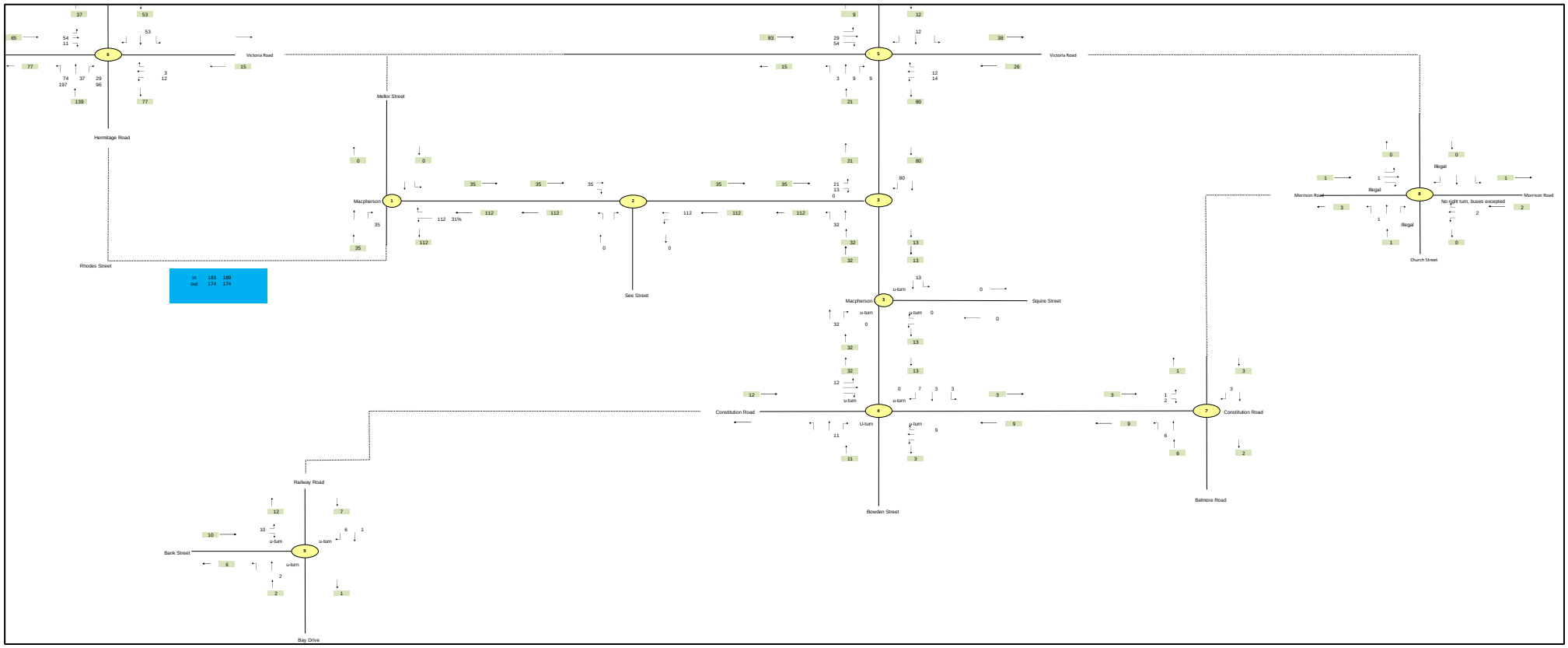


Figure 9.7: PM peak hour additional site generated traffic volumes



9.5. Traffic Impact

Based on the traffic generation and distribution estimates, all intersections were modelled in SIDRA. It should be noted that signal timings for all scenarios were specified as *"user given"*. These users given phase times were calculated from the SCATS phasing information. It is our understanding that all signalised intersections along Victoria Road are part of a sub system that is optimised by SCATS to get the optimal network performance. As we are only analysing some intersections that are part of a bigger network, it was deemed fit to utilise the average SCATS timings rather than let SIDRA optimise the signal timings. This approach provides consistency in comparison of results.

The SIDRA modelling results for the Future Base scenario, i.e. including background growth but not the additional traffic generated by the school and TAFE, is provided in Table 9.3 to Table 9.6.

Table 9.3: Intersection performance for Future Base scenario - 2022 AM

Intersection	Control	Degree of Saturation	Average delay (seconds)	Average queue (metres)	Level of Service
Macpherson Street/ Mellor Street	Priority	0.04	5	0	A
Macpherson Street/ See Street	Priority	0.05	5	0	A
Macpherson Street/ Bowden Street	Priority	0.26	15	2	B
Bowden Street/ Squire Street	Roundabout	0.14	9	2	A
Constitution Road/ Bowden Street	Signals	0.36	10	26	A
Victoria Road/ Bowden Street	Signals	1.27	47	358	D
Victoria Road/ Hermitage Road	Signals	1.21	51	478	D
Constitution Road/ Belmore Street	Signals	0.76	18	63	B
Church Street/ Morrison Road	Signals	1.12	21	164	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	0.11	11	2	A
Macpherson Street/ Mellor Street	Priority	0.04	5	0	A

Table 9.4: Intersection performance for Future Base scenario - 2022 PM

Intersection	Control	Degree of Saturation	Average delay (seconds)	Average queue (metres)	Level of Service
Macpherson Street/ Mellor Street	Priority	0.04	5	0	A
Macpherson Street/ See Street	Priority	0.03	6	0	A
Macpherson Street/ Bowden Street	Priority	0.26	12	2	A
Bowden Street/ Squire Street	Roundabout	0.13	10	2	A
Constitution Road/ Bowden Street	Signals	0.76	22	52	B
Victoria Road/ Bowden Street	Signals	0.83	23	231	B
Victoria Road/ Hermitage Road	Signals	1.26	44	467	D
Bowden Street/ Stone Street	Priority	0.07	12	1	A
Constitution Road/ Belmore Street	Signals	0.90	29	66	C
Church Street/ Morrison Road	Signals	0.98	17	153	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	0.19	11	3	A

Table 9.5: Intersection performance for Future Base scenario - 2032 AM

Intersection	Control	Degree of Saturation	Average delay (seconds)	Average queue (metres)	Level of Service
Macpherson Street/ Mellor Street	Priority	0.04	5	0	A
Macpherson Street/ See Street	Priority	0.05	5	0	A
Macpherson Street/ Bowden Street	Priority	0.31	19	2	B
Bowden Street/ Squire Street	Roundabout	0.92	12	18	A
Constitution Road/ Bowden Street	Signals	0.38	12	46	A
Victoria Road/ Bowden Street	Signals	1.45	70	367	E
Victoria Road/ Hermitage Road	Signals	1.50	78	554	F
Constitution Road/ Belmore Street	Signals	0.85	19	81	B
Church Street/ Morrison Road	Signals	1.24	26	215	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	0.12	11	2	A
Macpherson Street/ Mellor Street	Priority	0.04	5	0	A

Table 9.6: Intersection performance for Future Base scenario - 2032 PM

Intersection	Control	Degree of Saturation	Average delay (seconds)	Average queue (metres)	Level of Service
Macpherson Street/ Mellor Street	Priority	0.04	5	0	A
Macpherson Street/ See Street	Priority	0.03	6	0	A
Macpherson Street/ Bowden Street	Priority	0.27	13	2	A
Bowden Street/ Squire Street	Roundabout	0.14	10	2	A
Constitution Road/ Bowden Street	Signals	0.83	27	72	B
Victoria Road/ Bowden Street	Signals	0.99	36	335	C
Victoria Road/ Hermitage Road	Signals	2.00	92	550	F
Bowden Street/ Stone Street	Priority	0.08	13	1	A
Constitution Road/ Belmore Street	Signals	1.01	42	109	C
Church Street/ Morrison Road	Signals	1.08	20	153	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	0.20	12	4	A

* Average back of queue calculation has been restricted to the available queue storage space

Based on the traffic generation and distribution estimates, the SIDRA modelling results for the Future with Development scenario, i.e. including background growth and the additional traffic generated by the schools and TAFE, is provided in Table 9.7 to Table 9.10

Table 9.7: Intersection performance for Future with Development scenario - 2022 AM

Intersection	Control	Degree of Saturation	Average delay (seconds)	Average queue (metres)	Level of Service
Macpherson Street/ Mellor Street	Priority	0.04	6	1	A
Macpherson Street/ See Street	Priority	0.05	6	1	A
Macpherson Street/ Bowden Street	Priority	0.34	18	2	B
Bowden Street/ Squire Street	Roundabout	0.26	9	2	A
Constitution Road/ Bowden Street	Signals	0.63	17	52	B
Victoria Road/ Bowden Street	Signals	1.30	54	383	D
Victoria Road/ Hermitage Road	Signals	1.21	68	595	E
Bowden Street/ Stone Street	Priority	0.07	12	1	A
Constitution Road/ Belmore Street	Signals	0.76	17	63	B
Church Street/ Morrison Road	Signals	1.12	21	164	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	0.11	11	2	A

Table 9.8: Intersection performance for Future with Development scenario - 2022 PM

Intersection	Control	Degree of Saturation	Average delay (seconds)	Average queue (metres)	Level of Service
Macpherson Street/ Mellor Street	Priority	0.05	6	1	A
Macpherson Street/ See Street	Priority	0.05	6	0	A
Macpherson Street/ Bowden Street	Priority	0.40	14	4	A
Bowden Street/ Squire Street	Roundabout	0.13	10	2	A
Constitution Road/ Bowden Street	Signals	0.76	22	52	B
Victoria Road/ Bowden Street	Signals	1.02	27	250	B
Victoria Road/ Hermitage Road	Signals	1.21	53	499	D
Bowden Street/ Stone Street	Priority	0.07	12	1	A
Constitution Road/ Belmore Street	Signals	0.90	29	66	C
Church Street/ Morrison Road	Signals	0.98	17	153	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	0.19	11	3	A

Table 9.9: Intersection performance for Future with Development scenario - 2032 AM

Intersection	Control	Degree of Saturation	Average delay (seconds)	Average queue (metres)	Level of Service
Macpherson Street/ Mellor Street	Priority	0.04	6	1	A
Macpherson Street/ See Street	Priority	0.06	7	1	A
Macpherson Street/ Bowden Street	Priority	0.54	28	4	B
Bowden Street/ Squire Street	Roundabout	0.97	19	30	B
Constitution Road/ Bowden Street	Signals	0.39	13	52	A
Victoria Road/ Bowden Street	Signals	1.56	87	401	F
Victoria Road/ Hermitage Road	Signals	2.36	128	723	F
Bowden Street/ Stone Street	Priority	0.08	13	1	A
Constitution Road/ Belmore Street	Signals	0.85	19	81	B
Church Street/ Morrison Road	Signals	1.25	26	217	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	0.12	11	2	A

Table 9.10 Intersection performance for Future with Development scenario - 2032 PM

Intersection	Control	Degree of Saturation	Average delay (seconds)	Average queue (metres)	Level of Service
Macpherson Street/ Mellor Street	Priority	0.05	6	1	A
Macpherson Street/ See Street	Priority	0.06	7	1	A
Macpherson Street/ Bowden Street	Priority	0.59	20	7	B
Bowden Street/ Squire Street	Roundabout	0.14	11	2	A
Constitution Road/ Bowden Street	Signals	0.84	28	73	B
Victoria Road/ Bowden Street	Signals	1.13	38	314	C
Victoria Road/ Hermitage Road	Signals	1.84	120	550	F
Bowden Street/ Stone Street	Priority	0.08	13	1	A
Constitution Road/ Belmore Street	Signals	1.01	43	112	D
Church Street/ Morrison Road	Signals	1.09	20	153	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	0.21	12	4	A

* Average back of queue calculation has been restricted to the available queue storage space

A comparative summary of Level of Service for all scenarios is presented in Table 9.11 and Table 9.12.

