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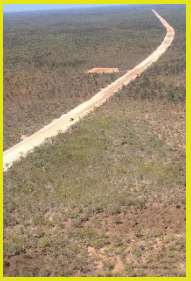


Palmerston City Centre Master Plan

Traffic Report - Final

Client: City of Palmerston, Northern Territory
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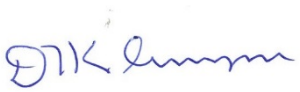
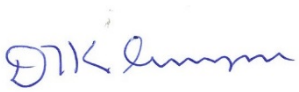
Prepared by:	Dale Kleimeyer
Position:	Senior Traffic Engineer
Signed:	
Date:	10 November 2014

Approved by:	Dale Kleimeyer
Position:	Senior Traffic Engineer
Signed:	
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Coote Burchills Engineering Pty Ltd ACN: 166 942 365

Level 8, Australia Fair Tower 42 Marine Parade SOUTHPORT QLD 4215
PO Box 3766, Australia Fair SOUTHPORT QLD 4215
Telephone: +61 7 5509 6400 Facsimile: +61 7 5509 6411 Email: admin@burchills.com.au

Internet: www.burchills.com.au

Executive Summary

Burchills has been commissioned by the City of Palmerston to prepare a Traffic Assessment Report for the City Centre Master Plan, in Palmerston, Northern Territory. The City Centre master plan encompasses an area bounded by Roystonea Avenue to the north, Temple Terrace to the east, Chung Wah Terrace to the south and the extension of Chung Wah Terrace across to Roystonea Avenue at the Intersection with Yarrawonga Road. Temple Terrace and Chung Wah Terrace carry high traffic demands. Roystonea Avenue is scheduled to become an urban arterial road and is also expected to carry very high traffic demands in future years. University Avenue is to be downgraded in terms of vehicle carrying capacity as part of the City Centre development, becoming one lane in either direction from the current crossection of two lanes in each direction.

The surrounding land use to the south and east is predominately residential. The Palmerston Bus Interchange is located inside the proposed Masterplan area on the western side of Temple Terrace opposite to the Hub on the corner of Temple Terrace and Roystonea Avenue. A new development called the Gateway is also proposed in Yarrawonga Road. The Palmerston Health Precinct is located north of Roystonea Avenue and is currently accessed via Roystonea Avenue, Temple Terrace and Farrar Boulevard. The Palmerston campus of the Charles Darwin University is located north-west of the City Centre in the suburb of Durack. Darwin is approximately 22 km to the north-east and is connected to Palmerston via the Stuart Highway and Roystonea Avenue.

Traffic count data was collected from a number of sources including historical traffic counts and recent extracts from the existing traffic signals operating in the surrounding streets. From an analysis of the surrounding road catchments and future land development proposals future growth predictions were derived for the individual roads associated with the study. The urban designers provided a detailed breakup of the floor space and land use proposed as part of the city centre Masterplan. In addition, the information provided contained advice regarding the number of car spaces to be provided as part of a new car parking strategy to be implemented with the City centre master Plan. The car parking rate being similar to CBD area in Australian Cities. The progressive implementation of further public transport is also recommended for the successful implementation of the car parking strategy.

Trip generation rates were subsequently developed for the land use and assigned to the surrounding road network.

As part of the study a time horizon of 30 years has been included as the horizon for the completion of the City Centre. The assessment includes results for years 2016, 2026 and 2046. Upgraded requirements for intersections and network roads within and surrounding the City Centre have been detailed in the report. The results show that additional capacity upgrades are required to the key intersection analysed and additional lane requirements to some of the roads. Estimating traffic demands over 32 years in the future has involved assumptions relating to population growth, travel trends, transport network development both public and private. All improvements recommended for the 2046 horizon year are for planning purposes only and should be verified by further detailed traffic monitoring prior to implementation.

In addition to the number of lanes recommended for the roads included in the study, provision for bicycle lanes is also recommended. Further a comprehensive pedestrian path network for the City Centre is also recommended.

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1. Introduction

The City Centre Master Plan for the City of Palmerston in the context of the greater Darwin transport of the existing and planned regional road network, public transport and bikeways.

1.1 Background

Following consultation workshops between Elton Consulting, Roberts Day and the City of Palmerston, a preferred master plan has been developed. A high level traffic assessment to consider the impacts, implications and solutions from a traffic perspective in order to support, or amend the preferred master plan was therefore required. To assist this process, liaison with the NT Transport Network Planning Division has also been undertaken.

Burchills (formerly VDM) have previously prepared a Traffic Impact Assessment (TIA) report for the Northern Territory Land Development Corporation for a site located south-east of the existing Palmerston CBD area between Maluka Drive and Roystonea Avenue. The results of this study plus a previous report also by another traffic consultant undertaken with the initial Master Plan will provide useful supporting information for this Traffic Assessment.

1.2 Scope

The assessment has been prepared to the following scope:

- Identify existing key traffic generating activity nodes including public parking stations;
- Existing road hierarchy – profile and theoretical mid-block capacities;
- Connectivity of the road network and interaction with public transport and other modes of transport;
- Existing traffic survey data – including any deficiencies where additional surveys are required;
- Existing intersections – type and function;
- Indicative travel demands associated with development of the City Centre Master Plan; and
- Assessment of the traffic generated from the implementation of the City Centre Master Plan and implications on existing and proposed roads and intersections.

1.3 Limitations

This report is limited by the following information:

- Palmerston City Master Plan Progress Report
- VDM Report
- i3 Report
- Traffic data from NT Transport
- Traffic data from CoP
- NT Government web site
- Burchills Scoping Study
- Gateway Shopping Centre TIA

This report includes traffic survey counts, background traffic projection, City Centre development trip generation and assumptions.

2. Existing Conditions

The subject site is the City Centre of Palmerston City at Roystonea Avenue, Palmerston. It is bordered to the south east by Temple Terrace, to the south west by Chung Wah Terrace and to the north by Chung Wah Terrace Extension. The site location is presented in Figure 2.1.

Figure 2-1 Study Area (Google Maps)

2.1 Surrounding Land Use

The surrounding land use to the south is predominately residential. This subject site contains the existing City Centre of Palmerston and surrounds plus a new extension of Chung Wah Terrace to link with Roystonea Ave. To the north of the subject site is a service commercial / industrial estate that is bordered by the Stuart Highway. The Palmerston campus of the Charles Darwin University is located west of the site in the suburb of Durack. Darwin City is approximately 22 km to the north-west of the subject site and is connected to Palmerston via the Stuart Highway and Roystonea Avenue.

The Palmerston Bus Interchange is located within the site on the corner of The Boulevard and Roystonea Avenue. The Palmerston Health Precinct is located north-east of Roystonea Avenue and is currently accessed via Roystonea Avenue, Temple Terrace and Farrar Boulevard. The Palmerston Shopping Centre is located in the City Centre, north-west of Temple Terrace and opposite the intersection with Maluka Drive.

The “Hub” development is located to the south-east of Temple Terrace which comprises fast food restaurants, retail land uses, cinemas and a community club. This existing “Hub” development is currently accessed via a left-in only access point on Temple Terrace. Traffic generated from the future proposed development of the Hub has been included as part of the study including an all movement access on Maluka Drive.

The proposed Gateway Shopping Centre Development is north of the subject site and is proposed to comprise retail land uses, cinemas and a hotel. The ‘Gateway” site is the triangular site bounded by Roystonea Avenue, Yarrawonga Road and the Stuart Highway.

2.2 Surrounding Road Network

The surrounding road network in the vicinity of the subject site includes the Temple Terrace, Chung Wah Terrace, Roystonea Avenue and University Avenue. The site in the context of the greater surrounding road network is presented in Figure 2.2.

Figure 2-2 Surrounding Road Networks (Google maps)

2.2.1 Temple Terrace

Temple Terrace is four (4) lane dual carriageway south and along the south west boundary of subject site and is a State-controlled Urban Arterial road. North of Roystonea Avenue, the number of lanes decreases to two, (1) lane in each direction. It provides a link between the Stuart Highway and Palmerston City. The intersection of Temple Terrace with Chung Wah Terrace is a roundabout, the Temple Terrace / Roystonea Avenue intersection and the Temple Terrace / Maluka Drive intersection are signal controlled. The existing Annual Average Daily Traffic (AADT) of Temple Terrace is approximately 10,700 vehicles per day (vpd).

2.2.2 Chung Wah Terrace

Chung Wah Terrace is a four (4) lane dual carriageway road. It is a State-controlled road classified as Urban Arterial in accordance with the Department of Lands and Planning. Chung Wah Terrace acts as a spine road linking residential precincts within Palmerston City. The current AADT of Chung Wah Terrace is approximately 17,400 vpd.

2.2.3 Roystonea Avenue

Roystonea Avenue is currently two (2) lane inbound from Darwin City and three (3) lanes outbound travelling towards Darwin City. Within the next 10 years, Roystonea Avenue is expected to be upgraded to an ultimate design of six (6) lanes. Roystonea Avenue is a State-controlled Urban Arterial road with a connection to the Stuart Highway north-west of the subject site. To the south, Roystonea Avenue intersects with Lambrick Avenue, which connects to the Stuart Highway. Ultimately, Roystonea Avenue is expected to continue through to Elrundie Avenue, the planned Weddell Arterial and the planned North-South Arterial. The existing AADT of Roystonea Avenue east of Temple Terrace is approximately 5,800 vpd. The existing AADT of Roystonea Avenue west of Temple Terrace is approximately 22,000 vpd.

2.2.4 University Avenue

University Avenue is a four (4) lane dual carriageway road within the subject site and is a State-controlled collector road. The intersection of University Avenue / Roystonea Avenue is signal controlled, and the intersection of University Avenue / Chung Wah Terrace is also signal controlled. The existing AADT of University Avenue is approximately 12,700 vpd.

2.3 Public Transport

The Palmerston Bus Interchange is located within the subject site, situated on the corner of The Boulevard and Roystonea Avenue, Palmerston. A number of services both within Palmerston and to Darwin (Route 8) operate from this interchange. The interchange provides a park and ride facility, cyclist enclosure, school bus drop off area and platform, and a separate public bus platform.

Bus routes 70, 71, 72, 73, 74 and 76 service Palmerston and its surrounding suburbs including Driver, Moulden, Woodroffe, Gray, Gunn, Durack, the Charles Darwin University, the Palmerston Health Precinct and the Indigenous Village. The majority of these routes operate Monday to Sunday and include public holidays. Of these services, Routes 72 and 73 also include a bus stop on Maluka Drive directly opposite the Hub.

Bus routes 440, 445, 446, 447 and 450 service rural locations including Humpty Doo, Coolalinga and Bees Creek with a stop at the Palmerston Interchange. Express bus routes OL1 and OL2 and the non-express bus route 9 both travel to / from Casuarina via the Palmerston Interchange. Both Routes 8 and 28 travel between Palmerston Interchange and Darwin. The School Service Platform services a number of schools in the surrounding area.

A map of the facilities provided at the Palmerston Bus Interchange is shown in Figure 2.3.

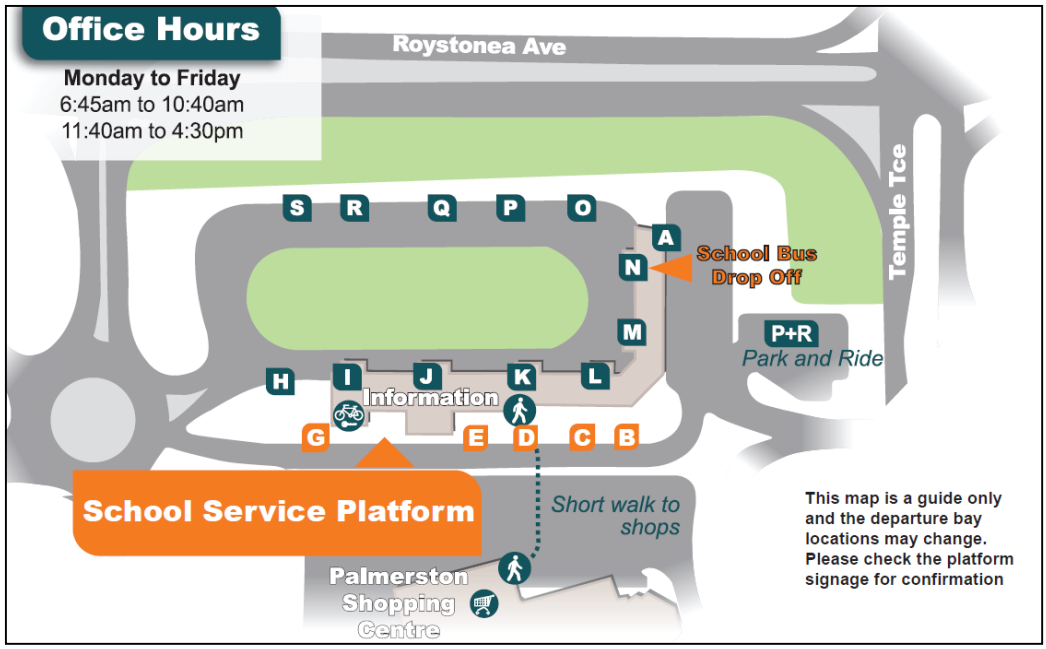


Figure 2-3 Palmerston Bus Interchange

2.4 Existing Pedestrian Facilities

There are a number of existing pedestrian facilities surrounding the subject site. These are presented in Figure 2.4.

Figure 2-4 Pedestrian Pathway Layout

As shown, the existing pedestrian facilities link land mark developments within the subject site including the nearby Hub, the Oasis Shopping Centre, the Palmerston Bus Interchange, Water Park, Palmerston shopping centre, Oasis shopping centre, Bunnings and City of Palmerston Council Chambers. An existing stand-alone signalized pedestrian crossing exists across Temple Terrace south of the Maluka Drive intersection. Both the Temple Terrace / Roystonea Avenue and the Temple Terrace / Maluka Drive intersections are signalized with pedestrian crossings provided.

This allows safe access to the Palmerston Shopping Centre and the Palmerston Bus Interchange.

3. Traffic Data

3.1 Review Existing Traffic Count Data Summary

Figure 3.1 shows the traffic survey locations and 2012 traffic Volumes on surrounding road network.

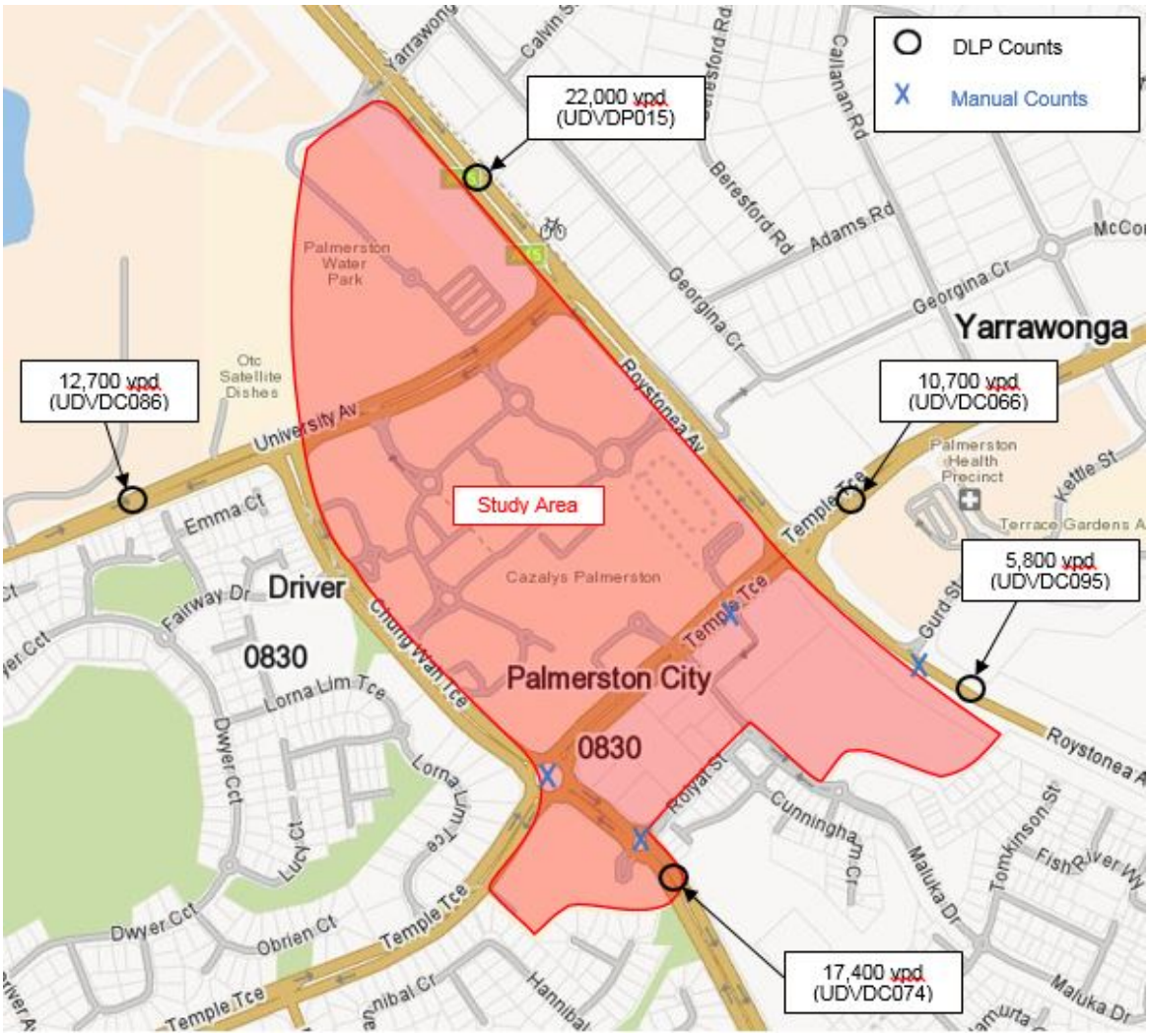


Figure 3-1 Traffic Survey Locations and 2012 Daily Traffic Volumes on Surrounding Road Network (NT Department of Lands (DLP) Annual traffic report)

The following is the set of count data available for each intersection to be assessed:

- Chung Wah Terrace / The Boulevard:
  - 2003 Through traffic counts on Chung Wah Terrace between Woolnaugh and Temple Terrace; and
  - 2011 Intersection Count.
- Roystonea Avenue / The Boulevard:
  - 2011 Intersection Count.
- Roystonea Avenue / University Avenue:
  - 2011 Intersection Count; and
  - 2014 SCATS Detector Data at Intersection.

- Roystonea Avenue / Yarrawonga Rd:
  - 2005 Yarrawonga Road through counts between Georgina and Toupein; and
  - 2011 Intersection Count;
  - 2014 SCATS Detector Data at Intersection.
- Temple Terrace / Maluka Drive:
  - 2011 Intersection Count; and
  - 2014 SCATS Detector Data at Intersection.
- Temple Terrace / Roystonea Avenue:
  - 2011 Intersection Count; and
  - 2014 SCATS Detector Data at intersection.
- Temple Terrace / Chung Wah Terrace:
  - 2012 Intersection Count.
- University Avenue / Chung Wah Terrace:
  - 2011 Intersection Count.
  - 2014 SCATS Detector Data at Intersection.
- University Avenue / Frances Drive:
  - 2011 Intersection Count.

The remaining intersections (listed below) do not have any traffic data available:

- Chung Wah Terrace Extension / Packard Avenue;
- Chung Wah Terrace / Police Station; and
- University Avenue / Bunnings Access.

3.2 Background Traffic Historical Growth Summary

The background traffic growth from the traffic count surveys derived from the DLP and manual traffic counts surveys from VDM as part of the Hub traffic study is summarized as follows:

- Chung Wah Terrace:
  - West of Temple Terrace = 0.66% per annum (compound growth) – 2003 to 2011;
- Roystonea Avenue:
  - West of Yarrawonga Rd= 1.95% p.a. – 2011 to 2014;
  - East of Yarrawonga Rd= 3.53% p.a. – 2011 to 2014;
  - West of University Avenue = 9.03% p.a. – 2011 to 2014;
  - East of University Avenue = 7.82% p.a. – 2011 to 2014;
  - West of Temple Terrace = 1.29% p.a. – 2011 to 2014;
  - East of Temple Terrace = 4.16% p.a. – 2011 to 2014.
- University Avenue:
  - South of Roystonea Avenue = 9.89% p.a. – 2011 to 2014.
- Yarrawonga Road:
  - North of Roystonea Avenue = 3.01% p.a. – 2005 to 2014.
- Temple Terrace:
  - North of Roystonea Avenue = 4.34% p.a. – 2011 to 2014;
  - South of Roystonea Avenue = -10.43% p.a. – 2011 to 2014;
  - North of Maluka Drive = -7.53% p.a. – 2011 to 2014; and
  - South of Maluka Drive = -10.43% p.a. – 2011 to 2014.

- Maluka Drive:
    - East of Temple Terrace = 5.47% p.a. – 2011 to 2014.

Note: With the traffic counts, there is overlapping counts for the historic data. East of Yarrawonga Rd and West of University Avenue are the same road link however have different historic growth because the West and East of Yarrawonga Rd data was taken from the Roystonea Ave/Yarrawonga Rd intersection and the West and East of University Avenue data was taken from the Roystonea/University Avenue intersection. Discrepancies between the historic growth between the two intersections is most likely due to the fact that the data was taken from two different intersections and also because the SCATS data (2014 data) only showed the number of vehicles in each lane from the detectors. If it was a shared through/left lane the turning split based on extrapolation of the historic data.

3.3 Residential Suburban Catchments and Projected Growth

In order to quantify the future traffic growth per road, an assessment of the catchments of the surrounding road network was performed. The existing and future catchments are presented in Figure 3.2.

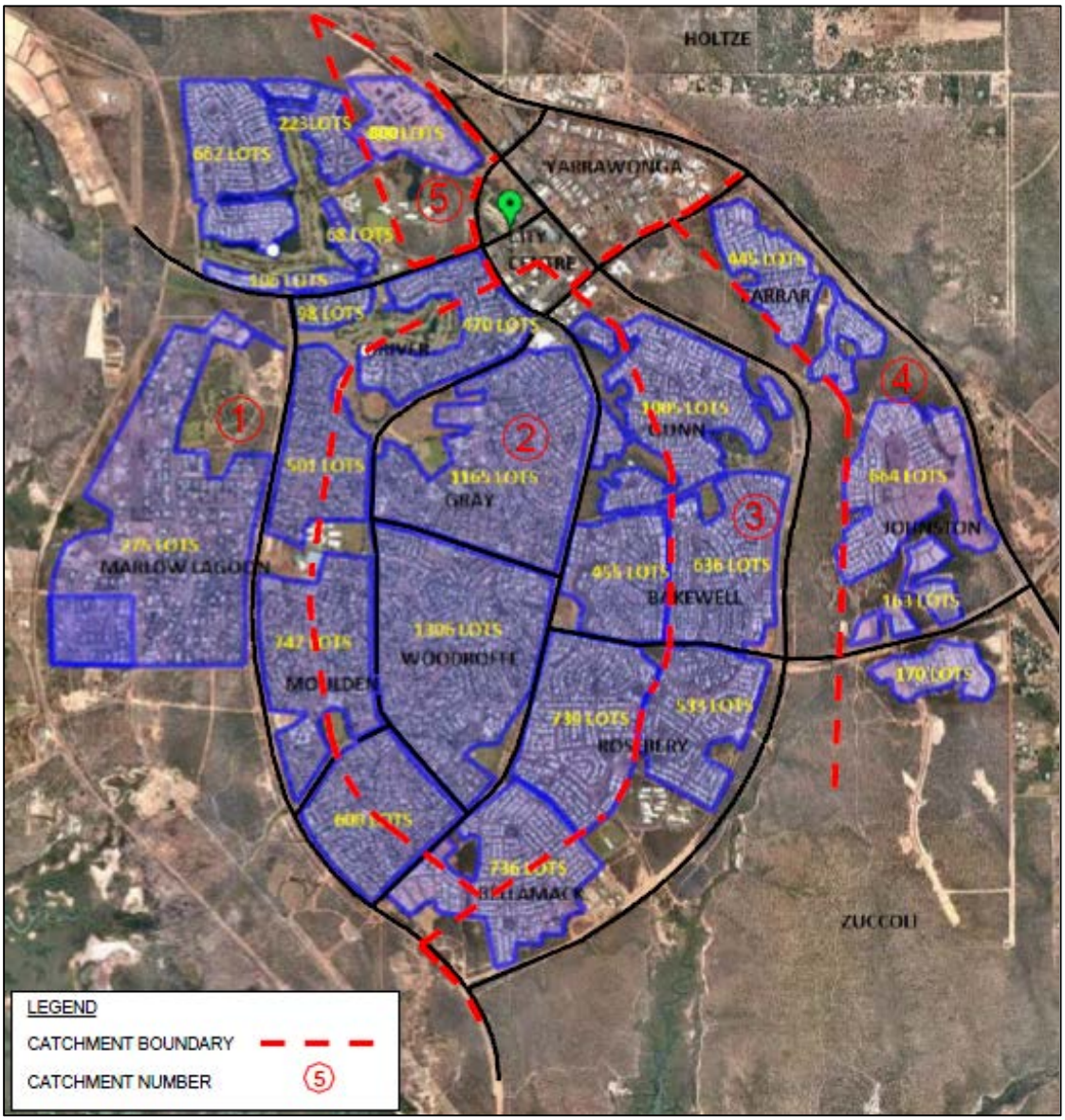


Figure 3-2 Suburban Residential Catchment Plan

The background allotments in Figure 3.2 were taken from Nearmap image and the outline drawn on the various allotment clusters in each suburb. Densities of the allotments were measured from the Northern Territory Government, Department of Planning and Infrastructure Land Tenure Plan, Palmerston Municipality. The densities were then applied to the area of each allotment cluster to determine the allotment numbers. For The Heights subdivision currently under construction, 800 allotments were allowed for the year 2046 with an estimated 40 houses lots presently under construction. For Zuccoli 2,000 completed houses were allowed up until 2046 and 3,000 lots allowed for Holtze by the year 2046.

Existing Catchments - Total number of lots in Palmerston = 11,697 lots; and

Future Catchments – Total number of lots in Palmerston = 17,457 lots.

The number of allotments determined by an area basis times the density of residential lots. A summary of the total number of residential lots contributing to each road surrounding the City Centre for the purposes of this assessment is presented below as the number of allotments for each of the roads as follows:

University Avenue is expected to incur a minimal increase in growth as there is limited potential for future residential development in this catchment.

Catchment 2 accessed via Chung Wah Terrace and Temple Terrace (South):

- 2016 Total = 5,438 lots (46%); and
- 2046 Total = 5,438 lots (31%).

Minimal growth is expected on both Chung Wah Terrace and Temple Terrace (South). There is limited potential for future increase in contributing allotments.

Catchment 3 accessed via Roystonea Avenue:

- 2016 Total = 2,291 lots (20%); and
- 2046 Total = 3,291 lots (19%).

Roystonea Avenue is expected to be continue as a City by-pass. An increase beyond normal growth is expected due to the development of the approved Zuccoli development south-east of Palmerston.

Catchment 4 accessed via Stuart Highway:

- 2016 Total = 1,442 lots (12%); and
- 2046 Total = 5,442 lots (31%).

Catchment 4 includes the addition of the Holtz development. This development is expected to result in an increase of traffic growth on Yarrawonga Road and Temple Terrace (North).

Catchment 5 accessed via Packard Avenue:

- 2016 Total = 40 lots (1%); and
- 2046 Total = 800 lots (5%).

The Packard Avenue catchment is still developing and currently only provides approximately 40 lots. The limit of this catchment is 800 lots.

Based on the future catchments and historic growth, the adopted traffic growth rates from 2014 onwards along each of the assessed roads are as follows:

- Packard Avenue:
  - 8% p.a. to 2026
  - 1% p.a. to 2046
- Yarrawonga Road:

    - 3% p.a. to 2046
- Maluka Drive:
    - 5% p.a. to 2016
    - 1% p.a. to 2046
- University Avenue:
    - 1% p.a. to 2046;
- Chung Wah Terrace:
    - 1% p.a. to 2046;
- Temple Terrace (North):
    - 4% p.a. to 2046;
- Temple Terrace (South):
    - 1% p.a. to 2046
- Roystonea Avenue:
    - 5% p.a. to 2016
    - 2% p.a. to 2046

With the introduction of the Chung Wah Extension, it is expected that traffic volumes on University Avenue and Roystonea Avenue between Chung Wah Terrace and Yarrawonga Road will reduce significantly. A reduction of 75% of existing University Avenue trips (Between Roystonea Avenue and Chung Wah Terrace) has been applied at 2026.

Inner city traffic volumes on Frances Drive and The Boulevard are not expected to increase up to 2016. As the proposed master plan development includes refurbishing of existing buildings within the city centre, a reduction to background trips between 2016 and 2046 of 5% p.a. has been applied to Frances Drive and The Boulevard. The background trips result from the use of the existing buildings which is progressively replaced by the land use and corresponding trip generation resulting from the Master Plan development.

Background traffic volumes at the 2016, 2026 and 2046 design years are attached in Appendix A including a summary sheet.

4. Proposed City Centre Master Plan

4.1 Development Master Plan

The proposed plan is based on creating a vibrant city centre that promotes a variety of amenities such as commercial / retail businesses mixed with short stay apartments and a residential component with a range of densities. An area that transforms the existing street system that creating and promotes a balance between pedestrians and vehicular traffic. A Master Plan layout as prepared by Roberts Day is presented in Figure 4.1.

Figure 4-1 Palmerston City Centre Master Plan

The adopted yields of the proposed land uses are summarized in Table 4.1. These provide a reasonable basis to estimate trips generated by the proposed development.

Table 4.1 Land Use Summary

GFA - Residential	Parking floors m²	Retail m²	Commercial m²	Residential m²	Total m²
BLOCK 1	3808.8	2792.2 (11.3%)	5584.4 (22.7%)	16256.7 (65.9%)	24,633.3
BLOCK 2	4519.2	2643.6 (10.3%)	5070.4 (19.8%)	17848.6 (69.8%)	25,562.6
BLOCK 3	0	3168 (16.8%)	6336 (33.6%)	9360.94 (49.6%)	18,864.9
BLOCK 4	3489.9	2,220 (17.2%)	4038.2 (31.4%)	6610.8 (51.4%)	12,869.1
BLOCK 5	7799.7	5707.7 (17.0%)	10687.3 (31.9%)	17084.0 (51.0%)	33,479.1
BLOCK 6	10736.7	3926.9 (11.2%)	7349.2 (20.9%)	23790.4 (67.8%)	35,066.5
BLOCK 7	0	1173.4 (33.3%)	2346.8 (66.7%)	0.00%	3520.2

BLOCK 8	1663.2	1424.4 (12.5%)	2848.8 (25.0%)	7122 (62.5%)	11,395.2
BLOCK 9	1296	1591.4 (6.1%)	3182.8 (12.1%)	21459.4 (81.8%)	26233.6
BLOCK 10	1296	1047.5 (14.9%)	1495 (21.31%)	4473.1 (63.7%)	7015.6
BLOCK 11	1815.3	1235.1 (13.1%)	2470.2 (26.2%)	5725.5 (60.7%)	9430.8
BLOCK 12	1852.2	1810 (9.2%)	3267.4 (16.7%)	14517.8 (74.1%)	19595.2
BLOCK 13	0	3316.2 (6.1%)	6632.4 (12.3%)	43905.4 (81.5%)	53854
BLOCK 14	0	2985.9 (9.1%)	5210 (15.8%)	24815.3 (75.2%)	33011.2
BLOCK 15	1638.9	1483.2 (10.4%)	2273.6 (15.9%)	10469.6 (73.6%)	14226.4
BLOCK 16	782.1	1000.1 (6.1%)	1540.2 (9.4%)	13861.8 (84.5%)	16402.1
BLOCK 17	2253.3	2251.7 (6.4%)	3647.3 (10.9%)	27’558.1 (82.4%)	33457.1
BLOCK 18	1952.1	2325.7 (7.1%)	4337 (13.2%)	26176 (79.7%)	32838.7
BLOCK 19	2107.8	1014.6 (17.2%)	1681.6 (28.5%)	3208.5 (54.3%)	5904.7
BLOCK 20	5298.3	2515.4 (7.6%)	5030.8 (15.2%)	25517.8 (77.2%)	33064
BLOCK 21	4267.2	2153.2 (7.6%)	3794.6 (13.4%)	22423.5 (79.0%)	28371.3
BLOCK 22	1681.5	3641.4 (9.6%)	6329.9 (16.7%)	28042.3 (73.8%)	38013.6
BLOCK 23	0	1743.7 (8.6%)	3487.4 (17.2%)	15054.8 (74.2%)	20285.9
BLOCK 24	14793.3	4781.4 (15.33%)	9562.8 (30.66%)	16847.9 (54.0%)	31192.1
BLOCK 25	2729.4	6818.0 (14.9%)	13281.9 (28.9%)	25740.2 (56.2%)	45840.1
BLOCK 26	5641.5	2737.7 (16.9%)	5475.4 (33.9%)	7915.7 (49.1%)	16128.8
BLOCK 27	7146.3	2982.6 (13.7%)	5965.2 (27.3%)	12884.7 (59.0%)	21832.5
BLOCK 28	7805.7	2212.9 (8.3%)	4425.8 (16.7%)	19903.5 (74.9%)	26542.2
BLOCK 29	7129.5	1998.7 (20.2%)	3997.4 (40.3%)	3914.7 (39.5%)	9910.8
BLOCK 30	3967.2	1718.7 (19.1%)	3437.4 (38.2%)	3855.1 (42.8%)	9011.2
BLOCK 31	696.3	1002.1 (7.3%)	2004.2 (14.6%)	10697.3 (78.1%)	13703.6
BLOCK 32	1830.8	2287.6 (25.8%)	4575.2 (51.5%)	2013.8 (22.7%)	8876.6
BLOCK 33	0	828.5 (8.5%)	1248.5 (12.8%)	7680 (78.7%)	9757
BLOCK 34	2883	999.3 (10.9%)	1998.6 (21.9%)	6103.7 (67.1%)	9101.6
BLOCK 35	1147.4	1656.4 (10.6%)	3312.8 (21.3%)	10613.0 (68.1%)	15582.2
BLOCK 36	0	794.7 (11.4%)	1214.7 (17.4%)	4980 (71.2%)	6989.4
BLOCK 37	404.1	1337.5 (13.0%)	2300.3 (22.4%)	6625.4 (64.6%)	10263.2
BLOCK 38	967.4	1764.4 (27.2%)	3264.4 (50.4%)	1448.2 (22.4%)	6477
BLOCK 39	688.2	938 (27.2%)	1578.4 (50.4%)	1361.4 (22. %)	3877.8
TOTAL	116,088	76,081 (11.23%)	144,135 (21.28%)	457,039 (67.48%)	677,255

Appendix B contains the expanded version of the floor plan areas as supplied by Roberts Day. The total area of 116,088 m² of parking is proposed which is supplemented by additional stand-alone parking stations and on-street parking. The total projected floor space area excluding the car spaces is 677,255.6 m².

Access to the subject site from the existing road network is provided at nine (9) locations:

- University Avenue – at Koullias Lane and Frances Drive;
- Chung Wah Terrace – at Fiveash Lane, opposite Fairway Drive, The Boulevard and Woolnough Place;
- Temple Terrace – entrance into Palmerston Shopping Centre (opposite Maluka Drive); Road 31 (Bus Interchange Access); and
- Roystonea Avenue – at The Boulevard with a new intersection proposed to the south east between The Boulevard and Temple Terrace.

Figure 4.2 Palmerston City Centre Access Points

5. Traffic Generation Model for City Centre

5.1 Development Master Plan

The future development footprint has been divided into 6 precincts P1 to P6 for ease of management of the future traffic demand scenario as agreed by the stakeholders. The agreed traffic generation per future development square metre in each precinct is presented in Table 5.1 below. Note that P2 is the existing development whose traffic generation is included in the baseline traffic census. The traffic model and analysis for this report is based on P1 to P6 generation presented in tables 5.2, 5.3 and 5.4 below. In late November 2014 the stakeholders considered a slightly revised study area, that we have labelled P7 on Figure 5.1. This precinct includes two (2) major developments, namely, The Hub and existing Oasis Shopping centre. It also includes a portion which may be subject to future redevelopment generally with a density similar to that utilised in the study for P1 to P6. The traffic generated by the two (2) major developments is included in the baseline traffic data. The future redevelopment in P7 could add between 10% and 15% additional traffic demand in the model scenario presented in this report within the planning horizon established.

In the event that this additional demand materialises then the triggers for upgrading transport infrastructure foreshadowed in this report may need to be "brought forward".

Figure 5-1 Trip Generation Precinct Plan Boundaries

The floor space and land use for each precinct is shown in Table 5.1.

Table 5.1 Precinct Land Use Summary

Precinct	Retail m²	Commercial m²	Residential m²	No. of Dwellings
P1	8812	16280	29742	397
P2				
P3	13255	25849	80640	1075
P4	17456	33605	102271	1364
P5	16076	30062	97014	1294
P6	20482	38339	147373	1965
TOTAL	76,081	144,135	457,039	6,095

Number of dwellings is based on an average floor of 75 m² per unit.

5.2 Traffic Generation

The following rates have been adopted for the proposed land uses of the City Centre Master Plan. These are published rates sourced from the Roads and Traffic Authority (RTA) *Guide to Traffic Generating Developments (2002).* It is assumed that development will grow linearly over the 30 year period between 2016 and 2046.

Retail: Up to the year 2026.

For the retail portion of the master planned development, the trip rate adopted is for 10,000 m^2 GLFA to 20,000 m2 GLFA (where GLFA = 75% GFA). Due to the size of the city centre area, it is considered reasonable to assume that trip rates are based on the accumulative retail areas for at least two precincts combined. As only a portion of the land use has been developed up to the year 2026, the Palmerston City car parking strategy is only partly implemented and a higher proportion of on street parking and overflow parking from existing at grade parking lots is available for retail use.

Peak Hour = 7.6 vph per 100m^2 GLFA; and

- Daily = 78 vpd per 100m^2 GLFA.

A pass-by rate of 10% has been applied to account for vehicles dropping into retail land uses on their usual trip pass the city centre.

Retail: From 2026 up to the year 2046.

Based on the assumption that full development will arbitrarily occur up to the 30 year design horizon year of 2046, the area of retail development increases to the ultimate planned floor space 76,081m². The size of the City Centre from Chung Wah Terrace to Roystonea Terrace is approximately 550 metres square in each direction including from Temple Terrace to University Avenue. Centralized parking stations are proposed and in terms of other parking, the Palmerston City parking strategy identifies the opportunity for approximately 800 plus on street spaces and 4 parking garages (built subject to market demand). In terms of a trip generation rate for the complete development of the City Centre, the model factors increased containment over time e.g. living and working in the City Centre and a modal shift to public transport. By 2046 use of public transport is expected to increase

in line with the car parking strategy and the increased area of retail available attracts less car trips per retail floor space area.

- Peak Hour = 4.6 vph per 100m^2 GLFA; and
- Daily = 47 vpd per 100m^2 GLFA.

A pass-by rate of 10% has been applied to account for vehicles dropping into retail land uses on their usual trip pass the city centre.

Commercial Up to year 2026.

- Peak Hour = 2 vph per 100m^2 GFA; and
- Daily = 10 vpd per 100m^2 GFA.

A cross-utilisation rate of 20% has been applied to retail / commercial trips to account for persons visiting more than one land use on their trip into the precinct.

Commercial From 2026 up to year 2046.

As per the retail, the car trip generation rate for commercial use reduces with increased public transport use and higher car occupancy rates. The rate of 2 per 100 m² as used up to 2026, is based on a private car use of 52% or private mode use of 62%. Rates adopted for 2026 are:

- Peak Hour = 1.6vph per 100m^2 GFA; and
- Daily = 8 vpd per 100m^2 GFA.

A cross-utilization rate of 20% has been applied to retail / commercial trips to account for persons visiting more than one land use on their trip into the precinct.

Residential Up to year 2026.

For the purposes of this assessment, the rate adopted for the residential land uses, is for small medium density units and flats (up to two bedrooms). This is due to the higher density of the residential component of the City Centre, and the smaller range of unit floor spaces. As only a portion of the land use has been developed up to the year 2026, the car parking strategy is only partly implemented and a higher proportion of on street parking and overflow parking from existing at grade parking lots is available for residential use.

- Peak Hour = 0.4 vph per dwelling; and
- Daily = 4 vpd per dwelling.

Residential From 2026 up to year 2026

As the City Centre develops, the car parking strategy is progressively implemented. The implications being:

- Controlling parking within local precincts by the Local Authority;
- Reflecting the capacity of the road system to cater for additional traffic;
- The availability of public transport; and
- Ensuring the full use of existing off-street parking areas.

With the City Centre developed, the residential use from a traffic perspective is considered high density which based on the *RTA Guide to Traffic Generating Developments* refers to a building containing 20 or more dwellings more than five levels, have basement level car parking and are located in close proximity to public transport services. The building may contain a component of commercial use. Trip generation rates adopted as follows:

- Peak Hour = 0.3 vph per dwelling; and
- Daily = 3 vpd per dwelling.

A summary of the trips generated in each precinct at each of the assessed design years is presented in Table 5.2, Table 5.3, and Table 5.4.

The explanation of units used in the tables is as follows:

- Retail is GLFA in 100m² units GLFA is taken as 75% of GFA.
- Commercial area is the actual floor space per 100 m²
- Number of dwellings is the floor space converted to number of dwellings based on a floor space area of 75m² per unit.
- For the year 2046, the total area as per the land use table supplied from Roberts Day, has been adopted for the tables.
- For 2026 one third of the land use area has been used for the trip generation rate and for
- 2016 one tenth of the 2026 floor space areas have been use for the trip generation rate.

Overall the tables reflect a reduction in the rate of increase of total car / vehicle trips generated as the City Centre develops due to Palmerston City car parking strategy to be implemented and subsequent increased use and provision of public transport Services to be provided. For residents and visitors within the City Centre, walking and other active transport means are also necessary in order to reduce car usage as reflected in the trip rates adopted.

Table 5.2 City Centre Development Trip Generation Summary – 2016

Land Use	Unit	AM Peak Hour				PM Peak Hour				Daily			
		Rate	In (%)	Out (%)	Total	Rate	In (%)	Out (%)	Total	Rate	In (%)	Out (%)	Total
Precinct 1													
Retail	2	7.6	10 60%	7 40%	17	7.6	8 50%	8 50%	17	78	86 50%	86 50%	172
Commercial	5	2	9 80%	2 20%	11	2	3 30%	8 70%	11	10	27 50%	27 50%	54
Residential	13	0.4	1 20%	4 80%	5	0.4	4 70%	2 30%	5	4	26 50%	26 50%	53
Retail / Commercial Sub-Total			19	9	28		12	16	28		113	113	226
Cross-Visitation		*20%*	*4*	*2*	*6*		*2*	*3*	*6*		*23*	*23*	*45*
Pass-By Trips		*10%*	*1*	*1*	*3*		*1*	*1*	*3*		*11*	*11*	*23*
Reduced Retail / Commercial Sub-Total			14	6	19		8	11	19		79	79	158
Residential Sub-Total			1	4	5		4	2	5		26	26	53
Precinct 1 Sub-Total			**15**	**10**	**25**		**12**	**13**	**25**		**106**	**106**	**211**
Precinct 3													
Retail	3	7.6	15 60%	10 40%	25	7.6	13 50%	13 50%	25	78	129 50%	129 50%	258
Commercial	9	2	14 80%	3 20%	17	2	5 30%	12 70%	17	10	43 50%	43 50%	86
Residential	36	0.4	3 20%	11 80%	14	0.4	10 70%	4 30%	14	4	72 50%	72 50%	143
Retail / Commercial Sub-Total			29	14	42		18	25	42		172	172	345
Cross-Visitation		*20%*	*6*	*3*	*8*		*4*	*5*	*8*		*34*	*34*	*69*
Pass-By Trips		*10%*	*2*	*2*	*4*		*2*	*2*	*4*		*17*	*17*	*34*
Reduced Retail / Commercial Sub-Total			21	9	30		12	18	30		121	121	241
Residential Sub-Total			3	11	14		10	4	14		72	72	143
Precinct 3 Sub-Total			**24**	**20**	**44**		**22**	**22**	**44**		**192**	**192**	**385**
Precinct 4													
Retail	4	7.6	20 60%	13 40%	33	7.6	17 50%	17 50%	33	78	170 50%	170 50%	340
Commercial	11	2	18 80%	4 20%	22	2	7 30%	16 70%	22	10	56 50%	56 50%	112
Residential	45	0.4	4 20%	15 80%	18	0.4	13 70%	5 30%	18	4	91 50%	91 50%	182
Retail / Commercial Sub-Total			38	18	56		23	32	56		226	226	452
Cross-Visitation		*20%*	*8*	*4*	*11*		*5*	*6*	*11*		*45*	*45*	*90*
Pass-By Trips		*10%*	*3*	*3*	*6*		*3*	*3*	*6*		*23*	*23*	*45*
Reduced Retail / Commercial Sub-Total			27	11	39		16	23	39		158	158	317
Residential Sub-Total			4	15	18		13	5	18		91	91	182
Precinct 4 Sub-Total			**31**	**26**	**57**		**29**	**28**	**57**		**249**	**249**	**499**
Precinct 5													
Retail	4	7.6	18 60%	12 40%	31	7.6	15 50%	15 50%	31	78	157 50%	157 50%	313
Commercial	10	2	16 80%	4 20%	20	2	6 30%	14 70%	20	10	50 50%	50 50%	100
Residential	43	0.4	3 20%	14 80%	17	0.4	12 70%	5 30%	17	4	86 50%	86 50%	173
Retail / Commercial Sub-Total			34	16	51		21	29	51		207	207	414
Cross-Visitation		*20%*	*7*	*3*	*10*		*4*	*6*	*10*		*41*	*41*	*83*
Pass-By Trips		*10%*	*3*	*3*	*5*		*3*	*3*	*5*		*21*	*21*	*41*
Reduced Retail / Commercial Sub-Total			25	10	35		14	21	35		145	145	290
Residential Sub-Total			3	14	17		12	5	17		86	86	173
Precinct 4 Sub-Total			**28**	**24**	**53**		**27**	**26**	**53**		**231**	**231**	**462**
Precinct 6													
Retail	5	7.6	23 60%	16 40%	39	7.6	19 50%	19 50%	39	78	200 50%	200 50%	399
Commercial	13	2	20 80%	5 20%	26	2	8 30%	18 70%	26	10	64 50%	64 50%	128
Residential	66	0.4	5 20%	21 80%	26	0.4	18 70%	8 30%	26	4	131 50%	131 50%	262
Retail / Commercial Sub-Total			44	21	64		27	37	64		264	264	527
Cross-Visitation		*20%*	*9*	*4*	*13*		*5*	*7*	*13*		*53*	*53*	*105*
Pass-By Trips		*10%*	*3*	*3*	*6*		*3*	*3*	*6*		*26*	*26*	*53*
Reduced Retail / Commercial Sub-Total			32	13	45		18	27	45		185	185	369
Residential Sub-Total			5	21	26		18	8	26		131	131	262
Precinct 6 Sub-Total			**37**	**34**	**71**		**37**	**35**	**71**		**316**	**316**	**631**
Retail / Commercial Total			119	50	168		69	100	168		687	687	1375
Residential Total			16	65	81		57	24	81		406	406	813
Total Trips			135	115	250		126	124	250		1094	1094	2187

Table 5.3 City Centre Development Trip Generation Summary – 2026

Land Use	Unit	AM Peak Hour				PM Peak Hour				Daily			
		Rate	In (%)	Out (%)	Total	Rate	In (%)	Out (%)	Total	Rate	In (%)	Out (%)	Total
Precinct 1													
Retail	22	7.6	100 60%	67 40%	167	7.6	84 50%	84 50%	167	78	859 50%	859 50%	1718
Commercial	54	2	87 80%	22 20%	109	2	33 30%	76 70%	109	10	271 50%	271 50%	543
Residential	132	0.4	11 20%	42 80%	53	0.4	37 70%	16 30%	53	4	265 50%	265 50%	529
Retail / Commercial Sub-Total			187	89	276		116	160	276		1131	1131	2261
Cross-Visitation		*20%*	*37*	*18*	*55*		*23*	*32*	*55*		*226*	*226*	*452*
Pass-By Trips		*10%*	*14*	*14*	*28*		*14*	*14*	*28*		*113*	*113*	*226*
Reduced Retail / Commercial Sub-Total			136	57	193		79	114	193		791	791	1583
Residential Sub-Total			11	42	53		37	16	53		265	265	529
Precinct 1 Sub-Total			**147**	**99**	**246**		**116**	**130**	**246**		**1056**	**1056**	**2112**
Precinct 3													
Retail	33	7.6	151 60%	101 40%	252	7.6	126 50%	126 50%	252	78	1292 50%	1292 50%	2585
Commercial	86	2	138 80%	34 20%	172	2	52 30%	121 70%	172	10	431 50%	431 50%	862
Residential	358	0.4	29 20%	115 80%	143	0.4	100 70%	43 30%	143	4	717 50%	717 50%	1433
Retail / Commercial Sub-Total			289	135	424		178	247	424		1723	1723	3446
Cross-Visitation		*20%*	*58*	*27*	*85*		*36*	*49*	*85*		*345*	*345*	*689*
Pass-By Trips		*10%*	*21*	*21*	*42*		*21*	*21*	*42*		*172*	*172*	*345*
Reduced Retail / Commercial Sub-Total			210	87	297		121	176	297		1206	1206	2412
Residential Sub-Total			29	115	143		100	43	143		717	717	1433
Precinct 3 Sub-Total			**239**	**202**	**440**		**221**	**219**	**440**		**1923**	**1923**	**3846**
Precinct 4													
Retail	44	7.6	199 60%	133 40%	332	7.6	166 50%	166 50%	332	78	1702 50%	1702 50%	3404
Commercial	112	2	179 80%	45 20%	224	2	67 30%	157 70%	224	10	560 50%	560 50%	1120
Residential	455	0.4	36 20%	145 80%	182	0.4	127 70%	55 30%	182	4	909 50%	909 50%	1819
Retail / Commercial Sub-Total			378	177	556		233	323	556		2262	2262	4524
Cross-Visitation		*20%*	*76*	*35*	*111*		*47*	*65*	*111*		*452*	*452*	*905*
Pass-By Trips		*10%*	*28*	*28*	*56*		*28*	*28*	*56*		*226*	*226*	*452*
Reduced Retail / Commercial Sub-Total			275	114	389		159	230	389		1583	1583	3167
Residential Sub-Total			36	145	182		127	55	182		909	909	1819
Precinct 4 Sub-Total			**311**	**260**	**571**		**286**	**285**	**571**		**2493**	**2493**	**4986**
Precinct 5													
Retail	40	7.6	183 60%	122 40%	305	7.6	153 50%	153 50%	305	78	1567 50%	1567 50%	3135
Commercial	100	2	160 80%	40 20%	200	2	60 30%	140 70%	200	10	501 50%	501 50%	1002
Residential	431	0.4	35 20%	138 80%	173	0.4	121 70%	52 30%	173	4	863 50%	863 50%	1725
Retail / Commercial Sub-Total			344	162	506		213	293	506		2068	2068	4137
Cross-Visitation		*20%*	*69*	*32*	*101*		*43*	*59*	*101*		*414*	*414*	*827*
Pass-By Trips		*10%*	*25*	*25*	*51*		*25*	*25*	*51*		*207*	*207*	*414*
Reduced Retail / Commercial Sub-Total			250	105	354		145	209	354		1448	1448	2896
Residential Sub-Total			35	138	173		121	52	173		863	863	1725
Precinct 4 Sub-Total			**284**	**243**	**527**		**266**	**261**	**527**		**2311**	**2311**	**4621**
Precinct 6													
Retail	51	7.6	233 60%	156 40%	389	7.6	195 50%	195 50%	389	78	1997 50%	1997 50%	3994
Commercial	128	2	204 80%	51 20%	256	2	77 30%	179 70%	256	10	639 50%	639 50%	1278
Residential	655	0.4	52 20%	210 80%	262	0.4	183 70%	79 30%	262	4	1310 50%	1310 50%	2620
Retail / Commercial Sub-Total			438	207	645		271	373	645		2636	2636	5272
Cross-Visitation		*20%*	*88*	*41*	*129*		*54*	*75*	*129*		*527*	*527*	*1054*
Pass-By Trips		*10%*	*32*	*32*	*64*		*32*	*32*	*64*		*264*	*264*	*527*
Reduced Retail / Commercial Sub-Total			318	133	451		185	267	451		1845	1845	3690
Residential Sub-Total			52	210	262		183	79	262		1310	1310	2620
Precinct 6 Sub-Total			**371**	**343**	**713**		**368**	**345**	**713**		**3155**	**3155**	**6310**
Retail / Commercial Total			1189	496	1685		689	996	1685		6874	6874	13748
Residential Total			163	650	813		569	244	813		4063	4063	8127
Total Trips			1351	1146	2497		1257	1240	2497		10937	10937	21875

Table 5.4 City Centre Development Trip Generation Summary – 2046

Land Use	Unit	AM Peak Hour				PM Peak Hour				Daily			
		Rate	In (%)	Out (%)	Total	Rate	In (%)	Out (%)	Total	Rate	In (%)	Out (%)	Total
Precinct 1													
Retail	66	4.6	182 60%	122 40%	304	4.6	152 50%	152 50%	304	47	1553 50%	1553 50%	3106
Commercial	163	1.6	208 80%	52 20%	260	1.6	78 30%	182 70%	260	8	651 50%	651 50%	1302
Residential	397	0.3	23 20%	92 80%	115	0.3	81 70%	35 30%	115	3	596 50%	596 50%	1191
Retail / Commercial Sub-Total			391	174	565		230	334	565		2204	2204	4409
Cross-Visitation		*20%*	*78*	*35*	*113*		*46*	*67*	*113*		*441*	*441*	*882*
Pass-By Trips		*10%*	*28*	*28*	*56*		*28*	*28*	*56*		*220*	*220*	*441*
Reduced Retail / Commercial Sub-Total			284	111	395		156	239	395		1543	1543	3086
Residential Sub-Total			23	92	115		81	35	115		596	596	1191
Precinct 1 Sub-Total			**307**	**203**	**510**		**236**	**274**	**510**		**2139**	**2139**	**4277**
Precinct 3													
Retail	99	4.6	274 60%	183 40%	457	4.6	229 50%	229 50%	457	47	2336 50%	2336 50%	4672
Commercial	258	1.6	331 80%	83 20%	414	1.6	124 30%	290 70%	414	8	1034 50%	1034 50%	2068
Residential	1075	0.3	62 20%	249 80%	312	0.3	218 70%	94 30%	312	3	1613 50%	1613 50%	3225
Retail / Commercial Sub-Total			605	266	871		353	518	871		3370	3370	6740
Cross-Visitation		*20%*	*121*	*53*	*174*		*71*	*104*	*174*		*674*	*674*	*1348*
Pass-By Trips		*10%*	*44*	*44*	*87*		*44*	*44*	*87*		*337*	*337*	*674*
Reduced Retail / Commercial Sub-Total			441	169	610		239	371	610		2359	2359	4718
Residential Sub-Total			62	249	312		218	94	312		1613	1613	3225
Precinct 3 Sub-Total			**503**	**418**	**921**		**457**	**465**	**921**		**3972**	**3972**	**7943**
Precinct 4													
Retail	131	4.6	361 60%	241 40%	602	4.6	301 50%	301 50%	602	47	3077 50%	3077 50%	6153
Commercial	336	1.6	430 80%	108 20%	538	1.6	161 30%	376 70%	538	8	1344 50%	1344 50%	2688
Residential	1364	0.3	79 20%	316 80%	396	0.3	277 70%	119 30%	396	3	2046 50%	2046 50%	4092
Retail / Commercial Sub-Total			791	348	1140		462	677	1140		4421	4421	8842
Cross-Visitation		*20%*	*158*	*70*	*228*		*92*	*135*	*228*		*884*	*884*	*1768*
Pass-By Trips		*10%*	*57*	*57*	*114*		*57*	*57*	*114*		*442*	*442*	*884*
Reduced Retail / Commercial Sub-Total			576	222	798		313	485	798		3095	3095	6189
Residential Sub-Total			79	316	396		277	119	396		2046	2046	4092
Precinct 4 Sub-Total			**655**	**538**	**1194**		**590**	**604**	**1194**		**5141**	**5141**	**10281**
Precinct 5													
Retail	121	4.6	333 60%	222 40%	555	4.6	277 50%	277 50%	555	47	2833 50%	2833 50%	5667
Commercial	301	1.6	385 80%	96 20%	481	1.6	144 30%	337 70%	481	8	1202 50%	1202 50%	2405
Residential	1294	0.3	75 20%	300 80%	375	0.3	263 70%	113 30%	375	3	1941 50%	1941 50%	3882
Retail / Commercial Sub-Total			718	318	1036		422	614	1036		4036	4036	8072
Cross-Visitation		*20%*	*144*	*64*	*207*		*84*	*123*	*207*		*807*	*807*	*1614*
Pass-By Trips		*10%*	*52*	*52*	*104*		*52*	*52*	*104*		*404*	*404*	*807*
Reduced Retail / Commercial Sub-Total			522	203	725		286	439	725		2825	2825	5650
Residential Sub-Total			75	300	375		263	113	375		1941	1941	3882
Precinct 4 Sub-Total			**597**	**503**	**1100**		**548**	**552**	**1100**		**4766**	**4766**	**9532**
Precinct 6													
Retail	154	4.6	424 60%	283 40%	707	4.6	353 50%	353 50%	707	47	3610 50%	3610 50%	7220
Commercial	383	1.6	491 80%	123 20%	613	1.6	184 30%	429 70%	613	8	1534 50%	1534 50%	3067
Residential	1965	0.3	114 20%	456 80%	570	0.3	399 70%	171 30%	570	3	2948 50%	2948 50%	5895
Retail / Commercial Sub-Total			915	405	1320		537	783	1320		5143	5143	10287
Cross-Visitation		*20%*	*183*	*81*	*264*		*107*	*157*	*264*		*1029*	*1029*	*2057*
Pass-By Trips		*10%*	*66*	*66*	*132*		*66*	*66*	*132*		*514*	*514*	*1029*
Reduced Retail / Commercial Sub-Total			666	258	924		364	560	924		3600	3600	7201
Residential Sub-Total			114	456	570		399	171	570		2948	2948	5895
Precinct 6 Sub-Total			**780**	**714**	**1494**		**763**	**731**	**1494**		**6548**	**6548**	**13096**
Retail / Commercial Total			2489	962	3452		1357	2095	3452		13422	13422	26845
Residential Total			354	1414	1768		1237	530	1768		9143	9143	18285
Total Trips			2843	2376	5219		2594	2625	5219		22565	22565	45130

Appendix C shows the distribution of the trips from the City Centre development to the road network.

