Costco, Marsden Park
Transport Impact Assessment

transportation planning, design and delivery

13S1023000 19/04/13

GTAconsultants

Costco, Marsden Park

Transport Impact Assessment

Issue: C 19/04/13

Client: Costco Wholesale Australia Pty Ltd
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Issue	Date	Description	Prepared By	Checked By	Approved By
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1. Introduction

1.1 Background

The 551ha Marsden Park Industrial Precinct was rezoned in November 2010 under the NSW Government's Precinct Acceleration Protocol. Located 40km west of Sydney CBD, the Precinct is anticipated to provide 10,000 jobs and 1,200 homes within Sydney's North West Growth Centre.

The rezoning was subject to a voluntary planning agreement which has provided funding towards the proposed upgrade of Richmond Road between Hollinsworth Road and Townson Road which is anticipated to be completed before 2014.

On completion Marsden Park Industrial Precinct will provide:

- 60ha of commercial land;
- 40ha of bulky goods retail;
- 206ha of industrial land;
- 63ha of conservation land and open space;
- Residential housing close to the planned Marsden Park town centre (located to the north of the Industrial Precinct) to accommodate 3,500 people.

GTA Consultants were commissioned by Costco Wholesale Australia Pty Ltd (Costco) in July 2012 to undertake a transport impact assessment to inform a Planning Proposal to amend the Blacktown Local Environmental Plan 1988 to facilitate an amendment to State Environmental Planning Policy (Sydney Region Growth Centres) 2006. The purpose of the proposed amendment is to facilitate a Costco warehouse development within Marsden Park Industrial Precinct, specifically within the B5 Business Development zone.

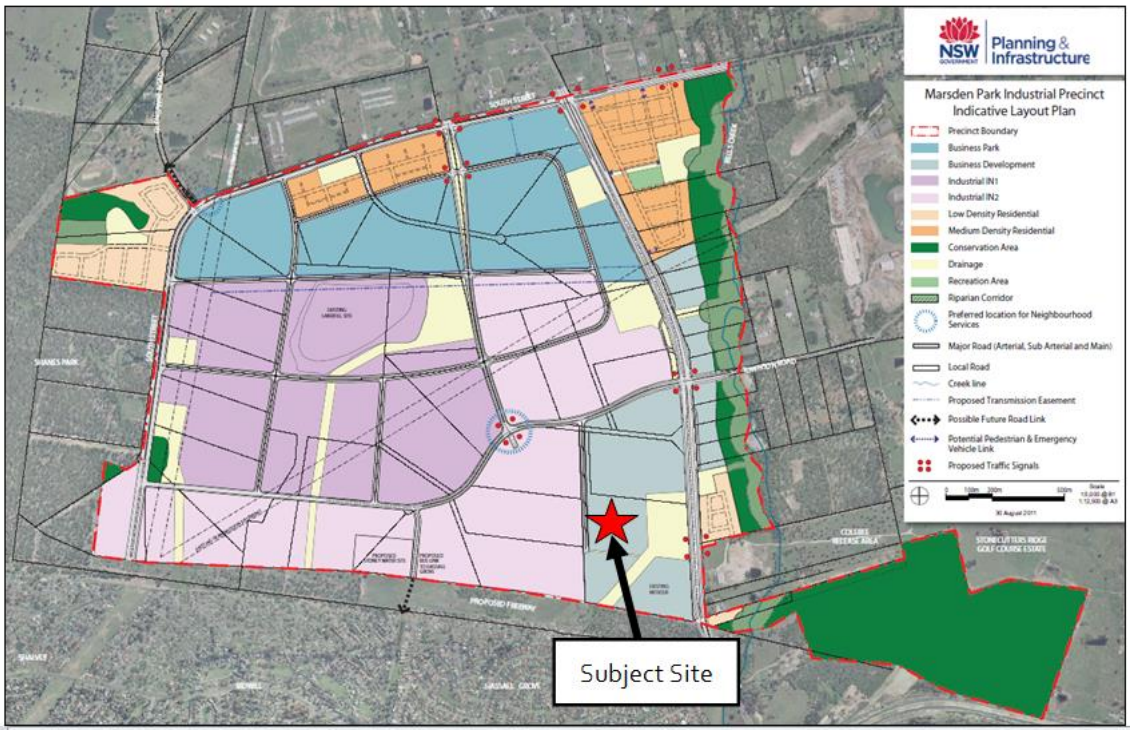
An indicative layout of the Marsden Park Industrial Precinct including the proposed Costco Wholesale development location is shown in Figure 1.1.

1.2 Purpose of this Report

This report sets out an assessment of the anticipated transport implications of the proposed development, including consideration of the following:

i the traffic generating characteristics of a Costco Warehouse development on the site, especially in comparison to those anticipated from the Marsden Park Precinct as a whole.
ii suitability of the proposed site in transport terms;
iii the transport impact of the development proposal on the surrounding road network.

Figure 1.1: Marsden Park Industrial Precinct – Indicative Layout Plan



Source: NSW Department of Infrastructure and Planning website (accessed 20/08/2012)

1.3 References

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

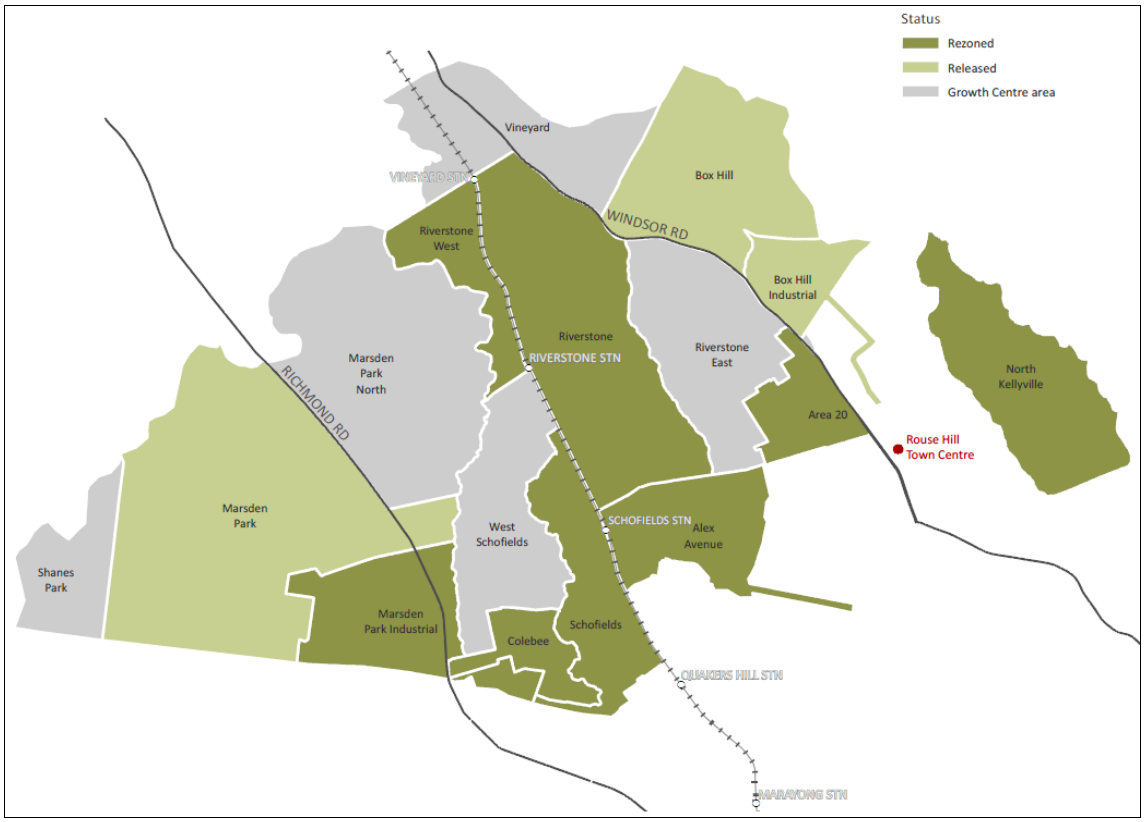
- Marsden Park Precinct Traffic and Transport Assessment, AECOM, September 2012;
- AECOM Memorandum Concerning "Concept design of Southern Boulevard Intersection to Bulky Goods Project – Operational Assessment, AECOM, July 2012;
- Richmond Road Upgrade Review of Environmental Factors (REF) submission, AECOM, 2011;
- Richmond Road Upgrade REF) November 2011 (APP Corporation);
- Colebee Traffic & Transport Assessment by John Coady Consulting, July 2010;
- Marsden Park Industrial Transport and Access Study from ARUP, August 2009;
- Richmond Road Intersection Traffic Modelling, Transport and Urban Planning, April 2009;
- Richmond Road Traffic Model Projections, Road Delay Solutions, April 2009
- AECOM DA1 – Environmental Assessment for Marsden Park Employment Area;
- Blacktown City Council Growth Centre Council Development Control Plan (DCP) 2010;
- NSW Transport and Infrastructure North West Sector Bus Servicing Plan (McCormick Rankin Cagney, 2009);
- RMS Guide to Traffic Generating Developments, version 2.2, October 2002.
- RMS Trip Generation and Parking Generation Surveys, Bulky Goods/ Hardware Stores – Analysis Report, Hyder Consulting, 2009
- other documents and data as referenced in this report.

2. Existing Conditions

Marsden Park Industrial Precinct is located within the North West Growth Centre, 40km west of Sydney CBD. The Growth Centre of approx. 10,000ha is comprised of 16 precincts which on completion will contain 70,000 new dwellings for 200,000 people.

The North West Growth Centre is shown in Figure 2.1.

Figure 2.1: North West Growth Centre Precinct Planning



Source: NSW Department of Infrastructure and Planning website (accessed 20/08/2012)

2.1 Road Network

2.1.1 Adjoining Roads

Richmond Road

Richmond Road is a classified State Road (MR537) aligned in a north-south direction that is a key link between the M7 and Richmond that travels through the Marsden Park Industrial Precinct as shown in Figure 2.1. It is a two-way road and in the vicinity of the Marsden Park Industrial Precinct configured with one-lane in each direction, set within a 25 metre wide road reserve (approx).

Richmond Road is shown in Figure 2.4 and Figure 2.5 and carries approximately 26,000 vehicles per day[1].

1 Based on 7 day, 24 hour traffic counts undertaken by CFEIT in February 2009.

Figure 2.2: Richmond Road (looking north)

Figure 2.3: Richmond Road (looking south)

Townson Road

Townson Road is a Local Road aligned in an east-west direction. It is a two-way road configured with one lane in each direction, set within a 20 metre wide road reserve (approx). Townson Road is shown in Figure 2.4.

Hollinsworth Road

Hollinsworth Road is a Local Road aligned in an east-west direction. It is a two-way road configured with one lane in each direction, set within a 14 metre wide road reserve (approx). Hollinsworth Road is shown in Figure 2.5.

Figure 2.4: Townson Road (looking east)

Figure 2.5: Hollinsworth Road (looking west)

2.1.2 Surrounding Intersections

The following intersections currently exist in the vicinity of the site:

- Richmond Road/ Townson Road (unsignalised);
- Richmond Road/ Hollinsworth Road (unsignalised);
- Richmond Road/ Rooty Hill North Road (signalised).

2.2 Traffic Volumes

2.2.1 Richmond Road, February 2009

7 day, 24 hour traffic counts were undertaken by CFEIT from 11 February 2009 as part of the study on Richmond Road, approx. 500m south of the intersection with Hollinsworth Road and are summarised in Table 2.1 with full results contained in Appendix A.

Table 2.1: Richmond Road Traffic Counts, February 2009 (CFEIT)

Direction	Weekday Average (veh/day)	Saturday (veh/day)	7 Day Average (veh/day)
Northbound	14,586	10,569	13,220
Southbound	14,321	10,456	13,038
Total	28,907	21,025	26,258

As shown in Table 2.1, the traffic counts undertaken in 2009 along Richmond Road recorded an average weekday volume of 28,907 vehicles (two-way).

2.2.2 Richmond Road, August 2005

7 day, 24 hour traffic data has been sourced from Roads and Maritime Services (RMS) for Richmond Road, north of Rooty Hill Road North for the week commencing 15 August 2005. The data is summarised in Table 2.1 with full results contained in Appendix A.

Table 2.2: Richmond Road Traffic Counts, February 2005 (RMS)

Direction	Weekday Average (veh/day)	Saturday (veh/day)	7 Day Average (veh/day)
Northbound	12,366	9,560	11,369
Southbound	12,144	9,429	11,192
Total	24,510	18,989	22,561

As shown in Table 2.2 in 2005 Richmond Road had an average weekday volume of 24,510 vehicles (two-way).

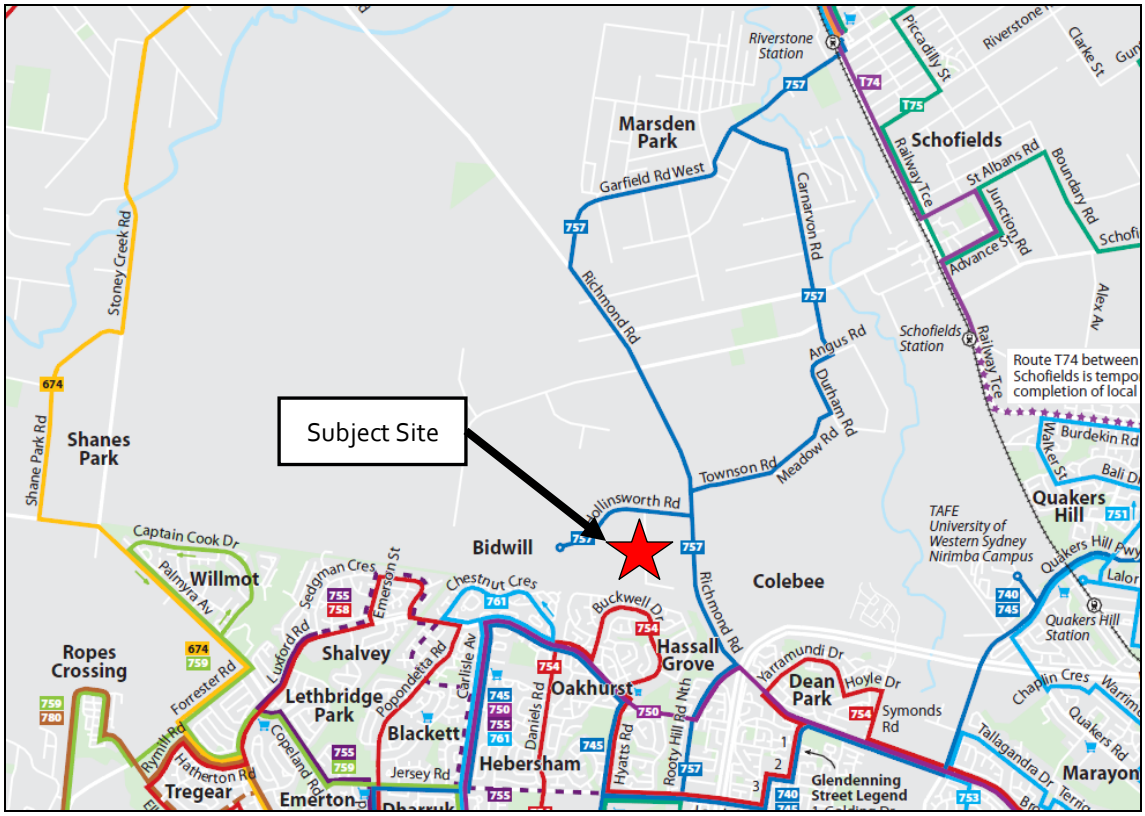
2.2.3 RMS Permanent Count Station

The RMS permanent traffic count station on Richmond Road south of Townson Road recorded Annual Average Daily Traffic (AADT) for 2005 of 21,983 vehicles.

