

# **CARPARK CERTIFICATION OF A PROPOSED MIXED USE DEVELOPMENT**

## ***608-612 High Street in Penrith***

Prepared for: Colpani Construction Co Pty Ltd

N1815775A (Version 1a)

May 2018

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## 1. INTRODUCTION

Motion Traffic Engineers was commissioned by Colpani Construction Co Pty Ltd to prepare a car parking certification report of a proposed Mixed Use development at 608-612 High Street in Penrith.

Vehicle access and egress to the car parking areas is via Union Lane.

Parking is provided at the ground level and on one basement level.

A truck loading bay is provided on the ground level

Reference is made to AS2890.1 (2004), AS2890.2 (2002) and AS2890.6 (2009) and Council's Development Control Plan for compliance.

## 2. DRIVEWAY AND RAMPS

The details of the driveway/ramp from Union Lane to the basement are as follows from the perspective of the inbound movement for descriptive purposes only:

- The width of the driveway is 6 metres at the property line and remains constant throughout the length of the ramp between the kerbs.
- A clearance of 300mm between kerb and wall have been provided on both sides of the ramp.
- The gradients along the centre line are as follows:
  - 5 percent for 3 metres
  - 12.5 percent for 4.8 metres
  - Flat for 4 metres
  - 12.5 percent for 2 metres
  - 25 percent for 10.3 metres
  - 12.5 percent for 2.1 metres

A convex safety mirror should be placed at the bottom of the ramp to increase the sight distance of the driver of oncoming vehicle.

The details of the driveway/ramp from Union Lane to ground floor are as follows from the perspective of the inbound movement for descriptive purposes only:

- The width of the driveway is 6 metres at the property line and widens to a wide car parking area.
- The gradients along the centre line are as follows:
  - Flat throughout the length of the driveway

### 3. CAR SPACES AND TRUCK LOADING BAY

The details of the car parking areas are as follows:

#### Basement

- The parking aisle has flat gradient
- The car parking aisle is 6.2 metres wide minimum
- The car park has 2.2 metres head room clearance throughout the basement
- The general 90-degree car spaces are 2.6 metres wide and 5.4 metres long minimum
- Spaces adjacent to walls have an additional 300mm width generally
- The disabled car space is 3.8 metres wide with a length of 6 metres
- Column setbacks comply with standards
- Blind aisle extensions of 1 metres minimum have been provided
- Wheel stops are required for the disabled car spaces (42 and 43) which are perpendicular to car space 41 and for car spaces facing each other

#### Ground Floor

- The parking aisle has flat gradient
- The car parking aisle is 6.4 metres wide minimum
- The general 90-degree car spaces are 2.5 metres wide and 5.4 metres long minimum
- Spaces adjacent to walls have an additional 300mm width generally
- The disabled car space is 2.4 metres wide with a length of 5.4 metres
  - Shared zone has been provided using the adjacent pedestrian footpath
- Column setbacks comply with standards
- Blind aisle extensions of 1 metres minimum have been provided
- A truck loading zone of 4.1 meters width and 10.4 meters length has been provided.

### 4. SWEPT PATHS

A swept turning path analysis is performed using a B99 and B85 vehicle to confirm that vehicle movements are adequate.

The following Swept Paths have been performed:

- B99 forward inbound from ramps through the parking aisles passing B85 shows inadequate manoeuvrability on the ramp
  - The ramp should be flared
- B85 forward inbound and reverse outbound to car spaces on the basement level shows adequate manoeuvrability.
- B85 forward inbound and reverse outbound, and reverse inbound and forward outbound to car spaces on the ground floor shows adequate manoeuvrability.

Union lane and High Street need to be placed in the architectural drawings for the truck swept paths.

All the swept paths are attached as annex with this report.

## **5. SIGHT DISTANCE**

The car driver's sight distance requirement to enter the external road is stated in Figure 3.2 of AS2890.1.

The sight distance varies according to the speed of the external road. Union Lane has a speed limit of 50km/hr.

The minimum sight distance required is 45 metres. The minimum vehicle sight distance is met.

The pedestrian sight distance triangle is met as set out in Figure 3.3 of AS2890.1.

## **6. CONCLUSIONS AND RECOMMENDATIONS**

The car parking area and driveway is generally compliant with Australian Standards and Council's DCP.

# APPENDIX A – SWEPT PATHS

# **PROPOSED MIX-USED DEVELOPMENT**

***608-612 High Street in Penrith***

## Traffic and Parking Impact Report

Prepared for: Colpani Construction Co Pty Ltd

N1815755A (Version 1b)

May 2018

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## **1. INTRODUCTION**

Motion Traffic Engineers was commissioned by Colpani Construction Co Pty Ltd to undertake a traffic and parking impact assessment of proposed mix-used development at 608-612 High Street in Penrith. The site is located within the Penrith City Centre.

The site has frontage to High Street and Union Lane. The proposed vehicle access and egress to the car park is from Union Lane, except for service vehicles which will exit from the site onto High Street. Currently the site is a car lot.

The proposed development will consist of a commercial space in the ground floor with apartments occupying the higher levels. Car parking will be provided at the ground and basement levels.

This traffic report focuses on the proposed development and changes in car usage and car park utilisation and additional trips from the proposed development.

In the course of preparing this assessment, the subject site and its environs have been inspected, plans of the development examined, and all relevant traffic and parking data collected and analysed.

## **2. BACKGROUND AND EXISTING CONDITIONS OF THE PROPOSED LOCATION**

### **2.1 Location and Land Use**

The proposed mixed-use development within the Penrith city centre.

The nearby land uses on High Street are retail and commercial business as well as residential homes. The Penrith Train Station and bus services are located nearby.

Figures 1 and 2 show the location of the mixed use site from the aerial and street map perspective respectively.

Figures 3 shows the existing site. Currently the site is unoccupied.



**Figure 1: Location of the Subject Site on Aerial**

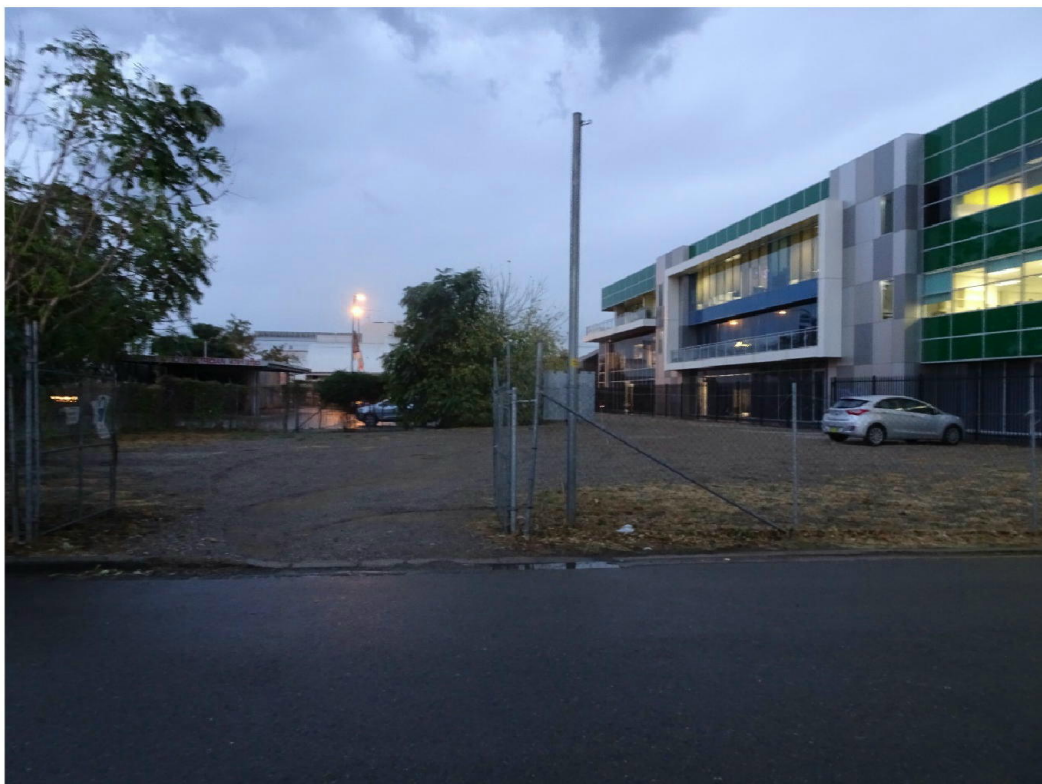


**Figure 2: Street Map of the Location of the Development**





**Figure 3a: Site Photo from High Street**



**Figure 3b: Site Photo from Union Lane**

## 2.2 Road Network

This section describes the roads near the proposed development.