6. Traffic Assessment Operations – 2016

6.1 Trip Distribution and Intersection Capacity Assessment 2016

This section of the report addresses the operation of the intersections for 2016 primarily based on the current configuration as they are presently operating. The only change being for the intersections at either end of the Boulevard where alterations to these intersections are currently being tendered by City of Palmerston with completion of the new arrangements in place by 2016. The remaining analysis represents circumstances similar to the current situation with traffic growth applied from 2014 to represent 2016 plus a small increase due to new development trips in the City Centre incurred up to 2016 from the present.

The previous Chapter 4 calculated the growth for the existing traffic volumes which have been assigned to the key intersections surrounding the City Centre as background traffic. The City Centre Traffic is derived from Table 5.2 City Centre Development Trip Generation Summary – 2016. The development Trips were added to the background traffic to derive the post development trips.

Figure 6.1and Figure 6.2 show the 2016 background traffic at each intersection for the AM and PM traffic.

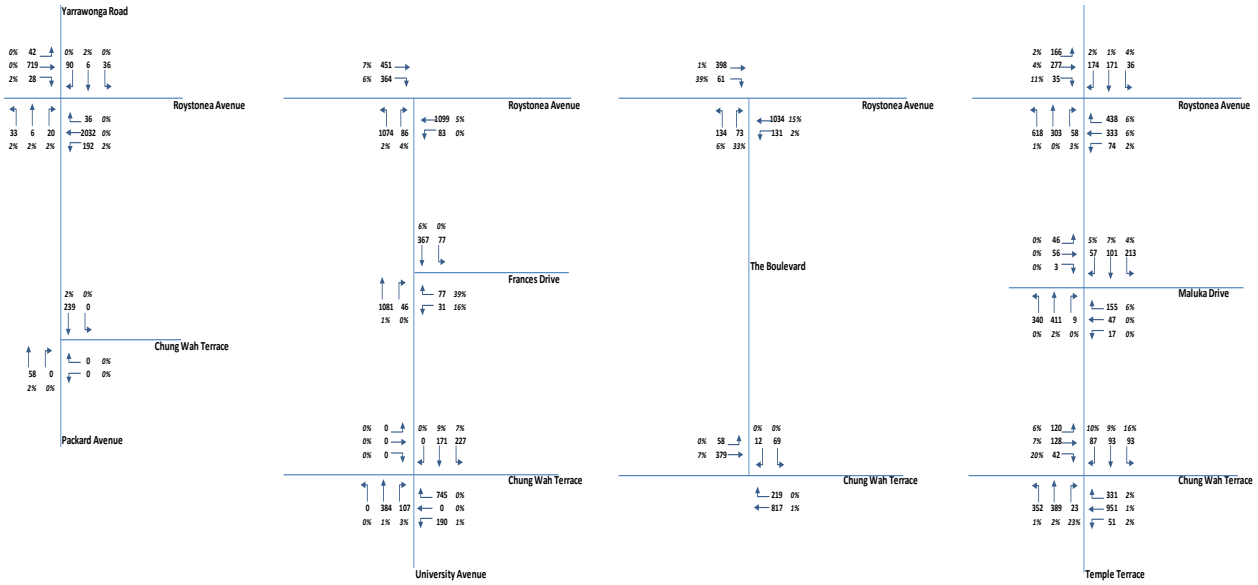


Figure 6-1 Background Traffic 2016 AM Trip Distribution

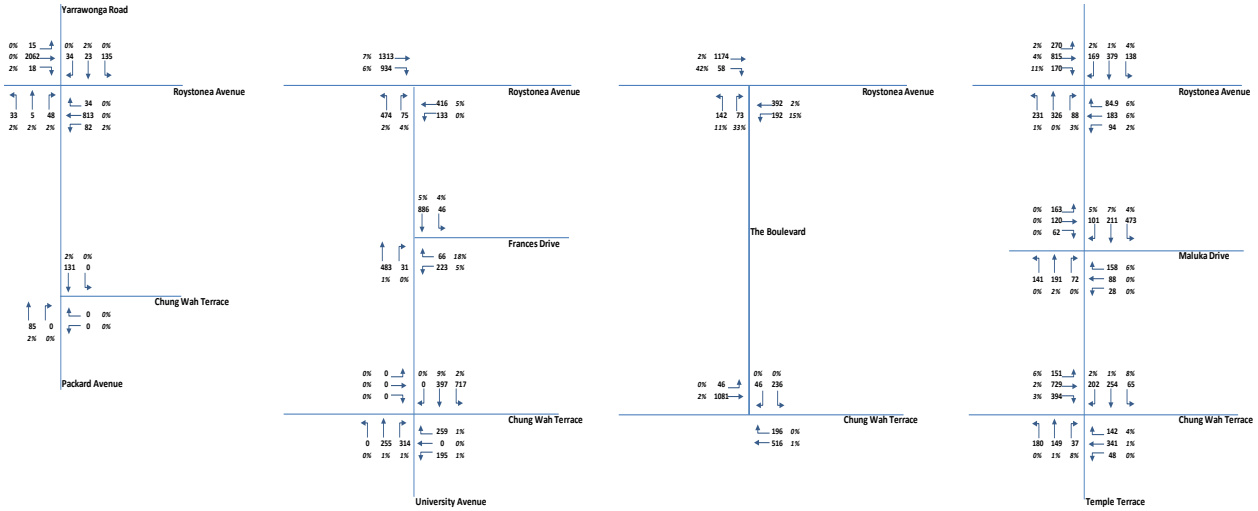


Figure 6-2 Background Traffic 2016 PM Trip Distribution

Figure 6.3 and Figure 6.4 show the 2016 post development traffic at each intersection for the AM and PM traffic. The figures show the combination of the background traffic with the start of the City Centre development traffic superimposed.

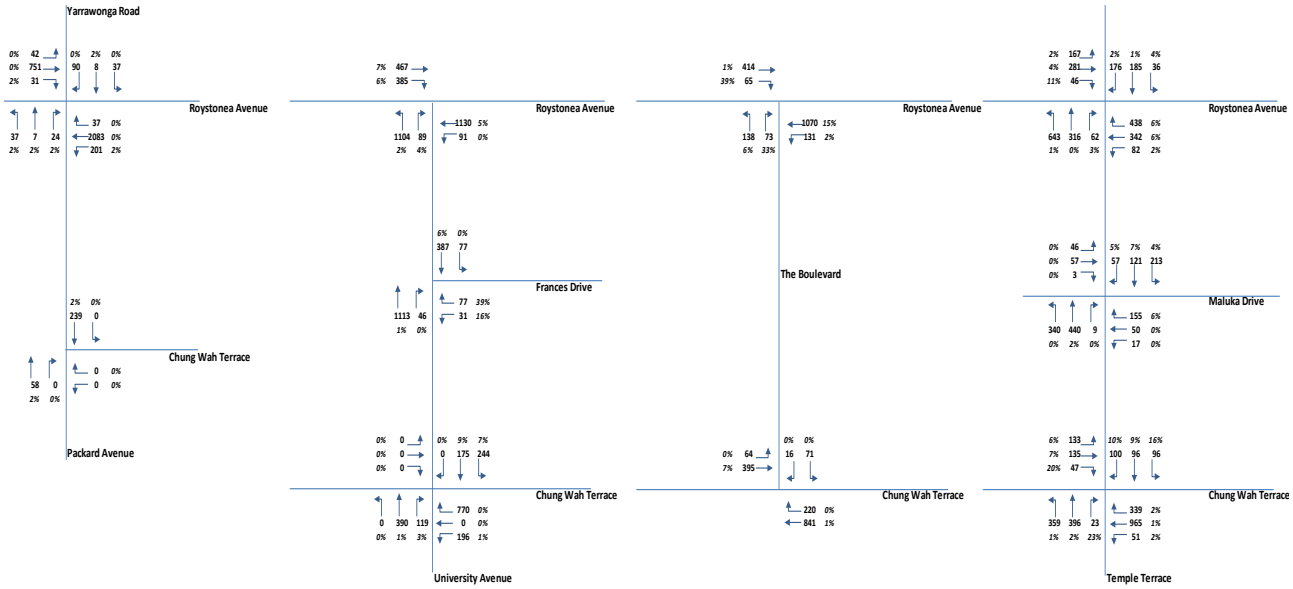


Figure 6-3 Post Development Traffic 2016 PM Trip Distribution

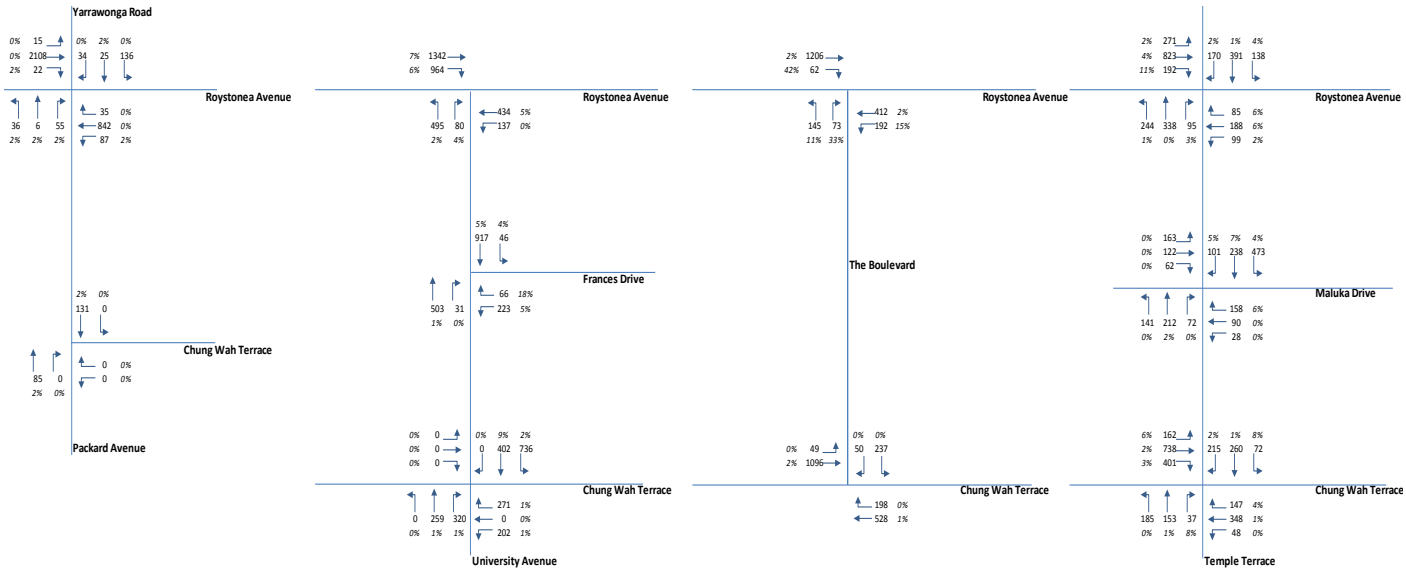


Figure 6-4 Post Development Traffic 2016 PM Trip Distribution

The above trip tables have been used for the input traffic volumes for the intersections.

Intersection capacity analysis has been carried out utilizing SIDRA INTERSECTION 5.1 (SIDRA) traffic modelling software. This is an advanced micro-analytical traffic evaluation tool that employs lane-by-lane and vehicle drive models. The key performance criteria considered are Degree of Saturation (DOS), Delays and Queuing. According to the *Guidelines for Assessment of Road Impacts of Developments (Department of Transport and Main Roads Queensland, 2006, ch. 6, pg. 7),* for signalized intersections, a DOS in excess of 90 % is considered over capacity. Above these values performance quickly deteriorates. DOS should also be kept below 85 % for roundabouts and 80 % for priority controlled intersections. In accordance with the *Guide to Traffic Generating Developments (RTA, 2002, t. 4.2)*, delays above 40 seconds for priority controlled intersections are considered unfavourable. Acceptable queue lengths are determined on a site by site basis, taking into account available storage and interaction with other intersections.

The following intersections have been analysed using SIDRA for the Pre Development and Post Development scenarios at the 2016 assessment year during both the weekday morning and evening peak hour periods:

- Temple Terrace / Chung Wah Terrace;
- Temple Terrace / Maluka Drive; and
- Temple Terrace / Roystonea Avenue.
- Roystonea Avenue / The Boulevard;
- Roystonea Avenue / Packard Avenue (future Chung Wah Terrace Extension) / Yarrawonga Road;
- Packard Avenue (future Chung Wah Terrace Extension);
- Roystonea Avenue / University Avenue;
- University Avenue / Frances Drive;
- University Avenue / Chung Wah Terrace;
- Chung Wah Terrace / The Boulevard;

The 2016 pre development represents the extrapolation of growth from the existing traffic, whereas the post 2016 also includes a small proportion of the development traffic resulting from initial development of the City Centre Master Plan a City Centre Development Trip Generation Summary – 2016 tables in Chapter 5.

6.2 Intersection Capacity Assessment Year 2016

This section provides a summary of the outcomes of the intersection capacity assessments for the aforementioned intersections. The performance of each intersection is detailed in this section of the report and all of the SIDRA output summaries are reproduced in Appendix D. This section tabulates the key performance indicators for each intersection including Degree of Saturation, Delay and Queue length.

6.2.1 Temple Terrace / Chung Wah Terrace Intersection

The Temple Terrace / Chung Wah Terrace intersection is a dual lane roundabout with four (4) approaches and a 25 m diameter central island. Figure 6.5 shows a photograph of the intersection looking from the direction of Temple Terrace towards the roundabout.

Figure 6-5 Temple Terrace / Chung Wah Intersection

The SIDRA model used in the analysis is shown in Figure 6.6.

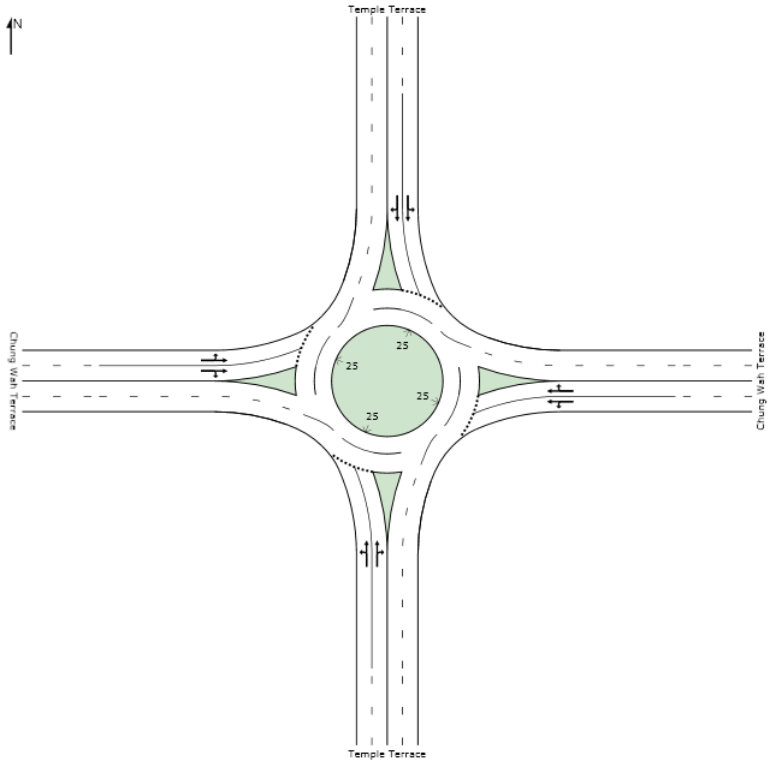


Figure 6-6 Sidra Model Layout Temple Terrace / Chung Wah Terrace Intersection

The performance summaries at the 2016 design year both with and without the proposed development trips are presented in Table 6.1 for the Temple Terrace / Chung Wah Terrace intersection.

Table 6.1 Temple Terrace / Chung Wah Terrace Performance Summary – 2015

Approach	Morning Peak						Evening Peak					
	Pre Development			Post Development			Pre Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
Temple Tce (S)	0.567	10.3	26.1	.595	10.9	28.5	0.198	6.4	6.5	.206	6.5	6.8
Chung Wah Tce (E)	0.530	6.3	24.1	.548	6.5	25.2	0.317	8.2	11.7	.331	8.4	12.3
Temple Tce (N)	0.118	6.3	4.2	.127	6.5	4.5	0.369	9.6	14.0	.394	9.9	15.5
Chung Wah Tce (W)	0.177	7.5	6.6	.195	7.6	7.4	0.554	7.4	27.4	.570	7.6	29.3

Overall for the Morning peak hour in the pre-development scenario the Level of Service is LOS A and for the evening peak hour, the average Level of Service is LOS A. For the post-development scenario, the Level of Service for the morning peak hour is LOS A and for the evening peak hour the average Level of Service is LOS A.

The abbreviations in the tables represent the following:

- DOS is Degree of Saturation.

- Delay is the average delay in seconds for each movement for the approach to the intersection.
- Queue is the average queue length in metres for each movement in the approach to the intersection.

6.2.2 Roystonea Avenue / Packard Road (Future Chung Wah Terrace Extension)

The Roystonea Avenue / Packard Avenue (future Chung Wah Terrace Extension) / Yarrawonga Road intersection is a signalized intersection with four (4) approaches. Figure 6.7 shows a photograph of the existing intersection looking from an easterly direction in Roystonea Ave towards the west, showing the western leg of Roystonea Ave.

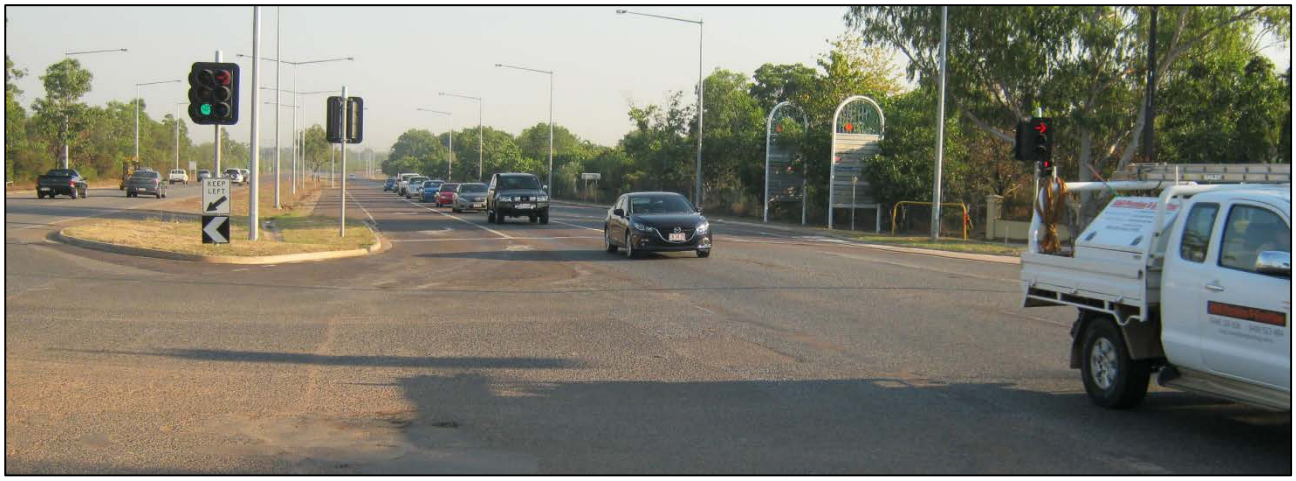


Figure 6-7 Roystonea Avenue / Packard Avenue (Future Chung Wah Terrace Extension) / Yarrawonga Road Intersection

The SIDRA model used in the analysis is shown in Figure 6.8.

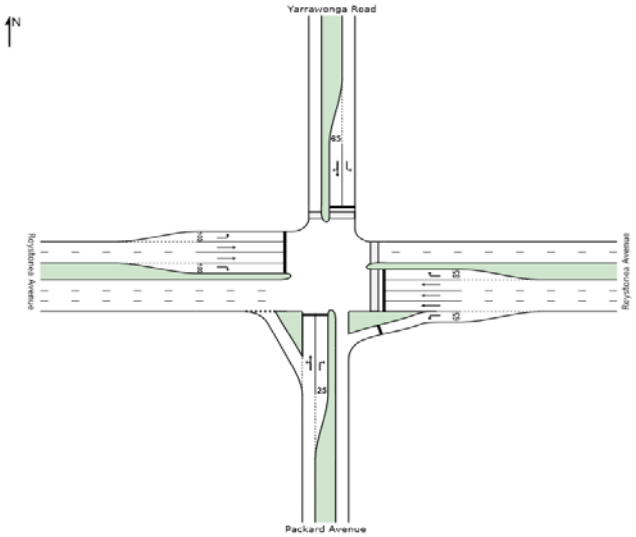


Figure 6-8 Sidra Model Layout Temple Terrace / Chung Wah Intersection

The performance summaries for the Roystonea Avenue / Packard Ave (future Chung Wah Terrace Extension) / Yarrawonga Road intersection at the 2016 design years are provided in Table 6.2.

Table 6.2 Roystonea Avenue / Packard Avenue (future Chung Wah Terrace Extension / Yarrawonga Road Intersection Performance Summary – 2016

Approach	Morning Peak						Evening Peak					
	Pre Development			Post Development			Pre Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
Packard Ave (S)	0.218	32.4	8.5	0.284	36.2	11.2	0.655	54.1	26.8	0.751	58.7	31.1
Roystonea Ave (E)	0.663	20.5	203.6	0.651	19.9	216.5	0.286	26.8	80.9	0.296	26.6	84.3
Yarrawonga Rd (N)	0.688	67.0	41.2	0.684	71.3	45.2	0.839	85.5	74.7	0.845	83.5	75.5
Roystonea Ave (W)	0.340	13.4	49.2	0.338	13.5	53.2	0.872	14.9	274.2	0.893	18.5	310.8

Overall for the morning peak hour in the pre-development scenario the Level of Service is LOS C and for the evening peak hour the average Level of Service is LOS C. In the post-development scenario, the Level of Service for the morning peak hour is LOS C and for the evening peak hour the average Level of Service is LOS C.

6.2.3 Future Chung Wah Terrace Extension / Packard Avenue

The future Chung Wah Terrace Extension / Packard Avenue intersection is a single lane roundabout with 23 metre diameter circle. Figure 6.9 shows a photograph of the existing intersection looking from Roystonea Ave towards the roundabout showing the northern approach of the existing roundabout.

Figure 6-9 Chung Wah Terrace Extension / Packard Avenue

The SIDRA model used in the analysis is shown in Figure 6.10.

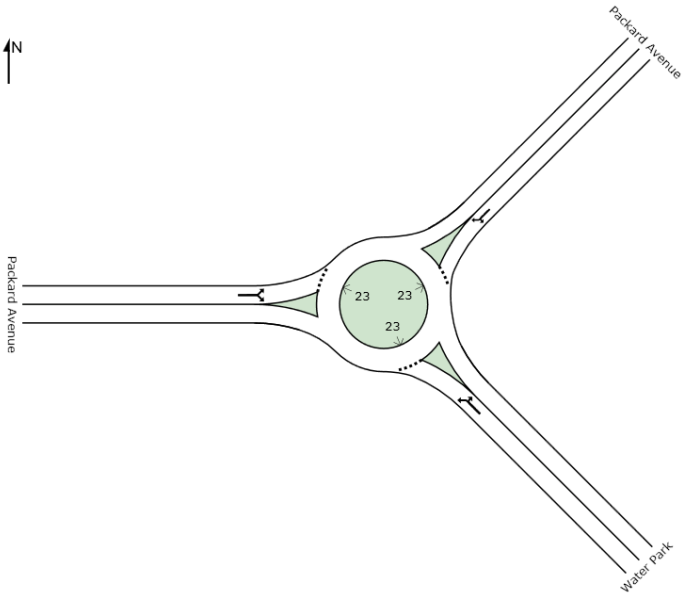


Figure 6-10 Sidra Model Layout future Chung Wah Terrace Extension / Packard Avenue

This intersection has been assessed using SIDRA at the 2016 design years. The performance summaries of the intersection are provided in Table 6.3.

Table 6.3 Future Chung Wah Terrace Extension / Packard Avenue Performance Summary – 2016

Approach	Morning Peak						Evening Peak					
	Pre Development			Post Development			Pre Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
Chung Wah Tce Extension (S)	.006	5.0	0.2	0.006	5.0	0.2	0.025	8.4	0.8	0.025	8.4	0.2
Packard Ave (E)	0.143	6.6	5.9	0.143	6.6	5.9	0.081	7.8	3.3	0.081	7.8	3.3
Packard Ave (W)	0.037	4.0	1.4	0.037	4.0	1.4	0.046	4.0	1.6	0.046	6.8	3.3

Overall for the Morning peak hour in the pre-development scenario the Level of Service is LOS A and for the evening peak hour the average Level of Service is LOS A. In the post-development scenario the Level of Service for the morning peak hour is LOS A and for the evening peak hour the average Level of Service is LOS A.

6.2.4 Roystonea Avenue / University Avenue

The Roystonea Avenue / University Avenue intersection is currently a signal -controlled intersection with Roystonea Avenue as the major road. Figure 6.11 shows a photograph of the existing intersection looking from University Ave towards the intersection showing the vehicles travelling through the right turn from Roystonea Ave into University Avenue and vehicles queued in Roystonea Avenue eastern approach.

Figure 6-11 Roystonea Ave / University Ave Intersection.

The SIDRA model used in the analysis is shown in Figure 6.12.

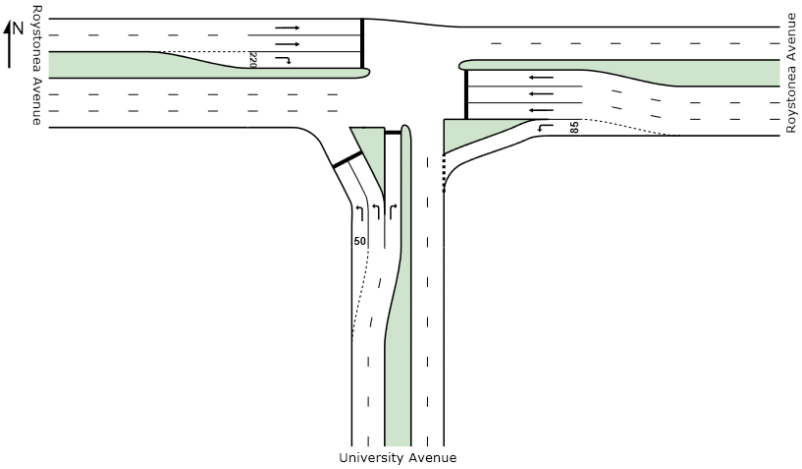


Figure 6-12 Sidra Model Layout Roystonea Ave / University Ave Intersection.

The performance summaries of the Roystonea Avenue / University Avenue intersection at 2016 are presented in Table 6.4.

Table 6.4 Roystonea Avenue / University Avenue Performance Summary – 2016

Approach	Morning Peak						Evening Peak					
	Pre Development			Post Development			Pre Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
University Ave (S)	0.587	16.4	67.4	0.592	17.2	75.3	0.069	15.7	28.6	0.738	15.9	30.9
Roystonea Ave (E)	0.746	20.4	67.3	0.731	21.1	73.8	0.734	43.2	52	0.766	44.4	54.9
Roystonea Ave (W)	0.786	15.0	70.9	0.743	14.4	76.6	0.795	9.3	237.4	0.82	10.0	261.8

Overall for the Morning peak hour in the pre-development scenario the Level of Service is LOS B and for the evening peak hour the average Level of Service is LOS B. In the post-development

scenario the Level of Service for the morning peak hour is LOS B and for the evening peak hour the average Level of Service is LOS B.

6.2.5 University Avenue / Frances Drive

The University Avenue / Frances Drive intersection is single lane entry into the CBD area with University Avenue as the major road. The SIDRA model used in the analysis is shown in Figure 6.13. A two stage analysis has been considered to allow for the sea gull turning movements located in the median.

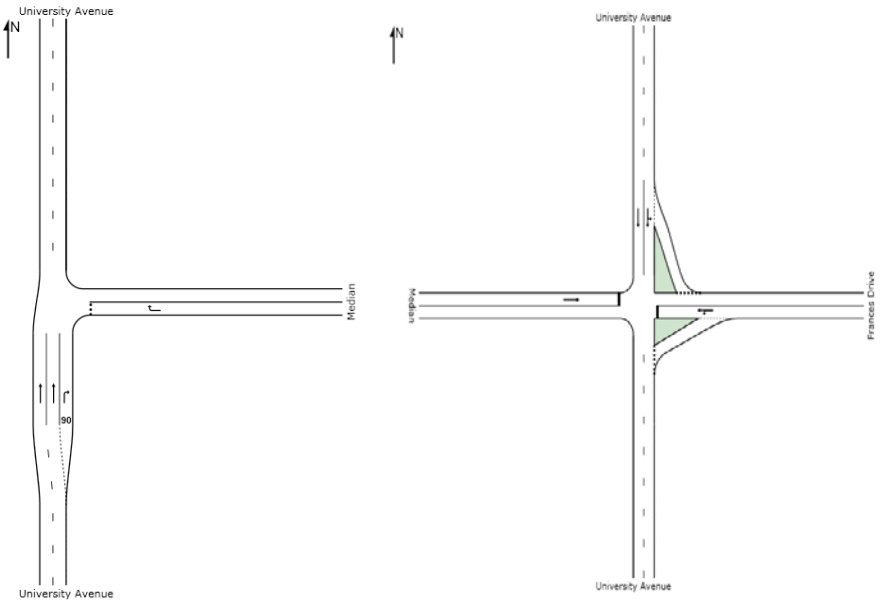


Figure 6-13 Sidra Model Layout University Ave / Frances Drive Intersection

The performance summaries of the University Avenue / Frances Drive intersection at 2016 are presented in Table 6.5.

Table 6.5 University Avenue / Frances Drive Performance Summary – 2016

Approach	Morning Peak					
	Pre Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
Frances Drive (E)	0.142	10.4	4.8	0.146	10.5	4.9
University Ave (N)	0.122	1.4	4.3	0.128	1.4	4.5
Median (W)	.054	12.3	1.3	0.055	12.4	1.4
University Ave (S)	0.279	0.4	0.0	0.287	0.4	0.0
Median (E)	0.384	2.4	13.9	0.409	2.5	14.8
Approach	**Evening Peak**					
	Pre Development			**Post Development**		
Frances Drive (E)	0.383	12.5	15.0	0.397	12.9	15.8
University Ave (N)	0.249	0.5	10.7	0.258	0.5	11.2
Median (W)	0.069	16.7	1.6	0.072	17.2	1.7
University Ave (S)	0.125	0.6	0.0	0.130	0.5	0.0

Median (E)	0.099	12.4	3.1	0.102	12.6	3.1

Overall the Level of service varied between LOS A and LOS C for the combined movements for both peak hours and both cases analysed.

6.2.6 University Avenue / Chung Wah Terrace Intersection

The University Avenue / Chung Wah Terrace intersection is a dual lane signalized intersection. Figure 6.14 shows a photograph of the existing intersection looking from University Ave towards the intersection showing Chung Wah Terrace on the left.

Figure 6-14 University Ave / Chung Wah Terrace Intersection

The SIDRA model used in the analysis is shown in Figure 6.15.

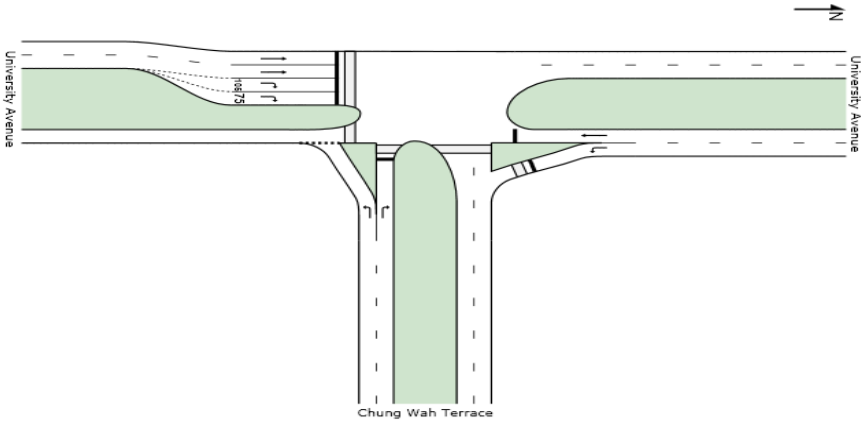


Figure 6-15 Sidra Model Layout University Ave / Chung Wah Terrace Intersection

The performance summaries of the University Avenue / Chung Wah Terrace intersection at 2016 are presented in Table 6.6.

Table 6.6 University Avenue / Chung Wah Terrace Performance Summary – 2015

Approach	Morning Peak						Evening Peak					
	Pre Development			Post Development			Pre Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
University Ave (S)	0.343	23.8	35.0	0.409	25.6	37.7	0.724	28.2	48.3	0.819	31.3	52.1
Chung Wah Tce (E)	.802	21.2	165.1	0.818	26.5	186.3	0.796	30.1	80.8	0.781	29.5	83.0
University Ave (N)	0.817	37.7	64.3	0.796	38.3	71.8	0.792	25.9	186.7	0.813	23.9	200.4

Overall for the Morning peak hour in the pre-development scenario the Level of Service is LOS C and for the evening peak hour the average Level of Service is LOS C. In the post-development scenario the Level of Service for the morning peak hour is LOS C and for the evening peak hour the average Level of Service is LOS C.

6.2.7 Chung Wah Terrace / The Boulevard

The existing Chung Wah Terrace / The Boulevard intersection is a give way priority controlled intersection with seagull turn lanes in the median. Figure 6.16 shows the intersection looking from the Boulevard towards Chung Wah Terrace.

Figure 6-16 Chung Wah Terrace / The Boulevard Intersection

Advice from City of Palmerston indicates that the intersection is to be re-configured in line with the upgrade of the Boulevard to a signalized intersection. The analysis has been based on the new arrangement with construction being completed by 2016. Figure 6.17 shows the Sidra model used in the analysis.

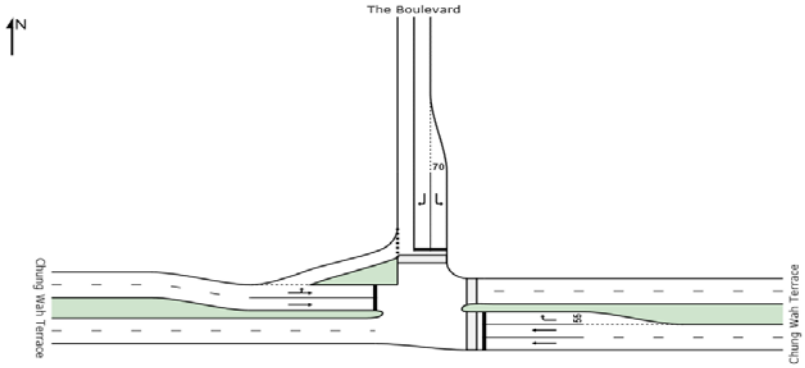


Figure 6-17 Sidra Model Chung Wah Terrace / The Boulevard Intersection

The performance summaries of the Chung Wah Terrace / The Boulevard intersection at 2016 are presented in Table 6.7.

Table 6.7 Chung Wah Terrace / The Boulevard Performance Summary – 2016

Approach	Morning Peak						Evening Peak					
	Pre Development			Post Development			Pre Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
Chung Wah Tce (E)	0.766	13.2	52.4	0.770	13.2	52.8	0.792	16.0	54.8	0.800	16.0	55.7
The Boulevard (N)	0.186	29.4	13.1	0.191	29.4	13.5	0.733	39.4	62.3	0.736	39.5	62.7
Chung Wah Tce (W)	0.312	16.3	30.8	0.328	16.3	32.6	0.645	16.1	95.7	0.655	16.2	98.3

Overall for the Morning peak hour in the pre-development scenario the Level of Service is LOS B and for the evening peak hour the average Level of Service is LOS B. In the post-development scenario the Level of Service for the morning peak hour is LOS B and for the evening peak hour the average Level of Service is LOS B.

6.2.8 Roystonea Avenue / The Boulevard

The existing Roystonea Avenue / The Boulevard intersection is a give way priority controlled intersection with seagull turn lanes in the median. Figure 6.18 shows the intersection looking from the Roystonea Avenue towards The Boulevard on the right.

Figure 6-18 Roystonea Avenue / The Boulevard Intersection.

Advice from City of Palmerston indicates that the intersection is to be re-configured in line with the upgrade of the Boulevard to a signalized intersection. The analysis has been based on the new arrangement with construction being completed by 2016. Figure 6.19 shows the Sidra model used in the analysis.

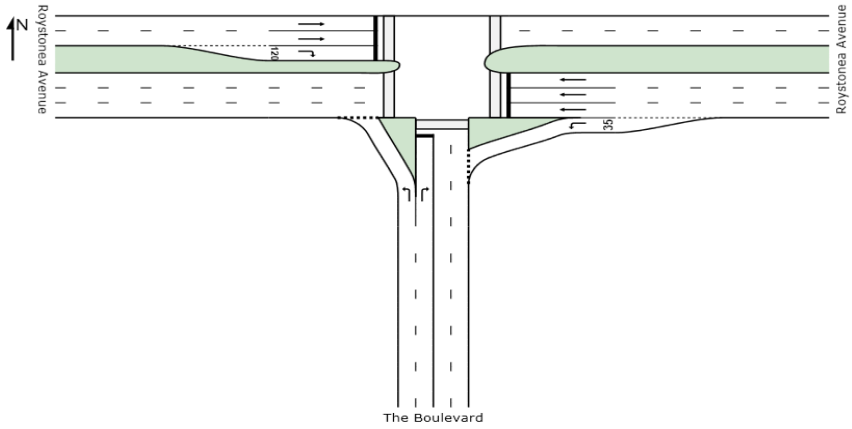


Figure 6-19 Sidra Model Roystonea Avenue / The Boulevard Intersection

The performance summaries of the Roystonea Avenue / The Boulevard intersection at 2016 are presented in Table 6.8.

Table 6.8 Roystonea Avenue / The Boulevard Performance Summary – 2016

Approach	Morning Peak						Evening Peak					
	Pre Development			Post Development			Pre Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
The Boulevard (S)	0.336	19.4	27.1	0.392	22.1	32.4	0.448	24.3	37.7	0.430	23.0	35.9
Roystonea Ave (E)	0.356	8.3	43.9	0.346	7.4	43.9	0.131	4.1	7.1	0.132	4.5	8.4
Roystonea Ave (W)	0.378	13.1	24.0	0.361	13.1	28.9	0.487	7.3	49.5	0.499	8.0	57.8

Overall for the Morning peak hour in the pre-development scenario the Level of Service is LOS B and for the evening peak hour the average Level of Service is LOS B. In the post-development scenario the Level of Service for the morning peak hour is LOS A and for the evening peak hour the average Level of Service is LOS A.

6.2.9 Temple Terrace / Maluka Drive

The Temple Terrace / Maluka Drive intersection is currently a signalized intersection with four (4) approaches. The northern approach to the intersection is an access point for the Palmerston Shopping Centre. Figure 6.20 shows the intersection looking from Maluka Drive towards the shopping centre access with Temple terrace on the right and left.

Figure 6-20 Temple Terrace / Maluka Drive Intersection

The Sidra model used for the analysis of the intersection is shown in Figure 6.21.

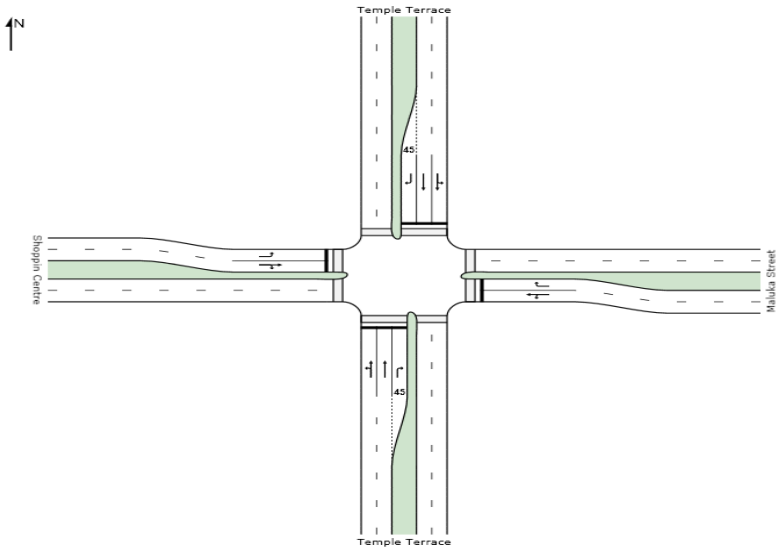


Figure 6-21 Sidra Model Temple Terrace / Maluka Drive Intersection

The performance summaries of the Temple Terrace / Maluka Drive intersection at 2016 are presented in Table 6.9.

Table 6.9 Temple Terrace / Maluka Drive Performance Summary – 2016

Approach	Morning Peak						Evening Peak					
	Pre Development			Post Development			Pre Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
Temple Tce (S)	0.885	46.4	125.4	0.918	52.5	141.3	0.549	31.6	38.8	0.549	31.4	41.5
Maluka Dr (E)	0.870	45.6	52.3	0.870	53.7	52.3	0.838	43.3	54.6	0.838	43.2	54.6
Temple Terrace (N)	0.524	34.6	51.5	0.524	34.4	51.5	0.891	41.8	159.6	0.891	41.4	159.6

Shopping Centre (W)	0.151	35.4	17.1	0.153	34.8	17.1	1.764	175.7	505.1	1.766	760.7	511.7

Overall for the Morning peak hour in the pre-development scenario the Level of Service is LOS D and for the evening peak hour the average Level of Service is LOS F. In the post-development scenario the Level of Service for the morning peak hour is LOS D and for the evening peak hour the average Level of Service is LOS F.

6.2.10 Temple Terrace / Roystonea Avenue

The Temple Terrace / Roystonea Avenue intersection is currently a traffic signal controlled intersection with Roystonea Avenue as the major road. Figure 6.22 shows the intersection looking from Temple Terrace north towards Roystonea Avenue western approach showing Temple Terrace northern approach in the foreground.

Figure 6-22 Temple Terrace / Roystonea Drive Intersection

The Sidra model used for the analysis of the intersection is shown in Figure 6.23.

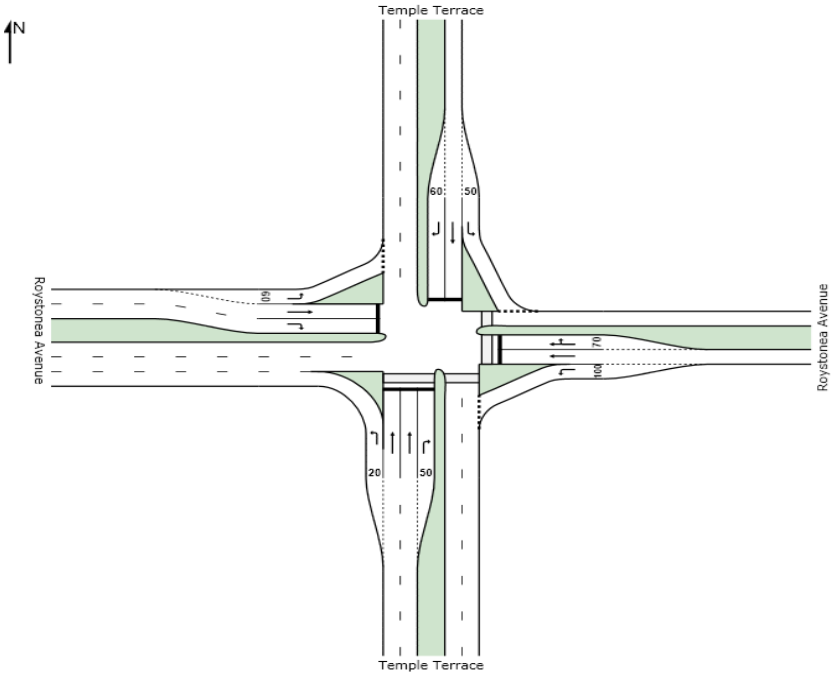


Figure 6-23 Sidra Model Temple Terrace / Roystonea Avenue Intersection

The performance summaries of the Temple Terrace / Roystonea Avenue intersection at 2016 are presented in Table 6.10.

Table 6.10 Temple Terrace / Roystonea Avenue Performance Summary – 2016

Approach	Morning Peak						Evening Peak					
	Pre Development			Post Development			Pre Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
Temple Tce (S)	0.499	18.4	42.6	0.540	17.3	40.4	0.907	50.5	109.6	0.871	49.7	113.9
Roystonea Ave (E)	0.904	43.7	171.9	0.894	37.2	154.2	0.519	53.1	69.1	0.555	53.8	71.2
Temple Tce (N)	0.855	43.8	61.9	0.854	38.8	56.3	1.195	281.4	590.4	1.228	316.6	656.8
Roystonea Ave (W)	0.874	36.4	101.6	0.910	36.8	99.2	1.228	332.8	1443.0	1.231	331.4	1465.6

Overall in the pre-development scenario, the Level of Service for the morning peak hour is LOS C and for the evening peak hour the average Level of Service is LOS F and for the Morning peak hour in the post-development scenario the Level of Service is LOS C and for the evening peak hour the average Level of Service is LOS F.

7. Traffic Operational Assessment – 2026

7.1 Trip Distribution and Intersection Capacity Assessment 2026

This section of the report addresses the operation of the intersections in the surrounding road network which will support development trips, giving consideration to intersection capacity at the intersections assessed for the rear 2026.

Capacity analysis has been carried out utilising SIDRA INTERSECTION 5.1 (SIDRA) traffic modelling software. The following intersections have been analysed using SIDRA for the Post Development scenarios at the 2026 assessment years during both the weekday morning and evening peak hour periods:

- Temple Terrace / Chung Wah Terrace;
- Temple Terrace / Maluka Drive; and
- Temple Terrace / Roystonea Avenue.
- Roystonea Avenue / The Boulevard;
- Roystonea Avenue / Chung Wah Terrace Extension / Yarrawonga Road;
- Packard Avenue Chung Wah Terrace Extension;
- Roystonea Avenue / University Avenue;
- University Avenue / Frances Drive;
- University Avenue / Chung Wah Terrace;
- Chung Wah Terrace / The Boulevard;

Figure 7.1 and Figure 7.2 show the trip distribution for each intersection for the morning peak hour for the background traffic.

