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VICTORIA ROAD PRECINCT REZONING PROPOSAL PRELIMINARY TRAFFIC AND TRANSPORT ASSESSMENT



DANIAS HOLDINGS PTY LTD

VICTORIA ROAD PRECINCT REZONING PROPOSAL

Preliminary Traffic and Transport Assessment

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This report has been prepared for Danias Holdings Pty Ltd in accordance with the terms and conditions of appointment for Victoria Road Precinct Rezoning Proposal dated 5 March 2014. Hyder Consulting Pty Ltd (ABN 76 104 485 289) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

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1 Introduction

1.1 Study Purpose

The following document provides a Preliminary Traffic and Transport Study (hereafter referred to as “the Study”) of a proposal to rezone land within the Victoria Road Precinct to permit development for mixed business and residential purposes under the Marrickville Local Environmental Plan (LEP) 2012. The Study has been commissioned by Danias Holdings Pty Ltd., one of the major landowners of properties within the Victoria Road Precinct.

In the course of preparing this report, relevant documents of the proposal have been reviewed and potential traffic impacts on the road network have been assessed. The Study identifies potential issues and makes recommendations on how to minimise impacts from rezoning proposal.

The overall outcome of the Study is a Traffic and Transport assessment which determines the impact on the strategic road network arising from the proposed rezoning proposal at Victoria Road Precinct.

1.2 Background

E & D Danias Pty Ltd and a number of land owners within the Victoria Road Precinct are seeking to rezone the existing industrial area within the Victoria Road Precinct from the current IN1 General Industrial zoning to a zoning suitable for the redevelopment of the site for a mixed use development including medium/high density residential, ‘neighbourhood retail’, commercial and industrial uses.

Following further meetings with Council and the NSW Department of Planning and Environment (DP&E), Council advised that it will consider revised planning controls for the precinct and that the proponent submit a planning proposal for the Precinct. Council further stated that it supports pursuing the Victoria Road Precinct proposal jointly and cooperatively with the Department of Planning through the Gateway process.

As part of the “Gateway” process for this Planning Proposal, a traffic, transport and access study is required to address the principles of integrated transport planning, explore alternative methods of transport and determine capacity of the local road network and any upgrades required.

Hyder Consulting Pty Ltd (Hyder)’s Study has assessed traffic impact from potential development capacity of 36 hectares of land identified in the Planning Proposal.

This report forms the traffic and transport element of the Victoria Road Precinct Planning Proposal.

1.3 Study Aims and Objectives

The main purpose of Hyder’s Study is to assess traffic and transport impact of the proposed site and provide mitigation measures where required. Traffic modelling results were used to determine impact on road network from proposed rezoning. The current study is to determine urban capability of the site. No specific timeframe has been established yet as to the phasing and timing of the proposed development.

Key objectives include:

- Identify traffic and transport issues that the proposed rezoning is likely to experience;

- Identify accessibility of the site considering bus services, bicycle and pedestrian infrastructure;
- Predict and assess additional traffic generated by the proposed development, based on RMS's Guide to Traffic Generating Developments (2002) and in agreement with the Roads and Maritime Services (RMS); and
- Identify appropriate traffic management and network improvements to support the Victoria Road Precinct development.

1.4 Study Area

The Victoria Road Precinct is located approximately 6 km south-west of the Sydney CBD within the Marrickville Local Government Area. It consists of properties forming 36 hectares of development area and is bounded by Sydenham Road to the south, Fitzroy Street to the east, Edinburgh and Addison Road to the north and sections of Illawarra Road, Shepherd Street to the west (boundaries illustrated in Figure 1-1).

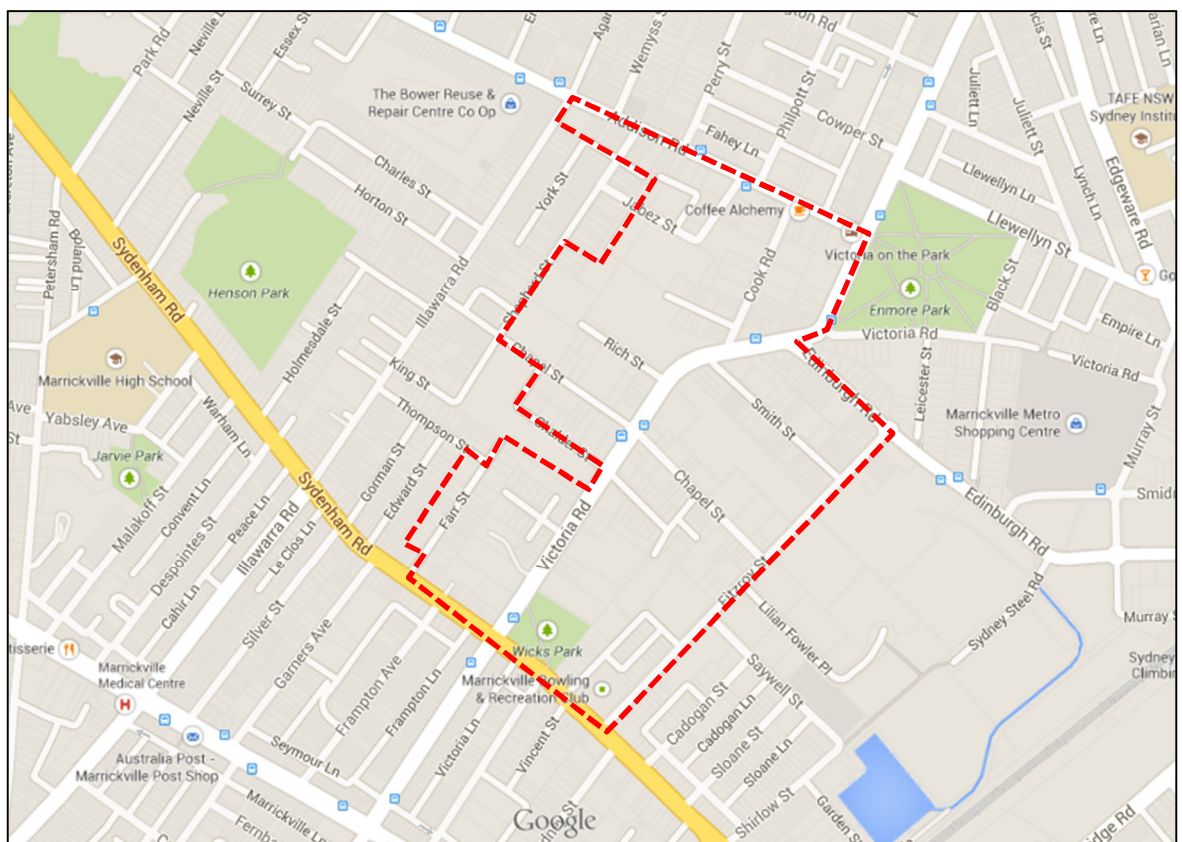


Figure 1-1 Study Area

1.5 Report Structure

The remainder of this report is structured as follows:

- Chapter 2: Existing Condition – overview of the existing conditions regarding the road network, public transport, Journey to Work data and pedestrian and cycle network. The results from traffic survey are summarised in this section.

- Chapter 3: Traffic and Transport Assessment – outlines the traffic generating potential of the development proposal, identifies access to and from site, describes its impact to road network and outlines mitigation measures on Victoria Road.
- Chapter 4: Summary of Findings – the summary of findings from traffic investigation.

2 Existing Conditions

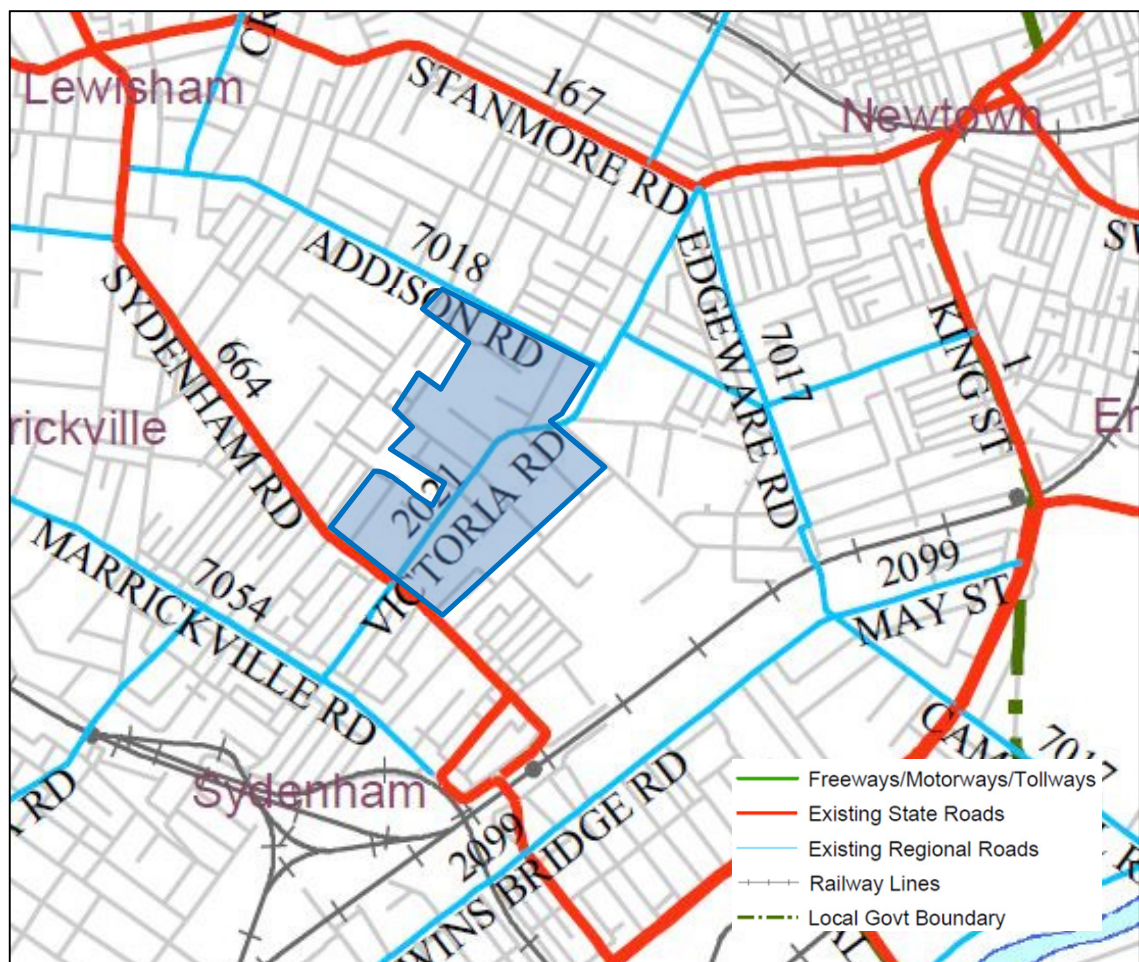
2.1 Road Hierarchy and Network

The precinct is mainly accessible via Sydenham Road at its southern boundary and Victoria Road, which forms a north-south spine through the study area.