Table 9.11: Intersection performance Level of Service Summary - AM

Intersection	Control	Future Base	Future with Development	Future Base	Future with Development
		2022	2022	2032	2032
Macpherson Street/ Mellor Street	Priority	A	A	A	A
Macpherson Street/ See Street	Priority	A	A	A	A
Macpherson Street/ Bowden Street	Priority	B	B	B	B
Bowden Street/ Squire Street	Roundabout	A	A	A	B
Constitution Road/ Bowden Street	Signals	A	B	A	A
Victoria Road/ Bowden Street	Signals	D	D	E	F
Victoria Road/ Hermitage Road	Signals	D	E	F	F
Bowden Street/ Stone Street	Priority	B	A	B	A
Constitution Road/ Belmore Street	Signals	B	B	B	B
Church Street/ Morrison Road	Signals	A	B	A	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	A	A	A	A

Table 9.12: Intersection performance Level of Service Summary - PM

Intersection	Control	Future Base	Future with Development	Future Base	Future with Development
		2022	2022	2032	2032
Macpherson Street/ Mellor Street	Priority	A	A	A	A
Macpherson Street/ See Street	Priority	A	A	A	A
Macpherson Street/ Bowden Street	Priority	A	A	A	B
Bowden Street/ Squire Street	Roundabout	A	A	A	A
Constitution Road/ Bowden Street	Signals	B	B	B	B
Victoria Road/ Bowden Street	Signals	B	B	C	C
Victoria Road/ Hermitage Road	Signals	D	D	F	F
Bowden Street/ Stone Street	Priority	A	A	A	A
Constitution Road/ Belmore Street	Signals	C	C	C	D
Church Street/ Morrison Road	Signals	B	B	B	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	A	A	A	A

From the results presented above the following can be observed:

- For the 2022 Future Base traffic conditions:
  - all intersections are performing at acceptable level of service D or better for both AM and PM peak.
  - a high degree of saturation (>1) indicates that the intersection of Victoria Road and Hermitage Road is operating at capacity for both AM and PM peak conditions and any further increase in traffic may lead to long delays and queues.
- With the additional schools and TAFE traffic in 2022:
  - all intersections would operate at acceptable level of service D or better except for Victoria Road and Hermitage Road during the AM peak hour
  - the phasing at Victoria Road and Hermitage Road is set as single diamond overlap with through movements at Hermitage Road running in one phase with filtered right turns. With the additional school traffic, the right turn (southbound) into Victoria Road is observed to experience a high delay and queues
  - a high degree of saturation (>1) is observed at Victoria Road and Bowden Street intersection for AM peak traffic conditions indicating that this intersection is operating at capacity.
- For the 2032 Future Base traffic conditions, all intersections are observed to perform at acceptable level of service D or better except for the following intersections:
  - Victoria Road and Hermitage Road
  - Victoria Road and Bowden Street
  - Constitution Road and Bowden Street.
- With the additional schools and TAFE traffic in 2032, delays and queues increase are observed to increase especially at the three intersections that were performing at or over capacity under 2032 Future Base conditions.
- With the additional schools and TAFE traffic, the key school access intersections on Victoria Road at Hermitage Road and Bowden Street experience higher delays and queue lengths compared to future base scenario results for both future years assessed.

- The modelling indicates that the intersection of Bowden Street and Stone Street would improve with the additional traffic. However, this intersection is impacted by the upstream and downstream queues at Bowden Street and the highest delay movement is reported. Slow moving traffic and Bowden street provides opportunities for turning traffic to find gaps and therefore intersection operation would be consistent with or without the schools and TAFE.
- Church Street and Morrison Road operates satisfactorily at level of service B with signal timing reconfiguration in the future.
- The future traffic signals at the intersection of Constitution Road and Bowden Street operates at an acceptable D or above for both future years.

Based on the above, the schools and TAFE traffic does have some impacts on critical intersections along Victoria Road. The network as a whole is observed to operate at satisfactory levels for the 2022 traffic conditions with the additional schools and TAFE traffic.

It is noted that Victoria Road is currently operating at capacity and any further increase in traffic may cause an increase in delays and queue lengths. The side streets along Victoria Road perform poorly as they do not get enough green time to clear the traffic. The results also indicate that while local street network has capacity to accommodate the additional traffic generated by the new school, however, the key access points at Victoria Road are unable to accommodate 2031 background growth. As such, it is recommended that the true impacts of the development at the ultimate year and the potential mitigation works required can only be quantified by assessing an upgraded Victoria Road. This corridor upgrade needs to be developed in conjunction with Roads and Maritime Services and TfNSW.

9.6. Primary School Mode Share Sensitivity Test

The mode share for primary school car trips is forecast to be 30 per cent; a 10 per cent reduction when compared to the existing Meadowbank Public School. A sensitivity test was carried out to analyse the performance of the network should the mode shift of 10 per cent to cycling (or active transport in general) not be achieved.

A comparison of the estimated trips under the two mode share scenarios is presented in Table 9.13.

Table 9.13: Estimated two-way car trips

Year	30 per cent Mode Share		40 per cent Mode Share		Difference	
	AM	PM	AM	PM	AM	PM
2022	221	231	229	270	8	40
2032	430	362	469	424	39	61

As indicated in the table above, a car mode share of 40 per cent would result in between 8- 40 additional two-way trips upon opening of the schools, increasing to between 40- 60 additional two-way car trips at full capacity (2032).

9.6.1. Traffic Impact

2022 intersection performance results with the additional school traffic (at 40 per cent car mode share) and additional TAFE traffic (as per Section 9.2) is presented in Table 9.14 and Table 9.15.

Table 9.14: Intersection performance for Future with Development Sensitivity scenario - 2022 AM

Intersection	Control	Degree of Saturation	Average delay (seconds)	Average queue (metres)	Level of Service
Macpherson Street/ Mellor Street	Priority	0.05	5	1	LOS A
Macpherson Street/ See Street	Priority	0.16	0	0	LOS A
Macpherson Street/ Bowden Street	Priority	0.24	0	0	LOS A
Bowden Street/ Squire Street	Roundabout	0.20	2	4	LOS A
Constitution Road/ Bowden Street	Signals	0.63	17	52	LOS B
Victoria Road/ Bowden Street	Signals	1.30	54	370	LOS D
Victoria Road/ Hermitage Road	Signals	1.21	63	571	LOS E
Bowden Street/ Stone Street	Priority	0.07	12	1	LOS A
Constitution Road/ Belmore Street	Signals	0.76	18	63	LOS B
Church Street/ Morrison Road	Signals	1.12	21	164	LOS B
Banks Street/ Bay Drive/ Railway Road	Roundabout	0.36	7	7	LOS A

Table 9.15: Intersection performance for Future with Development Sensitivity scenario - 2022 PM

Intersection	Control	Degree of Saturation	Average delay (seconds)	Average queue (metres)	Level of Service
Macpherson Street/ Mellor Street	Priority	0.05	6	1	LOS A
Macpherson Street/ See Street	Priority	0.12	0	0	LOS A
Macpherson Street/ Bowden Street	Priority	0.23	0	0	LOS A
Bowden Street/ Squire Street	Roundabout	0.22	4	5	LOS A
Constitution Road/ Bowden Street	Signals	0.76	22	52	LOS B
Victoria Road/ Bowden Street	Signals	1.01	27	255	LOS B
Victoria Road/ Hermitage Road	Signals	1.26	57	499	LOS E
Bowden Street/ Stone Street	Priority	0.29	0	1	LOS A
Constitution Road/ Belmore Street	Signals	0.90	30	67	LOS C
Church Street/ Morrison Road	Signals	0.98	17	153	LOS B
Banks Street/ Bay Drive/ Railway Road	Roundabout	0.44	7	9	LOS A

9.6.2. Summary of Sensitivity Test Results

Table 9.16 provides a comparison of results for the two different mode share scenarios assessed.

Table 9.16: Intersection performance Level of Service Summary-Sensitivity Test

Intersection	Control	AM		PM	
		30% car mode share	40% car mode share	30% car mode share	40% car mode share
Macpherson Street/ Mellor Street	Priority	A	A	A	A
Macpherson Street/ See Street	Priority	A	A	A	A
Macpherson Street/ Bowden Street	Priority	B	A	A	A
Bowden Street/ Squire Street	Roundabout	A	A	A	A
Constitution Road/ Bowden Street	Signals	B	B	B	B
Victoria Road/ Bowden Street	Signals	D	D	B	B
Victoria Road/ Hermitage Road	Signals	E	E	D	E
Bowden Street/ Stone Street	Priority	A	A	A	A
Constitution Road/ Belmore Street	Signals	B	B	C	C
Church Street/ Morrison Road	Signals	B	B	B	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	A	A	A	A

The results indicate that for the AM peak, the level of service remains the same. For PM peak the intersection of Victoria Road and Hermitage Road would operate at level of service E rather than D with the higher car mode share.

It is noted that the Victoria Road/ Hermitage Road intersection experiences an overall average delay of 57 seconds in the higher car mode share scenario, which is just one second above the threshold for level of service D (56 seconds). Therefore, the sensitivity analysis indicates that the increase in delay with a 40% car mode share is marginal for 2022 traffic conditions and it can be concluded that the network as a whole could still be expected to operate at satisfactory levels in 2022 (with the additional schools and TAFE traffic) if a primary school student mode shift away from private cars is not achieved.

9.7. Pick-up and Set-Down Impact

The southern side of Rhodes Street does not have sufficient capacity to accommodate bus stops, the proposed access, the proposed school crossing and an appropriate number of kerbside pick-up and set-down bays.

Therefore, four options were considered to better manage the kerbside uses along Rhodes Street and provide additional capacity for buses and pick-up and set-down provisions. These options include:

- **Option 1:** Provide primary school bus stops adjacent to the primary school access and high school bus stops between the schools and sports fields. The remainder of Rhodes Street (with the exception of no stopping restrictions for the proposed school crossing and driveway access) would be allocated to no parking, permitting pick-up/ set-down activity.

- **Option 2:** Provide primary school bus stops adjacent to the primary school access and high school bus stops off-street, within a hardstand sports area. The remainder of Rhodes Street (with the exception of no stopping restrictions for the proposed school crossing and driveway access) would be allocated to no parking, permitting pick-up/ set-down activity.
- **Option 3:** Provide high school bus stops off-street, within a hardstand sports area, with primary school bus stops on Rhodes Street, adjacent to the proposed off-street bus area. This would require primary school staff to chaperon primary school students being picked up and dropped off by buses. The remainder of Rhodes Street (with the exception of no stopping restrictions for the proposed school crossing and driveway access) would be allocated to no parking, permitting pick-up/ set-down activity.
- **Option 4:** Provide two primary school bus stops adjacent to the primary school access on Rhodes Street and high school bus stops on Macpherson Street, leaving the remainder of Rhodes Street (with the exception of no stopping restrictions for the proposed school crossing and driveway access) available for pick-up/ set-down activity. This would require high school staff to chaperon students being picked up and dropped off by buses. The remote location of the bus stops is also likely to result in surveillance and weather protection issues, as well as being more demanding in terms of teacher resources.

Under the first three options, the southern side of Macpherson Street would be restricted to 15-minute parking, which would allow parents/carers to stop and walk their children into the school (predominantly primary school parents/ carers). All options would require kerbside management by the schools to ensure appropriate use of the designated pick-up and set-down areas (as occurs at most schools). This would likely involve two staff members monitoring the pick-up and set-down areas along Rhodes Street during the peak arrival and departure periods before and after school to encourage compliance and manage student movement to and from vehicles.

On the basis of the above, Option 4 was selected on the basis that it meets the bus demand for the schools while also maximising kerbside along the frontage of the site for pick up and drop off activity. Options to provide bus facilities within the Schools boundary are not feasible due to spatial requirements, topography and/or operational safety considerations. The existing and proposed kerbside facilities are shown in Figure 9.8 and Figure 9.9 respectively.

