28 – 32 SOMERSET STREET, KINGSWOOD

Transport Impact Assessment

Prepared for:

Haracus Pty Ltd

17/06/2016

The Transport Planning Partnership Pty Ltd
ACN: 607 079 005

28 – 32 SOMERSET STREET, KINGSWOOD

Transport Impact Assessment

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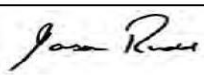
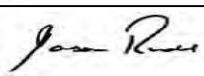
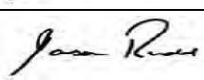
16021r01	06/06/16	V02	Wayne Johnson	Jason Rudd	
16021r01	08/06/16	V03	Wayne Johnson	Jason Rudd	
16021r01	17/06/16	V04	Wayne Johnson	Jason Rudd	

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APPENDICES

1 INTRODUCTION

1.1 Background

The Transport Planning Partnership (TTPP) has undertaken a transport impact assessment for Pure Projects on behalf of Haracus Pty Ltd.

A development application is to be lodged with Penrith City Council for a proposed development located on the corner of Somerset Street and Hargrave Street in Kingswood, Penrith.

Pre-DA schemes of the proposal included a loading dock on the ground level with access off Hargrave Street. The loading area was constrained in size and the 10.5m Penrith Garbage Truck was not able to drive in and out of the proposed loading area in a forward direction. Consequently, Penrith City Council did not provide support with the proposed scheme.

Based on Council's concerns, GTA Consultants prepared an independent '*Traffic Safety Review*' of the proposed loading arrangement. GTA Consultants reviewed the traffic volumes, travel speeds, stopping sight distance, pedestrian volumes and crash history on Hargrave Street as part of the traffic safety review.

Given the low traffic volumes, low travel speed, adequate sight distance, low number of pedestrians and proposed traffic management plan, GTA Consultants concluded that the proposed loading arrangement would not compromise the safety of road users. Penrith City Council reviewed the '*Traffic Safety Review*' and maintained their view that the 10.5m Penrith City Council garbage truck and service trucks shall only enter and exit the loading area in a forward direction.

Responding to Council's continued concerns, the loading dock was redesigned and The Transport Planning Partnership (TTPP) was commissioned by Pure Projects in April 2016 to undertake a transport impact assessment of the revised proposal to support the DA.

The DA proposes to demolish two existing single dwelling houses and construct 54 residential apartments across three existing lots (28-32 Somerset Street, Kingswood), to a maximum height of six storeys.

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:

- Existing traffic and parking conditions surrounding the site
- Suitability of the proposed parking in terms of supply (quantum) and layout
- Service vehicle requirements
- Pedestrian and bicycle requirements
- The traffic generating characteristics of the proposed development
- Suitability of the proposed access arrangements for the site
- The transport impact of the development proposal on the surrounding road network.

1.3 References

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

- An inspection of the site
- Penrith City Council Development Control Plan (DCP), 2014
- Australian Standard/ New Zealand Standard, Parking facilities, Part 1: Off-Street Car Parking AS/ NZS 2890.1:2004
- Australian Standard/ New Zealand Standard, Parking facilities, Part 2: Off-Street Commercial Vehicle Facilities AS/ NZS 2890.2:2004
- Traffic Safety Review prepared by GTA Consultants December 2015
- Plans for the proposed development prepared by Plus Architecture dated 03/06/16.

2 EXISTING TRANSPORT CONDITIONS

The subject site is located at 28-32 Somerset Street, Kingswood. The site is approximately 1,692m^2 in area with a 55m frontage to Somerset Street and a 19m frontage to Hargrave Street. The site is located directly opposite the Nepean Hospital.

The location of the subject site and its surrounding environs is shown below in **Figure 1**.