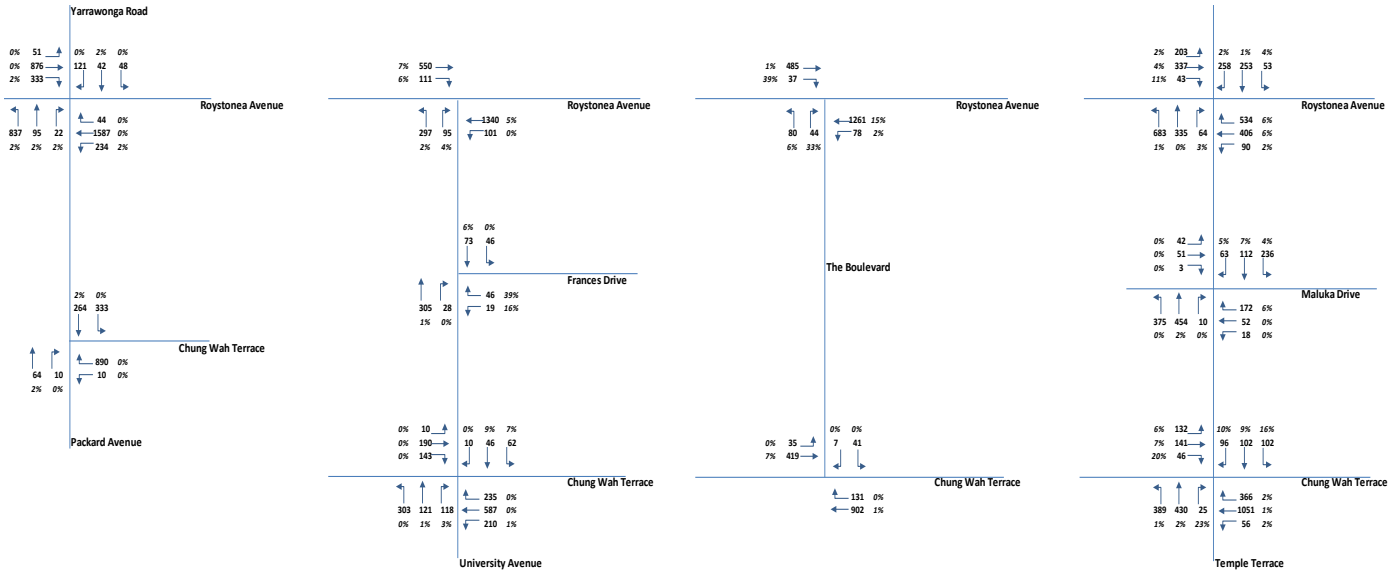


Figure 7-1 2026 AM Trip Distribution Background Traffic

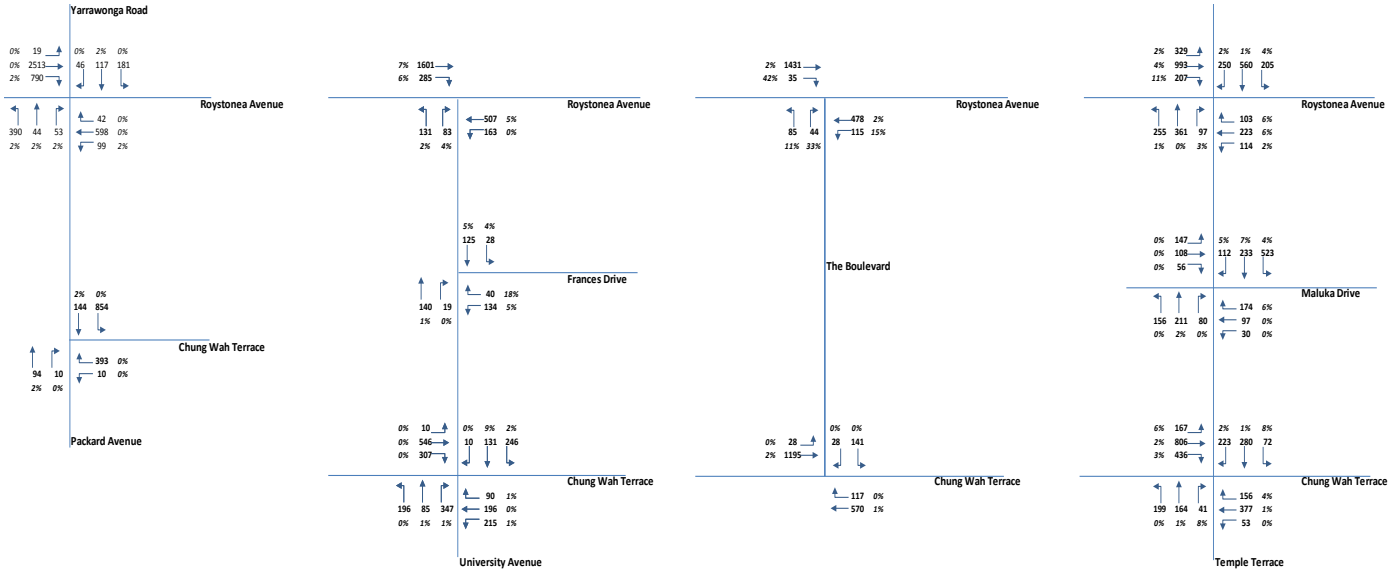


Figure 7-2 2026 PM Trip Distribution Background Traffic

Figure 7.3 and Figure 7.4 show the background traffic with the development trips from the City Centre superimposed. The City Centre Development trips as per table 5.3 City Centre Development Trips 2026.

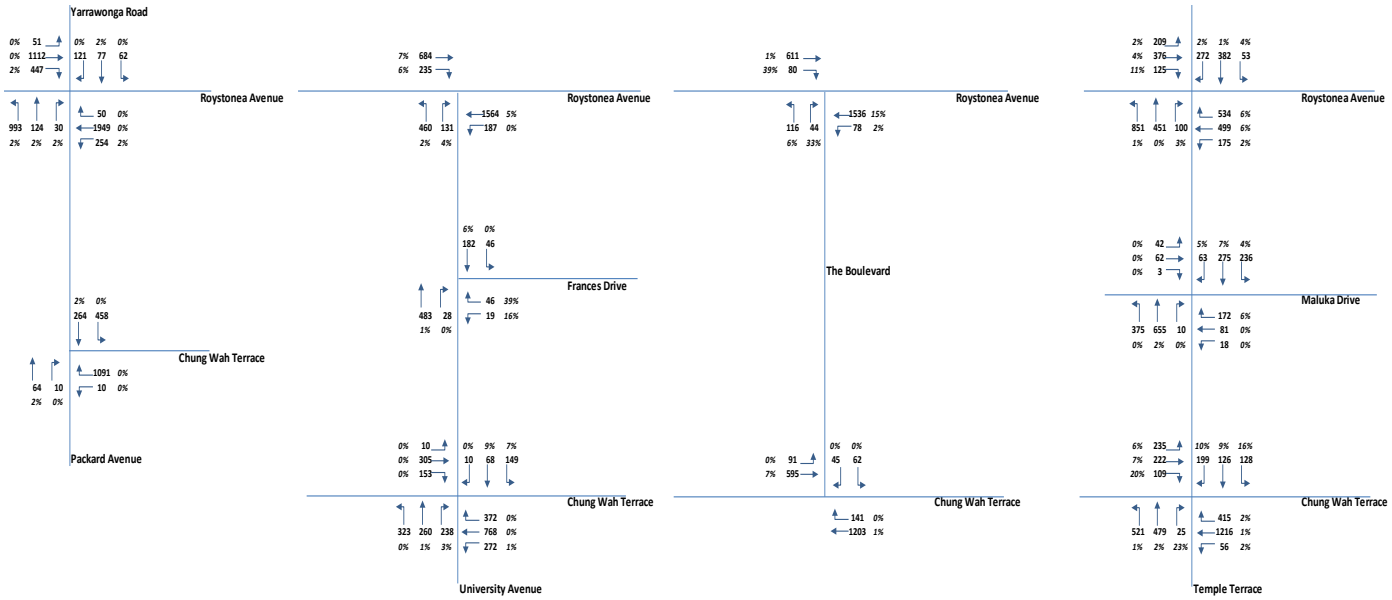


Figure 7-3 2026 AM Trip Distribution with Development Traffic

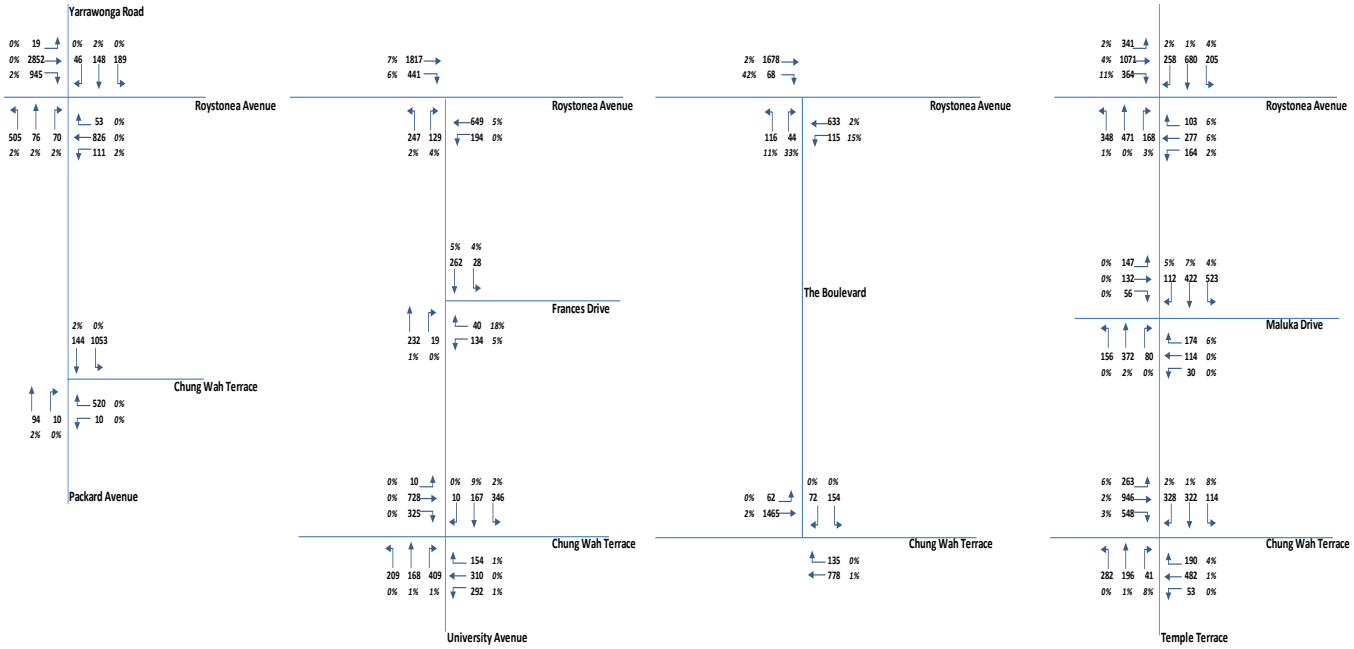


Figure 7-4 2026 PM Trip Distribution with Development Traffic

7.2 Intersection Capacity Assessment

This section provides a summary of the outcomes of the intersection capacity assessments for the aforementioned intersections. The performance of each intersection is detailed in this section of the report and all of the SIDRA output summaries are available in Appendix E.

7.2.1 Temple Terrace / Chung Wah Terrace

The dual lane roundabout with four (4) approaches and a 25 m diameter central island Temple Terrace / Chung Wah Terrace intersection failed to accommodate the 2026 traffic volume. The roundabout was replaced with a four lane signalized intersection for the analysis. The SIDRA model used in the analysis is shown in Figure 7.5.

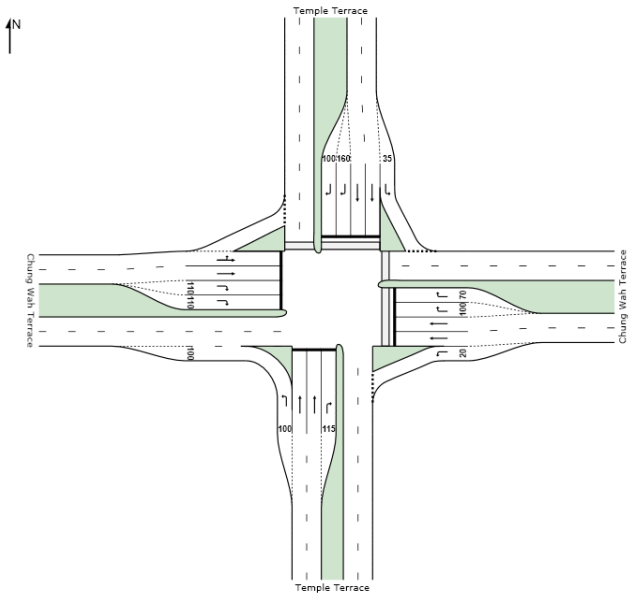


Figure 7-5 Sidra Model Layout Temple Terrace / Chung Wah Terrace Intersection.

The performance summaries at the 2016 design year both with and without the proposed development trips are presented in Table 7.1 for the Temple Terrace / Chung Wah Terrace intersection.

Table 7.1 Temple Terrace / Chung Wah Terrace Performance Summary – 2015

Approach	Morning Peak			Evening Peak		
	Post Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
Temple Tce (S)	0.445	19.6	69.5	0.813	29.2	37.5
Chung Wah Tce (E)	0.911	48.2	247.2	0.911	58.0	106.2
Temple Tce (N)	0.791	36.8	40.1	0.320	29.6	41.5
Chung Wah Tce (W)	0.539	23.2	39.8	0.725	27.3	146.9

Overall for the Morning peak hour in the post-development scenario the Level of Service for the morning peak hour is LOS D and for the evening peak hour the average Level of Service is LOS C.

The abbreviations in the tables represent the following:

- DOS is Degree of Saturation.
- Delay is the average delay in seconds for each movement for the approach.
- Queue is the average queue length in metres for each movement in the approach.

7.2.2 Roystonea Avenue / Chung Wah Terrace Extension / Yarrawonga Road

The Roystonea Avenue / Chung Wah Terrace Extension / Yarrawonga Road intersection is a signalized intersection with four (4) approaches. The existing configuration of this intersection did not support the forecast 2026 traffic volumes and several modifications were made including:

- Dual lanes in Yarrawonga Road
- Dual lanes in Packard Avenue
- Dual left turn Packard Ave. approach and dual right turn
- Three lanes east bound Roystonea Ave.
- Dual right turns in west approach Roystonea Ave. into Packard Ave
- Three through lanes west approach Roystonea Ave.

The upgrades being partly due to the extension of Chung Wah Terrace plus background traffic growth and City Centre Development trips. The SIDRA model used in the analysis is shown in Figure 7.6.

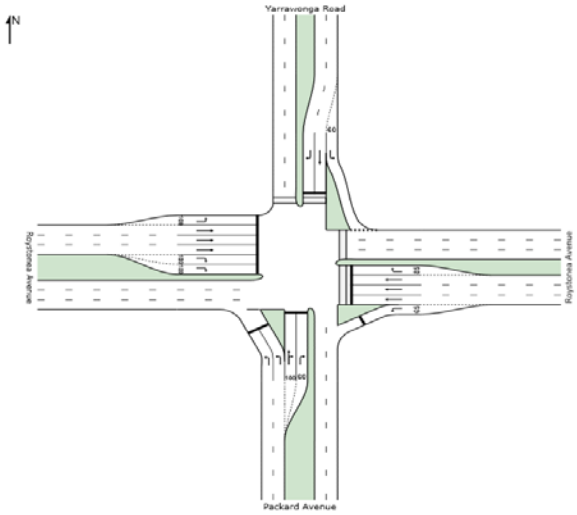


Figure 7-6 Sidra Model Layout Roystonea Avenue / Chung Wah Terrace Extension / Yarrawanga Avenue Intersection

The performance summaries for the Roystonea Avenue / Chung Wah Terrace Extension / Yarrawonga Road intersection at the 2026 design years are provided in Table 7.2.

Table 7.2 Roystonea Avenue / Chung Wah Terrace Extension / Yarrawonga Road Intersection Performance Summary – 2026

Approach	Morning Peak			Evening Peak		
	Post Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
Packard Ave. (Chung Wah Tce Extension) (S)	0.879	46.0	170.9	0.368	27.8	45.5
Roystonea Ave (E)	0.861	33.8	263.2	0.675	53.1	111.4
Yarrawonga Rd (N)	0.601	47.6	49.2	0.828	50.3	77.3
Roystonea Ave (W)	0.814	32.8	98.5	0.844	29.4	270.7

Overall for the Morning peak hour in the post-development scenario the Level of Service for the morning peak hour is LOS D and for the evening peak hour the average Level of Service is LOS C.

7.2.3 Chung Wah Terrace Extension / Packard Avenue

The Chung Wah Terrace Extension / Packard Avenue intersection is a single lane roundabout with 23 metre diameter circle. The SIDRA model used in the analysis is shown in Figure 7.7.

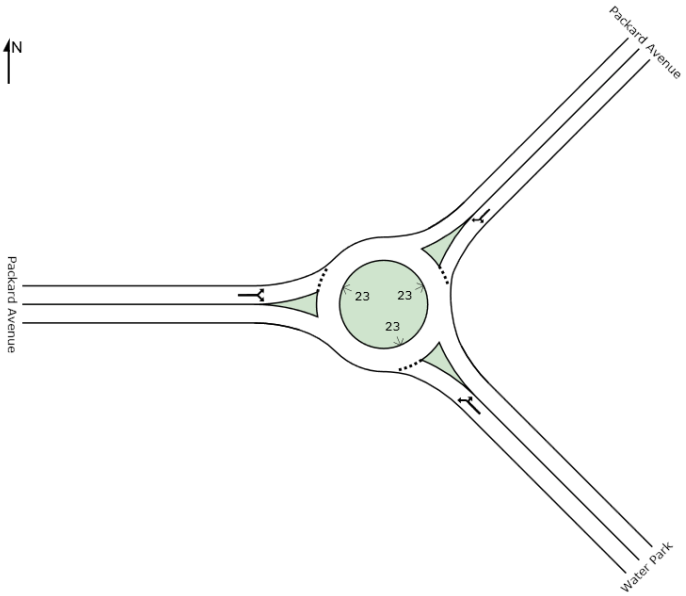


Figure 7-7 Sidra Model Layout Chung Wah Terrace Extension / Packard Avenue

This intersection has been assessed using SIDRA at the 2026 design years. The performance summaries of the intersection are provided in Table 7.3.

Table 7.3 Chung Wah Terrace Extension / Packard Avenue Performance Summary – 2016

Approach	Morning Peak			Evening Peak		
	Post Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
Chung Wah Tce Extension (S)	0.824	12.5	89.5	0.394	9.7	18.7
Packard Ave (NE)	0.3790	4.9	27.5	0.694	4.3	80.2
Packard Ave (W)	0.183	13.4	9.9	0.082	6.7	3.3

Overall for the Morning peak hour in the post-development scenario the Level of Service for the morning peak hour is LOS A and for the evening peak hour the average Level of Service is LOS A.

7.2.4 Roystonea Avenue / University Avenue

The Roystonea Avenue / University Avenue intersection is currently a signal -controlled intersection with Roystonea Avenue as the major road. In the 2026 case the analysis includes the three lanes east bound in Roystonea Ave and single lanes in each direction in University Ave. The SIDRA model used in the analysis is shown in Figure 7.8.

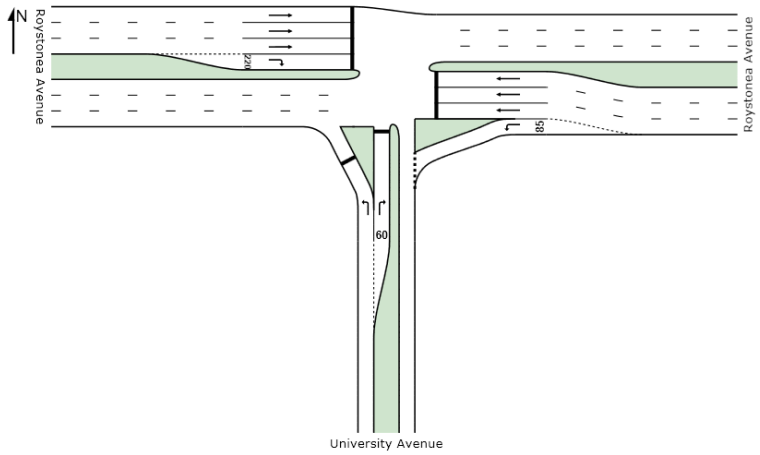


Figure 7-8 Sidra Model Layout Roystonea Ave / University Ave Intersection.

The performance summaries of the Roystonea Avenue / University Avenue intersection at 2026 are presented in Table 7.4.

Table 7.4 Roystonea Avenue / University Avenue Performance Summary – 2026

Approach	Morning Peak			Evening Peak		
	Post Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
University Ave S (S)	0.665	23.3	72.2	0.655	19.0	26.9
Roystonea Ave (E)	0.723	16.3	93.9	0.630	20.8	42.2
Roystonea Ave (W)	0.726	10.8	49.0	0.655	12.2	74.0

Overall for the Morning peak hour in the post-development scenario the Level of Service for the morning peak hour is LOS B and for the evening peak hour the average Level of Service is LOS B.

7.2.5 University Avenue / Frances Drive

The University Avenue / Frances Drive intersection is single entry lane in both directions into the City Centre area with University Avenue as the major road. The SIDRA model used in the analysis is shown in Figure 7.9. A left turn high angle entry lane has been added.

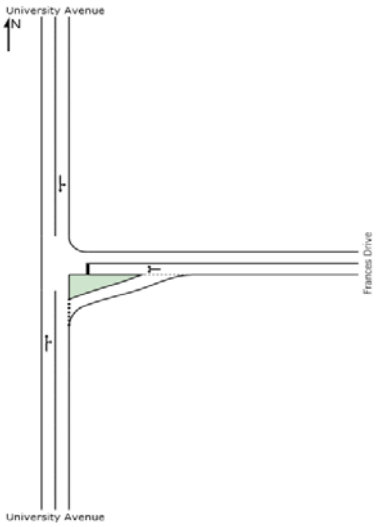


Figure 7-9 Sidra Model Layout University Ave / Frances Drive Intersection.

The performance summaries of the University Avenue / Frances Drive intersection at 2026 are presented in Table 7.5.

Table 7.5 University Avenue / Frances Drive Performance Summary – 2026

Approach	Morning Peak			Evening Peak		
	Post Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
University Ave (S)	0.269	1.3	13.8	0.134	1.5	6.2
Frances Drive (E)	0.146	12.0	4.3	0.177	7.4	5.2
University Ave (N)	0.122	1.1	0.0	0.154	0.6	0.0

Overall Level of service varied between LOS A and LOS A for the combined movements.

7.2.6 University Avenue / Chung Wah Terrace Intersection

The University Avenue / Chung Wah Terrace intersection is a dual lane signalized intersection with four approaches for the 2026 case. The analysis includes the extension of Chung Wah Terrace to Roystonea Ave / Yarrawonga Rd intersection. The SIDRA model used in the analysis is shown in Figure 7.10.

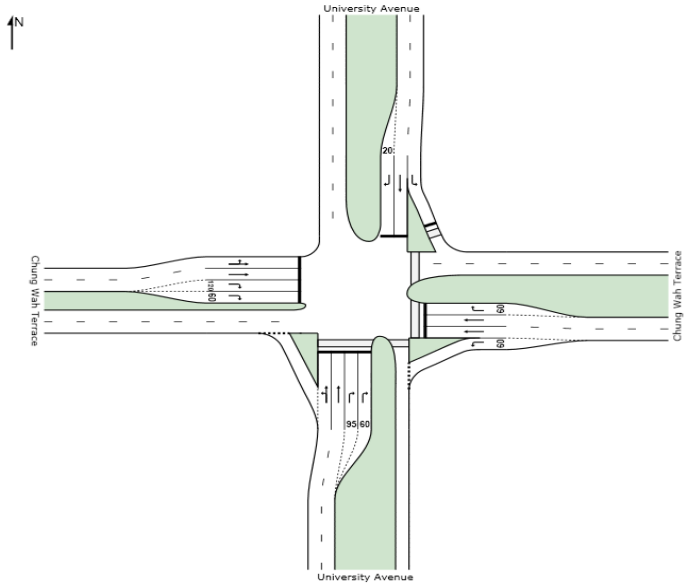


Figure 7-10 Sidra Model Layout University Ave / Chung Wah Terrace Intersection.

The performance summaries of the University Avenue / Chung Wah Terrace intersection at 2026 are presented in Table 7.6.

Table 7.6 University Avenue / Chung Wah Terrace Performance Summary – 2026

Approach	Morning Peak			Evening Peak		
	Post Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
University Ave (S)	0.523	19.1	47.8	0.863	29.1	57.9
Chung Wah Tce (E)	0.651	19.7	73.9	0.450	21.1	34.4
University Ave (N)	0.400	28.4	28.4	0.801	28.4	64.6
Chung Wah Tce (W)	0.751	36.6	38.3	0.828	35.2	97.1

Overall for the Morning peak hour in the post-development scenario the Level of Service for the morning peak hour is LOS C and for the evening peak hour the average Level of Service is LOS C.

7.2.7 Chung Wah Terrace / The Boulevard

The existing Chung Wah Terrace / The Boulevard intersection is a give way priority controlled intersection with seagull turn lanes in the median.

As per the 2016 analysis and advice from City of Palmerston that the intersection is to be re-configured in line with the upgrade of the Boulevard to a signalized intersection, the analysis has been based on the new arrangement with construction being completed by 2016. Figure 7.11 shows the Sidra model used in the analysis.

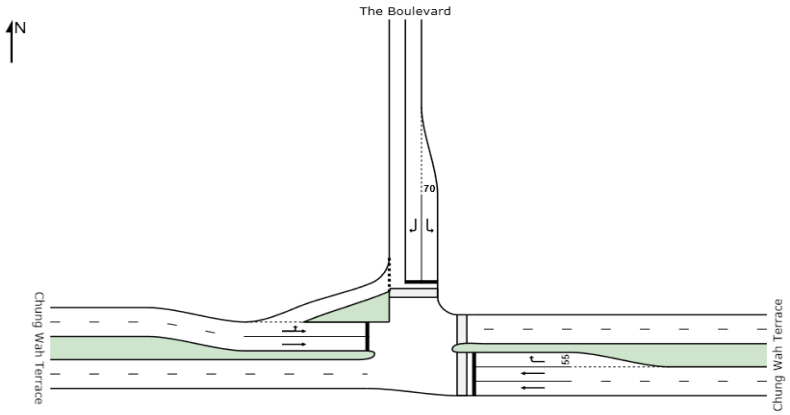


Figure 7-11 Sidra Model Chung Wah Terrace / The Boulevard Intersection.

The performance summaries of the Chung Wah Terrace / The Boulevard intersection at 2026 are presented in Table 7.7.

Table 7.7 Chung Wah Terrace / The Boulevard Performance Summary – 2026

Approach	Morning Peak			Evening Peak		
	Post Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
Chung Wah Tce (E)	0.721	10.2	73.8	0.836	13.3	58.4
The Boulevard (N)	0.244	46.0	18.5	0.734	61.1	62.5
Chung Wah Tce (W)	0.321	8.4	37.1	0.617	6.4	90.7

Overall for the Morning peak hour in the post-development scenario the Level of Service for the morning peak hour is LOS B and for the evening peak hour the average Level of Service is LOS B.

7.2.8 Roystonea Avenue / The Boulevard

The existing Roystonea Avenue / The Boulevard intersection is a give way priority controlled intersection with seagull turn lanes in the median.

Advice from City of Palmerston indicates that the intersection is to be re-configured in line with the upgrade of the Boulevard to a signalized intersection. For 2026 the analysis has been based on the new arrangement with construction being completed by 2016. Figure 7.12 shows the Sidra model used in the analysis. The model has adjusted eastbound lanes in Roystonea for the three lane upgrade.

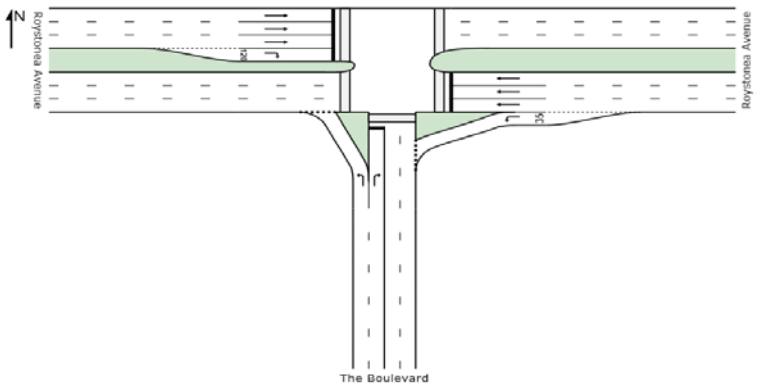


Figure 7-12 Sidra Model Roystonea Avenue / The Boulevard Intersection.

The performance summaries of the Roystonea Avenue / The Boulevard intersection at 2026 are presented in Table 7.8.

Table 7.8 Roystonea Avenue / The Boulevard Performance Summary – 2026

Approach	Morning Peak			Evening Peak		
	Post Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
The Boulevard (S)	0.244	21.4	22.6	0.283	23.5	26.7
Roystonea Ave (E)	0.462	6.7	66.2	0.166	4.2	14.2
Roystonea Ave (W)	0.492	12.2	43.8	0.431	7.6	49.6

Overall for the Morning peak hour in the post-development scenario the Level of Service for the morning peak hour is LOS A and for the evening peak hour the average Level of Service is LOS A.

7.2.9 Temple Terrace / Maluka Drive

The Temple Terrace / Maluka Drive intersection is currently a signalized intersection with four (4) approaches. The northern approach to the intersection is an access point for the Palmerston Shopping Centre. For 2026 separate turn lanes were added to accommodate the additional traffic using the intersection. A separate right turn lane from the shopping centre into Temple Terrace and left turn lane into the shopping centre from Temple Terrace. The Sidra model used for the analysis of the intersection is shown in Figure 7.13.

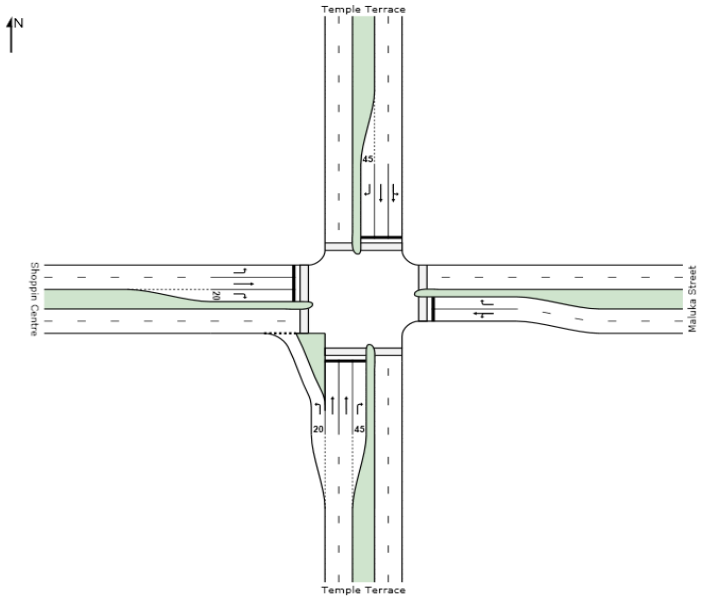


Figure 7-13 Sidra Model Temple Terrace / Maluka Drive Intersection.

The performance summaries of the Temple Terrace / Maluka Drive intersection at 2026 are presented in Table 7.9.

Table 7.9 Temple Terrace / Maluka Drive Performance Summary – 2026

Approach	Morning Peak			Evening Peak		
	Post Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
Temple Tce (S)	0.885	32.2	163.3	0.538	24.2	50.1
Maluka Dr (E)	0.869	47.4	64.3	0.888	52.9	73.2
Temple Terrace (N)	0.569	36.4	71.3	0.805	35.9	166.3
Shopping Centre (W)	0.143	33.1	15.4	0.377	41.7	43.8

Overall for the Morning peak hour in the post-development scenario the Level of Service is LOS D and for the evening peak hour the average Level of Service is LOS D.

7.2.10 Temple Terrace / Roystonea Avenue

The Temple Terrace / Roystonea Avenue intersection is currently a traffic signal controlled intersection with Roystonea Avenue as the major road. For the 2026 case the two lanes in each direction for Temple Terrace north approach were added, plus the three east bound lanes in Roystonea Ave and two lanes each direction in Roystonea east of the intersection and two right turn lanes at the eastern approach in Roystonea travelling into Temple Terrace north. The Sidra model used for the analysis of the intersection is shown in Figure 7.14.

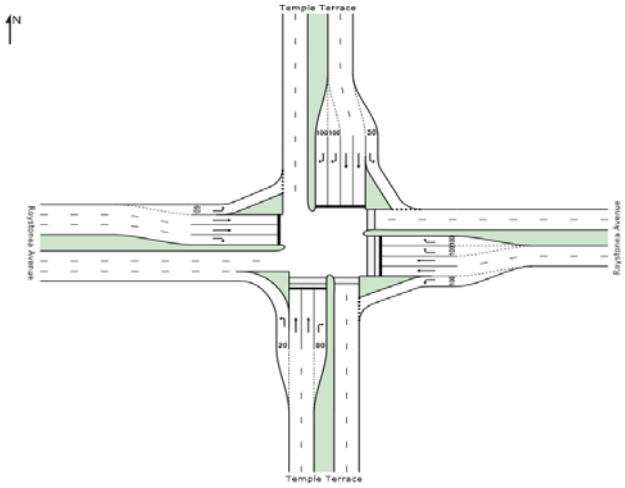


Figure 7-14 Sidra Model Temple Terrace / Roystonea Avenue Intersection.

The performance summaries of the Temple Terrace / Roystonea Avenue intersection at 2026 are presented in Table 7.10.

Table 7.10 Temple Terrace / Roystonea Avenue Performance Summary – 2026

Approach	Morning Peak			Evening Peak		
	Post Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
Temple Tce (S)	0.825	19.5	96.6	0.924	37.0	121.9
Roystonea Ave (E)	0.843	38.1	96.1	0.530	39.6	48.5
Temple Tce (N)	0.743	37.1	49.5	0.915	54.4	177.4
Roystonea Ave (W)	0.424	27.0	48.3	0.775	27.2	186.3

Overall for the Morning peak hour in the post-development scenario the Level of Service for the morning peak hour is LOS C and for the evening peak hour the average Level of Service is LOS F.

8. Traffic Operational Assessment – 2046

8.1 Trip Distribution and Intersection Capacity Assessment 2046

This section of the report addresses the operation of the intersections and surrounding road network which will support development trips, giving consideration to intersection capacity at the intersections assessed for the 2046 design year.

Trip distributions for year 2046 are shown in Figures:

- Figure 8.1 2046 AM Background Traffic Trip Distribution
- Figure 8.2 2046 PM Background Traffic Trip Distribution
- Figure 8.3 2046 AM Post Development Traffic Trip Distribution
- Figure 8.4 2046 PM Post Development Traffic Trip Distribution

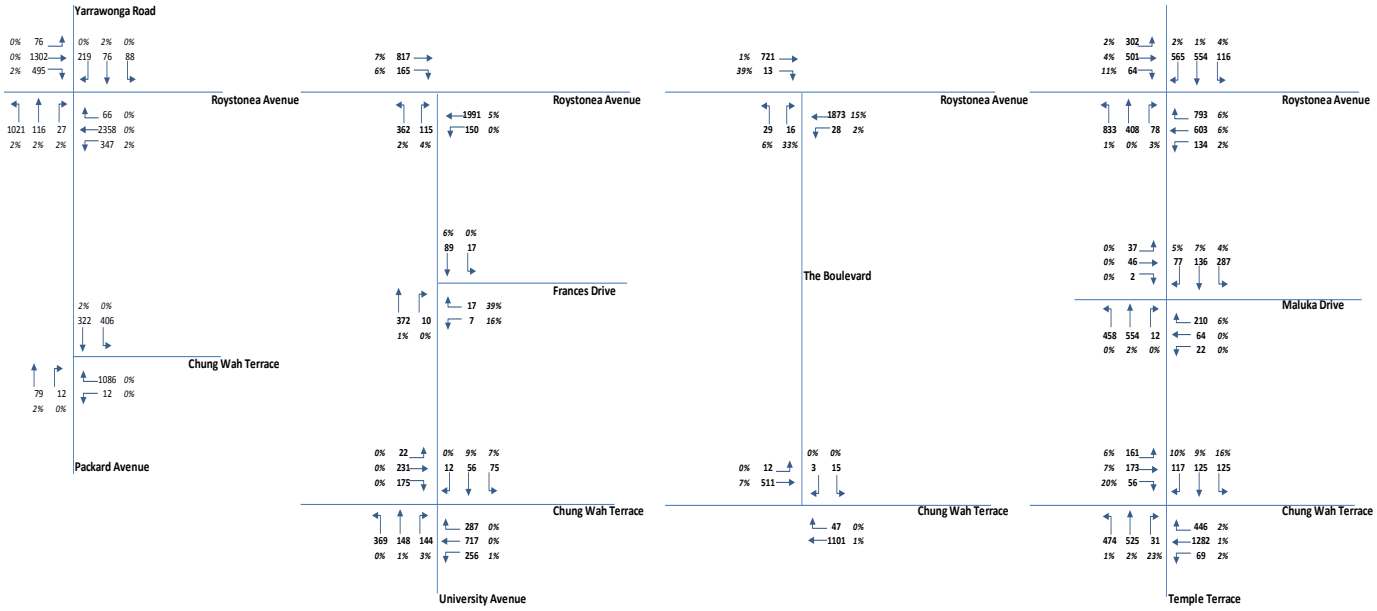


Figure 8-1 2046 AM Background Traffic Trip Distribution

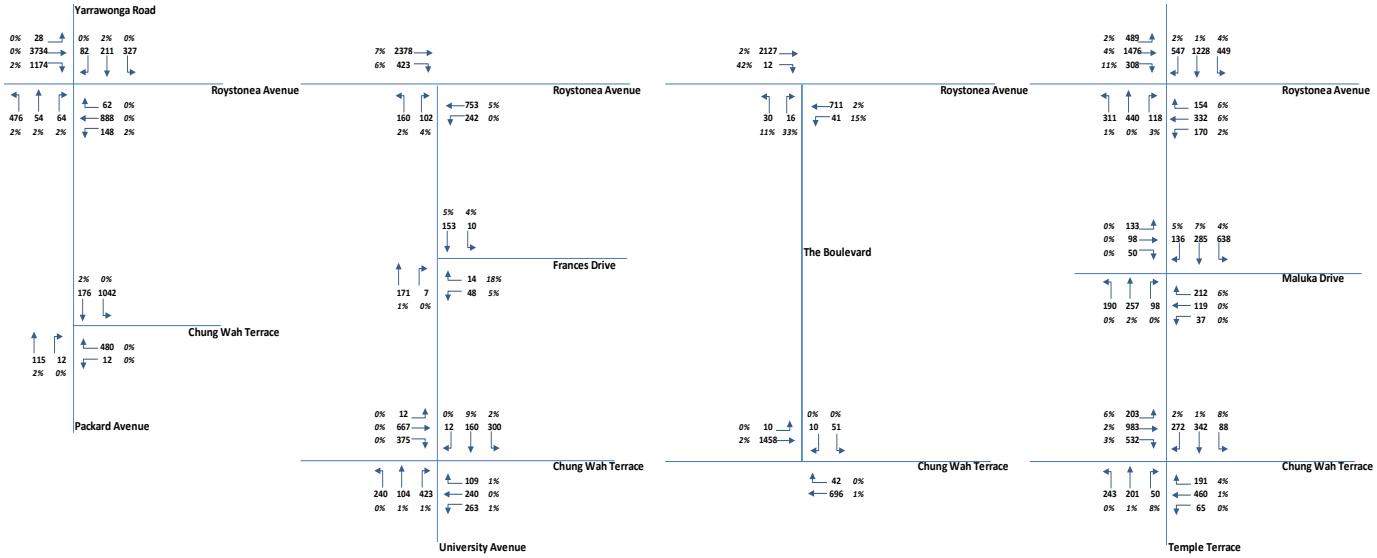


Figure 8-2 2046 PM Background Traffic Trip Distribution

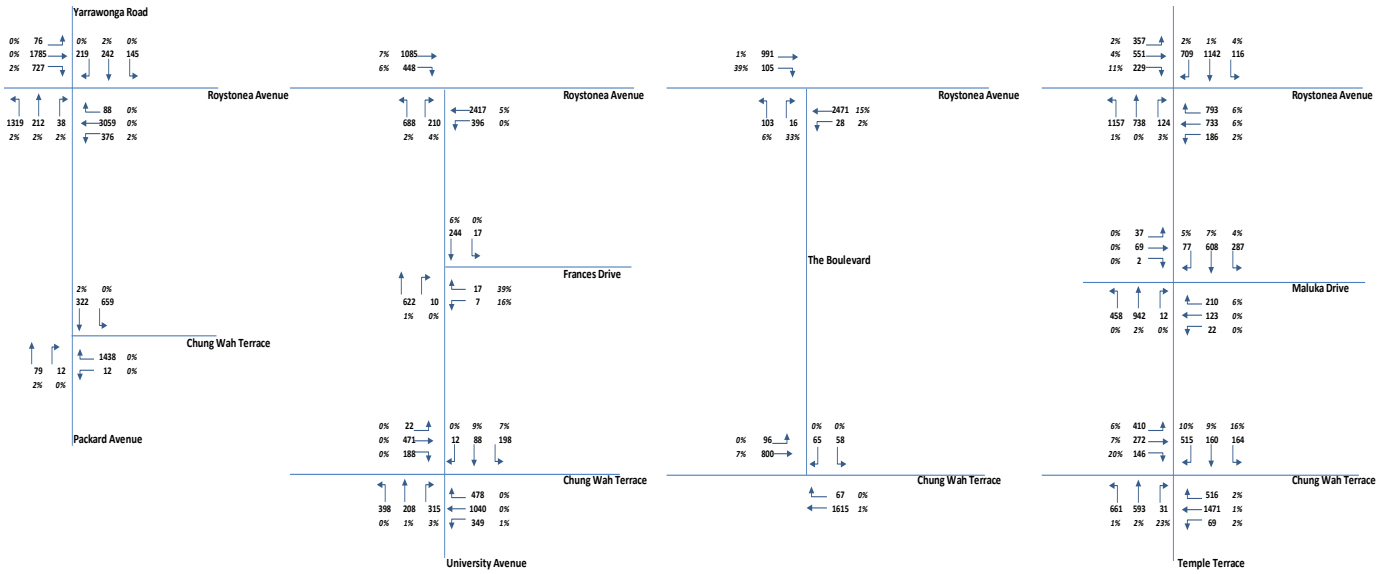


Figure 8-3 2046 AM Post Development Traffic Trip Distribution

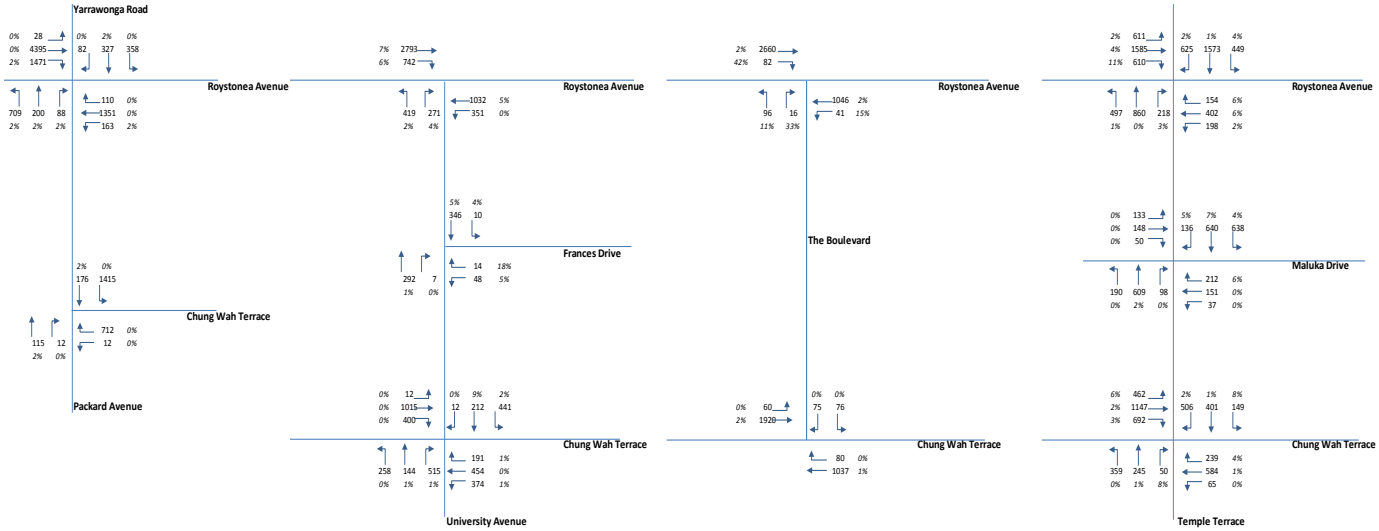


Figure 8-4 2046 PM Post Development Traffic Trip Distribution

Capacity analysis has been carried out utilizing SIDRA INTERSECTION 5.1 (SIDRA) traffic modelling software. The following intersections have been analysed using SIDRA for the Post Development scenarios at the 2046 assessment years during both the weekday morning and evening peak hour periods:

- Temple Terrace / Chung Wah Terrace;
- Temple Terrace / Maluka Drive; and
- Temple Terrace / Roystonea Avenue.
- Roystonea Avenue / The Boulevard;
- Roystonea Avenue / Chung Wah Terrace Extension / Yarrawonga Road;
- Packard Avenue Chung Wah Terrace Extension);
- Roystonea Avenue / University Avenue;
- University Avenue / Frances Drive;
- University Avenue / Chung Wah Terrace;
- Chung Wah Terrace / The Boulevard;

8.2 Intersection Capacity Assessment year 2046

This section provides a summary of the outcomes of the intersection capacity assessments for the aforementioned intersections. The performance of each intersection is detailed in this section of the report and all of the SIDRA output summaries are enclosed in Appendix D.

8.2.1 Temple Terrace / Chung Wah Terrace Intersection.

The existing dual lane roundabout with four (4) approaches and a 25 m diameter central island. Temple Terrace / Chung Wah Terrace intersection is replaced with the same as adopted for the 2026 analysis as a four leg signalized intersection for the 2046 analysis. The SIDRA model used in the analysis is shown in Figure 8.5.

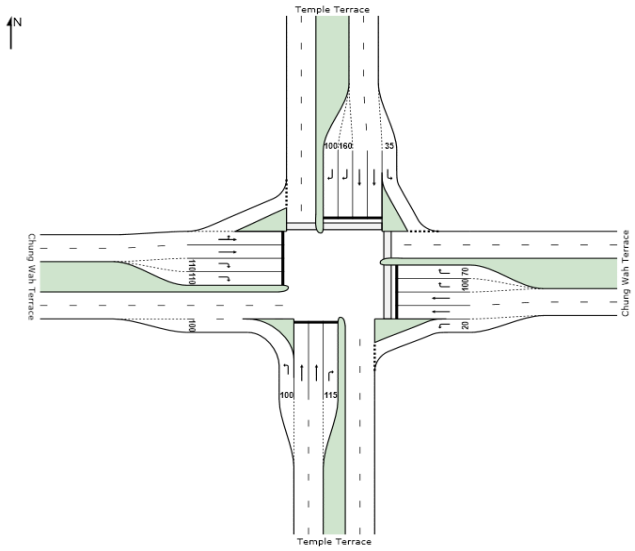


Figure 8-5 Sidra Model Layout Temple Terrace / Chung Wah Terrace Intersection.

The performance summaries at the 2016 design year both with and without the proposed development trips are presented in Table 8.1 for the Temple Terrace / Chung Wah Terrace intersection.

Table 8.1 Temple Terrace / Chung Wah Terrace Performance Summary – 2015

Approach	Morning Peak			Evening Peak		
	Post Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
Temple Tce (S)	0.898	40.3	23.6	0.915	36.6	59.5
Chung Wah Tce (E)	0.905	46.9	55.1	0.917	66.4	166.4
Temple Tce (N)	0.904	62.3	153.3	0.640	43.5	93.8
Chung Wah Tce (W)	0.898	35.4	77.6	0.803	25.5	232.4

Overall for the Morning peak hour in the post-development scenario the Level of Service for the morning peak hour is LOS D and for the evening peak hour the average Level of Service is LOS D.

The abbreviations in the tables represent the following:

- DOS is Degree of Saturation.
- Delay is the average delay in seconds for each movement for the approach.
- Queue is the average queue length in metres for each movement in the approach.

8.2.2 Roystonea Avenue / Chung Wah Terrace Extension / Yarrawonga Road

The Roystonea Avenue / Chung Wah Terrace Extension / Yarrawonga Road intersection is a signalized intersection with four (4) approaches. Additional modifications are made to the Sidra model for the 2046 case including four stand-up through lanes in each direction in Roystonea Ave. and dual right turn lanes in Yarrawonga Road north approach. The SIDRA model used in the analysis is shown in Figure 8.6.

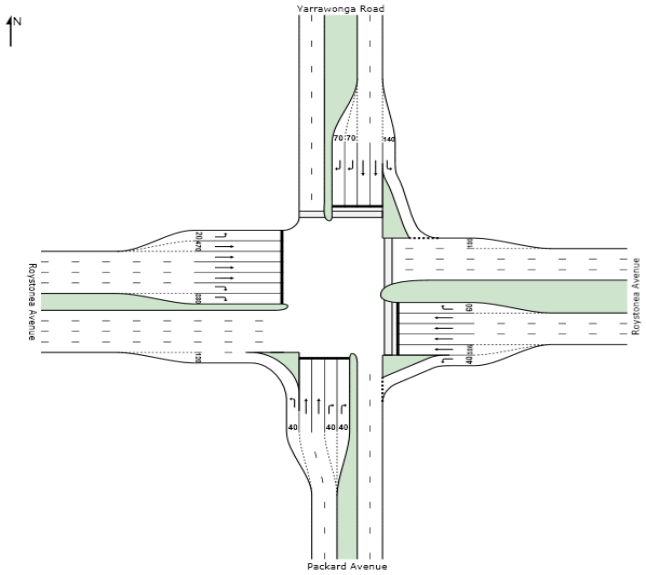


Figure 8-6 Sidra Model Layout Roystonea Avenue / Chung Wah Terrace Extension / Yarrawonga Road Intersection.

The performance summaries for the Roystonea Avenue / Chung Wah Terrace Extension / Yarrawonga Road intersection at the 2016 design years are provided in Table 8.2.

Table 8.2 Roystonea Avenue / Chung Wah Terrace Extension / Yarrawonga Road Intersection Performance Summary – 2015

Approach	Morning Peak			Evening Peak		
	Post Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
Packard Ave. Chung Wah Tce Extension (S)	0.826	18.1	59.6	0.541	23.5	45.1
Roystonea Ave (E)	0.882	29.8	370.9	0.888	49.9	155.5
Yarrawonga Rd (N)	.804	62.2	62.4	0.764	58.7	132.5
Roystonea Ave (W)	0.876	33.0	204.6	0.904	35.6	469.8

Overall for the Morning peak hour in the post-development scenario the Level of Service for the morning peak hour is LOS C and for the evening peak hour the average Level of Service is LOS D.

8.2.3 Chung Wah Terrace Extension / Packard Avenue.

The Chung Wah Terrace Extension / Packard Avenue intersection is a single lane roundabout with 23 metre diameter circle. Due to the increased traffic, the roundabout was converted to two circulating lanes for the 2046 analysis. The SIDRA model used in the analysis is shown in Figure 8.7.

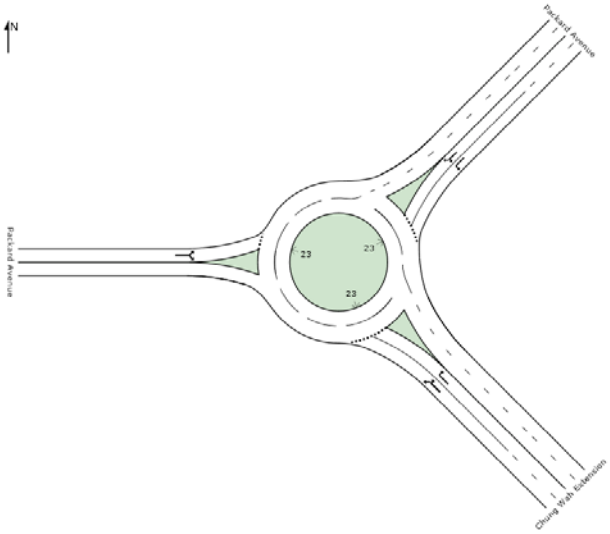


Figure 8-7 Sidra Model Layout Chung Wah Terrace Extension / Packard Avenue

This intersection has been assessed using SIDRA at the 2046 design year. The performance summaries of the intersection are provided in Table 8.3.

Table 8.3 Chung Wah Terrace Extension / Packard Avenue Performance Summary – 2046

Approach	Morning Peak			Evening Peak		
	Post Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
Chung Wah Tce Extension (S)	0.575	10.3	28.2	0.282	9.5	9.9
Packard Ave (E)	0.280	4.9	14.4	0.496	4.4	32.0
Packard Ave (W)	0.168	8.5	5.1	0.114	6.4	3.1

Overall for the Morning peak hour in the post-development scenario the Level of Service for the morning peak hour is LOS A and for the evening peak hour the average Level of Service is LOS A.

8.2.4 Roystonea Avenue / University Avenue

The Roystonea Avenue / University Avenue intersection is currently a signal -controlled intersection with Roystonea Avenue as the major road. No changes were made to the model for the 2046 analysis for the additional traffic volume using the intersection. The SIDRA model used in the analysis is shown in Figure 8.8.

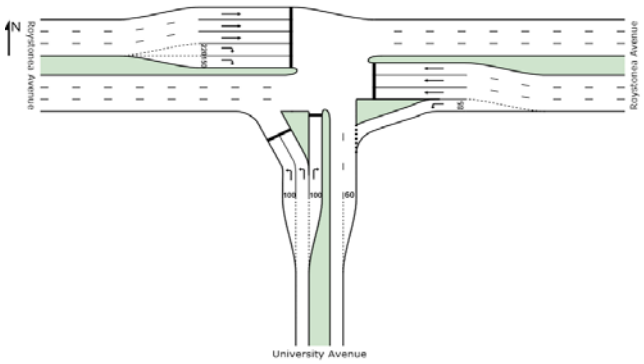


Figure 8-8 Sidra Model Layout Roystonea Ave / University Ave Intersection.

The performance summaries of the Roystonea Avenue / University Avenue intersection at 2046 are presented in Table 8.4.

Table 8.4 Roystonea Avenue / University Avenue Performance Summary – 2046

Approach	Morning Peak			Evening Peak		
	Post Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
University Ave S (S)	0.914	42.8	99.8	0.924	30.6	99.6
Roystonea Ave (E)	0.895	33.8	360.6	0.857	33.7	111.3
Roystonea Ave (W)	0.907	17.8	146.0	0.751	7.3	125.0

Overall for the Morning peak hour in the post-development scenario the Level of Service for the morning peak hour is LOS C and for the evening peak hour the average Level of Service is LOS B.

8.2.5 University Avenue / Frances Drive

The University Avenue / Frances Drive intersection is single lane entry into the CBD area with University Avenue as the major road. The SIDRA model used in the analysis is shown in Figure 8.9 which is the same as the 2026 model.

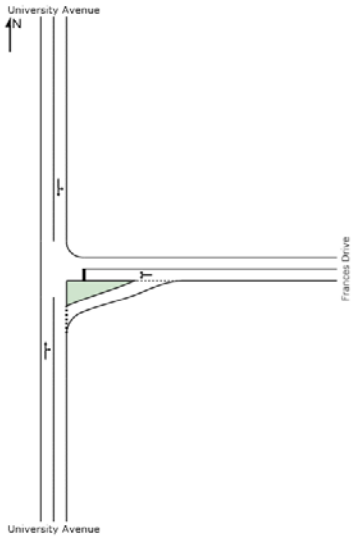


Figure 8-9 Sidra Model Layout University Ave / Frances Drive Intersection.