High Street is a town centre road near the development with restricted on-street parking. High Street has two lanes in each direction adjacent to the site. The sign-posted speed limit is 50km/hr except where the high pedestrian speed limit applies near the Penrith Town Centre. Figure 4 shows a photograph of High Street near the development.

Union Lane is a service road with one lane each way with commuter on street parking not permitted on both sides of the road. The default speed limit is 40km/hr. Figure 5 shows a photograph of Union Lane.

Worth Street is a town centre road with one lane each way with commuter on street parking not permitted on both sides of the road. The default speed limit is 40km/hr. Figure 6 shows a photograph of Worth Street.



**Figure 4: High Street looking East from Worth Street**



**Figure 5: Union Lane looking north from adjacent the site**



**Figure 6: Worth Street looking South from High Street**

## 2.3 Intersection Description

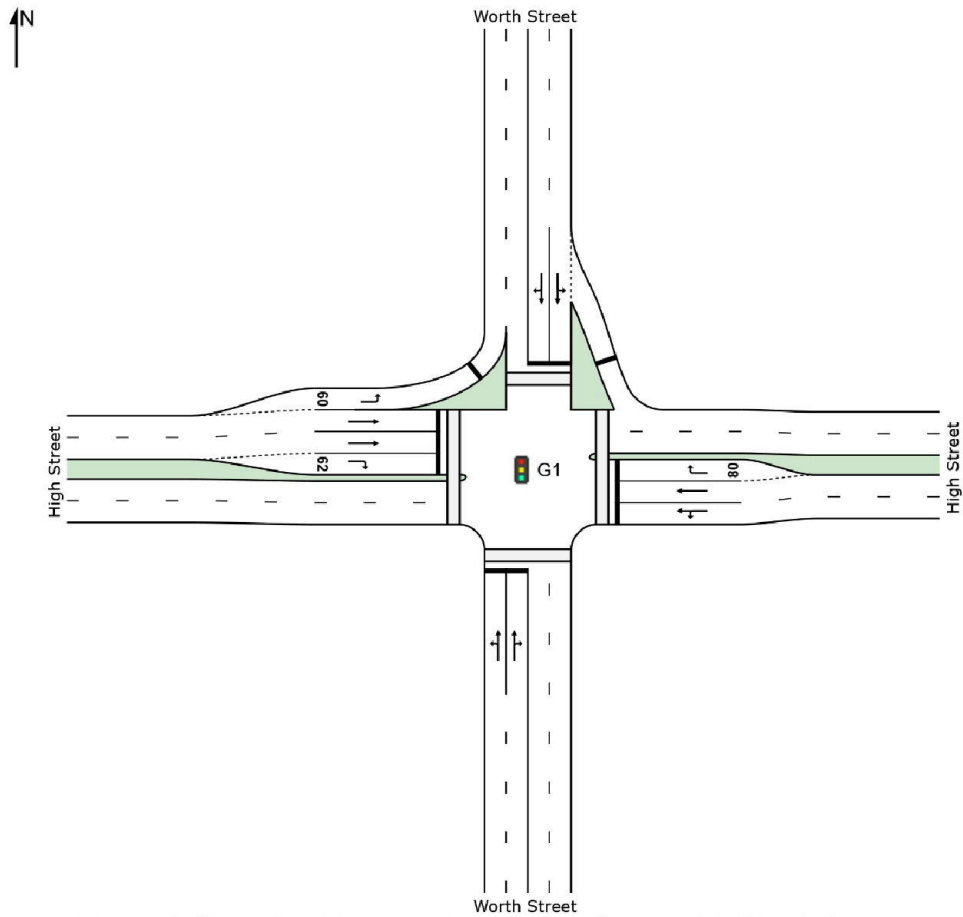
As part of the traffic impact assessment, the performance of two nearby intersections were surveyed and assessed:

- Signalised intersection of High Street with Worth Street
- Priority-controlled intersection of Worth Street with Union lane

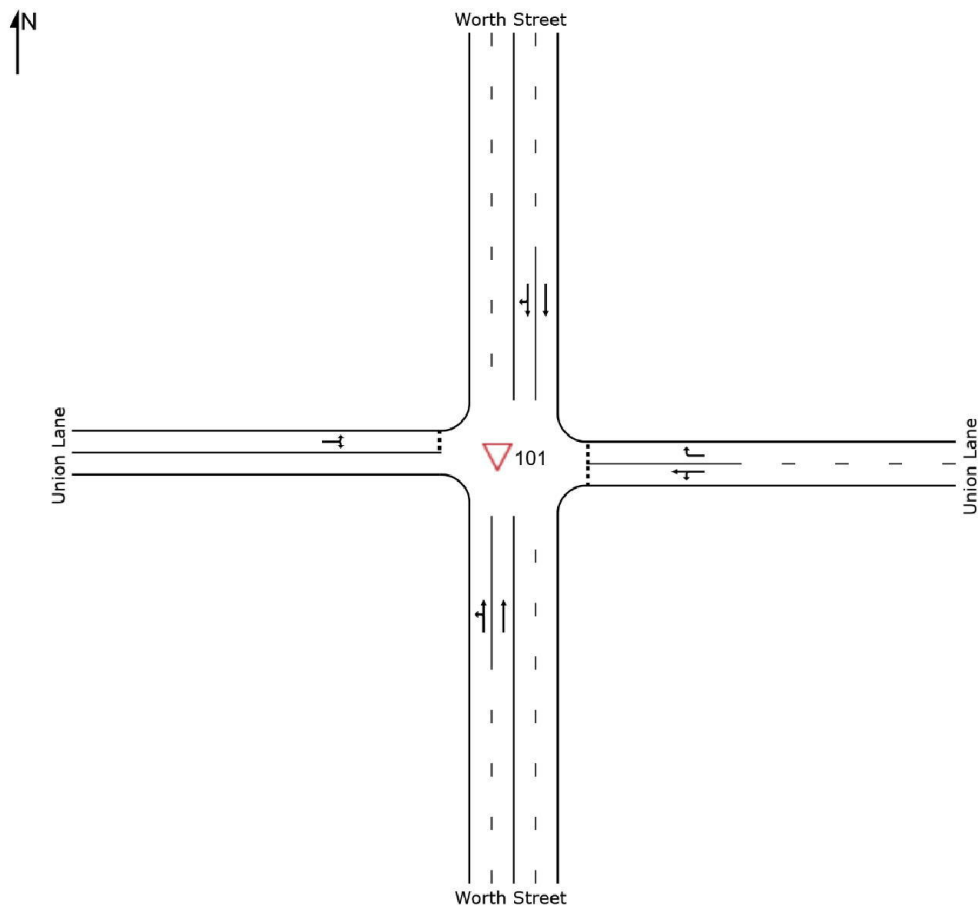
External traffic travelling to and from the site will most likely need to travel through the above intersection.