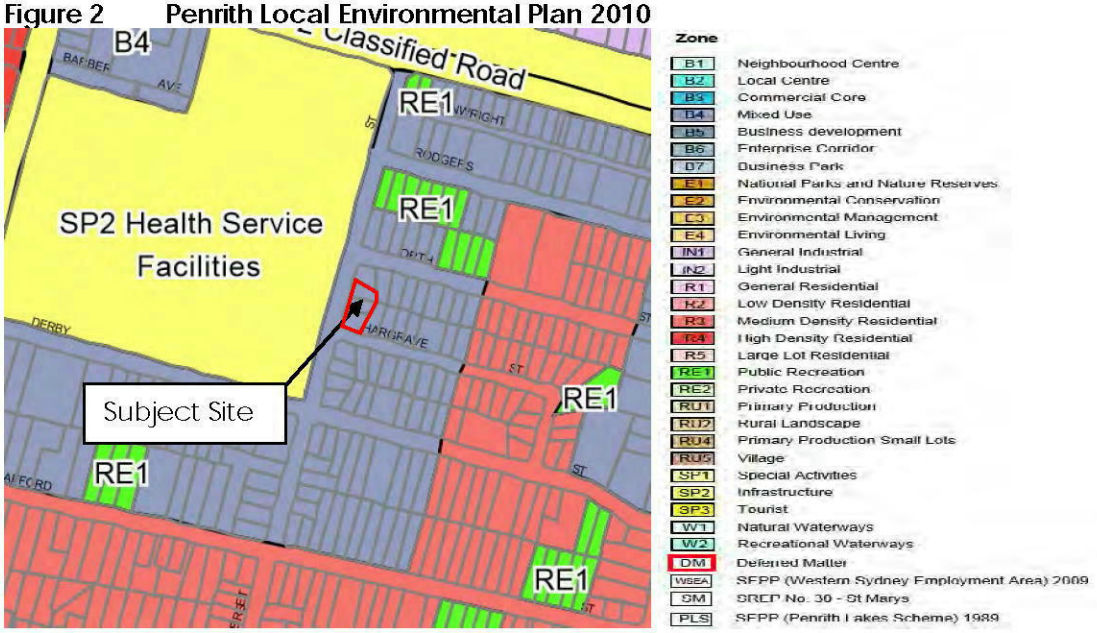
Figure 1 Subject Site and its Environs

Source: www.google.com.au

The land use classification of the subject site and neighbouring properties has recently changed from low density residential to high density residential and mixed use, as shown in **Figure 2**.

As such, although the neighbouring properties are currently residential it is likely that these residential houses would be converted to residential apartments and commercial offices sometime in the near future.

Figure 2 Penrith Local Environmental Plan 2010



Source: Penrith City Council Land Environmental Plan

2.1 Road Network

The roads surrounding the subject site are described briefly below.

Great Western Highway

Great Western Highway is a Roads and Maritime Services (RMS) State Road(A44) that generally runs in an east-west direction between the Blue Mountains in the west and the M4 Motorway in the east. Great Western Highway is generally a 23m wide six lane two-way road with restricted parking lanes provided on both sides of the road.

The posted speed limit on the Great Western Highway is 60km/hr, and carries approximately 19,000 vehicles per day.

Somerset Street

Somerset Street is a local street under the jurisdiction of Penrith City Council that runs in a north-south direction adjacent to the western boundary of the site. Somerset Street is a 12.2m wide two-lane two-way road with restricted parking on both sides of the street, as shown below in Figure 3.

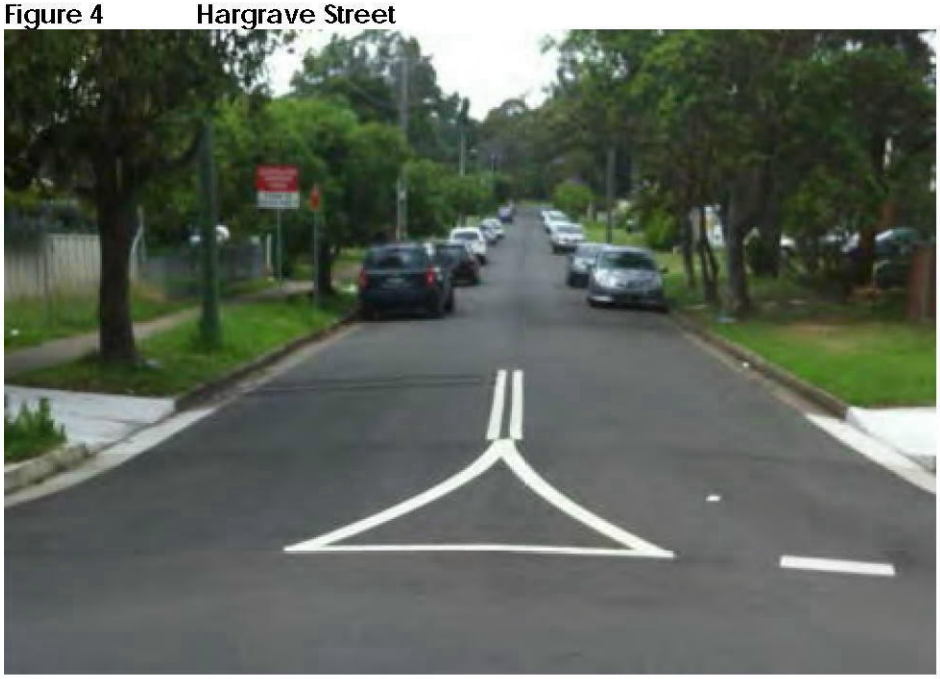
The posted speed limit on Somerset Street is 50km/hr and carries approximately 6,200 vehicles per day.

Figure 3 Somerset Street

Hargrave Street

Hargrave Street is a local street that runs in a west-east direction adjacent to the southern boundary of the site. Hargrave Street is a 7.2 m wide one-lane two-way road with unrestricted parking on both sides of the street, as shown below in Figure 4.

Figure 4 Hargrave Street



2.2 Traffic Volumes

2.2.1 Hargrave Street Tube Count

In order to gain an appreciation of existing travel volumes on Hargrave Street, a 7-day tube count was undertaken covering Friday 20th November 2015 to Thursday 26th November 2015.