The performance summaries of the University Avenue / Frances Drive intersection at 2046 are presented in Table 8.5.

Table 8.5 University Avenue / Frances Drive Performance Summary – 2046

Approach	Morning Peak			Evening Peak		
	Post Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
University Ave (S)	0.328	1.4	18.7	0.156	1.6	8.0
Frances Drive (E)	0.074	14.7	2.0	0.071	7.8	1.9
University Ave (N)	0.139	0.4	0.0	0.189	0.2	0.0

Overall Level of Service LOS A achieved for the combined movements.

8.2.6 University Avenue / Chung Wah Terrace Intersection

The University Avenue / Chung Wah Terrace intersection is a dual lane signalized intersection. The SIDRA model used in the analysis is shown in Figure 8.10.

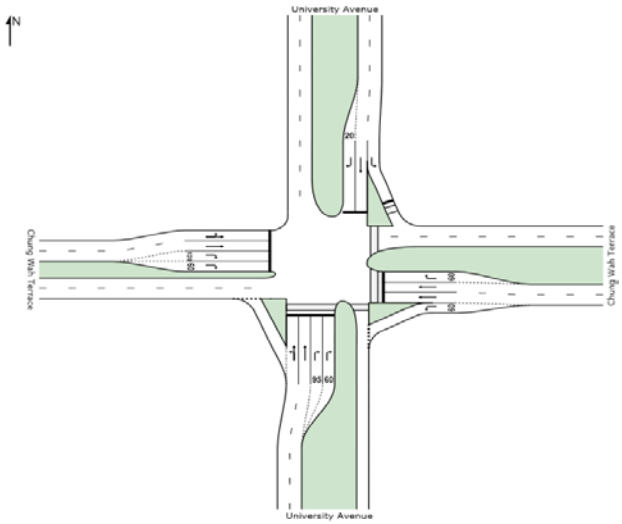


Figure 8-10 Sidra Model Layout University Ave / Chung Wah Terrace Intersection.

The performance summaries of the University Avenue / Chung Wah Terrace intersection at 2046 are presented in Table 8.6.

Table 8.6 University Avenue / Chung Wah Terrace Performance Summary – 2046

Approach	Morning Peak			Evening Peak		
	Post Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
University Ave (S)	0.758	24.8	69.9	0.884	39.3	98.4
Chung Wah Tce (E)	0.885	26.4	138.8	0.895	39.2	82.1
University Ave (N)	0.557	31.3	42.3	0.865	43.8	138.1
Chung Wah Tce (W)	0.844	38.7	64.8	0.895	33.4	158.5

Overall for the Morning peak hour in the post-development scenario the Level of Service for the morning peak hour is LOS C and for the evening peak hour the average Level of Service is LOS D.

8.2.7 Chung Wah Terrace / The Boulevard

The existing Chung Wah Terrace / The Boulevard intersection is a give way priority controlled intersection with seagull turn lanes in the median.

No change to this intersection which is the same as the advice from City of Palmerston that the intersection is to be re-configured in line with the upgrade of the Boulevard to a signalized intersection. The analysis has been based on the new arrangement with construction being completed by 2016. Figure 8.11 shows the Sidra model used in the analysis for 2046.

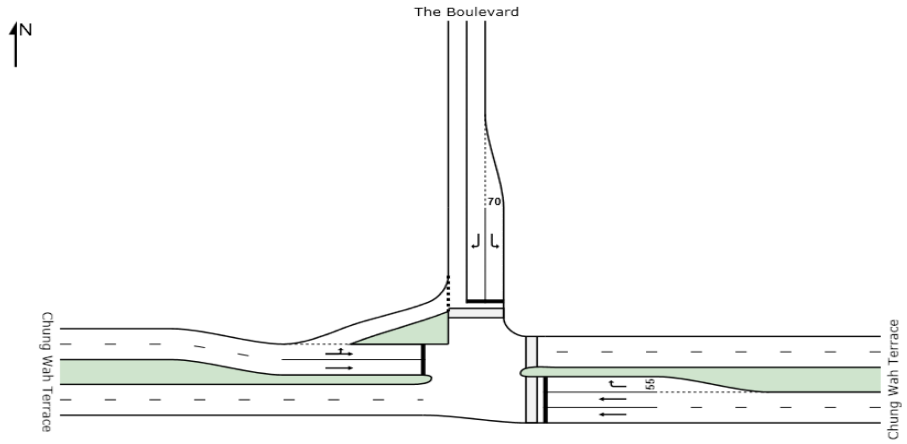


Figure 8-11 Sidra Model Chung Wah Terrace / The Boulevard Intersection.

The performance summaries of the Chung Wah Terrace / The Boulevard intersection at 2046 are presented in Table 8.7.

Table 8.7 Chung Wah Terrace / The Boulevard Performance Summary – 2046

Approach	Morning Peak			Evening Peak		
	Post Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
Chung Wah Tce (E)	0.531	8.4	123.7	0.646	8.7	59.1
The Boulevard (N)	0.363	68.8	29.0	0.472	78.1	38.3
Chung Wah Tce (W)	0.345	2.8	22.5	0.709	1.6	50.4

Overall for the Morning peak hour in the post-development scenario the Level of Service for the morning peak hour is LOS A and for the evening peak hour the average Level of Service is LOS A.

8.2.8 Roystonea Avenue / The Boulevard

The existing Roystonea Avenue / The Boulevard intersection is a give way priority controlled intersection with seagull turn lanes in the median.

No change adopted for the Sidra model for the 2046 analysis which is the same as the advice from City of Palmerston that the intersection is to be re-configured in line with the upgrade of the Boulevard to a signalized intersection. The analysis has been based on the new arrangement with construction being completed by 2016. Figure 8.12 shows the Sidra model used in the analysis.

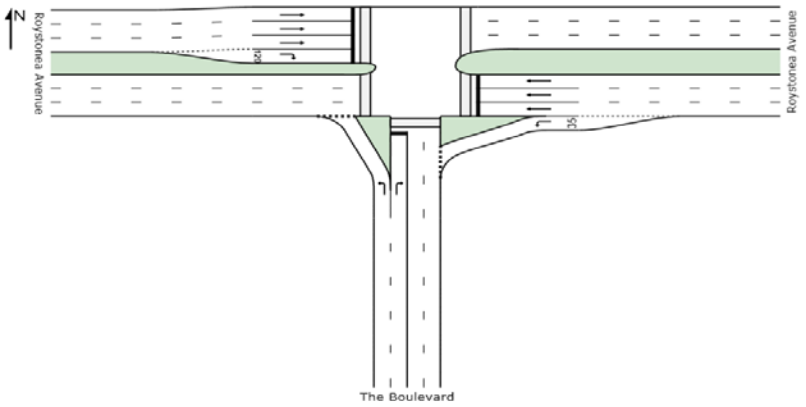


Figure 8-12 Sidra Model Roystonea Avenue / The Boulevard Intersection.

The performance summaries of the Roystonea Avenue / The Boulevard intersection at 2046 are presented in Table 8.8.

Table 8.8 Roystonea Avenue / The Boulevard Performance Summary – 2046

Approach	Morning Peak			Evening Peak		
	Post Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
The Boulevard (S)	0.198	21.1	33.8	0.124	14.8	9.8
Roystonea Ave (E)	0.694	5.7	127.8	0.261	2.7	17.6
Roystonea Ave (W)	0.677	10.9	71.7	0.664	6.2	88.5

Overall for the Morning peak hour in the post-development scenario the Level of Service for the morning peak hour is LOS A and for the evening peak hour the average Level of Service is LOS A.

8.2.9 Temple Terrace / Maluka Drive

The Temple Terrace / Maluka Drive intersection is currently a signalized intersection with four (4) approaches. The same configuration has been adopted for the 2046 analysis as used for the 2026 case. The Sidra model used for the analysis of the intersection is shown in Figure 8.13.

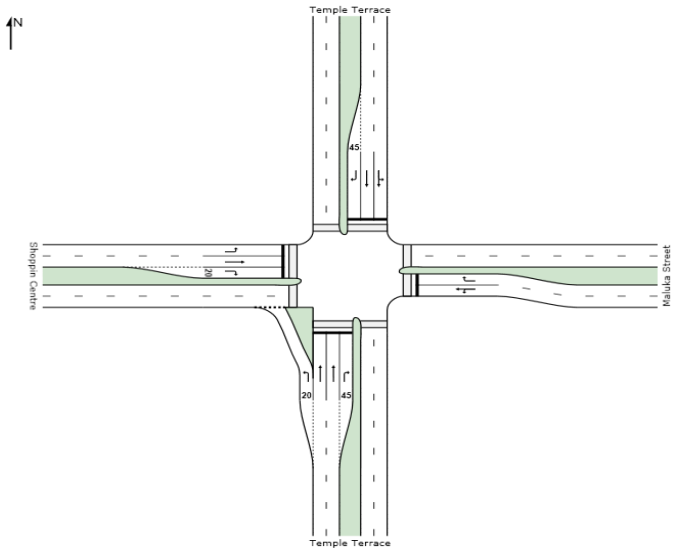


Figure 8-13 Sidra Model Temple Terrace / Maluka Drive Intersection

The performance summaries of the Temple Terrace / Maluka Drive intersection at 2046 are presented in Table 8.9.

Table 8.9 Temple Terrace / Maluka Drive Performance Summary – 2046

Approach	Morning Peak			Evening Peak		
	Post Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
Temple Tce (S)	0.886	34.6	283.9	0.905	51.3	166.6
Maluka Dr (E)	0.904	62.7	102.6	0.893	63.3	105.7
Temple Terrace (N)	0.606	27.9	126.8	0.868	37.5	268.7
Shopping Centre (W)	0.194	45.0	23.1	0.490	51.6	54.9

Overall for the Morning peak hour in the post-development scenario the Level of Service for the morning peak hour is LOS D and for the evening peak hour the average Level of Service is LOS D.

8.2.10 Temple Terrace / Roystonea Avenue

The Temple Terrace / Roystonea Avenue intersection is currently a traffic signal controlled intersection with Roystonea Avenue as the major road. The Sidra model used for the analysis in 2046 which is a further upgrade from 2026 intersection is shown in Figure 8.14. The alterations included:

- Three lanes in either direction in Temple terrace at the northern approach.
- Three through lanes in either direction in Roystonea Avenue.
- Three through approach lanes in Temple Terrace south approach and dual right turn into Roystonea. Avenue east approach.

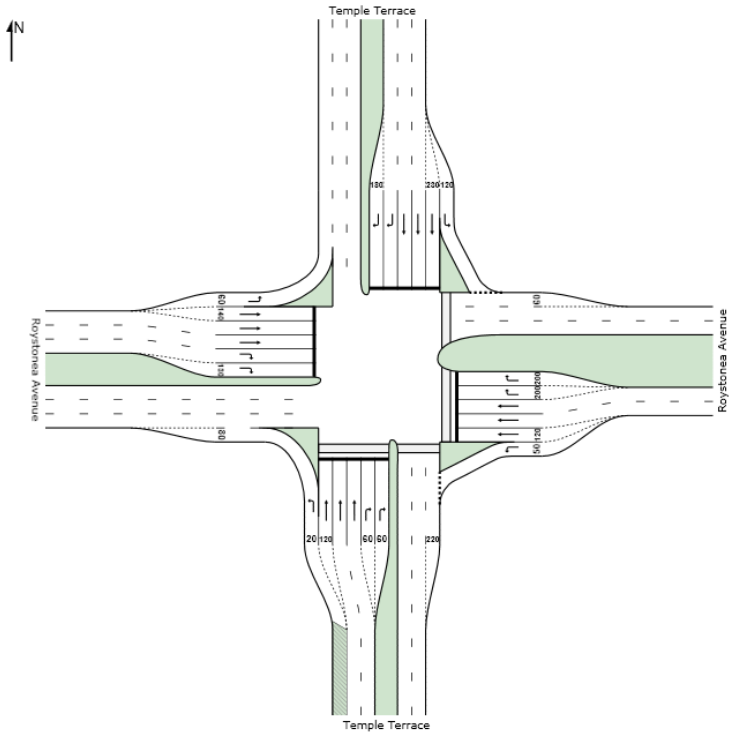


Figure 8-14 Sidra Model Temple Terrace /Roystonea Avenue Intersection

The performance summaries of the Temple Terrace / Roystonea Avenue intersection at 2046 are presented in Table 8.10.

Table 8.10 Temple Terrace / Roystonea Avenue Performance Summary – 2046

Approach	Morning Peak			Evening Peak		
	Post Development			Post Development		
	DOS (%)	Delay (sec)	Queue (m)	DOS (%)	Delay (sec)	Queue (m)
Temple Tce (S)	0.936	31.7	150.1	0.931	50.5	189.2
Roystonea Ave (E)	0.914	59.0	199.0	0.901	51.5	56.7
Temple Tce (N)	0.904	60.4	176.8	0.926	52.5	228.6
Roystonea Ave (W)	0.758	35.8	90.8	0.935	41.28	336.5

Overall for the Morning peak hour in the post-development scenario the Level of Service for the morning peak hour is LOS D and for the evening peak hour the average Level of Service is LOS D.

9. Road Capacity Analysis

9.1 Traffic projection / Road Capacity Analysis

Road capacity analysis has been carried out for key road links within the assessed road network at the 2016, 2026 and 2046 design years. Mid-block capacities have been determined in compliance with Austroads *Guide to Traffic Management Part 3: Traffic Studies and Analysis* Section 5.2.1. According to Austroads, the following typical mid-block capacities for urban roads are as presented in Table 9.1.

Table 9.1 2016 Road Capacity Analysis – Roystonea Avenue

Type of lane	One-way mid-block capacity (veh/h)
Median or inner lane	
Divided road	1000
Undivided road	900
Middle lane (of a 3 lane carriageway)	
Divided road	900
Undivided road	1000
Kerb lane	
Adjacent to parking lane	900
Occasional parked vehicles	600
Clearway conditions	900

According to Austroads, mid-block traffic volumes may increase to up to 1,400 vehicles per lane per hour where the following conditions exist:

- Adequate flaring at major upstream intersections;
- Uninterrupted flow from a wider carriageway upstream of an intersection approach and flowing at capacity;
- Control or absence of crossing or entering traffic at minor intersections by major road priority controls;
- Control or absence of parking;
- Control or absence of right turns by banning turning at difficult intersections;
- High volume lows of traffic from upstream intersections during more than one phase of a signal cycle; and
- Good co-ordination of traffic signals along the route.

The road links analysed in this section of the report are:

- Roystonea Avenue;
- Chung Wah Terrace;
- University Avenue;

- The Boulevard;
- Temple Terrace; and
- Maluka Drive.

9.2 Roystonea Avenue

Roystonea Avenue has been assessed from west of Yarrawonga Road through to east of Temple Terrace. Due to the existing and proposed road conditions, mid-block road traffic volumes of 1,400 per lane per hour has been adopted for Roystonea Avenue. Currently, between the Stuart Highway and Temple Terrace, Roystonea Avenue has three (3) lanes westbound and two (2) lanes eastbound. West of Temple Terrace, Roystonea Avenue reduces to an undivided two (2) lane carriageway. Figure 9.1 shows Roystonea Avenue at the University Avenue Intersection showing the three lanes westbound and the two lanes in eastbound.

Figure 9-1 Roystonea Avenue

A summary of the 2016 road capacity analysis, both with and without the proposed Masterplan development, is presented in Table 9.2.

Table 9.2 2016 Road Capacity Analysis – Roystonea Avenue

	2016 Background						2016 Post Development					
	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes
Roystonea Avenue												
West of Yarrawonga Road												
Eastbound	2	2800	788	2095	N	2	2	2800	824	2146	N	2
Westbound	3	4200	2155	879	N	2	3	4200	2210	912	N	2
East of Yarrawonga Road												
Eastbound	2	2800	775	2244	N	2	2	2800	813	2299	N	2
Westbound	3	4200	2260	928	N	2	3	4200	2321	965	N	2
East of University Avenue												
Eastbound	2	2800	815	2247	N	2	2	2800	853	2306	N	2
Westbound	3	4200	2173	890	N	2	3	4200	2234	929	N	2
East of The Boulevard												
Eastbound	2	2800	459	1232	N	1	2	2800	479	1267	N	1
Westbound	3	4200	1168	534	N	1	3	4200	1208	557	N	1
East of Temple Terrace												
Eastbound	1	1400	478	1255	N	1	1	1400	494	1286	N	1
Westbound	1	1400	1125	582	N	1	1	1400	1161	602	N	1

As demonstrated, the existing lane configuration of Roystonea Avenue is expected to cater for 2016 traffic volumes.

A summary of the 2026 and 2046 road capacity analysis with the proposed Masterplan development carried out, is presented in Table 9.3.

Table 9.3 2026 & 2046 Road Capacity Analysis – Roystonea Avenue

	2026 Post Development With Chung Wah Ext.						2046 Post Development With Chung Wah Ext.					
	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes
Roystonea Avenue												
West of Yarrawonga Road												
Eastbound	2	2800	1610	3816	Y	3	2	2800	2588	5893	Y	5
Westbound	3	4200	3063	1377	N	3	3	4200	4597	2143	Y	4
East of Yarrawonga Road												
Eastbound	2	2800	1205	3111	Y	3	2	2800	1968	4841	Y	4
Westbound	3	4200	2253	991	N	2	3	4200	3523	1625	N	3
East of University Avenue												
Eastbound	2	2800	919	2258	N	2	2	2800	1533	3535	Y	3
Westbound	3	4200	2024	896	N	2	3	4200	3105	1452	N	3
East of The Boulevard												
Eastbound	2	2800	692	1746	N	2	2	2800	1096	2742	N	2
Westbound	3	4200	1652	750	N	2	3	4200	2574	1142	N	2
East of Temple Terrace												
Eastbound	1	1400	709	1776	Y	2	1	1400	1137	2806	Y	3
Westbound	1	1400	1622	883	Y	2	1	1400	2599	1524	Y	2

It is understood that there is intention to upgrade Roystonea Avenue to a six (6) lane dual carriageway west of Temple Terrace in the future. As demonstrated above, the need to upgrade Roystonea Avenue to three (3) lanes eastbound between the Stuart Highway (west of Yarrawonga Road) and University Avenue is triggered at 2026. Also, at this time, east of Temple Terrace, mid-block traffic volumes on Roystonea Avenue require an additional lane in each direction.

By 2046, the road capacity assessment demonstrates that further capacity is required on Roystonea Avenue. The Table above states that due to the assumptions adopted, five (5) lanes are required eastbound on Roystonea Avenue west of Yarrawonga Road to cater for the expected demand. However, estimating traffic demands over 30 years in the future involves many assumptions relating to population growth, travel trends and transport network development. It is therefore recommended that instead, by 2046, Roystonea Avenue provides:

- West of Yarrawonga Road: four (4) lanes in either direction;
- Between Yarrawonga Road and Temple Terrace: three (3) lanes in either direction; and
- East of Temple Terrace: two (2) lanes in either direction.

All improvements recommended for the 2046 horizon year should be verified by further detailed traffic monitoring prior to implementation. The 32 year design horizon is for analysis and planning purposes only, and actual timing of improvements will depend on many factors that cannot be accurately predicted in the long term.

9.3 Chung Wah Terrace

Chung Wah Terrace has been assessed between Packard Avenue (Chung Wah Terrace Extension) and to the east of Temple Terrace. Chung Wah Terrace is currently a four (4) lane dual carriageway road. Figure 9.2 shows the existing Chung Wah Terrace.

Figure 9-2 Chung Wah Terrace

A summary of the 2016 assessment based on the mid-block capacities presented in Table 9.1 is presented in Table 9.4. As shown, at this time the Chung Wah Terrace Extension has not been built.

Table 9.4 2016 Road Capacity Analysis – Chung Wah Terrace

	2016 Background						2016 Post Development					
	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes
Chung Wah Terrace Ext.												
West of Chung Wah Terrace												
Northbound												
Southbound												
Chung Wah Terrace												
East of University Avenue												
Eastbound	2	1900	335	1031	N	2	2	1900	363	1057	N	2
Westbound	2	1900	934	454	N	1	2	1900	966	473	N	1
East of The Boulevard												
Eastbound	2	1900	437	1127	N	2	2	1900	458	1145	N	2
Westbound	2	1900	829	562	N	1	2	1900	857	579	N	1
East of Temple Terrace												
Eastbound	2	1900	243	832	N	1	2	1900	254	847	N	1
Westbound	2	1900	1333	531	N	2	2	1900	1354	542	N	2

The results demonstrate that the existing configuration of two (2) lanes in either direction caters for the mid-block traffic volumes expected at 2016.

A summary of the 2026 and 2046 road capacity analysis of Chung Wah Terrace is presented in Table 9.5.

Table 9.5 2026 & 2046 Road Capacity Analysis – Chung Wah Terrace

	2026 Post Development With Chung Wah Ext.						2046 Post Development With Chung Wah Ext.					
	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes
Chung Wah Terrace Ext.												
West of Chung Wah Terrace												
Northbound	2	1900	468	1063	N	2	2	1900	672	1427	N	2
Southbound	2	1900	1101	530	N	2	2	1900	1450	724	N	2
Chung Wah Terrace												
East of University Avenue												
Eastbound	2	1900	693	1483	N	2	2	1900	984	1970	Y	3
Westbound	2	1900	1412	756	N	2	2	1900	1866	1019	N	2
East of The Boulevard												
Eastbound	2	1900	686	1526	N	2	2	1900	896	1980	Y	3
Westbound	2	1900	1248	850	N	2	2	1900	1680	1112	N	2
East of Temple Terrace												
Eastbound	2	1900	376	1102	N	2	2	1900	467	1347	N	2
Westbound	2	1900	1687	725	N	2	2	1900	2056	888	Y	3

The results demonstrate that at 2046, increased capacity is required east of University Avenue. Due to the conditions of the Chung Wah Terrace road environment, it is considered that an increase in capacity up 1,200 vph can be catered for. This slight increase above the nominal 900 vph allows the existing lane configuration to provide adequate mid-block capacity over the design horizon.

The mid-block capacity at the 2046 horizon year should be verified by further detailed traffic monitoring prior to implementation. The 32 year design horizon is for analysis and planning purposes only and actual timing of improvements will depend on many factors that cannot be accurately predicted in the long term.

The assessment also demonstrates that in order to provide adequate road link capacity for the Chung Wah Terrace Extension, two (2) lanes in either direction should be provided.

9.4 University Avenue

University Avenue has been assessed between Roystonea Avenue and south of Chung Wah Terrace. University Avenue is currently a four (4) lane dual carriageway. A summary of the 2016 road capacity analysis, with and without the proposed Masterplan development, is presented in Table 9.6.

Table 9.6 2016 Road Capacity Analysis – University Avenue

	2016 Background						2016 Post Development					
	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes
University Avenue												
South of Roystonea Avenue												
Northbound	2	1900	1160	550	N	2	2	1900	1193	575	N	2
Southbound	2	1900	447	1067	N	2	2	1900	477	1101	N	2
South of Frances Drive												
Northbound	2	1900	1127	514	N	2	2	1900	1159	534	N	2
Southbound	2	1900	398	1109	N	2	2	1900	418	1140	N	2
South of Chung Wah Terrace												
Northbound	2	1900	491	569	N	1	2	1900	509	579	N	1
Southbound	2	1900	361	592	N	1	2	1900	371	605	N	1

The results demonstrate that the existing lane configuration of University Avenue is able to cater for the 2016 mid-block road traffic volumes.

At 2026, it is assumed that the Chung Wah Extension has been constructed. The introduction of this additional connection to Roystonea Avenue, is expected to reduce the traffic volumes considerably on University Avenue. A summary of the 2026 and 2046 road capacity analysis is presented in Table 9.7.

Table 9.7 2026 & 2046 Road Capacity Analysis – University Avenue

	2026 Post Development With Chung Wah Ext.						2046 Post Development With Chung Wah Ext.					
	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes
University Avenue												
South of Roystonea Avenue												
Northbound	2	1900	591	376	N	1	2	1900	898	691	N	1
Southbound	2	1900	422	636	N	1	2	1900	844	1093	N	2
South of Frances Drive												
Northbound	2	1900	511	250	N	1	2	1900	632	298	N	1
Southbound	2	1900	201	396	N	1	2	1900	250	394	N	1
South of Chung Wah Terrace												
Northbound	2	1900	821	787	N	1	2	1900	921	916	N	1
Southbound	2	1900	493	784	N	1	2	1900	625	986	N	1

As demonstrated, with the introduction of the Chung Wah Extension, the mid-block road traffic volumes can be catered within one (1) lane in each direction. This allows the University Avenue road links to be reduced to a two (2) lane capacity for the remainder of the design horizon.

9.5 The Boulevard

The Boulevard has been assessed between Roystonea Avenue and Chung Wah Terrace. The existing layout of The Boulevard includes one (1) lane in either direction. Figure 9.3 shows a recent photo of the Boulevard. Looking towards Chung Wah Terrace.

Figure 9-3 The Boulevard

A summary of the 2016, 2026 and 2046 road capacity analysis is presented in Table 9.8 and Table 9.9.

Table 9.8 2016 Road Capacity Analysis – The Boulevard

	2016 Background						2016 Post Development					
	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes
The Boulevard												
South of Roystonea Avenue												
Northbound	1	1000	207	215	N	1	1	1000	211	218	N	1
Southbound	1	1000	192	250	N	1	1	1000	196	254	N	1
North of Chung Wah Terrace												
Northbound	1	1000	277	242	N	1	1	1000	284	247	N	1
Southbound	1	1000	81	282	N	1	1	1000	87	288	N	1

Table 9.9 2026 & 2046 Road Capacity Analysis – The Boulevard

	2026 Post Development With Chung Wah Ext.						2046 Post Development With Chung Wah Ext.					
	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes
The Boulevard												
South of Roystonea Avenue												
Northbound	1	1000	160	160	N	1	1	1000	118	112	N	1
Southbound	1	1000	159	183	N	1	1	1000	133	123	N	1
North of Chung Wah Terrace												
Northbound	1	1000	232	197	N	1	1	1000	163	140	N	1
Southbound	1	1000	106	226	N	1	1	1000	124	151	N	1

As demonstrated, the existing two (2) lane capacity of The Boulevard is expected to cater for the mid-block traffic volumes over the design horizon.

9.6 Temple Terrace

Temple Terrace has been assessed between just north of Roystonea Avenue to south of Chung Wah Terrace. The existing configuration of Temple Terrace is three (3) lanes north of Roystonea Avenue, and four (4) lanes south of Roystonea Avenue. Temple Terrace is shown in Figure 9.4.

Figure 9-4 Temple Terrace

A summary of the road link capacity of Temple Terrace at 2016 is presented in Table 9.10.

Table 9.10 2016 Road Capacity Analysis – Temple Terrace

	2016 Background						2016 Post Development					
	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes
Temple Terrace												
North of Roystonea Avenue												
Northbound	2	1900	907	681	N	1	2	1900	920	694	N	1
Southbound	1	1000	381	686	N	1	1	1000	396	699	N	1
South of Roystonea Avenue												
Northbound	2	1900	979	645	N	1	2	1900	1020	676	N	2
Southbound	2	1900	280	642	N	1	2	1900	314	682	N	1
South of Maluka Drive												
Northbound	2	1900	760	404	N	1	2	1900	789	425	N	1
Southbound	2	1900	121	301	N	1	2	1900	140	328	N	1
South of Chung Wah Terrace												
Northbound	2	1900	764	366	N	1	2	1900	778	376	N	1
Southbound	2	1900	185	696	N	1	2	1900	194	709	N	1

As demonstrated, the 2016 mid-block traffic volumes can be catered for within the existing lane configuration of Temple Terrace.

A summary of the 2026 and 2046 road capacity analysis, with the proposed Masterplan development, is presented in Table 9.11.

Table 9.11 2026 & 2046 Road Capacity Analysis – Temple Terrace

	2026 Post Development With Chung Wah Ext.						2046 Post Development With Chung Wah Ext.					
	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes
Temple Terrace												
North of Roystonea Avenue												
Northbound	2	1900	1193	916	N	2	2	1900	1888	1625	N	2
Southbound	1	1000	706	1143	Y	2	1	1000	1967	2647	Y	3
South of Roystonea Avenue												
Northbound	2	1900	1402	988	N	2	2	1900	2020	1575	Y	3
Southbound	2	1900	682	1207	N	2	2	1900	1557	2381	Y	3
South of Maluka Drive												
Northbound	2	1900	1041	607	N	2	2	1900	1412	896	N	2
Southbound	2	1900	296	509	N	1	2	1900	633	728	N	1
South of Chung Wah Terrace												
Northbound	2	1900	1025	519	N	2	2	1900	1285	654	N	2
Southbound	2	1900	292	923	N	1	2	1900	374	1158	N	2

The results demonstrate that at 2026 additional capacity in the form of one (1) southbound lane, north of Roystonea Avenue is required. At 2046, further capacity is required between Maluka Drive and north of Roystonea Avenue. However as mentioned previously, estimating traffic demands over 30 years in the future involves many assumptions relating to population growth, travel trends and transport network development. Also, based on the restricted parking conditions and associated road environment of Temple Terrace, increased capacity above the nominal 900 vph is expected. It is therefore recommended that instead, by 2046, Temple Terrace continues to provide only two (2) lanes in either direction in this area.

All improvements recommended for the 2046 horizon year should be verified by further detailed traffic monitoring prior to implementation. The 32 year design horizon is for analysis and planning purposes only, and actual timing of improvements will depend on many factors that cannot be accurately predicted in the long term.

9.7 Maluka Drive

Maluka Drive is a two (2) lane undivided roadway east of Temple Terrace. Figure 9.5 shows Maluka Drive looking from Temple Terrace.

Figure 9-5 Maluka Drive.

A summary of the 2016, 2026 and 2046 analysis is presented in Table 9.12 and Table 9.13.

Table 9.12 2016 Road Capacity Analysis – Maluka Drive

	2016 Background						2016 Post Development					
	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes
Maluka Drive												
East of Temple Terrace												
Eastbound	1	900	278	666	N	1	1	900	280	668	N	1
Westbound	1	900	219	273	N	1	1	900	222	275	N	1

Table 9.13 2026 & 2046 Road Capacity Analysis – Maluka Drive

	2026 Post Development With Chung Wah Ext.						2046 Post Development With Chung Wah Ext.					
	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes	Existing No. Lanes	Existing Capacity (vph)	AM Peak (vph)	PM Peak (vph)	Exceed Capacity?	Required No. Lanes
Maluka Drive												
East of Temple Terrace												
Eastbound	1	900	308	735	N	1	1	900	368	883	N	1
Westbound	1	900	271	319	N	1	1	900	355	401	N	1

As demonstrated above, the existing two (2) lanes of Maluka Terrace provide sufficient capacity for the expected mid-block traffic volumes over the design horizon.

10. Pedestrians and Cyclists Provisions

10.1 Cyclist Provisions

According to Palmerston Subdivisional Guidelines (City of Palmerston, 2007), '*subdivision design is to incorporate a system of…shared pedestrian / cycle paths and on road bicycle routes connecting residential areas and open space to provide access through the subdivision and connecting with other pathway systems…'.* The Palmerston Subdivisional Guidelines (City of Palmerston, 2007) do not provide any further guidance in relation to on-road cycle routes and the typical road cross-sections provided (Standard Drawing No. DEV703-C-DWG-004/5, City of Palmerston, Palmerston Subdivisional Guidelines, 2007, app. E) do not allow for on road cycle provision.

In order to provide on road cycle lanes that meet the design requirements of *Guide to Road Design Part 3: Geometric Design (Austroads, 2009a),* it would be necessary to either widen the carriageway from the minimum widths required under the Palmerston Subdivisional Guidelines (City of Palmerston, 2007) or in the case of 'Primary Collector (Bus Route)', ban parking.

According to Austroads *Guide to Road Design Part 3: Geometric Design (2009a, pg. 68 & 72),* the absolute minimum width for an on-road dedicated cycle lane is 1.2 m however 1.5 m is desirable. An alternative option is a shared 'bicycle / car parking' lane which should be 4.0 m wide to allow for parallel parking and safe cyclist movement. This is in addition to the through traffic lanes.

Alternatively, off-road provisions could be incorporated in the verge. The minimum for a shared pedestrian / cycle path is 3.0 m (City of Palmerston, Palmerston Subdivisional Guidelines, 2007, pg. 23) however where high volumes of pedestrians or cyclists are present, or on commuter routes, the width should be increased.

It is recommended that a cycle network be developed for the City centre and surrounding roads to support active transport and support the reduction in car dependency in addition to the car parking strategy to be implemented.

10.2 Pedestrian Paths

Section 2.4 showed the existing pedestrian network throughout the City Centre. A comprehensive pedestrian network is recommended with the City centre development. City of Palmerston *(Palmerston Subdivisional Guidelines, 2007, Section 3.5.2, pg. 21-22)* determines the rationale to be applied for pedestrian footpath widths. In the City Centre '*footpaths shall be a minimum 1.5 metres wide in all roads and open space areas. Footpaths shall widen to 2.5 m minimum width in the vicinity of meeting points, schools, shops and other activity centres'*

11. Roadway / Intersection Upgrade Summary

11.1 Roadway upgrade summary

The summary of the number of lanes for each road is shown in Table 11.1.

Table 11.1 Road Lanes Summary

Road	Travel Lane Recommendation
Roystonea Avenue	
	West of Yarrawonga Road: four (4) lanes in either direction ultimately required;
	Between Yarrawonga Road and Temple Terrace: three (3) lanes in either direction; and
	East of Temple Terrace: two (2) lanes in either direction.
Chung Wah Terrace	
	Existing configuration of two (2) lanes in either direction caters for the mid-block traffic volumes expected.
	Chung Wah Terrace Extension, two (2) lanes in either direction should be provided.
University Avenue	
	The existing lane configuration of University Avenue is able to cater for the 2016 mid-block road traffic volumes.
	The introduction of the Chung Wah Extension, allows for University Avenue to be reduced to a two (2) lane capacity for the remainder of the design horizon.
The Boulevard	
	The existing two (2) lane capacity of The Boulevard is expected to cater for the mid-block traffic volumes over the design horizon.
Temple Terrace	
	The 2016 mid-block traffic volumes can be catered for within the existing lane configuration of Temple Terrace.
	Based on increased capacity above the nominal 900 vph Temple Terrace continues to provide only two (2) lanes in either direction in this area.
Maluka Drive	
	The existing two (2) lanes of Maluka Terrace provide sufficient capacity for the expected mid-block traffic volumes over the design horizon.

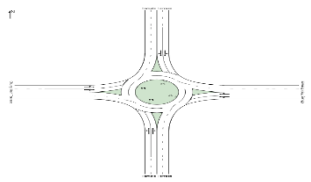
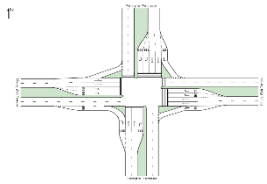
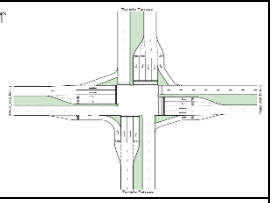
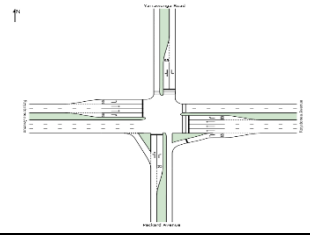
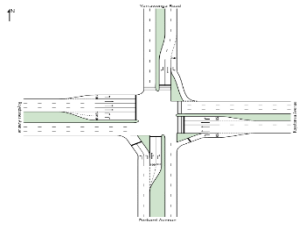
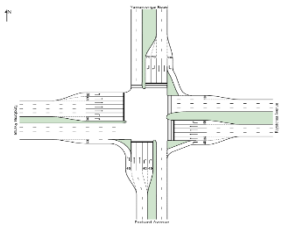
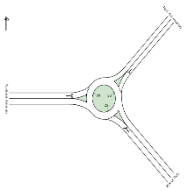
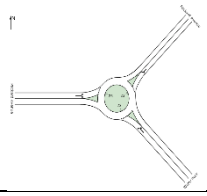
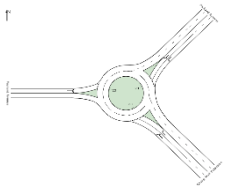
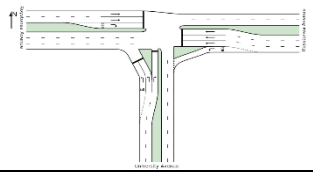
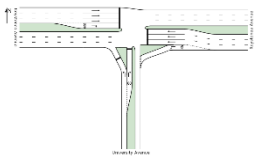
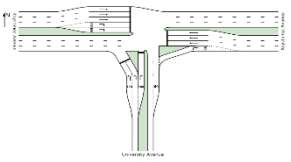
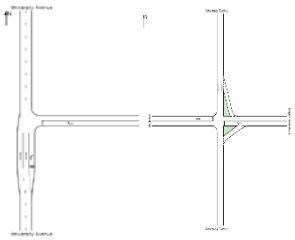
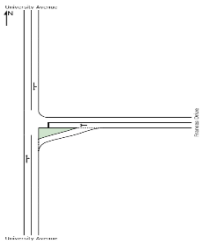
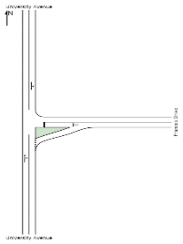
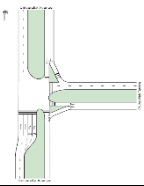
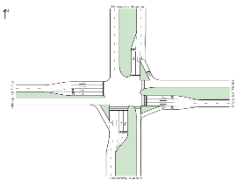
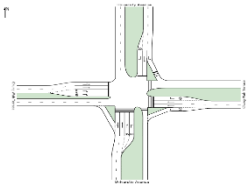
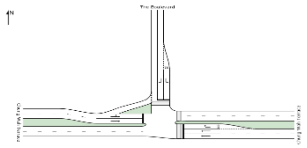
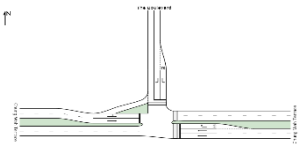
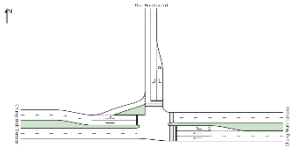
In addition to the standard lane widths, provision for on road cycle lanes and also pedestrian pathways within the verge of the urban roads is recommended. Additional road reserve width being required to accommodate the pedestrian and cyclist requirement. Also the provision of indented bus bays along all bus routes within the City Centre is recommended.

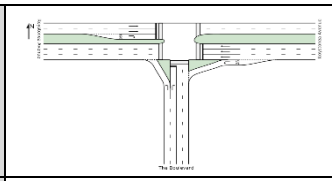
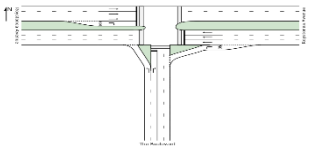
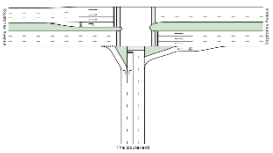
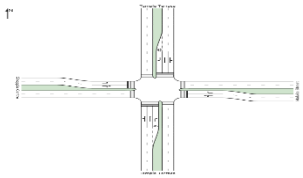
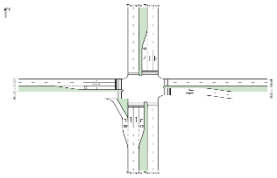
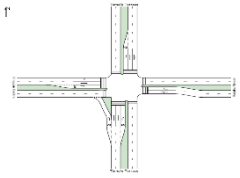
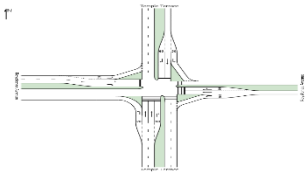
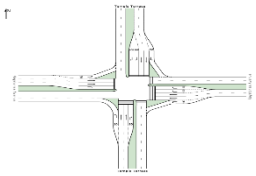
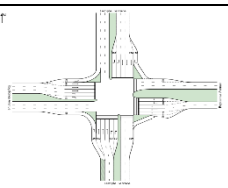
2046 lane requirements are listed for planning purposes only and have been based on the assumptions as previously detailed. Actual timing of improvements will depend on many factors that cannot be accurately predicted in the long term and should be further monitored prior to implementation.

11.2 Intersection Upgrade Summary

The report details the capacity requirement for each intersection resulting from the Sidra analysis of the trip distribution for 2016, 2026 and 2046. Table 11.2 shows the summary of each intersection analyzed.

Table 11.2 Intersection Upgrade Summary

Intersection / Year	2016	2026	2046
Temple Terrace / Chung Wah Terrace.			
Roystonea Avenue / Packard Avenue (future Chung Wah Terrace Extension) / Yarrawonga Rd.			
Packard Avenue (future Chung Wah Terrace Extension).			
Roystonea Avenue / University Avenue.			
University Avenue / Frances Drive.			
University Avenue / Chung Wah Terrace.			
Chung Wah Terrace / The Boulevard.			

Roystonea Avenue / The Boulevard.			
Temple Terrace / Maluka Drive.			
Temple Terrace / Roystonea Avenue.			

According to the *Guidelines for Assessment of Road Impacts of Developments (Department of Transport and Main Roads Queensland, 2006* traffic forecasting and associated impacts is based on a 10 year design horizon. Estimating traffic demands over 30 years in the future involves many assumptions relating to population growth, travel trends, transport network development both public and private and also, based on the restricted parking conditions to be implemented as part of the City Centre Master Plan.

All improvements recommended for the 2046 horizon year should be verified by further detailed traffic monitoring prior to implementation. The 32 year design horizon is for analysis and planning purposes only, and actual timing of improvements will depend on many factors that cannot be accurately predicted in the long term.

12. Recommendations

This report includes Traffic Survey Counts summary, Background Traffic projection, City Centre Trip Generation and Assumptions that were previously submitted in Report No: BE140072 TMP 01 as part of the traffic assessment for the City Centre.

The assumptions in this report have been used to determine background and development trips associated with the City centre Development. Trip generation for the City Centre development has been adopted published rates where similar car parking strategies exist to the car strategy to be implemented.

The trips were then used as input volumes into the Sidra software for analysis of intersection performance and subsequent trials to determine upgrading requirements to address performance deficiencies resulting from the increased traffic volumes for the background traffic growth and City centre development.

Upgraded requirements for intersections and network roads within and surrounding the City Centre have been detailed in the report. As stated in the report according to the Guidelines for Assessment of Road Impacts of Developments (Department of Transport and Main Roads Queensland, 2006 traffic forecasting and associated impacts is based on a 10 year design horizon. The report also includes recommendations for a 2046 design horizon. Estimating traffic demands over 32 years in the future involves many assumptions relating to population growth, travel trends, transport network development both public and private and also, based on the parking conditions to be implemented as part of the City Centre Master Plan. The 32 year design horizon is for analysis and planning purposes only, and actual timing of improvements will depend on many factors that cannot be accurately predicted in the long term. All improvements recommended for the 2046 horizon year should be verified by further detailed traffic monitoring prior to implementation.

Further recommendations include:

- The progressive implementation of further public transport is also recommended for the successful implementation of the car parking strategy.
- In addition to the number of lanes recommended for the roads included in the study, additional corridor width for the provision for bicycle lanes is also recommended.
- A comprehensive pedestrian path network construction for the City Centre is also recommended.

13. References

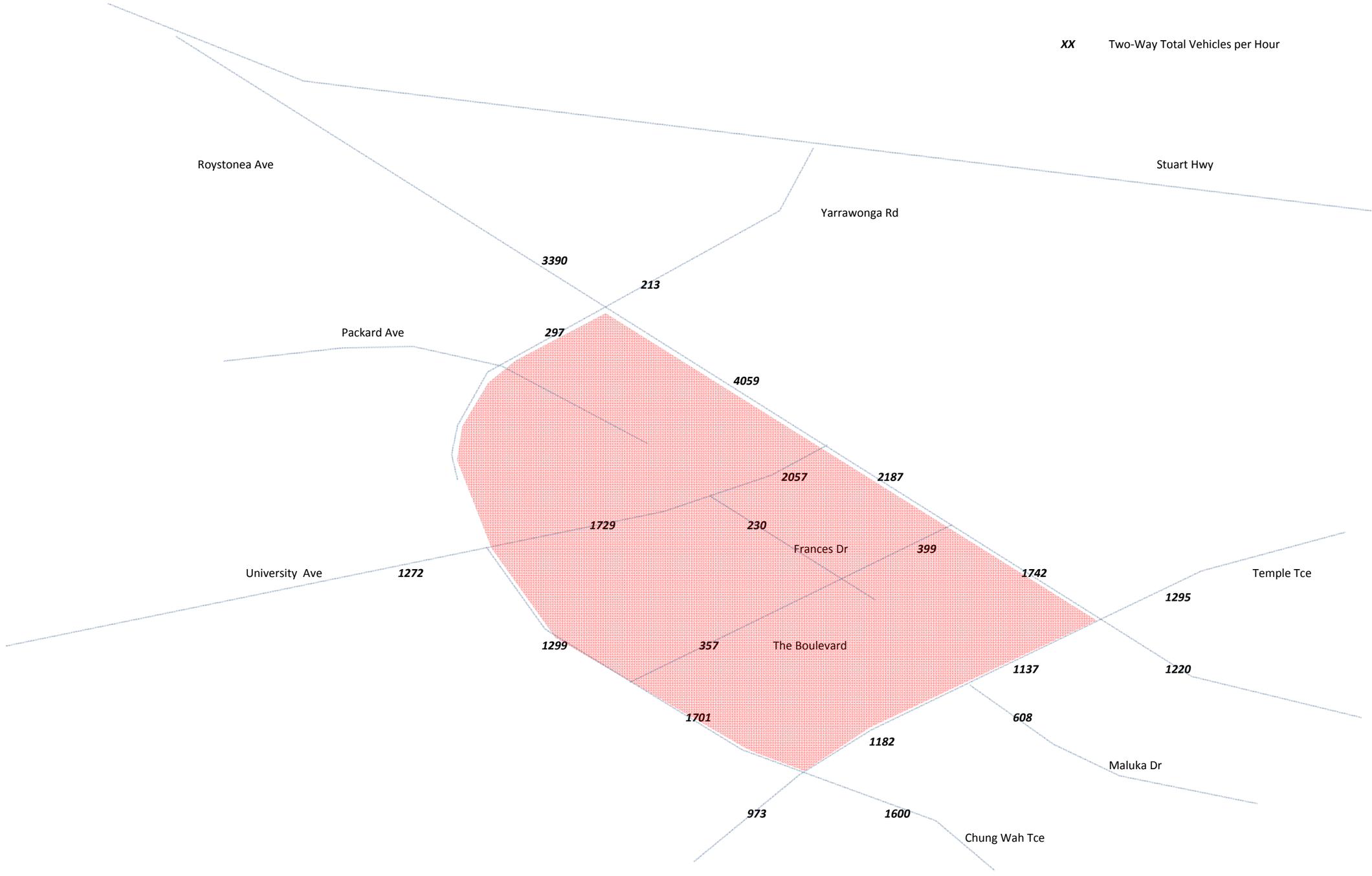
- Australian Standards 2004, *Parking Facilities Part 1: Off-street car parking AS/NZS 2890.1*, Standards Australia and Standards New Zealand, Sydney and Wellington.
- Austroads 2010, *Guide to Road Design Part 4A: Signalised and Signalised Intersections*, Austroads Inc., Sydney.
- Austroads 2009a, *Guide to Road Design Part 3: Geometric Design*, Austroads Inc., Sydney.
- Austroads 2009b, *Guide to Road Design Part 4: Intersections and Crossings – General*, Austroads Inc. Sydney.
- Austroads 2008a, *Guide to Traffic Management Part 8: Local Area Traffic Management*, Austroads Inc., Sydney.
- Austroads 2008b, *Guide to Traffic Management Part 2: Traffic Theory*, Austroads Inc., Sydney.
- Austroads 2007, *Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings*, Austroads Inc., Sydney.
- Austroads *Guide to Traffic Management Part 3: Traffic Studies and Analysis* Section 5.2.1.
- City of Palmerston 2007, *Palmerston Subdivisional Guidelines*, City of Palmerston, Palmerston City.
- Department of Lands and Planning (DLP), *Annual Traffic Report*, Northern Territory Government, Darwin.
- Department of Main Roads 2006, *Guidelines for Assessment of Road Impacts of Developments,* Queensland Government, Brisbane.
- Institute of Public Works Engineering Australia, Queensland Division Inc. (IPWEAQ) 2010, *Complete Street: Guidelines for Urban Street Design*, IPWEAQ, Brisbane.
- Roads and Traffic Authority (RTA) 2002, *Guide to Traffic Generating Developments*, Roads and Traffic Authority, Sydney.