Sydenham Road is a State Road connecting Stanmore Road at its northwest end to Princes Highway at its southeast end.

Stanmore Road provides an east-west connection between Petersham and Enmore and links up to the Princes Highway at Newtown. Further east, the Princes Highway connects to City Road that leads on to the Sydney CBD. West of Petersham, Stanmore Road becomes Canterbury Road leading all the way to Bankstown in the southwest region.

Victoria Road is a Regional Road from Marrickville Road to Stanmore Road. It is a two-lane two way sealed road with kerb and gutter on both sides. Parallel parking is generally permitted on both sides but includes certain time restrictions to allow clearway conditions. The centreline and lane designations are marked and the posted speed limit on Victoria Road is 60 km/h.

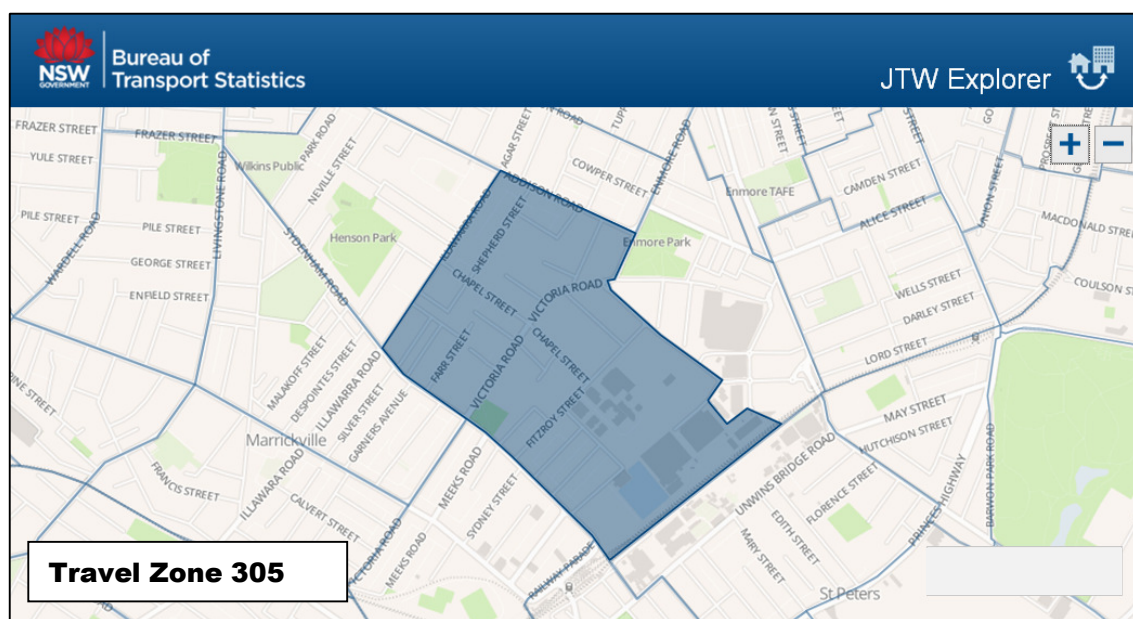


Source: Roads and Maritime Services

Figure 2-2 Road Network Hierarchy

2.2 Journey to Work Data Analysis

The study area is contained within travel zone 305 as defined in the 2011 Census Journey to Work (JTW) data. An analysis of the data shows that around 62% of work trips for those working and living in the Precinct are undertaken by private transport.



Source: Bureau of Transport Statistics, JTW 2011

Figure 2-3 2011 JTW Travel Zone

Table 2-1 below shows the modal share of work trips for employed residents in the travel zone. It shows that only 29% of trips were undertaken by public transport (train and busses) within the travel zone showed in Figure 2-3. About 48% of trips were taken by private cars (both as drivers or passengers).

Table 2-1 Mode of Travel (Top 10 Destinations of Work)

Place of Work	Number of Trips	Car	Public Transport	Other	Total
Sydney Inner City	149	37%	45%	18%	100%
Marrickville-Sydenham-Petersham	59	31%	0%	69%	100%
Botany	21	86%	14%	0%	100%
Eastern Suburbs – South	18	61%	39%	0%	100%
North Sydney – Mosman	15	73%	27%	0%	100%
No fixed place of Work	15	40%	0%	60%	100%
Bankstown	14	64%	0%	36%	100%
Leichhardt	8	63%	38%	0%	100%

Place of Work	Number of Trips	Car	Public Transport	Other	Total
Strathfield – Burwood – Ashfield	7	100%	0%	0%	100%
Parramatta	7	57%	43%	0%	100%
Combined Percentage		48%	29%	23%	100%

Source: Bureau of Transport Statistics, JTW 2011

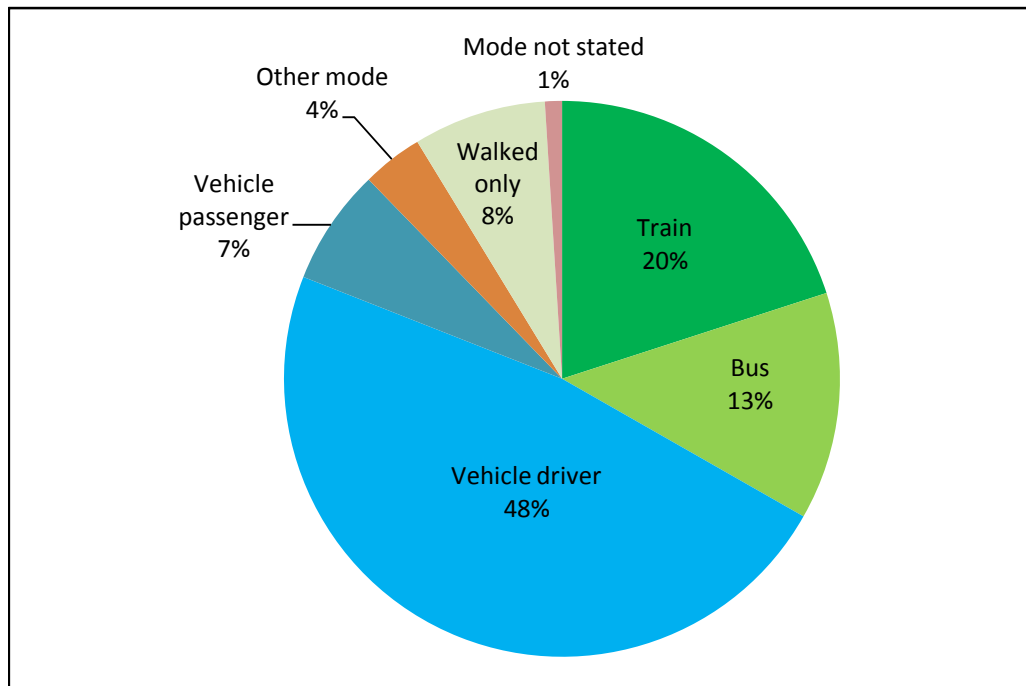


Figure 2-4 Travel Mode Split (JTW for Travel Zone 305 as an Origin)

Table 2-2 below shows the modal share of work trips for employed people working in the travel zone. It shows that only 18% of trips were undertaken by public transport (train and busses) within the travel zone showed in Figure 2-3.

Table 2-2 Mode of Travel (Top 10 Places of Origins of Workers in Travel Zone)

Place of Residence	Number of Trips	Car	Public Transport	Other	Total
Canterbury	446	76%	17%	7%	100%
Marrickville-Sydenham-Petersham	396	45%	12%	43%	100%
Strathfield-Burwood-Ashfield	311	63%	24%	13%	100%
Kogarah-Rockdale	301	70%	22%	8%	100%
Hurstville	253	71%	20%	9%	100%

Place of Residence	Number of Trips	Car	Public Transport	Other	Total
Sydney Inner City	191	54%	29%	17%	100%
Bankstown	172	70%	22%	8%	100%
Eastern Suburbs – South	126	79%	11%	10%	100%
Cronulla-Miranda-Caringbah	119	83%	5%	12%	100%
Eastern Suburbs - North	99	79%	13%	8%	100%
Combined Percentage		73%	19%	8%	100%

Source: Bureau of Transport Statistics, JTW 2011

In terms of travel mode split for JTW to travel zone 305 as a destination, Figure 2-5 shows that 73% of people working in the study area use car (as driver and as passenger) as the mode of travel.

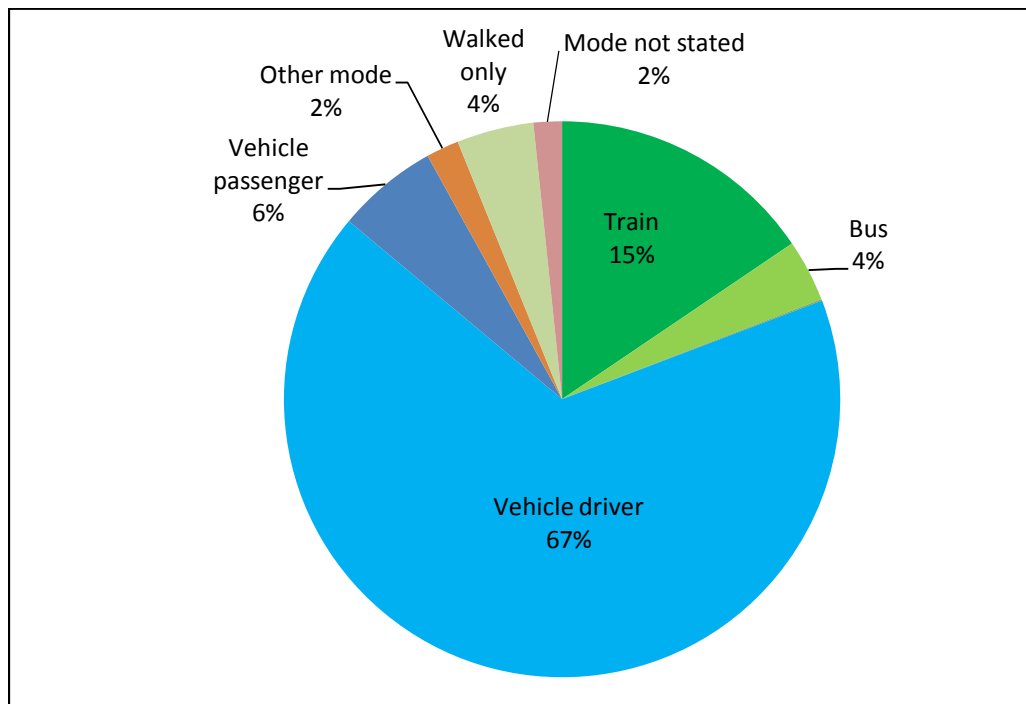


Figure 2-5 Travel Mode Split (JTW for Travel Zone 305 as a Destination)

2.3 Existing Public Transport Network

2.3.1 Bus Services

Victoria Road Precinct is accessible by public bus service. A summary of existing services is provided in Table 2-3. The table shows all bus services that run along Victoria Road including route number, route description, operating hours and service frequency during the AM and PM peak hour.