The tube counter recorded all traffic entering and exiting Hargrave Street.

Figure 5 shows graphically the traffic volumes recorded for an average weekday and an average weekend day, based on the results of the survey.

Figure 5 Hargrave Street - Traffic Volume Survey

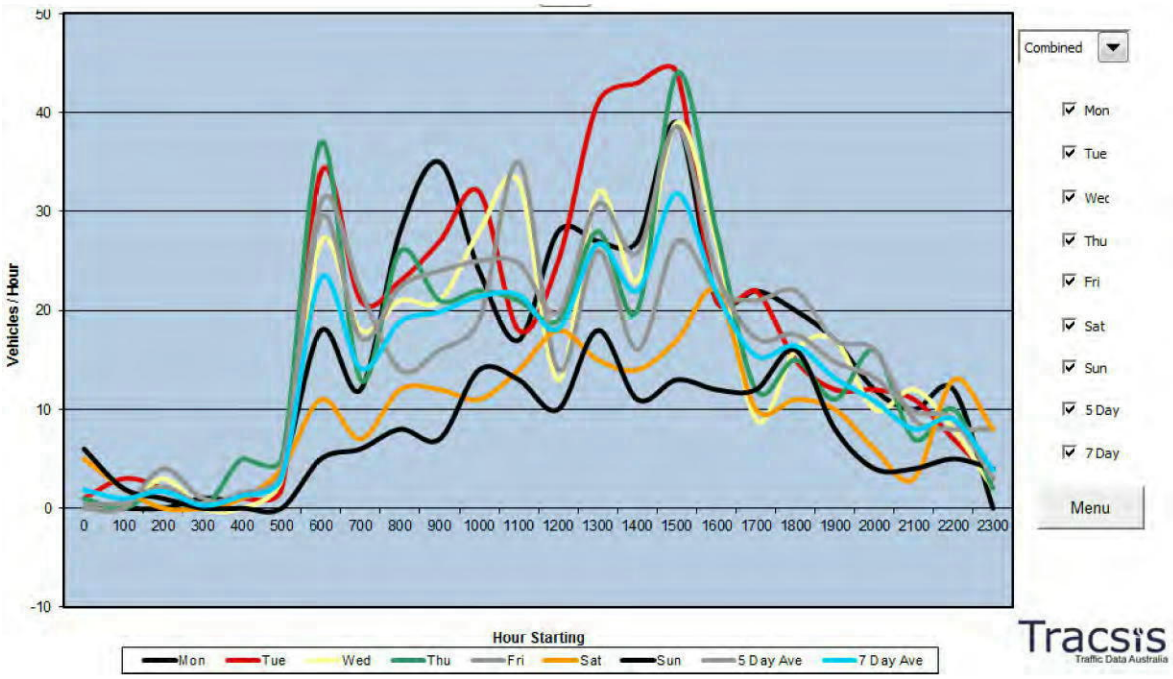


Figure 5 shows the maximum peak hour volume on Hargrave Street is 44 vehicles/ hour between 3:00pm and 4:00pm.

With regard to the environmental performance of residential roads, **Figure 6** is extracted from the *RMS Guide To Traffic Generating Developments (October 2002)*.

As such, Hargrave Street operates at levels well below the environmental goal threshold for a local street.

Figure 6 Environmental Capacity Performance Standards on Residential Streets

Road class	Road type	Maximum Speed (km/hr)	Maximum peak hour volume (veh/hr)
Local	Access way	25	100
	Street	40	200 environmental goal
			300 maximum
Collector	Street	50	300 environmental goal
			500 maximum

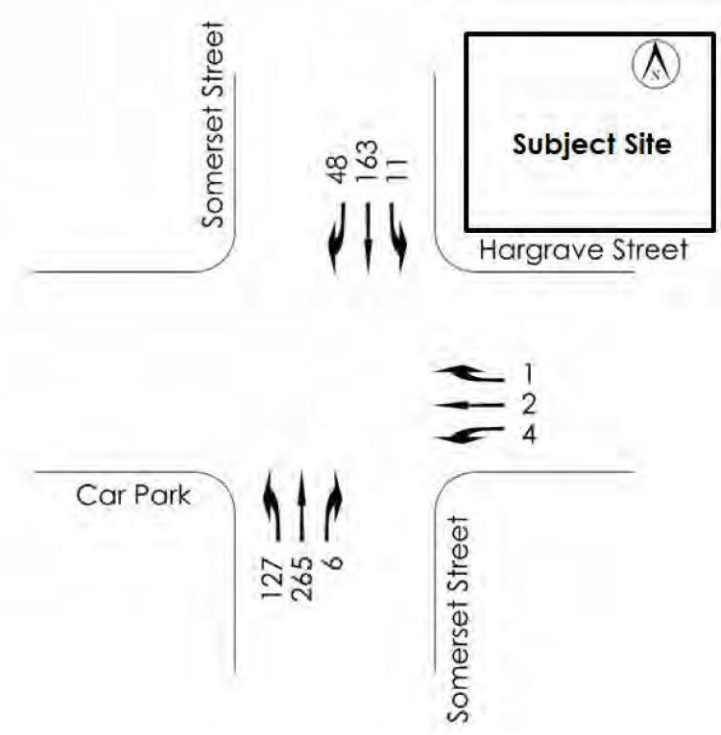
Note: Maximum speed relates to the appropriate design maximum speeds in new residential developments. In existing areas maximum speed relates to 85th percentile speed.