Appendix A – Background Traffic Volumes 2016, 2026, and 2046

	2011			Growth	2012			Growth	2014			Growth	2016			Growth	2026				2026			Growth	2046		
	Without Chung Wah Ext				Without Chung Wah Ext				Without Chung Wah Ext				Without Chung Wah Ext				Without Chung Wah Ext				With Chung Wah Ext				With Chung Wah Ext.		
	AM Peak	PM Peak	Daily	Rate	AM Peak	PM Peak	Daily	Rate	AM Peak	PM Peak	Daily	Rate	AM Peak	PM Peak	Daily	Rate	AM Peak	PM Peak	Daily		AM Peak	PM Peak	Daily	Rate	AM Peak	PM Peak	Daily
Roystonea Avenue																											
West of Yarrawonga Road									3075	2508	27915	5%	3390	2765	30776	2%	4133	3371	37516		4133	3371	37516	2%	6141	5009	55747
East of Yarrawonga Road									3157	2691	29240	5%	3481	2967	32237	2%	4243	3617	39297	Decrease	2539	2131	23349	2%	3773	3166	34696
West of University Avenue									3682	3149	34155	5%	4059	3472	37656	2%	4948	4232	45902	Decrease	3245	2746	29955	2%	4821	4081	44511
East of University Avenue									1984	1781	18825	5%	2187	1964	20755	2%	2666	2394	25300		2666	2394	25300	2%	3962	3557	37594
West of The Boulevard	1482	1515	14985	8%	1601	1636	16184	8%	1867	1908	18877	5%	2058	2104	20812	2%	2509	2565	25369		2509	2565	25369	2%	3728	3811	37697
East of The Boulevard	1489	1580	15345	2%	1519	1612	15652	2%	1580	1677	16284	5%	1742	1849	17953	2%	2124	2253	21885		2124	2253	21885	2%	3156	3348	32520
West of Temple Terrace									1503	1686	15945	5%	1657	1859	17579	2%	2020	2266	21429		2020	2266	21429	2%	3002	3367	31843
East of Temple Terrace									1107	1449	12780	5%	1220	1598	14090	2%	1488	1947	17176		1488	1947	17176	2%	2211	2894	25522
Packard Avenue																											
South of Roystonea Avenue									255	185	2200	8%	297	216	2566	1%	329	238	2835	Increase	2032	1724	18782	1%	2480	2104	22918
West of Chung Wah Terrace																				Increase	1704	1486	15947	1%	2079	1813	19459
Yarrawonga Road																											
North of Roystonea Avenue									201	230	2155	3%	213	244	2286	3%	287	328	3073		287	328	3073	3%	518	592	5549
University Avenue																											
South of Roystonea Avenue									2016	1758	18870	1%	2057	1793	19249	1%	2272	1981	21263	Decrease	568	495	5316	1%	693	604	6486
South of Frances Drive	1309	1600	14545	9%	1427	1744	15854	9%	1695	2072	18836	1%	1729	2114	19215	1%	1910	2335	21225	Decrease	206	849	5278	1%	252	1036	6440
South of Chung Wah Terrace	963	1034	9985	9%	1050	1127	10884	9%	1247	1339	12931	1%	1272	1366	13191	1%	1405	1509	14571		1405	1509	14571	1%	1715	1841	17779
Frances Drive																											
East of University Avenue	230	366	2980	0%	230	366	2980	0%	230	366	2980	0%	230	366	2980	-5%	138	219	1784		138	219	1784	-5%	49	79	640
Chung Wah Terrace																											
South of Packard Avenue																				Increase	1704	1486	15947	1%	2079	1813	19459
East of University Avenue	1236	1612	14240	1%	1248	1628	14382	1%	1273	1661	14671	1%	1299	1694	14966	1%	1435	1871	16532		1435	1871	16532	1%	1751	2284	20172
West of The Boulevard	1207	1612	14095	1%	1219	1628	14236	1%	1244	1661	14522	1%	1269	1694	14814	1%	1401	1871	16364		1401	1871	16364	1%	1710	2284	19967
East of The Boulevard	1426	1952	16890	1%	1440	1972	17059	1%	1469	2011	17402	1%	1499	2052	17752	1%	1656	2266	19609		1656	2266	19609	1%	2020	2765	23926
West of Temple Terrace					1635	1970	18025	1%	1668	2010	18387	1%	1701	2050	18757	1%	1879	2264	20719		1879	2264	20719	1%	2293	2763	25281
East of Temple Terrace					1538	1326	14320	1%	1569	1353	14608	1%	1600	1380	14901	1%	1768	1524	16460		1768	1524	16460	1%	2157	1860	20085
The Boulevard																											
South of Roystonea Avenue	399	464	4315	0%	399	464	4315	0%	399	464	4315	0%	399	464	4315	-5%	239	278	2584		239	278	2584	-5%	86	100	926
North of Chung Wah Terrace	357	524	4405	0%	357	524	4405	0%	357	524	4405	0%	357	524	4405	-5%	214	314	2637		214	314	2637	-5%	77	112	945
Temple Terrace																											
North of Roystonea Avenue									1197	1276	12365	4%	1295	1380	13374	4%	1916	2043	19797		1916	2043	19797	4%	4199	4476	43377
South of Roystonea Avenue									1217	1221	12190	1%	1241	1246	12435	1%	1371	1376	13736		1371	1376	13736	1%	1673	1679	16761
North of Maluka Drive	1432	1372	14020	-8%	1317	1262	12898	-8%	1115	1068	10917	1%	1137	1090	11137	1%	1257	1204	12302		1257	1204	12302	1%	1533	1469	15011
South of Maluka Drive	1048	1113	10805	-10%	943	1002	9725	-10%	764	811	7877	1%	779	828	8035	1%	861	914	8876		861	914	8876	1%	1050	1116	10830
North of Chung Wah Terrace					1136	1054	10950	1%	1159	1075	11170	1%	1182	1097	11395	1%	1306	1212	12587		1306	1212	12587	1%	1593	1478	15358
South of Chung Wah Terrace					935	1084	10095	1%	954	1106	10298	1%	973	1128	10505	1%	1075	1246	11604		1075	1246	11604	1%	1311	1520	14159
Maluka Drive																											
East of Temple Terrace	476	696	5860	5%	500	731	6153	5%	551	806	6784	5%	608	888	7479	1%	671	981	8261		671	981	8261	1%	819	1197	10081

Total Trips Redistributed

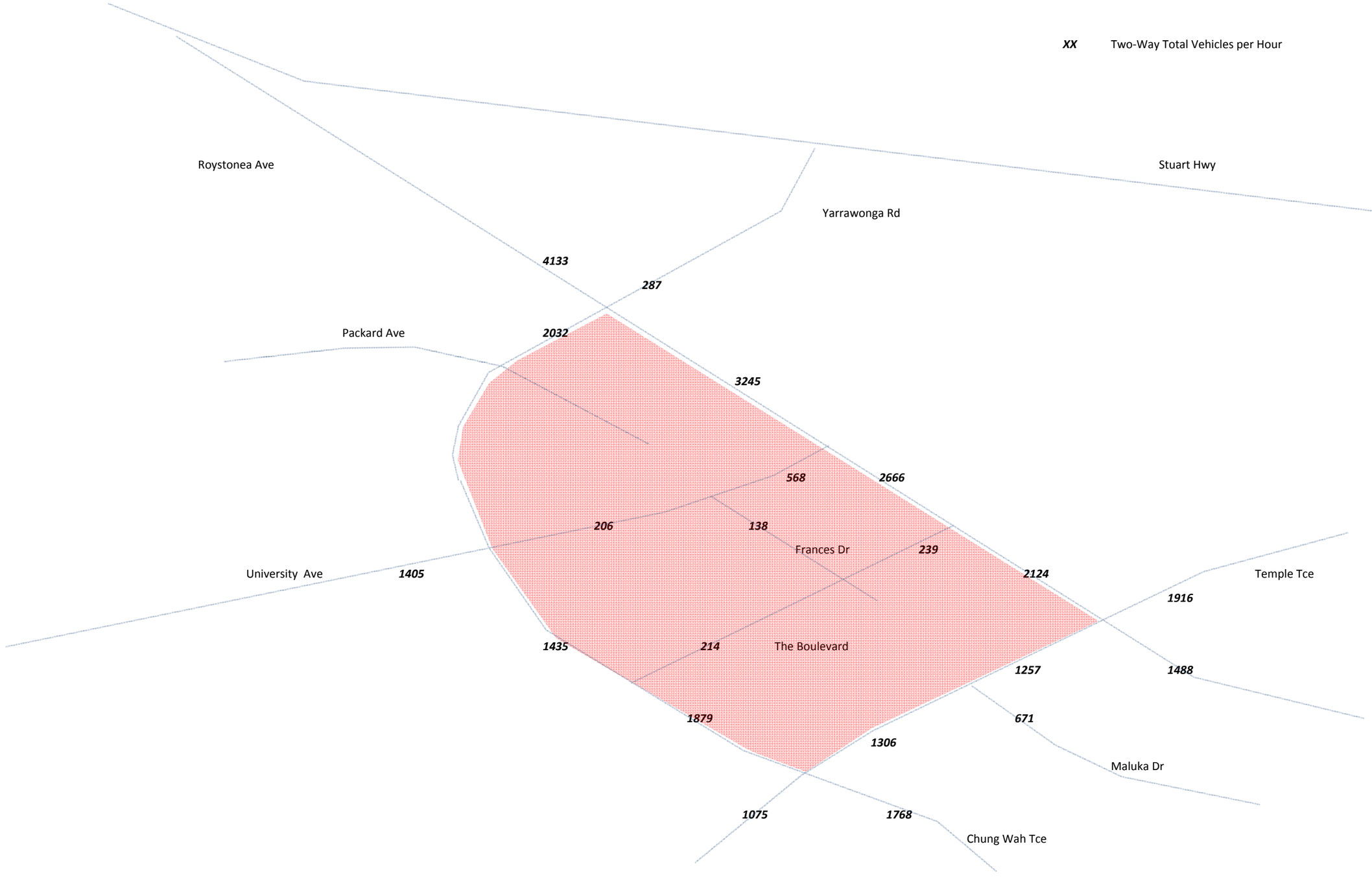
	75%	75%	75%
Total	1704	1486	15947



BE140072 Palmerston City Centre Masterplan

Figure C2: 2016 AM Peak Background Traffic

BURCHILLS ENGINEERING SOLUTIONS



BE140072 Palmerston City Centre Masterplan

Figure C2: 2026 AM Peak Background Traffic

BURCHILLS ENGINEERING SOLUTIONS

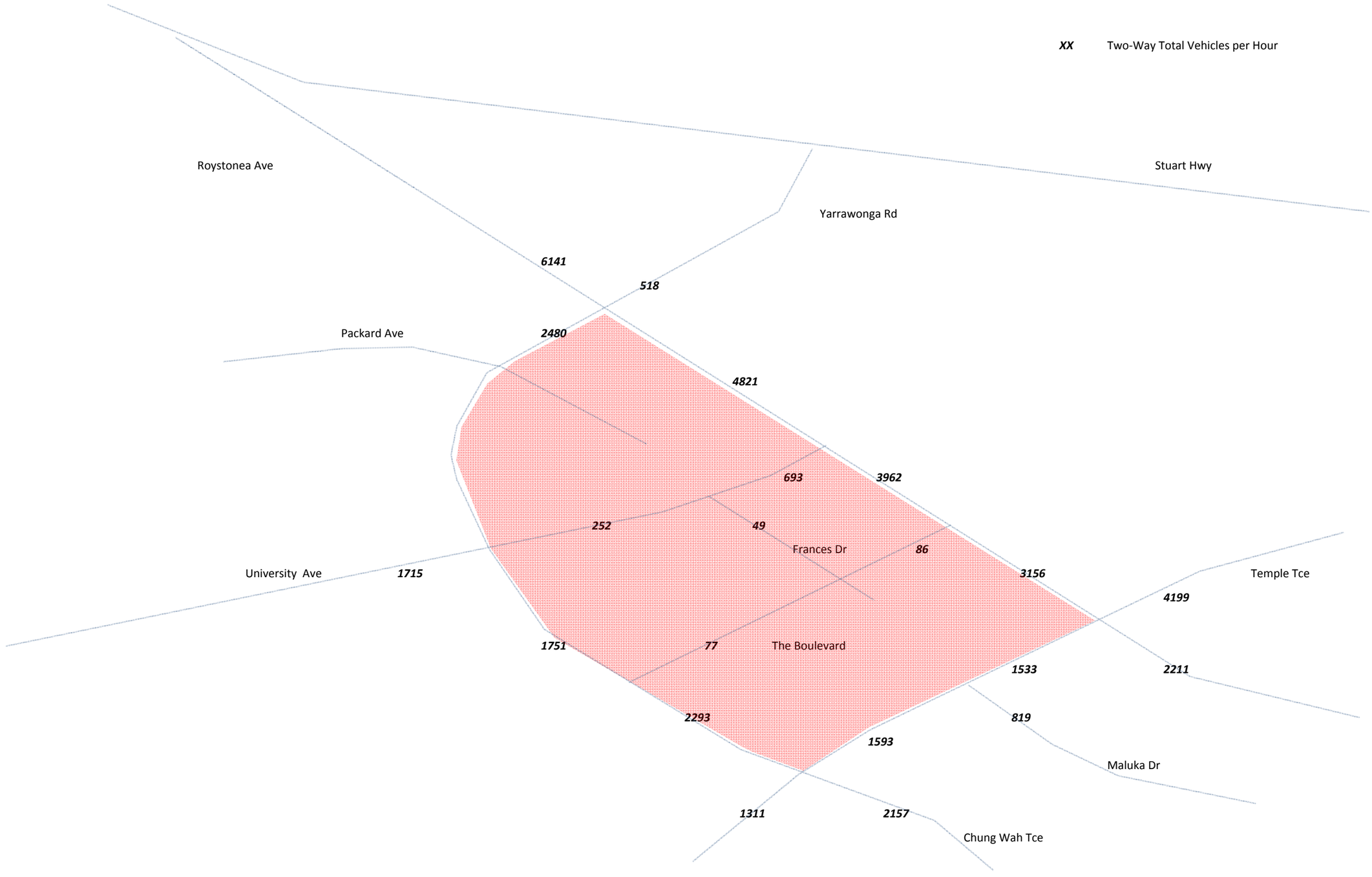


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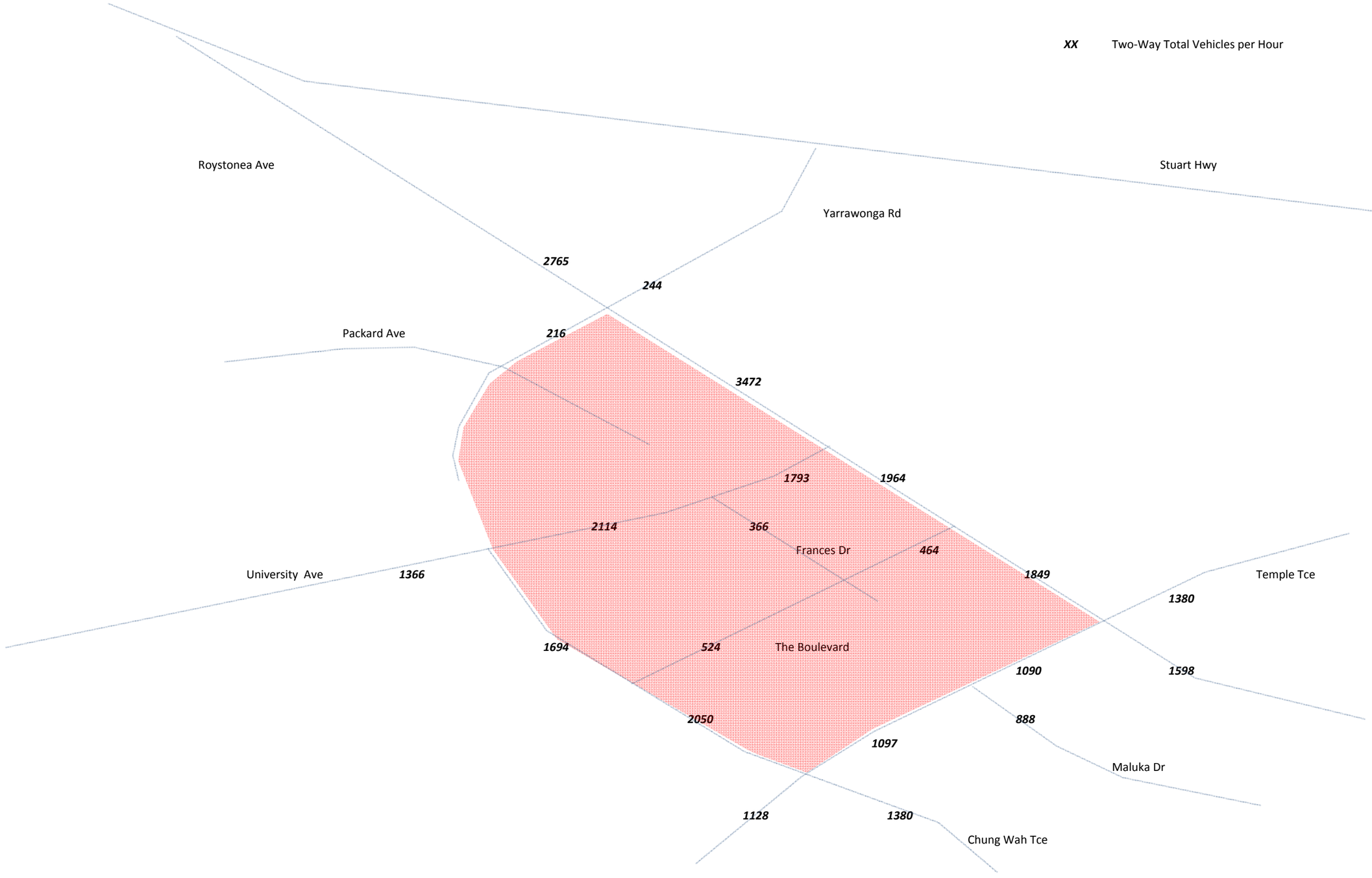
Figure C2: 2046 AM Peak Background Traffic

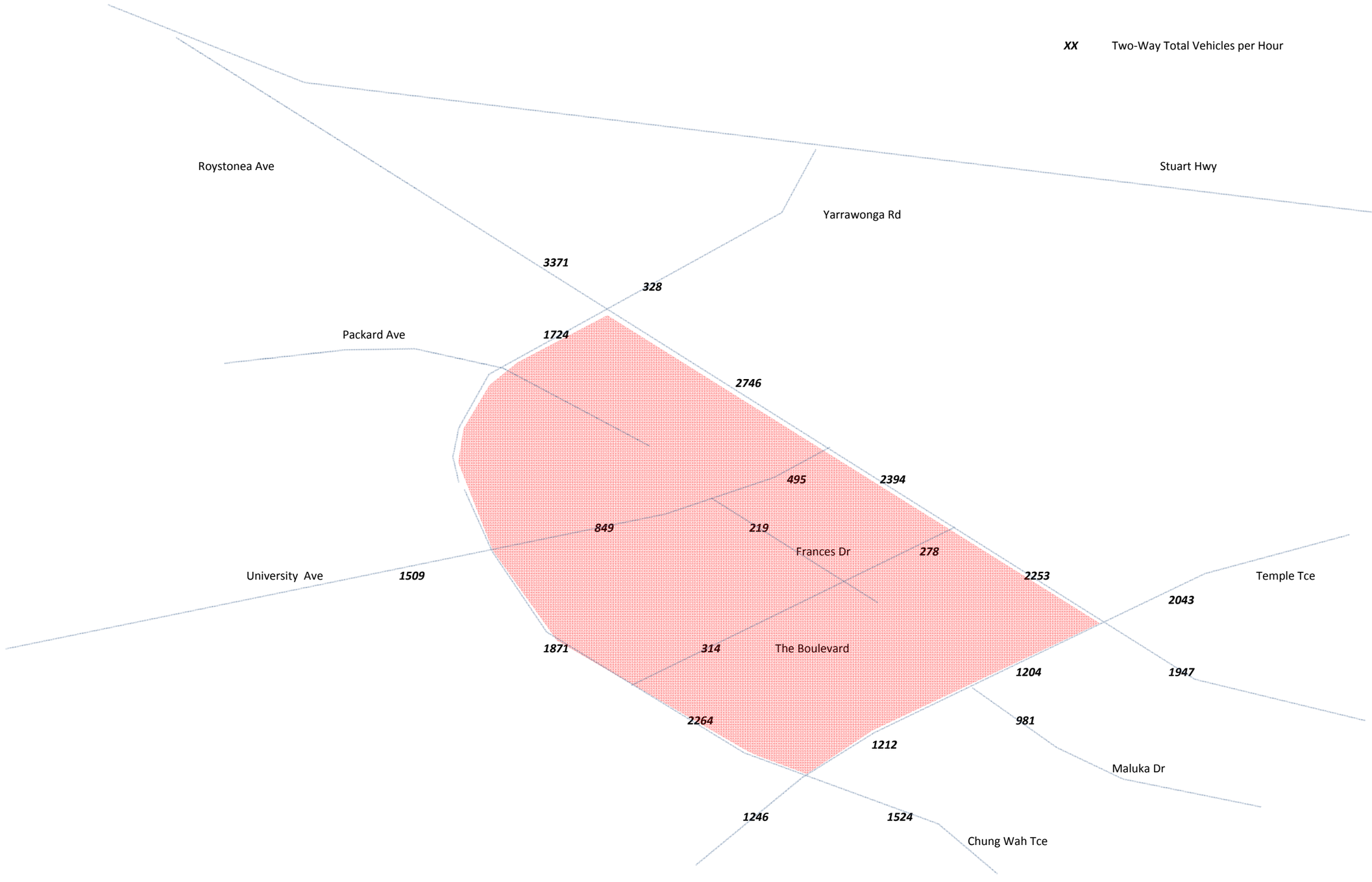
BURCHILLS ENGINEERING SOLUTIONS



BE140072 Palmerston City Centre Masterplan

Figure C2: 2016 PM Peak Background Traffic

BURCHILLS ENGINEERING SOLUTIONS



BE140072 Palmerston City Centre Masterplan

Figure C2: 2026 PM Peak Background Traffic

BURCHILLS ENGINEERING SOLUTIONS

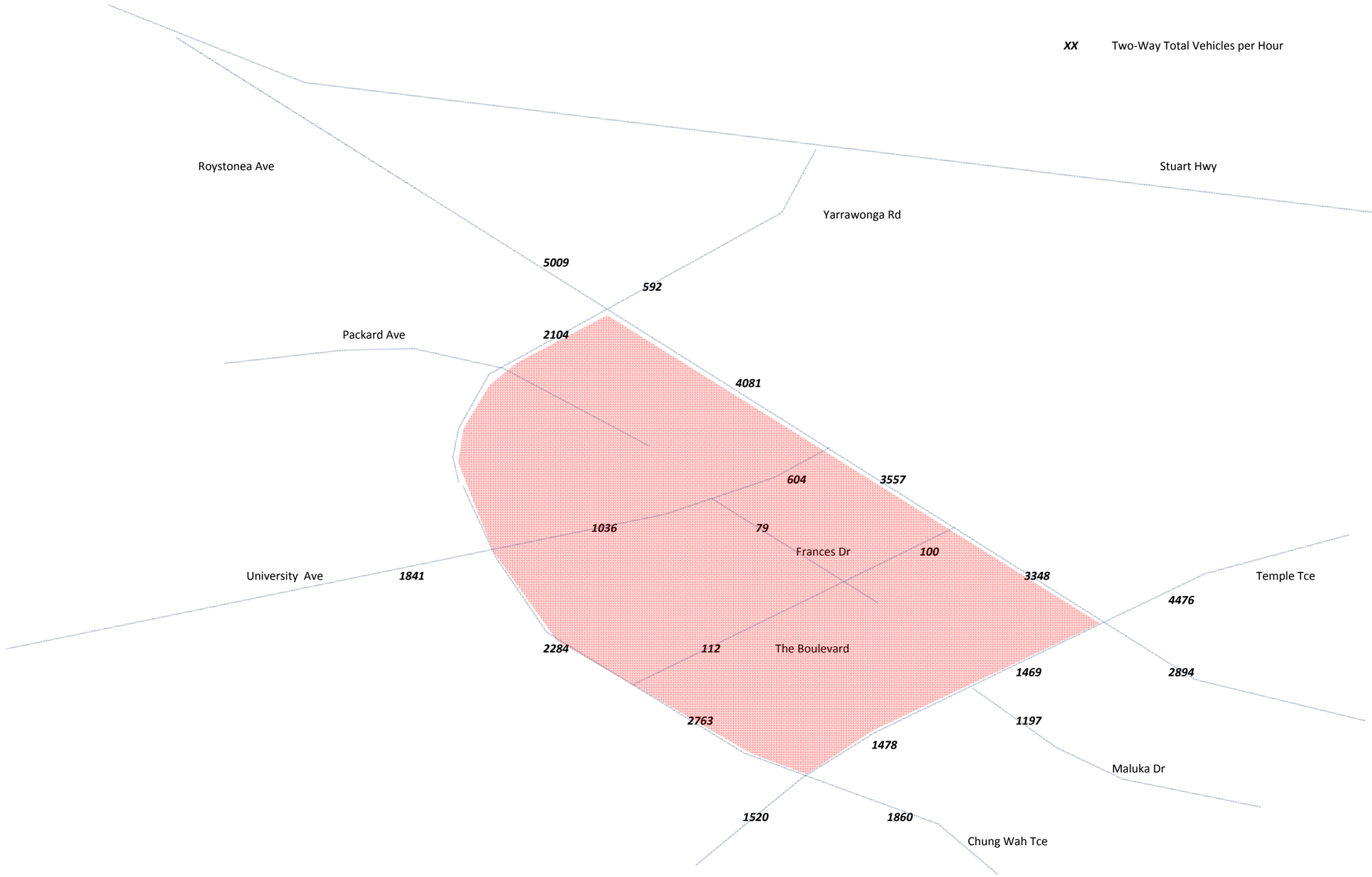


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Figure C2: 2046 PM Peak Background Traffic

BURCHILLS ENGINEERING SOLUTIONS

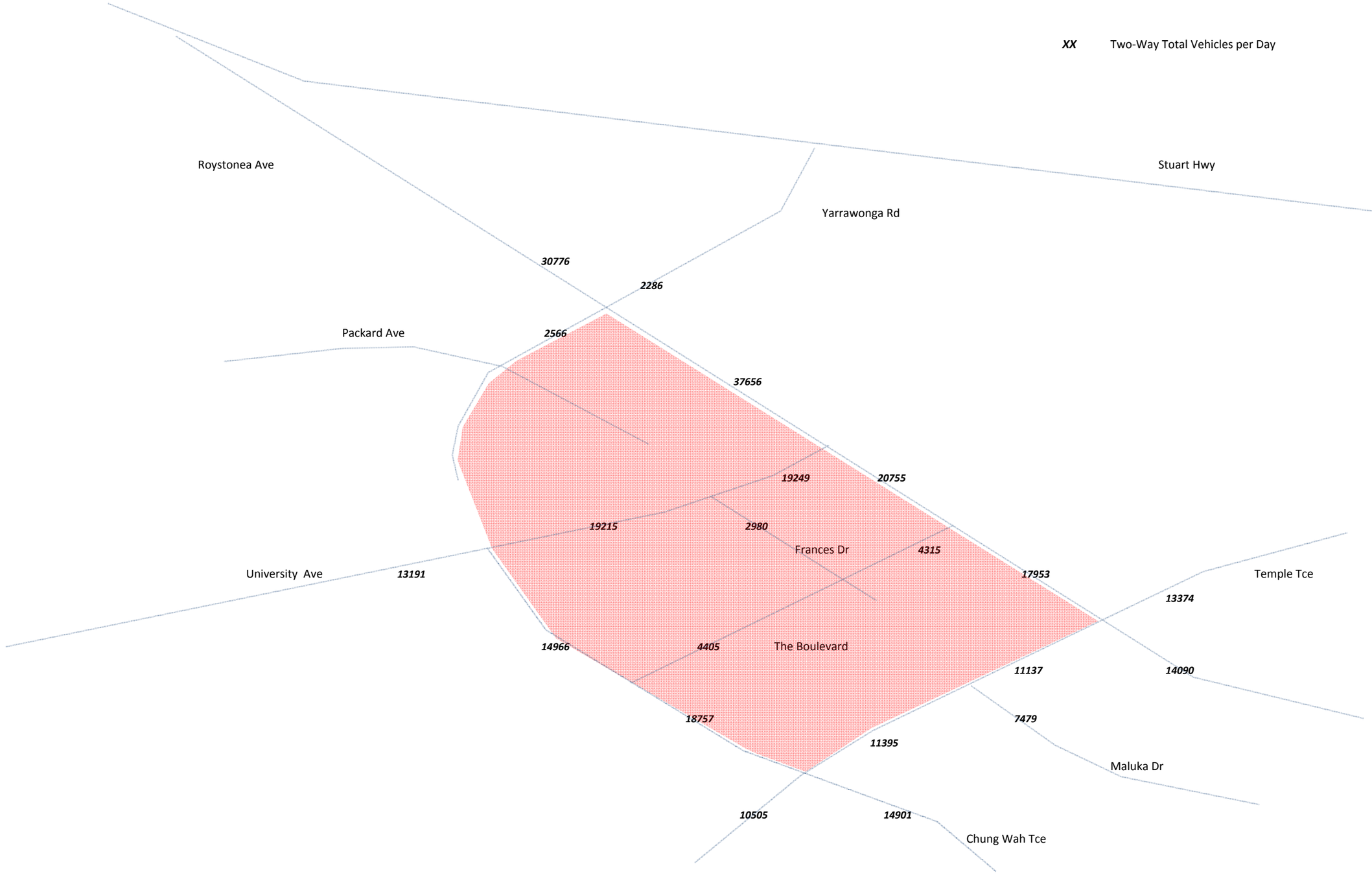

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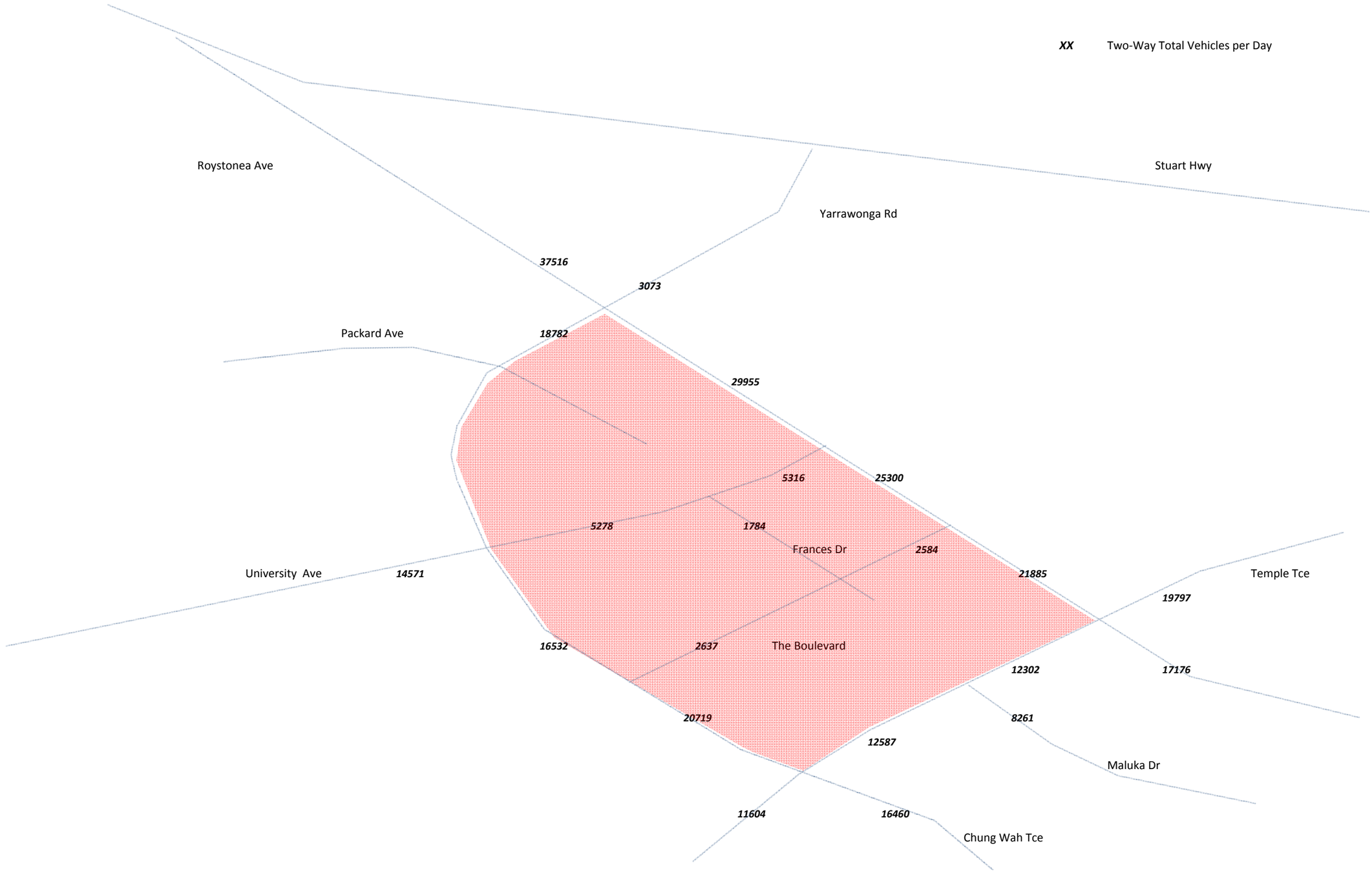
Figure C2: 2016 Daily Background Traffic

BURCHILLS ENGINEERING SOLUTIONS



BE140072 Palmerston City Centre Masterplan

Figure C2: 2026 Daily Background Traffic

BURCHILLS ENGINEERING SOLUTIONS

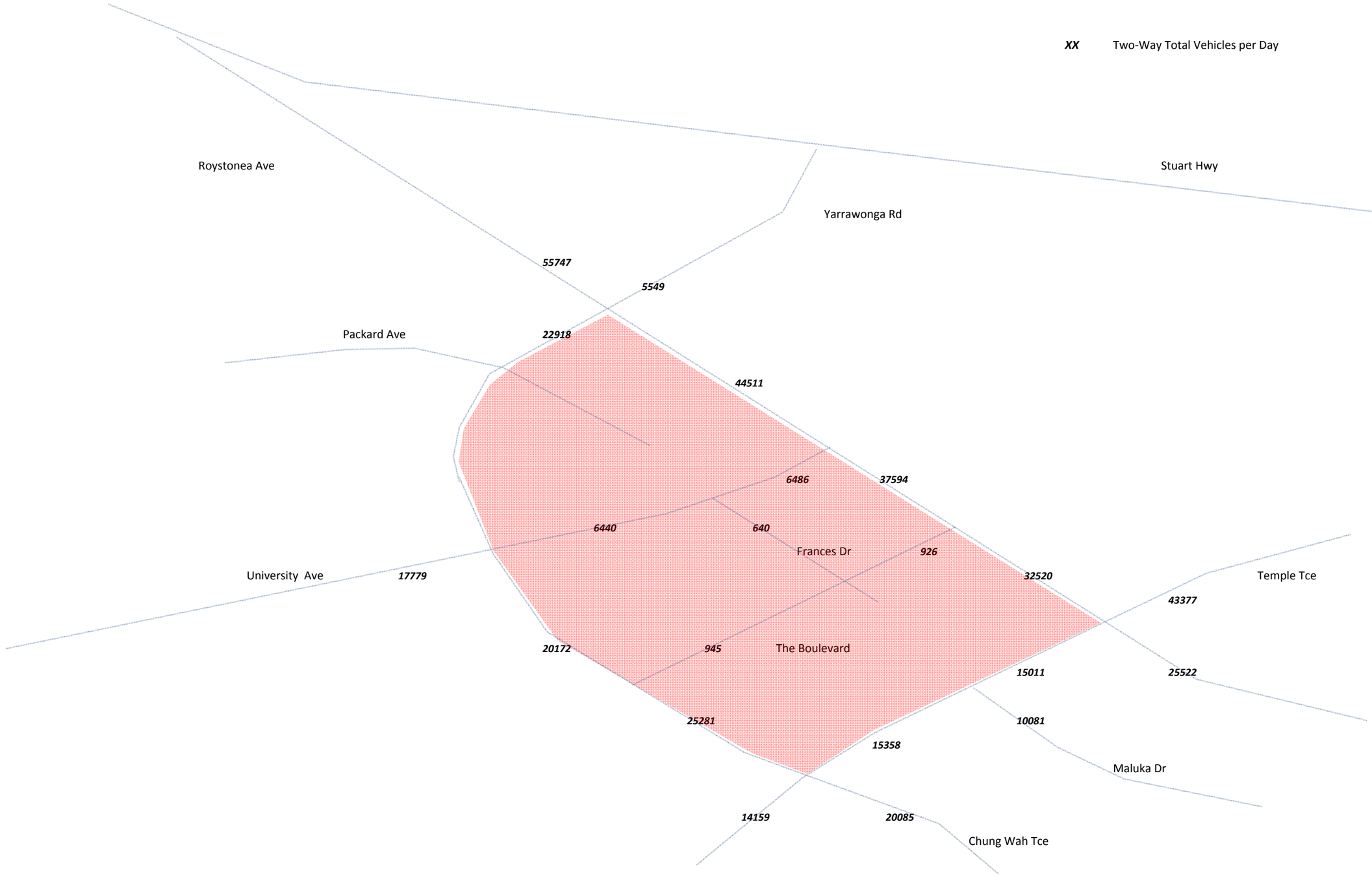


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Figure C2: 2046 Daily Background Traffic

BURCHILLS ENGINEERING SOLUTIONS

Appendix B – Land Use Schedule

GFA - Residential	Podium Area	Podium Floors	Tower area	Tower Floors	Total	+ Parking	Parking floors		Retail	Commercial	Residential
BLOCK 1											
1a	225.2	3			675.6				225.2	450.4	0
1b	225.2	5			1126				225.2	450.4	450.4
1c	262.9	4			1051.6				262.9	525.8	262.9
1d	233.1	5			1165.5				233.1	466.2	466.2
1e	231.2	3			693.6				231.2	462.4	0
1f	231.2	4			924.8				231.2	462.4	231.2
1g	231.2	5			1156				231.2	462.4	462.4
1h	222.5	3			667.5				222.5	445	0
1i	221.6	4			886.4				221.6	443.2	221.6
1j	708.1	5	708.1	18	16286.3	1269.6	3		708.1	1416.2	14162
total					24633.3		3808.8		2792.2	5584.4	16256.7
BLOCK 2											
2a	701.4	7			4909.8				701.4	1402.8	2805.6
2b	649	8			5192				649	1298	3245
2c	454.8	8	454.8	16	10915.2				454.8	909.6	9550.8
2d	492	6.6			3247.2				492	984	1771.2
2e	238	5			1190				238	476	476
2f	108.4	1			108.4	1506.4	3		108.4	0	0
total					25562.6		4519.2		2643.6	5070.4	17848.6
BLOCK 3											
3a	499.7	5	281.5	18	7565.5				499.7	999.4	6066.4
3b	440.2	5.6			2465.12				440.2	880.4	1144.52
3c	344.3	4			1377.2				344.3	688.6	344.3
3d	144.5	3			433.5				144.5	289	0
3e	300	4			1200				300	600	300
3f	300	5			1500				300	600	600
3g	303.6	3			910.8				303.6	607.2	0
3h	463.7	3	391.7	1.6	2017.82				463.7	927.4	626.72
3i	372	3.75			1395				372	744	279
total					18864.94		0		3168	6336	9360.94
BLOCK 4											
4a	221.3	6	221.3	18	5311.2				221.3	442.6	4647.3
4b	221.3	5			1106.5				221.3	442.6	442.6
4c	412.4	3			1237.2				412.4	824.8	0
4d	300	3			900				300	600	0
4e	426.5	4			1706				426.5	853	426.5
4f	218.4	5			1092				218.4	436.8	436.8
4g	219.2	6			1315.2				219.2	438.4	657.6
4h	201	1			201	1163.3	3		201	0	0
total					12869.1		3489.9		2,220	4038.2	6610.8
BLOCK 5											
a	695.3	3	308.4	1	2394.3				695.3	1390.6	308.4
b	350	3	278	2	1606				350	700	556
c	301.1	5			1505.5				301.1	602.2	602.2
d	293.2	3			879.6				293.2	586.4	0
e	351.7	4			1406.8				351.7	703.4	351.7
f	403.7	3	331.7	3	2206.2				403.7	807.4	995.1
g	203.5	3	131.5	20	3240.5				203.5	407	2630

TOTALS	(m^2)
Retail	76080.4
Commercial	144134
Residential	457035.24
Combined	677249.64
Parking	116088.3

h	221.4	1	191.4	22	4432.2				221.4	442.8	3768
i	252.3	6			1513.8				252.3	504.6	756.9
j	252.2	5			1261				252.2	504.4	504.4
k	163.1	1			163.1	2599.9	3		163.1	0	0
total					20609		7799.7		3487.5	6648.8	10472.7

BLOCK 6

a	227.8	25			5695				227.8	455.6	5011.6
b	359.4	25			8985				359.4	718.8	7906.8
c	262.1	23			6028.3				262.1	524.2	5242
d	244.1	3	172.1	20	4174.3				244.1	488.2	3442
e	244.1	3	172.1	3	1248.6				244.1	488.2	516.3
f	521.4	4	232.1	1	2317.7				521.4	1042.8	753.5
g	263.1	3			789.3				263.1	526.2	0
h	281.7	3			845.1				281.7	563.4	0
i	281.7	3			845.1				281.7	563.4	0
j	513.8	3	442.8	1	1984.2				513.8	1027.6	442.8
k	237.7	4			950.8				237.7	475.4	237.7
l	237.7	4			950.8				237.7	475.4	237.7
m	252.3	1			252.3	3578.9	3		252.3	0	0
total					35066.5		10736.7		3926.9	7349.2	23790.4

BLOCK 7

a	1173.4	3			3520.2				1173.4	2346.8	0
total					3520.2				1173.4	2346.8	

BLOCK 8

	1424.4	8			11395.2	554.4	3		1424.4	2848.8	7122
total					11395.2		1663.2		1424.4	2848.8	7122

BLOCK 9

a	120	6			720				120	240	360
b	312.5	8			2500				312.5	625	1562.5
c	300	8			2400				300	600	1500
d	621.4	24			14913.6				621.4	1242.8	13049.4
e	237.5	24			5700	432	3		237.5	475	4987.5
total					26233.6		1296		1591.4	3182.8	21459.4

BLOCK 10

a	69.4	3			208.2				69.4	138.8	0
b	296.9	4	179.4	4	1187.6				296.9	593.8	296.9
c	208.7	4			834.8				208.7	417.4	208.7
d	300	1	254.9	25	300				300	0	0
e	172.5	26			4485	432	3		172.5	345	3967.5
total					7015.6		1296		1047.5	1495	4473.1

BLOCK 11

a	90	3			270				90	180	0
b	1145.1	8			9160.8	605.1	3		1145.1	2290.2	5725.5
total					9430.8		1815.3		1235.1	2470.2	5725.5

BLOCK 12

a	176.3	1			176.3				176.3	0	0
b	308.8	5			1544				308.8	617.6	617.6

c	507.4	6	264	2	3572.4				507.4	1014.8	2050.2
d	225.3	23			5181.9				225.3	450.6	4506
e	292.2	23			6720.6				292.2	584.4	5844
f	300	8			2400	617.4	3		300	600	1500
total					19595.2		1852.2		1810	3267.4	14517.8

BLOCK 13

a	155.1	16			2481.6				155.1	310.2	2016.3
b	369	30			11070				369	738	9963
c	315	8			2520				315	630	1575
d	385.9	26			10033.4				385.9	771.8	8875.7
e	273.6	25			6840				273.6	547.2	6019.2
f	374.6	25			9365				374.6	749.2	8241.2
g	384	8			3072				384	768	1920
h	300	8			2400				300	600	1500
i	384	8			3072				384	768	1920
j	375	8			3000				375	750	1875
total					53854		0		3316.2	6632.4	43905.4

BLOCK 14

a	224.7	8			1797.6				224.7	449.4	1123.5
b	358.1	24			8594.4				358.1	716.2	7520.1
c	358.3	18			6449.4				358.3	716.6	5374.5
d	275.3	17			4680.1				275.3	550.6	3854.2
e	372.4	8			2979.2				372.4	744.8	1862
f	358.1	8			2864.8				358.1	716.2	1790.5
g	358.1	8			2864.8				358.1	716.2	1790.5
h	300	8			2400				300	600	1500
i	380.9	1			380.9				380.9	0	0
total					33011.2		0		2985.9	5210	24815.3

BLOCK 15

a	346.4	1			346.4				346.4	0	0
b	299.1	24			7178.4				299.1	598.2	6281.1
c	272	8			2176				272	544	1360
d	255	8			2040				255	510	1275
e	310.7	8			2485.6	546.3	3		310.7	621.4	1553.5
total					14226.4		1638.9		1483.2	2273.6	10469.6

BLOCK 16

a	230	1			230				230	0	0
b	497.2	21			10441.2				497.2	994.4	8949.6
c	272.9	21			5730.9	260.7	3		272.9	545.8	4912.2
total					16402.1		782.1		1000.1	1540.2	13861.8

BLOCK 17

a	198	1			198				198	0	0
b	363.8	16			5820.8				363.8	727.6	4729.4
c	389.7	16			6235.2				389.7	779.4	5066.1
d	300	16			4800	751.1	3		300	600	3900
total					17054		2253.3		1251.5	2107	13695.5

BLOCK 18

a	1105.8	3	848.9	25	24539.9				1105.8	2211.6	21222.5
b	282	3	210	5	1896				282	564	1050

c	317.9	8			2543.2				317.9	635.8	1589.5
d	231.4	8			1851.2				231.4	462.8	1157
e	231.4	8			1851.2				231.4	462.8	1157
f	157.2	1			157.2	650.7	3		157.2	0	0
total					32838.7		1952.1		2325.7	4337	26176

BLOCK 19

a	86.9	1			86.9				86.9	0	0
b	275.4	3	206.5	4	1652.2				275.4	550.8	826
c	271.8	3	182.9	5	1729.9				271.8	543.6	914.5
d	293.6	8			2348.8				293.6	587.2	1468
e	86.9	1			86.9	702.6	3		86.9	0	0
total					5904.7		2107.8		1014.6	1681.6	3208.5

BLOCK 20

a	287.4	8			2299.2				287.4	574.8	1437
b	341.2	8			2729.6				341.2	682.4	1706
c	144	3			432				144	288	0
d	341.1	29			9891.9				341.1	682.2	8868.6
e	351.7	29			10199.3				351.7	703.4	9144.2
f	177.6	3			532.8				177.6	355.2	0
g	237.4	8			1899.2				237.4	474.8	1187
h	260.1	8			2080.8				260.1	520.2	1300.5
i	374.9	8			2999.2	1766.1	3		374.9	749.8	1874.5
total					33064		5298.3		2515.4	5030.8	25517.8

BLOCK 21

a	255.9	1			255.9				255.9	0	0
b	319.5	8			2556				319.5	639	1597.5
c	542	22			11924				542	1084	10298
d	144	3			432				144	288	0
e	194.7	8			1557.6				194.7	389.4	973.5
f	295.3	8			2362.4				295.3	590.6	1476.5
G	401.8	8	357	17	9283.4	1422.4	3		401.8	803.6	8078
total					28371.3		4267.2		2153.2	3794.6	22423.5

BLOCK 22

a	300	8			2400				300	600	1500
b	605.1	3	461.1	5	4120.8				605.1	1210.2	2305.5
c	362.5	8			2900				362.5	725	1812.5
d	220.5	1			220.5	560.5	3		220.5	0	0
total					9641.3		1681.5		1488.1	2535.2	5618

BLOCK 23

a	389.9	8			3119.2				389.9	779.8	1949.5
b	196.6	26			5111.6				196.6	393.2	4521.8
c	317.9	7	227.9	19	6555.4				317.9	635.8	5601.7
d	260.7	3	188.7	5	1725.6				260.7	521.4	943.5
e	278.6	6			1671.6				278.6	557.2	835.8
f	300	3	240.5	5	2102.5				300	600	1202.5
total					20285.9		0		1743.7	3487.4	15054.8

BLOCK 24

a	429.4	8	273.1	18	8351				429.4	858.8	7062.8
b	144	3			432				144	288	0

c	218.5	8			1748				218.5	437	1092.5
d	299.5	8			2396				299.5	599	1497.5
e	300	8			2400				300	600	1500
f	300	7			2100				300	600	1200
g	225	5			1125				225	450	450
h	334.6	3	262.6	1	1266.4				334.6	669.2	262.6
i	466.2	3	266	1	1664.6				466.2	932.4	266
j	625.3	3			1875.9				625.3	1250.6	0
k	261.4	5			1307				261.4	522.8	522.8
l	207.9	5			1039.5				207.9	415.8	415.8
m	400.2	3	307.3	3	2122.5				400.2	800.4	921.9
n	297.6	3	195.6	5	1870.8				297.6	595.2	978
o	207.6	3	135.6	5	1300.8				207.6	415.2	678
p	64.2	3			192.6	4931.1	3		64.2	128.4	0
total					**31192.1**		**14793.3**		**4781.4**	**9562.8**	**16847.9**

BLOCK 25

a	300	7			2100				300	600	1200
b	544	5	227.1	1	2947.1				544	1088	1315.1
c	214.8	3	141.9	1	786.3				214.8	429.6	141.9
d	207.6	3	135.6	1	758.4				207.6	415.2	135.6
e	211.8	3			635.4				211.8	423.6	0
f	381.2	19			7242.8				381.2	762.4	6099.2
g	177	1			177	909.8	3		177	0	0
total					**14647**		**2729.4**		**2036.4**	**3718.8**	**8891.8**

BLOCK 26

a	239.7	3			719.1				239.7	479.4	0
b	221.7	3	149.8	1	814.9				221.7	443.4	149.8
c	282	3	210	3	1476				282	564	630
d	499.1	5	217.2	1	2712.7				499.1	998.2	1215.4
e	621.6	8			4972.8				621.6	1243.2	3108
f	274.1	3	170.6	5	1675.3				274.1	548.2	853
g	211.4	3	171	5	1489.2				211.4	422.8	855
h	220.9	8			1767.2				220.9	441.8	1104.5
	167.2	3			501.6	1880.5	3		167.2	334.4	0
total					**16128.8**		**5641.5**		**2737.7**	**5475.4**	**7915.7**

BLOCK 27

a	311	3			933				311	622	0
b	282	3	210	1	1056				282	564	210
c	634.2	3	330.7	3	2894.7				634.2	1268.4	992.1
d	326.2	25			8155				326.2	652.4	7176.4
e	342.4	6			2054.4				342.4	684.8	1027.2
f	281.9	3	210	4	1685.7				281.9	563.8	840
g	282	3	180	5	1746				282	564	900
h	347.8	8			2782.4				347.8	695.6	1739
i	175.1	3			525.3	2382.1	3		175.1	350.2	0
total					**21832.5**		**7146.3**		**2982.6**	**5965.2**	**12884.7**

BLOCK 28

a	360	8			2880				360	720	1800
b	285	8			2280				285	570	1425
c	282	3	210	17	4416				282	564	3570
d	297	3	195	5	1866				297	594	975

e	270	8			2160				270	540	1350
f	171.7	18			3090.6				171.7	343.4	2575.5
g	288.6	18			5194.8				288.6	577.2	4329
h	258.6	18			4654.8	2601.9	3		258.6	517.2	3879
total					26542.2		7805.7		2212.9	4425.8	19903.5

BLOCK 29

a	588.9	5	696.9	1	3641.4				588.9	1177.8	1874.7
b	300	4			1200				300	600	300
c	282	3	210	2	1266				282	564	420
d	210	5			1050				210	420	420
e	300	6			1800				300	600	900
f	317.8	3			953.4	2376.5	3		317.8	635.6	0
total					9910.8		7129.5		1998.7	3997.4	3914.7

BLOCK 30

a	375.3	4			1501.2				375.3	750.6	375.3
b	371.2	3	299	1	1412.6				371.2	742.4	299
c	282	3	210	2	1266				282	564	420
d	375.2	7			2626.4				375.2	750.4	1500.8
e	315	7			2205	1322.4	3		315	630	1260
total					9011.2		3967.2		1718.7	3437.4	3855.1

BLOCK 31

a	77.3	8			618.4				77.3	154.6	386.5
b	256.8	8			2054.4				256.8	513.6	1284
c	257	8			2056				257	514	1285
d	411	2	339.7	24	8974.8	232.1	3		411	822	7741.8
total					13703.6		696.3		1002.1	2004.2	10697.3

BLOCK 32

a	329.7	3			989.1				329.7	659.4	0
b	307.3	5			1536.5				307.3	614.6	614.6
c	289.3	4			1157.2				289.3	578.6	289.3
d	289.3	4			1157.2				289.3	578.6	289.3
e	307.7	3			923.1				307.7	615.4	0
f	292.3	5			1461.5				292.3	584.6	584.6
g	236	4			944				236	472	236
h	236	3			708	1830.8	1		236	472	0
total					8876.6		1830.8		2287.6	4575.2	2013.8

BLOCK 33

a	240	29			6960				240	480	6240
b	180	11			1980				180	360	1440
c	408.5	2			817				408.5	408.5	0
total					9757				828.5	1248.5	7680

BLOCK 34

a	329.6	15			4944				329.6	659.2	3955.2
b	300	4			1200				300	600	300
c	369.7	8			2957.6	2883	1		369.7	739.4	1848.5
total					9101.6		2883		999.3	1998.6	6103.7

BLOCK 35

a	373.7	9			3363.3				373.7	747.4	2242.2

b	283.3	11			3116.3	1147.4	1		283.3	566.6	2266.4
total					6479.6		1147.4		657	1314	4508.6
BLOCK 36											
a	374.7	2			749.4				374.7	374.7	0
b	180	8			1440				180	360	900
c	240	20			4800				240	480	4080
total					6989.4				794.7	1214.7	4980
BLOCK 37											
a	267.2	4			1068.8				267.2	534.4	267.2
b	275.5	8			2204	404.1	1		275.5	551	1377.5
total					3272.8		404.1		542.7	1085.4	1644.7
BLOCK 38											
a	264.4	2			528.8				264.4	264.4	0
b	532.5	5			2662.5				532.5	1065	1065
c	383.2	4			1532.8				383.2	766.4	383.2
d	584.3	3			1752.9	967.4	1		584.3	1168.6	0
total					6477		967.4		1764.4	3264.4	1448.2
BLOCK 38											
a	226.9	9			2042.1				226.9	453.8	1361.4
b	413.5	3			1240.5				413.5	827	0
c	297.6	2			595.2	688.2	1		297.6	297.6	0
total					3877.8		688.2		938	1578.4	1361.4

Appendix C – Calculation Sheet & Trip Distribution 2016, 2026, and 2046

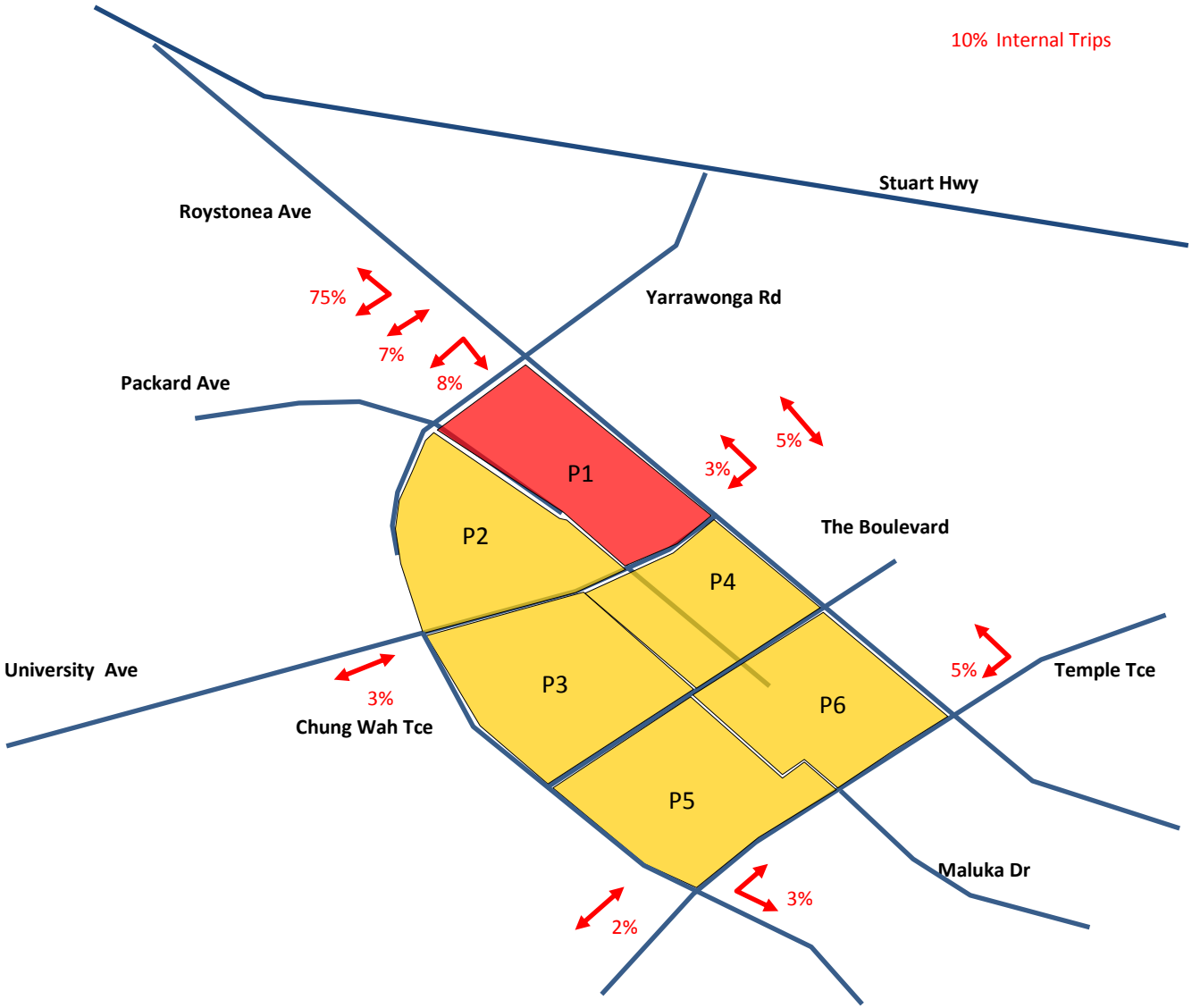

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Figure C2: Precinct 1 AM Peak Residential Distribution (%) - 2016