Key destination to the north-east is the Sydney CBD, west is Dulwich Hill and Canterbury, east is Alexandria and Bondi Junction, and southwest is Kingsgrove.

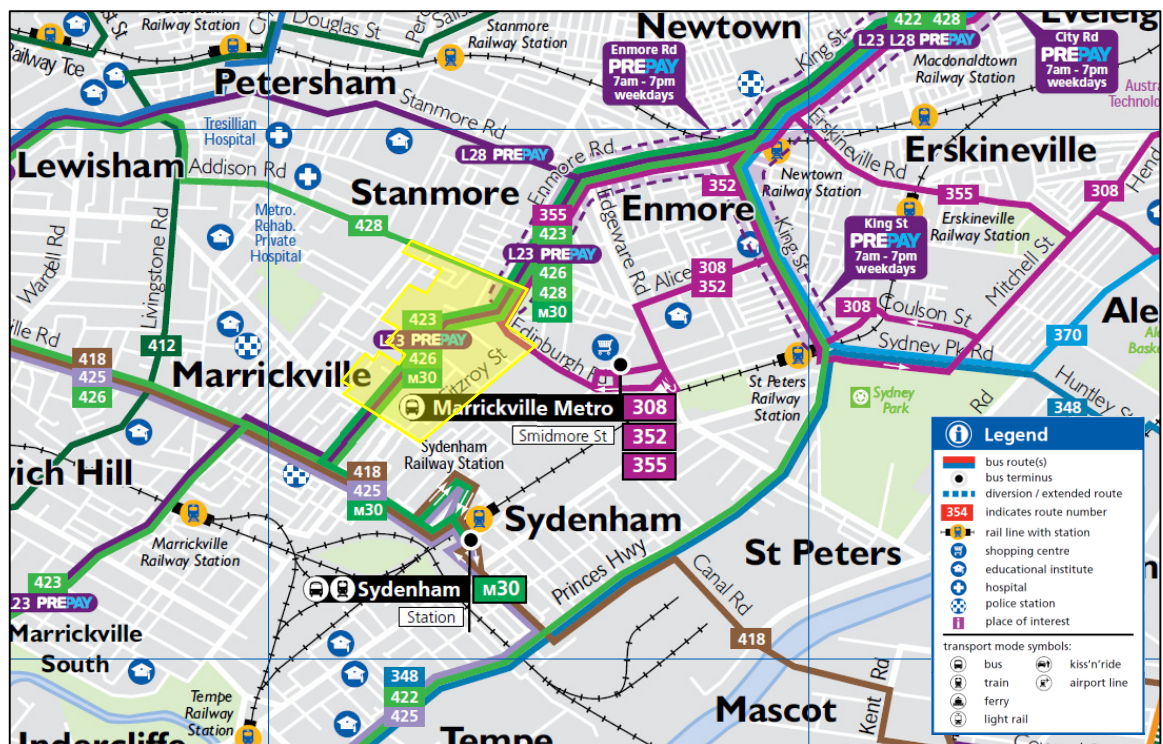
Table 2-3 lists the bus routes servicing the key road corridors in the study area and Figure 2-6 shows the regular bus network servicing the Victoria Road Precinct.

Table 2-3 Current Bus Service Frequency, 2013

Bus Route	Route	Route Description	Service Frequency
Victoria Road Corridor			
423	Kingsgrove to City	Kingsgrove Depot, Earlwood, Undercliffe, Marrickville, Enmore, Newtown, Sydney Uni, Railway Square, Town Hall, Wynyard and Circular Quay	Weekday: every 10 mins peak, 15 mins off-peak Weekend: every 20 mins
426	Dulwich Hill to City	Dulwich Hill, Marrickville, Enmore, Newtown, University of Sydney, Railway Square, Town Hall, Wynyard and Circular Quay	Weekday: every 10 mins peak, 15 mins off-peak Weekend: every 20 mins
L23 Prepay	Kingsgrove to City	Kingsgrove Depot, Earlwood, Undercliffe, Marrickville, Enmore, Newtown, Sydney Uni, Railway Square, Town Hall, Wynyard and Circular Quay	Limited stops, Peak Hour Service Weekday: every 10 mins
M30	Sydenham to Mosman	Sydenham, Newtown, Sydney CBD and Neutral Bay and Mosman	Weekday: every 10 mins peak, 15 mins off-peak Weekend: every 20 mins
Sydenham Road Corridor			
418	Burwood to Bondi Junction	Burwood, Croydon, Ashfield, Hurlstone Park, Dulwich Hill, Marrickville, Sydenham, Mascot, Rosebery, Kingsford, Randwick, Queens Par and Bondi Junction	Weekday: every 20 mins peak, 30 mins off-peak Weekend: every 30 mins
425	Dulwich Hill to Tempe	Dulwich Hill, Marrickville, Sydenham and Tempe	Limited stops, Peak Hour Service Weekday: every 30 mins
M30	Sydenham to Mosman	Sydenham, Newtown, Sydney CBD and Neutral Bay and Mosman	Weekday: every 10 mins peak, 15 mins off-peak Weekend: every 20 mins
Addison Road Corridor			
428	Canterbury to City	Canterbury, Dulwich Hill, Petersham, Enmore, Newtown, University of Sydney, Railway Square, Town Hall, Wynyard and Circular Quay	Weekday: every 10 mins peak, 15 mins off-peak Weekend: every 20 mins

Bus Route	Route	Route Description	Service Frequency
Edinburgh Road Corridor			
308	Marrickville Metro to City	Marrickville Metro, Newtown, Erskineville, Alexandria, Redfern, Surry Hills, Haymarket and Sydney CBD	Weekday: every 22 mins peak, 30 mins off-peak Weekend: every 30 mins
352	Marrickville Metro to Bondi Junction	Marrickville Metro, Newtown, Chippendale, Surry Hills, Darlinghurst, Paddington, Woollahra and Bondi Junction	Limited Service Weekday: every 20 mins peak, 30 mins off-peak Weekend: every 30 mins
355	Marrickville Metro to Bondi Junction via Alexandria	Marrickville Metro, Enmore, Newtown, Erskineville, Alexandria, Waterloo, Redfern, Surry Hills, Moore Park and Bondi Junction	Limited Service Weekday: every 30 mins peak, 30 mins off-peak Weekend: every 30 mins
M30	Sydenham to Mosman	Sydenham, Newtown, Sydney CBD and Neutral Bay and Mosman	Weekday: every 10 mins peak, 15 mins off-peak Weekend: every 20 mins

Source: Transport Info, TfNSW



Source: Transport Info, TfNSW

Figure 2-6 Bus Network

There are four (two on each side) bus stops along Victoria Road between Sydenham Road and Edinburgh road. Except for the bus stop near Chapel Street on the southbound direction, the three other bus stops are sheltered bus stops.

2.3.2 Rail Services

A number of railway stations are located within the Marrickville local government area. The closest railway station to the Precinct is the Sydenham Rail Station located approximately 500m to the south of the Precinct. Sydenham Station is serviced by a total of three suburban lines and two intercity lines.

- The Inner West line goes from Liverpool to the City via Revesby, stopping at Sydenham station
- The Bankstown line – Liverpool to Sydney CBD via Bankstown stopping at Dulwich Hill, Marrickville and Sydenham stations
- Eastern Suburbs/Illawarra Line goes from Waterfall or Cronulla to Bondi Junction via Wolli Creek and Town Hall
- South Coast Line
- Southern Highlands Line



Source: Transport Info, TfNSW

Figure 2-7 Suburban Rail Network

Sydenham Station has a high frequency of service owing to the number of lines servicing the station. Other stations like Dulwich Hill, Marrickville and St Peters operate on a frequency of one train approximately every 15 minutes during weekday commuter periods and every 30 minutes at other times. The rail frequency for key commuter peaks and week end periods are outlined below in **Table 2-4**.

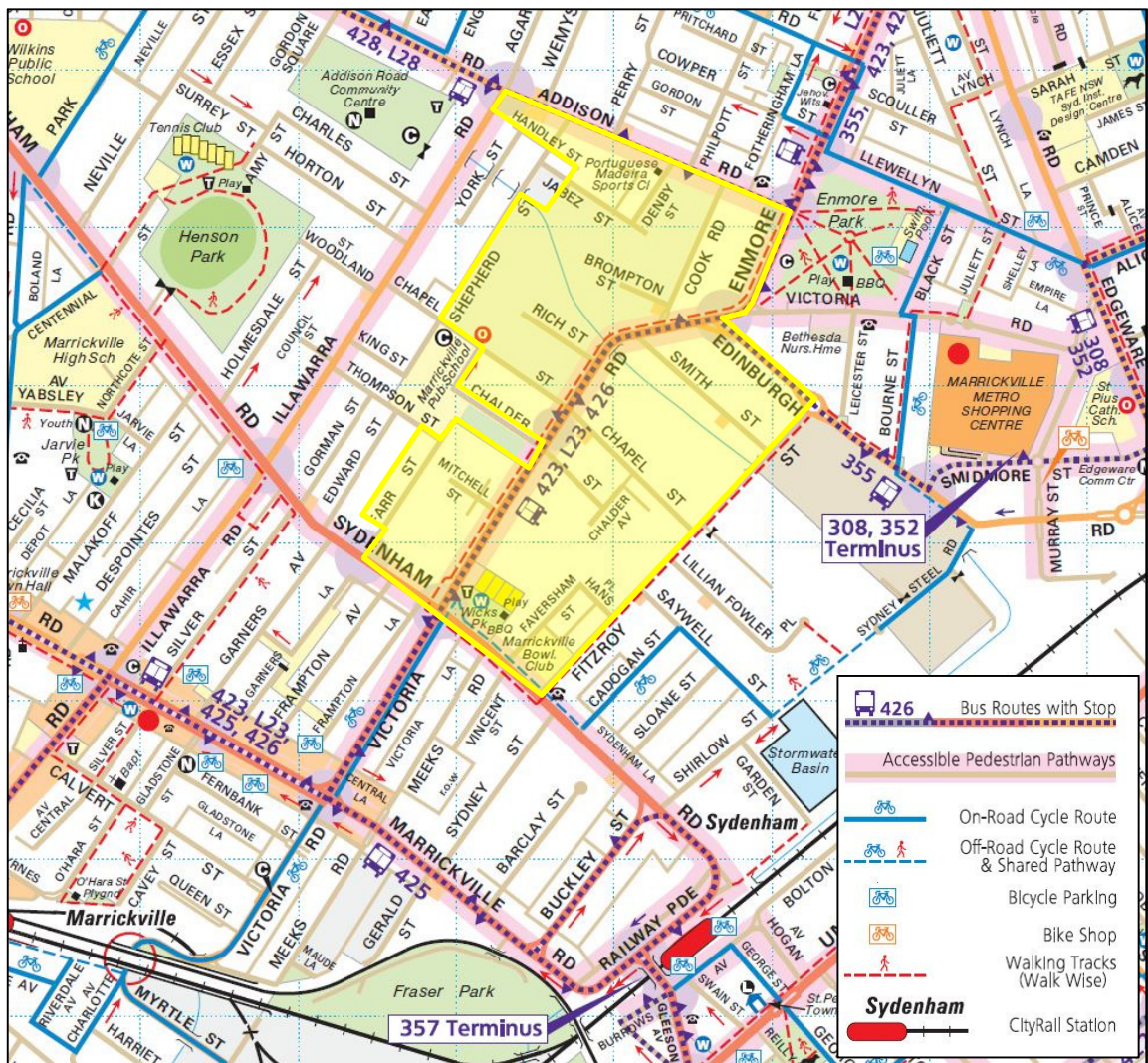
Table 2-4 Current Peak Hour Rail Service Frequency, 2013