2.2.2 Intersection Traffic Count

On Thursday 26th November 2015, traffic movement counts were carried out at the intersection of Hargrave Street and Somerset Street.

The peak morning hour summary was recorded between 7:45am and 8:45am and the results of the survey are shown in **Figure 7**.

Figure 7 Hargrave Street and Somerset Street Intersection



2.3 Intersection Operation

The operation of the key intersection within the study area has been assessed using the network modelling function in SIDRA INTERSECTION[1], 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 1 shows the criteria that SIDRA INTERSECTION adopts in assessing the level of service.

Table 1 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 2 presents a summary of the existing operation of the intersection, with full results presented in Appendix A of this report.

Table 2 Existing Operating Conditions

Intersection	Peak	Degree of Saturation (DOS)	Average Delay (sec)	Level of Service (LOS)
Hargrave Street and Somerset Street	AM	0.305	7.7	A

On the basis of the above assessment and site observations, the local road network currently operates well with spare capacity.

2.4 Public Transport

2.4.1 Bus Services

The site has good access to bus services as it is located 120 – 170m walking distance to bus stops located on Derby Street.

Bus service 774, 775 and 776 are operated by Busways and all three routes connect Penrith with Mt Druitt.

2.4.2 Train Line

Train services on the T1 Western Line links the Blue Mountains and Sydney CBD via Lidcombe.

Kingswood Station is located approximately 500m north-east of the subject site. Regular services are provided in the T1Western Line with a general frequency of 30 minutes during weekdays and weekends, except for weekend's early morning and late night when hourly services are provided.

2.5 Pedestrian and Cyclist Facilities

Paved footpaths are provided on both sides of Somerset Street and on the northern side of Hargrave Street.

Pedestrian crossing refuge facilities are provided on the northern approach of the roundabout at Somerset Street and Hargrave Street.

No provisions for cyclist are provided along Somerset Street or Hargrave Street.

3 OVERVIEW OF DEVELOPMENT PROPOSAL

The proposal scheme includes demolition of two on-site detached residential dwellings and the construction of 54 residential apartments and 184m^2 of commercial area, to a maximum of six storeys, as summarised below in **Table 3**.

Table 3 Development Schedule

Land Use	No. Bedrooms	No. of Apartments	Gross Floor Area (m^2)
Residential	1-bedroom	12	
	2-bedroom	39	
	3-bedroom	3	
Commercial			184
Total		**54**	**184**

3.1 Car Parking

The proposed development will provide a total of 74 parking spaces, the breakdown of car parking spaces is provided below:

- 58 residential car spaces, including 6 adaptable residential car spaces
- 11 visitor spaces
- 5 commercial spaces

The suitability of the proposed car parking provision is discussed in Section 4.1 of this report.

3.2 Vehicle Access

Vehicle access to the basement car park is proposed via a new 6.5m wide two-way driveway to Hargrave Street. The access driveway will provide for all vehicles accessing the site, including for servicing/ garbage collection purposes.

The suitability of the proposed access arrangements is discussed in Section 4.2 of this report.

3.3 Bicycle Facilities

The development plans show that 15 bicycle spaces are proposed.

The suitability of the proposed bicycle provision is discussed in Section 5 of this report.

3.4 Loading Area

Loading facilities are proposed within the basement car park. The loading area has been designed for use by the Penrith City Council Waste Collection Vehicle which is 10.5m in length. The location of the loading area is separate to residential car spaces.

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

4 CAR PARKING

4.1 Car Parking Requirements

The car parking requirements for different development types are set out in the Penrith City Council DCP (2010). A review of the car parking rates and the commercial floor area schedule results in a DCP parking requirement for the proposed development is summarised below in Table 4.

Table 4 Penrith DCP Car Parking Requirements

Land Use	Apartment Type	No. of Apartments/ Size	DCP Parking Rate	DCP Parking Requirement
Residential	1-bedroom	12	1 space per 1 bedroom	12
	2-bedroom	39	1 space per 2 bedrooms	39
	3-bedroom	3	2 spaces per 3 bedrooms	6
Visitor		54	1 visitor space per 5 units	11
Commercial		184	1 space per 40m^2 GFA	5
Total				**73**

One car space will be shared between visitors to the residential development and a resident car wash bay.

Based on the above, the proposed development is required to provide 73 car parking spaces. The development proposes a total of 74 car parking spaces and therefore complies with the Penrith City Council DCP's car parking requirement.

The proposed 74 car spaces include 6 adaptable residential car spaces.