The signalised intersection of High Street with Worth Street is a four-leg intersection with all turn movements permitted. The north leg of this intersection is a short leg which directly connects to the Penrith Plaza carpark. Left slip lanes are provided to and from Penrith Plaza Car Park. The number on the lanes represent the length of short lanes in metres. Pedestrian crossings are provided on all approaches. Figure 6 presents the layout of this intersection using SIDRA 7 (an industry standard intersection assessment program).

The priority-controlled intersection of Worth Street with Union Lane is a four-leg intersection. The eastern approach on Lane Street is an approach only. Drivers on Union lane needs to give way to traffic on Worth Street. Figure 7 presents the layout of this intersection using SIDRA 7.



**Figure 6: Signaled intersection of High Street with Worth Street**



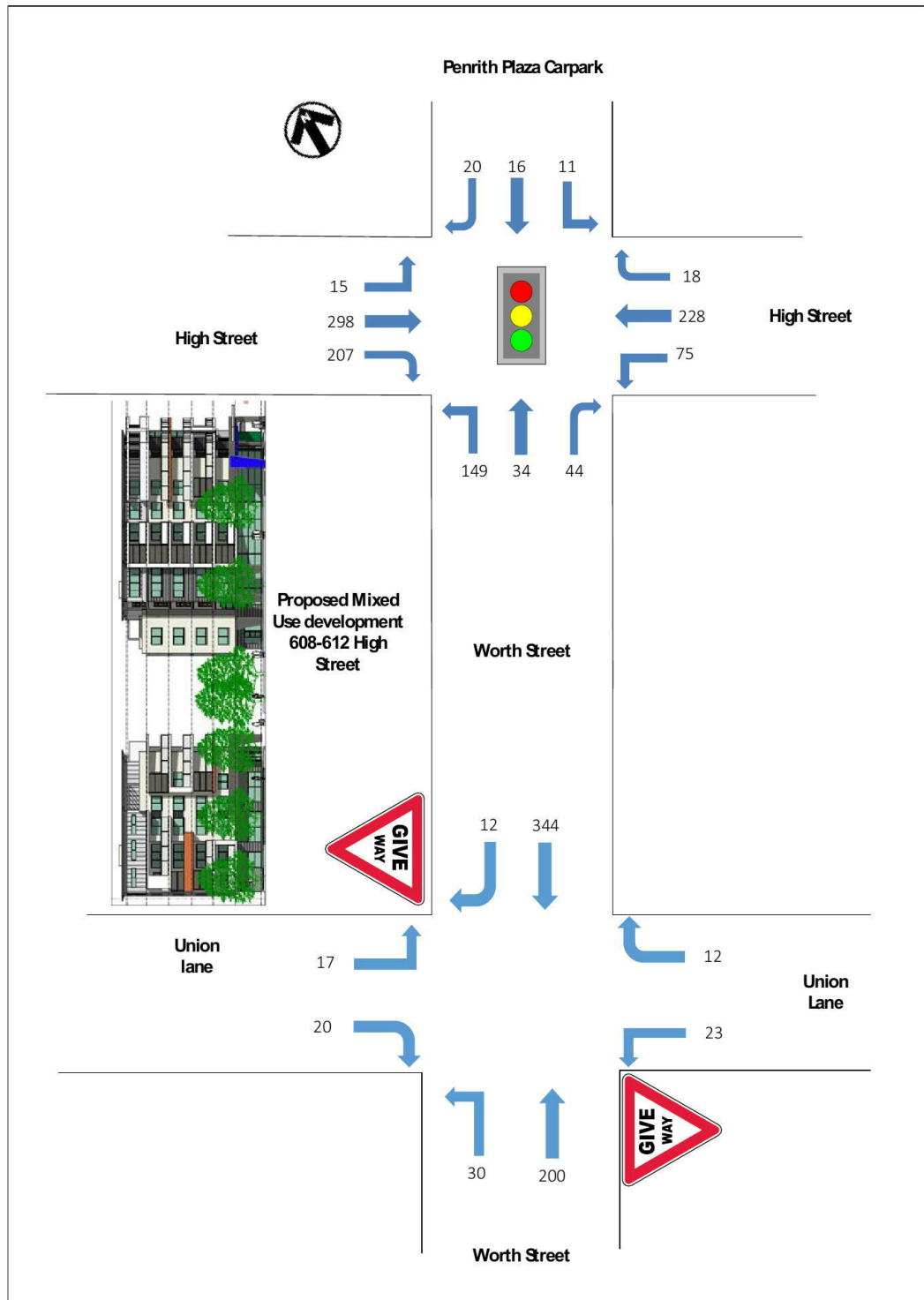
**Figure 7: Priority-controlled intersection of Worth Street with Union Lane**

## 2.4 Existing Traffic Volumes

As part of the traffic assessment, traffic counts have been undertaken at the intersections for the weekday AM and PM peak periods. The peak hour was 8-9 AM and 5-6 PM.

The survey hours are to capture the traffic movements when the retail and other businesses are most active in the Penrith City Centre as well as the proposed mixed-use development.

The following Figures present the traffic volumes in vehicles for the weekday peak hours.