Service at Sydenham Station	Weekday		Weekend	
	AM Peak 7:30 to 8:30	PM Peak 17:00 to 18:00	AM Peak 10:00 to 11:00	PM Peak 18:00 to 19:00
To Central	20	11	8	8
From Central	10	7	8	8

Source: www.transportnsw.info

2.4 Pedestrian and Cyclist Network

Walking and cycling infrastructure in the vicinity of the precinct is in the form of shared pathways alongside the road corridors. See Figure 2-8.



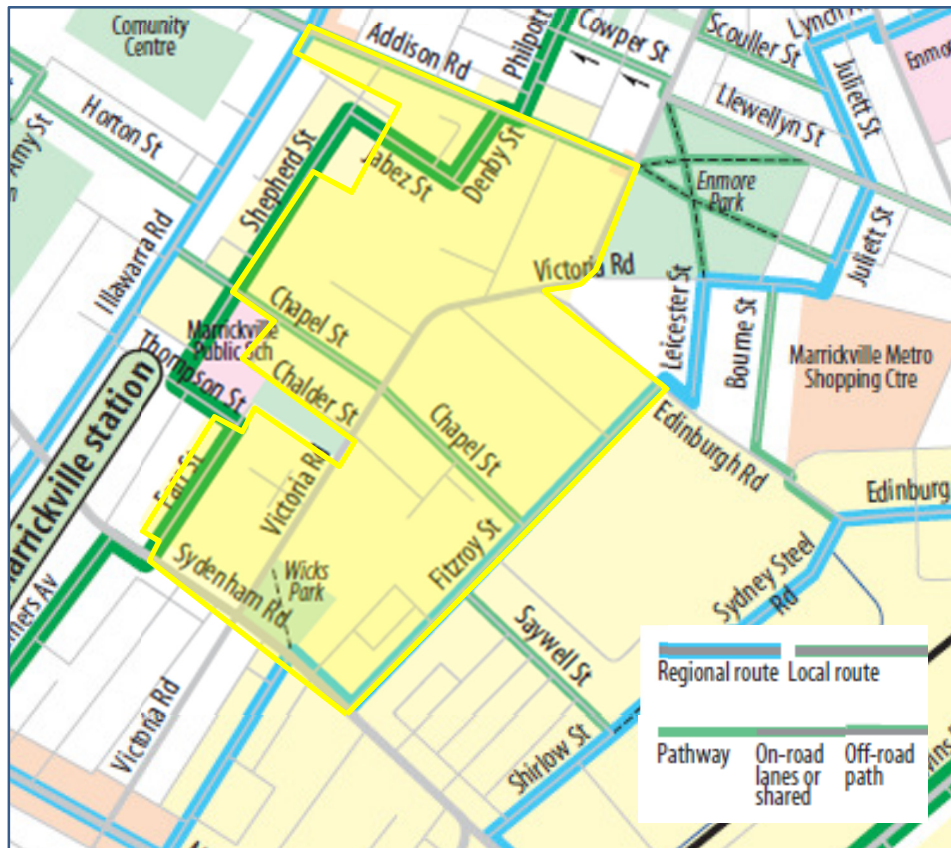
Source: Marrickville Council Stay Active Map

Figure 2-8 Pedestrian and Cycle Network in the vicinity of the Study Area

In 2007, Marrickville Council adopted the Marrickville Cycling Plan. The Plan identified 12 Regional Routes (RR) and 20 Local Routes (LR) across the Marrickville LGA. Two LL and 2 RR provide cycle access to and through the Precinct.

Figure 2-9 shows a local route is defined along the western fringe of the Precinct linking the residential areas in and around Enmore (via Shepherd Street and Farr Street) to Marrickville Station and Town Centre and along Chapel Street from Fitzroy Street to Illawarra Street. Regional routes are also defined close to the Precinct along Illawarra Road and Fitzroy Street.

The cycle routes located within the Precinct are essential to develop the cycle network to facilitate the movement of cyclists through the development area. At this stage, Council has yet to implement the measures identified in the Plan.



Source: Marrickville Council Cycle Plan Map

Figure 2-9 Marrickville Cycle Plan, 2007

2.5 Parking

Parking in the Precinct is provided by on-street parking and off-street parking facilities for some properties. The Marrickville DCP 2011 has defined three categories for parking area standards based on accessibility. The precinct lies within the area designated as Parking Area 2 location which denotes that the area is moderately accessible. This implies that the parking rates that apply to the properties fall between the most constrained (Parking Area 1) and the least constrained (Parking Area 3). Along the stretch of Victoria Road, on-street parking is generally permitted on both sides but with restrictions during the 7-9 AM clearway time period. At present a number of business and industrial sites do not provide any or sufficient on-site parking as evidenced by heavily utilisation of on-street parking and use of kerb areas for parking and business loading dock purposes. Currently, due to the shortage of parking on site, some businesses park across the pedestrian footpaths

2.6 Crash Data Analysis

This assessment is based on the crash data supplied by the RMS for five year period from July 2008 to June 2013. Crash data between 2008 and 2013 indicates that about 133 crashes occurred on Victoria Road between Sydenham Road and Stanmore Road. No fatal crashes were recorded on this section of Victoria Road.

Table 2-5 Crash Data summary

Location	Total Number of Crashes	Fatal Crashes	Injury Crashes	Non-Injury Crashes	Casualties		
					Killed	Injured	Total
Victoria Road	133	0	77	56	0	92	92

Source: Roads and Maritime Services Crash Data

Figure 2-10 shows the number of crashes by crash type that occurred on Victoria Road. The crash data showed that “intersection, adjacent approaches” crashes dominated on Victoria Road (21.8%). This was followed by “rear-end” crashes (19.5%) and “opposing vehicles, turning” crashes (15.0%). Pedestrians were involved in 12.5% of the crashes.

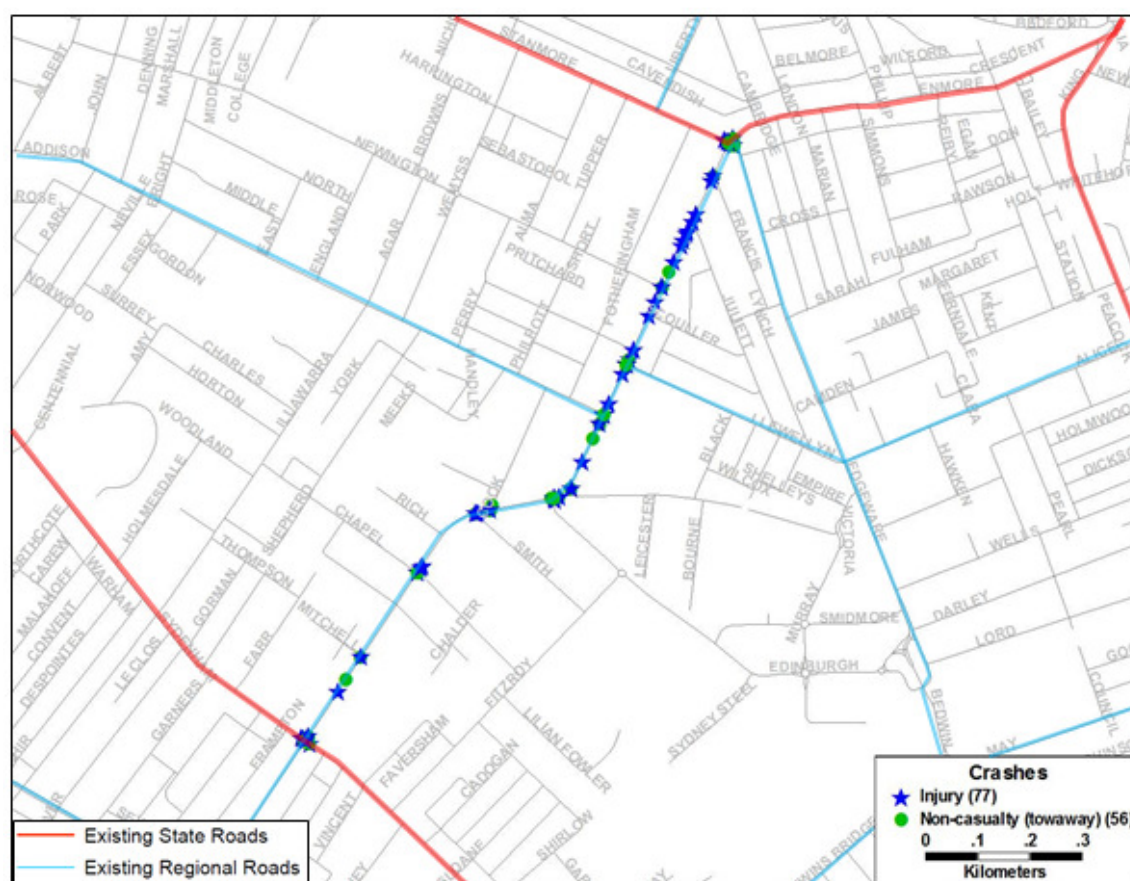


Figure 2-10 Type of Crashes on Victoria Road

2.7 Traffic Data

Intersection volume counts were undertaken at three key intersections along Victoria Road. The survey was undertaken on a regular weekday, Wednesday, 2nd April 2014. The intersection counts were collected for both morning (6:30am to 9:30am) and evening (3:30 pm to 6:30pm) peak periods.

Table 2-5 summarises the corresponding locations.

Table 2-6 Traffic Survey Locations

ID	Location
I-1	Sydenham Road – Victoria Road
I-2	Victoria Road – Chapel Street
I-3	Victoria Road – Rich Street

From the surveys, the peak volumes occurred during the hours listed in Table 2-7. The turning movements at the three intersections are shown graphically in Figure 2-11 for AM and PM peak traffic conditions.