4.2 Car Parking Layout Review

The car park layout has been reviewed against the requirements of the Penrith City Council DCP, the Australian Standard for Off Street Car Parking (AS2890.1:2004 and AS2890.6:2009) and the Australian Standard for Off Street Commercial Vehicle Facilities (AS2890.2:2002). This assessment includes a review of the following:

- Hargrave Street access
- Car space dimensions, including aisle width accessibility car spaces
- Access ramp and vertical clearance
- Security

The details of this review are provided below indicate that the proposed car parking layout is expected to operate satisfactorily.

4.2.1 Hargrave Street Access

The proposed site access driveway is a minimum 6.5m wide with swept paths illustrating that vehicles are able to enter/ exit the site independently (excluding service vehicles) with all vehicles turning left-in and right-out of the site, as shown in Appendix B.

As mentioned in Section 2.1, Hargrave Street is currently a local residential street approximately 7.2 wide with parking generally provided on both sides of the street. As a result, Hargrave Street is not sufficiently wide enough to accommodate service vehicles undertaking all turning movements at the subject site access.

TTPP recommends that 'No Stopping' signs are installed along one side of Hargrave Street to provide sufficient road width for two-way traffic and for waste collection/ service vehicles to enter/ exit future developments on Hargrave Street (subject to Traffic Committee Approval).

4.2.2 Somerset Street On-street Parking

All redundant driveways on Somerset Street will be removed and a new driveway access will be provided on Hargrave Street near the eastern boundary.

Unrestricted parking is provided along Somerset Street along the subject site's street frontage. No parking is provided on Hargrave Street along the subject site's street frontage.

As such, the removal of three residential driveways on Somerset Street will result in an additional three on-street car spaces.

4.2.3 Car Space and Aisle Width Dimensions

The basement car park has been designed in accordance with AS2890.1: 2004 and provides car parking spaces 2.4m wide by 5.4m long, with a minimum 5.8m wide aisles. Structural columns are located outside the vehicle design template with all spaces providing access by an 85th percentile car. A review of the car space envelope is provided in Appendix B.

Six residential adaptable units are being provided in the proposed development with six accessible spaces on level 2 of the basement car park. The accessible car spaces have been designed in accordance with AS2890.6: 2009 with 2.4m wide by 5.4m long spaces and a 2.4m wide and 5.4m long shared area adjacent to the accessible space.

4.2.4 Ramp Design and Vertical Clearance

The waste/ collection loading area for the development is located in basement level 1 of the car park (discussed in Section 6).

A vehicular ramp from Hargrave Street to basement level 1 of the car park will be provided with a maximum gradient of 1:6.5 (15%) with 7m long summit and sag transitions. The maximum change of grade between ramp transitions is 6.25%. A longitudinal cross section of the basement car park ramp is provided in Appendix C.

A vertical clearance of 4.5m for heavy rigid trucks has been provided on the ramp and within the service area.

The ramp to the basement level 2 car park is a minimum 5.5m wide and will provide for two-way traffic movements between the basement car parking levels. The maximum grade of the ramp is 1:4 (25%) with appropriate transitions of 2m.

5 SUSTAINABLE TRANSPORT INFRASTRUCTURE

The bicycle parking provision requirements are set out in the Penrith City Council DCP. With regard to parking for bicycles, the Penrith City Council DCP states the following:

"Bicycle parking in accordance with the suggested bicycle parking provision rates for different land use types in the document 'Planning Guidelines for Walking and Cycling' (NSW Government 2004). Bicycle parking spaces should comply with AS2890.3 1993 Bicycle Parking Facilities".

The *'Planning Guidelines for Walking and Cycling'* contain suggested bicycle parking provision rates for different land use types.

The suggested bicycle parking provision for the development is summarised below in **Table 5**.

Table 5 Suggested Bicycle Parking Rates

Apartments	No. of Units/ staff	Suggested Parking Rate		Suggested Parking Provision	
		Residents	Visitors	Residents	Visitors
Apartments	54	20%-30%	5%-10%	11 - 16	3 - 6
Commercial	4 staff	3%-5%	5%-10%	0 - 1	0 - 1
Total				**14 - 24**	

Based on the above, the proposed development is required to provide between 14 and 24 bicycle parking spaces for use by residents and visitors. The development proposes a total of 15 bicycle storage spaces and therefore complies with the suggested rates.

It should be noted that a number of bus stops are located on Derby Street and Kingsgrove Railway Station is located within easy walking distance (500m) and therefore the development is well located to public transport services to encourage sustainable transport.

6 LOADING AREA

6.1 Loading Arrangements

Loading facilities are proposed within the basement level 1 car park in the north-east corner of the site. Access is provided via the Hargrave Street access driveway, with the area designed for use by service vehicles up to 10.5m in length. The on-site waste storage facility is located close to the loading area in the north-east corner of the site and, when combined with the loading area dimensions, will allow for easy access for waste collection purposes.

6.2 Penrith Garbage Truck Swept Path

Swept paths of a 10.5m Penrith Garbage Truck entering the site, reversing into the loading area and exiting the site via Hargrave Street in a forward direction are included in this report as Appendix B.