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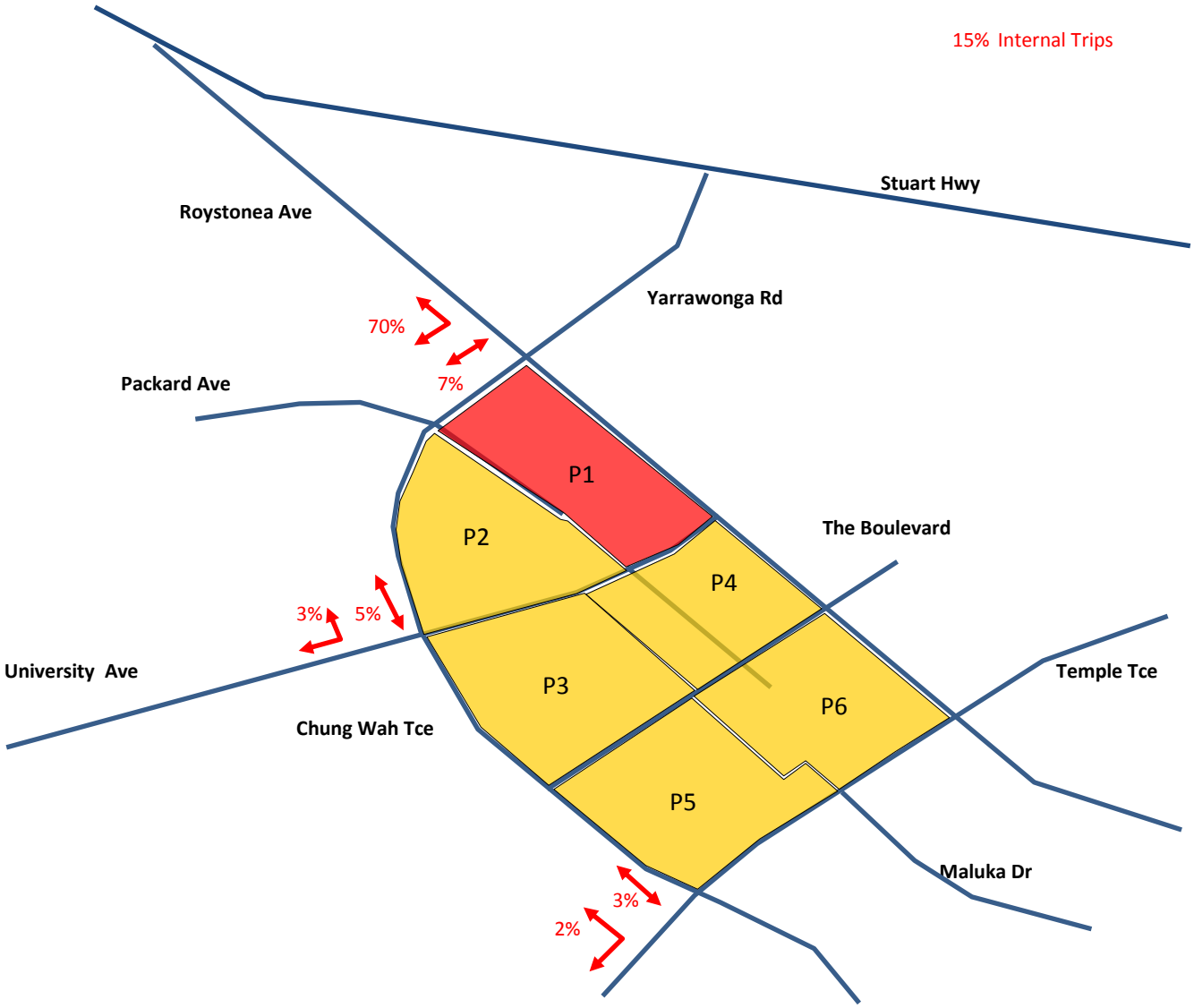

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Figure C2: Precinct 1 AM Peak Residential Distribution (%) - 2026

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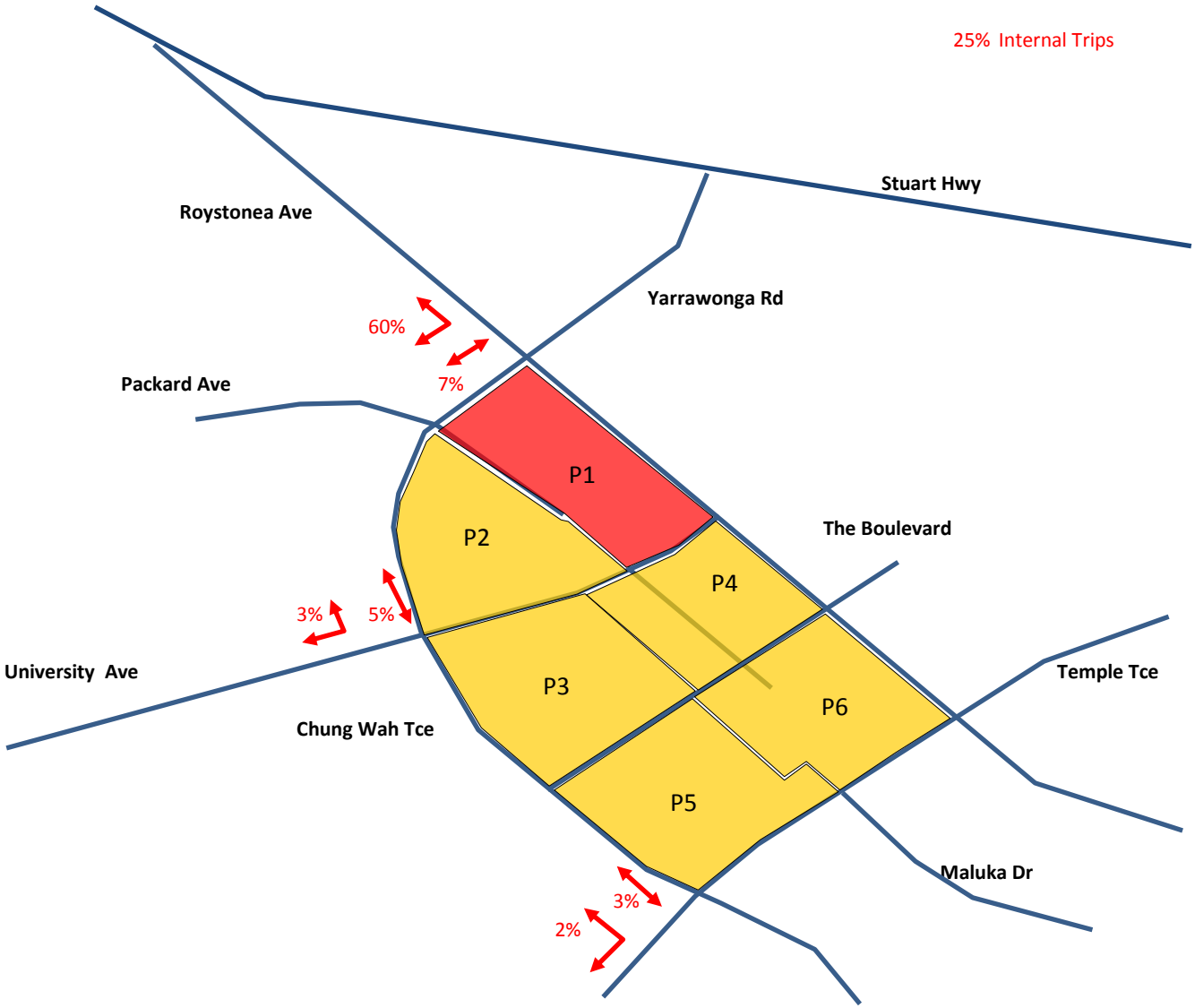

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Figure C2: Precinct 1 AM Peak Residential Distribution (%) - 2046

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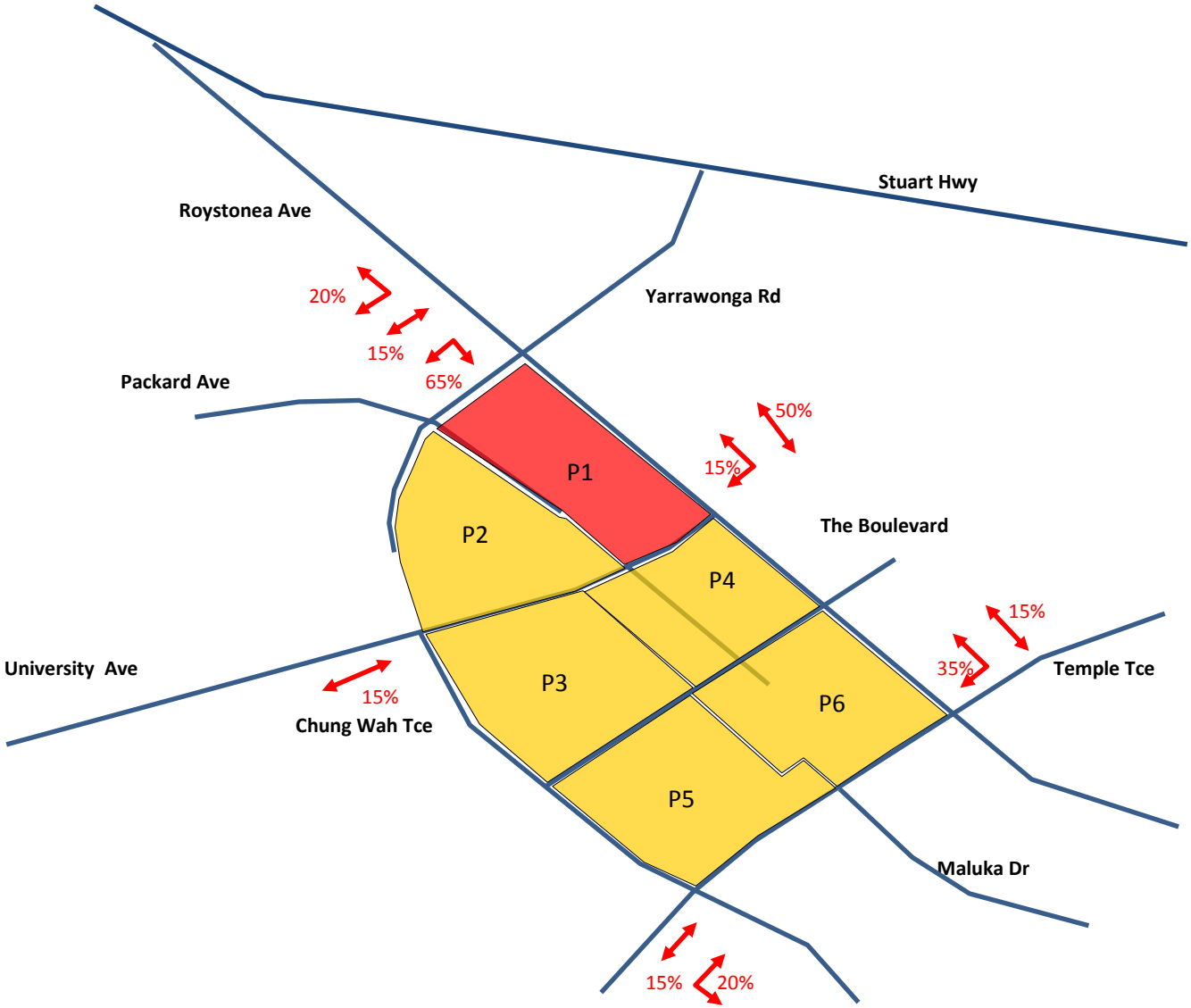

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Figure C2: Precinct 1 AM Peak Commercial Distribution (%) - 2016

BURCHILLS ENGINEERING SOLUTIONS

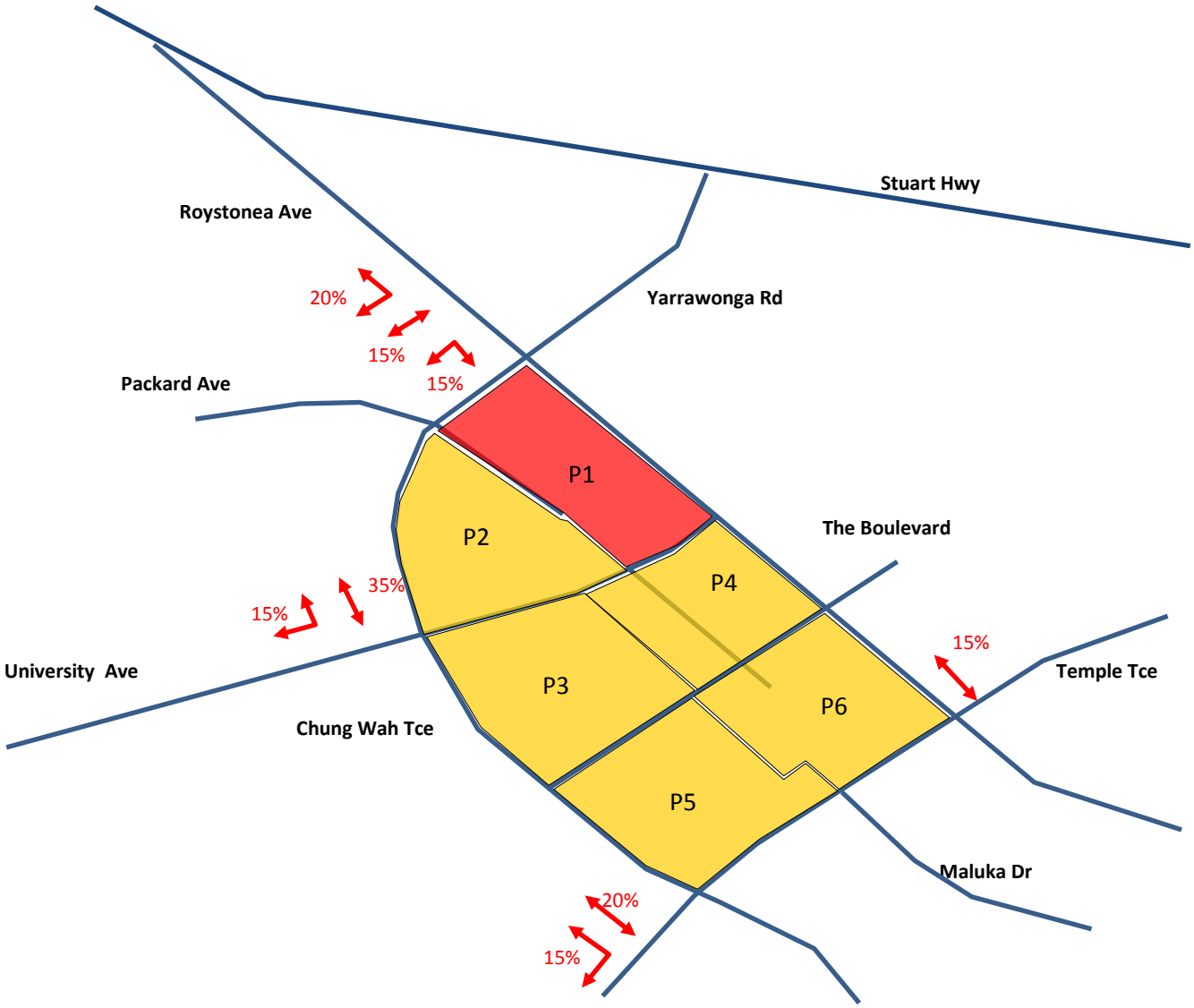

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Figure C2: Precinct 1 AM Peak Commercial Distribution (%) - 2026

BURCHILLS ENGINEERING SOLUTIONS

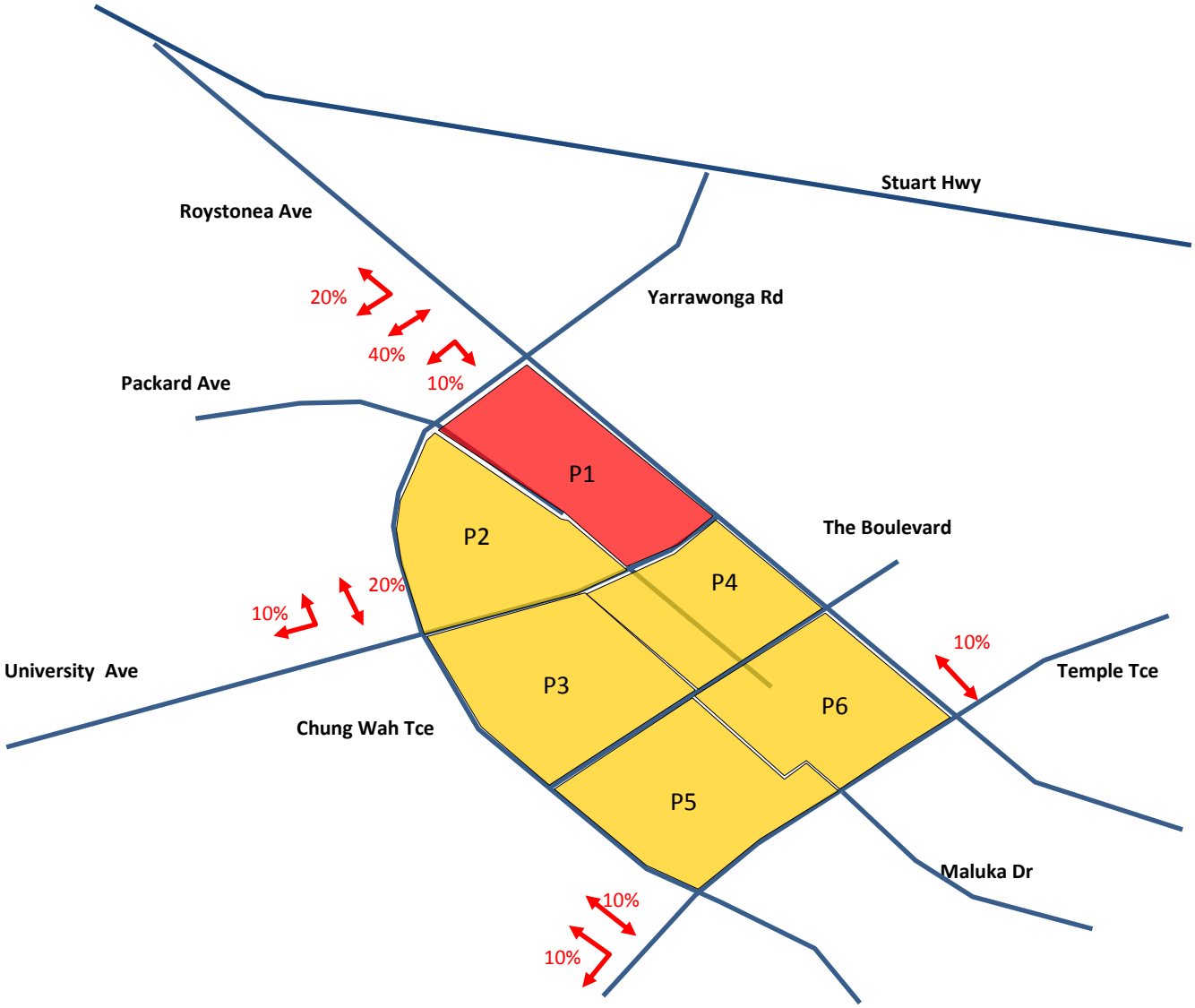

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Figure C2: Precinct 1 AM Peak Commercial Distribution (%) - 2046

BURCHILLS ENGINEERING SOLUTIONS

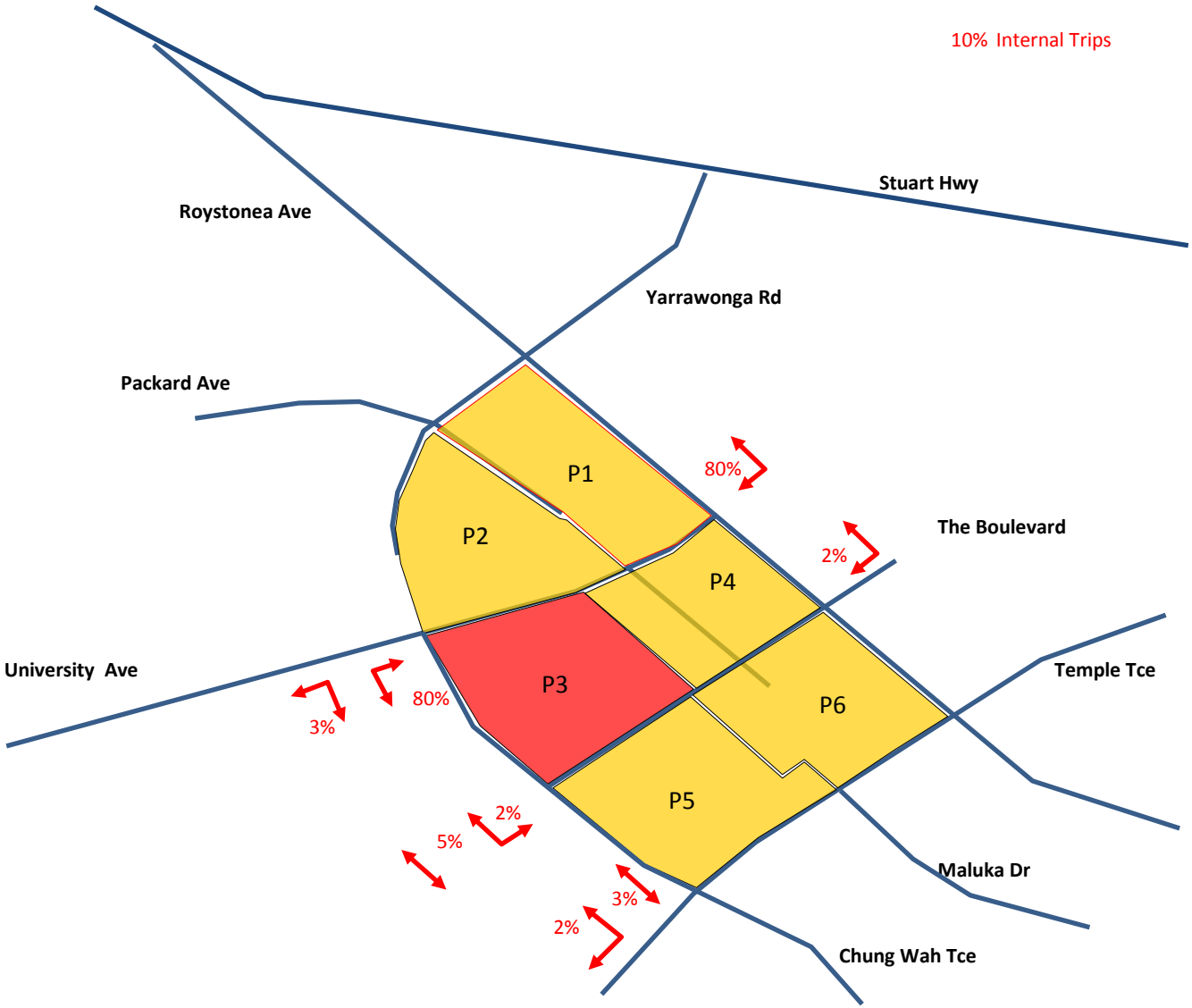

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Figure C2: Precinct 3 AM Peak Residential Distribution (%) - 2016

BURCHILLS ENGINEERING SOLUTIONS

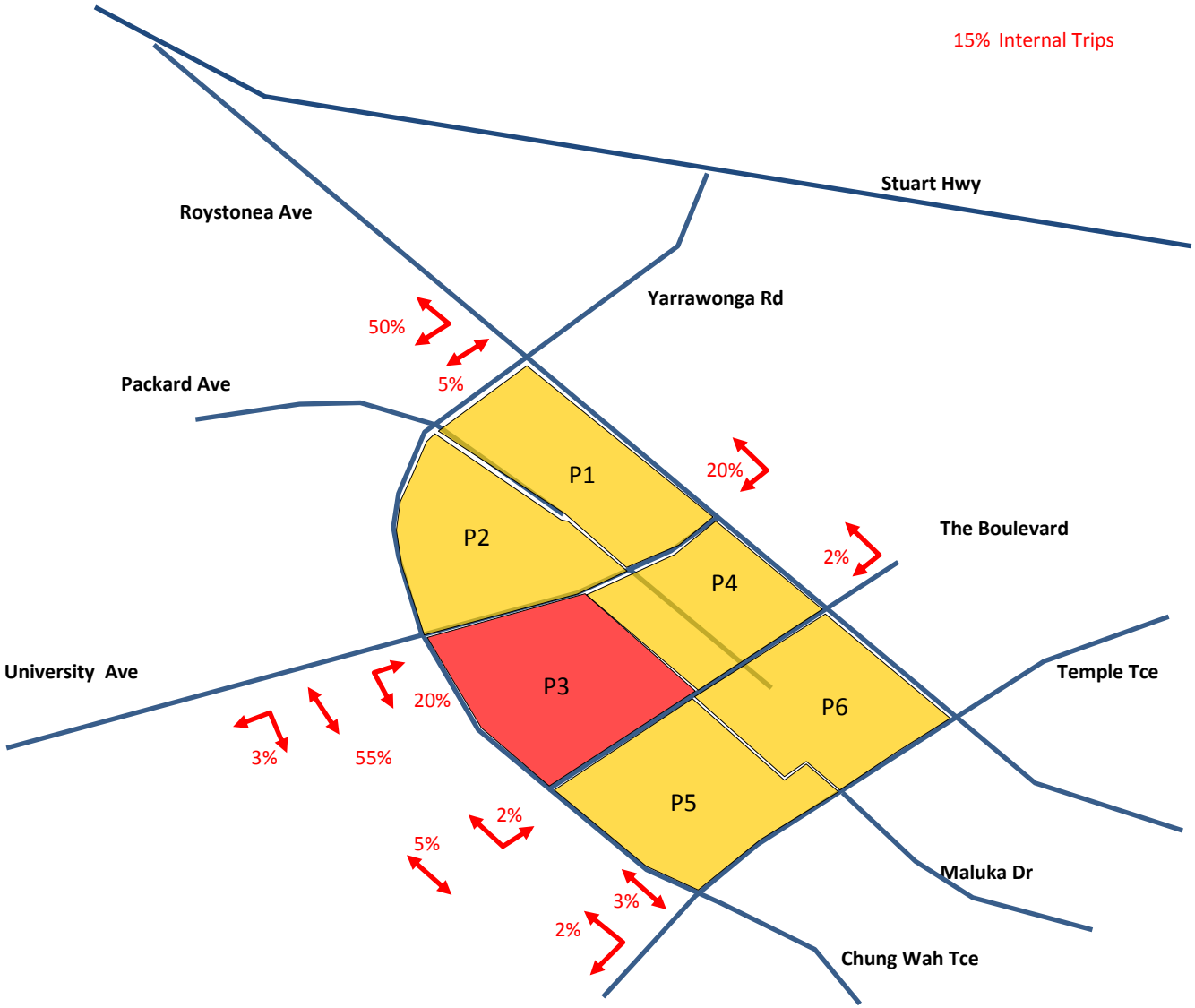

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Figure C2: Precinct 3 AM Peak Residential Distribution (%) - 2026

BURCHILLS ENGINEERING SOLUTIONS

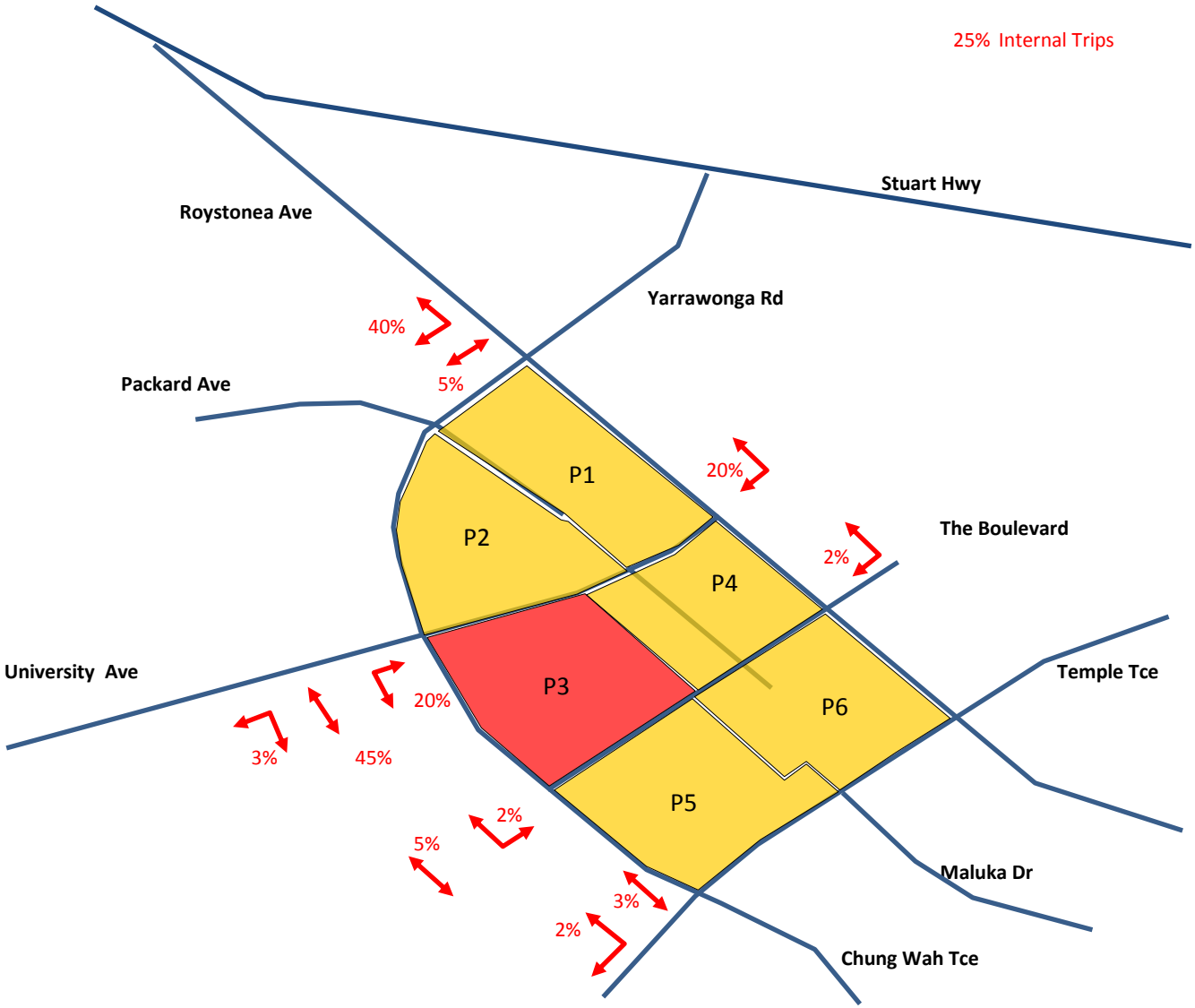

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Figure C2: Precinct 3 AM Peak Residential Distribution (%) - 2046

BURCHILLS ENGINEERING SOLUTIONS

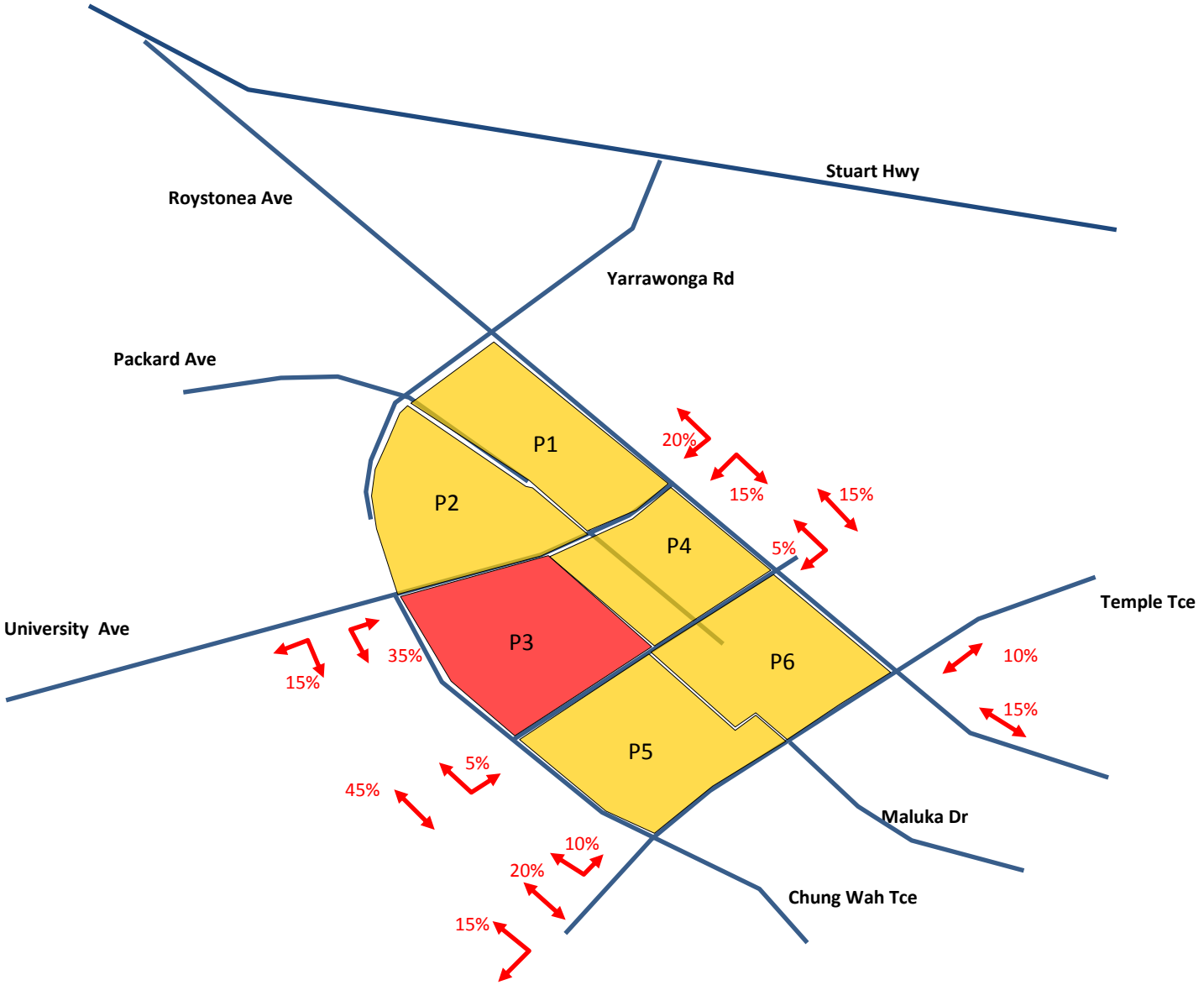

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Figure C2: Precinct 3 AM Peak Commercial Distribution (%) - 2016

BURCHILLS ENGINEERING SOLUTIONS

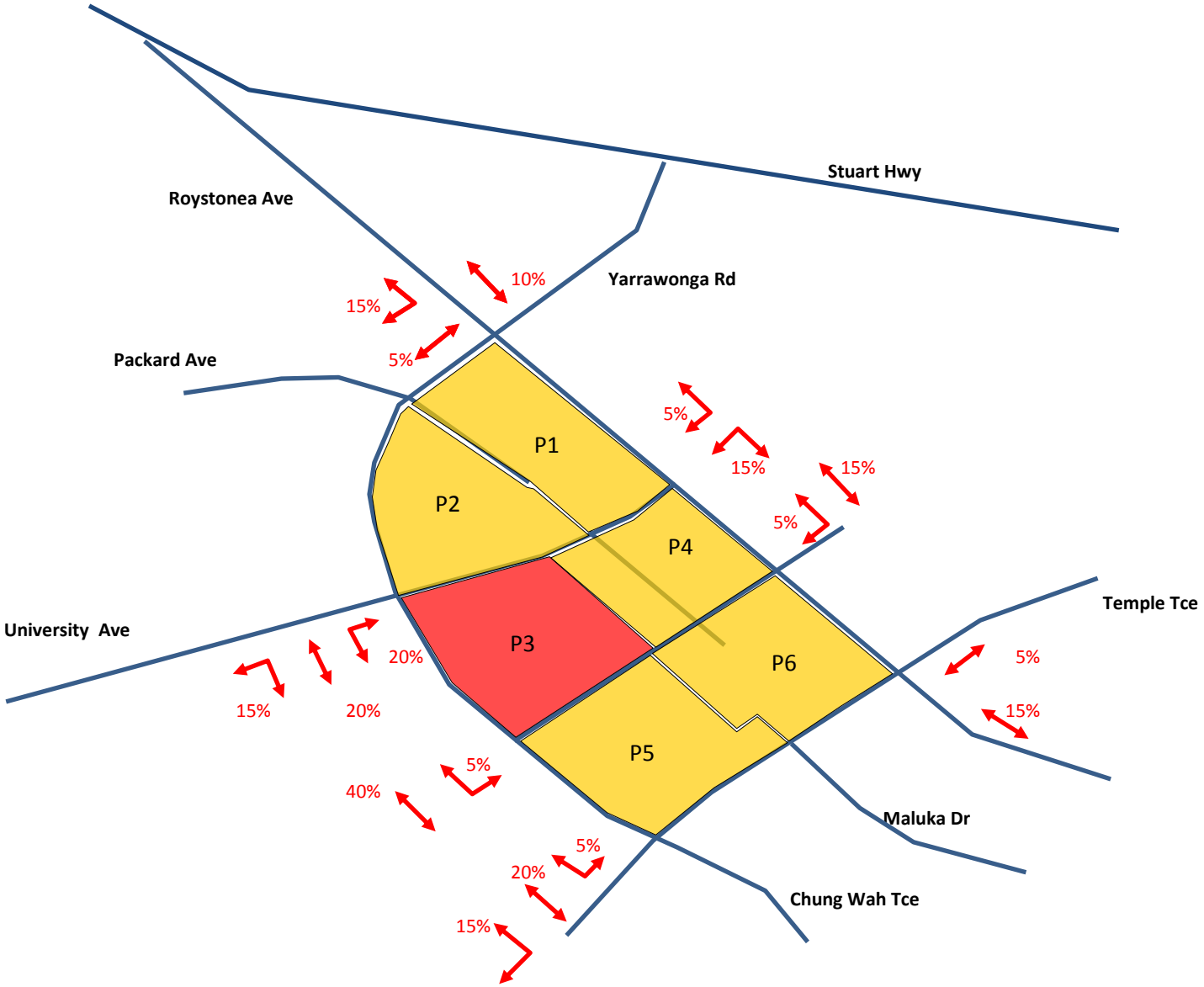

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Figure C2: Precinct 3 AM Peak Commercial Distribution (%) - 2026

BURCHILLS ENGINEERING SOLUTIONS

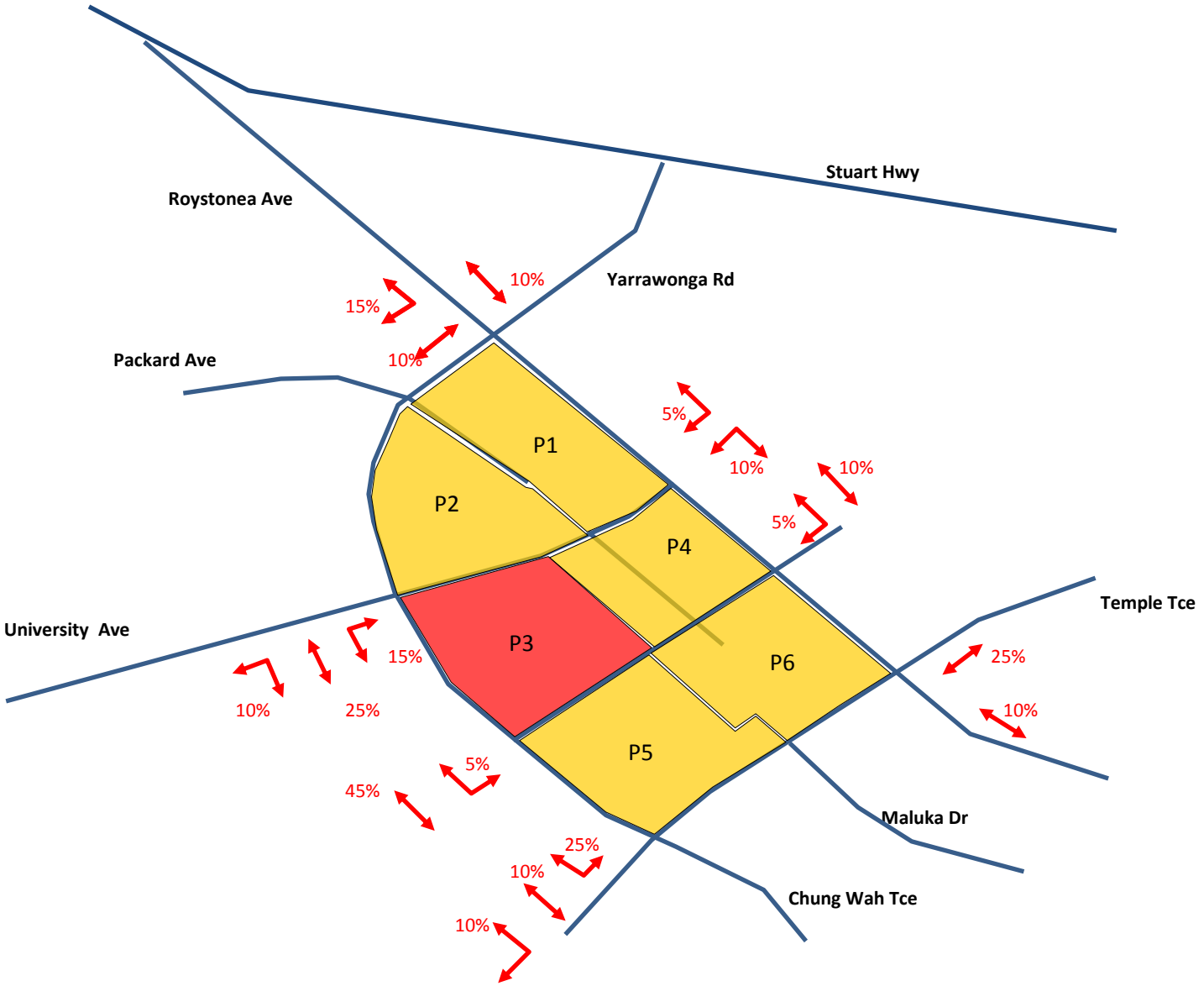

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Figure C2: Precinct 3 AM Peak Commercial Distribution (%) - 2046

BURCHILLS ENGINEERING SOLUTIONS

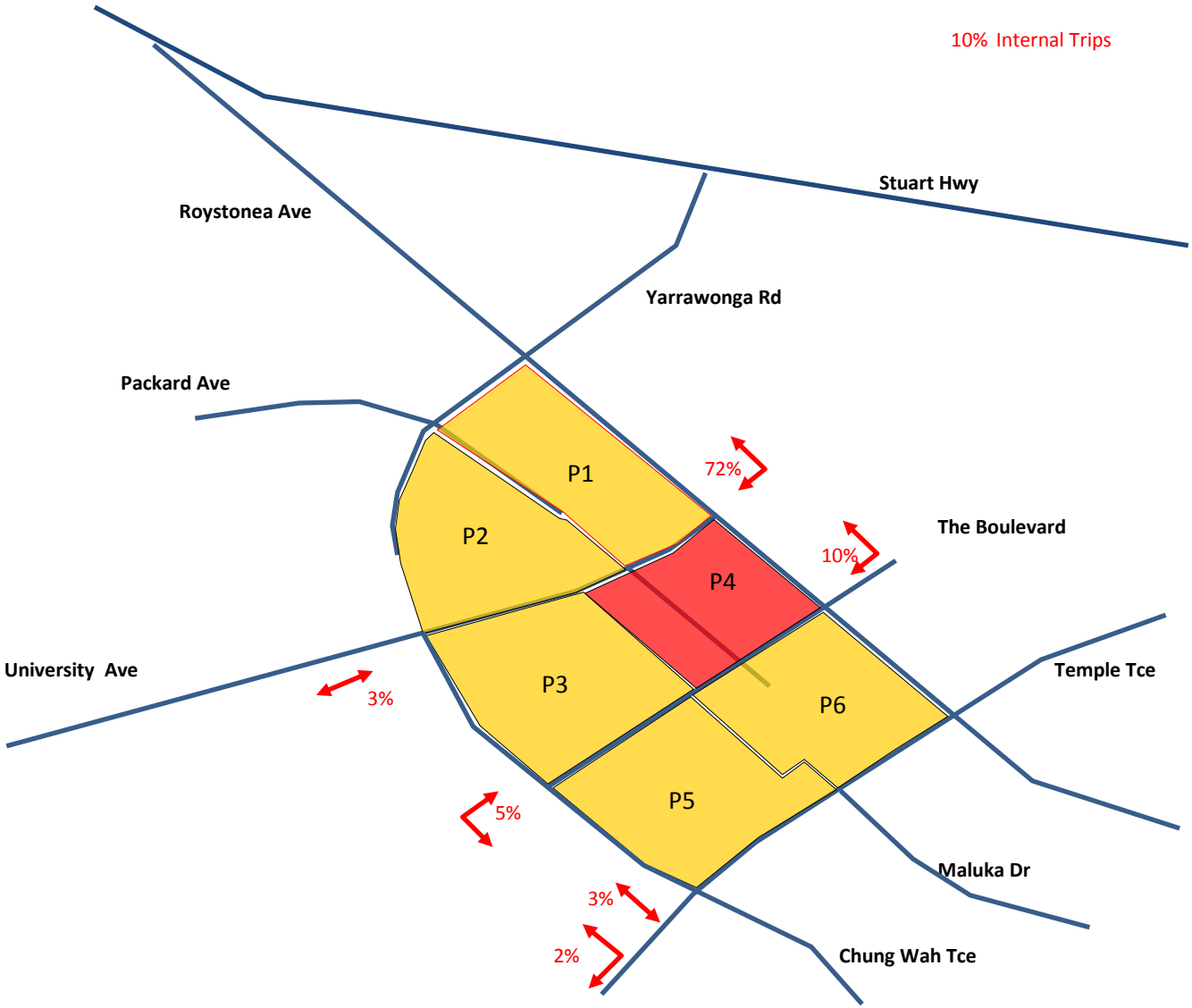

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Figure C2: Precinct 4 AM Peak Residential Distribution (%) - 2016

BURCHILLS ENGINEERING SOLUTIONS

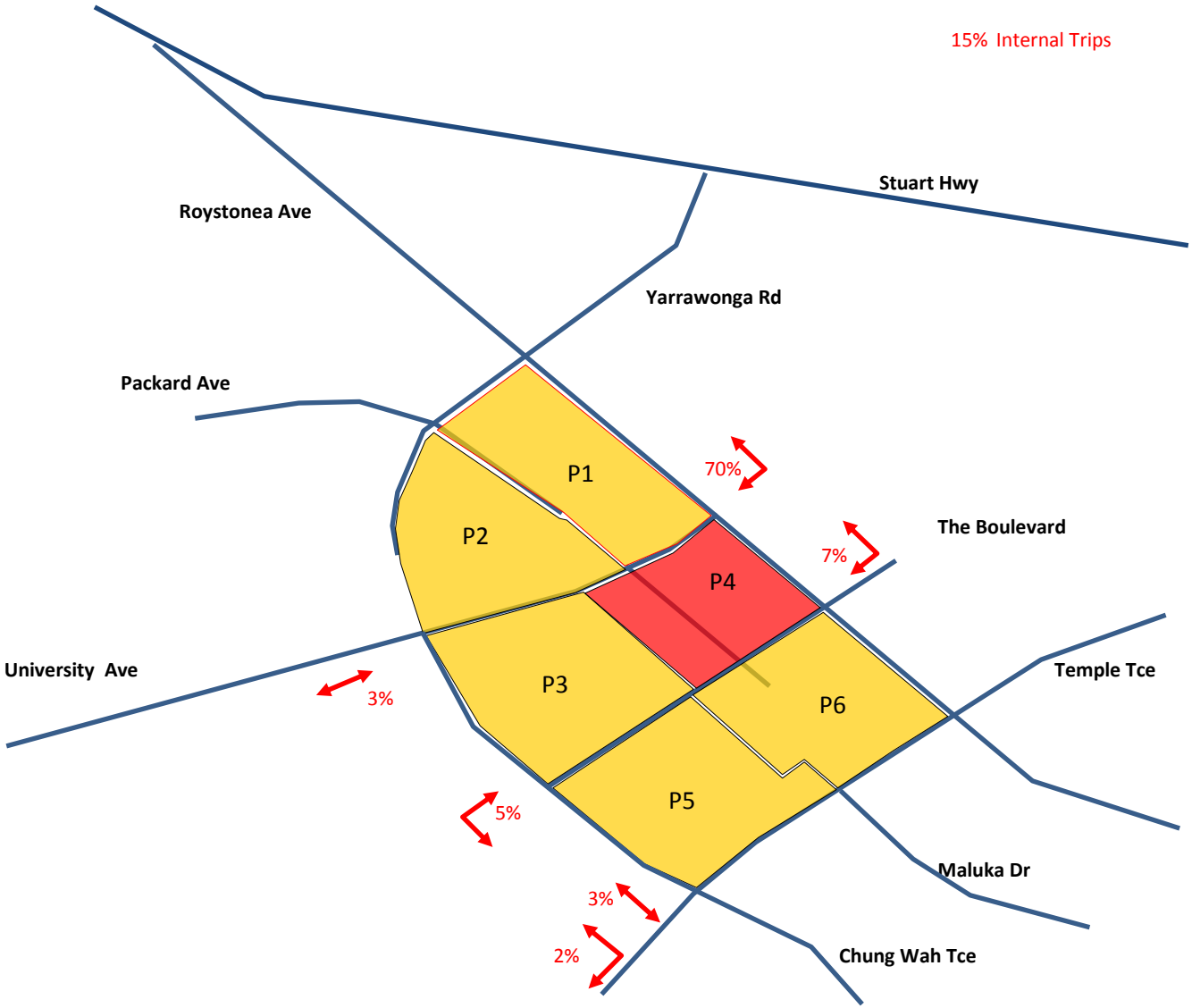

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Figure C2: Precinct 4 AM Peak Residential Distribution (%) - 2026

BURCHILLS ENGINEERING SOLUTIONS

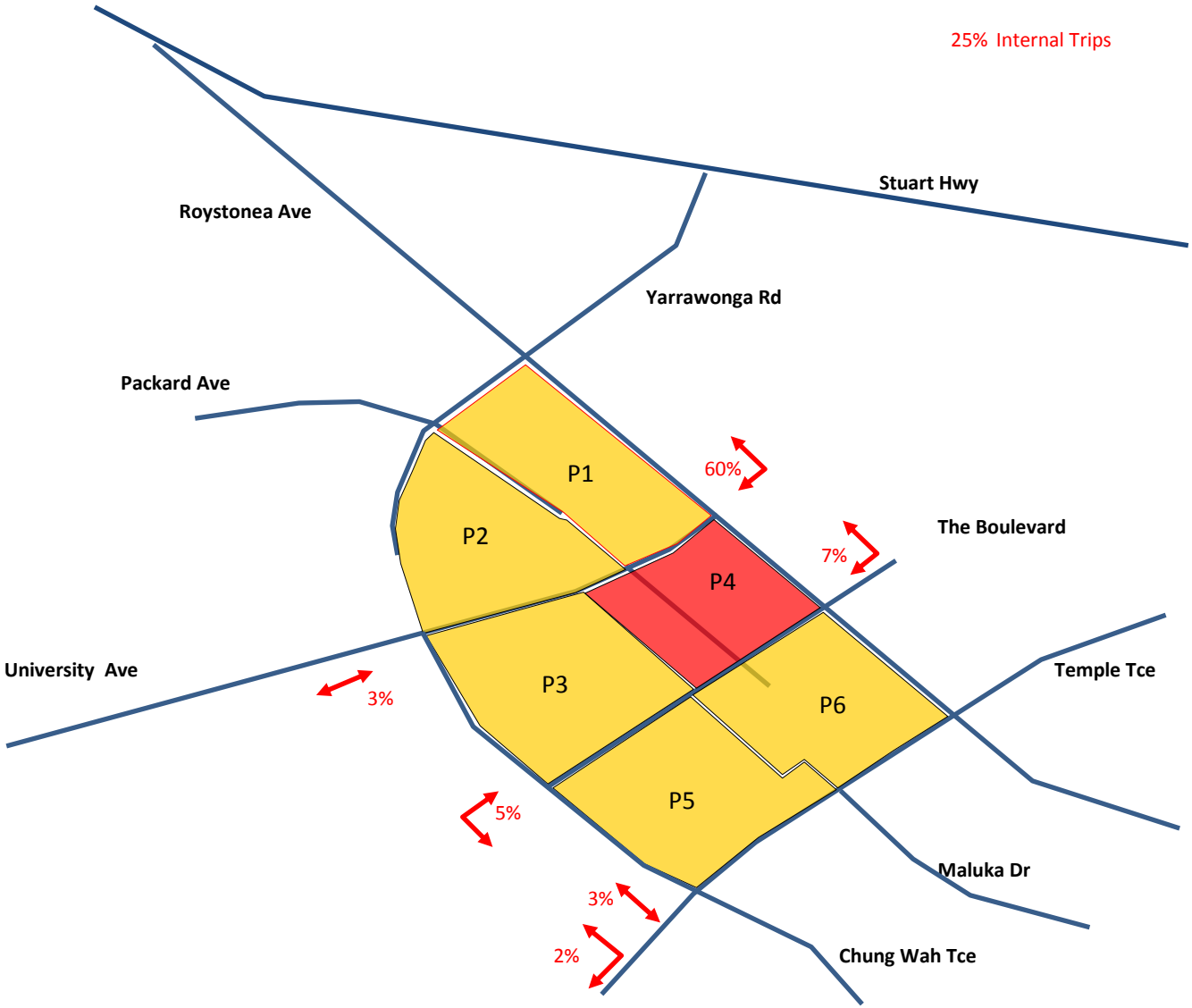

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Figure C2: Precinct 4 AM Peak Residential Distribution (%) - 2046