Table 2-7 Observed Peak Hour

ID	Location	AM Peak	PM Peak
I-1	Sydenham Road – Victoria Road	7:45-8:45	4:30-5:30
I-2	Victoria Road – Chapel Street	8:15-9:15	3:30-4:30
I-3	Victoria Road – Rich Street	8:15-9:15	3:30-4:30

The following observations were derived:

- Peak directional flow on Victoria Road during the AM peak is northbound. The opposite was observed for the PM peak.
- Peak directional flow on Sydenham Road is eastbound during the AM peak period and westbound during the PM peak period.
- There is a heavy left turn traffic from Sydenham Road west onto Victoria Road northbound in the AM peak and the opposite (right turn from Victoria Road north onto Sydenham Road west) was observed for the PM peak.
- The dominant movement from Chapel Street at the intersection with Victoria Road is the left turning movement from Chapel Street west northbound on Victoria Road. This was observed for both the AM and PM peak periods.
- From Chapel Street east, the dominant movement at the intersection is the left turning movement onto Victoria Road southbound for both the AM and PM peak periods.
- At the intersection of Rich Street with Victoria Road, inbound traffic to Rich Street are equally distributed between the north and south while outbound traffic tend to travel northbound

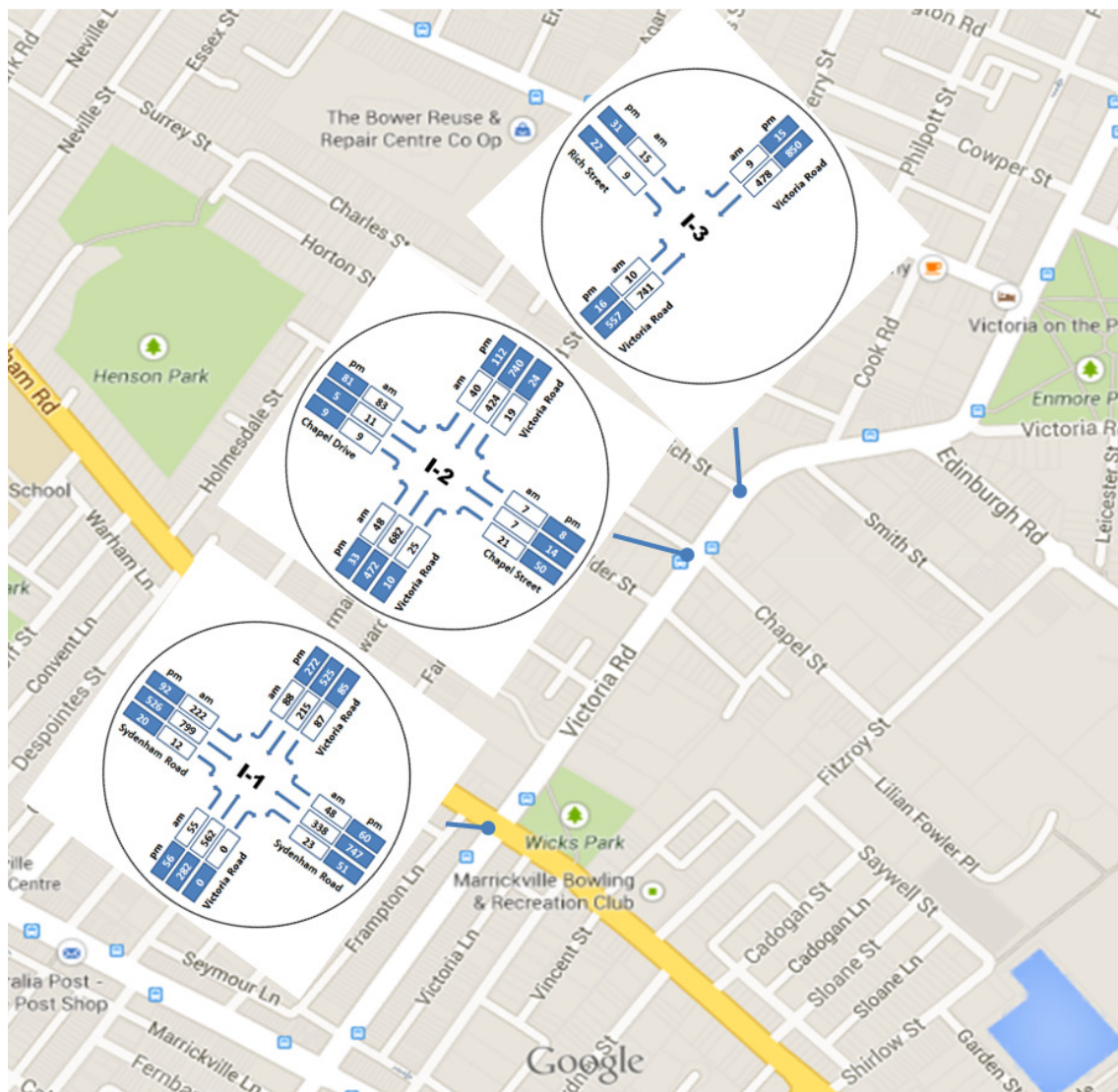


Figure 2-11 AM and PM Peak Hour Volumes

2.8 Network Performance Indicators

Network performance is best described by the indicators of Level of Service (LoS), Average Vehicle Delay (AVD) and the Degree of Saturation (DS) during peak hours. The intersection performance indicators adopted in this assessment, are presented below.

2.8.1 Intersection Capacity

The Level of Service criteria set by the Roads and Maritime Services (RMS)¹ is outlined in Table 2-8. In analysing intersection performance, a Level of Service “D” or better is generally acceptable to the RMS.

¹ Guide to Traffic Generating Developments, RMS 2002

Table 2-8 Level of Service Criteria for Intersections

Level of Service	Average Delay (seconds/vehicle)	Traffic Signals, Roundabout	Give Way and Stop Signs
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	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals incidents will cause excessive delays	At capacity, requires other control mode
F	More than 70	Roundabouts require other control mode	

Source: *Guide to Traffic Generating Developments, RMS 2002*

The RMS's guideline has recommended that with roundabout, Stop and Give Way sign control intersections, the LoS value is determined by the critical movement with the highest delay per vehicle. With this type of intersection control, some movements suffer high levels of delay while other movements have minimal delay.

Average Vehicle Delay (AVD)

AVD is a measure of the operational performance of a road network or an intersection. AVD is determined globally over a road network or within a cordon during an assignment model run. The AVD exhibited on comparable network models, for analogous peak periods, forms the basis of comparing the operational performance of the road network.

AVD is used in the determination of an intersection's Level of Service. Generally, the total delay incurred by vehicles through an intersection, is averaged to give an indicative delay on any specific approach. Longer delays do occur but only the average over the peak hour period is reported.

Degree of Saturation (DS)

The Degree of Saturation (DS) of an intersection is usually taken as the highest ratio of traffic volume on an approach to the intersection, compared with its theoretical capacity and is a measure of the utilisation of available green time. The DS reported is generally of a critical movement through the intersection, rather than the DS of the intersection, unless equal saturation occurs on all approaches.

For intersections controlled by traffic signals, generally both queue length and delay increase rapidly as DS approaches 1.0. An intersection operates satisfactorily when its DS is kept below 0.875. Degrees of saturation above 1.0 represent oversaturated conditions when demand exceeds capacity. When the DS exceeds 0.9, extensive queues can be expected.

Three key intersections were assessed for existing operational performance using SIDRA Intersection Analysis. . SIDRA Intersection calculates the amount of delay experienced by vehicles using an intersection, and gives a Level of Service rating which indicates the relative

performance of that intersection with regard to the average delay (in seconds per vehicle) experienced by vehicles at the intersection. The results are summarised in Table 2-9.

Table 2-9 Intersection Level of Service

Int ID	Intersection	Control	AM			PM		
			DOS	LOS	Ave Delay (sec)	DOS	LOS	Ave Delay (sec)
I-1	Sydenham Road – Victoria Road	Signals	0.61	B	28.1	0.68	C	31.5
I-2	Victoria Road – Chapel Street	Give Way/ Stop	1.0	F	>200	>1.0	F	>200
I-3	Victoria Road – Rich Street	Give Way	0.61	F	>200	>1.0	F	>200

The modelling results indicate that the signalised intersection of Sydenham Road/ Victoria is performing at a satisfactory level of service and may still have some spare capacity to accommodate additional traffic.

For both the Chapel Street/Victoria Road and Rich Street/Victoria Road intersections, the poor performance is attributed to the delays experienced by vehicles on the minor roads to turn or cross vehicles on Victoria Road. The above modelling assumes 'ideal' gap acceptance values for approaching vehicles from a minor road. In reality, some drivers tend to be more aggressive and will attempt to enter the intersection with lower gap acceptance values. The heavy flow on Victoria Road compared to vehicle volumes from Chapel Street or Rich Street limits the ability for vehicles on the minor road to find sufficient gap to merge into or cross the major road. The analysis suggests that with additional traffic from any future development, similar movement constraints can occur. Depending on the additional volume of traffic anticipated to use the intersections, future upgrade or improvements to the intersection may merit some consideration.

2.8.2 Mid Block Capacity and Thresholds

Midblock capacity and thresholds are based on the particular road links or intersections to ensure a satisfactory LoS of D, or better.

These thresholds represent the 'Capacity' of specific road types. Traffic volumes observed on the road that are higher than the prescribed thresholds will be perceived by the community and road users as being over saturated.

While generally a single trafficable lane may carry up to 1900 vehicles per hour, the capacity of each particular road type has been determined by considering a number of key factors noted in Austroads 'Roadway Capacity' manual including, but not limited to:

- Vehicle speed;
- Volume of vehicles demanding to use the carriageway (linked to road classification);
- Potential for lane changing (higher vehicle volumes reduce the incidence of lane changing);
- Available lane widths and lateral clearances;
- Surrounding land use characteristics (industrial, residential, retail, commercial, etc);
- Vertical carriageway alignment;

- Horizontal carriageway alignment;
- Carriageway condition; and,
- Carriageway access (driveways, side street intersections, etc).

Subsequently, varying lane capacities apply to each classification and road type, adopted during the course of this assessment, as shown in Table 2-10.

As a consequence, road links reporting a volume in excess of the adopted thresholds, should be considered for remedial treatment and reclassification in order to achieve their specific volume threshold.