7 TRAFFIC IMPACT GENERATION

7.1 Traffic Generation

Traffic generation estimates for the proposed development have been sourced from the RMS Guide to Traffic Generating Developments 2002 and the RMS Technical Direction 2013/04.

7.1.1 Residential

RMS TDT 2013/ 04 provides updated rates for high density residential flat dwellings (2012 surveys) that are close to public transport services and almost exclusively residential in nature. TDT 2013/ 04 indicates an average AM peak hour trip generation for sites surveyed in Sydney of 0.19 trips per apartment. PM peak hour rates are slightly lower at 0.15 trips/ hour.

7.1.2 Commercial

The commercial traffic generation rates in the RMS TDT 2013/ 04 are as follows:

- Weekday AM peak hour – 1.6 trips per 100m^2 GFA
- Weekday PM peak hour – 1.2 trips per 100m^2 GFA.

7.1.3 Summary

Estimates of the peak hour traffic generation resulting from the proposed development are set out in **Table 6**.

Table 6 Traffic Generation Estimates

Land Use	Size	Weekday AM		Weekday PM	
		Rate	Trips/ Hr	Rate	Trips/ Hr
Residential	54 units	0.19 trips per unit	11	0.15 trips per unit	9
Commercial	184m^2	1.6 trips per 100m^2 GFA	3	1.2 trips per 100m2 GFA	3
Total			**14**		**12**

Table 6 indicates that the site would potentially generate 14 vehicle movements in a weekday AM Peak hour and 12 vehicle movements in a weekday PM Peak hour.

7.2 Trip Distribution and Assignment

The directional distribution and assignment of traffic generated by the proposed development will largely be influenced by the configuration of the local road network in the immediate vicinity of the site.

For the purposes of estimating vehicle movements, the assumed directional distribution for the residential and commercial uses are shown in **Table 7**.

Table 7 Directional Distribution

Direction	Residential	Commercial
Hargrave Street (West)	100%	100%
Hargrave Street (East)	0%	0%
Somerset Street (South)	50%	50%
Somerset Street (North)	50%	50%

In addition, the following directional split of traffic (i.e. the ratio between the inbound and outbound traffic movements) has been assumed to be the commercial and residential components during a Weekday AM Peak Hour, with a reversed directional split in the Weekday PM Peak Hour:

- Residential: 20% in/ 80% out
- Commercial: 80% in/ 20% out.

7.3 Traffic Impact

An assessment of the impacts the future traffic would have on the surrounding road network can be made by comparing intersection performance prior to and following full site development.

The impact of this additional traffic on the Somerset Street and Hargrave Street intersection has been assessed using SIDRA INTERSECTION. **Table 8** presents a summary of the anticipated future operation of the intersection following the development of the site under the proposed planning controls with full results included in Appendix A of this report.

Table 8 Future Operating Conditions

Intersection	Peak	Degree of Saturation (DOS)	Average Delay (sec)	Level of Service (LOS)
Hargrave Street and Somerset Street	AM	0.311	7.8	A

Table 8 shows that the intersection of Somerset Street and Hargrave Street would continue to operate well with spare capacity.

Therefore, against existing traffic volumes in the vicinity of the site, the additional traffic generated by the proposed development could not be expected to compromise the safety or function of the surrounding road network.