Figure 9.8: Existing kerbside facilities

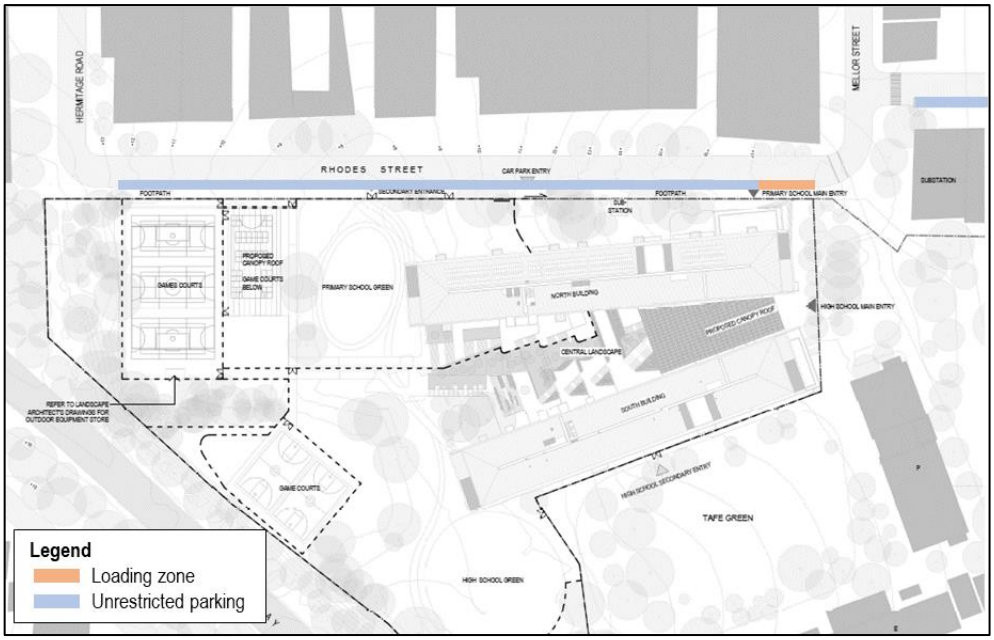
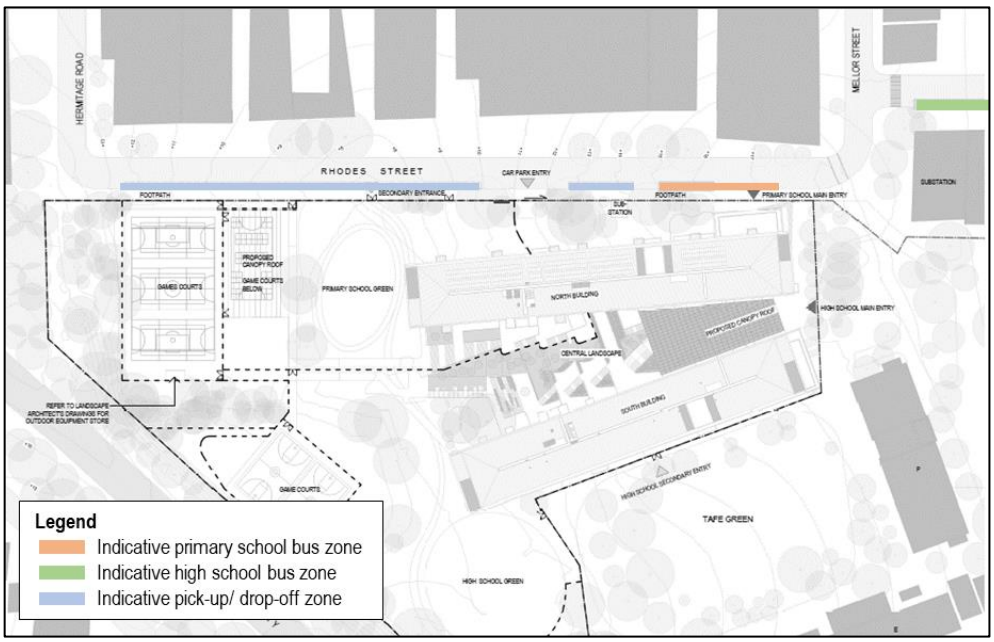


Figure 9.9: Proposed kerbside facilities



Based on the Rhodes Street pick-up and set-down area capacity of 29 spaces and an average dwell time of two minutes per vehicle (consistent with the 'no parking' time limit and GTA observations at schools with a level of active pick-up/ drop-off management), this results in capacity for up to 870 vehicles per hour. It is anticipated that at the ultimate capacity for both primary and secondary schools, up to 485 vehicles per hour would pick-up or set-down passengers in the AM or PM school peak hours respectively. As such, the provision is considered acceptable.

Council has recommended signposting indicating 'no parking' between 8-9:30am and 2:30pm-4pm on school days, noting this would be determined under separate Traffic Committee approvals. Signage and linemarking are shown on the civil plans accompanying the SSDA.

The school and pedestrian crossings and lengthening of the Bowden Street/ Macpherson Street right turn bay will result in the permanent loss of following on-street parking spaces:

- One loading zone space on the southern side of Rhodes Street (due to bus zone)
- 3 unrestricted spaces on the northern side of Rhodes Street (due to school crossing)
- 2 unrestricted spaces on the western side of Mellor Street (due to school crossing)
- 2 unrestricted spaces on the southern side of Macpherson Street (due to bus zone/ pedestrian crossing)
- 1 2P space on the northern side of Macpherson Street (due to pedestrian crossing)
- 2 unrestricted spaces on the eastern side of Bowden Street (due to lengthening of Bowden Street/ right turn bay).

The on-street parking changes would result in the displacement of the following on-street parking spaces during school pick-up and set-down periods:

- 28 unrestricted spaces on the southern side Rhodes Street.

The on-street bus zones would result in the displacement of the following on-street parking spaces during bus zone hours:

- 5 unrestricted spaces on the southern side of Rhodes Street
- 9 unrestricted spaces on the southern side of Macpherson Street.

The parking demand surveys carried out in June 2018 indicate that the on-street parking demand along these affected streets are almost fully utilised during the school pick-up and set-down periods on Rhodes Street and the southern side of Macpherson Street. Parking on the northern side of Macpherson Street is about 33 to 44 per cent utilised during school drop-off and set-down times respectively, indicating the local demand is primarily for all-day parking.

In terms of on-street parking impact, the following is noted:

- Much of the affected parking is adjacent to the existing TAFE site (Rhodes Street) and electricity substation (Macpherson Street), with on-street parking impact along any residential frontages minimised.
- As many of the surrounding industrial uses generally involve employees arriving early in the morning (i.e. before staff and student arrivals), the remaining unrestricted parking will be unaffected by school activities.
- Much of the affected parking is most likely used by the adjacent industrial uses and is effectively an overspill from this precinct. Local employees currently using this on-street parking would need to park within their tenancies or consider alternative travel modes.
- The affected parking would generally still be available for general short-term parking use outside of school pick-up and set-down periods and therefore remaining available for TAFE student and/ or local visitor use.

The traffic modelling detailed in the previous sections assumes that the majority of the school pick-up and set-down activity occurs within the designated zone on Rhodes Street as discussed above. However, it is likely that a limited amount of high school pick-up and set-down activity could occur at the following broader locations:

- See Street in the vicinity of any future pick-up and set-down facility associated with the Multi-Trades and Digital Technology Hub SSDA.
- Other local streets within a short walk of the schools including Hermitage Road, Mellor Street, Macpherson Street, Forsyth Street. This would typically be within available on-street parking spaces or driveways.
- Meadowbank Station on either the eastern side (Railway Road kiss-and-ride zone) or western side Bank Street (kiss-and-ride zone) or available locations on Constitution Road West.

Given the majority of student pick-up and set-down activity is typically part of linked trips, no significant pick-up and set-down activity is expected on the western side of Meadowbank Station under current network arrangements. It would also be quicker for high school students to walk from Victoria Road (or the immediate side-street locations where pick-up and set-down activity could occur) than from Meadowbank Station.

9.8. Mitigating Measures and Intersection Works

Victoria Road currently has very limited spare capacity to accommodate any significant growth as observed from the existing conditions assessment (Section 3). However, development has been planned and approved in the region such as the Shepherds Bay Development.

At this stage it is not clear how road authorities plan to accommodate this growth. It is recommended that mitigation measures be developed in conjunction with other development projects in the vicinity. Direction from Roads and Maritime is required as to what upgrades can be assumed at Victoria Road to accommodate the background growth.

A comparison of the background growth and the additional school traffic at the two critical intersections along Victoria Road for year 2032 is provided in Table 9.17.

Table 9.17: Relevant proportions of additional future traffic

Peak Hour	Intersection	Existing Traffic	Background growth	New School traffic	Total Traffic 2032	Background traffic (per cent)	Development traffic (per cent)
AM	Victoria Road/ Bowden Street	4,956	544	175	5,675	11%	4%
	Victoria Road/ Hermitage Road	5,166	527	338	6,031	10%	7%
	Total	**10,122**	**1,071**	**513**	**11,706**	**11%**	**5%**
PM	Victoria Road/ Bowden Street	4,360	577	142	5,079	13%	3%
	Victoria Road/ Hermitage Road	4,711	570	273	5,554	12%	6%
	Total	**9,071**	**1,147**	**415**	**10,633**	**13%**	**5%**

The above analysis indicates that the anticipated background growth is in the order of 10 per cent and 13 per cent while the schools traffic is in the order of 3 per cent to 7 per cent.

From the results presented in Section 9.5, Victoria Road has some limited capacity and can accommodate background traffic up to year 2022. However, the intersection of Victoria Road and Hermitage Road and Victoria Road and Bowden Street operates at a high degree of saturation under 2022 AM peak traffic conditions with the new school and TAFE traffic. Victoria Road is a major arterial road which carries high volume of traffic and the efficient movement of the through traffic is important Roads and Maritime. A mitigation measure was tested to improve the performance of these two intersections, being additional phase at Hermitage Road and Bowden Street to clear traffic queues on these side streets. The proposed phasing at Hermitage Road and Bowden Street intersections is shown in Figure 9.10 and Figure 9.11.