2.3 Public Transport

Richmond Road, Hollinsworth Road and Townson Road are served by the route 757 bus service operated by Busways as shown in Figure 2.6. Route 757 is an hourly service between Riverstone to Marsden Park and Mt. Druitt via Plumpton, including to Riverstone railway station. There are two existing bus stops on either side of Richmond Road at South Street.

Figure 2.6: Bus Network Map



Source: Busways

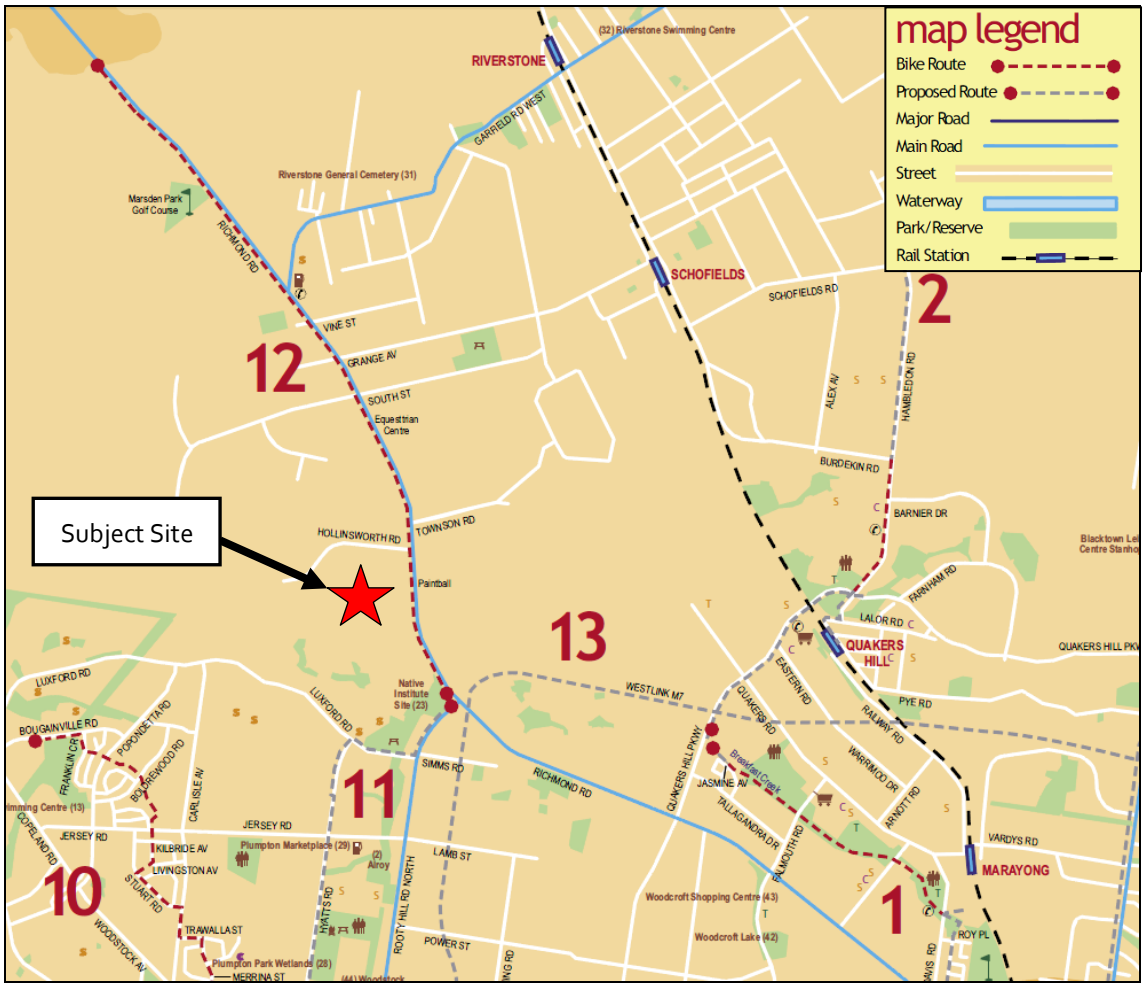
Riverstone railway station is located approx. 7km north-east from Marsden Park Industrial Precinct on the Western Line of the CityRail network. Western Line rail services stopping at Riverstone operate between Richmond and Chatswood with services every 30 minutes during peak and off-peak periods.

2.4 Pedestrian and Cycle Infrastructure

Richmond Road forms part of an on-road cycle route connecting Rooty Hill Road North and Richmond as shown in Figure 2.7. Bicycle shoulder lanes are in place along both sides of Richmond Road in the vicinity of the subject site.

There is no dedicated pedestrian infrastructure in the immediate vicinity of the Marsden Park Industrial Precinct.

Figure 2.7: Cycle Routes



Source: Blacktown City Council

3. Development Proposal

3.1 Land Uses

As GTA Consultants understands it, 256ha of the Marsden Park Industrial Precinct will integrate industrial, commercial and bulky goods land uses and be known as Sydney Business Park. An area situated in the south-eastern corner of the Industrial Precinct has been ear-marked as a bulky goods precinct and will be a key component of Sydney Business Park.

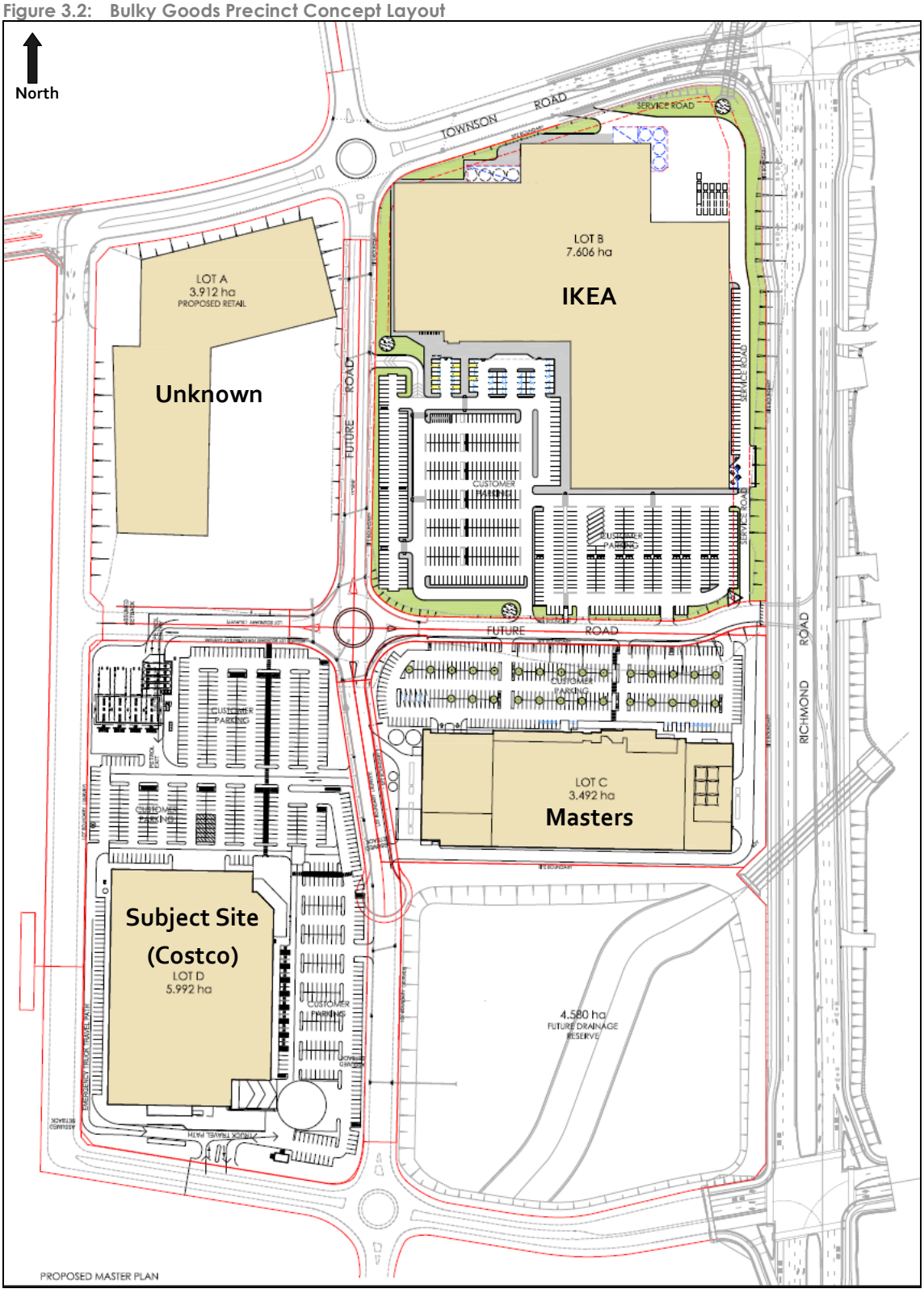
The Bulky Goods Precinct is shown in Figure 3.1.

Figure 3.1: Marsden Park Industrial Precinct

Source: NSW Department of Infrastructure and Planning website (accessed 20/08/2012)

The Bulky Goods Precinct is to comprise four lots; A to D as shown in the concept layout shown in Figure 3.2.

Figure 3.2: Bulky Goods Precinct Concept Layout



Background Image Source: Leffler Simes Architects (preliminary drawing no. SK002, dated 21/01/2013)

The lot sizes, Gross Floor Area (GFA) and anticipated tenants of the Bulky Goods Precinct are summarised in Table 3.1.

Table 3.1: Bulky Goods Precinct Development Schedule

Lot	Tenant	Lot Area (ha)	GFA (m²)
A	Unknown	3.912	24,180 [1]
B	IKEA	7.606	29,143
C	Masters	3.492	13,234
D	Costco	5.992	13,746
	Total	**21.002**	**80,303**

Data Source: Leffler Simes Architects (preliminary drawing no. SK002, dated 21/01/2013) except Lot A GFA.

[1] Based on a GLA of 18,135m² contained in Operational Assessment of Southern Boulevard intersection to Bulky Goods, memo to Michael Gray (AECOM, 2012) and a general rule of 100m² GFA equals 75m² GLA (RMS Guide to Traffic Generating Developments, 2002, Section 3.6.1).

As shown in Table 3.1 the Bulky Goods Precinct covers an area of over 20ha with a total GFA of over 80,000m^2.

Costco intends to develop a members only, wholesale retail store with a GFA of 13,746m^2, 713 car parking spaces and a service station on Lot D within the Bulky Goods Precinct as shown in Figure 3.3.

Costco is a warehouse type retail outlet providing its members a wide range of merchandise including groceries, electrical appliances, hardware, office supplies, furniture and automotive supplies. Costco is a member's only retailer requiring an annual membership fee from shoppers. The service station would also only be available to Costco members.

Costco opened its first Sydney store at Auburn in July 2011 and operates similar stores in Melbourne and Canberra. It is proposed to open a second Sydney Costco store at Casula Crossroads and as such the proposed development at Marsden Park is anticipated to be Costco's third store in the Sydney region which will open for business some time in 2014/2015.

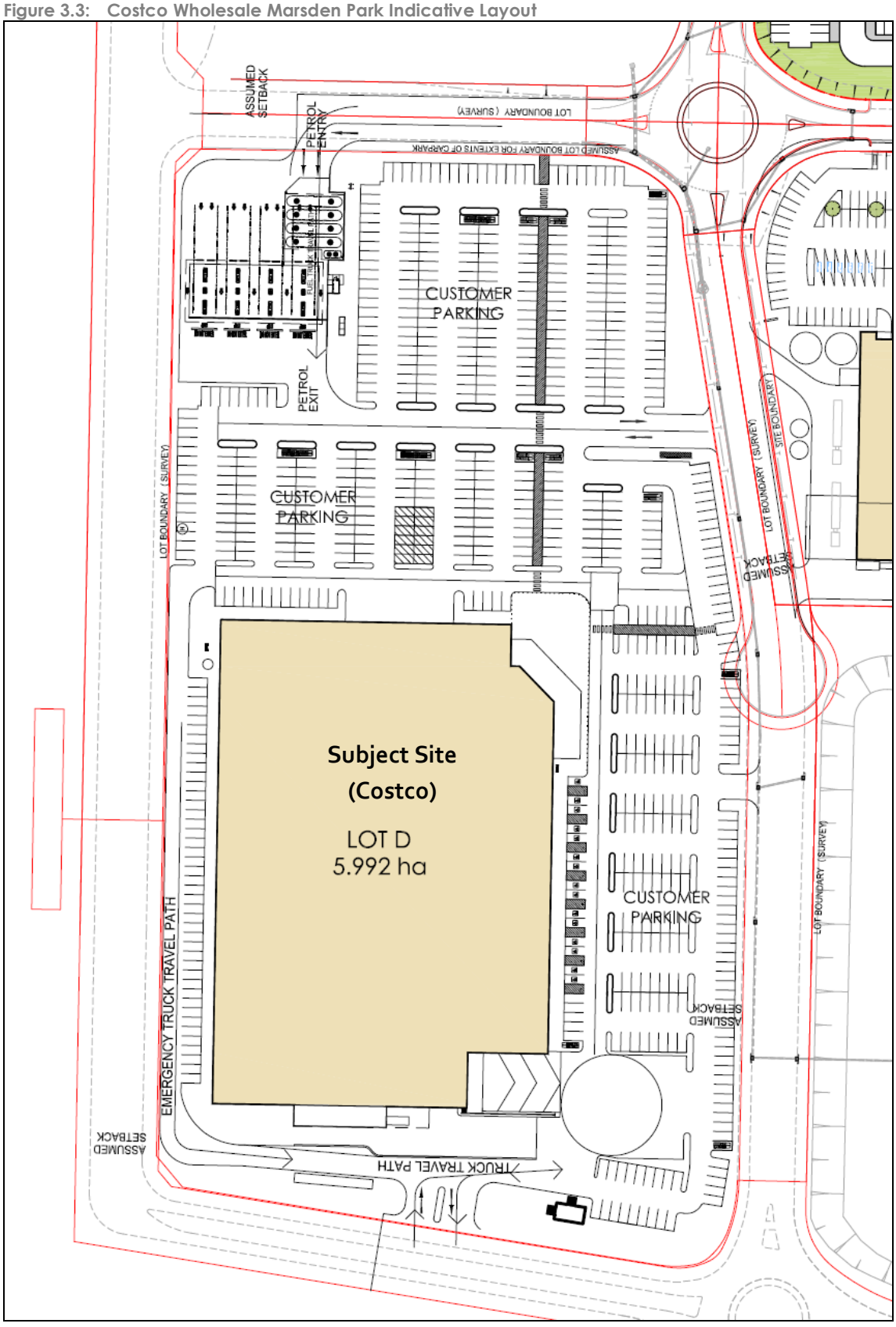
3.2 Future Road Network

Construction works have commenced to upgrade 3.4km of Richmond Road adjacent to the bulky goods precinct from Bells Creek, Colebee to Vine Street West, Marsden Park. The upgrade involves:

- Converting Richmond Road from a two lane road to a four lane divided road with a central median and a speed limit of 80km/h, catering for a possible future upgrade to a six lane road.
- New signalised four-way intersections at Townson Road, South Street and access to the Colebee Precinct east of Richmond Road as well as to the bulky goods precinct.
- Altered arrangement at Grange Avenue intersection to restrict traffic movements to left-in/ left-out.
- Indented bus bays and stops at Townson Road and South Street, with bus priority at intersections.
- Closure Road intersection (when new access is provided at Townson Road).
- An off-road shared user path on the western side of the road, with provision for a future shared user path on the eastern side.