**Figure 8: Existing Weekday Traffic Volumes AM Peak Hour**

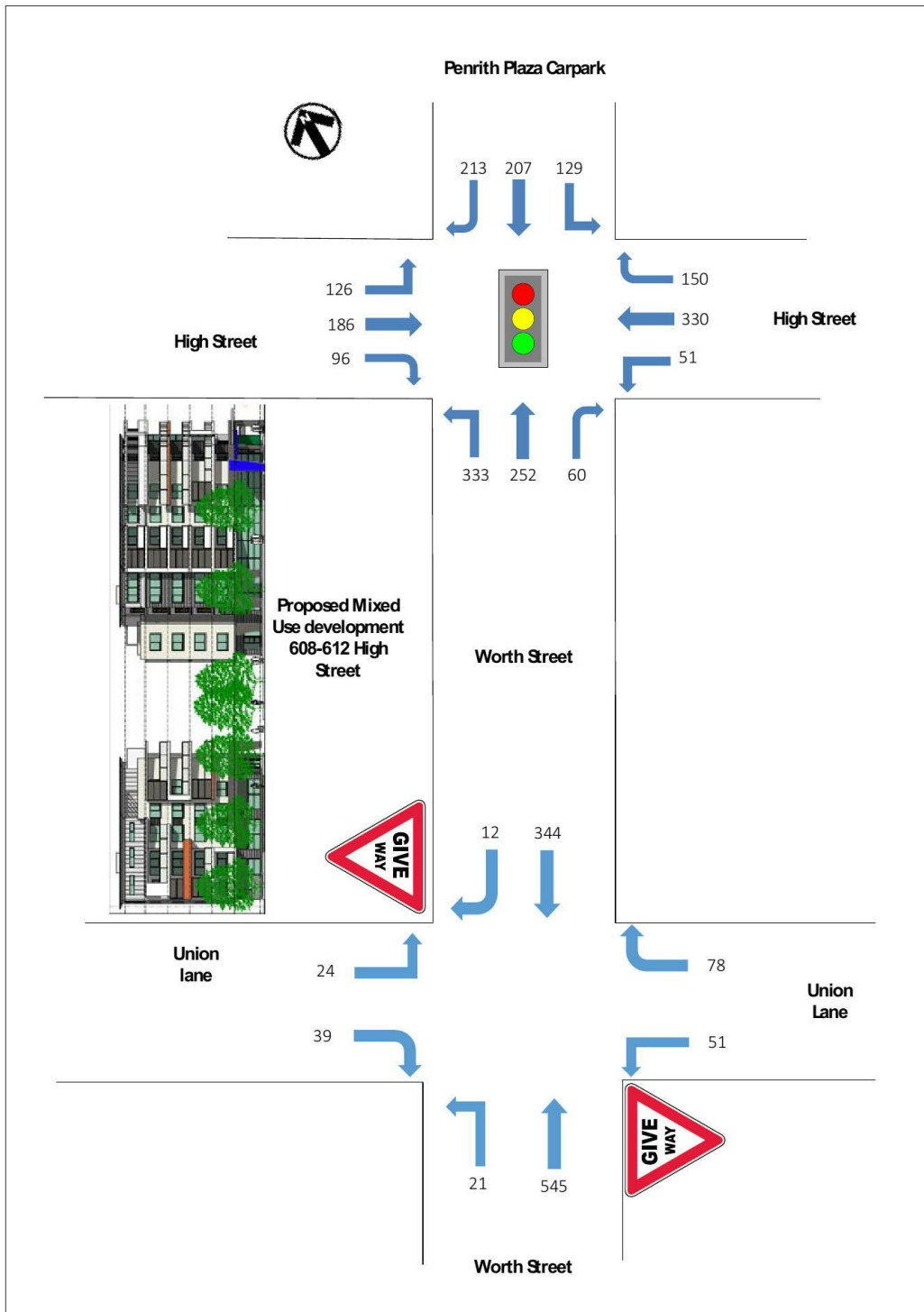


Figure 9: Existing Weekday Traffic Volumes PM Peak Hour



## 2.5 Intersection Assessment

As part of the traffic impact assessment, the performance of two nearby intersections were surveyed and assessed:

- Signalised intersection of High Street with Worth Street
- Priority-controlled intersection of Worth Street with Union lane

The existing intersection operating performance was assessed using the SIDRA software package (version 7) to determine the Degree of Saturation (DS), Average Delay (AVD in seconds) and Level of Service (LoS) at each intersection. The SIDRA program provides Level of Service Criteria Tables for various intersection types. The key indicator of intersection performance is Level of Service, where results are placed on a continuum from ‘A’ to ‘F’, as shown in Table below.

LoS	Traffic Signal / Roundabout	Give Way / Stop Sign / T-Junction control
A	Good operation	Good operation
B	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	Satisfactory	Satisfactory, but accident study required
D	Operating near capacity	Near capacity & accident study required
E	At capacity, at signals incidents will cause excessive delays.	At capacity, requires other control mode
F	Unsatisfactory and requires additional capacity, Roundabouts require other control mode	At capacity, requires other control mode

**Table 1: Intersection Level of Service**

The Average Vehicle Delay (AVD) provides a measure of the operational performance of an intersection as indicated below, which relates AVD to LOS. The AVD’s should be taken as a guide only as longer delays could be tolerated in some locations (i.e. inner city conditions) and on some roads (i.e. minor side street intersecting with a major arterial route). For traffic signals, the average delay over all movements should be taken. For roundabouts and priority control intersections (sign control) the critical movement for level of service assessment should be that movement with the highest average delay.

LoS	Average Delay per Vehicles (seconds/vehicle)
A	Less than 14
B	15 to 28
C	29 to 42
D	43 to 56
E	57 to 70
F	>70

**Table 2: Intersection Average Delay (AVD)**

The degree of saturation (DS) is another measure of the operational performance of individual intersections. For intersections controlled by traffic signals both queue length and delay increase rapidly as DS approaches 1. It is usual to attempt to keep DS to less than 0.9. Degrees of Saturation in the order of 0.7 generally represent satisfactory intersection operation. When DS exceed 0.9 queues can be anticipated.

The results of the intersection analysis are as follows:

Signalised intersection of High Street with Worth Street

- The overall intersection has a LoS C for the AM and PM peak hours
- There is spare capacity at this intersection.

Priority-controlled intersection of Worth Street with Union lane

- All turn movements have a LoS A or B for both peak hours
- There is spare capacity at this intersection.

The full SIDRA results are presented in Appendix A.

## 2.6 Public Transport

The nearest bus stop is 200 metres from the development on High Street. This bus stop is serviced by the 688, 689, 690P and 691 bus routes. These provide transport to a range of suburbs including Penrith, Emu Plains, Emu Heights and surrounding suburbs. Penrith train station is 700 metres from the development. Trains regularly leave this station heading to major town centres including St Marys, Mount DrUITT and Sydney CBD.

Overall, the site has excellent access to public transport.

Figure 10 shows a map of the local public transport services.

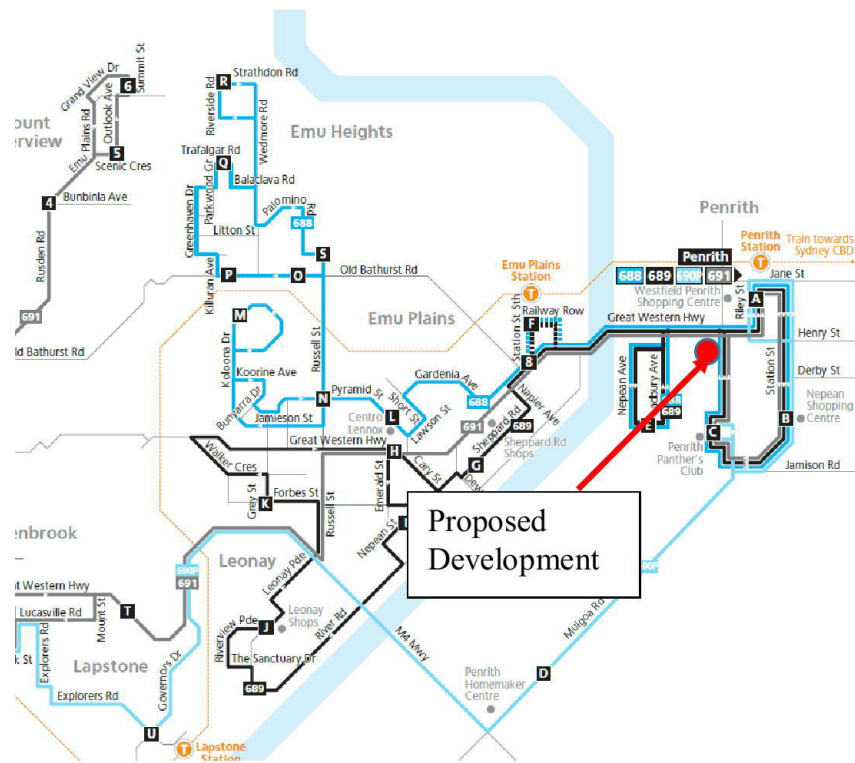


Figure 10: Local transport map

## 2.7 Conclusions on the Existing Conditions

The nearby intersection performs well with sufficient spare capacity to accommodate additional traffic.

The local area is well serviced by bus services and the Penrith Train Station.

### **3. PROPOSED MIXED-USE DEVELOPMENT**

The details of the proposed development are as follows:

- 43 two-bedroom apartments (level one and above)
- 326m<sup>2</sup> Commercial tenancy (ground level)

On-site parking will be provided at ground and one basement level.

The site has frontage to High Street and Union Lane. The proposed vehicle access and egress to the car park is from Union Lane, except the service vehicle will exit from the site to High Street and enter the site from Union Lane.

A full scaled plan of the proposed residential development is provided as part of the Planning Application.