Figure 9.10: Proposed Mitigation (phasing) at Victoria Road and Hermitage Road intersection

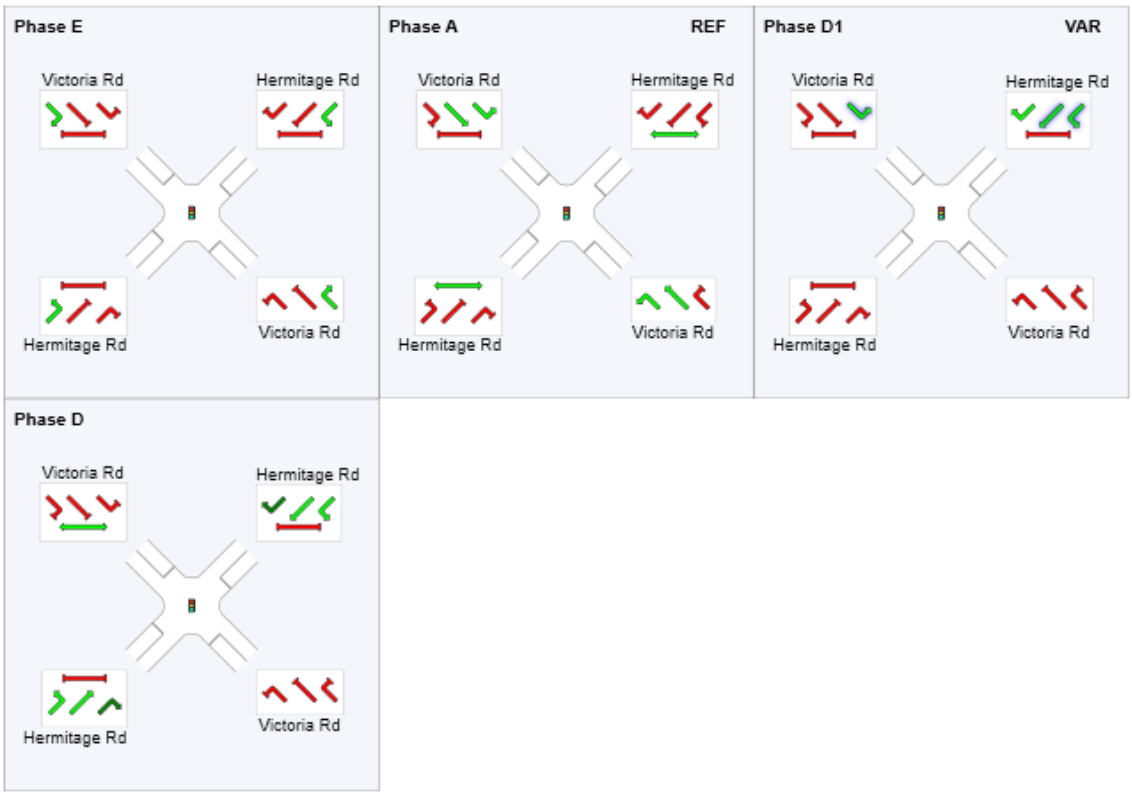
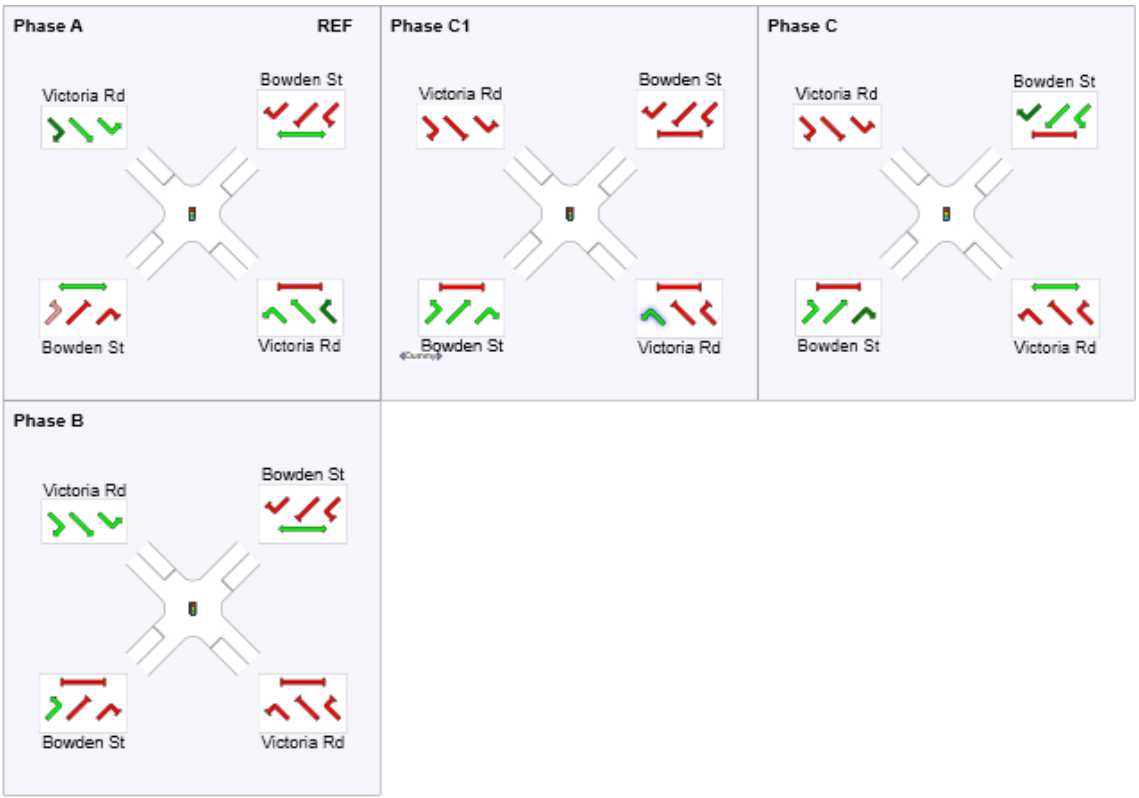


Figure 9.11: Proposed Mitigation (phasing) at Victoria Road and Bowden Street intersection



With the proposed mitigation, the degree of saturation reduces from 1.2 to 1.0 for the 2022 AM peak traffic conditions. As such there is benefit in implementing additional leading right turn phases for the side streets to cater for the additional traffic generated by the schools and TAFE. SIDRA Network estimates that the queues on Victoria Road are marginally impacted (increases by approximately 30 vehicles in westbound direction), while the overall performance of the network is better when compared to original phasing results.

The 2032 background growth is between 530 and 600 vehicles per hour, which almost equates to an additional traffic lane. Hence it is proposed that any further mitigation measures be tested to accommodate the background growth first. It is also prudent that these mitigation measures be developed in conjunction with Roads and Maritime as Victoria Road is a State Road.

9.9. Other Community Uses

It is understood that selected facilities of the schools, including but not limited to the community hall and gymnasium, may be operated outside of standard school hours on a "user pays" basis. Hours of operation are anticipated to be between 4pm and 10pm on weekdays and during weekend periods. Weekend usage times are yet to be determined but could be expected to be within 6pm to 8pm.

The community hall located along the Rhodes Street frontage may be available for hire by local sporting groups, the Australian Electoral Commission and local community groups. The hall can cater for up to 300 persons. It is anticipated that the hall would be booked two nights a week and at least one weekend each month.

The gymnasium located at ground level as part of the High School could be operated outside of standard school hours for 30 weeks per year but not during exam periods. It would be used an average of two nights per week as well as at weekends. Activities could vary from sporting activities to larger congregations.

Activities in the hall and gymnasium are likely to be split up into smaller groups, with activities such as sporting games running for (say) an hour each session. This would distribute the traffic demand throughout the hours of operation and avoid large groups of people arriving and departing on site at the same time during weeknight and weekend periods. It is recommended that community activities be scheduled to allow for around a 10 to 15-minute offset between each activity to minimise the overlap with people departing the site as people are arriving. Through implementation of these measures, the traffic impact of the ancillary community uses outside of school hours is expected to be minor.

The playing fields will also cater for sporting games on weekends and during holiday periods, however during daylight hours only as no external lighting has been proposed. It is recommended that these sporting games also be scheduled with a 10 to 15-minute offset/ separation to minimise the associated traffic and parking impact on the surrounding road network.

The Department of Education would liaise with Council should school facilities be used frequently by any larger groups of people.

10. PRELIMINARY CONSTRUCTION TRAFFIC MANAGEMENT PLAN

10

10.1. Introduction

This preliminary Construction Traffic Management Plan (CTMP) provides an overview of the initiatives to be implemented as part of the construction works. Specifically, the preliminary CTMP considers the following:

- construction site access arrangements
- anticipated truck volumes during construction stages
- truck routes to/ from the site
- requirements for works zones
- pedestrian and cyclist access
- site personnel parking
- traffic control measures
- overview of CTMP requirements.

A detailed CTMP will need to be prepared prior to the issue of the construction certificate and contain confirmed construction details with the awarded contractor.

The general principles of traffic management during construction activities are as follows:

- minimise the impact on pedestrian and cyclist movements
- maintain appropriate public transport access
- minimise the loss of on-street parking
- minimise the impact on adjacent and surrounding buildings
- maintain access to/ from adjacent buildings
- restrict construction vehicle movements to designated routes to/ from the site
- manage and control construction vehicle activity near the site
- carry out construction activity in accordance with approved hours of works.

10.2. Overview of Activities

10.2.1. Description of Construction Activities

The expected duration of the construction works is approximately 23 months. Assuming commencement in September 2020, completion is anticipated in early 2022. A broad breakdown of the work stages is detailed in Table 10.1.

Table 10.1: Construction work stages

Stage	Description	Dates	Duration
1	Site preparation	September 2020 to October 2020	1 month
2	Excavation	October 2020 – December 2020	2 months
3	Building substructure	November 2020 – May 2021	6 months
4	Building structure	February 2021 – December 2021	10 months
5	Façade and fit out	July 2021 to April 2022	9 months
6	Landscaping and civil works	December 2021 to April 2022	4 months
7	Commissioning	February 2022 to March 2022	2 months

10.2.2. Work Hours

Construction work would be undertaken in accordance to development consent conditions. The typical work hours are expected to be:

- Monday to Friday: 7:00am to 7:00pm
- Saturday: 8:00am to 4:00pm
- Sundays and public holidays: No work.

Truck movements will be minimised during the surrounding road network peak hours (6:00am to 9:00am and 3:00pm to 7:00pm). The appointed contractor will be responsible for instructing and controlling all subcontractors regarding the hours of work. Any work outside the approved construction periods would be subject to specific prior approval from City of Ryde Council. Such work may include:

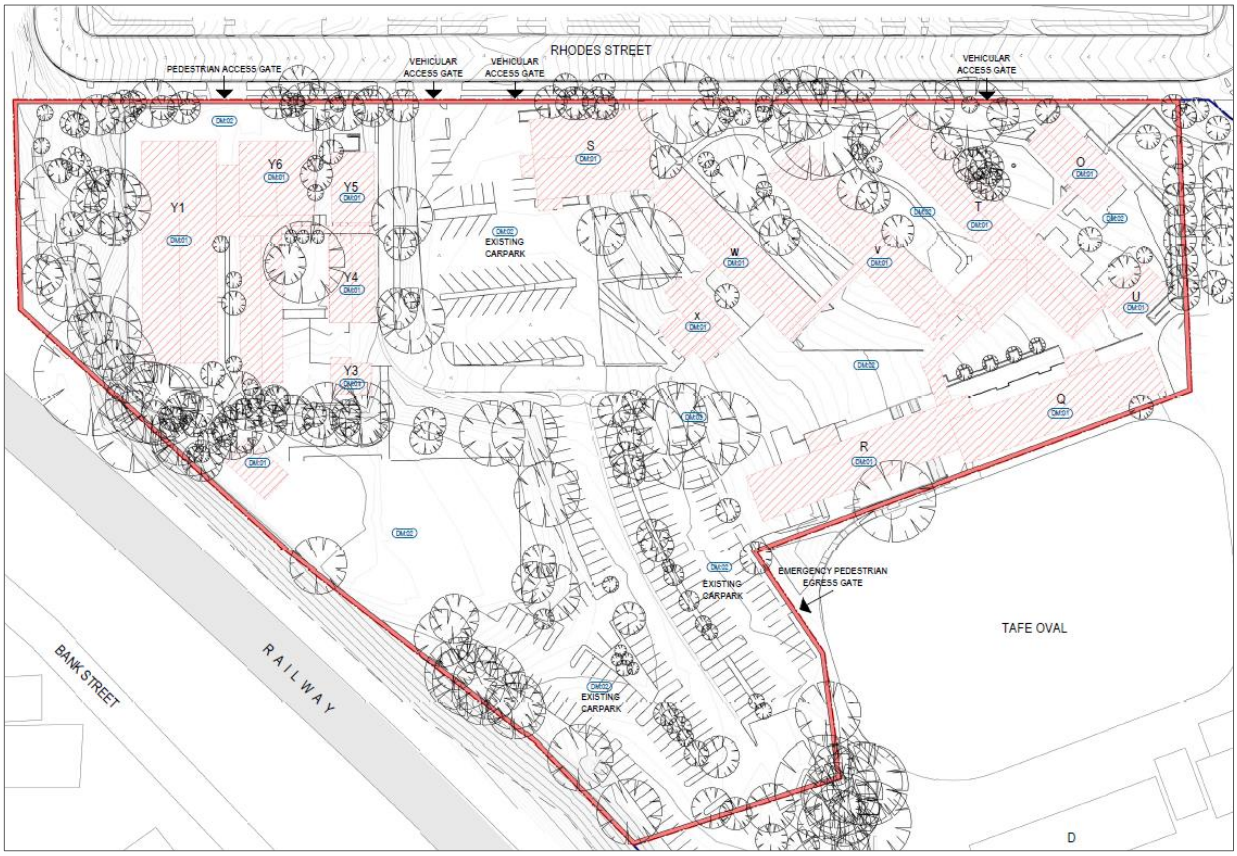
- delivery of cranes, large plant or equipment required to the site
- non-noise generating activity.