Table 2-10 Typical One-way Mid Block Capacities for Urban Roads with Interrupted Flow

Road Type Conditions	Lane Capacity at Level of Service F (vehicle per hour)
Urban Undivided Road / Inner Lane with Clearways and signal coordination	900
Outer or kerb lane with clearway conditions	900
Outer or kerb lane with occasionally parked vehicles	600
2 Lane Residential Street with on street parking	700

Source: Table 7.1, Austroads Roadway Capacity

From Table 2-10, it can be assumed that Victoria Road with clearway conditions during the AM peak (No parking restrictions are imposed from 7-9 AM) will have a capacity of 1,800 vehicles per hour per direction. During the off peak when on-street parking restrictions are lifted, the capacity is reduced to 1,500 vehicles per hour per direction. Traffic volumes observed at the intersections (shown in Figure 2-11) suggest that the existing volume on Victoria Road for the peak direction of flow is in the order of 800-900 vehicles per hour. This suggests that with clearway conditions during the peak hour, Victoria Road will have some spare capacity to accommodate some 600 vehicles in the peak direction.

3 Traffic and Transport Assessment

3.1 Existing Traffic Generation

The existing land use on the site consists largely of industrial development and mixed used commercial/residential developments. Data on actual GFA is unavailable for the existing land use and is approximated based on assumptions on likely floor space ratios.

Existing Mixed Use

- The actual total GFA of the existing mixed use development is also unknown at this stage. The existing mixed use has a total land area of 21,715 sq. m. consisting of four parcels. Based on the Marrickville LEP 2011, two parcels fall within the zone with maximum FSR of 1.75 and the other two parcels fall within the zone with maximum FSR of 0.95. The two parcels along Addison Road could potentially have a FSR of 1.75. The Danias survey results indicated that the commercial land use consisted mostly of office and shop type development. An ocular inspection was also undertaken at the site to investigate the likely FSR. It was found that one parcel on the corner of Addison Road and Illawarra Road was a carwash facility with a single storey building and the second parcel had a 2 storey building with onsite parking. Part of the building was used for Bingo events with scheduled sessions. For the purpose of this assessment, a floor space ratio of 0.95 was assumed for all four parcels to derive an indicative estimate of the existing GFA. This equates to a total of 20,629 sq. m.
- Peak hour trip rate for office /commercial trip generation is assumed to be 2 vehicle trips per hour per 100 m2 of GFA
- 80% / 20% inbound/outbound trip split was assumed for AM Peak office and commercial developments; and
- 20% / 80% inbound/outbound trip split was assumed for PM Peak office and commercial developments.

Existing Industrial

- The total site area for existing general industrial and light industrial land use are 229,008 sq.m. and 18,833 sq.m., respectively. The actual total GFA of the existing industrial development is unknown. In Marrickville LEP 2011, industrial zones have a maximum FSR of 1:0.95 and as such the total potential floor space is equivalent to 0.95 of the land area. This equates to a GFA of 235,442 sq.m.
- Peak hour trip rate for general industrial is assumed to be 0.50 vehicle trips per hour per 100 m2 of GFA
- Peak hour trip rate for light industrial is assumed to be 0.56 vehicle trips per hour per 100 m2 of GFA
- Existing total peak traffic generation for industrial land use is approximately 1,188 vehicle trips in one hour
- 80% / 20% inbound/outbound trip split was assumed for AM Peak industrial developments; and
- 20% / 80% inbound/outbound trip split was assumed for PM Peak industrial developments.

Other existing land uses

- Trip generation for other existing land uses that will remain the same within the precinct has not been calculated. A traffic growth factor will be applied in the future scenario to account for background growth.

In summary, the net trip generation is estimated as shown in Table 3-11

Table 3-11 Existing Traffic Generation

Land Use	AM Peak 1 Hour (Vehicles)			PM Peak 1 Hour (Vehicles)		
	In	Out	Two Way	In	Out	Two Way
Mixed use	330	83	413	83	330	413
Industrial 1	870	218	1088	218	870	1088
Industrial 2	80	20	100	20	80	100
Total	1281	320	1601	320	1281	1601

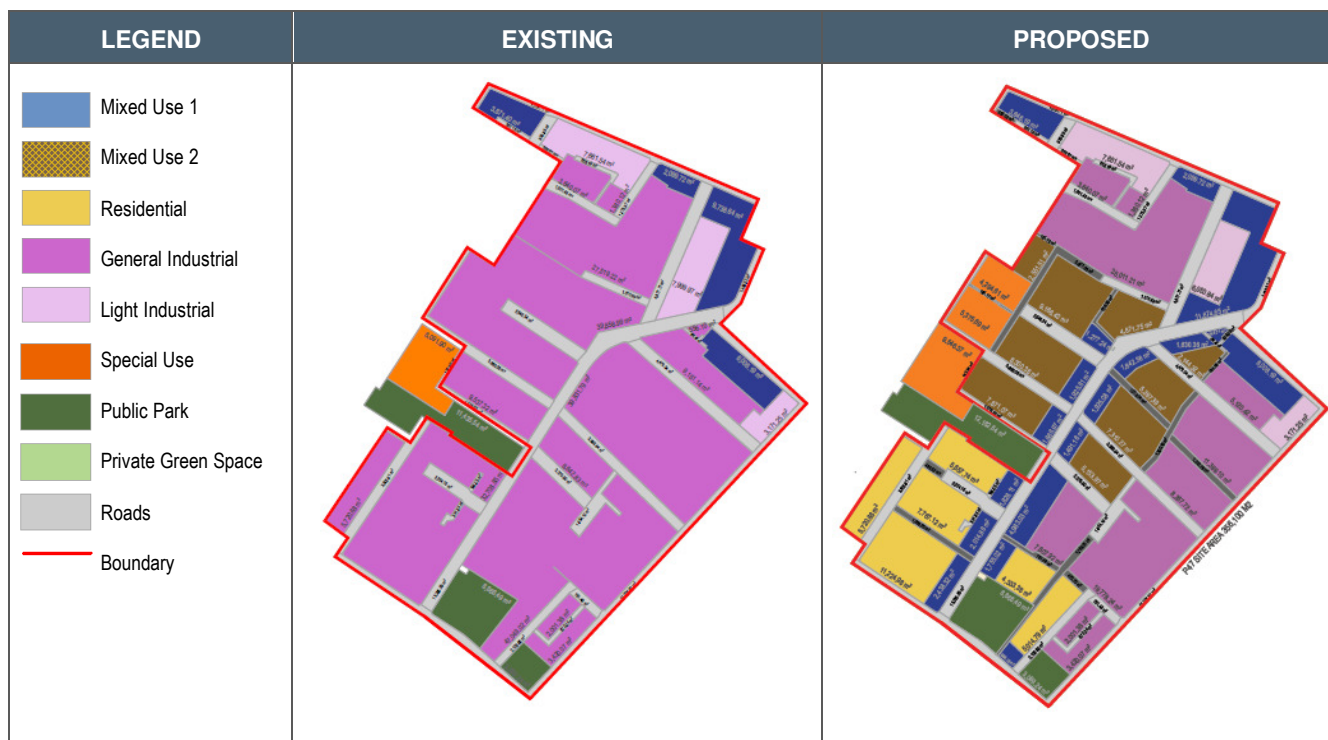
The existing land use development within the Victoria Road Precinct currently generates approximately a total of 1,601 vehicle trips in one peak hour.

3.2 Development Potential

The Victoria Road Precinct is approximately 36 hectares in area consisting of approximately 70% of industrial land use, 6% mixed use, 21% of roadways and footpaths and the remaining 3% of public parks and recreational areas. The precinct is predominantly zoned IN1 General Industrial. Some small patches of land are zoned IN2 light industrial, B4 Mixed Use and B7 Business Park. The parcels are located on the northern and western edges of the precinct.

An indicative master plan has been prepared for the Victoria Road Precinct which has informed the proposed planning provisions contained in the planning proposal. The key features of the master plan include land uses consisting of creative industries, residential and commercial, as well as retention of some existing industrial and business lands:

- Predominantly six-storey street edge to Victoria Road, with a range of showroom type commercial premises and neighbourhood retail and shop-top housing
- Creative industries precinct centred around Rich Street with complementary business premises
- Low-scale residential development in the vicinity of Shepherd Street and Farr Street
- High residential development within the Southern precinct of the Wicks Park



Source: Turner Studio

Figure 3-12 Existing and Proposed Land Use

3.3 Potential Traffic Generation

The trip generation rates for proposed residential, commercial and industrial developments have been estimated using RMS's Guide to Traffic Generating Developments, Issue 2.2, October 2002.

3.3.1 Assumptions

Following assumptions are made from the proposed developments:

Proposed Residential

- High density housing for all residential land use was assumed. A trip rate of 0.19 vehicles per hour per dwelling is applied as per RMS guideline;
- 20% / 80% inbound/outbound trip split was assumed for AM Peak residential developments; and
- 80% / 20% inbound/outbound trip split was assumed for PM Peak residential developments.

Proposed Mixed Use

- Peak hour trip rate for showroom/commercial trip generation is assumed to be 1.2 vehicle trips per hour per 100 m² of GLFA;
- 100 m² of GFA is equal to 75 m² of Gross Leasable Floor Area (GLFA);
- Peak hour trip rate for creative industries/commercial trip generation is assumed to be 2 vehicle trips per hour per 100 m² of GFA
- 80% / 20% inbound/outbound trip split was assumed for AM Peak office and commercial developments; and

- 20% / 80% inbound/outbound trip split was assumed for PM Peak office and commercial developments.

Proposed Industrial

- Peak hour trip rate for general industrial is assumed to be 0.50 vehicle trips per hour per 100 m² of GFA
- Peak hour trip rate for light industrial is assumed to be 0.56 vehicle trips per hour per 100 m² of GFA
- 80% / 20% inbound/outbound trip split was assumed for AM Peak industrial developments; and
- 20% / 80% inbound/outbound trip split was assumed for PM Peak industrial developments.

Proposed Special Site

- Peak hour trip rate for special site is assumed to be 1.0 vehicle trip per hour per 100 m² of GFA
- 80% / 20% inbound/outbound trip split was assumed for AM Peak special land use developments; and
- 20% / 80% inbound/outbound trip split was assumed for PM Peak special land use developments.

Table 3-12 summarises RMS's trip generation rates adopted for residential, mixed use, industrial and special site development land, respectively.

Table 3-12 Trip generation rates adopted

Land Use	Development Type	RMS' Trip Generation Rates
Residential	High density (Metropolitan Sub-Regional Centres)	0.19 peak hour vehicle trips per dwelling 0.09 peak hour vehicle trips per bedroom
Mixed Use 1	Showrooms/Commercial	1.2 peak hour vehicle trips per 100 m ² of GLFA.
Mixed Use 2	Creative Industries/Commercial	2 peak hour vehicle trips per 100 m ² of GFA.
Mixed Use 3*	Office/Commercial (Existing)	2 peak hour vehicle trips per 100 m ² of GFA.
Industrial 1 (IN1)	General Industries (warehouse)	0.50 peak hour vehicle trips per 100 m ² of GFA.
Industrial 2 (IN2)	Light Industries (Business Park/Industrial Estate)	0.56 peak hour vehicle trips per 100 m ² of GFA.
Special Site	Educational, Cultural or Community Facility	1.0 peak hour vehicle trips per 100 m ² of GFA**

*There are four (4) parcels of land with mixed use development. No changes to FSR are being proposed

**The RMS Guide does not provide any trip generation rates for this type of land use. This trip rate is assumed to be applicable to 'Special Site' land use and is indicative.