## 4. CAR PARKING CONSIDERATIONS

### 4.1 Penrith Council Planning Scheme

The car parking requirements for the proposed development are presented in Council's Development Control Plan (DCP) with the car parking rates as follows as it applies to this development:

#### Residential Flat Buildings

- 1 car space per 2-bedroom apartment
- 1 visitor parking space per 5 apartments

#### Retail premises

- Penrith City Centre – 1 space per 30m<sup>2</sup> GFA

Table 3 summarises the car parking requirements of the proposed mixed use development. The development complies with Council's residential tenant and commercial tenancies.

The development is one short of meeting residential visitor car spaces with seven provided versus eight required.

Overall the proposed mixed use complies with

Residential Parking Provision

Use	Number of Units	Parking Rate	Car spaces Required	Car Spaces Provided
2-Bedroom	43	1 car spaces per unit	43	43
Service Vehicles		1 car space per 40 units	1	1
Visitor Parking		1 car space per 5 units	9	8
<b>Total</b>			<b>53</b>	<b>52</b>

### Commercial Parking Provision

Use	GFA (m <sup>2</sup> )	Parking Rate	Car spaces Required On-Site (*)	Car Spaces Provided
Retail Premises	326	1 car space per 30m <sup>2</sup>	7	8
<b>Total</b>			<b>7</b>	<b>8</b>

**Table 3: Summary of Car Parking Requirements**

Note\*: The Penrith City Council DCP states:

*“A maximum of 60% of the total number of commercial parking spaces required by a development, other than for service vehicles, car washing bays and parking spaces allocated to people with disability, are to be provided on-site.”*

## 4.2 Adequacy of Car Parking Provision

The site is located within walking distance to the Penrith Train Station and bus routes.

The proposed development complies with Penrith City Council’s car parking requirements for residential and commercial parking.

There is sufficient overall on-site parking to ensure all parking is met on-site.

## 5. VEHICLE TRAFFIC IMPACT CONSIDERATIONS

### 5.1 Traffic Generation for the Proposed Development

The RTA Guide to Traffic Generating Developments Updated Surveys provides average weekday AM and PM peak hour trip generation rates for high density residential apartments located in area where a train station is within walking distance as follows:

#### *Residential*

- 0.15 trips per car space for the AM peak hour period
- 0.12 trips per car space for the PM peak hour period

#### *Commercial*

The RTA Guide provides the peak hour trip generation rate for office and commercial businesses as follows:

- 2 per 100 m<sup>2</sup> GFA for the AM and PM peak hour period

Table 6 summarises the trip generation for the proposed development.

Table 7 summarises the net trip generation and distribution of the existing and proposed developments.

Overall the proposed development is a modest trip generator.

#### *Residential*

Peak Hour	Criteria	Number	Trip Generating Rate	Trips Generated
AM	Car Spaces	43	0.15	7
PM	Car Spaces	43	0.12	6
			<b>Total</b>	<b>13</b>

#### *Commercial*

Peak Hour	Criteria	Number	Trip Generating Rate	Trips Generated
AM and PM	GFA	326	0.02	7
			<b>Total</b>	<b>7</b>

**Table 6: Summary of Trip Generation for the Proposed Development for Weekday Peak Hours**

	<b>Residential</b>		
	Origin	Destination	Total
AM Peak Hour	6	1	7
PM Peak Hour	1	5	6
	<b>Commercial</b>		
	Origin	Destination	Total
AM Peak Hour	0	7	7
PM Peak Hour	7	0	7
	<b>Total</b>		
	Origin	Destination	Total
AM Peak Hour	6	8	14
PM Peak Hour	8	5	13

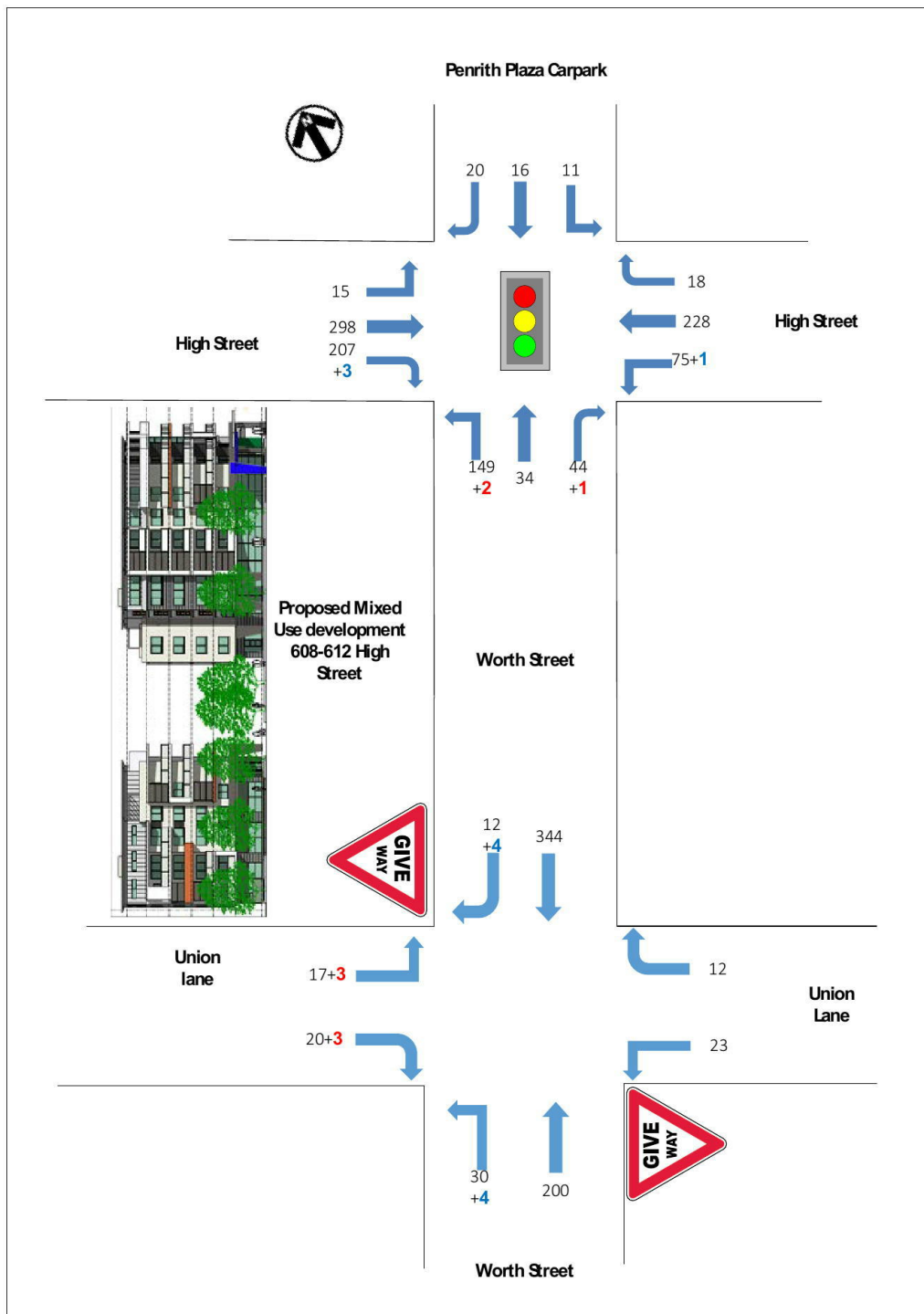
**Table 7: Weekday Net Trip Distribution for the Proposed and Existing Developments**