10.2.3. Site Access

The primary construction access is proposed via Rhodes Street on the eastern side of the site, for use by vehicles up to 19 metre articulated vehicles. Two secondary accesses will be provided from Rhodes Street towards Hermitage Road. A pedestrian only access will be provided on the western end of Rhodes Street. Figure 10.1 illustrates the proposed access locations to the construction site.

All loading and unloading of materials will be undertaken on-site.

Figure 10.1: Proposed construction works site accesses



Source: Woods Bagot

10.2.4. Construction Staff Parking

The anticipated average and peak number of workers during the construction works is anticipated to be 300 and 500 personnel per day. It is estimated that there will be approximately 200 car parking spaces available to workers up until March 2022, however travel arrangements for construction workers will be refined once a contractor is appointed.

Notwithstanding this, given the site's proximity to high frequency public transport services, including Meadowbank Railway Station, all workers will be encouraged to use public transport to access the site, with appropriate tool/ equipment drop-off arrangements made. This will be incorporated into the site induction program.

10.2.5. Heavy Vehicle Traffic Generation

It is anticipated that the site will be primarily serviced by vehicles of a size up to and including 12.5-metre HRVs with some deliveries expected to require use of 19 metre articulated vehicles. During peak construction activity, it is anticipated that the site will generate up to 100 trucks per day (200 two-way movements), or an average of 11 trucks per hour (22 two-way movements). This activity is expected to occur during the demolition and excavation stage. Given that traffic modelling for post development scenarios has been completed and indicates that the surrounding intersections will operate satisfactorily with higher traffic volumes, the construction traffic impact is expected to be minor. Further to this, 11 construction vehicles per hour would equate to less than one vehicle in every second traffic signal cycle.

Concrete pours during the building structure stage are expected to result in lower vehicle movements than the above, with approximately 50 vehicle movements per day or 5 vehicles per hour.

10.2.6. Heavy Vehicle Access Routes

Construction traffic will generally have origins and destinations to/ from the north and west of the site. The proposed construction vehicle routes have been selected to minimise the use of local roads and use arterial roads where possible (illustrated in Figure 10.2 and Figure 10.3). The proposed routes are as follows:

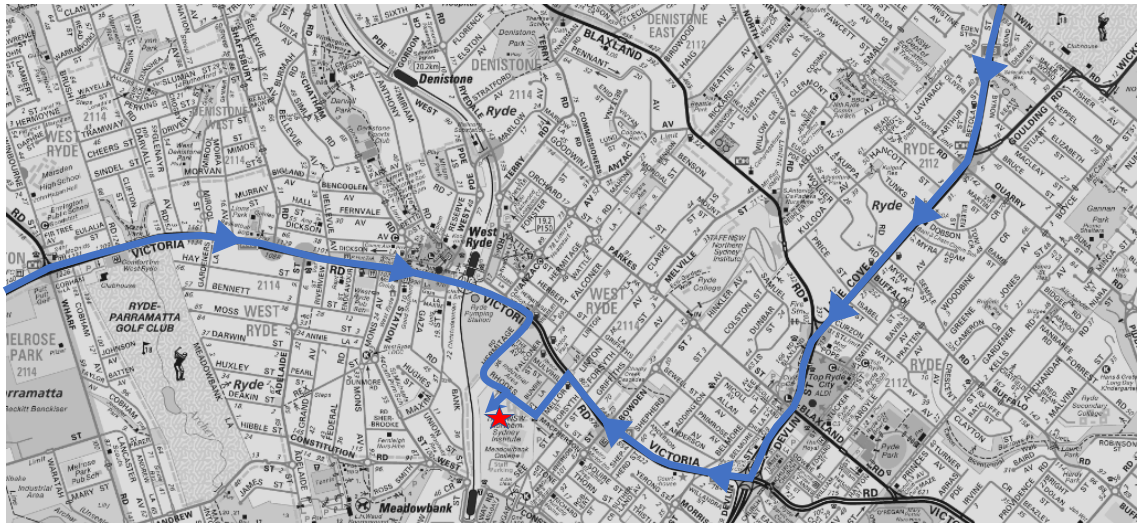
Approach

- From north:
  - Pennant Hills Road, Silverwater Road, Victoria Road, Hermitage Road, Rhodes Street
  - Lane Cove Road, Victoria Road, Mellor Street, Rhodes Street.
- From west:
  - M4 Western Motorway, James Ruse Drive, Victoria Road, Hermitage Road, Rhodes Street
  - Old Windsor Road, Cumberland Highway, James Ruse Drive, Victoria Road, Hermitage Road, Rhodes Street.

Departure

- Towards north:
  - Rhodes Street, Hermitage Road, Victoria Road, Silverwater Road, Pennant Hills Road
  - Rhodes Street, Hermitage Road, Victoria Road, Lane Cove Road.
- Towards west:
  - Rhodes Street, Hermitage Road, Victoria Road, James Ruse Drive, M4 Western Motorway
  - Rhodes Street, Hermitage Road, Victoria Road, James Ruse Drive, Cumberland Highway, Old Windsor Road.

Figure 10.2: Construction vehicle approach routes



Basemap source: Sydway

Figure 10.3: Construction vehicle departure routes

Basemap source: Sydway

10.3. Construction Traffic Management

10.3.1. Traffic Guidance Scheme

A Traffic Guidance Scheme (TGS) for the proposed construction works would be prepared once a contractor is appointed and submitted to the relevant authorities for approval.

Detailed information for work site operation is contained in the *Traffic Control at Work Sites* manual (Roads and Maritime, 2018). The control of traffic at work sites must be undertaken in accordance with WorkCover requirements and the appointed contractor's own workplace health and safety manuals.

The proposed TGS for the work site includes the following considerations and assumptions:

- Construction vehicle activity, including the loading/ unloading of trucks and all materials handling to be provided within the construction site boundaries at all times.
- Placement of accredited site personnel or traffic controllers to manage construction vehicle access to the site and designated work zones, minimising disruption to through traffic.
- Construction site accesses to provide appropriate sight distances and safe environment for all users.
- Clear definition of the work site boundary to be provided by erection of construction hoarding around the site boundaries adjacent to public roads.
- Pedestrians to be guided around the site via existing footpaths.
- Pedestrian safety to be maintained at all times.
- All signage will be clean, clearly visible and unobstructed.

10.3.2. Pedestrian and Cyclist Management

Pedestrian and cyclist movements will be maintained around the site. Traffic controllers will be positioned at site accesses throughout the construction works to temporarily hold pedestrians in the event of vehicles entering and exiting the site. Hoardings will be installed around the perimeter of the site to prevent pedestrian access.

10.3.3. Public Transport

The construction work is not expected to impact existing bus services near the site.

10.3.4. Traffic Impacts

The anticipated heavy vehicle volumes are not expected to have any notable impact on the surrounding road network. As part of any site induction, drivers should be specifically alerted to the pedestrian activity associated with the NSW TAFE site, with appropriate care and safety at this location.

10.3.5. Parking Impacts

The introduction of site access on the Rhodes Street frontage would require temporary removal of some on-street parking. It is anticipated that up to eight on-street parking spaces would be required to be temporarily removed during the construction works.

The use of on-street parking on the surrounding local road network by construction personnel will not be permitted. This restriction will be communicated during the induction of personnel and reinforced in toolbox talks. The appointed contractor would be required to propose an appropriate approach for reducing construction worker travel by private car (including but not limited to use of public transport as noted above, carpooling, group transport and/ or shuttle services from subcontractor premises or key transport nodes), as well as an on-street parking monitoring program with corrective actions as required.

10.3.6. Impacts to Neighbouring Properties

Surrounding property access is not expected to be affected during the construction work of the proposed development.

10.3.7. Emergency Vehicle Access

Emergency vehicle access to the site will be maintained.

Access to the neighbouring sites by emergency vehicles would not be affected by the proposed construction activity. Any such emergencies will also be treated with priority.

Emergency protocols on the site would include a requirement for accredited site personnel to assist with emergency access from the street. All truck movements to the site and/ or incident point would be suspended and cleared. Consequently, any potential impact on emergency access would be effectively managed throughout the works.

Liaison would be maintained with the police and emergency services agencies throughout the construction period and a 24-hour contact would be made available for 'out-of-hours' emergencies and access.

10.3.8. Existing and Future Developments

The TAFE multi-trades and digital technology hub is currently proposed to be under construction at the same time as the MEEPSP. No other existing or future developments are known to be occurring concurrently in the immediate area surrounding the site.

10.3.9. Traffic Movements in Adjoining Council Areas

No adverse impact is expected from the movement of heavy vehicles through adjacent council areas.

10.3.10. Site Inspections and Record Keeping

The construction work would be monitored to ensure that it proceeds as set out in the Construction Management Plan provided by the appointed contractor. A daily inspection before the start of the construction activity should take place to ensure that conditions accord with those stipulated in the plan and there are no potential hazards. Any potential risks or non-conformances to the Construction Management Plan would be identified, recorded and dealt with if they arise.

10.3.11. Site Induction

All staff employed on the site by the appointed contractor (including sub-contractors) would be required to undergo a site induction.

The induction would include permitted access routes to and from the construction site for site staff and delivery vehicles, limited parking arrangements, as well as standard environmental, WHS, driver protocols and emergency procedures. The agreed work hours must be included as part of this induction.

11.CONCLUSION

11

11.1. Introduction

This proposal involves the redevelopment of the northern portion of the TAFE NSW site, which has been acquired by the Department of Education. The site will be developed into new kindergarten to year 12 schools that can accommodate 1,000 primary students and 1,620 high school students. The redevelopment will include new classrooms, collaborative learning spaces, open space, sports fields and associated facilities.

The Greater Sydney Commission is currently in the process of preparing a Meadowbank Education and Employment Precinct Master Plan for the broader Meadowbank Education and Employment Precinct. The masterplan is focussed on mode shift and provides actions that will enable greater pedestrian access, cycle usage and access to public transport.

A travel study was completed by Frank Turquoise Group to support the proposed schools, addressing both staff and student travel and providing details of travel demand management measures to minimise the impact on general traffic and bus operations, including the provision of facilities to increase the non-car mode share for travel to and from the site and encourage higher car occupancy rates of private vehicles accessing the site. These initiatives and travel demand management measures have been incorporated into the School Travel Plan.

11.2. Pedestrians and Cyclists

The proposed schools are likely to generate pedestrian volumes of about 950 pedestrians per hour (including students and staff) including walking trips linked with train and bus trips. The main pedestrian movements will approach to/ from the south of the site, given the surrounding residential catchment and the location of Meadowbank Railway Station, with an estimated total of about 670 pedestrian movements during the peak hour.

To accommodate these estimated pedestrian volumes and facilitate both bus and private car set-down/ pick-up activity, it is proposed to widen the footpaths along the southern side of Rhodes Street, Macpherson Street. In addition, pedestrian crossing facilities are proposed on Rhodes Street and Macpherson Street for safe pedestrian movement.