3.3.2 Trip Generation

Applying the trip generation rates given in Table 3-13 provides an indicative estimate of potential trip generation.

Table 3-13 Indicative Peak Hour Trip Generation

Land Use	GFA (sq.m.)	NLA (sq.m.)	Number of Units	Trip Generation Rate (vehicle trips/hr)	Peak Vehicle Trips
Residential	239,764		3,080	0.19/100 m ² GFA	585
Mixed Use 1	2,911	2,621		1.2/100 m ² GLFA	31
Mixed Use 2	43,302	38,973		2.0/100 m ² GFA	866
Mixed Use 3 ¹	20,629			2.0/100 m ² GFA	413
Industrial 1 ²	84,366			0.50/100 m ² GFA	422
Industrial 2 ²	16,039			0.56/100 m ² GFA	90
Special Site	9794			1.0/100 m ² GFA	98
Total					2,505

¹ In Marrickville LEP 2011, industrial zones have a maximum FSR of 1:0.95 and as such the total potential floor space is equivalent to 0.95 of the

² In Marrickville LEP 2011, industrial zones have a maximum FSR of 1:0.95 and as such the total potential floor space is equivalent to 0.95 of the land area.

In summary, the proposed development within the Victoria Road Precinct would generate a total of 2,505 vehicle trips in one peak hour. In terms of directional flow, the peak vehicle trips are given in Table 3-14.

Table 3-14 Directional Traffic Generation

Land Use	AM Peak 1 Hour (Vehicles)			PM Peak 1 Hour (Vehicles)		
	Inbound	Outbound	Two Way	Inbound	Outbound	Two Way
Residential	117	468	586	468	117	586
Mixed Use 1	25	6	31	6	25	31
Mixed Use 2	693	173	866	173	693	866
Mixed Use 3	330	83	413	83	330	413
Industrial 1	338	84	422	84	338	422
Industrial 2	72	18	90	18	72	90
Special Site	78	20	98	20	78	98
Total	1,653	852	2,505	852	1,653	2,505

3.3.3 Net Traffic Generation

This planning proposal envisages that 57% of the land area currently zoned as IN1 Industrial will be rezoned to a business zone permitting mixed use development. The change in zoning will incur a net difference in the traffic generation attributed to the change in land use. Hence, the impact on traffic shall be assessed based on the net change in traffic generation rather than on the overall new traffic generation potential of the development.

In order to derive an estimate of the net change in traffic generation, a comparison is made of future traffic generation with the existing traffic generation based on assumed existing GFA.

The net traffic generation is summarised in Table 3-15.

Table 3-15 Net Traffic Generation

Land Use	AM Peak 1 Hour (Vehicles)			PM Peak 1 Hour (Vehicles)		
	In	Out	Two Way	In	Out	Two Way
Proposed Future	1,653	852	2,505	852	1,653	2,505
Existing	1,281	320	1,601	320	1,281	1,601
Net	372	532	904	372	532	904

The net traffic generation attributed to the rezoning proposal is estimated to be 904 vehicle trips in one peak hour.

3.4 Proposed Site Access Arrangements

Whilst Victoria Road will remain to be the key access corridor with Sydenham Road to the south and Enmore Road to the north, the future site access arrangements will vary between blocks and between land uses. The rezoning proposal includes new links and road connections that will create new linkages to the external network (particularly to the east of the Precinct) that will effect a redistribution of traffic within the Precinct. The new east-west and north-south road links to the east of Victoria Road will allow direct access. The proposed residential land use on the southwest corner of the Precinct will have frontage on Sydenham Road and will likely have access on Sydenham Road. The new mixed use development fronting Victoria Road and in the vicinity of Rich Street and Chapel Street will require access from Victoria Road. The industrial zone on the eastern boundary of the precinct can be accessed via Fitzroy Street on the east or Victoria Road from the west. The minor road connections will allow service access but the main access corridor is expected to be Victoria Road.

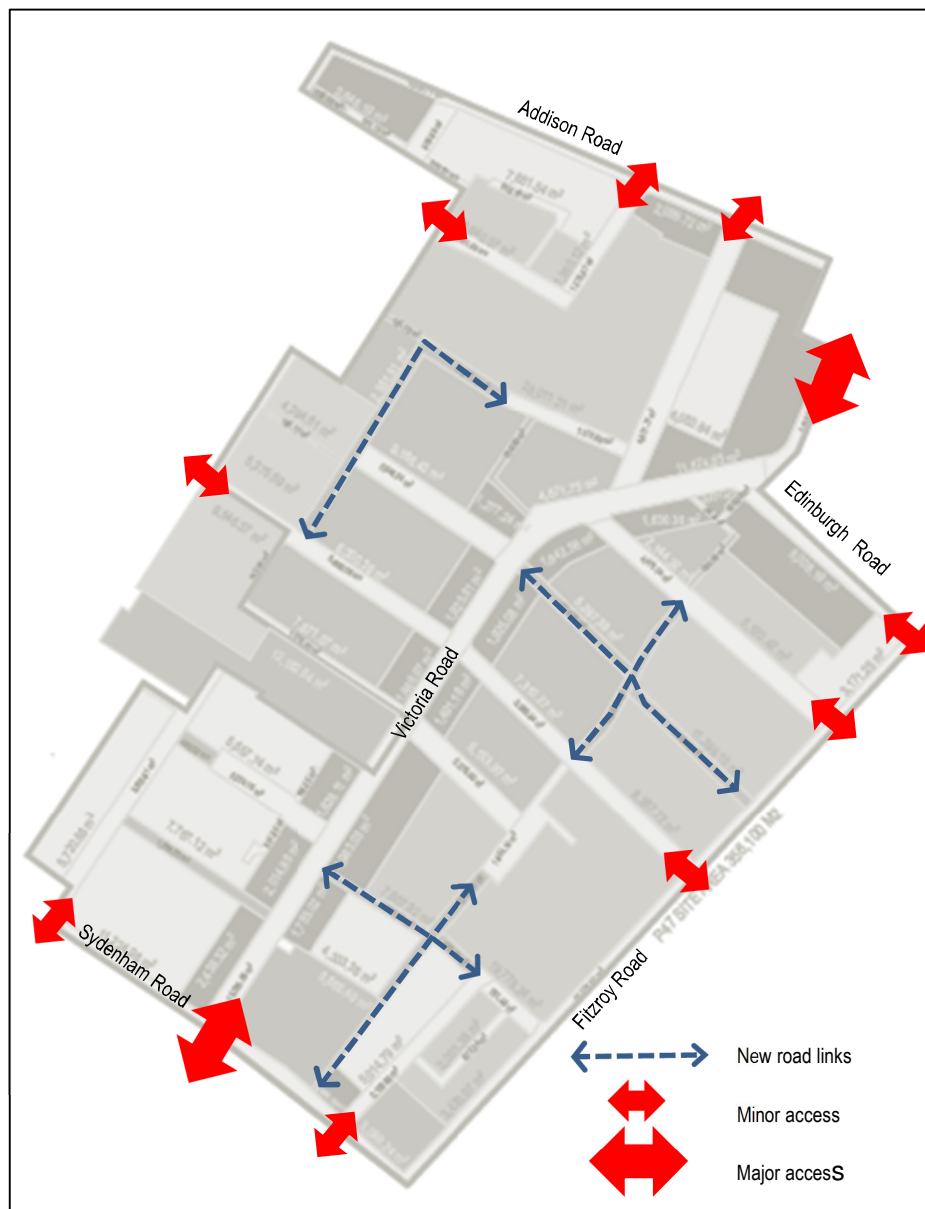


Figure 3-13 Access Options from the external Network

3.5 Potential Trip Distribution

The potential trip distribution is based on the JTW data analysis and the corresponding road network connections to and from the key destinations.

Residential will effectively have more outbound trips in the AM Peak while industrial and mixed use will have more inbound trips in the AM peak.

Figure 3-14 shows the likely trip distribution for the additional trips in the AM peak with the development. The distribution suggest heavy outbound distribution patterns from the precinct to the north towards the Sydney CBD while heavy inbound distribution patterns from the west via Addison Road and Sydenham Road and from the east via Sydenham Road.

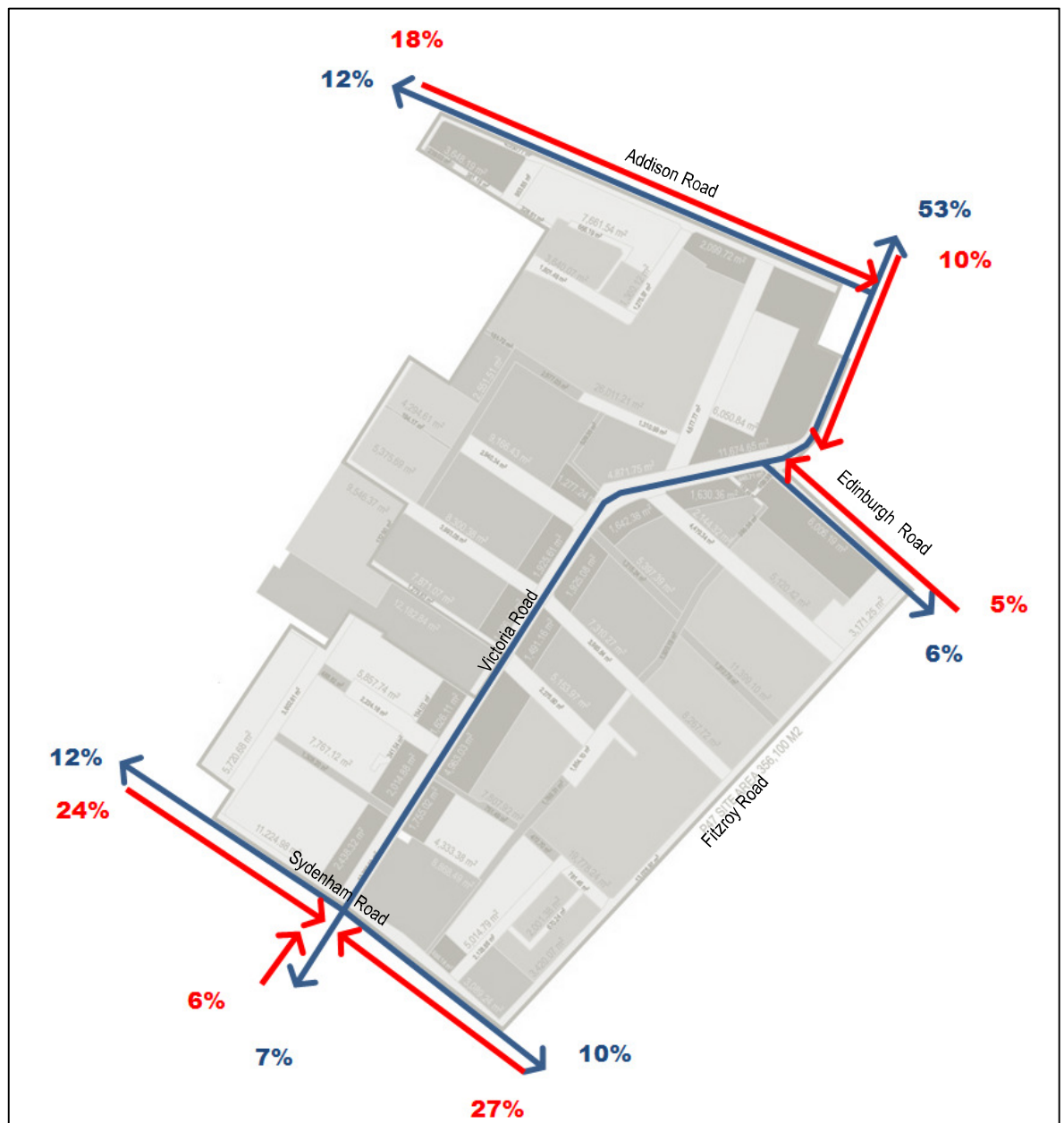


Figure 3-14 Potential Trip Distribution (AM Peak)