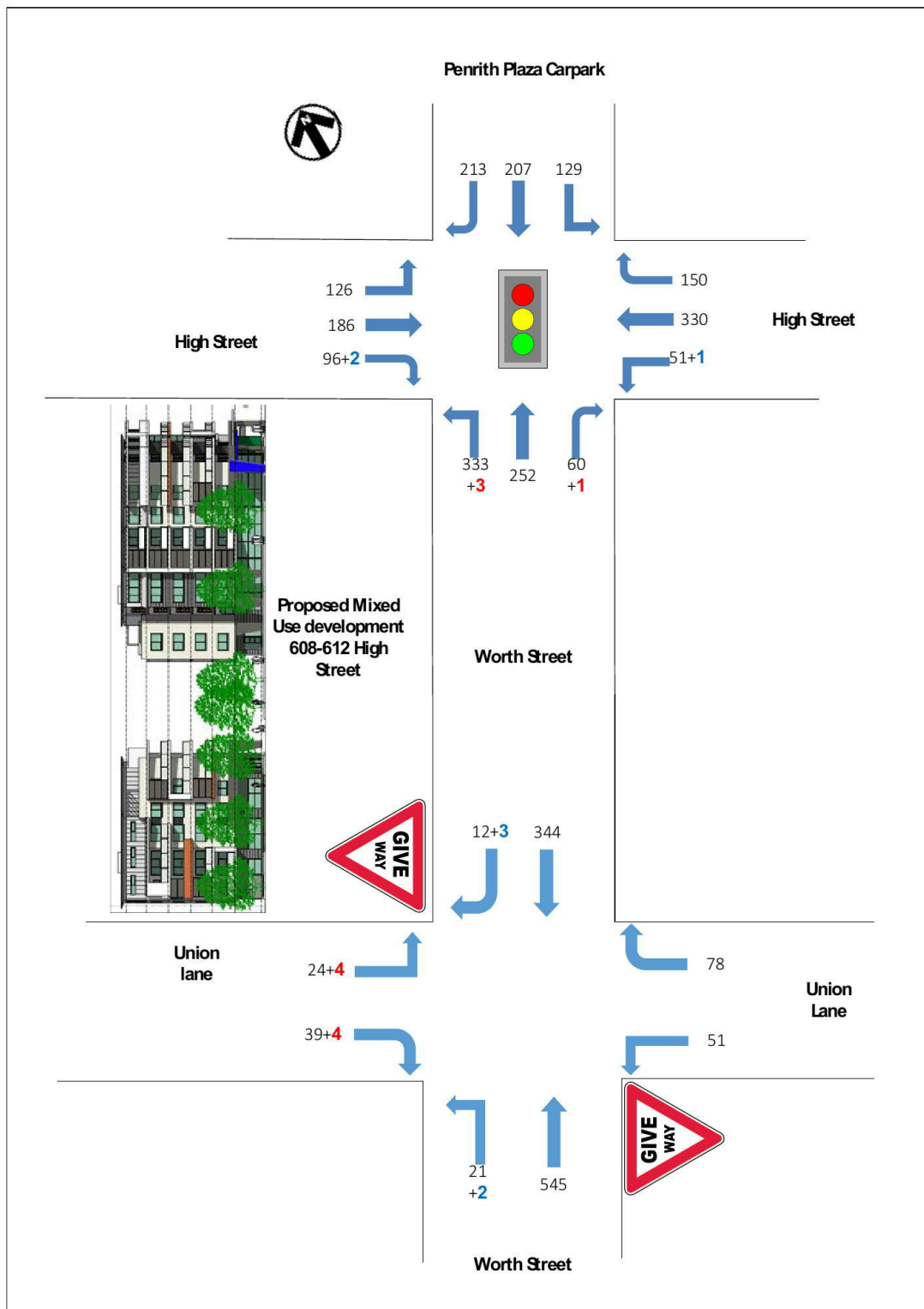
## 5.2 Traffic Volumes

The additional development trips are assigned onto the local traffic network. The following figures present the existing with the trips generated by the proposal (in red for origin and blue for destination trips) for the respective peak hours.

The additional development trips represent a small proportion of the existing traffic volumes.



**Figure 12: Weekday AM Peak Hour Traffic Volumes with Mixed Use Traffic**



**Figure 13: Weekday PM Peak Hour Traffic Volumes with Mixed Use Traffic**

### 5.3 Intersection Assessment

An intersection assessment has been undertaken for the two surveyed intersections.

The results of the intersection analysis are as follows:

#### Signalised intersection of High Street with Worth Street

- The overall intersection has a LoS C for the AM and PM peak hour respectively
- The additional mixed development trips do not change the overall intersection LoS

#### Priority-controlled intersection of Worth Street with Union lane

- All turn movements have a LoS A or B for both peak hours
- The additional mixed development trips do not change the LoS of any turn movements

The full SIDRA results with the development traffic are presented in Appendix B. The existing conditions are presented in Appendix A.

## 6. CONCLUSIONS

Based on the considerations presented in this report, it is considered that:

### *Car Parking Spaces*

- The proposed mixed use development overall complies with Penrith Council's Development Control Plan for car spaces

### *Traffic*

- The proposed development is a modest trip generator for the weekday AM and PM peak hours.
- The additional trips from the proposed development can be accommodated at the nearby intersections without noticeably affecting intersection performance, delays or queues.
- There are no traffic engineering reasons why a planning permit for the proposed mixed-use development at 608-612 High Street in Penrith should be refused.

# APPENDIX A

## SIDRA Intersection Results for Existing Traffic Conditions

Table A1: Weekday Intersection Performance of Worth Street with High Street AM Peak Hour

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total	HV %				Vehicles	Distance				
		veh/h	%	v/c	sec		veh	m				km/h
South: Worth Street												
4	L2	157	0.0	0.301	21.4	LOS B	4.3	30.0	0.81	0.74	0.81	22.0
5	T1	36	0.0	0.301	39.6	LOS C	4.3	30.0	0.89	0.74	0.89	7.3
6	R2	46	0.0	0.301	54.3	LOS D	3.8	26.3	0.94	0.75	0.94	16.0
Approach		239	0.0	0.301	30.5	LOS C	4.3	30.0	0.85	0.74	0.85	18.0
East: High Street												
7	L2	79	0.0	0.378	46.9	LOS D	7.9	55.5	0.90	0.76	0.90	17.4
8	T1	240	0.0	0.378	43.4	LOS D	8.1	56.8	0.90	0.74	0.90	20.2
9	R2	19	0.0	0.033	34.1	LOS C	0.8	5.3	0.72	0.65	0.72	18.0
Approach		338	0.0	0.378	43.7	LOS D	8.1	56.8	0.89	0.74	0.89	19.5
North: Worth Street												
10	L2	12	0.0	0.046	20.0	LOS B	0.9	6.3	0.70	0.51	0.70	19.9
11	T1	17	0.0	0.046	20.0	LOS B	0.9	6.3	0.70	0.51	0.70	10.0
12	R2	21	0.0	0.104	53.0	LOS D	1.1	7.9	0.93	0.67	0.93	9.8
Approach		49	0.0	0.104	34.1	LOS C	1.1	7.9	0.80	0.58	0.80	12.1
West: High Street												
1	L2	16	0.0	0.010	11.9	LOS A	0.1	0.5	0.13	0.82	0.13	23.5
2	T1	314	0.0	0.367	43.3	LOS D	7.9	55.0	0.90	0.73	0.90	20.3
3	R2	218	0.0	0.377	38.2	LOS C	10.0	69.7	0.83	0.77	0.83	16.1
Approach		547	0.0	0.377	40.4	LOS C	10.0	69.7	0.85	0.75	0.85	19.0
All Vehicles		1174	0.0	0.378	39.1	LOS C	10.0	69.7	0.86	0.74	0.86	18.8