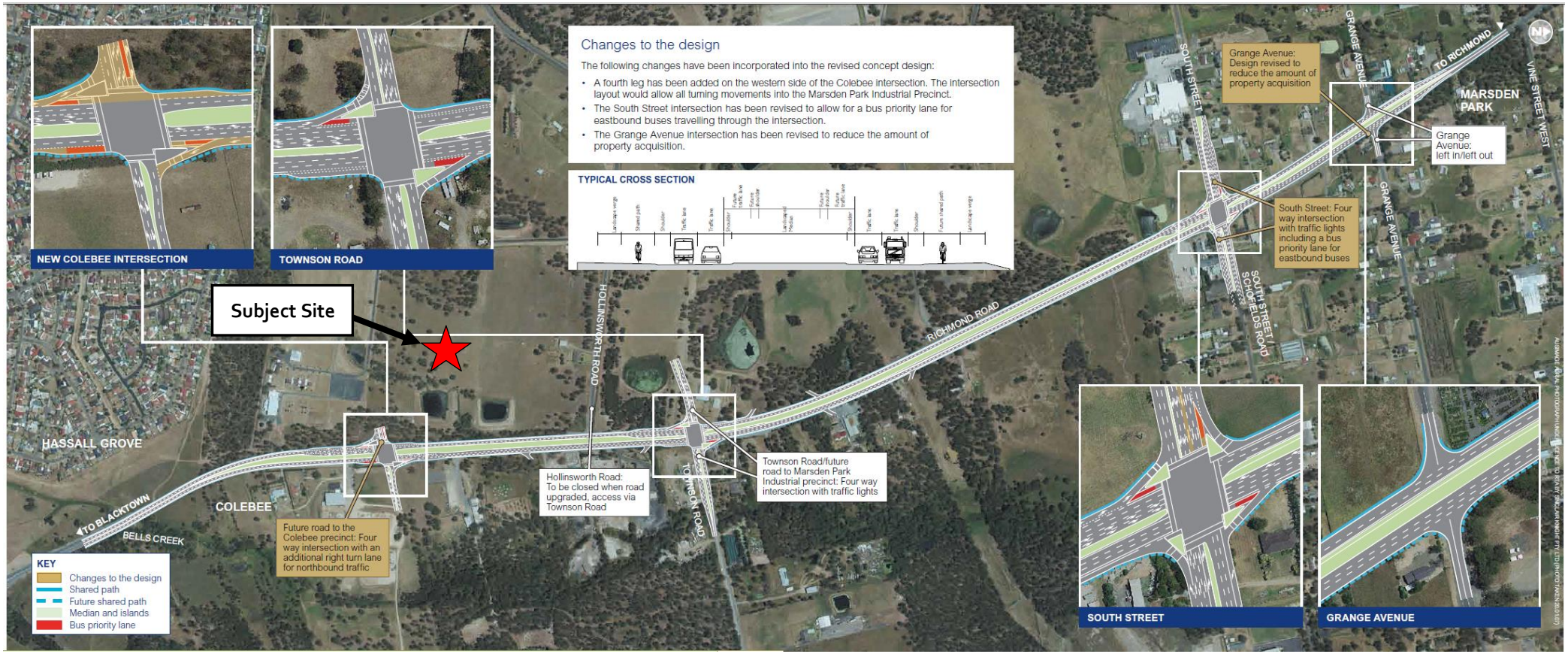
A location plan of the extent of the proposed upgrade is shown in Figure 3.4

Figure 3.3: Costco Wholesale Marsden Park Indicative Layout



Background Image Source: Leffler Simes Architects (preliminary drawing no. SK002, dated 21/01/2013)

Figure 3.4: Proposed Richmond Road Upgrade Location Plan



Background Image Source: Richmond Road Upgrade Community Update (RMS, July 2012)

3.3 Vehicle Access

As shown in Figure 3.4, access to the bulky goods precinct is proposed via two new signalised intersections from Richmond Road; Townson Road to the north and 'Future Southern Access Road/ Southern Boulevard' to the south.

As part of the upgrade of Richmond Road, it is proposed to extend Townson Road west of Richmond Road and to signalise its intersection with Richmond Road. Townson Road will function as one of the key accesses to the Marsden Park Industrial Precinct.

The upgrade of Richmond Road also proposes to create a new signalised intersection south of Townson Road. This will provide access to the Colebee residential development east of Richmond Road via the unformed 'Colebee Access Road/ Smith Access' and the Bulky Goods Precinct to the west via the unformed 'Future Southern Access Road/ Southern Boulevard'.

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

3.4 Layout & Loading Facilities

It is anticipated that the site retail store would be serviced by 19.0m articulated vehicles, while the service station would be serviced by a 20.0m B-Double truck (fuel delivery tanker).

The detailed operation of the development would be considered at the development application stage.

4. Transport Studies

Numerous traffic studies relating to the Marsden Park Industrial Precinct have been undertaken including several in relation to the proposed upgrade of Richmond Road. An overview of the relevant studies is given below.

4.1 Richmond Road Traffic Model Projections, April 2009 (Road Delay Solutions)

Road Delay Solutions were engaged by Wyndham Prince and APP to undertake strategic modelling to provide future mid-block traffic volumes and vehicle movement flows at the key intersections on Richmond Road including Garfield Road West, Grange Avenue, South Street and Townson Road. This assessment used a Sydney wide traffic network model (Netanal) to predict traffic volumes for the key intersections based on staged development occupation years of 2011, 2016, 2012 and 2036.

The main purpose of the strategic model was to provide traffic flow volumes for the operational SCATES and SIDRA models to be undertaken by Transport and Urban Planning (TUPA). This analysis was required to substantiate the recommended geometric configurations and phase optimisation of proposed traffic signal sites associated with the upgrade of Richmond Road.

As part of the study turning counts were undertaken in February 2009 at the following intersections on Richmond Road; Garfield Road West, Vine Street, Grange Avenue, Hollinsworth Road, Townson Road, South Street, M7 westbound on-ramp as well as at the Rooty Hill Road/ M7 Motorway intersection.

4.2 Richmond Road Intersection Traffic Modelling, April 2009 (Transport and Urban Planning - TUPA)

TUPA were engaged by Wyndham Prince and APP to undertake operational intersection analysis with SCATES and SIDRA models using the traffic volumes from the Road Delay Solutions assessment and input them into SCATES and SIDRA models to establish:

- Cross section and lane details for Richmond Road between intersections;
- Lane configurations at the Townson Road and South Street intersections.

The assessment undertaken by TUPA assumed that the upgrade of Richmond Road to four lanes and thence to six lanes, north and south of the Townson Road and South Street intersections had been completed. It was also assumed that Townson Road and South Street had been upgraded.

7 day/ 24 hour traffic counts were undertaken by CFEIT from 11 February 2009 as part of the study on Richmond Road; approx. 500m south of the intersection with Hollinsworth Road (see Section 2.2).

Based on the projected traffic volumes, SIDRA and SCATES modelling was undertaken for the intersections of Richmond Road/ Townson Road and Richmond Road/ South Street for 2011, 2016, 2021 and 2036 scenarios.

4.3 Marsden Park Industrial Precinct (Employment) Precinct, Transport and Access Study, August 2009 (ARUP)

This report summarised the transport and access aspects associated with the overall development of the Marsden Park Industrial Precinct. Future traffic volumes and the proposed road hierarchy for the major internal and external precinct roads were referenced based on the results of the 2036 NETANAL traffic model developed by Glen Varley of Road Delay Solutions Pty Ltd.

The report also determined the future intersection requirements based on the forecast volumes of the 2036 NETANAL traffic model results. This assessment recommended the lane configurations for the Richmond Road intersections with Grange Avenue, South Street, Townson Road and the intersection for the Colebee Precinct. It also recommended closure of Hollingsworth Road.

The report assessed future heavy vehicle movements associated with the precinct including routes, volumes and recommended minimum left turn "turnout" radii of approx. 25 metres at most intersections within the Precinct to permit future turning movements up to B-Triple road train trucks in anticipation that they will be permitted to operate with the Sydney Metropolitan Region.

This assessment also assessed the sustainable transport modes including pedestrian, cycling, bus and rail transport. It recommended pedestrian and cyclist facilities to be included in the Richmond Road Upgrade as well as future bus routes and bus priority at signalised intersections.

4.4 Colebee Traffic and Transport Assessment, July 2010 (John Cody Consulting)

This assessment is entitled 'Proposed Development of Stage 1 of the 'Smith' Land Component of the Colebee Release – Traffic and Transport Assessment' was prepared as part of the DA application for Blacktown City Council. The Colebee release area is located on the eastern side of Richmond Road and has the potential for approx. 1,100 dwellings for 3,000 people.

This report took the traffic volumes from the Road Delay Solutions assessment and input them into SCATES and SIDRA models to establish the lane configurations at the Colebee intersection with Richmond Road. A 'T-intersection' layout was developed which did not provide through access from the Colebee release area to the Southern Access Road to the Bulky Goods Precinct.

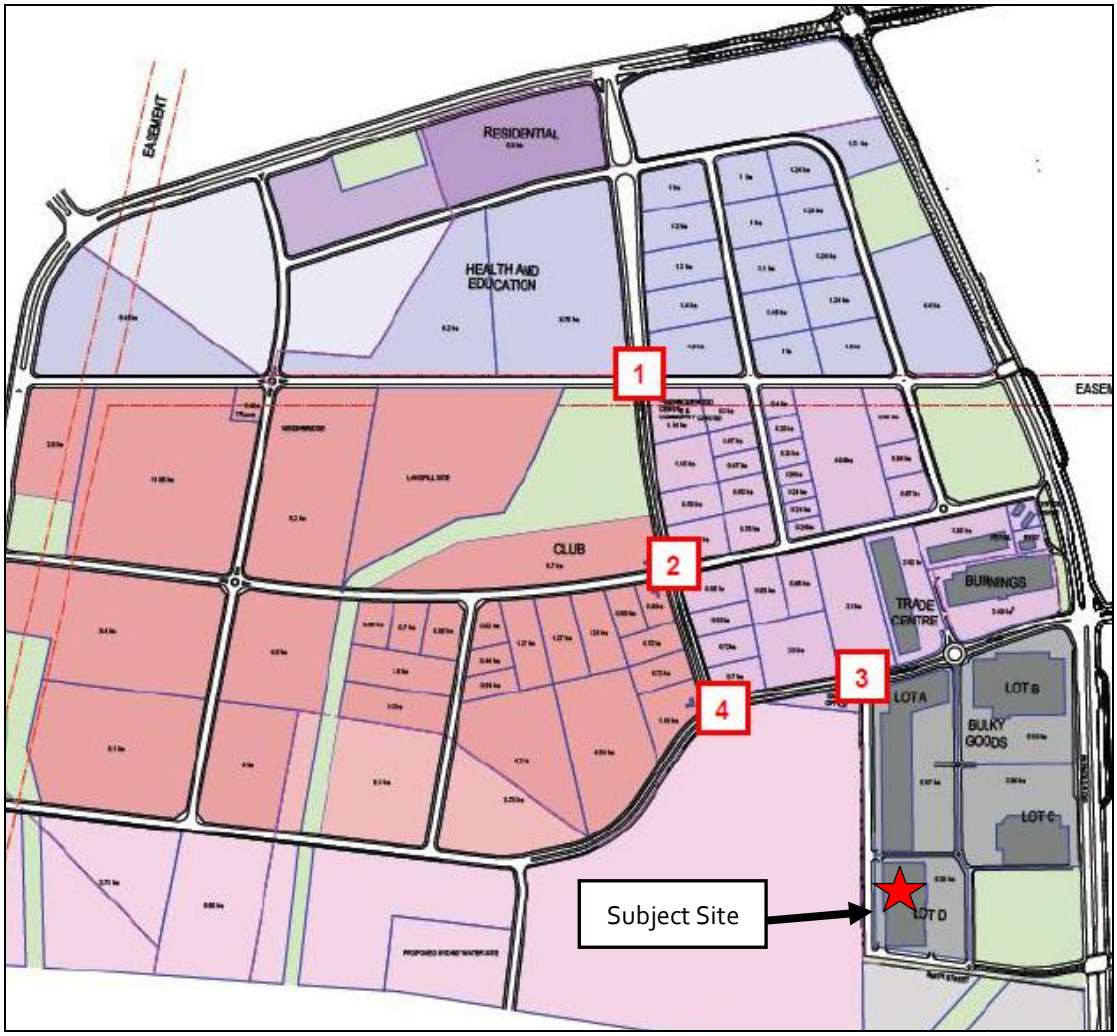
This report also contained SCATES modelling of the Richmond Road/ Smith Land Access Road intersection up to 2036 undertaken by Road Delay Solutions in May 2010. The traffic forecasts used as part of this assessment differed from those contained in the Road Delay Solutions Traffic and Transport Model Validation (Section 4.1).

4.5 Marsden Park Industrial Precinct DA2 TIA, October 2011 (AECOM)

This report sought to determine the internal intersection layouts required to support development for a 10 year horizon (2021), and to support full development of the Marsden Park Industrial Precinct in 2036. Intersection performance was assessed the four internal intersections shown in Figure 4.1.

Forecast traffic flows from the 2021 and 2036 Netanal models developed for the Marsden Park Industrial (Employment) Precinct, Transport and Access Study (ARUP, 2009) were adapted to develop detailed traffic forecasts within the Marsden Park Industrial Precinct, which formed the basis for the assessment. This assessment recognised the limitations of the Netanal models to provide sufficient detail of traffic movements within the precinct due to its strategic nature. As a result, trip totals to and from zones and the distribution of trips outside of the precinct were extracted from the model and used to reforecast traffic movements within the precinct using detailed spatial planning data (road network and land use) in combination with the Netanal trip generation and external distribution data.

Figure 4.1: AECOM Modelled Intersections



Source: Marsden Park Industrial Precinct DA2 TIA (AECOM)

4.6 Richmond Road Upgrade Review of Environmental Factors (REF), November 2011 (APP Corporation)

APP prepared the REF for the upgrade of 3.4km of Richmond Road from Bells Creek, Colebee to Vine Street West, Marsden Park on behalf of RMS. The purpose of the REF was to describe the proposal and to document the likely impacts of the proposal on the environment and to detail proposed mitigation measures. The proposed upgrade of Richmond Road involves:

- Converting from a two lane road to a four lane divided road with a central median and a speed limit of 80km/h, catering for a possible future upgrade to a six lane road.
- New signalised intersections at Townson Road, South Street and access to the Colebee Precinct.
- Altered arrangement at Grange Avenue intersection to restrict traffic movements to left-in/ left-out.
- Indented bus bays and stops at Townson Road and South Street, with bus priority at intersections.
- Closure of Hollinsworth Road intersection (when new access is provided at Townson Road).
- An off road shared user path on the western side of the road, with provision for a future shared user path on the eastern side.