The existing north-south pedestrian connection through the TAFE campus will be improved by minor upgrade works (by TAFE as part of a separate approvals process), which connects Meadowbank Station with the schools.

There are limited cyclist provisions surrounding the site, which is not considered sufficient to support the cyclist demand associated with the proposed schools, particularly given students will be the main cyclists to and from the site. It is recommended that shared paths are constructed along the key pedestrian and cyclist desire lines to support the broader precinct.

11.3. Public Transport

Meadowbank Railway Station will provide a key transport mode to support the proposed development. Under existing conditions, the rail services operating through this station are over capacity. Under the NSW Government's Future Transport Strategy, the More Trains, More Services program is targeting capacity increases and upgrades to improve peak hour crowding on rail services. Improvements to the capacity and reliability of the T1 Northern Line will be critical for encouraging and facilitating public transport use for the proposed schools, noting that the Sydney Metro CBD and Southwest currently under construction is expected to relieve some pressures on the T1 Northern Line. On the basis of the above it is expected that sufficient rail capacity will be available to service the requirements of the schools.

High-frequency bus services, including the M52, currently operate along Victoria Road. It is understood that there is sufficient capacity on these existing services to accommodate staff and high school student travel demand, noting some of these services would currently be used for access to the existing Marsden High School. Available bus stops are generally within a five-minute walk of the schools, with existing footpaths along Forsyth Street, Mellor Street and Hermitage Road providing appropriate pedestrian accessibility.

11.4. Road Network

SIDRA Intersection and SIDRA Network modelling was used to assess the current operation of the surrounding road network. These results indicate that under existing traffic volumes, the intersections of Victoria Road/ Bowden Street, Victoria Road/ Hermitage Road and Church Street/ Morrison Road are operating at or close to capacity during the AM and PM peak hours. The remaining intersections assessed operate at acceptable levels of service of C or above during the AM and PM peak hours, with satisfactory delays and queue lengths. Anticipated opening year (2021/22) results indicate that the network has some spare capacity to accommodate the background growth and the additional traffic generated by the proposed new school and TAFE. The additional traffic can be accommodated with minor changes to the current phasing arrangements at the Victoria Road intersections with Hermitage Road and Bowden Street, with minimal impact on through traffic.

Forecast future 2031/32 traffic volumes (without the proposed school) would result in Victoria Road intersections exceeding capacity. With the addition of the proposed school traffic and TAFE traffic, the two key school access intersections from Victoria Road at Hermitage Road and Bowden Street, operate at or above capacity. It is noted that the minor roads intersecting with Victoria Road experience existing and future delays (and do not necessarily clear queues in a single signal cycle) due to limited green time as a result of significant traffic volumes and congestion on Victoria Road.

11.5. Car Parking

The car parking requirements based on the City of Ryde Council Development Control Plan 2014, results in the off-street parking requirement of 135 car parking spaces for the proposed development. The travel study completed by Frank Turquoise Group also identified potential active and public transport shift that can be applied to the existing Meadowbank education precinct, with initiatives from this study incorporated into the School Travel Plan.

With the policies and initiatives that are in control of the new schools, the development proposes a total of 60 car parking spaces for opening year (2022), with ongoing and additional travel initiatives (and broader anticipated infrastructure provided by others) to assist in maintaining this provision as staffing numbers increase. It is prudent that the travel plan be monitored for its success at opening year (and beyond) to encourage mode shift to active and public transport modes and higher vehicle occupancy rates, minimising the demand for private vehicle travel.

11.6. Pick-Up and Set-Down Arrangements

Four options have been considered to provide pick-up and set-down (private vehicles and buses) along Rhodes Street and/or adjacent roads. Under all options, parking on both sides of Macpherson Street would be restricted. This would result in the displacement of existing unrestricted parking spaces during school pick-up and set-down times along the southern side of Rhodes Street and both sides of Macpherson Street. The proposed arrangements prioritise school bus activity over private car travel to encourage bus travel and simplify the management of students travelling by bus. The kerbside uses will be strictly managed by the schools to limit impacts on the surrounding area.

11.7. Summary of Mitigation and Management Measures

Table 11.1: Summary of mitigation and management measures

Mitigation and management measure	Detailed design	Pre-construction	Construction	Operation
Upgrade footpaths along south side of Rhodes St and Macpherson St. Provide new shared path on the western side of Hermitage Road if possible	✓			
Install bicycle parking and end-of-trip facilities within the schools.	✓			
Finalise, implement and monitor a Travel Plan, addressing both staff and student travel.	✓			✓
Widen Rhodes St and Macpherson St to accommodate buses and stops. Modify the Bowden St right turn bay at Macpherson St to accommodate buses.	✓	✓		
Work with Roads and Maritime Services to adjust traffic signal phasing and timing at Victoria Rd intersections with Hermitage Rd and Bowden St.				✓
Introduce kerbside parking restrictions during school pick-up and set-down periods.				✓
Develop and implement a kerbside management plan for school pick-up and set-down periods.				✓
Prepare, implement and maintain a detailed Construction Traffic Management Plan.		✓	✓	

A. MODEL CALIBRATION

A

A.1. Calibration

The role of the calibration process adopted for the project was to develop a model that is fit for purpose and produces results that can be used in the context of the overall study.

A.1.1. Site Inspection and Survey Videos

A site inspection was carried out by observing the videos collected as part of the classified intersection surveys. The observations are detailed below.

Victoria Road and Bowden Street Intersection

At Victoria Road, for the eastbound right turn into Bowden Street, vehicles accept smaller critical gap to make the turn. In many instances westbound through vehicles were observed to either nearly miss or slow down to allow the turning vehicle to complete their turn. An instance was observed at 8:00 am where the truck is still completing the right turn and a car is observed travelling in the westbound through direction and marginally misses the truck. This indicates that the truck accepted a smaller gap to make the turn (Figure A.1).

Figure A.1: Observed gap acceptance behaviour at Victoria Road

Bowden Street (north approach) has two lanes and both of them are shared lanes. It was observed that the right turning traffic, from Bowden Street to Victoria Road would block the second lane and vehicles would use the kerbside lane to travel straight through at Bowden Street. This behaviour was observed during both AM and PM peak hours and an instance of this during the PM period is presented in Figure A.2.

Figure A.2: Lane Utilisation at Bowden Street – southbound

A.1.2. Modelling Assumptions

The following outlines several adjustments made to model parameters and assumptions made during the process of model development and calibration:

- Initially SIDRA was allowed to optimise the signal timings, however the results were not matching the existing conditions. Therefore, to better match the existing delays and queues, fixed phase times were applied. These fixed phase times were calculated from the SCATS data provided by Roads and Maritime.
- Gap Acceptance factor at Victoria Road (eastbound) at the Bowden Street intersection has been changed from a default value of 1 to 0.5 to simulate the behaviour of vehicles accepting shorter gaps to make the turn.
- To simulate the observed behaviour at shared lanes, the default lane utilisation was changed at the following locations
    - Bowden Street (north approach) lane 2 – 60% for AM and PM Peak hour
    - Hermitage Road (north and south approach) lane 1 – 80% for AM Peak hour
    - Victoria Road at Victoria Road and Hermitage Road intersection at lane 1 – 70% for AM peak hour
    - Hermitage Road (south approach) lane 2 – 60% for PM Peak hour.

A.1.3. Queue Length Validation

In order to further validate the calibration of the SIDRA models, comparisons were made between observed and modelled queues for each approach to the two Victoria Road intersections modelled.

Detailed queue length data was not collected for this study as part of the traffic survey program, however the intersection survey videos and on-site observations were used for validation purposes. It is noted that the level of accuracy in queue measurement is dependent on the definition of the queue which can be ambiguous.

Videos collected on survey days and as part of site visits (which include travel time surveys) for the critical intersections along Victoria Road (at Bowden Road and Hermitage Road) were observed for the peak hours of 8-9am and 2:30–3:30pm (the modelled peak hours). Three cycles were observed within each 15-minute interval and maximum queues were recorded for each 15-minute interval. The average of these maximum queues over the hour was used to compare against the average modelled network queue and are presented in Figure A.3.

Figure A.3: Average Observed vs Modelled Queues at Victoria Road Intersections

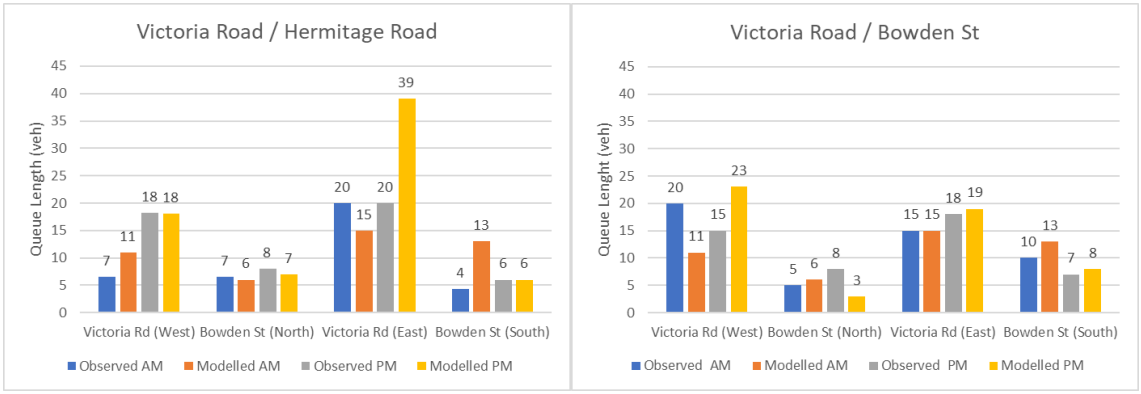


Figure A.3 indicates that the modelled average queues at all approaches are generally close to the observed queues, noting that westbound queues along Victoria Road at Hermitage Road for the PM peak hour were difficult to observe as they were beyond the sight line of the camera and were moving queues. The observed queue is noted as 20 vehicles in the above graph, being the limit of the video assessment. The model is indicating a queue of 39 vehicles at this approach, which is generally consistent with what was observed during site visits.

The queues on Victoria Road can vary and depend on coordination between the upstream and downstream signals. The SIDRA model is limited in that it cannot simulate this dynamic behaviour. As average SCATS signal timings have been used in the models and the queues were generally a good match, the models were considered calibrated and deemed fit for study purposes.