**Table A2: Weekday Intersection Performance of Worth Street with Union Lane AM Peak Hour**

<b>Movement Performance - Vehicles</b>												
Mov ID	Turn	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total	HV %				Vehicles	Distance				
		veh/h	%	v/c	sec		veh	m				km/h
<b>South: Worth Street</b>												
1	L2	32	0.0	0.062	3.4	LOS A	0.0	0.0	0.00	0.12	0.00	39.6
2	T1	211	0.0	0.062	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	38.9
Approach		242	0.0	0.062	0.4	NA	0.0	0.0	0.00	0.06	0.00	39.2
<b>East: Union Lane</b>												
4	L2	24	0.0	0.024	6.3	LOS A	0.1	0.6	0.29	0.56	0.29	45.0
5	T1	1	0.0	0.024	10.5	LOS A	0.1	0.6	0.29	0.56	0.29	52.4
6	R2	13	0.0	0.032	12.2	LOS A	0.1	0.8	0.60	0.77	0.60	39.0
Approach		38	0.0	0.032	8.4	LOS A	0.1	0.8	0.39	0.63	0.39	43.1
<b>North: Worth Street</b>												
8	T1	362	0.0	0.099	0.1	LOS A	0.1	0.8	0.03	0.02	0.03	39.3
9	R2	13	0.0	0.099	4.5	LOS A	0.1	0.8	0.06	0.03	0.06	39.6
Approach		375	0.0	0.099	0.2	NA	0.1	0.8	0.03	0.02	0.03	39.4
<b>West: Union Lane</b>												
10	L2	18	0.0	0.069	3.7	LOS A	0.2	1.7	0.31	0.54	0.31	35.2
12	R2	21	0.0	0.069	11.0	LOS A	0.2	1.7	0.31	0.54	0.31	34.9
Approach		39	0.0	0.069	7.6	LOS A	0.2	1.7	0.31	0.54	0.31	35.0
All Vehicles		694	0.0	0.099	1.2	NA	0.2	1.7	0.05	0.10	0.05	39.0

**Table A3: Weekday Intersection Performance of Worth Street with High Street PM Peak Hour**

<b>Movement Performance - Vehicles</b>												
Mov ID	Turn	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total	HV %				Vehicles	Distance				
		veh/h	%	v/c	sec		veh	m				km/h
<b>South: Worth Street</b>												
4	L2	351	0.0	0.597	21.3	LOS B	11.2	78.4	0.87	0.80	0.87	22.1
5	T1	265	0.0	0.597	36.6	LOS C	14.3	99.9	0.91	0.80	0.91	8.1
6	R2	63	0.0	0.597	44.2	LOS D	14.3	99.9	0.92	0.80	0.92	18.4
Approach		679	0.0	0.597	29.4	LOS C	14.3	99.9	0.89	0.80	0.89	16.3
<b>East: High Street</b>												
7	L2	54	0.0	0.615	54.3	LOS D	11.0	77.2	0.98	0.81	0.98	16.0
8	T1	347	0.0	0.615	50.9	LOS D	11.2	78.2	0.98	0.81	0.98	18.6
9	R2	158	0.0	0.594	56.7	LOS E	8.9	62.3	0.99	0.81	0.99	13.3
Approach		559	0.0	0.615	52.9	LOS D	11.2	78.2	0.98	0.81	0.98	17.0
<b>North: Worth Street</b>												
10	L2	136	0.0	0.351	13.7	LOS A	10.2	71.7	0.59	0.56	0.65	22.3
11	T1	218	0.0	0.351	13.7	LOS A	10.2	71.7	0.59	0.56	0.65	12.0
12	R2	224	0.0	0.623	48.7	LOS D	12.2	85.7	0.97	0.81	0.97	10.3
Approach		578	0.0	0.623	27.3	LOS B	12.2	85.7	0.74	0.66	0.77	13.4
<b>West: High Street</b>												
1	L2	133	0.0	0.081	12.0	LOS A	0.6	4.5	0.14	0.83	0.14	23.5
2	T1	196	0.0	0.298	47.8	LOS D	5.1	35.6	0.92	0.73	0.92	19.3
3	R2	101	0.0	0.380	54.8	LOS D	5.5	38.4	0.95	0.77	0.95	12.7
Approach		429	0.0	0.380	38.4	LOS C	5.5	38.4	0.69	0.77	0.69	18.2
All Vehicles		2245	0.0	0.623	36.4	LOS C	14.3	99.9	0.84	0.76	0.85	16.3



**Table A4: Weekday Intersection Performance of Worth Street with Union Lane PM Peak Hour**

<b>Movement Performance - Vehicles</b>												
Mov ID	Turn	Demand Total	Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	of Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	v/c	sec		veh	m				km/h
<b>South: Worth Street</b>												
1	L2	22	0.0	0.153	3.4	LOS A	0.0	0.0	0.00	0.03	0.00	40.1
2	T1	574	0.0	0.153	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	39.6
Approach		596	0.0	0.153	0.1	NA	0.0	0.0	0.00	0.02	0.00	39.7
<b>East: Union Lane</b>												
4	L2	54	0.0	0.052	6.3	LOS A	0.2	1.3	0.29	0.58	0.29	44.9
5	T1	1	0.0	0.052	18.3	LOS B	0.2	1.3	0.29	0.58	0.29	52.4
6	R2	82	0.0	0.401	28.0	LOS B	1.6	11.4	0.86	1.01	1.12	28.5
Approach		137	0.0	0.401	19.4	LOS B	1.6	11.4	0.63	0.84	0.79	33.5
<b>North: Worth Street</b>												
8	T1	362	0.0	0.101	0.2	LOS A	0.2	1.3	0.05	0.02	0.05	38.8
9	R2	13	0.0	0.101	6.8	LOS A	0.2	1.3	0.12	0.04	0.12	39.3
Approach		375	0.0	0.101	0.4	NA	0.2	1.3	0.05	0.02	0.05	38.8
<b>West: Union Lane</b>												
10	L2	25	0.0	0.241	5.3	LOS A	0.9	6.1	0.68	0.79	0.74	30.5
12	R2	41	0.0	0.241	23.8	LOS B	0.9	6.1	0.68	0.79	0.74	30.3
Approach		66	0.0	0.241	16.8	LOS B	0.9	6.1	0.68	0.79	0.74	30.4
All Vehicles		1174	0.0	0.401	3.4	NA	1.6	11.4	0.13	0.16	0.15	36.2