BURCHILLS ENGINEERING SOLUTIONS

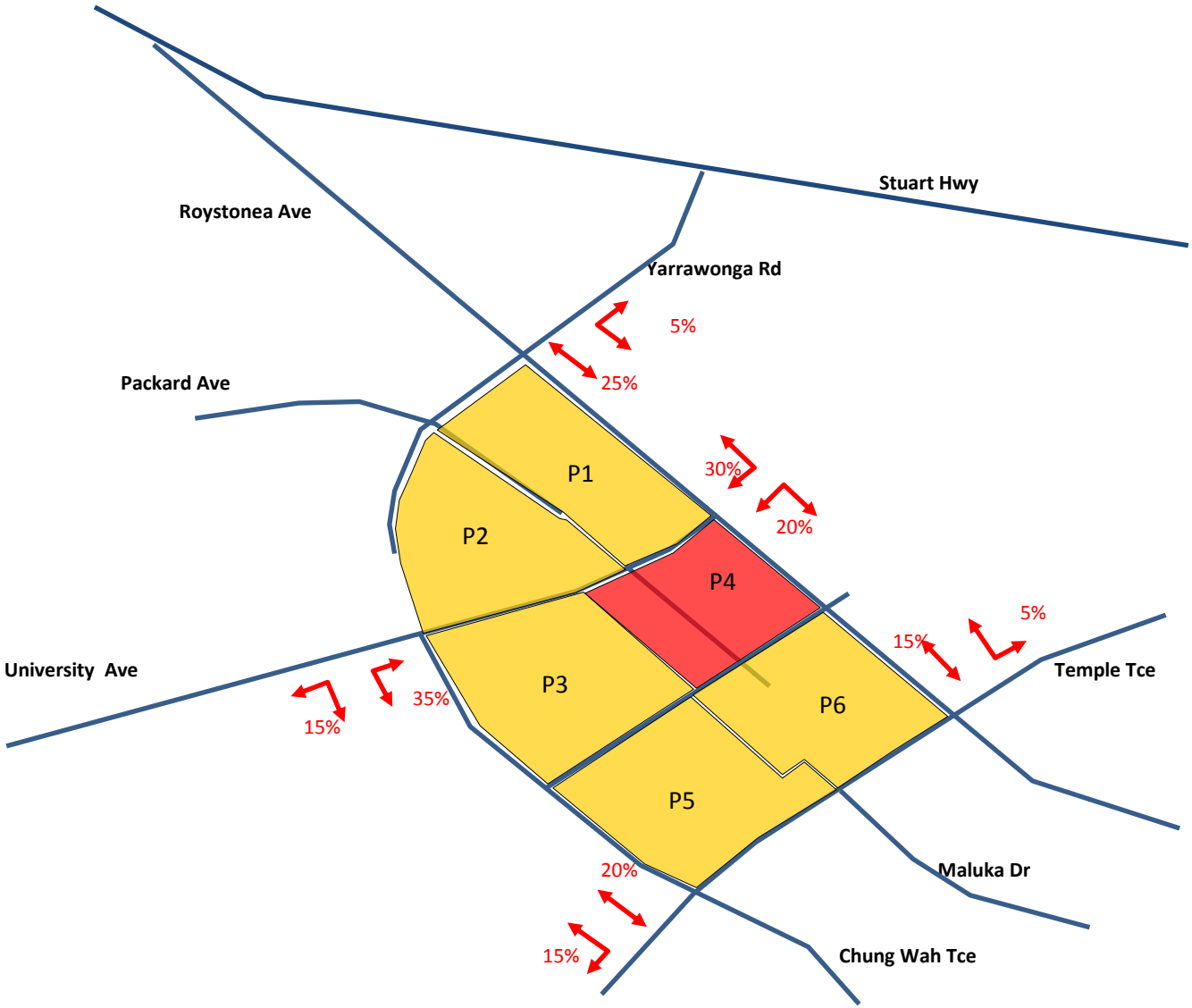

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Figure C2: Precinct 4 AM Peak Commercial Distribution (%) - 2016

BURCHILLS ENGINEERING SOLUTIONS

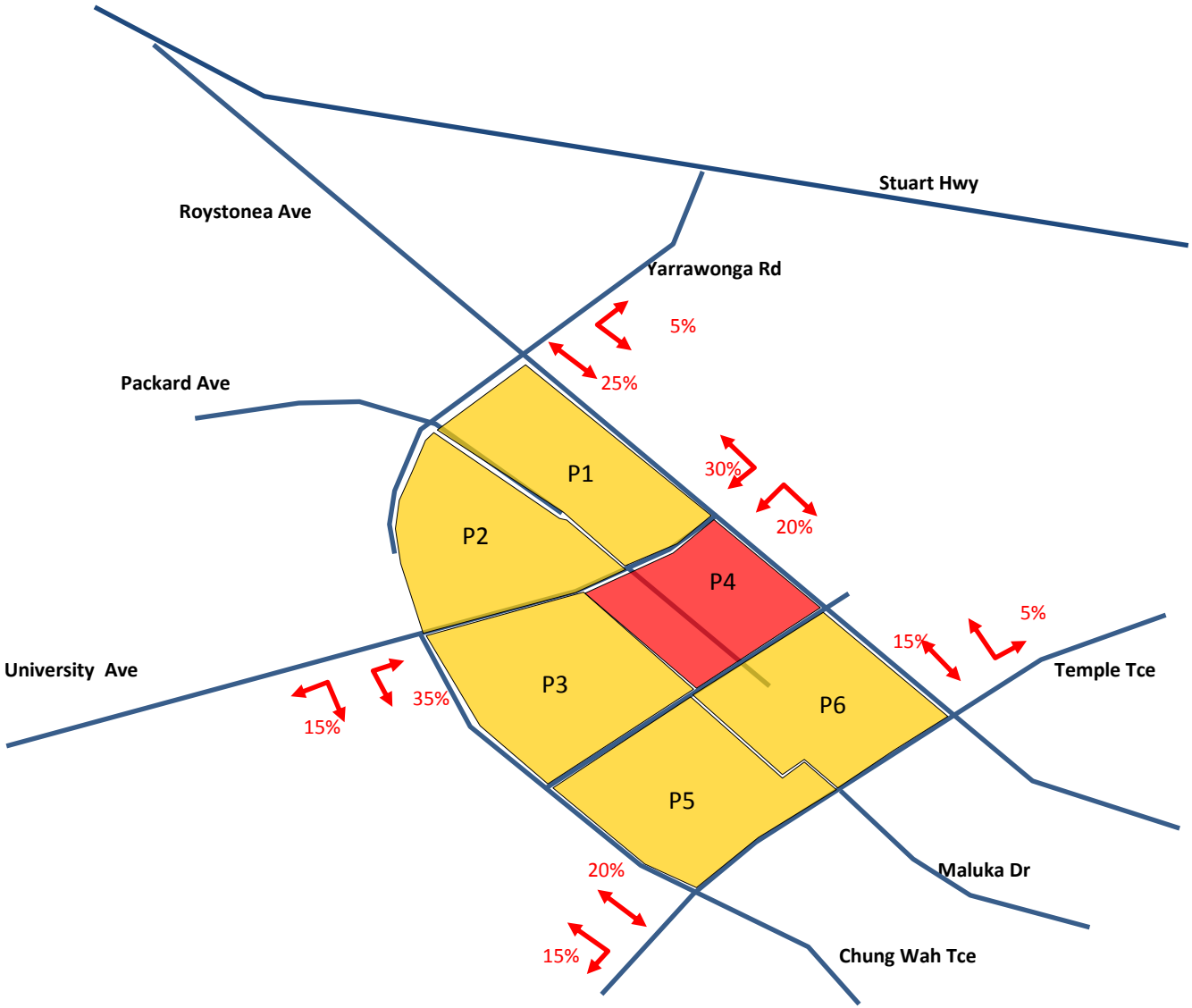

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Figure C2: Precinct 4 AM Peak Commercial Distribution (%) - 2026

BURCHILLS ENGINEERING SOLUTIONS

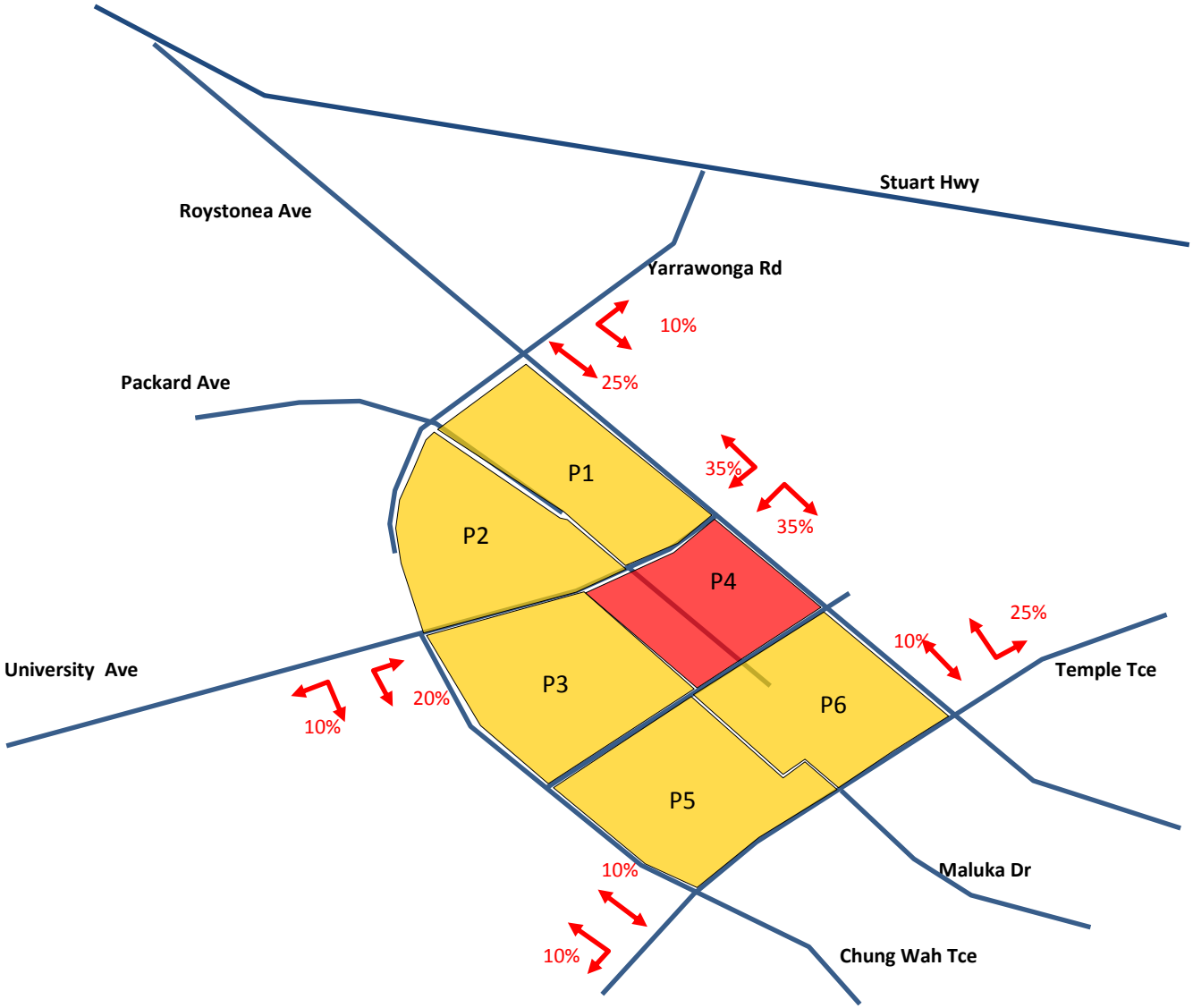

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Figure C2: Precinct 4 AM Peak Commercial Distribution (%) - 2046

BURCHILLS ENGINEERING SOLUTIONS

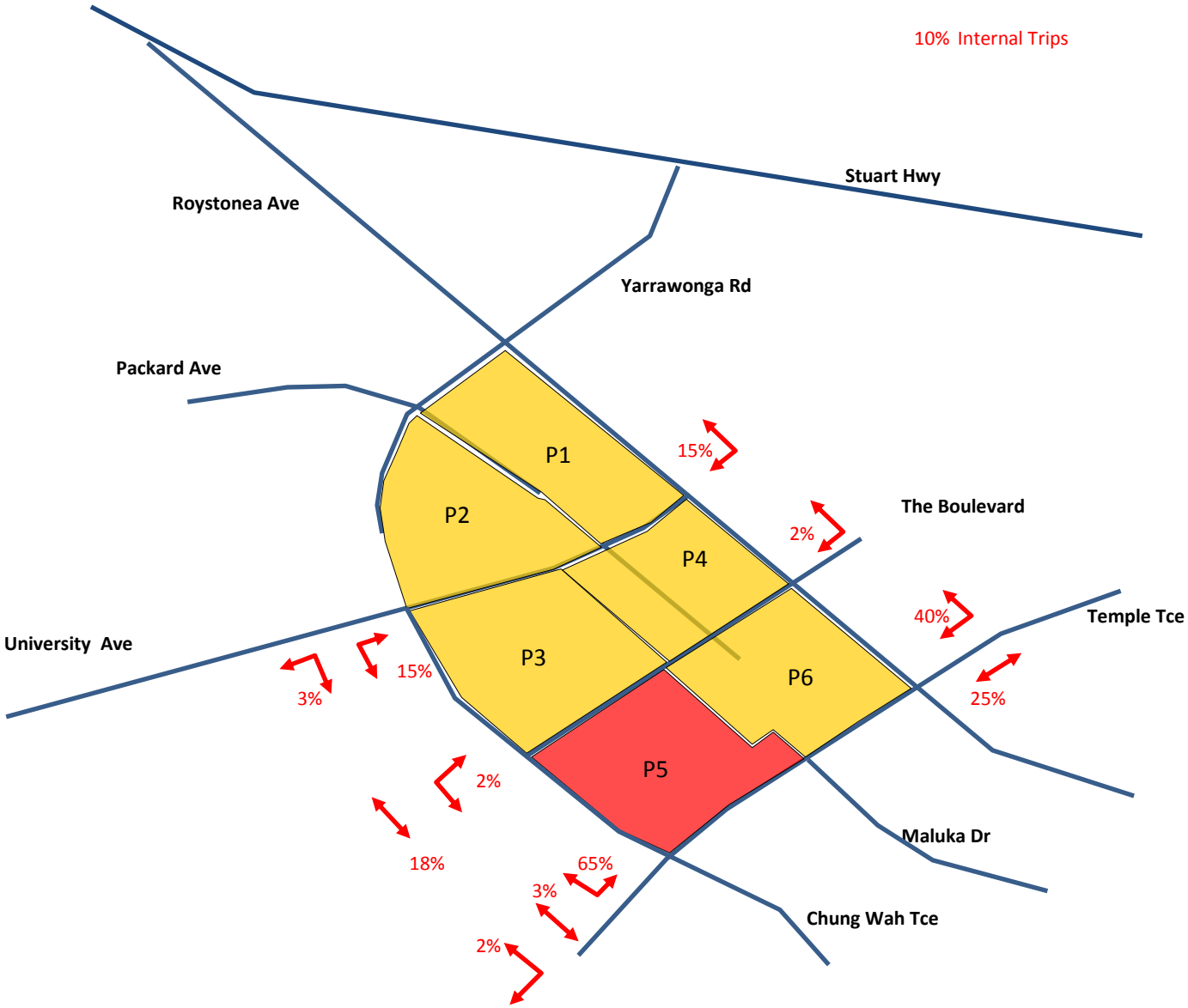

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Figure C2: Precinct 5 AM Peak Residential Distribution (%) - 2016

BURCHILLS ENGINEERING SOLUTIONS

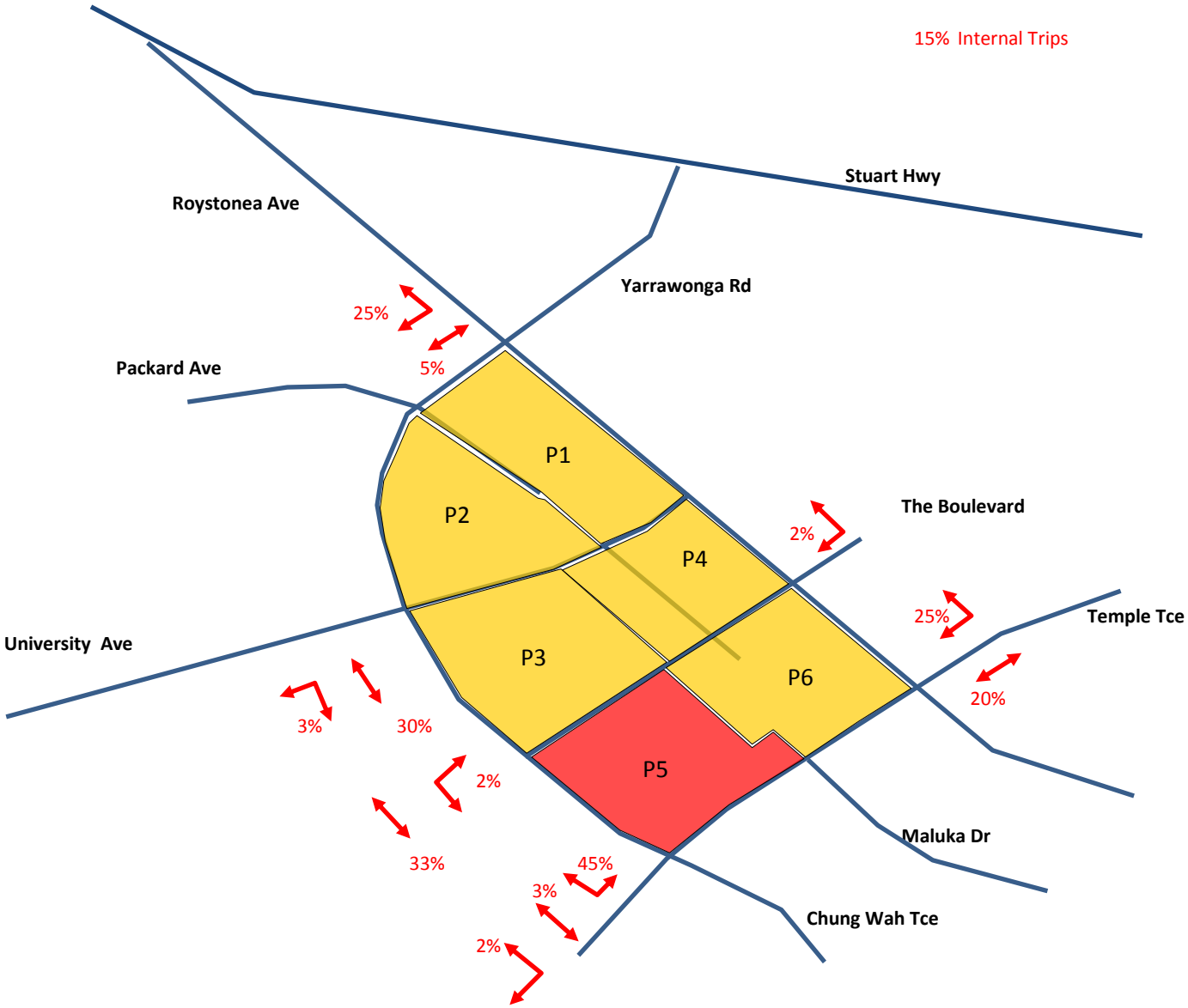

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Figure C2: Precinct 5 AM Peak Residential Distribution (%) - 2026

BURCHILLS ENGINEERING SOLUTIONS

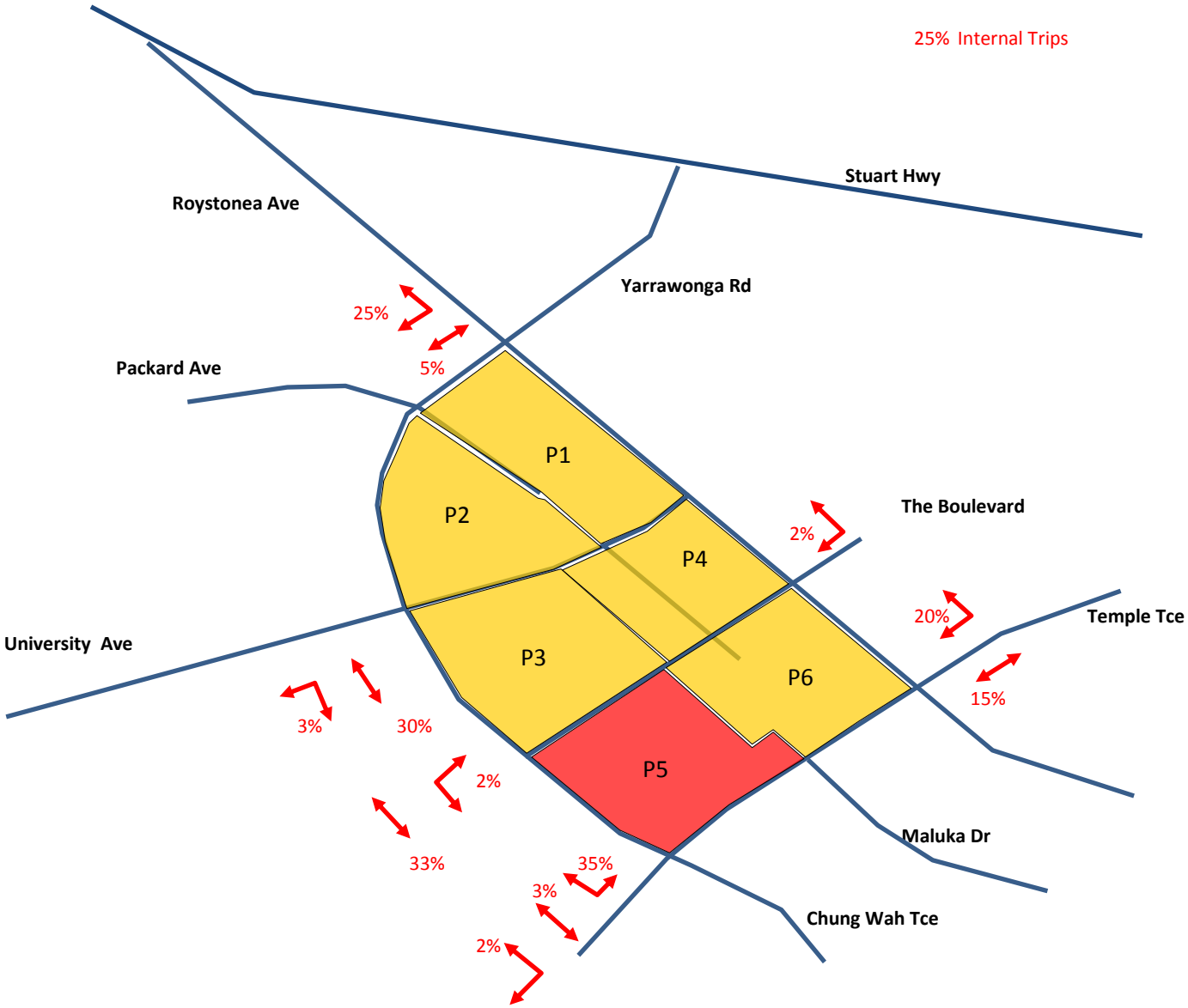

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Figure C2: Precinct 5 AM Peak Residential Distribution (%) - 2046

BURCHILLS ENGINEERING SOLUTIONS

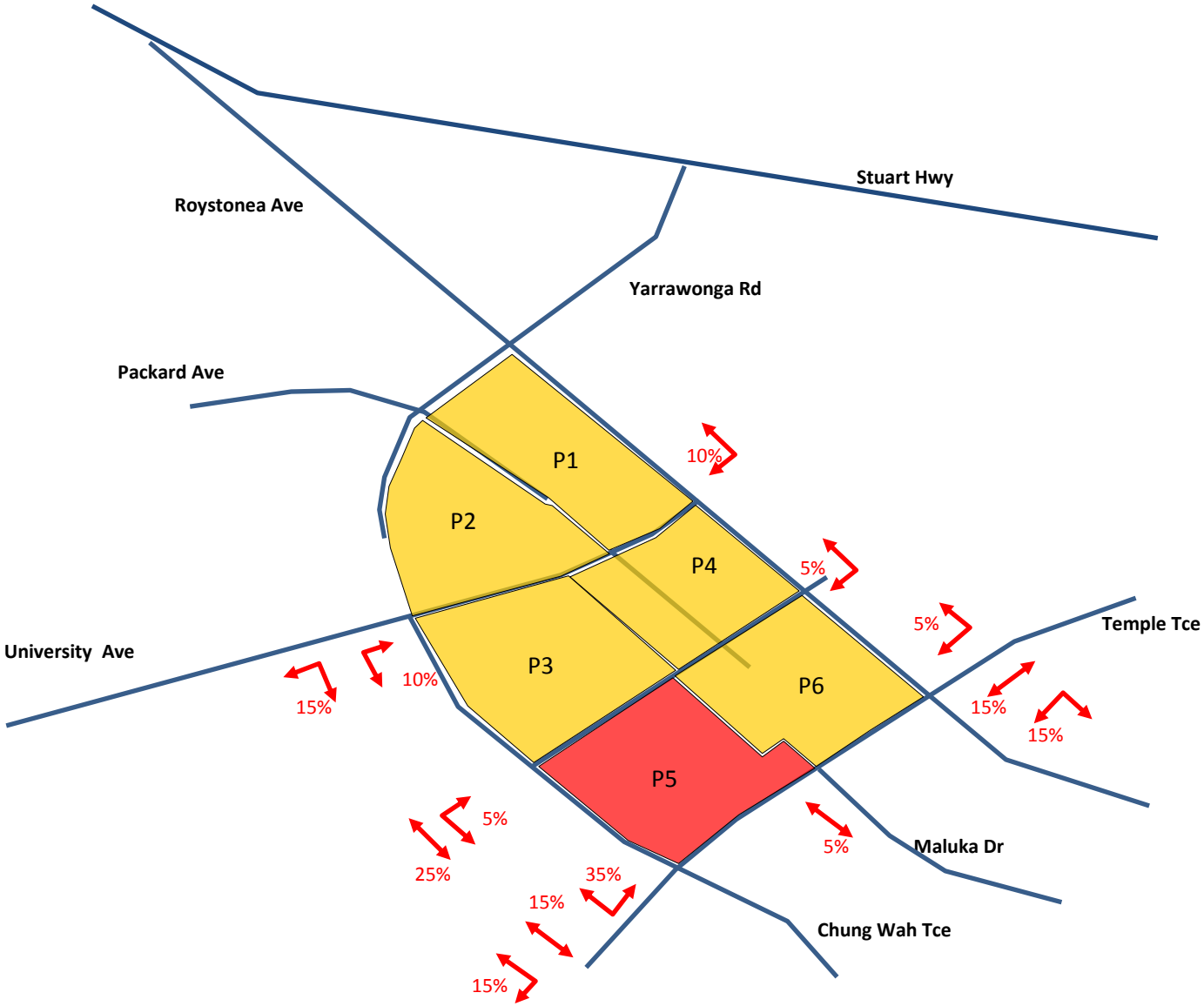

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Figure C2: Precinct 5 AM Peak Commercial Distribution (%) - 2016

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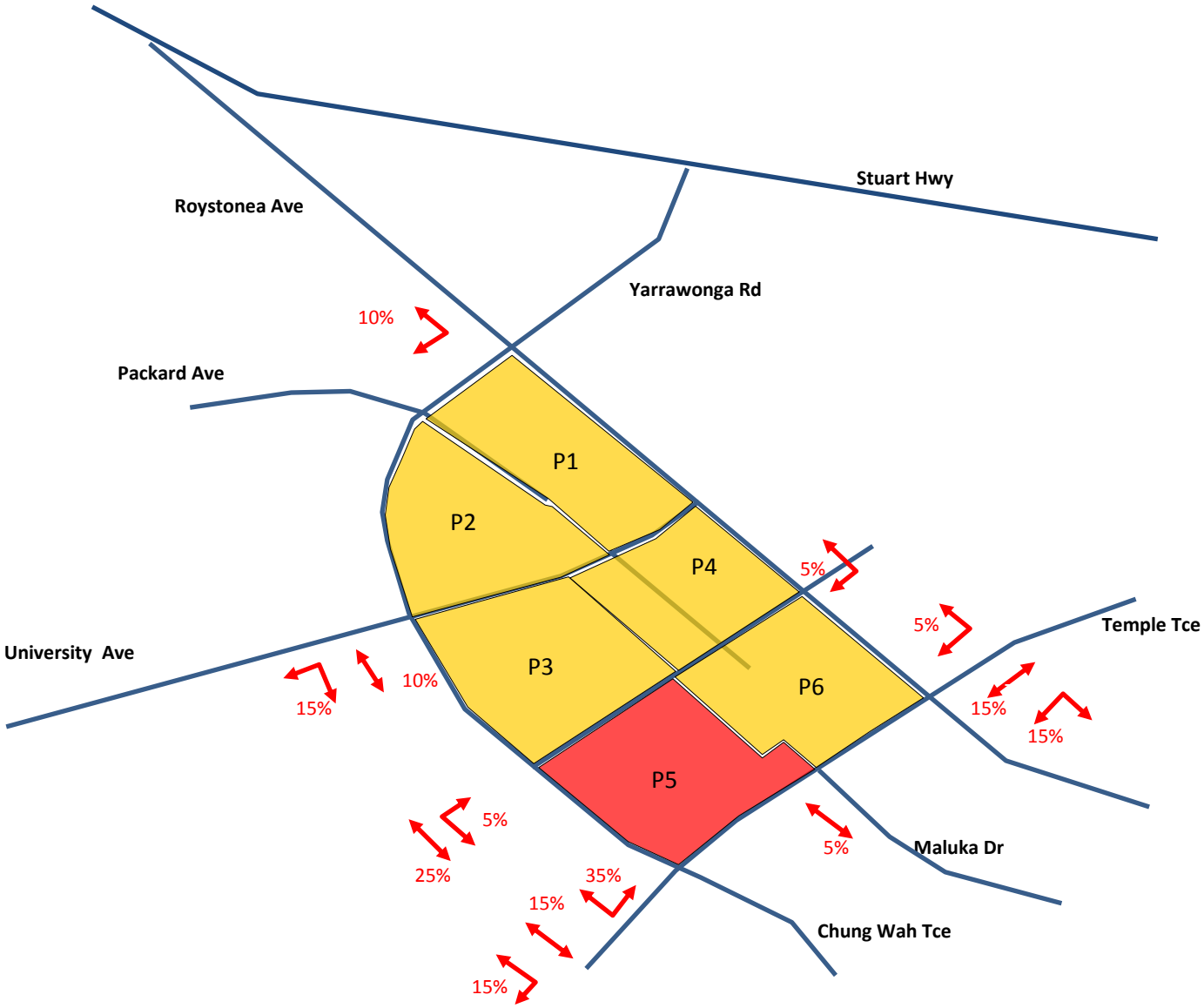

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Figure C2: Precinct 5 AM Peak Commercial Distribution (%) - 2026

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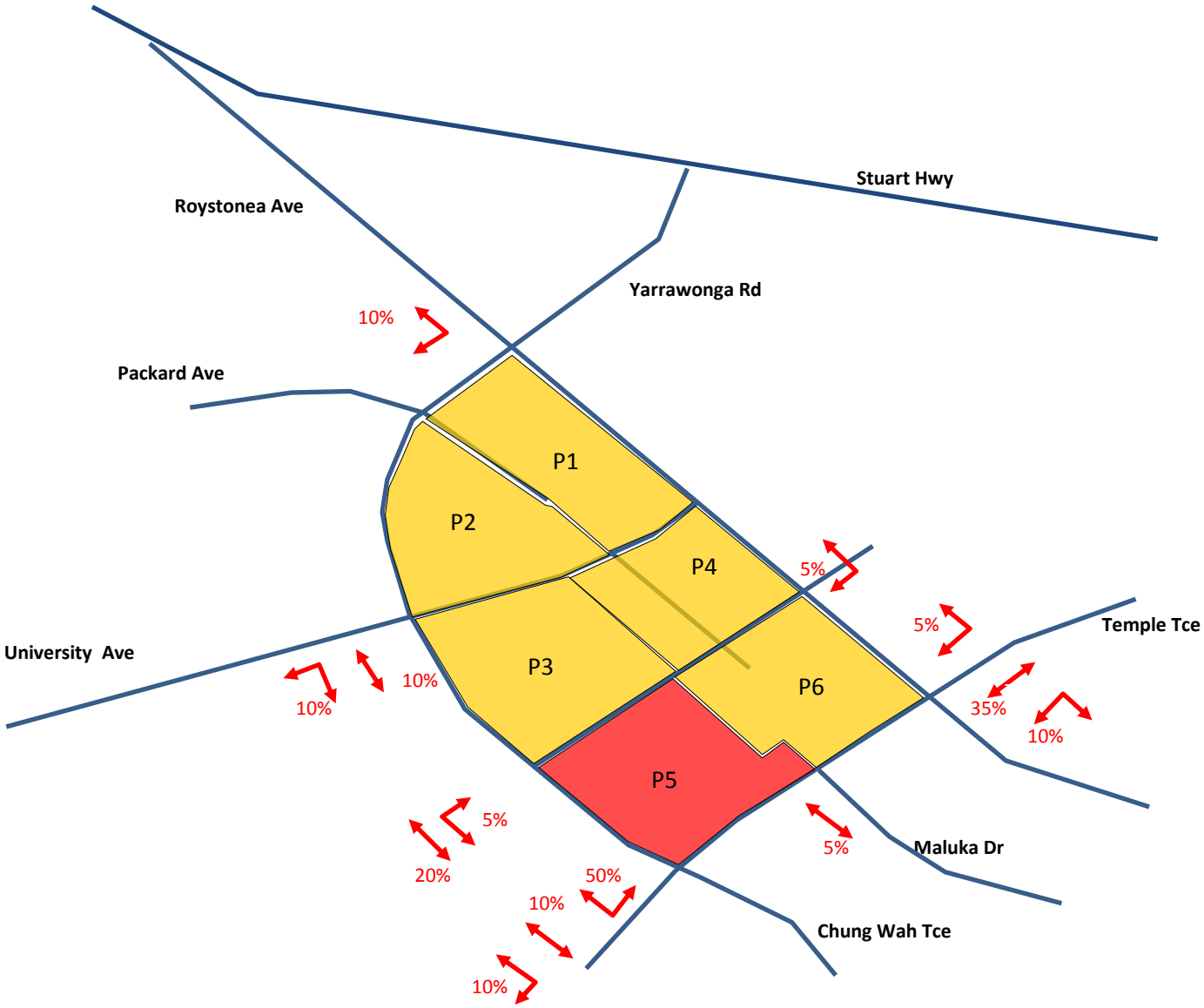

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Figure C2: Precinct 5 AM Peak Commercial Distribution (%) - 2046

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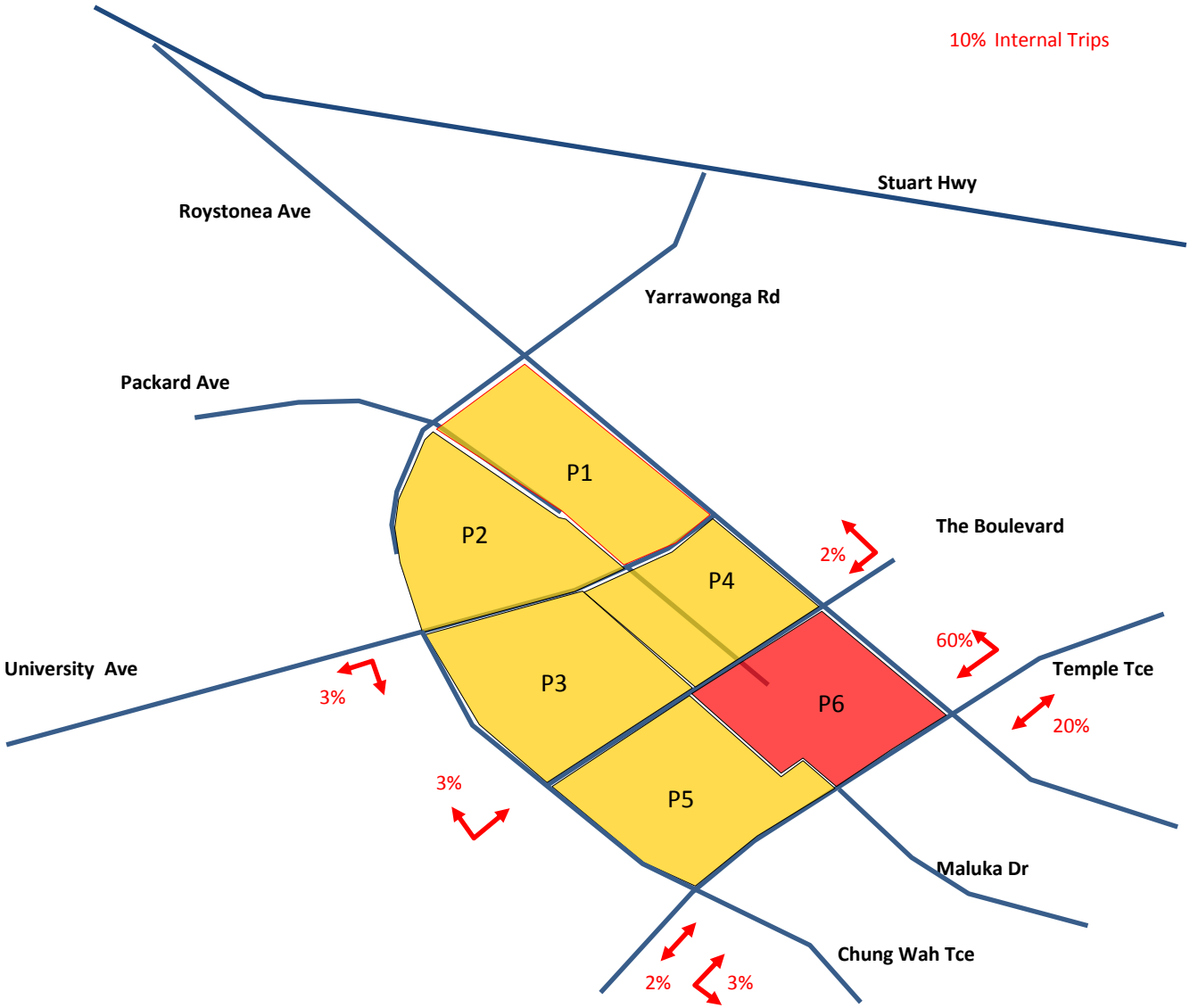

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Figure C2: Precinct 6 AM Peak Residential Distribution (%) - 2016

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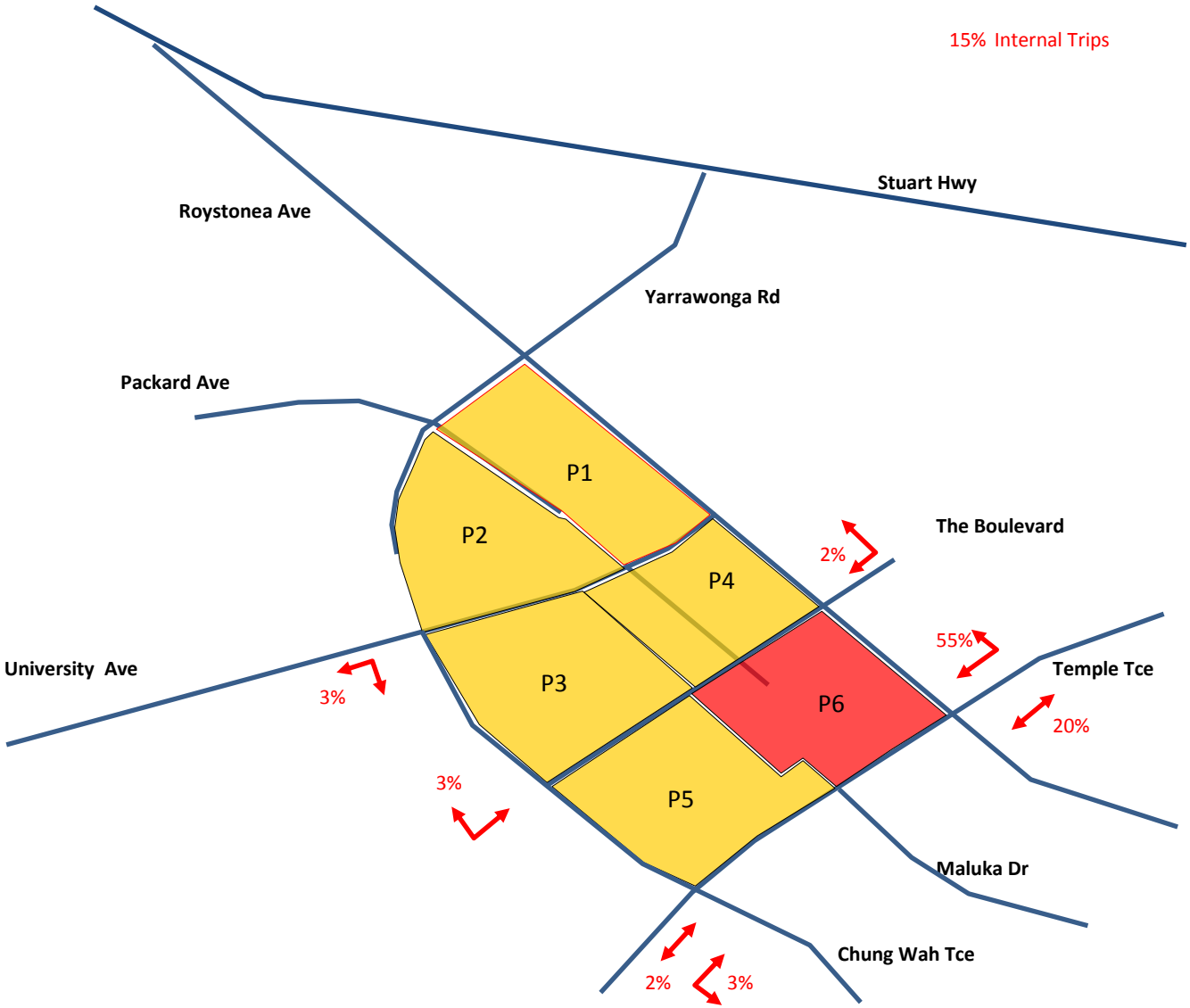

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Figure C2: Precinct 6 AM Peak Residential Distribution (%) - 2026

BURCHILLS ENGINEERING SOLUTIONS

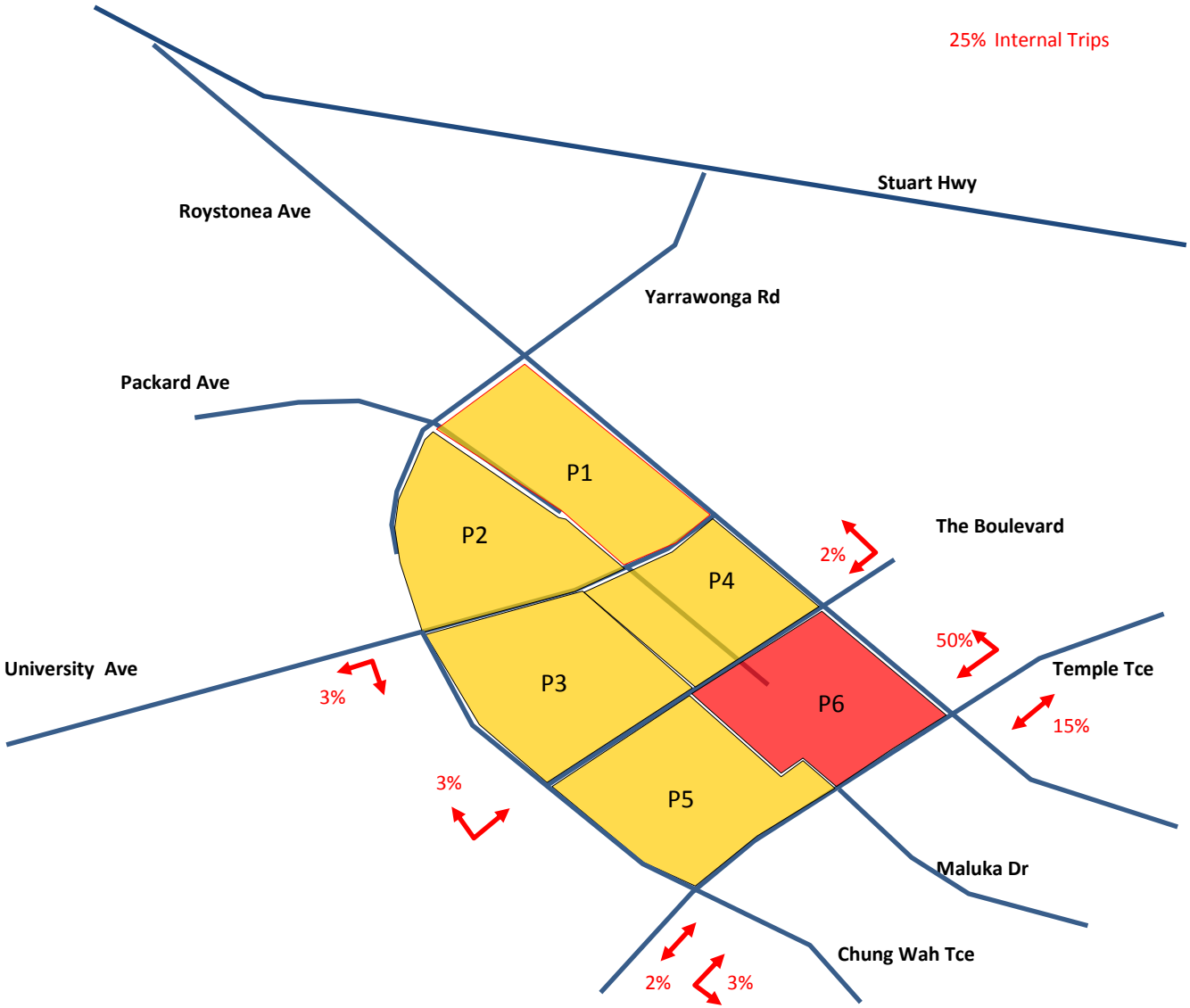

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Figure C2: Precinct 6 AM Peak Residential Distribution (%) - 2046

BURCHILLS ENGINEERING SOLUTIONS

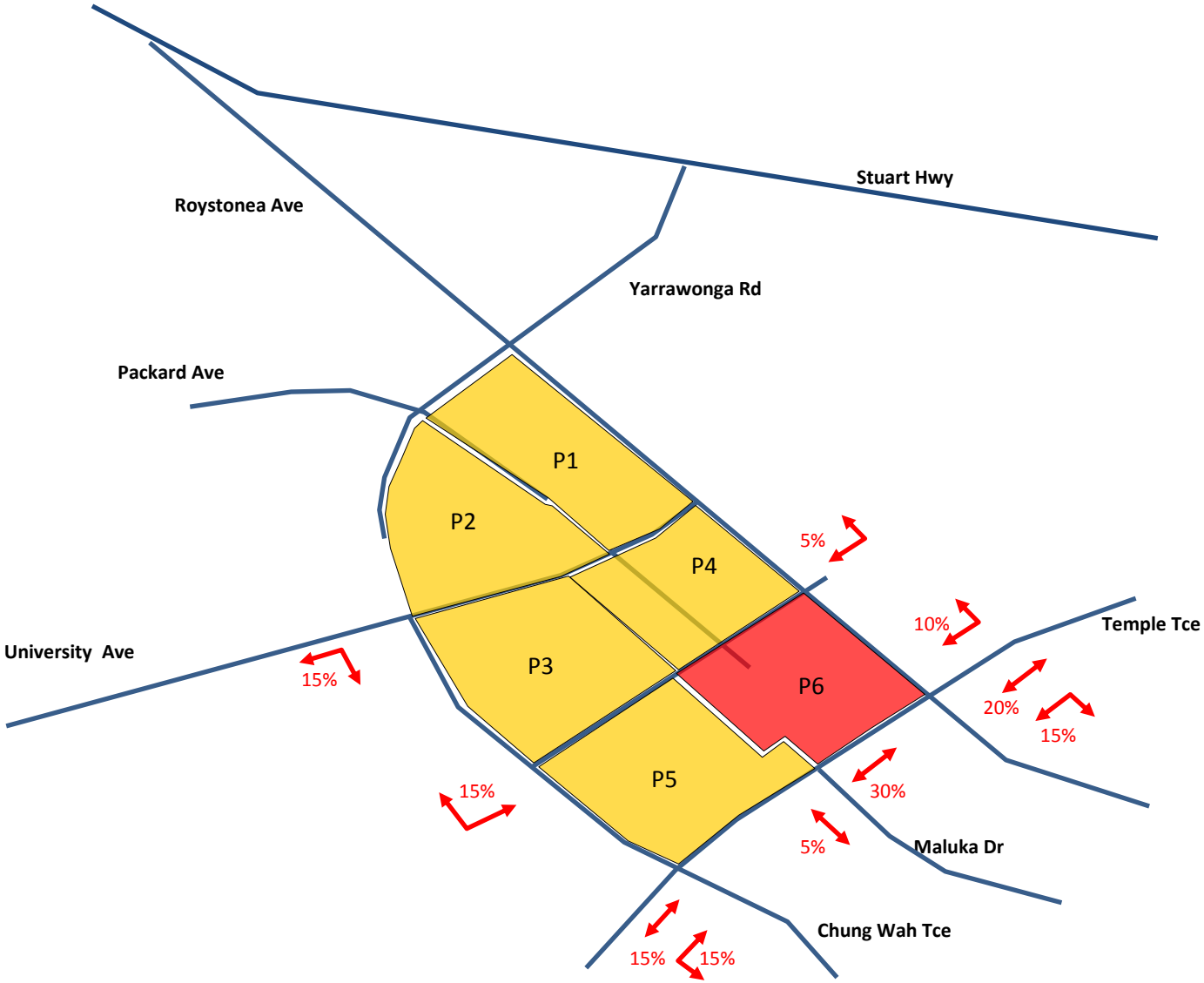

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Figure C2: Precinct 6 AM Peak Commercial Distribution (%) - 2016

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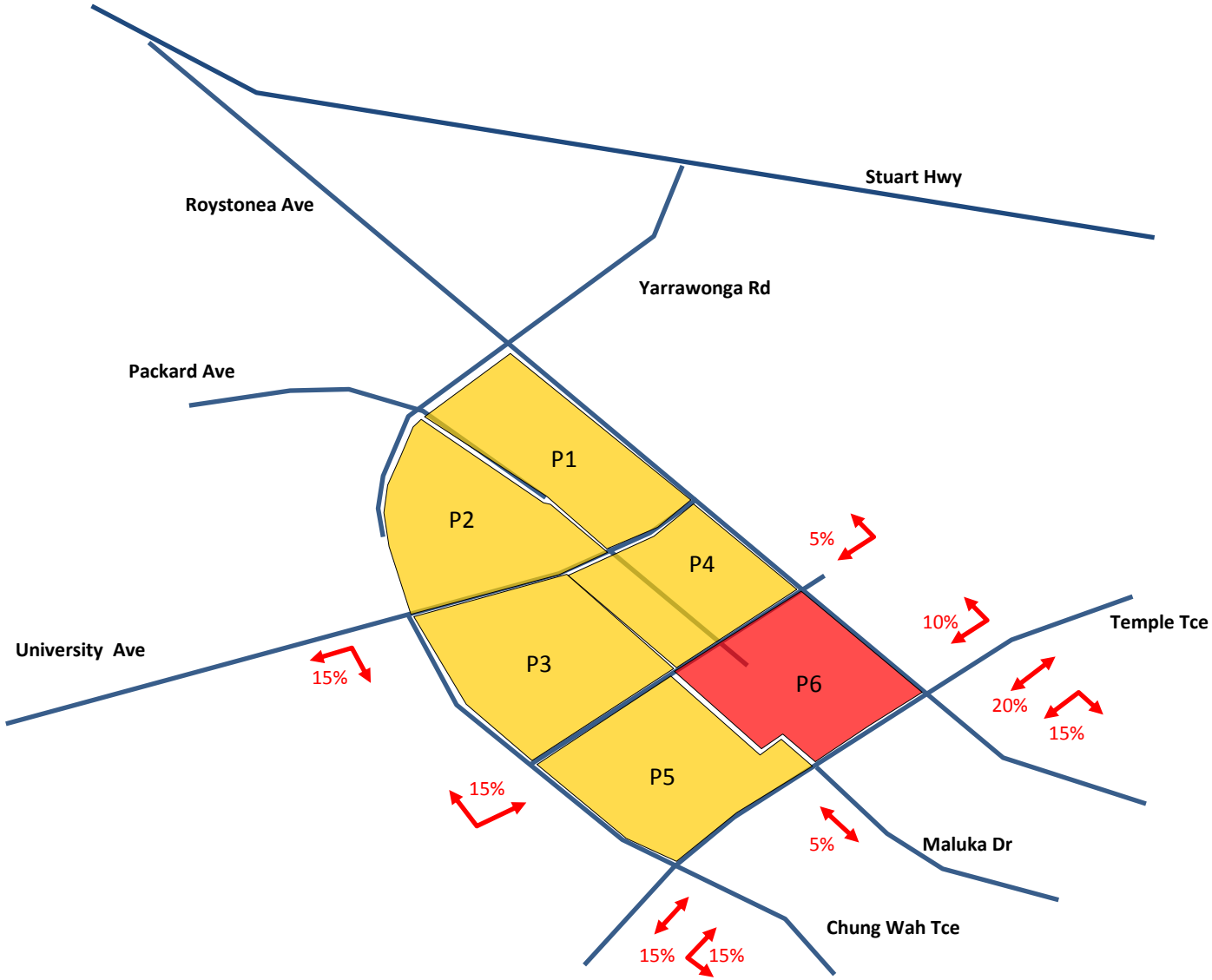