8 CONCLUSIONS

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

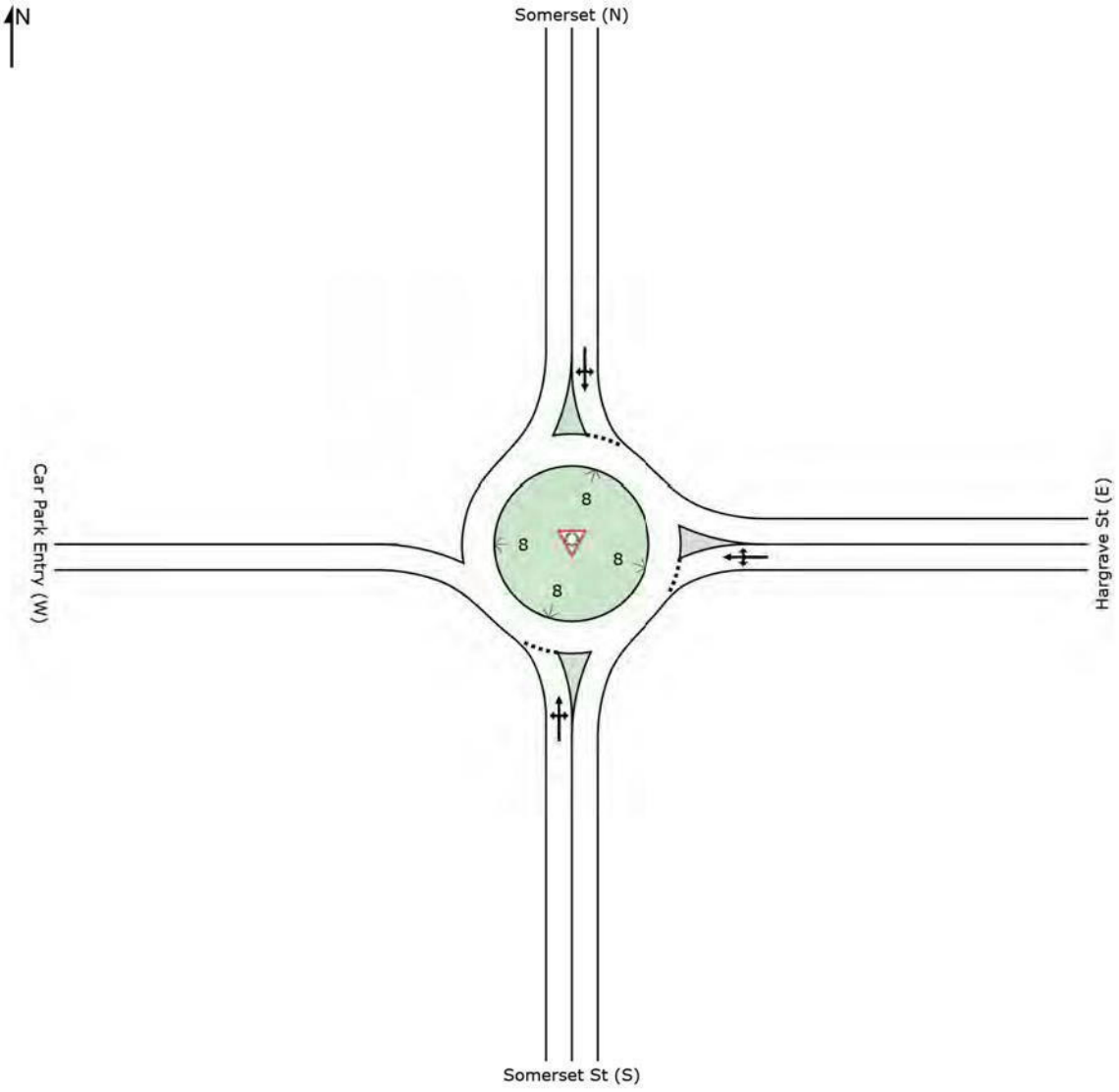
- A Development Application is to be lodged with Penrith City Council for land currently occupied at 28 – 32 Somerset Street, Kingswood.
- 54 residential apartments and 184m^2 of commercial floor area are proposed.
- The site is located adjacent to Nepean Hospital and is within easy walking distance of Kingswood Railway Station.
- The proposed development is required to provide 73 spaces under the Penrith City Council DCP (2012).
- One car wash bay is proposed to be provided.
- The proposed supply of 74 spaces is consistent with these requirements and is considered to be appropriate.
- The removal of three residential driveways on Somerset Street will result in an additional three on-street car spaces.
- The proposed parking layout is consistent with the dimensional requirements as set out in the Australian Standard for Off Street Car Parking (AS2890.1:2004 and AS2890.6:2009).
- The provision of loading facilities has been designed to accommodate the 10.5m Penrith City Council Garbage Truck and is consistent with the requirements of Australian Standard (AS2890.2:2002). Swept path assessment indicates that there is sufficient space for vehicles to enter and exit the site in a forward direction via Hargrave Street.
- The provision of 15 bicycle facilities meets the NSW Planning Guidelines for Walking and Cycling suggested rates of between 14 and 24 bicycle racks provided within the basement car park.
- The proposed development is expected to generate up to 14 and 12 additional vehicle movements in the weekday AM and PM peak hours, respectively.
- Against existing traffic volumes in the vicinity of the site, the traffic generation of the proposed development is not expected to have a significant impact on surrounding road network.

Overall it is concluded that the proposed development of this site can be satisfactorily accommodated within the surrounding road network.

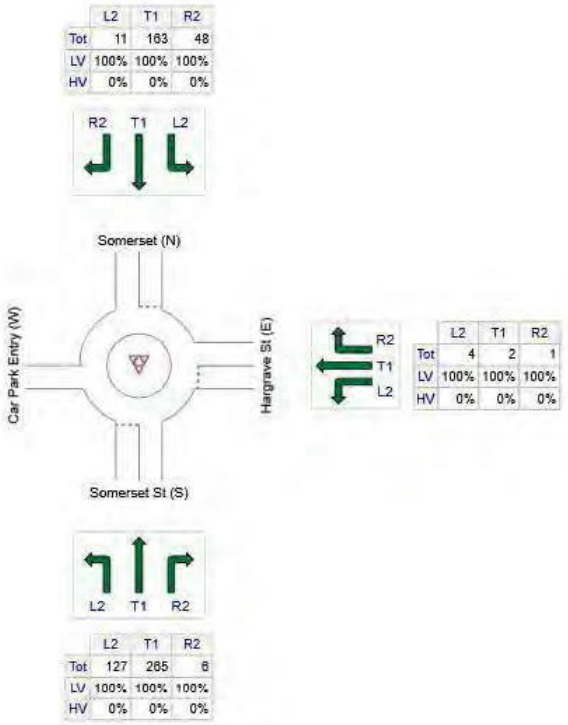
Furthermore, the site's location and proximity to good levels of public transport `renders this site as an appropriate site with opportunities to achieve Council's broader transport objectives and reduced private vehicle travel.