The REF contained concept design plans of the proposed road layout prepared by J. Wyndham Prince as well as proposed intersection layouts for South Street, Townson Road and Colebee intersection.

A location plan showing the extent of the Richmond Road upgrade is shown in Figure 3.4.

4.7 Richmond Road Upgrade REF – Submission, Traffic Modelling and Operational Assessment, December 2011 (AECOM)

AECOM prepared a submission to the Richmond Road Upgrade REF on behalf of Marsden Park Developments Pty Ltd. The submission outlined the benefit to the exhibited project of providing two additional access points to Richmond Road. Two scenarios were assessed:

- Scenario 1 – Access via South Street and Townson Road, as proposed in the Richmond Road Upgrade REF.
- Scenario 2 – As per Scenario 1 plus two additional access roads; at Smith access (south of Townson Road) and; via a Central Collector Road intersecting with Richmond Road located between South Street and Townson Road.

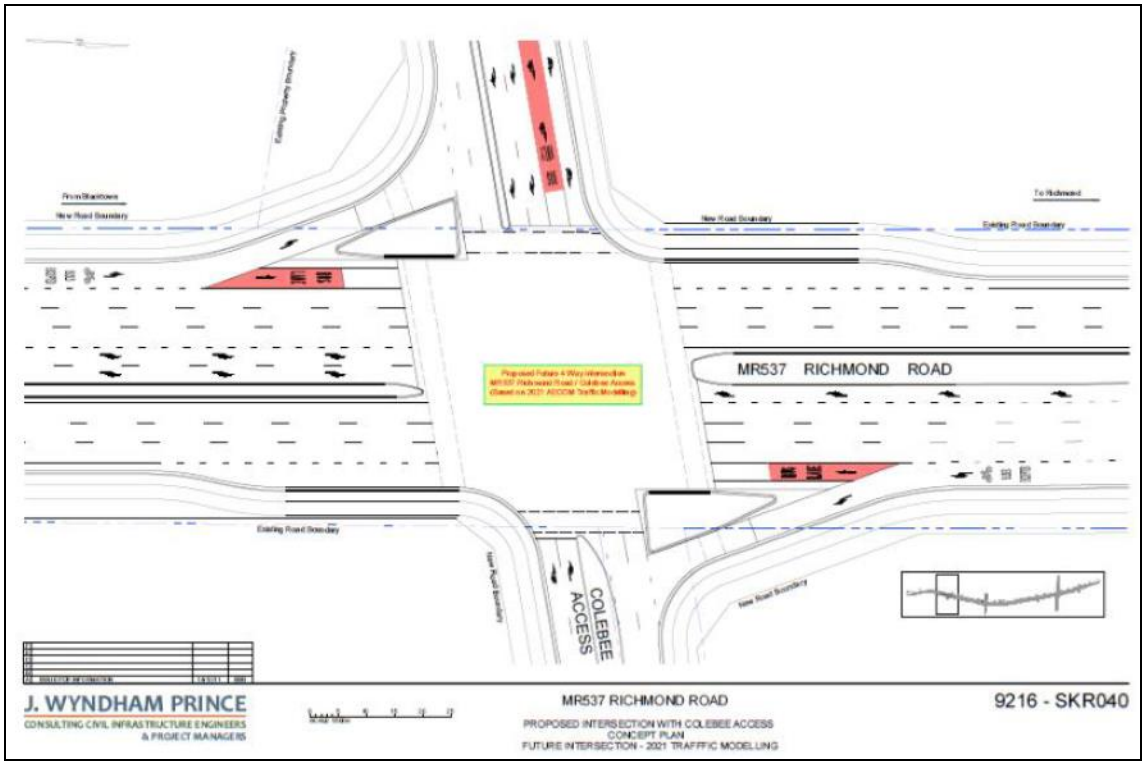
The submission included an assessment of the Netanal model prepared by Road Delay Solutions to support the REF. It was found that the traffic forecasting for the intersection upgrades used to support the REF included low trip generation during the weekday PM peak period associated with the Marsden Park Industrial Precinct and specifically the southeast corner in the area of the Bulky Goods Precinct.

Based on a bulky goods precinct GLA of 70,000m^2 and using the RMS traffic generation rate for bulky good retail of 2.5 vehicle trips (two-way)/ weekday peak hour/ 100m^2 GLA (RMS *Guide to Traffic Generating Developments*, 2002) it was estimated that the bulky goods precinct would generate in excess of 1,700 vehicle movements per weekday peak hour (two way).

The REF submission found inconsistencies in the traffic forecasting and distribution of the Netanal model prepared by Road Delay Solutions and in the subsequent assessment of individual intersections due to the differing traffic forecasts and studies. As such, revised traffic forecasts were developed for Richmond Road using inputs from the REF and supporting documentation which included additional trips to/ from the bulky goods precinct being added to trip ends to/ from Townson Road and distributed on the Richmond Road corridor.

This report contained revised concept designs for the road upgrade including a revised intersection layouts prepared by Wyndham Prince Pty Ltd. The intersection layout for the Richmond Road/ Colebee Access was revised from a 'T-intersection' only providing access to the Colebee release area to a four way intersection providing access to the Southern Access Road of the Bulky Goods Precinct as shown in

Figure 4.2: Richmond Road/ Colebee Access/ Southern Access Road Revised Intersection Layout



Source: J. Wyndham Prince taken from Richmond Road Upgrade REF Submission (AECOM, December 2011)

4.8 SCATES Modelling for Year 2021 Traffic Volumes, Richmond Road, March 2012 (TUPA)

TUPA were engaged by RMS Infrastructure and Development to undertake SCATES modelling for Richmond Road based on three intersection concept designs of the proposed road upgrade prepared by RMS. The projected 2021 traffic volumes were based on the RMS EMME2 network model. This assessment assumed that in 2021 the Bulky Goods Precinct would be approx. 30% developed and operating.

4.9 Richmond Road Upgrade REF Submissions Report, April 2012, Hills Environmental

This report summarised the submissions received as part of the Richmond Road upgrade REF. This report contained revised concept designs for the road upgrade including revised intersection layouts prepared by Wyndham Prince Pty Ltd. The intersection layout for the Richmond Road/ Colebee Access was revised from a 'T-intersection' only providing access to the Colebee release area to a four way intersection providing access to the Southern Access Road of the Bulky Goods Precinct.

4.10 Operational Assessment of Southern Boulevard intersection to Bulky Goods, Memo to Michael Gray, July 2012 (AECOM)

AECOM were commissioned by Marsden Park Developments Pty Ltd to provide traffic advice to assist and inform the concept design development of the Southern Boulevard intersection to the Bulky Goods Precinct (future road number 18) as shown in Figure 4.3.

The analysis included demand forecasting and an operational assessment of the proposed intersection assuming full development of the Bulky Goods Precinct by 2021 using a single lane roundabout configuration.

This study assumed that access to the Bulky Goods Precinct would be via two primary road connections:

- Townson Road/ Future Road no. 18 at the northern end of the Bulky Goods Precinct;
- Southern Boulevard/ Future Road no. 18 at the southern end of the Bulky Goods Precinct.

The demand forecasting for this assessment was stated as being consistent with previous traffic forecast notably:

- Richmond Road Upgrade REF – Submission: Traffic Modelling and Operational Assessment (AECOM, 2011). This study considered total traffic associated with the precinct, as identified by the Richmond Road Upgrade REF (RMS), including traffic distribution associated with additional precinct access points and additional traffic associated with the Bulky Goods Precinct.
- Advice relating to traffic generation and patterns relating to the Marsden Park Industrial Precinct Bulky Goods Precinct (AECOM, 2012). This work included the detailed assessment of anticipated trip generation for the Precinct based on the proposed type and size of land uses.

The traffic generation estimates for the Bulky Goods Precinct used in the study are summarised in Table 4.1.

Table 4.1: Bulky Goods Precinct Total Trip Generation

Lot	GLA (m^2)	AM Peak Hour Trip Generation/ 100 m^2 GLA	AM Traffic Generation (vph)	PM Peak Hour Trip Generation/ 100 m^2 GLA	PM Traffic Generation (vph)
A	18,135	0.28	51	2.5	453
B	23,790	0.28	67	2.5	595
C	13,543	0.28	38	2.7	366
D	13,618	0.28	38	2.7	368
Total	**69,086**		**194**		**1782**

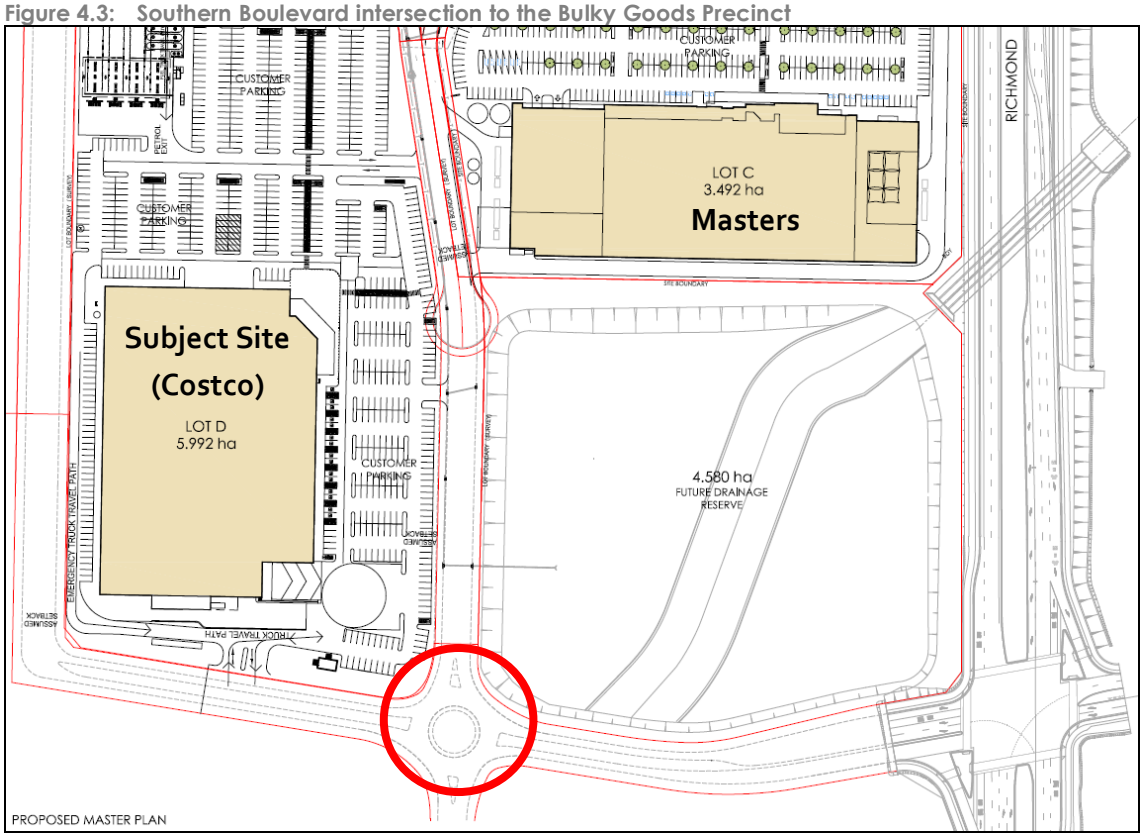
As shown in Table 4.1 the study estimated that the subject site would generate 194 and 1,782 vehicle movements (two-way) in the AM and PM peak hours respectively.

The operational assessment found that the proposed intersection would op1erate within capacity at a Level of Service (LOS) A (minimal delays) during forecast 2021 AM and PM peak traffic conditions,

following full development of the Bulky Goods Precinct by 2021 using a single lane roundabout configuration.

PM peak sensitivity testing indicated that when forecast traffic travelling to and from the Bulky Goods Precinct via the Southern Boulevard/ Future Road no. 18 intersection was increased by a further 75% above forecast demand, the proposed intersection would still operate at an average LOS B. This assumed a scenario whereby approximately 75% of total trips generated by the Bulky Goods Precinct would use the Southern Boulevard intersection as the point of access. As such, this study found that the proposed roundabout configuration would provide an effective and efficient southern access point for anticipated demand entering and exiting the Bulky Goods Precinct.

Figure 4.3: Southern Boulevard intersection to the Bulky Goods Precinct



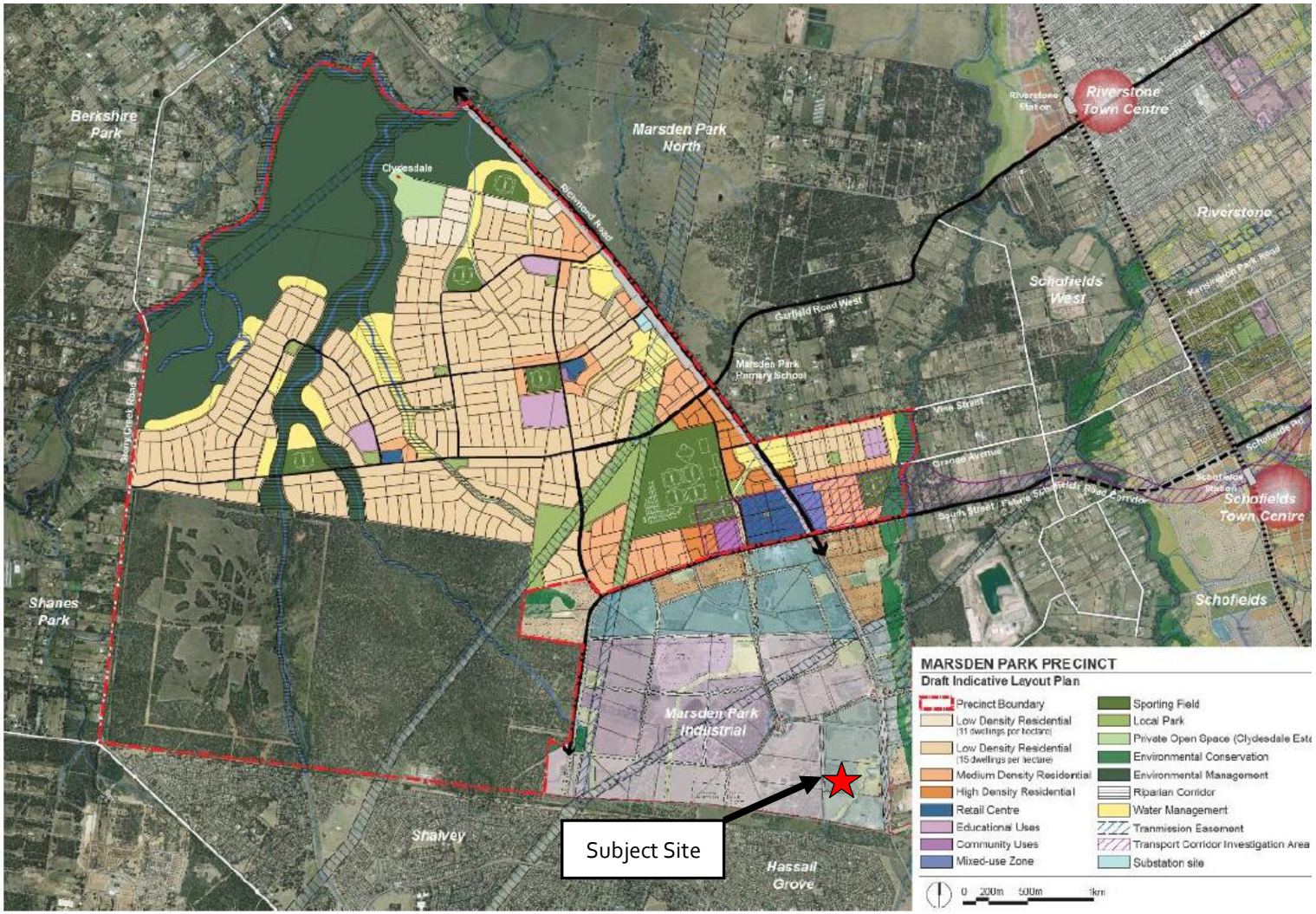
Background Image Source: Leffler Simes Architects (preliminary drawing no. SK002, dated 21/01/2013)

4.11 Marsden Park Precinct Traffic and Transport Assessment, AECOM, September 2012

This traffic and transport assessment was carried out by AECOM for Woorong Park Pty Ltd on behalf of DoPI with the intention of being part of a suite of documents that would form part of the overall Marsden Park Precinct Plan.