## APPENDIX B

### *SIDRA Intersection Results for Existing and Mixed Use Traffic*

**Table B1: Weekday Intersection Performance of Worth Street with High Street AM Peak Hour with mixed use traffic**

<b>Movement Performance - Vehicles</b>												
Mov ID	Turn	Demand Total	Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	of Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	v/c	sec		veh	m				km/h
<b>South: Worth Street</b>												
4	L2	159	0.0	0.305	21.4	LOS B	4.3	30.4	0.81	0.74	0.81	21.9
5	T1	36	0.0	0.305	39.5	LOS C	4.3	30.4	0.89	0.74	0.89	7.3
6	R2	47	0.0	0.305	54.4	LOS D	3.8	26.7	0.94	0.75	0.94	15.9
Approach		242	0.0	0.305	30.5	LOS C	4.3	30.4	0.85	0.74	0.85	18.1
<b>East: High Street</b>												
7	L2	80	0.0	0.379	46.9	LOS D	7.9	55.6	0.90	0.76	0.90	17.3
8	T1	240	0.0	0.379	43.4	LOS D	8.1	57.0	0.90	0.74	0.90	20.2
9	R2	19	0.0	0.033	34.1	LOS C	0.8	5.3	0.72	0.65	0.72	18.0
Approach		339	0.0	0.379	43.7	LOS D	8.1	57.0	0.89	0.74	0.89	19.5
<b>North: Worth Street</b>												
10	L2	12	0.0	0.046	20.0	LOS B	0.9	6.3	0.70	0.51	0.70	19.9
11	T1	17	0.0	0.046	20.0	LOS B	0.9	6.3	0.70	0.51	0.70	10.0
12	R2	21	0.0	0.104	53.0	LOS D	1.1	7.9	0.93	0.67	0.93	9.8
Approach		49	0.0	0.104	34.1	LOS C	1.1	7.9	0.80	0.58	0.80	12.1
<b>West: High Street</b>												
1	L2	16	0.0	0.010	11.9	LOS A	0.1	0.5	0.13	0.82	0.13	23.5
2	T1	314	0.0	0.367	43.3	LOS D	7.9	55.0	0.90	0.73	0.90	20.3
3	R2	221	0.0	0.382	38.3	LOS C	10.1	70.8	0.83	0.77	0.83	16.0
Approach		551	0.0	0.382	40.4	LOS C	10.1	70.8	0.85	0.75	0.85	18.9
All Vehicles		1181	0.0	0.382	39.1	LOS C	10.1	70.8	0.86	0.74	0.86	18.7

**Table B2: Weekday Intersection Performance of Worth Street with Union Lane AM Peak Hour with mixed use traffic**

<b>Movement Performance - Vehicles</b>												
Mov ID	Turn	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total	HV %				Vehicles	Distance				
		veh/h	%	v/c	sec		veh	m				
<b>South: Worth Street</b>												
1	L2	36	0.0	0.064	3.4	LOS A	0.0	0.0	0.00	0.14	0.00	39.5
2	T1	211	0.0	0.064	0.0	LOS A	0.0	0.0	0.00	0.06	0.00	38.8
Approach		246	0.0	0.064	0.5	NA	0.0	0.0	0.00	0.07	0.00	39.1
<b>East: Union Lane</b>												
4	L2	24	0.0	0.024	6.3	LOS A	0.1	0.6	0.29	0.56	0.29	45.0
5	T1	1	0.0	0.024	10.6	LOS A	0.1	0.6	0.29	0.56	0.29	52.4
6	R2	13	0.0	0.032	12.3	LOS A	0.1	0.8	0.60	0.78	0.60	38.8
Approach		38	0.0	0.032	8.4	LOS A	0.1	0.8	0.39	0.63	0.39	43.1
<b>North: Worth Street</b>												
8	T1	362	0.0	0.100	0.1	LOS A	0.2	1.1	0.04	0.02	0.04	39.2
9	R2	17	0.0	0.100	4.5	LOS A	0.2	1.1	0.08	0.05	0.08	39.5
Approach		379	0.0	0.100	0.3	NA	0.2	1.1	0.04	0.02	0.04	39.2
<b>West: Union Lane</b>												
10	L2	21	0.0	0.081	3.7	LOS A	0.3	2.0	0.30	0.54	0.30	35.1
12	R2	24	0.0	0.081	11.2	LOS A	0.3	2.0	0.30	0.54	0.30	34.8
Approach		45	0.0	0.081	7.7	LOS A	0.3	2.0	0.30	0.54	0.30	35.0
All Vehicles		708	0.0	0.100	1.3	NA	0.3	2.0	0.06	0.10	0.06	38.8

**Table B3: Weekday Intersection Performance of Worth Street with High Street PM Peak Hour with mixed use traffic**

<b>Movement Performance - Vehicles</b>												
Mov ID	Turn	Demand Total	Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	of Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	v/c	sec		veh	m				km/h
<b>South: Worth Street</b>												
4	L2	354	0.0	0.600	21.3	LOS B	11.3	79.2	0.87	0.80	0.87	22.1
5	T1	265	0.0	0.600	36.7	LOS C	14.4	100.5	0.91	0.80	0.91	8.1
6	R2	64	0.0	0.600	44.3	LOS D	14.4	100.5	0.92	0.80	0.92	18.4
Approach		683	0.0	0.600	29.5	LOS C	14.4	100.5	0.89	0.80	0.89	16.3
<b>East: High Street</b>												
7	L2	55	0.0	0.616	54.3	LOS D	11.1	77.5	0.98	0.81	0.98	16.0
8	T1	347	0.0	0.616	50.9	LOS D	11.2	78.5	0.98	0.81	0.98	18.6
9	R2	158	0.0	0.594	56.7	LOS E	8.9	62.3	0.99	0.81	0.99	13.3
Approach		560	0.0	0.616	52.9	LOS D	11.2	78.5	0.98	0.81	0.98	17.0
<b>North: Worth Street</b>												
10	L2	136	0.0	0.351	13.7	LOS A	10.2	71.7	0.59	0.56	0.65	22.3
11	T1	218	0.0	0.351	13.7	LOS A	10.2	71.7	0.59	0.56	0.65	12.0
12	R2	224	0.0	0.623	48.7	LOS D	12.2	85.7	0.97	0.81	0.97	10.3
Approach		578	0.0	0.623	27.3	LOS B	12.2	85.7	0.74	0.66	0.77	13.4
<b>West: High Street</b>												
1	L2	133	0.0	0.081	12.0	LOS A	0.6	4.5	0.14	0.83	0.14	23.5
2	T1	196	0.0	0.298	47.8	LOS D	5.1	35.6	0.92	0.73	0.92	19.3
3	R2	103	0.0	0.388	54.9	LOS D	5.6	39.3	0.95	0.77	0.95	12.7
Approach		432	0.0	0.388	38.5	LOS C	5.6	39.3	0.69	0.77	0.69	18.2
All Vehicles		2253	0.0	0.623	36.4	LOS C	14.4	100.5	0.84	0.76	0.85	16.3

**Table B4: Weekday Intersection Performance of Worth Street with Union Lane PM Peak Hour with mixed use traffic**

<b>Movement Performance - Vehicles</b>												
Mov ID	Turn	Demand Total	Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back Vehicles	of Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	v/c	sec		veh	m				km/h
<b>South: Worth Street</b>												
1	L2	24	0.0	0.154	3.4	LOS A	0.0	0.0	0.00	0.04	0.00	40.0
2	T1	574	0.0	0.154	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	39.6
Approach		598	0.0	0.154	0.1	NA	0.0	0.0	0.00	0.02	0.00	39.7
<b>East: Union Lane</b>												
4	L2	54	0.0	0.052	6.3	LOS A	0.2	1.3	0.30	0.58	0.30	44.9
5	T1	1	0.0	0.052	18.5	LOS B	0.2	1.3	0.30	0.58	0.30	52.4
6	R2	82	0.0	0.407	28.4	LOS B	1.6	11.5	0.87	1.01	1.13	28.3
Approach		137	0.0	0.407	19.7	LOS B	1.6	11.5	0.64	0.84	0.80	33.3
<b>North: Worth Street</b>												
8	T1	362	0.0	0.103	0.3	LOS A	0.2	1.6	0.06	0.02	0.06	38.5
9	R2	16	0.0	0.103	6.8	LOS A	0.2	1.6	0.14	0.05	0.14	39.1
Approach		378	0.0	0.103	0.5	NA	0.2	1.6	0.07	0.02	0.07	38.6
<b>West: Union Lane</b>												
10	L2	29	0.0	0.270	5.8	LOS A	1.0	7.1	0.68	0.81	0.77	30.4
12	R2	45	0.0	0.270	24.6	LOS B	1.0	7.1	0.68	0.81	0.77	30.1
Approach		75	0.0	0.270	17.2	LOS B	1.0	7.1	0.68	0.81	0.77	30.2
All Vehicles		1187	0.0	0.407	3.6	NA	1.6	11.5	0.14	0.16	0.16	36.0