Appendix A – Traffic Modelling SIDRA Results

Hargrave Street/ Somerset Street Interesection

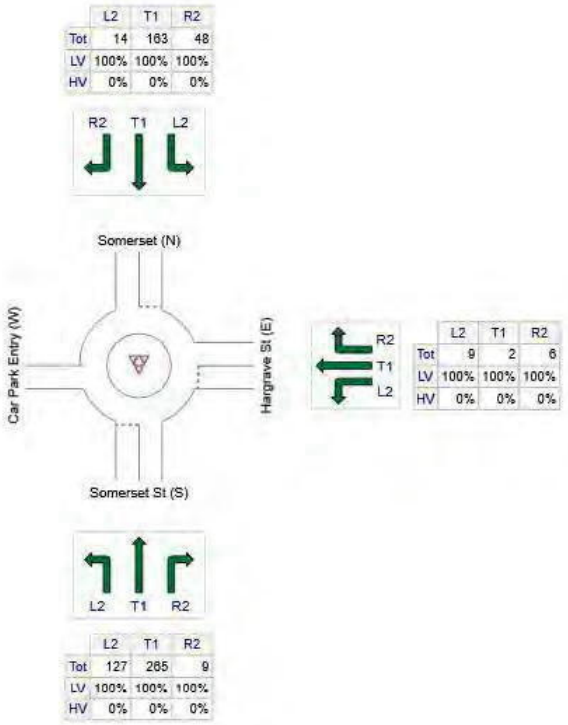


Existing AM Peak



Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Somerset St (S)											
1	L2	134	0.0	0.305	4.3	LOS A	1.8	12.9	0.21	0.45	21.0
2	T1	279	0.0	0.305	4.1	LOS A	1.8	12.9	0.21	0.45	9.9
3	R2	6	0.0	0.305	7.0	LOS A	1.8	12.9	0.21	0.45	44.6
Approach		419	0.0	0.305	4.2	LOS A	1.8	12.9	0.21	0.45	16.0
East: Hargrave St (E)											
4	L2	4	0.0	0.007	5.1	LOS A	0.0	0.2	0.36	0.52	42.8
5	T1	2	0.0	0.007	5.9	LOS A	0.0	0.2	0.36	0.52	27.5
6	R2	1	0.0	0.007	7.7	LOS A	0.0	0.2	0.36	0.52	41.4
Approach		7	0.0	0.007	5.7	LOS A	0.0	0.2	0.36	0.52	34.7
North: Somerset (N)											
7	L2	12	0.0	0.148	2.5	LOS A	0.8	5.6	0.05	0.47	45.1
8	T1	172	0.0	0.148	2.5	LOS A	0.8	5.6	0.05	0.47	37.0
9	R2	51	0.0	0.148	5.1	LOS A	0.8	5.6	0.05	0.47	21.5
Approach		234	0.0	0.148	3.0	LOS A	0.8	5.6	0.05	0.47	27.6
All Vehicles		660	0.0	0.305	3.8	LOS A	1.8	12.9	0.15	0.46	18.8

Future AM Peak



Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Somerset St (S)											
1	L2	134	0.0	0.311	4.3	LOS A	1.9	13.2	0.22	0.46	21.0
2	T1	279	0.0	0.311	4.1	LOS A	1.9	13.2	0.22	0.46	9.9
3	R2	9	0.0	0.311	7.0	LOS A	1.9	13.2	0.22	0.46	44.5
Approach		422	0.0	0.311	4.2	LOS A	1.9	13.2	0.22	0.46	16.2
East: Hargrave St (E)											
4	L2	9	0.0	0.017	5.1	LOS A	0.1	0.6	0.36	0.55	42.5
5	T1	2	0.0	0.017	6.0	LOS A	0.1	0.6	0.36	0.55	27.4
6	R2	6	0.0	0.017	7.8	LOS A	0.1	0.6	0.36	0.55	41.1
Approach		18	0.0	0.017	6.1	LOS A	0.1	0.6	0.36	0.55	38.1
North: Somerset (N)											
7	L2	15	0.0	0.154	2.5	LOS A	0.8	5.9	0.07	0.46	45.0
8	T1	172	0.0	0.154	2.5	LOS A	0.8	5.9	0.07	0.46	36.9
9	R2	51	0.0	0.154	5.1	LOS A	0.8	5.9	0.07	0.46	21.5
Approach		237	0.0	0.154	3.0	LOS A	0.8	5.9	0.07	0.46	27.9
All Vehicles		677	0.0	0.311	3.9	LOS A	1.9	13.2	0.17	0.46	19.3

Appendix B – Swept Path Analysis

Appendix C – Basement Car Park Ramps Longitudinal Sections