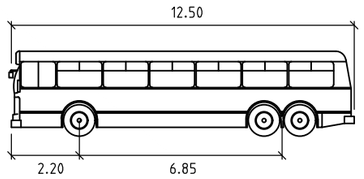
B. BUS SWEPT PATH ASSESSMENT

B

SWEPT PATH KEY

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

ASSUMED SPEED **10**km/h



BUS

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

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SWEPT PATH ASSESSMENT

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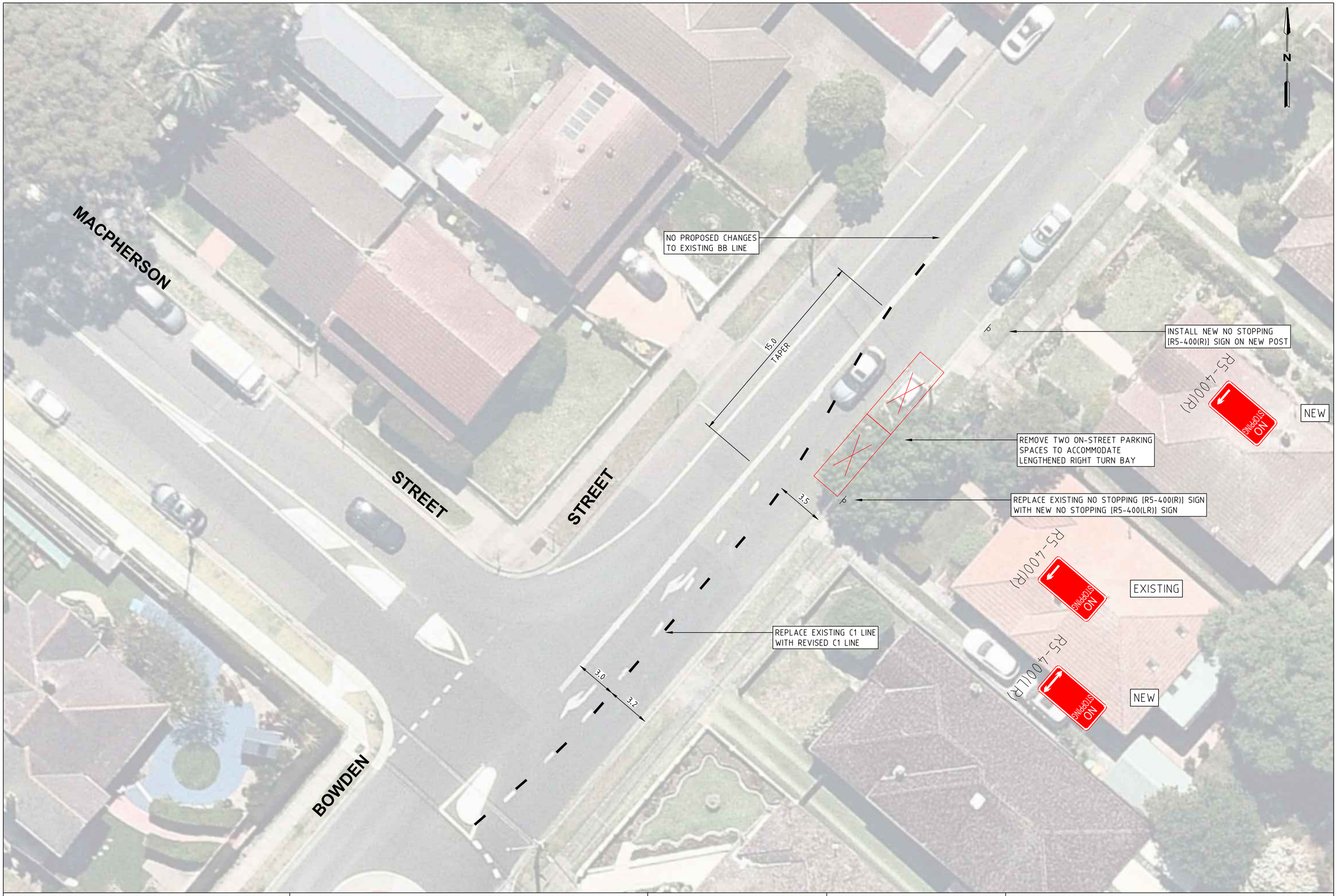

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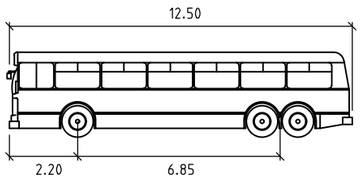
CONCEPT LAYOUT

DRAWING NO. N147950-06-02 SHEET 02 OF 08 ISSUE P1

SWEPT PATH KEY

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

ASSUMED SPEED **10**km/h



BUS

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

MACPHERSON STREET

BOWDEN STREET

BUS AUSTROADS 2013 (AV)

BUS AUSTROADS 2004 (AV-12)

N

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SWEPT PATH ASSESSMENT

DRAWING NO. N147950-06-03 SHEET 03 OF 08 ISSUE P1

SWEPT PATH KEY

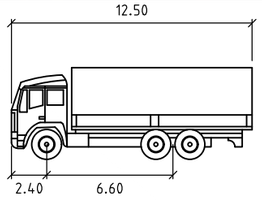
VEHICLE CENTRE LINE

VEHICLE TYRE PATH

VEHICLE BODY PATH

500mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED **10**km/h



HRV

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 35.2

MACPHERSON STREET

STREET

BOWDEN

HRV STANDARDS (B)

HRV STANDARDS (B)

N

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SWEPT PATH ASSESSMENT

DRAWING NO. N147950-06-04 SHEET 04 OF 08 ISSUE P1

MODIFY EXISTING KERB ALIGNMENT TO ALLOW FOR PARKING AND TURNING.

BUNBIE LANE

RHODES STREET

MODIFY KERB ALIGNMENT. MAKE SMOOTH CONNECTION TO EXISTING.

MELLOR STREET

MAKE SMOOTH CONNECTION TO EXISTING KERB

SCHOOL CROSSING

PROVIDE 2 NEW BUS STOPS

PRIMARY SCHOOL ENTRANCE

MELLOR STREET

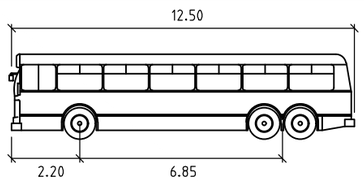
MACPHERSON STREET

PROPOSED PEDESTRIAN C

SWEPT PATH KEY

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

ASSUMED SPEED **10**km/h



BUS

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

N

3.00
3.00
15.00
15.00
3.60
2.50
3.00
3.10
3.10
2.30
3.00
2.50
KG
LK
PR

CIVIL BASE DRAWING
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SWEPT PATH ASSESSMENT

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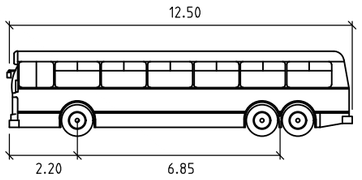
SWEPT PATH KEY

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

ASSUMED SPEED **10**km/h



BUS

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

HERMITAGE ROAD

HERMITAGE ROAD

RHODES STREET

ADDITIONAL SURVEY INFORMATION REQUIRED FOR FURTHER ANALYSIS AND DESIGN. ROAD AND KERB LAYOUT MAY BE SUBJECT TO FUTURE CHANGES

ESTIMATED BUS TURNING BODY

MODIFY EXISTING KERB ALIGNMENT TO ALLOW BUS TURNING RADIUS

PROPOSED FOOTPATH WIDENING

2.30
3.50
3.50
5.85
2.30
3.00
0.74
6.20

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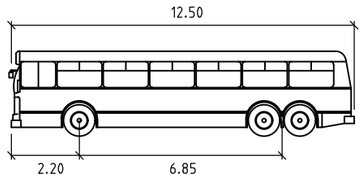
SWEPT PATH ASSESSMENT

DRAWING NO. N147950-06-06 SHEET 06 OF 08 ISSUE P1

SWEPT PATH KEY

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

ASSUMED SPEED **10**km/h



BUS

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

VICTORIA ROAD

HERMITAGE ROAD

N

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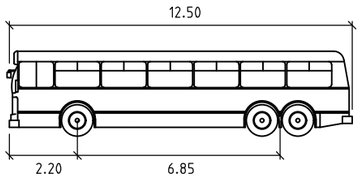
SWEPT PATH ASSESSMENT

DRAWING NO. N147950-06-07 SHEET 07 OF 08 ISSUE P1

SWEPT PATH KEY

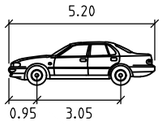
- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- **500**mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED **10**km/h



BUS

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



B99

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

VICTORIA ROAD

HERMITAGE ROAD

N

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SWEPT PATH ASSESSMENT

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C. LOADING DOCK AND CAR PARK COMPLIANCE REVIEW

C

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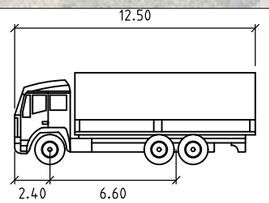
SWEPT PATH ASSESSMENT

DRAWING NO. N147950-06-01   SHEET 01 OF 03   ISSUE P1

SWEPT PATH KEY

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- **600**mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED **5**km/h



HRV

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 35.2

CIVIL BASE DRAWING IN GREEN
DRAWING MSP-EN-CV-00511
REVISION 06
BY ENSTRUCT
DATED 08.10.'19

ARCHITECTURAL BASE DRAWING IN BLUE
DRAWING MSP-WB-AR-DA201
REVISION 07
BY WOODS BAGOT
DATED 17.06.'19

N

NO STOPPING ZONE

7.5m WIDE TWO WAY VEHICULAR CROSSOVER TO CARPARK ENTRY

PARKING LANE
THROUGH LANE
THROUGH LANE
PARKING LANE

MODIFY EXISTING KERB ALIGNMENT TO ALLOW FOR BUS STOPPING AND TURNING

RHODES STREET

BUNBIE LANE

PROVIDE 2 NEW

PRIMARY SCHOOL ENTRANCE

PRIMARY SCHOOL OUTDOOR COVERED

SERVERY

CANTEEN

FCR

WASTE

FIRE SERVICE WATER TANK

RWT PUMP & FILTRATION

RAIN WATER HARVEST TANK

MECH. PLANT

PS BS / GA

PS CLN

PS GS

HS GS

HS BS

HS CLN

HS ARCHIVE STORE

STAFF EOT

CIRC

RL 10300

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MEADOWBANK P-12 COLLEGE

SWEPT PATH ASSESSMENT

DRAWING NO. N147950-06-02 SHEET 02 OF 03 ISSUE P1

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ARCHITECTURAL BASE DRAWING IN BLUE
DRAWING MSP-WB-AR-DA201
REVISION 07
BY WOODS BAGOT
DATED 17.06.'19

N

NO STOPPING ZONE
7.5m WIDE TWO WAY VEHICULAR CROSSOVER TO CARPARK ENTRY
PARKING LANE
THROUGH LANE
THROUGH LANE
PARKING LANE
RHODES STREET
BUNBIE LANE
MODIFY EXISTING KERB ALIGNMENT TO ALLOW FOR BUS STOPPING AND TURNING
PROVIDE 2 NEW
PRIMARY SCHOOL ENTRANCE
PRIMARY SCHOOL OUTDOOR COVERED
SERVERY
FCR
CANTEEN
WASTE
FIRE SERVICE WATER TANK
RAIN WATER HARVEST TANK
RWT PUMP & FILTRATION
PS BS / GA
PS CLN
PS BS / GA
PS GS
HS GS
HS BS
HS CLN
HS ARCHIVE STORE
STAFF EOT
CIRC
VOID
HIGH SCHOOL COVERED OUTDOOR PLAY BELOW
COMMS
12.04 EXISTING FLOOR FINISH
RL 10300
RL 9500
RL 16300

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WARNING
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THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

DESIGNED E.YE
DESIGN CHECK D.CHOI
APPROVED BY B.MAYNARD
DATE ISSUED 13.12.'19

SCALE A3 0 1.25 2.5 5 1:250
CAD FILE NO. N147950-07-P1.DWG

MEADOWBANK P-12 COLLEGE

LAYOUT

DRAWING NO. N147950-06-03 SHEET 03 OF 03 ISSUE P1

D. SCHOOL CROSSING SIGHT LINE ASSESSMENT

D

BASE DRAWING BASED ON THE FOLLOWING DRAWING
DRAWING: MSP-EN-CV-00511
AUTHOR: ENSTRUCT
REVISION: 06
DATE: 8 OCTOBER 2019

MELLOR STREET

SIGHT LINE IMPACTED BY PARKED VEHICLES

SIGHT LINE OVERLAPS PRIVATE PROPERTY

SIGHT LINE IMPACTED BY EXISTING TREE

DESIRABLE MINIMUM STOPPING SIGHT DISTANCE
SPEED: 40 km/h
REACTION TIME: 1.5 sec

Horizontal Alignment Sight Line Report

Eye Distance From Driver's Side:	0.50 m
Eye Distance From Vehicle Front:	1.50 m
Stopping Sight Distance:	34.00 m
Interval Distance:	3.00 m