The report assessed the transport and access requirements for the Marsden Park Precinct based on an indicative layout plan developed by AECOM as shown in Figure 4.4.

Figure 4.4: Marsden Park Precinct Indicative Layout Plan



Source: Marsden Park Precinct Traffic and Transport Assessment, AECOM, September 2012

As shown in Figure 4.4, the extent of the precinct assessed did not include the Marsden Park Industrial Precinct and therefore did not include the Bulky Goods Precinct. The precinct is expected to accommodate approximately 10,600 dwellings which will consist primarily of low density residential housing with several medium and high density housing in key locations such as along primary road corridors as well as surrounding retail and commercial areas, schools and sporting fields.

The report covered a range of transport modes and considered improvements to public transport, walking and cycling networks in the area.

An assessment of road network opportunities was undertaken from both a strategic point of view as well as at a more local level to ensure appropriate highway connections are provided with capacity to meet future forecast traffic volumes.

Traffic Modelling

AECOM maintains and develops a Sydney Strategic Traffic Assignment Model using the software package CUBE (version 5.1.2). This model can provide traffic volumes on all major links in the Sydney Metropolitan Area road network.

The CUBE model was used to forecast traffic volumes within the Marsden Park Precinct under 2021 and 2036 year horizons based on the proposed future land uses and infrastructure developments in the precinct and the wider North West Growth Centre. The forecast traffic volumes on Richmond Road in the vicinity of the bulky goods precinct under 2021 and 2036 year horizons are summarised in Table 4.2 with full results contained in Appendix C.

Table 4.2: Richmond Road Forecast Traffic Volumes (Passenger Car Units (PCU))

Direction	2021 AM Peak	2021 PM Peak	2036 AM Peak	2036 PM Peak
Northbound	2,419	2,688	2,413	4,344
Southbound	2,517	2,551	3,973	3,108
Total	**4,936**	**5,239**	**6,386**	**7,452**

Source: Marsden Park Precinct Traffic and Transport Assessment, (Appendix A), AECOM, September 2012

The traffic volumes shown in Table 4.2 represent Passenger Car Units (PCU), a common measurement used in traffic modelling to indicate the equivalent number of cars in the traffic stream. A car is measured as 1.0 PCU while motorbikes may be measured at 0.4 PCU and large vehicles such as buses or trucks at 2.5 PCU or higher. The Traffic and Transport Assessment did not state the equivalent factors used in the calculation of forecast traffic volumes.

AECOM has used this model to provide traffic forecasts in both South West and North West Growth Centres including Oran Park, Schofields, Austral and Leppington North as well as for the assessment of the Bringelly Road upgrade.

The model was intended to identify the likely traffic volumes on the strategic road network within the precinct to confirm that the precinct plan is appropriate. The model did not consider road requirements beyond the boundary of the Marsden Park Precinct, so in turn did not include the Bulky Goods Precinct, or the Richmond Road intersections at Townson Road or the Future Southern Access Road.

4.12 Summary

The traffic forecasting and modelling undertaken to date has included traffic generated by a bulky goods retail development of the subject site. The only previous traffic study to state the traffic

generation rate used for the Bulky Goods Precinct was the operational assessment of the Southern Boulevard/ Future Access Road intersection undertaken by AECOM (Section 4.10), i.e. 2.7 vehicle trips per 100m^2 GLA in the PM peak hour. It is assumed that all other traffic forecasting utilised the RMS *Guide to Traffic Generating Developments* (2002) rate of 2.5 vehicle trips per weekday peak hour per 100m^2 Gross Leasable Floor Area (GLA).

It is anticipated that a Costco development will generate traffic in excess of a typical bulky goods development.

The quantum of this additional traffic, the distribution of it onto the road network and the subsequent modelling on the intersections is contained in Section 7.

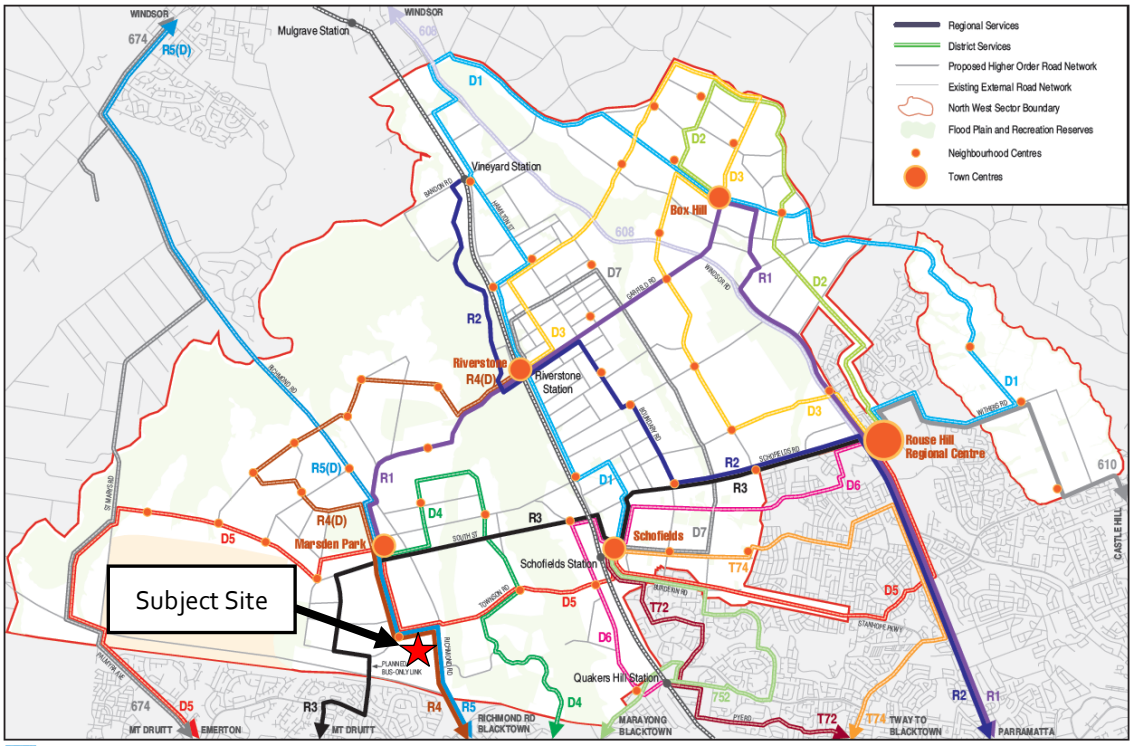
5. Sustainable Transport Infrastructure

5.1 Proposed Public Transport

5.1.1 Bus Network

Bus network planning for the North West Growth Centre is directed by the North West Sector Bus Servicing Plan (2009) prepared by McCormick Rankin Cagney for NSW Transport and Infrastructure. The recommended North West Growth Centre bus network, including regional and district services is shown in Figure 5.1.

Figure 5.1: Proposed All Day Bus Routes



Source: North West Sector Bus Servicing Plan (McCormick Rankin Cagney, 2009)

As shown in Figure 5.1, the Marsden Park Industrial Precinct will be served by three regional services and one district service as follows:

i Regional Routes:

- R3: Mount Druitt – Marsden Park – Schofields – Rouse Hill
- R4/R5: Blacktown – Richmond Road – Marsden Park.

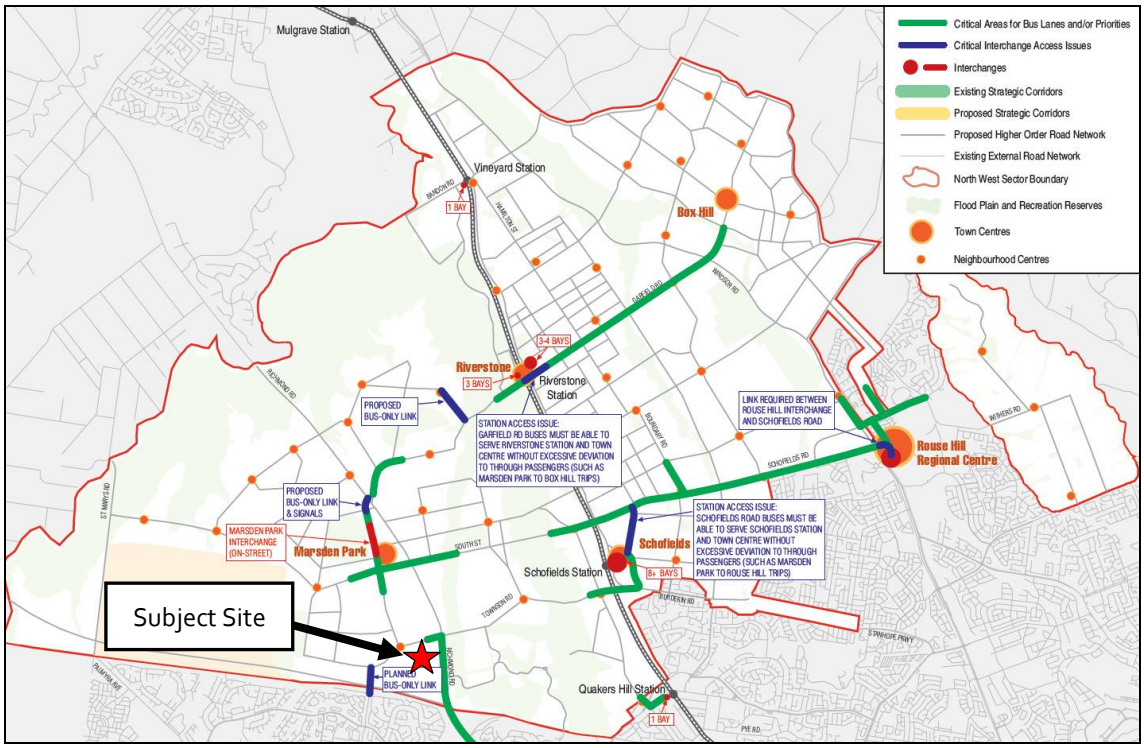
ii District Routes:

- D4: Blacktown – Colebee – Marsden Park.

The regional routes 'R3' would provide access to Mount Druitt, Schofields, and Rouse Hill railway stations while R4/R5 would provide a direct service to Blacktown Station.

The North West Sector Bus Servicing Plan also identified the future bus infrastructure requirements in relation to the proposed development of the North West Growth Centre as shown in Figure 5.2.

Figure 5.2: Bus Infrastructure Requirements



Source: North West Sector Bus Servicing Plan (McCormick Rankin Cagney, 2009)

As shown in Figure 5.2, the bus interchange requirements within Marsden Park Industrial Precinct identified in the North West Sector Bus Servicing Plan include:

- An on-street bus interchange west of Richmond Road;
- Two bus only links west of Richmond Road.

5.1.2 North West Rail Link

The North West Rail Link is a priority rail infrastructure project for the NSW Government to provide a 23km rail link through the North West Growth Centre. The rail link would connect to the existing CityRail network and provide eight new stations at Cherrybrook, Castle Hill, Hills Centre, Norwest, Bella Vista, Kellyville, Rouse Hill and Cudgegong Road as well as 4,000 commuter car parking spaces. The North West Rail Link is shown in Figure 5.3.

Figure 5.3: North West Rail Link

Source: North West Rail Link website: http://northwestrail.com.au, (Transport for NSW) accessed 30/08/2012

Following community consultation, the NSW Government recently announced that a dedicated public transport corridor would be provided from the end of the North West Rail Link at Cudgegong Road west to Schofields Station then onto Marsden Park, a distance of approx. 6.8km. This corridor has now been included in the NSW Government's Long Term Transport Master Plan with Transport for NSW now working to finalise the planning rules to protect this corridor. This protection means any development within or near the corridor will need to consider potential impacts to the viability of the corridor's future use for public transport.

Figure 5.4: Marsden Park Public Transport Corridor

Source: Northwest options website: http://northwestoptions.com.au/ (Transport for NSW), accessed 18/04/2013

5.2 Walking and Cycling Network

Shared paths are proposed on both sides of Richmond Road as part of the road upgrade. The signalised intersections along Richmond Road would provide safe crossing points for pedestrians and cyclists.

6. Traffic Impact Assessment

6.1 Traffic Generation

To determine the impact of the proposed development on the surrounding road network, the estimated traffic generating characteristics of the Costco store and other bulky goods retail stores require consideration.

As a basis for the assessment, it has been assumed that the current infrastructure requirements in the vicinity have been based upon a typical bulky goods use. However, the proposed Costco stores are likely to have different traffic generation rates when compared to a typical bulky goods store on the same site. Similarly and to ensure a robust assessment is made, an additional allowance has been made for IKEA which generally has different characteristics to a typical bulky goods use.

The traffic impact assessment outlined below was undertaken based on the initial figures of lot size and GLA for the bulky goods precinct available at the time. The lot sizes and GFA of the bulky goods precinct lots have since been revised as reflected in the current development schedule (Table 3.1). A comparison of the initial and current development schedule are summarised in Table 6.1.

Table 6.1: Bulky Goods Precinct Development Schedule

Lot	Tenant	Initial Development Schedule [1]		Current Development Schedule		
		Lot Area (ha)	GLA (m^2)	Lot Area (ha) [2]	GFA (m^2) [2]	GLA (m^2) [3]
A	Unknown	3.75	18,135	3.912	24,180	18,135
B	IKEA	7.36	32,000	7.606	29,143	21,857
C	Masters	3.45	13,543	3.492	13,234	9,925
D	Costco	6.18	13,618	5.992	13,746	10,309
Total		**20.74**	**77,296**	**21.002**	**80,303**	**60,226**

[1] Data Source: Lot Area and GLA Source (except IKEA): Operational Assessment of Southern Boulevard intersection to Bulky Goods, Memo to Michael Gray (AECOM, 2012). IKEA GLA estimated based on GLA of IKEA Tempe

[2] Data Source: Leffler Simes Architects (preliminary drawing no. SK002, dated 21/01/2013) except Lot A GFA which is based on a GLA of 18,135m^2 contained in Operational Assessment of Southern Boulevard intersection to Bulky Goods, memo to Michael Gray (AECOM, 2012) and a general rule of 100m^2 GFA equals 75m^2 GLA (RMS Guide to Traffic Generating Developments, 2002, Section 3.6.1).