3.6 Traffic Implications

The trip distribution described in Figure 3-14 was used to determine entry and exit paths for the net traffic generation potential of the development. Section 3.3.3 noted that the net traffic generation potential is 904 additional vehicle trips during the peak hour. Applying the distribution and assuming all inbound vehicles would proceed to Victoria Road and outbound vehicles would come from Victoria Road, an estimate is derived for the additional peak hour traffic at the Sydenham Road/Victoria Road intersection. This is shown in Figure 3-15

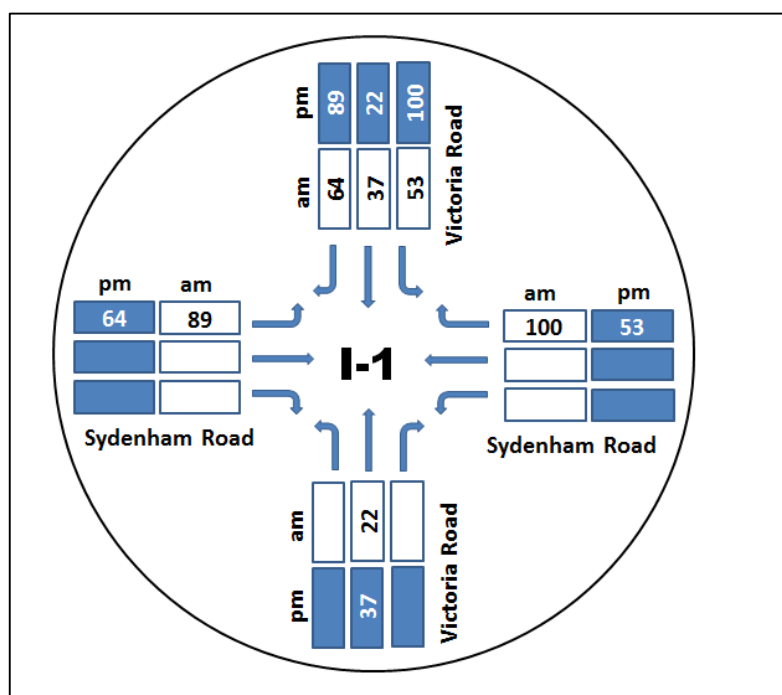


Figure 3-15 Net Potential Peak Hour Additional Traffic Volumes

Table 3-16 Future Intersection Level of Service

Int ID	Intersection	Control	AM			PM		
			DOS	LOS	Ave Delay (sec)	DOS	LOS	Ave Delay (sec)
I-1	Sydenham Road – Victoria Road	Signals	0.935	C	37.8	1.03	E	61.4

The modelling suggests that with the additional traffic on the existing intersection configuration and with no changes to the current signal phasings, the intersection's performance is likely to deteriorate and heavy queuing can be expected on the southwest approach of the intersection on Victoria Road. This can be mitigated through signal coordination and further remedial measures can be considered to improve the intersection performance.

It should be emphasised that this is only a preliminary analysis for the purpose of identifying, at a broad level, whether the existing road network would accommodate the additional traffic expected to be generated by the rezoning proposal.

In terms of mid-block capacity, it is anticipated that the additional traffic in the peak direction will be up to 211 vehicle trips. The analysis in Section 2.8.2 indicated that there would be some spare capacity in the order of up to 600 vehicles in the peak direction. Hence, there would be sufficient capacity in the mid-block to absorb the additional traffic.

It should be noted, however, that in an urban environment, the performance of the traffic network is most critically governed by the performance of the at-grade intersections. This is because the midblock sections generally have less flow impedance compared with intersections where the traffic from each approach must be time-separated through traffic control measures. As such, the likely performance of the intersections along Victoria Road will be critical to the satisfactory performance of the network. This preliminary assessment has looked at the performance of the intersections in isolation of the overall network. The outcomes are indicative

and further modelling may be required to inform the future stages of the development proposal and the final design. Should this planning proposal proceed to the next stage, a more detailed modelling assessment will have to be undertaken.

3.7 Next Steps

In view of the outcomes of the analysis, a list of options have been identified to for mitigating potential traffic impacts

Issue	Options	Next Steps
Road network and Intersection capacity	Investigate signal coordination at Sydenham Road / Victoria Road intersection and intersection upgrade at Victoria Road/ Chapel Street and Victoria Road/Rich Street intersections. Develop options for intersection upgrades	Further network modelling to test options and assess overall network performance
Parking	Review on-street parking and off street parking provisions	Develop a parking strategy to address parking requirements for the Victoria Road Precinct.

3.8 Current Infrastructure Proposals

The implications of any future road (i.e. Westconnex) and public transport upgrades relevant to the Precinct will be assessed as part of the detailed modelling in the next Stage of the traffic and transport assessment study.

4 Summary of Findings

This Preliminary Traffic and Transport Assessment Study has been prepared by Hyder Consulting Pty Ltd. to support a planning proposal to rezone land within the Victoria Road Precinct to permit development for mixed business and residential purposes under the Marrickville Local Environmental Plan (LEP) 2012. The Study has been commissioned by Danias Holdings Pty Ltd., one of the major landowners of properties within the Victoria Road Precinct.

An assessment of the existing conditions has been undertaken to determine potential constraints and limitations of the precinct in terms of roadway capacity, intersection capacity, public transport provisions, site access, pedestrian and cycle network.

Intersection traffic volume counts were carried out for three intersections along Victoria Road for AM and PM peak periods. The survey outlines directional turning movement flows at the intersection and identifies the peak one hour flow for the AM and the PM peak periods.

The results of the intersection analysis for the existing conditions indicated that the Sydenham Road/Victoria Road signalised intersection is performing satisfactory and has spare capacity to accommodate additional traffic. The analysis of the Victoria Road /Chapel Street and Victoria Road/Rich Street priority intersections indicated that for both intersections the poor performance is attributed to the delays experienced by vehicles on the minor roads to turn or cross vehicles on Victoria Road. The modelling assumes 'ideal' gap acceptance values for approaching vehicles from a minor road. In reality, some drivers tend to be more aggressive and will attempt to enter the intersection with lower gap acceptance values. The heavy flow on Victoria Road compared to vehicle volumes from Chapel Street or Rich Street limits the ability for vehicles on the minor road to find sufficient gap to merge into or cross the major road. The analysis suggests that with additional traffic from any future development, similar movement constraints can occur. Depending on the additional volume of traffic anticipated to use the intersections, future upgrade or improvements to the intersection may merit some consideration.

The ultimate scale of the Precinct and its final built form are indicative at this stage. For the purpose of carrying out a strategic assessment of the development, potential trip generation is calculated based on information available at this stage. Trip generation rates are derived from guidelines provided in the RMS Guide to Traffic Generating Developments (October 2002 and May 2013 update) and where necessary, assumptions have been made on certain parameters required for the calculations. The assumptions are outlined in the relevant sections of the report.

Travel mode and distribution patterns were informed by statistics from the 2011 Census and JTW data. This considered the likely places of residence of workers currently working in the Precinct and likely places of work destinations of current residents of the Precinct. The analysis assumed the current travel demand profile would be carried forward to the future.

The impact on traffic was assessed based on the net change in traffic generation rather than on the overall new traffic generation potential of the development alone. In summary, the proposed development within the Victoria Road Precinct would generate a total of approximately 2,500 vehicle trips in one peak hour.

The existing land use development within the Victoria Road Precinct currently generates approximately a total of approximately 1,600 vehicle trips in one peak hour.

The net traffic generation attributed to the rezoning proposal is estimated to be approximately 900 vehicle trips in one peak hour.

The trip distribution was used to determine entry and exit paths for the net traffic generation potential of the development. Applying the distribution and assuming all inbound vehicles would

proceed to Victoria Road and outbound vehicles would come from Victoria Road, an estimate was derived for the additional peak hour traffic at the Sydenham Road/Victoria Road intersection. The modelling results suggest that with the additional traffic on the existing intersection configuration and with no changes to the current signal phasings, the intersection's performance is likely to deteriorate and heavy queuing can be expected on the southwest approach of the intersection on Victoria Road. Hence, remedial measures will need to be considered to improve the intersection performance.

It should be emphasised that this is only a preliminary analysis for the purpose of identifying, at a broad level, whether the existing road network would accommodate the additional traffic expected to be generated by the rezoning proposal.

In terms of mid-block capacity, it is anticipated that the additional traffic in the peak direction will be approximately up to 200 vehicle trips. The analysis indicated that there would be some spare capacity in the order of up to 600 vehicles in the peak direction. Hence, there would be sufficient capacity in the mid-block to absorb the additional traffic.

It should be noted, however, that in an urban environment, the performance of the traffic network is most critically governed by the performance of the at-grade intersections. This is because the midblock sections generally have less flow impedance compared with intersections where the traffic from each approach must be time-separated through traffic control measures. As such, the likely performance of the intersections along Victoria Road will be critical to the satisfactory performance of the network. This preliminary assessment has looked at the performance of the intersections in isolation of the overall network. The outcomes are indicative and further modelling will be required to inform the future stages of the gateway process and the final design. Should this planning proposal proceed to the next stage, a more detailed modelling assessment will be required as demand for development of the site progresses, as part of the development application process. This will ensure that the concepts inherent in the planning process are further developed into a multi-dimensional shape for each of the development parcels planned for the Victoria Road Precinct as part of the rezoning.