B99 6.3mR GTA

RHODES STREET

BUNBIE LANE

PRIMARY SCHOOL ENTRANCE

MACPHERSON

ON 17/02/2020 AT 2:14:38 PM

PLOTTED BY : Eric.Ye

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DESIGNED	E.YE
DESIGN CHECK	B.MAYNARD
APPROVED BY	B.MAYNARD
DATE ISSUED	17 FEBRUARY 2020
SCALE	A3
	0 X X 1:500
CAD FILE NO.	N147950-03-P4.dgn

MEADOWBANK P-12 COLLEGE

STOPPING SIGHT DISTANCE

DRAWING NO. N147950-03-01 SHEET 01 OF 03 ISSUE P4

BASE DRAWING BASED ON THE FOLLOWING DRAWING
DRAWING: MSP-EN-CV-00511
AUTHOR: ENSTRUCT
REVISION: 06
DATE: 8 OCTOBER 2019

DESIRABLE MINIMUM STOPPING SIGHT DISTANCE
SPEED: 30 km/h
REACTION TIME: 1.5 sec

Horizontal Alignment Sight Line Report

Eye Distance From Driver's Side:	0.50 m
Eye Distance From Vehicle Front:	1.50 m
Stopping Sight Distance:	22.34 m
Interval Distance:	3.00 m

MELLOR STREET
BUNBIE LANE
RHODES STREET
MACPHERSON
PRIMARY SCHOOL ENTRANCE
B99 6.3mR GTA

ON 17/02/2020 AT 2:14:40 PM
PLOTTED BY : Eric.Ye

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DESIGNED	E.YE
DESIGN CHECK	B.MAYNARD
APPROVED BY	B.MAYNARD
DATE ISSUED	17 FEBRUARY 2020
SCALE	A3
CAD FILE NO.	N147950-03-P4.dgn

0 X X 1:500

MEADOWBANK P-12 COLLEGE

STOPPING SIGHT DISTANCE

DRAWING NO. N147950-03-02 SHEET 02 OF 03 ISSUE P4

BASE DRAWING BASED ON THE FOLLOWING DRAWING
DRAWING: MSP-EN-CV-00511
AUTHOR: ENSTRUCT
REVISION: 06
DATE: 8 OCTOBER 2019

DESIRABLE MINIMUM STOPPING SIGHT DISTANCE
SPEED: 20 km/h
REACTION TIME: 1.5 sec

Horizontal Alignment Sight Line Report

Eye Distance From Driver's Side:	0.50 m
Eye Distance From Vehicle Front:	1.50 m
Stopping Sight Distance:	12.71 m
Interval Distance:	3.00 m

MELLOR STREET
MACPHERSON
BUNBIE LANE
RHODES STREET
PRIMARY SCHOOL ENTRANCE
B99 6.3mR GTA

ON 17/02/2020 AT 2:14:42 PM
PLOTTED BY : Eric.Ye

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DESIGNED E.YE
DESIGN CHECK B.MAYNARD
APPROVED BY B.MAYNARD
DATE ISSUED 17 FEBRUARY 2020
SCALE A3 1:500
CAD FILE NO. N147950-03-P4.dgn

MEADOWBANK P-12 COLLEGE

STOPPING SIGHT DISTANCE

DRAWING NO. N147950-03-03 SHEET 03 OF 03 ISSUE P4

E. COUNCIL MEETING MINUTES

Meadowbank School

Council Meeting Minutes

Project: Meadowbank Schools		
Meeting Name: Draft Travel Plan discussion		
Meeting Chair: Justin Barrett, Schools Infrastructure NSW, Senior Project Director		
Date: Friday 12 April 2019	**Time:** 1:30 pm to 2:30 pm	
Location: The Binary Centre, 3 Richardson Place North Ryde - Meeting Room NRO L1 Woolwich		
Purpose: Discussion with Council regarding the travel management of the Meadowbank Education Precinct.		
Attendees:		
Name	**Organisation**	**Initials**
Justin Barrett	Schools Infrastructure NSW - Senior Project Director	JB
Karissa Kendall	Schools Infrastructure NSW - Associate Project Director	KK
Rebecca Lehman	Frank Turquoise Group - Director Strategic Planning	RL
Wayne Rylands	City of Ryde Council - Director City Works	WR
Dyalan Govender	CoR - Manager Urban Strategy	DG
Charles Mahfoud	CoR - Manager Civil Infrastructure & Integration	CM
Kelly Yoon	CoR - Acting Manager Traffic, Transport and Development	KY
Sanju Reddy	CoR - Senior Coordinator Building & Development Advisory Service	SR
Alaine Roff	Urbis, Town Planning Consultant - Associate Director	AR
Brett Maynard	GTA Consultants, Transport Planners - Director	BM
Chris Savva	Woods Bagot, Head Design Consultant - Senior Associate	CS
Ian Downes	blueVisions - Senior Project Manager	ID
Joelle Jello	blueVisions - Assistant Project Manager	JJ
Apologies:		
Steve Holden	blueVisions - Project Director	SH

Circulation:	**Date:**
All attendees and apologies.	16/04/2019

Attachments:

- Meadowbank School – 190412 Council of Ryde

Item	Description	Action By	Date
1.	**Welcome and Commencement**		
1.1.	**Introduction**		
1.1.1.	Apologies listed on the front page	Note	-
1.1.2.	RL highlighted the below key recommendations from the Greater Sydney Commission's Stage 1 Findings on the Assurance Review of Planning in the Ryde LGA: • Establish a Ryde LGA coordination group • Complete Macquarie park Investigation Area Master Plan • Masterplan additional sites to complement existing residential development – specifically Meadowbank Education Precinct. • Review Local Planning Controls	Note	-
1.2.	**Briefly present the project and draft Travel Plan proposal**		
1.2.1.	Key considerations for the Meadowbank Education Precinct include: • Regional Route 01 (RR01) • Pedestrian link from station through TAFE • TAFE multi-trade hub • Pick up/drop off options • Local bicycle and pedestrian infrastructure • Rail corridor crossing.	Note	-
1.2.2.	RL's presentation is summarized as follows: • The education precinct will trigger higher travel demand in the area which calls for the need of more sustainable travel arrangements such as walking, biking, and public transport. • A benchmarking study has been conducted to identify an appropriate parking ratio for new and upgraded school precincts. • Residential catchment: ○ The current status, around 338 students are within the school walking catchment and around 546 students are within the bicycle catchment. ○ Parents are not considering walking as an option for their kids as it is unsafe with the number of cars and not enough crossings. ○ SSTS scheme provides students with access to an Opal card for 2 public transport trips (to and from school). 79% of students live within 10-minute walk of public transport; however, 47% are ineligible for the SSTS. The SSTS must be	Note	-

revisited.
    - The travel demand needs to accommodate the new catchment areas: many Marsden High School students are coming from the other side of the railway line; students also need to be able to walk safely at least to Victoria Rd and catch the bus to the school.
- Transport catchment:
    - The footpath network is severed at each intersection, and in some cases, there may not be footpaths.
    - The bicycle network is incomplete.
    - Staff are ineligible for the SSTS and many students live too close to qualify for the SSTS.
- Data sources for the staff and student journey to school show the different modes each person currently uses. The GTA travel survey shows that 75% of the staff drive to school while the Aurecon travel survey reveals that 63% of staff drive to the school.
- It is considered that if a parent is driving to work, they tend to drop off their kids before they go to work and if they catch public transport themselves, they take their kids either via public transport or walking to school.
- There is a high rate of students that are dropped off, this either requires a review of kerb space for drop off and pick up or a change in infrastructure and programs to change travel behavior.
- Working based on the “predict and provide” model for car parking:
    - Development Control Plan requires 1 car space per 2 employees and 1 space per 10 students over age of 17. This results in 86 car spaces on day 1 and would require 135 at full occupancy (end state) for the Meadowbank School. SINSW don’t provide student parking therefore this results in a reduced requirement of 72 on day 1 and 110 at full occupancy.
    - The City of Ryde’s Integrated Transport Strategy includes many Meadowbank initiatives and infrastructure, including managing car parking.
    - If all future parking we predict is to be provided, there will be nearly 1:1 car space for staff. This will not change the travel behavior and the parking demand will grow.
- “Decide and provide” access modes:
    - Analysis: when organisations provide parking space for employees, the parking reaches its capacity fast and overflow parking occurs in the

	surrounding residential areas. ○ When on-site parking is restricted and on-street parking management is in place, staff use other transport modes, including active and public transport and car pooling. This is the foundation of the "decide and provide model". ○ Current study is suggesting 72 car spaces for as the school will not be fully occupied on day 1. The level of traffic to the school needs to be managed and students and staff encouraged to use other travel modes. ○ For staff and students, new infrastructure and transport programs are required to increase active transport, public transport and car pooling use. Infrastructure and operations include new footpaths plus crossings, new bicycle infrastructure, new bus routes to Marsden, and more Victoria Rd bus services. ○ Programs include promotion of active transport, expanded access to SSTS, staff car pool matching program and walking, scooting and bicycle riding training for students. • Barriers to walking and bicycle riding: ○ Crossing Victoria Road ○ Impermeable rail line ○ Pedestrian network deficiencies: ▪ Incomplete footpath network ▪ No pedestrian crossings ▪ Topography ○ Bicycle network deficiencies: ▪ Incomplete bicycle network ▪ Topography ○ Barriers to access nearby public transport. ▪ Pedestrian access to Victoria Rd buses ▪ Buses to Marsden residential area		
1.3.	**Update re infrastructure and planning context, incl budget or community priorities**		
1.3.1.	PAMPs (both Meadowbank and West Ryde): • DG advised that the items in the PAMPs are funded by 7/11 contributions. • DG also highlighted that the PAMPs were developed with no allowance for a school of this size in the area.	Note	-
1.3.2.	CoR Integrated Transport Strategy Key Policy Position LU 4.1 – *Investigate reduced or maximum parking rates* is scheduled for completion by the end of 2020 and a position on this will follow.	Note	-

1.3.3.	Key Policy Position PK1.1 – *Develop a Parking Classification Scheme and Parking Classification Map* – DG advised that the parking classification for Rhodes Street is not changing as it was managed as an industrial area and was not planned for a school. DG also highlighted that the preference is not to have a primary school in that area as Council had in mind to keep it as a light industrial area.	Note	-
1.3.4.	DG advised that the LEP is being reviewed, with the review to be completed by 2021.	Note	-
1.3.5.	CoR advised that their aim is to preserve the industrial land in that area and to encourage any industrial type of work to occur there.	Note	-
1.3.6.	BM to forward the traffic modelling to KY. KY advised that there are some adjustments to the SEARs. KY to issue a copy of the updated letter from CoR that informed these adjustments.	BM & KY	17/04/2019
1.3.7.	RL to contact KY to discuss the remaining items on the integrated transport strategy. KY to share other parking and traffic issues with the team as most of the upgrades are on the north side of Constitution Rd.	RL	12/04/2019
1.4.	**Other Business**		
1.4.1.	Flooding works: • CM advised he is responsible for civil infrastructure and integration works at CoR. CM questioned how the team addressed flooding issues. • CS advised that the SEARs has been followed and flood modelling has been completed on the site, based on CoR flood modelling.	Note	-
1.4.2.	WR advised that modifications including the requirement for installation of traffic signals at the intersection of Constitution Rd and Bowden St are the subject of consent conditions currently in place for an existing development approval. A dispute is in progress between Council and the Applicant which is yet to be resolved. BM confirmed that traffic modelling for the school assumes that signals are in place on the basis of this requirement.	Note	-
1.5.	**Meeting Closed at 2:30 pm**		
	Minutes drafted by JJ and reviewed by ID/RL/KK		

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