[3] Estimated on the basis of 100m^2 GFA equals 75m^2 GLA (RMS Guide to Traffic Generating Developments, 2002, Section 3.6.1).

As shown in Table 6.1, while the total lot area of the bulky goods precinct has increased on the initial development schedule, the lot area for the Costco site has decreased slightly. The GLA of Lots B, C and D have decreased significantly by approx. 78% or 17,000m^2.

The traffic impact assessment outlined below was undertaken using the initial development schedule GLA of 77,296m^2. Consequently, this represents a conservative estimate of traffic generated by the bulky goods precinct, i.e. the amount of traffic generated by the development has been overestimated by a magnitude of approx. 22%.

6.1.1 RMS Guide to Traffic Generating Developments (2002)

The RMS *Guide to Traffic Generating Developments* (2002) contains traffic generation estimates for different development types. The rate for bulky goods retail stores is based on surveys undertaken in 1990 where a wide range of traffic generation rates were found. These surveys found that the average generation rate for bulky goods retail stores were:

- Thursday PM peak hour: **2.5 vehicle movements per 100m² GLA**
- Saturday peak hour: **6.6 vehicle movements per 100m² GLA**

However, the RMS Guide states that in relation to this type of development:

"The trip generation rates varied so widely that average generation rates cannot be recommended". (RMS Guide to Traffic Generating Developments, Section 3.6.8).

6.1.2 RMS Trip Generation and Parking Generation Surveys, Bulky Goods/ Hardware Stores – Analysis Report, Hyder Consulting 2009

Fundamental land use, economic and social changes have taken place since the bulky goods retail store surveys undertaken in 1990 which have the potential to impact the relevance and reliability of the information contained in the Guide. Such changes include:

- the emergence of new business types (e.g. IKEA) and new land use types (e.g. business parks);
- the growth and increase in popularity of on-line retailing;
- changes in car ownership, demographics and housing affordability;
- changes in retail trading hours.

In 2008 RMS commenced a program of updating the trip generation information for different land use types. In 2008/ 2009 Hyder Consulting undertook trip generation surveys of bulky goods stores in New South Wales for the RMS. These surveys found the average trip generation rates for bulky goods retail stores in the Sydney Metropolitan Area to be:

- Weekday PM peak hour: **1.01 vehicle movements per 100m² GFA**
- Saturday peak hour: **3.75 vehicle movements per 100m² GFA**

Guidance in the RMS *Guide to Traffic Generating Developments* states that that

"The generation rates given are based on (GLA) which provides a better indication of trip generation than gross floor area. As a general guide, 100m² gross floor area equals 75m² gross leasable floor area". (RMS *Guide to Traffic Generating Developments*, Section 3.6.1).

Consequently we feel that the trip rates should be adjusted to 1.35 trips per 100m² GLA (weekday PM peak hour) and 5.00 trips per 100m² GLA (Saturday) based on the general relationship between GFA and GLA.

6.1.3 Costco Site

Traffic generation estimated for the proposed development have been sourced from the RMS *Guide to Traffic Generating Developments* (2002) and an empirical assessment of the existing Costco store at Auburn as outlined below.

RMS Guide to Traffic Generating Developments (2002)

Application of the RMS bulky goods rate for the Costco site results in a traffic generation estimate as summarised in Table 6.2.

Table 6.2: Estimated Development Traffic Generation (RMS rate)

GLA (m²)	Design Generation Rates		Traffic Generation Estimates	
	Thursday PM Peak Hour	Saturday Peak Hour	Thursday PM Peak Hour	Saturday Peak Hour
13,618	2.5 vehicle movements / 100m² GLA	6.6 vehicle movements / 100m² GLA	341 vehicle movements / hour	899 vehicle movements / hour

Table 6.2 indicates that based on the RMS rate, the site could potentially generate 341 vehicle movements during a typical weekday peak hour and 899 vehicle movements during a typical Saturday peak hour.

Costco Crossroads Traffic Assessment Report, Halcrow (2012)

Halcrow undertook a Traffic Assessment Report for the proposed Costco Crossroads store at Casula in 2012. As requested by the RMS, traffic generation surveys were undertaken at the existing Costco store at Auburn during the following times:

- Thursday 1 December 2011 – 7:00am to 12:00pm and 5:00pm to 7:00pm
- Saturday 4 February 2012 – 6:00am to 10:00pm.

The results of the traffic generation surveys are summarised in Table 6.3 with the peak hour generation rate per 100m² of GLA contained in brackets.

Table 6.3: Costco Auburn Traffic Generation Survey Results

Peak Period	Peak Hour	Arrivals	Departures	Two-way Total
Thursday AM Peak	8:00am–9:00am	406 (2.9)	133 (1.0)	539 (3.9)
Thursday PM Peak	5:00pm–6:00pm	276 (2.0)	259 (1.9)	535 (3.9)
Saturday Peak	12:15pm – 1:15pm	459 (3.3)	499 (3.6)	958 (6.9)

As shown in Table 6.3, it was found that the Auburn store generated 539 vehicle movements (two-way) during the weekday peak period, the equivalent of a traffic generation rate of 3.9 vehicle trips per 100m² of GLA. It was found that the store generated 958 vehicle movements (two-way) during the Saturday peak period, the equivalent of a traffic generation rate of 6.9 vehicle trips per 100m² of GLA.

The Auburn store of approx. 13,750m² GLA is similar in size to the proposed Marsden Park store of 13,618m². However it is noted that the Auburn store also includes Costco's Australian Head Office which has a floor area of approx. 2,000m² which accommodates 70 staff. Therefore, the above weekday peak period traffic generation would include a component of administration staff which will not be at the Marsden Park site.

Application of the Auburn store traffic generation rates results in traffic generation for the Marsden Park store as summarised in Table 6.4.

Table 6.4: Estimated Development Traffic Generation (Costco Auburn rate)

GLA (m²)	Design Generation Rates		Traffic Generation Estimates	
	Weekday Peak Hour	Saturday Peak Hour	Weekday Peak Hour	Saturday Peak Hour
13,618	3.9 vehicle movements/100m² GLA	6.9 vehicle movements/100m² GLA	532 vehicle movements/ hour	940 vehicle movements/ hour

Table 6.4 indicates that based on the traffic generation rates of the Auburn store, the site could potentially generate in the order of 532 vehicle movements during a typical weekday peak hour and 940 vehicle movements during a typical Saturday peak hour.

However, the Auburn store does not have a service station which is proposed for the Marsden Park store for use by Costco car holders. Based on a North American study[2], a Costco fuelling station would generate about 8.75 and 11.875 trips per hour per pump for the weekday and weekend peak periods respectively. Assuming that the new Costco site at Marsden Park would have eight pumps, this would generate an additional 70 and 85 vehicle movements per hour (two-way) during the weekday PM and weekend peak periods respectively.

Costco Site Traffic Generation Summary

Given the traffic generation surveys undertaken at Costco's Auburn store in 2011/12, the RMS rate for the Thursday PM peak hour is considered to vastly underestimate the traffic generated by the development and as such is considered to be inappropriate for application to the Marsden Park site.

It is noted that the Auburn store is currently the only Costco store in the Sydney region. The addition of second store at Casula Crossroads and a third store at Marsden Park is likely to disperse traffic movements between the three stores. As such, the application of empirical traffic generation estimates from the Auburn store for the Marsden Park site is considered to represent an overestimate of the likely traffic generated by the site.

Given this, the traffic generated by the Costco store at Marsden Park has been estimated by adopting 80% of the empirical traffic generation estimates of the Auburn store, plus the additional traffic generated by the proposed service station and also discounting for the traffic generated by the office component at the Auburn store which would not be at the Marsden Park site. This results in a traffic generation estimate as summarised in Table 6.5.

Table 6.5: Estimated Costco Traffic Generation

Description	Thursday AM Peak Hour (two-way)	Thursday PM Peak Hour (two-way)	Saturday Peak Hour (two-way)
80% of Auburn store traffic	425	425	752
Less adjustment for floor space of Marsden Park [1]	6	6	10
Less office traffic [2]	40	40	0
Plus service station traffic	35	70	85
Total	**506**	**541**	**847**

[1] Adjustment of Auburn store traffic to reflect proposed floor space at the Marsden Park site by 1%
[2] Based on office space of 2,000m² at 2.0 vehicle trips/ peak hour/ 100m² (RMS Guide to Traffic Generating Developments)

As shown in Table 6.5, if the Marsden Park store is 80% as successful as the Auburn Store, the proposed Costco store at Marsden Park could be expected to generate 506, 541 and 847 vehicle movements (two-way) during the weekday AM, weekday PM and Saturday peak periods respectively.

6.1.4 IKEA Site

It is understood that Lot B of the Bulky Goods Precinct is to be developed as an IKEA store of approximately 32,000m² GLA, similar in size to the IKEA Tempe store.

RMS Guide to Traffic Generating Developments (2002)

Application of the RMS bulky goods rate for the IKEA site results in a traffic generation estimate as summarised in Table 6.6.

[2] Langley Costco Gas Bar Addition – Transportation Evaluation, 10 February 2012 prepared by Kittelson & Associates Inc.

Table 6.6: Estimated IKEA Traffic Generation (RMS rate)

GLA (m^2)	Design Generation Rates		Traffic Generation Estimates	
	Thursday PM Peak Hour	Saturday Peak Hour	Thursday PM Peak Hour	Saturday Peak Hour
32,000	2.5 vehicle movements / 100m^2 GLA	6.6 vehicle movements / 100m^2 GLA	800 vehicle movements / hour	2,112 vehicle movements / hour

Table 6.6 idicates that based on the RMS rate, the site could potentially generate 800 vehicle movements during a typical weekday peak hour and 2,112 vehicle movements during a typical Saturday peak hour.

IKEA Victoria Gardens, Richmond, Victoria

As part of a previous project to determine the trip generation of IKEA's Tempe store prior to opening, GTA Consultants analysed empirical trip generation data from existing IKEA stores at Victoria Gardens Shopping Centre in Richmond, Victoria and at Springwood, Queensland.

GTA Consultants undertook trip generation surveys of the existing IKEA located at Victoria Gardens Shopping Centre in Richmond, Victoria in 2007 as part of the transport impact assessment for the proposed IKEA development at Springvale, Victoria. The Victoria Gardens, Richmond store has a GLA of 22,500m^2.

The surveys were undertaken on a Friday 16 March 2007 and Saturday 17 March 2007 during the daytime and evening peak periods. These surveys indicated trip generation rates for the IKEA site at Victoria Gardens shown in Table 6.7.

Table 6.7: Victoria Gardens IKEA, Richmond, Victoria – Surveyed Customer Trip Generation Rates

Day of Week	Trip Generation Rate (Road Network Peak Period)
Friday	1.14 vehicles/100m^2 GLA
Saturday	3.74 vehicles/100m^2 GLA

Note: These rates include adjustments to represent the 85th percentile and an adjustment to reflect 100% primary trips to IKEA.

IKEA Springwood, Queensland

GTA Consultants obtained Saturday trip generation data from IKEA for their Springwood, Queensland store (surveyed on 25 November 2006) which is summarised in Table 6.8.

Table 6.8: Springwood IKEA, Queensland – Trip Generation Rates

Day of Week	Trip Generation Rate (Road Network Peak Period)
Saturday	3.83 vehicles/100m^2 GLA

As shown in Table 6.7 and Table 6.8, the Saturday trip generation rate for IKEA Springwood of 3.83 vehicles/ 100m^2 GLA were similar with GTA Consultants surveyed result of 3.74 vehicles/ 100m^2 GLA GLFA before any adjustments were applied.

IKEA Tempe

Given the empirical traffic generation data above, GTA Consultants utilised the following trip generation rates to determine the trip generation of IKEA's Tempe store prior to opening.

Table 6.9: IKEA Tempe – Trip Generation Rate

Day of Week	Trip Generation Rate (Road Network Peak Period)
Thursday	1.32 vehicles/100m² GLA
Saturday	3.53 vehicles/100m² GLA

IKEA Traffic Generation Summary

Given the empirical traffic generation data available for IKEA stores the RMS bulky goods retail rates are considered to overestimate IKEA traffic. The application of the Tempe store trip generation rates for the Marsden Park IKEA is therefore considered appropriate. As such, the estimated traffic generation for the Marsden Park IKEA is summarised in Table 6.10.

Table 6.10: Estimated IKEA Traffic Generation

GLA (m²)	Design Generation Rates		Traffic Generation Estimates	
	Thursday PM Peak Hour (IKEA Tempe rate)	Saturday Peak Hour (IKEA Tempe rate)	Weekday PM Peak Hour	Saturday Peak Hour
32,000	1.32 vehicle movements / 100m² GLA	3.53 vehicle movements / 100m² GLA	423 vehicle movements / hour	1,130 vehicle movements / hour

As shown in Table 6.10, the IKEA store at Marsden Park is estimated to generate 423 and 1,130 vehicle movements (two-way) respectively during a typical Thursday PM and Saturday peak hour.

6.1.5 Bulky Goods Precinct Lots A and C

Traffic generation for the remaining Bulky Goods precinct lots (A and C) have been estimated using the average bulky goods rate taken from the RMS Trip Generation and Parking Generation Surveys undertaken by Hyder Consulting in 2008/ 2009 (Section 6.1.2). Application of this rate for Lots A and C results in a traffic generation estimate as summarised in Table 6.11.

Table 6.11: Lot A and C Traffic Generation Estimate Summary

Lot	Tenant	Lot Area (ha)	GLA (m²)	Traffic Generation Rate		Traffic Generation Estimate	
				Weekday PM Peak Hour	Saturday Peak Hour	Weekday PM Peak Hour	Saturday Peak Hour
A	Unknown	3.75	18,135	1.35 vehicle movements / 100m² GLA	5.00 vehicle movements / 100m² GLA	245 vehicle movements / hour	907 vehicle movements / hour
C	Masters	3.45	13,543	1.35 vehicle movements / 100m² GLA	5.00 vehicle movements / 100m² GLA	183 vehicle movements / hour	677 vehicle movements / hour
	Total	**7.20**	**31,678**	-	-	**428 vehicle movements / hour**	**1,584 vehicle movements / hour**

As shown in Table 6.11, Lots A and C of the Bulky Goods precinct is estimated to generate 428 and 1,584 vehicle movements (two-way) respectively during a typical Weekday PM and Saturday peak hour.

6.1.6 Bulky Goods Precinct Traffic Generation Summary

As discussed above, the proposed Bulky Goods precinct is expected to generate significantly more traffic during a Saturday peak period than during the weekday PM peak period.

The estimated traffic generated by the Bulky Goods precinct during the Weekday PM and Saturday peak periods are summarised in Table 6.12.

Table 6.12: Bulky Goods Precinct Traffic Generation Estimate Summary

Lot	Tenant	Lot Area (ha)	GLA (m^2)	Traffic Generation Rate		Traffic Generation Estimate	
				Weekday PM Peak Hour	Saturday Peak Hour	Weekday PM Peak Hour	Saturday Peak Hour
A	Unknown	3.75	18,135	1.35 vehicle movements / 100m^2 GLA	5.00 vehicle movements / 100m^2 GLA	245 vehicle movements / hour	907 vehicle movements / hour
B	IKEA	7.36	32,000	1.32 vehicle movements / 100m^2 GLA	3.53 vehicle movements / 100m^2 GLA	422 vehicle movements / hour	1,130 vehicle movements / hour
C	Masters	3.45	13,543	1.35 vehicle movements / 100m^2 GLA	5.00 vehicle movements / 100m^2 GLA	183 vehicle movements / hour	677 vehicle movements / hour
D	Costco	6.18	13,618	3.9 vehicle movements / 100m^2 GLA	6.9 vehicle movements / 100m^2 GLA	541 vehicle movements / hour [1]	847 vehicle movements / hour [1]
	Total	**20.74**	**77,296**	**-**	**-**	**1,391 vehicle movements / hour**	**3,561 vehicle movements / hour**

[1] Adjusted from Auburn store traffic with the addition of service station traffic as detailed in Section 6.1.3

As shown in Table 6.12, the Bulky Goods precinct is estimated to generate 1,391 and 3,561 vehicle movements (two-way) respectively during a typical Thursday PM and Saturday peak hour.

Table 6.13 provides a comparison between the estimated traffic generated by the bulky goods precinct calculated by AECOM in their Operational Assessment of the Southern Boulevard intersection to Bulky Goods Precinct (July 2012, Section 4.10) and that calculated by GTA Consultants above.

Table 6.13: Estimated Bulky Goods Precinct Traffic Comparison

Lot	Tenant	Lot Area (ha)	Weekday PM Traffic Generation Estimate		
			AECOM (July 2012)	GTA Consultants	Difference
A	Unknown	3.75	453 vehicle movements / hour	245 vehicle movements / hour	- 208
B	IKEA	7.36	595 vehicle movements / hour	422 vehicle movements / hour	- 173
C	Masters	3.45	366 vehicle movements / hour	183 vehicle movements / hour	- 183
D	Costco	6.18	368 vehicle movements / hour	541 vehicle movements / hour [1]	173
	Total	**20.74**	**1,782 vehicle movements / hour**	**1,391 vehicle movements / hour**	**-391 vehicle movements / hour**

[1] Adjusted from Auburn store traffic with the addition of service station traffic as detailed in Section 6.1.3

As shown in Table 6.13, it is estimated that the Bulky Goods precinct will generate 391 vehicle movements (two-way) less during the weekday PM peak hour than that previously estimated by AECOM in their Operational Assessment of the Southern Boulevard intersection to Bulky Goods Precinct (July 2012).

With regard to the Saturday, traffic, no estimate of bulky goods development traffic was made as no Saturday model was assembled for Richmond Road. However, in building a Saturday model in which the Saturday traffic generation could be tested, two points have been noted.

- The traffic generated by land uses other than bulky goods retail in the Marsden Park Industrial Precinct (other than the Bulky Goods Precinct) is expected to be significantly less during a Saturday peak period when compared to the weekday peak periods.

- The through traffic on Richmond Road during a Saturday peak hour is also likely to be significantly less that during a weekday PM peak hour.

6.1.7 Richmond Road Though Traffic

Weekday Peak Hours

Table 6.14 provides a comparison of the available forecast traffic volumes along Richmond Road at Townson Road for 2021 and 2036 weekday peak periods.

Table 6.14: Richmond Road Forecast Traffic Volume Comparison (at Townson Road)

Year	Peak	Direction	Richmond Road Traffic Model Projections (Road Delay Solutions, 2009)	Richmond Road Upgrade REF (RMS/APP, 2011)	Submission to Richmond Road Upgrade REF – SIDRA models (AECOM, 2011)	Marsden Park Precinct Traffic and Transport Assessment (PCUs) (AECOM, 2012)
2021	AM	Northbound	3,019	-	1,047	2,419
		Southbound	924	3,080	2,582	2,517
	PM	Northbound	1,240	2,390	2,386	2,688
		Southbound	2,130	-	1,305	2,551
2036	AM	Northbound	3,351	-	-	2,413
		Southbound	1,830	3,530	-	3,973
	PM	Northbound	2,033	3,672	-	4,344
		Southbound	3,242	-	-	3,108

As shown in Table 6.14, there is significant variability between the forecast traffic volumes along Richmond Road.

It is important to note that the forecast traffic volumes from the Marsden Park Precinct Traffic and Transport Assessment represent Passenger Car Units (PCU), a common measurement used in traffic modelling to indicate the equivalent number of cars in the traffic stream. A car is measured as 1.0 PCU while motorbikes may be measured at 0.4 PCU and large vehicles such as buses or trucks at 2.5 PCU or higher. The Traffic and Transport Assessment did not state the equivalent factors used in the calculation of forecast traffic volumes. Given this, in subsequent traffic modelling to assess the performance of key intersections in the vicinity of the site, the PCU values were used for Richmond Road through traffic volumes with no additional allowance was made for heavy vehicles.

To calculate Richmond Road traffic volumes for weekday peak in 2025 (estimated Costco opening year plus 10 years) a comparison of the forecast 2021 and 2036 traffic volumes from the Marsden Park Precinct Traffic and Transport Assessment was undertaken the results of which are summarised in Table 6.15.

Table 6.15: Richmond Road 2021 and 2036 Forecast Traffic Flow Comparison (at Townson Road)

Peak	Direction	Forecast Traffic Flows (Marsden Park Precinct Traffic and Transport Assessment (PCUs) (AECOM, 2012))		Total Increase	Average Per Annum Increase (2021-2036)	Average Per Annum Growth Rate (2021-2036)
		2021	2036			
Weekday PM	Northbound	2,688	4,344	1,656	111	4.1%
	Southbound	2,551	3,108	557	38	1.5%
Total		**7,260**	**9,488**	**2,213**	**149**	**2.8%**

As shown in Table 6.15 a comparison of the forecast 2021 and 2036 weekday PM peak hour traffic flows results in an average per annum increase of 4.1% for northbound traffic and 1.5% for southbound traffic. Application of these growth rates results in forecast 2025 weekday PM peak hour flows as shown in Table 6.16.

Table 6.16: Richmond Road Forecast 2025 Weekday PM Traffic Flows (at Townson Road)

Peak	Direction	Forecast 2021 Traffic Flows (Marsden Park Precinct Traffic and Transport Assessment (PCUs) (AECOM, 2012))	Average Per Annum Growth Rate (Table 6.15)	Forecast 2025 Traffic Flows
Weekday PM	Northbound	2,688	4.1%	3,129
	Southbound	2,551	1.5%	2,704
Total		**5,239**	**2.8%**	**5,833**

As shown in Table 6.16 application of the average per annum growth rate calculated in Table 6.15 results in 2025 weekday peak hour traffic volumes for Richmond Road of 3,129 vehicles northbound and 2,704 southbound.

Saturday Peak Hour

There are no projections for future year traffic on Richmond Road during a Saturday peak hour. As the Bulky Goods Precinct and the proposed Costco store generate significantly more traffic on a Saturday, it is considered necessary to provide a robust estimate of the Richmond Road through traffic on a Saturday and to remodel the intersections under Saturday conditions.

In order to establish Saturday base flows in 2025, the following analysis has been undertaken:

- The Saturday traffic growth on Richmond Road was established by using recorded flows in 2009 and predicted 2021 flows.
- The weekday growth factors were then used to growth the 2009 Saturday counts to 2025 Saturday.

These calculations are shown in more detail below.

The annual increase in weekday traffic volumes have been calculated by comparing the 2009 recorded weekday PM peak hour volumes with the forecast 2021 weekday PM traffic volumes from the Marsden Park Precinct Traffic and Transport Assessment (AECOM, 2012) as shown in Table 6.17.

Table 6.17: Richmond Road Recorded and Forecast Traffic Volume Comparison (at Townson Road)

Peak	Direction	2009 Recorded Weekday PM Peak Hour [1]	Marsden Park Precinct Traffic and Transport Assessment (PCUs) (AECOM, 2012)	Total Increase	Average Per Annum Increase (2009-2021)	Average Per Annum Growth Rate (2009-2021)
Weekday PM	Northbound	1,412	2,688	1,276	106	7.5%
	Southbound	1,068	2,551	1,483	124	11.6%
	Total	**2,480**	**5,239**	**2,759**	**230**	**9.3%**

[1] Thursday 12 February 2009, 16: 00-17:00 (Traffic Counts undertaken by CFEIT (Section 2.2.1))

As shown in Table 6.17 a comparison of the recorded weekday PM peak hour volumes with the 2021 forecast weekday PM peak hour results in an average per annum increase of 7.5% for northbound traffic and 11.6% for southbound traffic. Application of these growth rates to the recorded 2009 Saturday peak hour flows results in forecast 2025 Saturday peak hour flows as shown in Table 6.18.

Table 6.18: Richmond Road Forecast Traffic Volumes (at Townson Road) – Saturday Peak Hour

Peak	Direction	2009 Recorded Saturday Peak Hour [1]	Average Per Annum Growth Rate (Table 6.17)	Forecast 2025 Saturday Peak Hour Volumes
Saturday	Northbound	829	7.5%	1,824
	Southbound	804	11.6%	2,296

[1] Saturday 14 February 2009, 12: 00-13:00 (Traffic Counts undertaken by CFEIT (Section 2.2.1))

As shown in Table 6.18, application of the average per annum growth rate calculated in Table 6.17 results in Saturday peak hour forecast traffic volumes for Richmond Road of 1,824 vehicles northbound and 2,296 southbound.

6.2 Background Traffic

In addition to the traffic generated by the Bulky Goods Precinct and the Richmond Road through traffic two other components require consideration in assessing the performance of key intersections in the vicinity of the site:

- Marsden Park Industrial Precinct Traffic (other than the Bulky Goods Precinct);
- Traffic to/ from the eastern side of Richmond Road i.e. Smith Land Release via Colebee Access.

While this traffic will not access the four Bulky Goods Precinct lots, it does impact the Richmond Road intersections with Townson Road and the Future Southern Access Road.

Traffic volumes for these components have been calculated from two sources:

- SIDRA INTERSECTION model for the 2021 weekday PM peak used by AECOM for their submission to the Richmond Road Upgrade REF (Section 4.7).
- Operational Assessment of the Southern Boulevard intersection to Bulky Goods Precinct (Section 4.10).

In lieu of any available data for background traffic for the Saturday peak hour, these flows have been assumed to be 75% of the weekday PM peak hour background traffic flows.

6.3 20% Pass By Traffic

A development such as the Bulky Goods Precinct would have a 20% pass by traffic element. This does not reduce the traffic generated by the Bulky Goods Precinct, instead if the traffic generation of the Bulky Goods Precinct is X trips, the Richmond Road traffic volumes passing through the intersection will reduce by 20% of X, although the turning volumes at the intersection would remain the same (i.e. the trip generation of the site remains the same).

6.4 Multi-Purpose Visits

Given the three known tenants of the Bulky Goods Precinct; Costco, IKEA and Masters, there is likely to be a high incidence of multi-purpose visits where one or more of the stores are visited. This results in a discount to the overall traffic generation of the bulky goods precinct.

The RMS Guide to Traffic Generating Developments (2002) provides discount rates for multi-purpose visits to shopping centres based on the size of the centre. Section 3.6.1 of the Guide suggests discounts to trip generation as follows:

- 25% - less than 10,000m^{2}GLA
- 20% - 10,000-30,000m^2 GLA
- 15% - over 30,000m^2 GLA.

Given the lack of available data for multi-purpose visits to bulky goods retail sites, the application of the shopping centre discount rate is considered appropriate in the case of Marsden Park. Considering the GLA of the Bulky Goods Precinct (77,296m^2), a 15% discount has been applied to all traffic generated by the Bulky Goods Precinct as summarised in Table 6.19.

Table 6.19: Bulky Goods Precinct Traffic Generation Estimate Summary with Multi-Purpose Visit Discount

Lot	Tenant	GLA (m^2)	Traffic Generation Estimate (Table 6.12)		Traffic Generation Estimate (with 15% discount for multi-purpose visits)	
			Weekday PM Peak Hour	Saturday Peak Hour	Weekday PM Peak Hour	Saturday Peak Hour
A	Unknown	18,135	245 vehicle movements / hour	907 vehicle movements / hour	208 vehicle movements / hour	771 vehicle movements / hour
B	IKEA	32,000	422 vehicle movements / hour	1,130 vehicle movements / hour	359 vehicle movements / hour	961 vehicle movements / hour
C	Masters	13,543	183 vehicle movements / hour	677 vehicle movements / hour	156 vehicle movements / hour	575 vehicle movements / hour
D	Costco	13,618	541 vehicle movements / hour	847 vehicle movements / hour	460 vehicle movements / hour	720 vehicle movements / hour
	Total	**77,296**	**1,391 vehicle movements / hour**	**3,561 vehicle movements / hour**	**1,183 vehicle movements / hour**	**3,027 vehicle movements / hour**

As shown in Table 6.19 with the application of a 15% discount the Bulky Goods Precinct is estimated to generate 1,183 and 3,027 vehicle movements (two-way) respectively during a typical Thursday PM and Saturday peak hour.

6.5 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:

i configuration of the arterial road network in the immediate vicinity of the site;
ii operation of intersections providing access between the local and arterial road network;
iii distribution of households in the vicinity of the site;
iv surrounding employment centres, retail centres and schools in relation to the site;
v likely distribution of employee's residences in relation to the site;
vi configuration of access points to the site.

With consideration to the above, for the purposes of estimating vehicle movements, the following directional distributions have been assumed:

- Trips to and from Lots A and B of the Bulky Goods Precinct would use the Richmond Road/ Townson Road intersection;
- Trips to and from Lots C and D of the Bulky Goods Precinct would use the Richmond Road/ Future Southern Access Road intersection.

This directional distribution of Bulky Goods Precinct traffic is in accordance with that undertaken by AECOM as part of the Operational Assessment of Southern Boulevard intersection to Bulky Goods as detailed in the Memo to Michael Gray in July 2012 (Section 4.10). This results in the forecast demand splits as shown in Table 6.20.

Table 6.20: Bulky Goods Precinct Key Access Points – Forecast Demand Splits

Access Point	Bulky Goods Precinct Lot	Weekday PM Traffic Generation (two-way)	Saturday Traffic Generation (two-way)
Townson Road	A and B	567 (48%)	1,732 (57%)
Future Southern Access Road	C and D	616 (52%)	1,295 (43%)
	Total	**1,183**	**3,027**

In addition to this, the directional split of traffic (i.e. the ratio between the inbound and outbound traffic movements) has been assumed to be 50% inbound and 50% outbound in both the weekday PM and Saturday peak hour.

This directional split of traffic is in contrast to the modelling undertaken by AECOM as part of the Operational Assessment of Southern Boulevard intersection to Bulky Goods (Section 4.10) which assumed that 85% of weekday PM peak hour trips originate in the Bulky Goods Precinct. This assumption was based on the Richmond Road – Traffic Model Projections generated by Road Delay Solutions (Section 4.1).

Based on the above, Figure 6.1 and Figure 6.2 have been prepared to show the estimated turning movements in the vicinity of the bulky goods precinct during the 2025 weekday PM and Saturday peak periods.

Figure 6.1: Forecast Traffic Volumes – 2025 Weekday PM Peak Hour

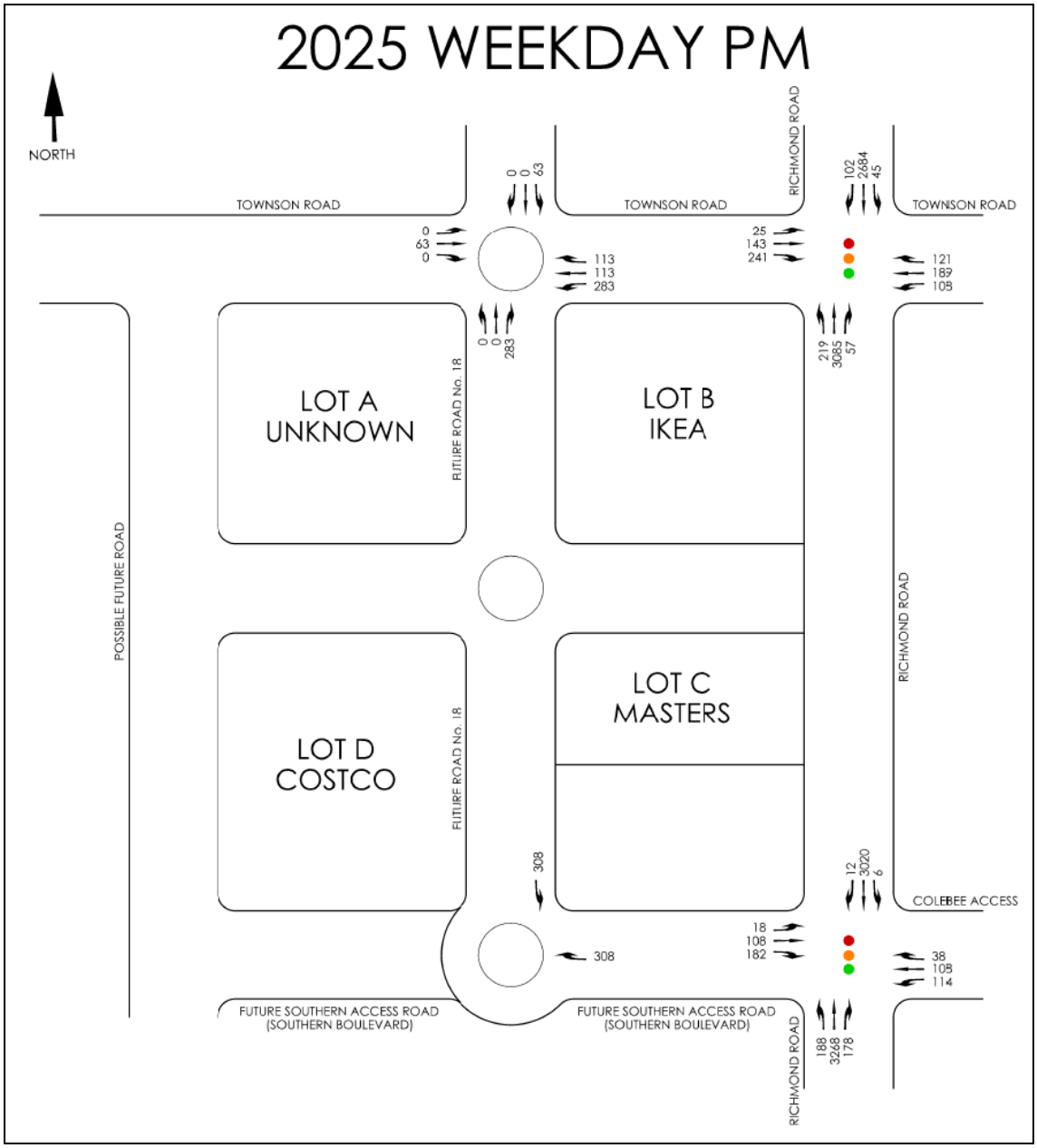
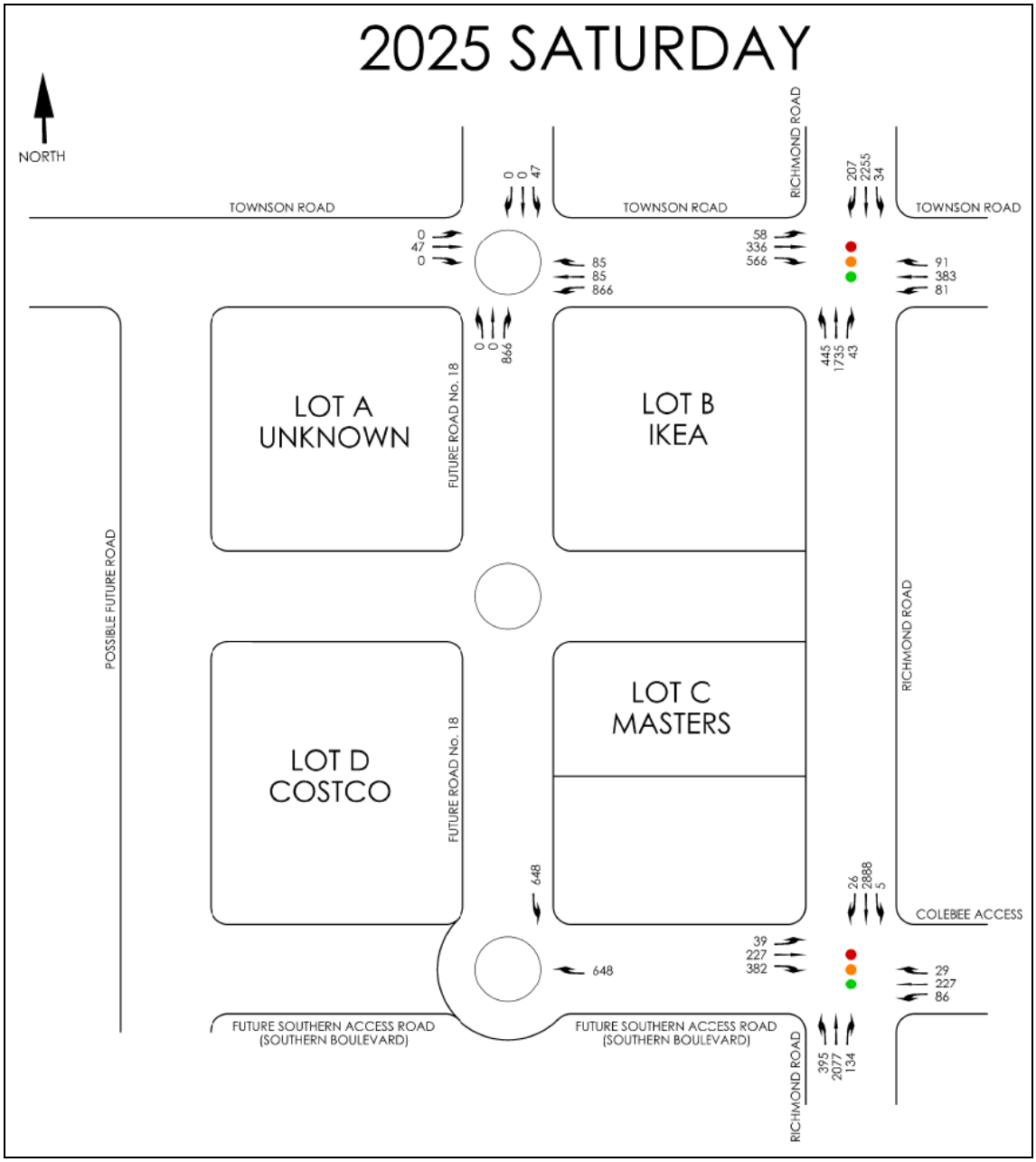


Figure 6.2: Forecast Traffic Volumes – 2025 Saturday Peak Hour



6.6 Intersection Layouts

The geometric layout of the Richmond Road intersections used for this assessment is based on the concept designs included in the Richmond Road Upgrade REF and the associated REF Submission Report.

The intersection layouts taken from SIDRA INTERSECTION are shown in Figure 6.3 and Figure 6.4.

Figure 6.3: Richmond Road/ Townson Road

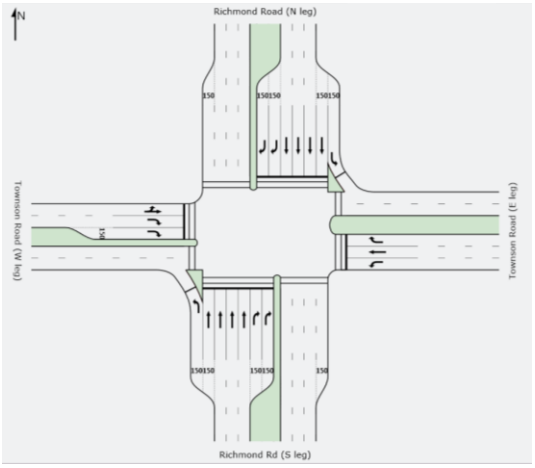
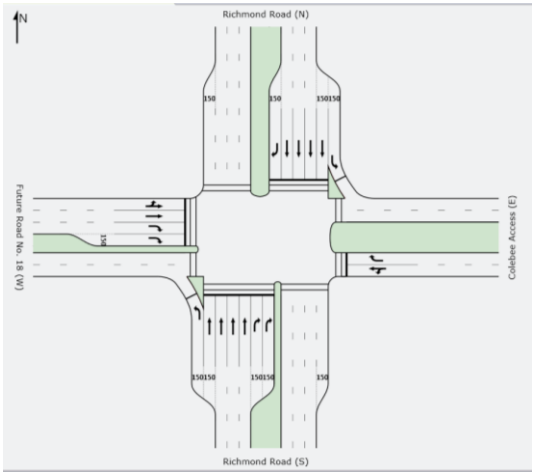


Figure 6.4: Richmond Road/ Colebee Access Road/ Future Southern Access



6.7 Intersection Operation

The operation of the key intersections within the study area have been assessed using SIDRA INTERSECTION[3], a computer based modelling package which calculates intersection performance.

The commonly used measure of intersection performance, as defined by the RMS, is vehicle delay. SIDRA INTERSECTION determines the average delay that vehicles encounter and provides a measure of the level of service. Table 6.21 shows the criteria that SIDRA INTERSECTION adopts in assessing the level of service.

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

Table 6.21: SIDRA INTERSECTION Level of Service Criteria

Level of Service (LOS)	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

Table 6.22 and Table 6.23 present a summary of the future operation of the intersections surrounding the Bulky Goods Precinct during the 2025 weekday PM peak hour and 2025 Saturday peak hour, with full results presented in Appendix C.

Table 6.22: Intersection Operation – 2025 Weekday PM Peak Hour

Intersection	Demand Flow	Degree of Saturation (DOS)	Average Delay (sec)	95th Percentile Queue (m)	Level of Service (LOS)
Richmond Road/ Townson Road	7019	0.735	14.8	103	B
Richmond Road/ Colebee Access/ Future Southern Access Road	7240	0.832	22.3	380	B
Townson Road/ Future Road No. 18	924	0.228	6.5	8	A
Future Southern Access Road/ Future Road No. 18	616	0.187	7.7	0	A

Table 6.23: Intersection Operation – 2025 Saturday Peak Hour

Intersection	Demand Flow	Degree of Saturation (DOS)	Average Delay (sec)	95th Percentile Queue (m)	Level of Service (LOS)
Richmond Road/ Townson Road	6234	0.887	41.1	273	C
Richmond Road/ Colebee Access/ Future Southern Access Road	6515	0.838	31.5	252	C
Townson Road/ Future Road No. 18	2101	0.638	7.4	37	A
Future Southern Access Road/ Future Road No. 18	1296	0.393	7.7	0	A

As shown in Table 6.22 and Table 6.23, the four intersections assessed operate within capacity in the weekday and Saturday peak hours under 2025 traffic conditions however some queuing is experienced on the Richmond Road approaches.

On the basis of the above assessment, it is clear that the addition of traffic generated by the Bulky Goods Precinct including the Costco development and the increase of traffic on Richmond Road is not expected to compromise the operation of the four intersections assessed under 2025 traffic conditions.

7. Conclusion

Based on the analysis & discussions presented within this report, the following conclusions are made:

i The 551ha Marsden Park Industrial Precinct is located 40km west of Sydney CBD and is anticipated to provide 10,000 jobs and 1,200 homes within Sydney's North West Growth Centre.

ii On completion Marsden Park Industrial Precinct will provide:

- 60ha of commercial land
- 40ha of bulky goods retail
- 206ha of industrial land
- 63ha of conservation land and open space
- Residential housing close to the planned Marsden Park town centre (located to the north of the Industrial Precinct) to accommodate 3,500 people.

iii Costco is intending to develop a members only, wholesale retail store with a GFA of 13,746m^2, 713 car parking spaces and a service station on Lot D within the 'bulky goods precinct', which is located within the south-eastern corner of the Marsden park Industrial Precinct.

iv It is anticipated that Lot B of the bulky goods precinct will be developed as an IKEA of 29,143m^2 GFA while Lot C is anticipated to be developed as a Masters store of 13,234m^2 GFA.

v Empirical research indicates that the bulky goods precinct will generate significantly more traffic during a Saturday peak hour than a weekday AM or PM peak hour.

vi Based on traffic generation rates from Costco's Auburn store, it is anticipated that the Costco development in Marsden Park will generate 532 and 940 vehicle movements (two-way) during the respective weekday PM and Saturday peak hours. With the reduction due to the Costco office in Auburn and the addition of service station traffic for Marsden Park, the site is expected to generate 541 and 847 vehicle movements (two-way) during the respective weekday PM and Saturday peak hours. With the application of a 15% discount for multi-purpose visits to the Bulky Goods Precinct, the Costco development is expected to generate 460 and 720 vehicle movements (two-way) during the respective weekday PM and Saturday peak hours.

vii Lots A, B, C and D of the Bulky Goods Precinct (including Costco and IKEA) are estimated to generate 1,391 and 3,561 vehicle movements (two-way) during a typical weekday PM and Saturday peak hour respectively. With the application of a 15% discount for multi-purpose visits, the four Bulky Goods lots are estimated to generate 1,183 and 3,027 vehicle movements (two-way) during a typical weekday PM and Saturday peak hour respectively.

viii Construction has commenced to upgrade a 3.4km section of Richmond Road adjacent to the Bulky Goods Precinct from Bells Creek, Colebee to Vine Street West, Marsden Park.

ix As part of the upgrade of Richmond Road, it is proposed to signalise Townson Road and extend it west of Richmond Road where is anticipated to function as one of the key accesses to the Marsden Park Industrial Precinct.

x The upgrade of Richmond Road also proposes to create a new signalised intersection south of Townson Road at the access to the Colebee residential development east of Richmond Road via the unformed 'Colebee Access Road/ Smith Access'. A fourth arm to this

intersection was included in revised concept designs included in the Richmond Road Upgrade REF Submissions Report. This will provide access Bulky Goods Precinct via the unformed 'Future Southern Access Road/ Southern Boulevard'.

xi It is anticipated that traffic accessing Lots A and B of the Bulky Goods Precinct will do so via Townson Road and traffic access Lots C and D will do so via the 'Future Southern Access Road/ Southern Boulevard'.

xii On the basis of the above assessment, it is clear that the addition of traffic generated by the Bulky Goods Precinct including the Costco development and the increase of traffic on Richmond Road is not expected to compromise the operation of the four intersections assessed under 2025 traffic conditions.

Appendix A

Survey Results