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Figure C2: Precinct 6 AM Peak Commercial Distribution (%) - 2026

BURCHILLS ENGINEERING SOLUTIONS

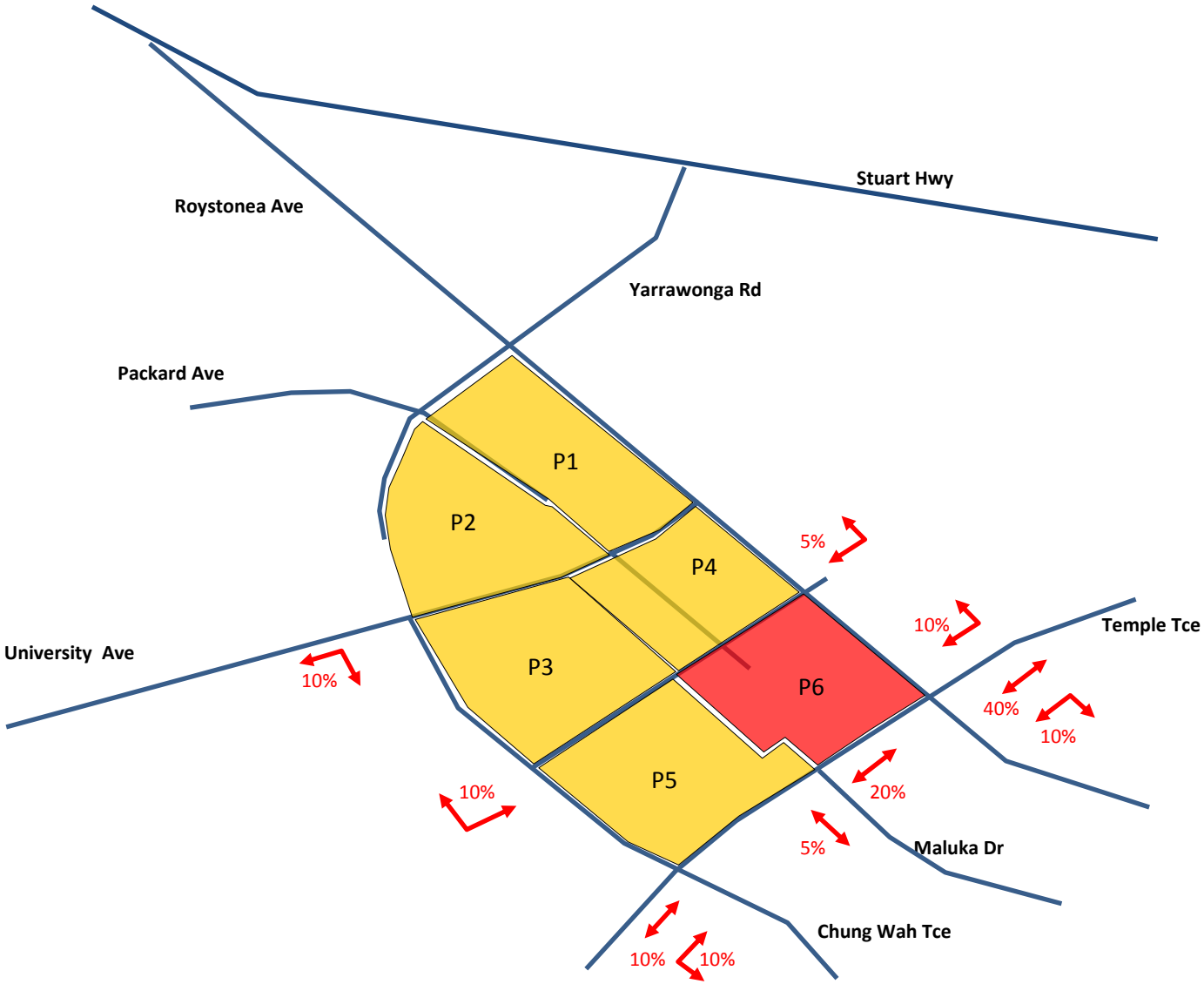

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Figure C2: Precinct 6 AM Peak Commercial Distribution (%) - 2046

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Appendix D – Trip Distribution

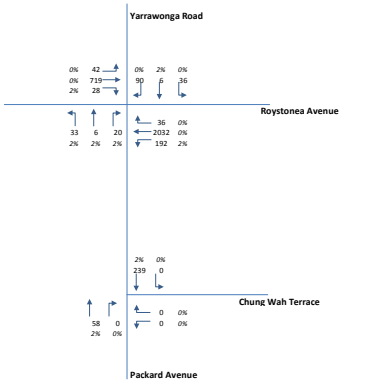

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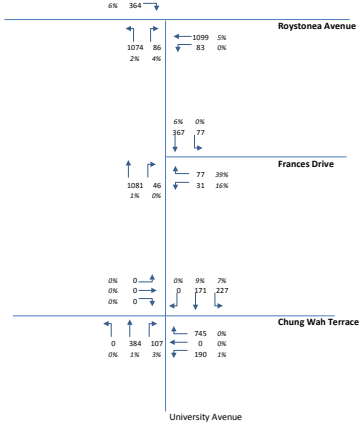
Figure C2: 2016 AM Background Traffic - 1



BE140072 Palmerston City Centre Masterplan
Figure C2: 2016 AM Background Traffic - 2

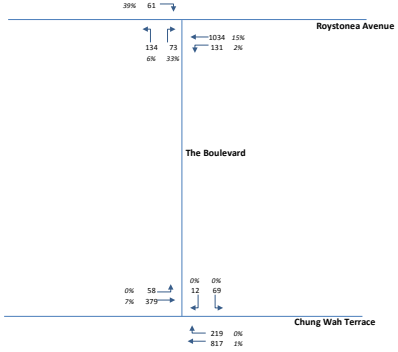


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Figure C2: 2016 AM Background Traffic- 3

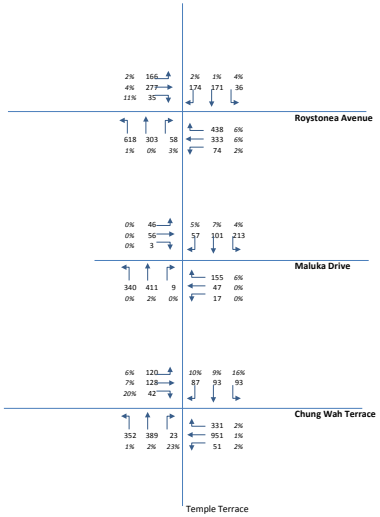

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Figure C2: 2016 AM Background Traffic - 4

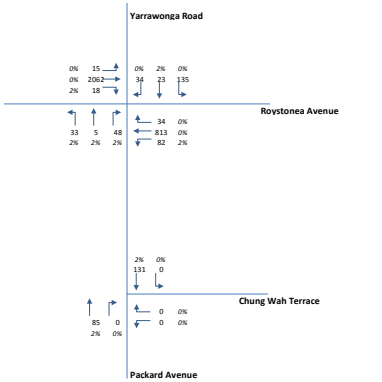

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Figure C2: 2016 PM Background Traffic - 1

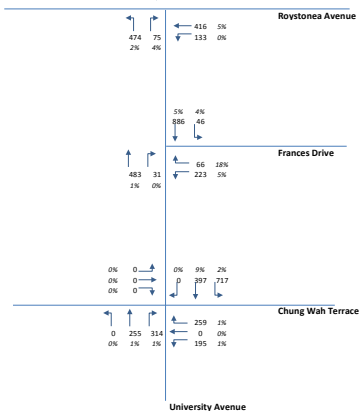

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Figure C2: 2016 PM Background Traffic - 2

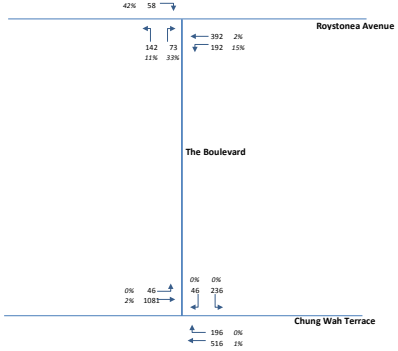

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Figure C2: 2016 PM Background Traffic - 3

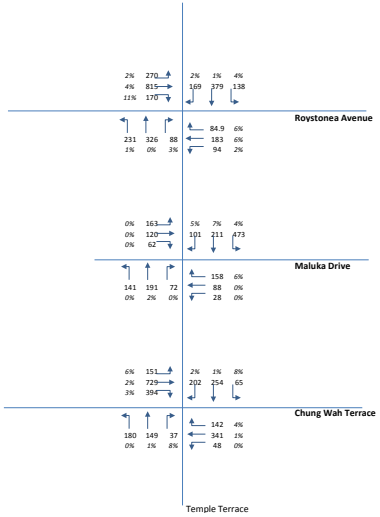

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Figure C2: 2016 PM Background Traffic - 4

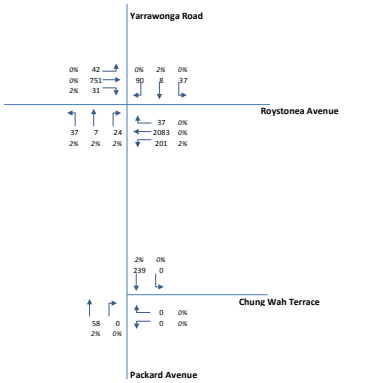

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Figure C2: 2016 AM Post Development Traffic - 1

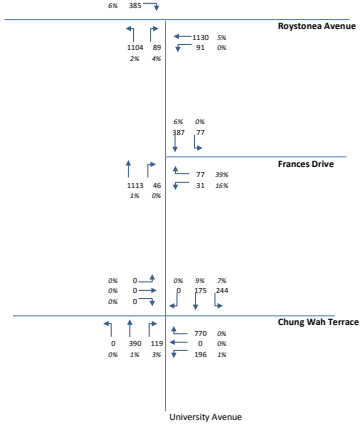

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Figure C2: 2016 AM Post Development Traffic - 2

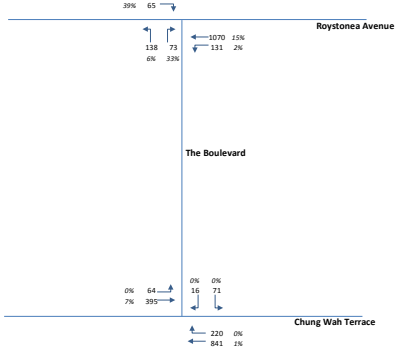

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Figure C2: 2016 AM Post Development Traffic- 3

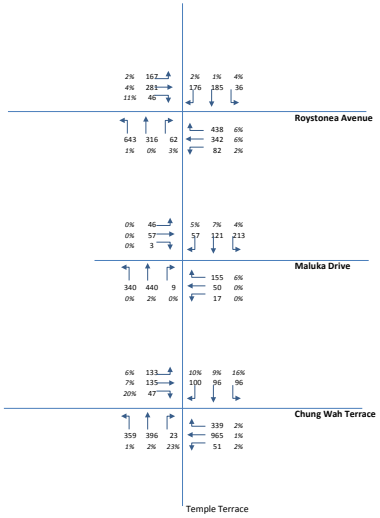

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Figure C2: 2016 AM Post Development Traffic - 4

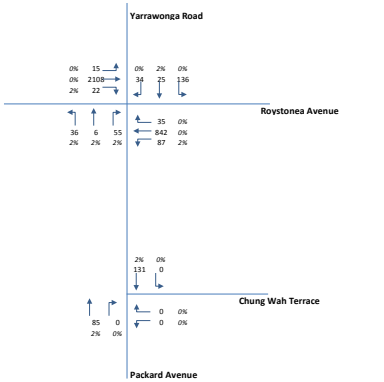

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Figure C2: 2016 PM Post Development Traffic - 1

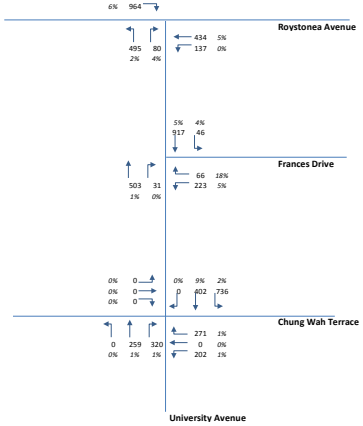

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Figure C2: 2016 PM Post Development Traffic - 2

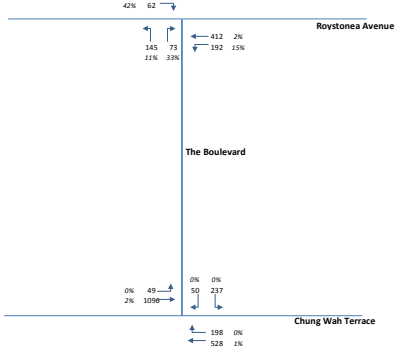

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Figure C2: 2016 PM Post Development Traffic - 3

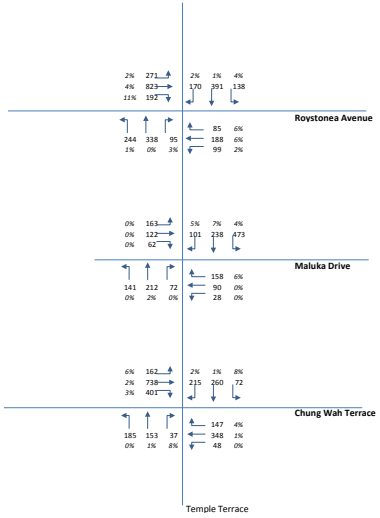

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Figure C2: 2016 PM Background Traffic - 4

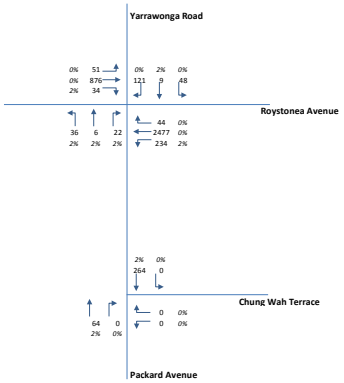

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Figure C2: 2026 AM Background Traffic - 1

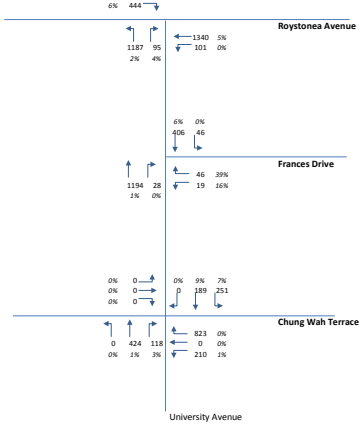

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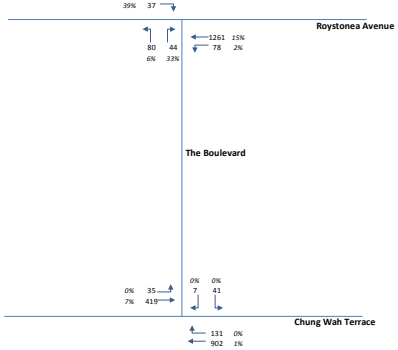
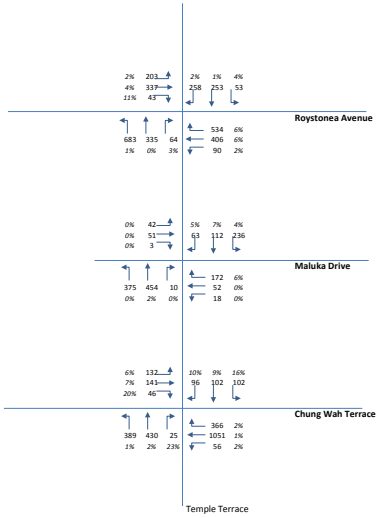
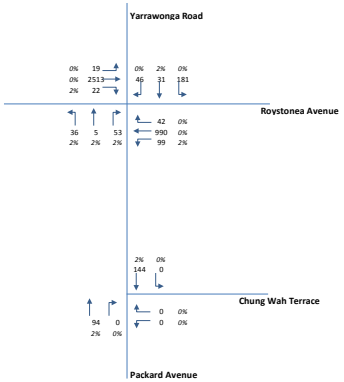
Figure C2: 2026 AM Background Traffic - 2



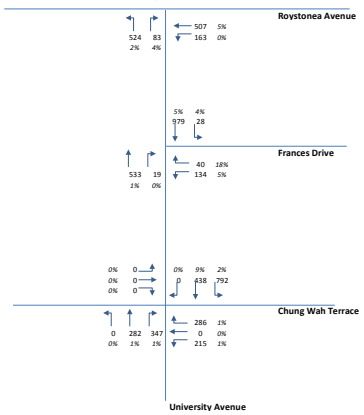
BE140072 Palmerston City Centre Masterplan
Figure C2: 2026 AM Background Traffic- 3



BE140072 Palmerston City Centre Masterplan
Figure C2: 2026 AM Background Traffic - 4



BE140072 Palmerston City Centre Masterplan
Figure C2: 2026 PM Background Traffic - 1



BE140072 Palmerston City Centre Masterplan
Figure C2: 2026 PM Background Traffic - 2

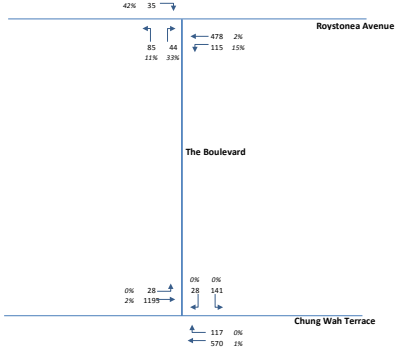


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Figure C2: 2026 PM Background Traffic - 3

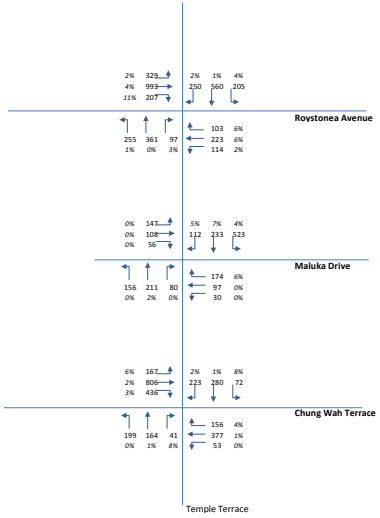

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Figure C2: 2026 PM Background Traffic - 4

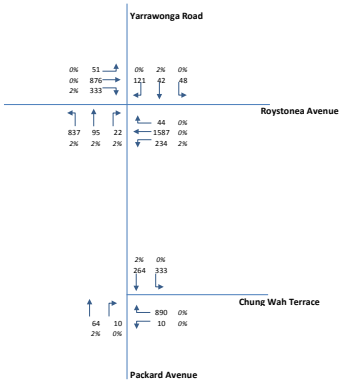

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Figure C2: 2026 AM Background Traffic with Chung Wah Ext. - 1

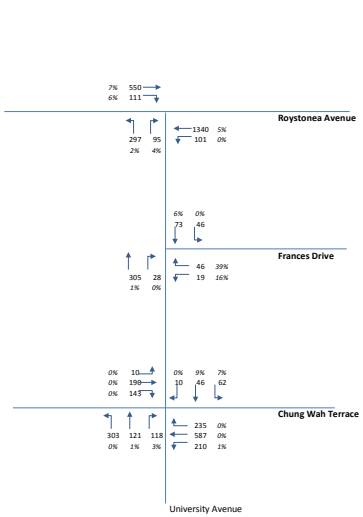

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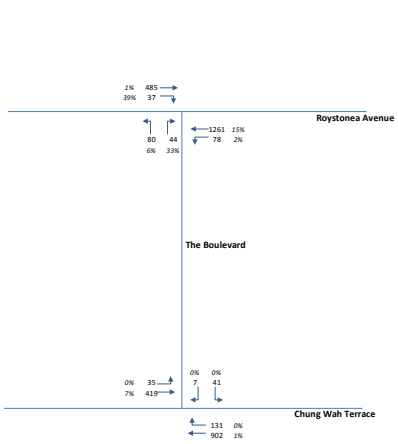
Figure C2: 2026 AM Background Traffic with Chung Wah Ext. - 2



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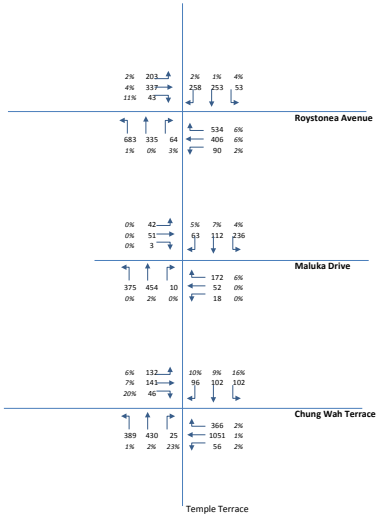

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Figure C2: 2026 AM Background Traffic with Chung Wah Ext. - 4

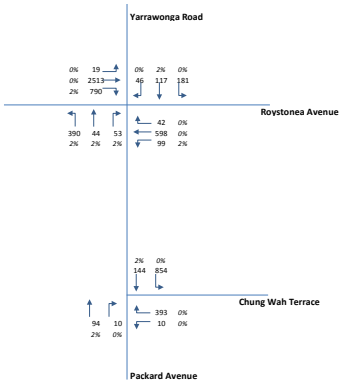

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Figure C2: 2026 PM Background Traffic with Chung Wah Ext. - 1

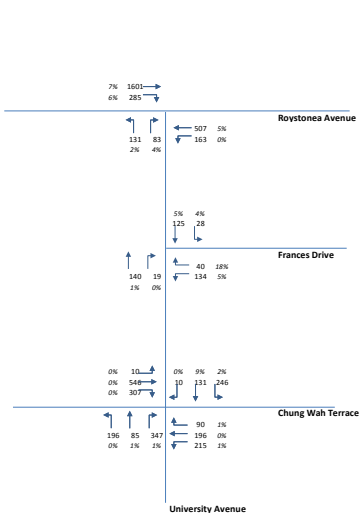

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Figure C2: 2026 PM Background Traffic with Chung Wah Ext. - 2

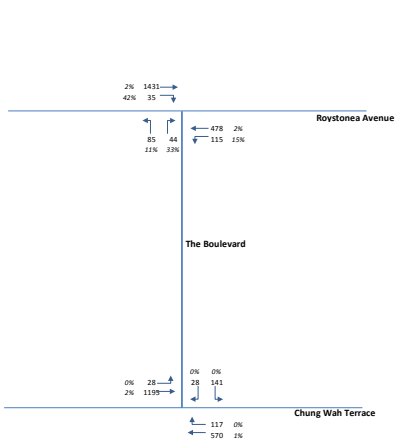

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Figure C2: 2026 PM Background Traffic with Chung Wah Ext. - 3

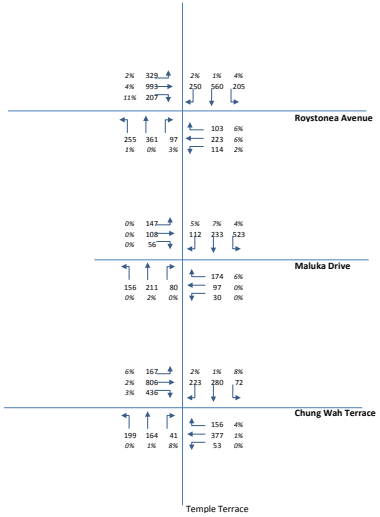

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Figure C2: 2026 PM Background Traffic with Chung Wah Ext. - 4

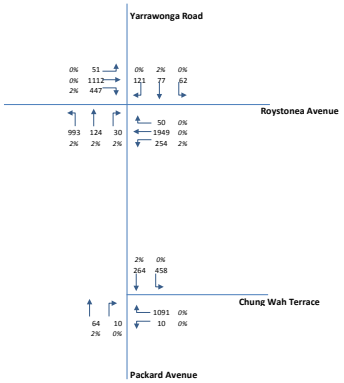

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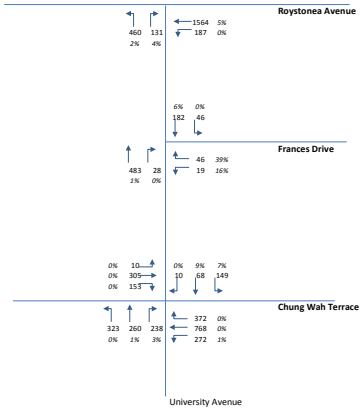
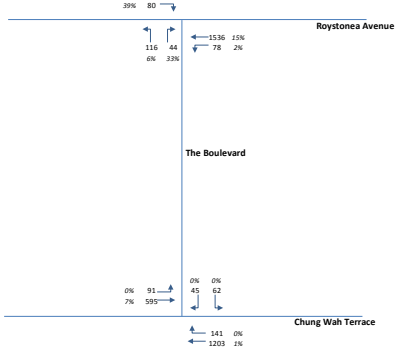
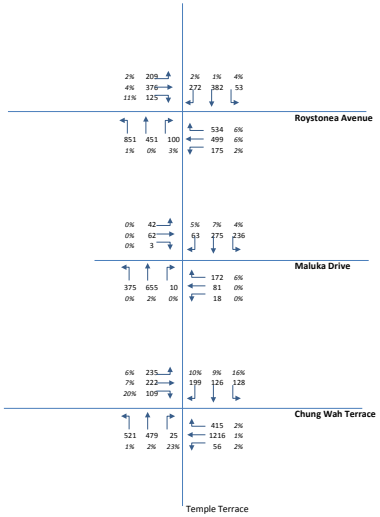
Figure C2: 2026 AM Post Development Traffic - 1



BE140072 Palmerston City Centre Masterplan
Figure C2: 2026 AM Post Development Traffic - 2



BE140072 Palmerston City Centre Masterplan
Figure C2: 2026 AM Post Development Traffic- 3



BE140072 Palmerston City Centre Masterplan
Figure C2: 2026 AM Post Development Traffic - 4

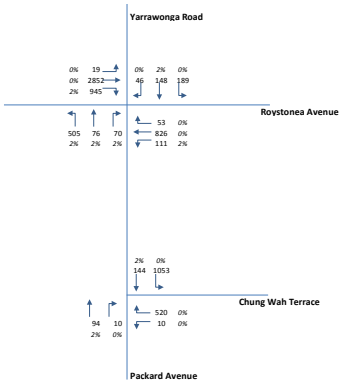


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Figure C2: 2026 PM Post Development Traffic - 1

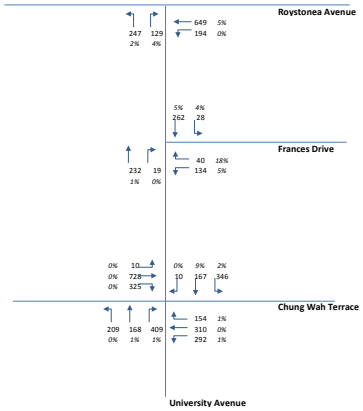

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Figure C2: 2026 PM Post Development Traffic - 2

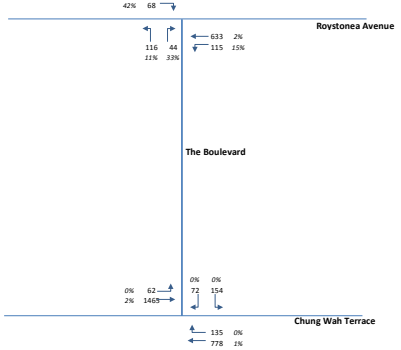

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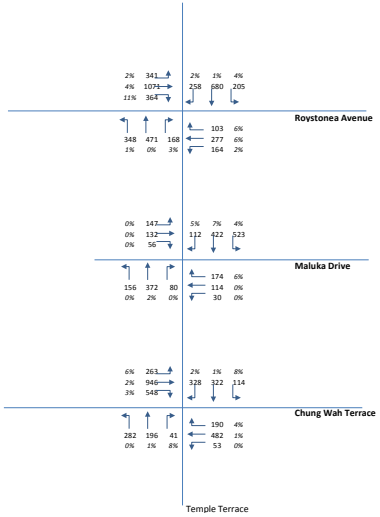
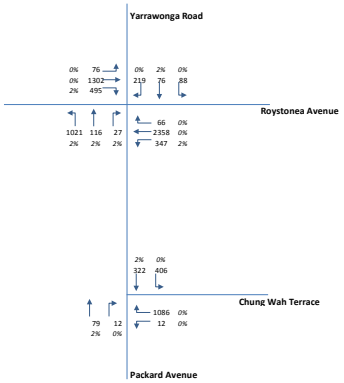
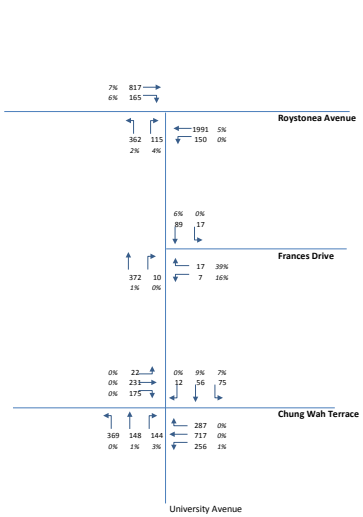
Figure C2: 2026 PM Post Development Traffic - 3



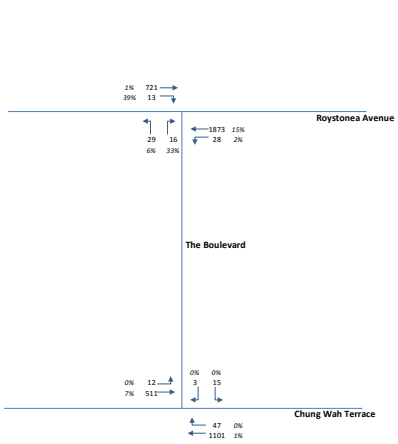
BE140072 Palmerston City Centre Masterplan
Figure C2: 2026 PM Post Development Traffic - 4



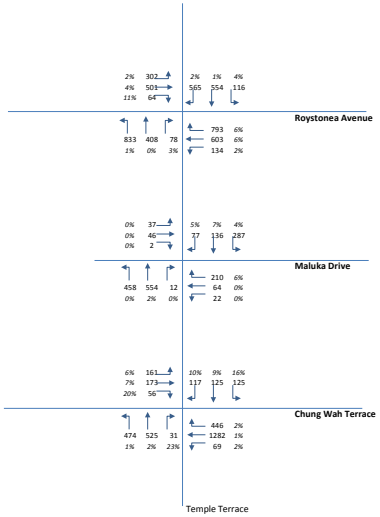
BE140072 Palmerston City Centre Masterplan
Figure C2: 2046 AM Background Traffic with Chung Wah Ext. - 1



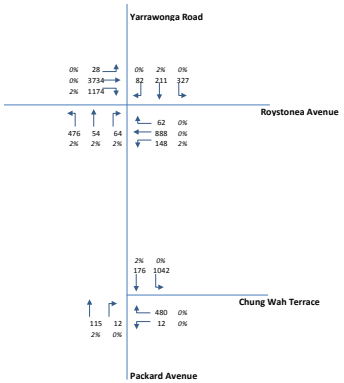
BE140072 Palmerston City Centre Masterplan
Figure C2: 2046 AM Background Traffic with Chung Wah Ext. - 2



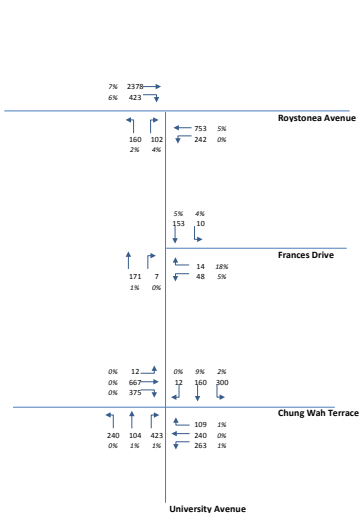
BE140072 Palmerston City Centre Masterplan
Figure C2: 2046 AM Background Traffic with Chung Wah Ext. - 3



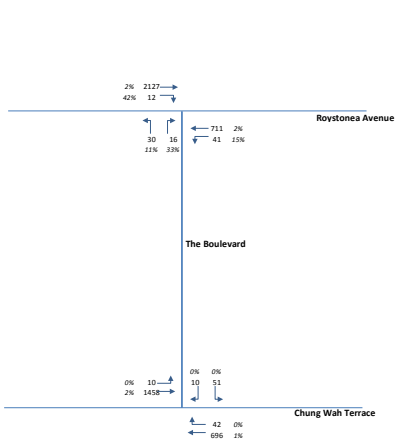
BE140072 Palmerston City Centre Masterplan
Figure C2: 2046 AM Background Traffic with Chung Wah Ext. - 4



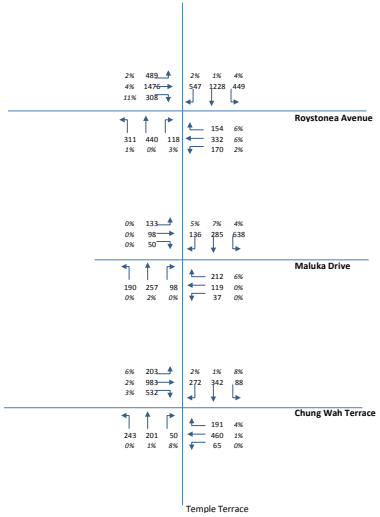
BE140072 Palmerston City Centre Masterplan
Figure C2: 2046 PM Background Traffic with Chung Wah Ext. - 1



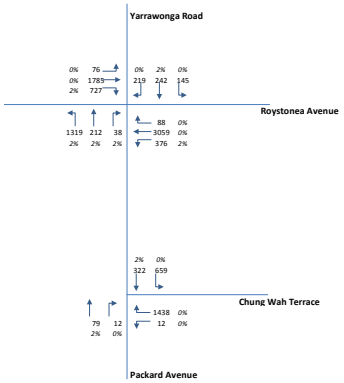
BE140072 Palmerston City Centre Masterplan
Figure C2: 2046 PM Background Traffic with Chung Wah Ext. - 2

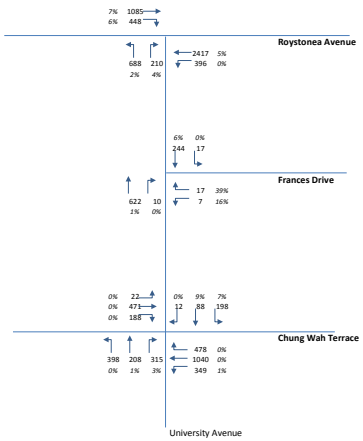


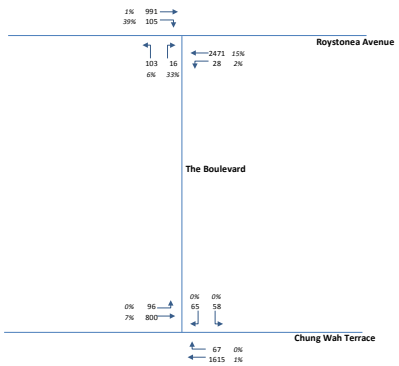
BE140072 Palmerston City Centre Masterplan
Figure C2: 2046 PM Background Traffic with Chung Wah Ext. - 3

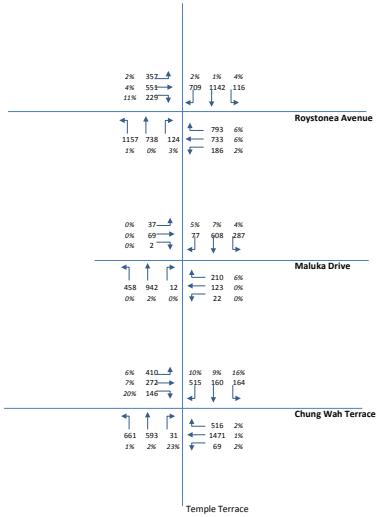


BE140072 Palmerston City Centre Masterplan
Figure C2: 2046 PM Background Traffic with Chung Wah Ext. - 4







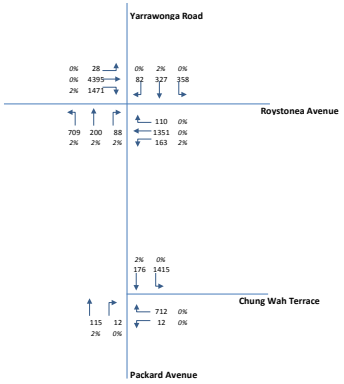


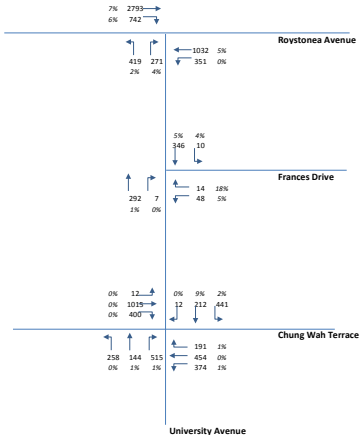
BE140072 Palmerston City Centre Masterplan
Figure C2: 2046 AM Post Development Traffic - 1

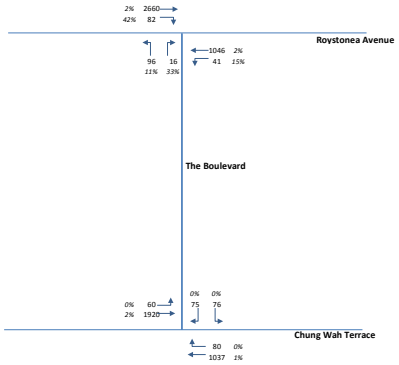
BE140072 Palmerston City Centre Masterplan
Figure C2: 2046 AM Post Development Traffic - 2

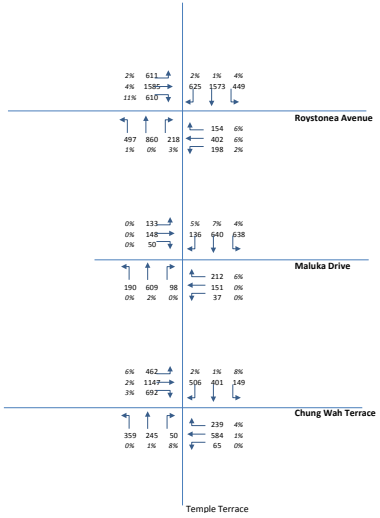
BE140072 Palmerston City Centre Masterplan
Figure C2: 2046 AM Post Development Traffic- 3

BE140072 Palmerston City Centre Masterplan
Figure C2: 2046 AM Post Development Traffic - 4









BE140072 Palmerston City Centre Masterplan
Figure C2: 2046 PM Post Development Traffic - 1

BE140072 Palmerston City Centre Masterplan
Figure C2: 2046 PM Post Development Traffic - 2

BE140072 Palmerston City Centre Masterplan
Figure C2: 2046 PM Post Development Traffic - 3

BE140072 Palmerston City Centre Masterplan
Figure C2: 2016 PM Post Development Traffic - 4

Appendix E – SIDRA Outputs

MOVEMENT SUMMARY

Site: 2016 AM Background

BE140072 Palmerston City Centre Masterplan
Packard Avenue / Water Park
2016 AM BackgroundTraffic
Roundabout

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
SouthEast: Water Park											
21a	L1	6	0.0	0.006	4.2	LOS A	0.0	0.2	0.30	0.43	55.4
23	R2	1	0.0	0.006	9.5	LOS A	0.0	0.2	0.30	0.43	55.9
Approach		7	0.0	0.006	5.0	LOS A	0.0	0.2	0.30	0.43	55.4
NorthEast: Packard Avenue											
24	L2	72	0.0	0.143	3.7	LOS A	0.8	5.9	0.05	0.57	53.7
26a	R1	167	2.0	0.143	7.9	LOS A	0.8	5.9	0.05	0.57	54.5
Approach		239	1.4	0.143	6.6	LOS A	0.8	5.9	0.05	0.57	54.3
West: Packard Avenue											
10a	L1	58	2.0	0.037	3.6	LOS A	0.2	1.4	0.02	0.42	56.8
12a	R1	6	0.0	0.037	7.8	LOS A	0.2	1.4	0.02	0.42	56.8
Approach		64	1.8	0.037	4.0	LOS A	0.2	1.4	0.02	0.42	56.8
All Vehicles		310	1.5	0.143	6.0	LOS A	0.8	5.9	0.05	0.53	54.8

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2016 AM Post

BE140072 Palmerston City Centre Masterplan
Packard Avenue / Water Park
2016 AM Post Development Traffic
Roundabout

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
SouthEast: Water Park											
21a	L1	6	0.0	0.006	5.6	LOS A	0.0	0.2	0.30	0.95	49.8
23	R2	1	0.0	0.006	11.8	LOS B	0.0	0.2	0.30	0.95	49.8
Approach		7	0.0	0.006	6.5	LOS A	0.0	0.2	0.30	0.47	49.8
NorthEast: Packard Avenue											
24	L2	72	0.0	0.143	5.9	LOS A	0.8	5.9	0.05	1.24	48.4
26a	R1	167	2.0	0.143	10.1	LOS B	0.8	5.9	0.05	1.24	48.4
Approach		239	1.4	0.143	8.8	LOS A	0.8	5.9	0.05	0.62	48.4
West: Packard Avenue											
10a	L1	58	2.0	0.037	5.0	LOS A	0.2	1.4	0.02	0.94	52.1
12a	R1	6	0.0	0.037	10.1	LOS B	0.2	1.4	0.02	0.94	52.1
Approach		64	1.8	0.037	5.5	LOS A	0.2	1.4	0.02	0.47	52.1
All Vehicles		310	1.5	0.143	8.1	LOS A	0.8	5.9	0.05	0.58	49.1

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2016 PM Background

BE140072 Palmerston City Centre Masterplan
Packard Avenue / Water Park
2016 PM Background Traffic
Roundabout

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
SouthEast: Water Park											
21a	L1	6	0.0	0.025	4.1	LOS A	0.1	0.8	0.26	0.58	53.0
23	R2	26	0.0	0.025	9.4	LOS A	0.1	0.8	0.26	0.58	53.5
Approach		32	0.0	0.025	8.4	LOS A	0.1	0.8	0.26	0.58	53.4
NorthEast: Packard Avenue											
24	L2	1	0.0	0.081	3.7	LOS A	0.5	3.3	0.05	0.60	52.8
26a	R1	131	2.0	0.081	7.8	LOS A	0.5	3.3	0.05	0.60	53.6
Approach		132	2.0	0.081	7.8	LOS A	0.5	3.3	0.05	0.60	53.6
West: Packard Avenue											
10a	L1	60	2.0	0.046	3.7	LOS A	0.2	1.6	0.11	0.40	56.4
12a	R1	6	0.0	0.046	7.9	LOS A	0.2	1.6	0.11	0.40	56.4
Approach		66	1.8	0.046	4.0	LOS A	0.2	1.6	0.11	0.40	56.4
All Vehicles		230	1.7	0.081	6.8	LOS A	0.5	3.3	0.10	0.54	54.3

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2016 PM Post

BE140072 Palmerston City Centre Masterplan
Packard Avenue / Water Park
2016 PM Post Development Traffic
Roundabout

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
SouthEast: Water Park											
21a	L1	6	0.0	0.025	5.5	LOS A	0.1	0.8	0.26	1.23	46.5
23	R2	26	0.0	0.025	11.7	LOS B	0.1	0.8	0.26	1.23	46.5
Approach		32	0.0	0.025	10.5	LOS B	0.1	0.8	0.26	0.62	46.5
NorthEast: Packard Avenue											
24	L2	1	0.0	0.081	5.9	LOS A	0.5	3.3	0.05	1.30	47.2
26a	R1	131	2.0	0.081	10.1	LOS B	0.5	3.3	0.05	1.30	47.2
Approach		132	2.0	0.081	10.0	LOS B	0.5	3.3	0.05	0.65	47.2
West: Packard Avenue											
10a	L1	60	2.0	0.046	5.1	LOS A	0.2	1.6	0.11	0.90	51.4
12a	R1	6	0.0	0.046	10.2	LOS B	0.2	1.6	0.11	0.90	51.4
Approach		66	1.8	0.046	5.5	LOS A	0.2	1.6	0.11	0.45	51.4
All Vehicles		230	1.7	0.081	8.8	LOS A	0.5	3.3	0.10	0.59	48.2

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2026 AM Post

BE140072 Palmerston City Centre Masterplan
Packard Avenue / Chung Wah Extension
2026 AM Post Development Traffic
Roundabout

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Chung Wah Extension											
21a	L1	10	0.0	0.824	7.2	LOS A	12.8	89.5	0.81	0.70	50.5
23	R2	1091	0.0	0.824	12.5	LOS B	12.8	89.5	0.81	0.70	51.0
Approach		1101	0.0	0.824	12.5	LOS B	12.8	89.5	0.81	0.70	51.0
NorthEast: Packard Avenue											
24	L2	458	0.0	0.379	3.7	LOS A	3.9	27.5	0.12	0.48	54.7
26a	R1	185	2.0	0.379	7.9	LOS A	3.9	27.5	0.12	0.48	55.6
Approach		643	0.6	0.379	4.9	LOS A	3.9	27.5	0.12	0.48	55.0
West: Packard Avenue											
10a	L1	64	2.0	0.183	12.8	LOS B	1.4	9.9	0.98	0.90	49.7
12a	R1	10	0.0	0.183	17.0	LOS B	1.4	9.9	0.98	0.90	49.7
Approach		74	1.7	0.183	13.4	LOS B	1.4	9.9	0.98	0.90	49.7
All Vehicles		1818	0.3	0.824	9.8	LOS A	12.8	89.5	0.57	0.63	52.2

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2026 PM Post

BE140072 Palmerston City Centre Masterplan
Packard Avenue / Chung Wah Extension
2026 PM Post Development Traffic
Roundabout

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
SouthEast: Chung Wah Extension											
21a	L1	10	0.0	0.394	4.4	LOS A	2.7	18.7	0.39	0.63	51.9
23	R2	520	0.0	0.394	9.8	LOS A	2.7	18.7	0.39	0.63	52.4
Approach		530	0.0	0.394	9.7	LOS A	2.7	18.7	0.39	0.63	52.3
NorthEast: Packard Avenue											
24	L2	1053	0.0	0.694	3.8	LOS A	11.4	80.2	0.18	0.44	55.1
26a	R1	144	2.0	0.694	7.9	LOS A	11.4	80.2	0.18	0.44	55.9
Approach		1197	0.2	0.694	4.3	LOS A	11.4	80.2	0.18	0.44	55.2
West: Packard Avenue											
10a	L1	66	2.0	0.082	6.1	LOS A	0.5	3.3	0.60	0.61	54.1
12a	R1	10	0.0	0.082	10.3	LOS B	0.5	3.3	0.60	0.61	54.1
Approach		76	1.7	0.082	6.7	LOS A	0.5	3.3	0.60	0.61	54.1
All Vehicles		1803	0.2	0.694	6.0	LOS A	11.4	80.2	0.26	0.50	54.2

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2046 AM Post Upg

BE140072 Palmerston City Centre Masterplan
Packard Avenue / Chung Wah Extension
2046 AM Post Development Traffic
Roundabout

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
SouthEast: Chung Wah Extension											
21a	L1	12	0.0	0.575	4.9	LOS A	4.0	28.2	0.50	0.68	51.5
23	R2	1438	0.0	0.575	10.3	LOS B	4.0	28.2	0.51	0.68	51.9
Approach		1450	0.0	0.575	10.3	LOS B	4.0	28.2	0.51	0.68	51.9
NorthEast: Packard Avenue											
24	L2	659	0.0	0.280	3.9	LOS A	2.1	14.4	0.10	0.47	55.0
26a	R1	226	2.0	0.280	7.9	LOS A	2.0	14.2	0.10	0.53	54.7
Approach		885	0.5	0.280	4.9	LOS A	2.1	14.4	0.10	0.49	54.9
West: Packard Avenue											
10a	L1	79	2.0	0.168	8.0	LOS A	0.7	5.1	0.72	0.84	53.2
12a	R1	12	0.0	0.168	12.2	LOS B	0.7	5.1	0.72	0.84	53.2
Approach		91	1.7	0.168	8.5	LOS A	0.7	5.1	0.72	0.84	53.2
All Vehicles		2426	0.3	0.575	8.3	LOS A	4.0	28.2	0.37	0.62	53.0

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2046 PM Post Upg

BE140072 Palmerston City Centre Masterplan
Packard Avenue / Chung Wah Extension
2046 PM Post Development Traffic
Roundabout

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
SouthEast: Chung Wah Extension											
21a	L1	12	0.0	0.282	4.2	LOS A	1.4	9.9	0.32	0.64	52.1
23	R2	712	0.0	0.282	9.6	LOS A	1.4	9.9	0.33	0.64	52.6
Approach		724	0.0	0.282	9.5	LOS A	1.4	9.9	0.33	0.64	52.5
NorthEast: Packard Avenue											
24	L2	1415	0.0	0.496	4.0	LOS A	4.6	32.0	0.12	0.46	55.1
26a	R1	176	2.0	0.496	7.9	LOS A	4.5	32.0	0.13	0.48	55.6
Approach		1591	0.2	0.496	4.4	LOS A	4.6	32.0	0.12	0.46	55.1
West: Packard Avenue											
10a	L1	80	2.0	0.114	5.9	LOS A	0.4	3.1	0.53	0.67	54.4
12a	R1	12	0.0	0.114	10.1	LOS B	0.4	3.1	0.53	0.67	54.4
Approach		92	1.7	0.114	6.4	LOS A	0.4	3.1	0.53	0.67	54.4
All Vehicles		2407	0.2	0.496	6.0	LOS A	4.6	32.0	0.20	0.52	54.3

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2016 AM Post

BE140072 Palmerston City Centre
Chung Wah Terrace / The Boulevard
2016 AM Post Development Traffic
Signals - Fixed Time Cycle Time = 65 seconds (Optimum Cycle Time - Minimum Delay)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Chung Wah Terrace											
5	T1	841	1.0	0.353	6.6	LOS A	6.5	46.2	0.53	0.46	54.1
6	R2	220	0.0	0.770	38.3	LOS D	7.5	52.8	1.00	0.92	36.2
Approach		1061	0.8	0.770	13.2	LOS B	7.5	52.8	0.62	0.55	49.1
North: The Boulevard											
7	L2	71	0.0	0.191	29.6	LOS C	1.9	13.5	0.87	0.74	39.6
9	R2	16	0.0	0.043	28.5	LOS C	0.4	2.9	0.83	0.68	40.0
Approach		87	0.0	0.191	29.4	LOS C	1.9	13.5	0.86	0.73	39.7
West: Chung Wah Terrace											
10	L2	64	0.0	0.328	21.8	LOS C	4.4	32.1	0.60	0.62	46.0
11	T1	395	7.0	0.328	15.4	LOS B	4.4	32.6	0.62	0.57	47.4
Approach		459	6.0	0.328	16.3	LOS B	4.4	32.6	0.62	0.58	47.2
All Vehicles		1607	2.2	0.770	14.9	LOS B	7.5	52.8	0.64	0.57	47.9

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P21	East Stage 1	50	26.8	LOS C	0.1	0.1	0.91	0.91
P22	East Stage 2	50	26.8	LOS C	0.1	0.1	0.91	0.91
P3	North Full Crossing	50	17.8	LOS B	0.1	0.1	0.74	0.74
All Pedestrians		150	23.8	LOS C			0.85	0.85

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 PM Background

BE140072 Palmerston City Centre
Chung Wah Terrace / The Boulevard
2016 PM Background Traffic
Signals - Fixed Time Cycle Time = 75 seconds (Optimum Cycle Time - Minimum Delay)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Chung Wah Terrace											
5	T1	516	1.0	0.200	5.1	LOS A	3.6	25.3	0.41	0.35	55.3
6	R2	196	0.0	0.792	44.7	LOS D	7.8	54.8	1.00	0.92	34.1
Approach		712	0.7	0.792	16.0	LOS B	7.8	54.8	0.57	0.51	47.2
North: The Boulevard											
7	L2	236	0.0	0.733	40.4	LOS D	8.9	62.3	1.00	0.88	35.5
9	R2	46	0.0	0.143	34.6	LOS C	1.5	10.3	0.88	0.73	37.5
Approach		282	0.0	0.733	39.4	LOS D	8.9	62.3	0.98	0.86	35.8
West: Chung Wah Terrace											
10	L2	46	0.0	0.645	23.0	LOS C	12.8	90.7	0.67	0.64	45.9
11	T1	1081	2.0	0.645	15.8	LOS B	13.4	95.7	0.68	0.63	47.5
Approach		1127	1.9	0.645	16.1	LOS B	13.4	95.7	0.68	0.63	47.4
All Vehicles		2121	1.3	0.792	19.2	LOS B	13.4	95.7	0.68	0.62	45.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P21	East Stage 1	50	31.8	LOS D	0.1	0.1	0.92	0.92
P22	East Stage 2	50	31.8	LOS D	0.1	0.1	0.92	0.92
P3	North Full Crossing	50	15.4	LOS B	0.1	0.1	0.64	0.64
All Pedestrians		150	26.3	LOS C			0.83	0.83

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 PM Post

BE140072 Palmerston City Centre
Chung Wah Terrace / The Boulevard
2016 PM Post Development Traffic
Signals - Fixed Time Cycle Time = 75 seconds (Optimum Cycle Time - Minimum Delay)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Chung Wah Terrace											
5	T1	528	1.0	0.204	5.1	LOS A	3.7	26.0	0.41	0.35	55.3
6	R2	198	0.0	0.800	45.0	LOS D	8.0	55.7	1.00	0.93	34.0
Approach		726	0.7	0.800	16.0	LOS B	8.0	55.7	0.57	0.51	47.2
North: The Boulevard											
7	L2	237	0.0	0.736	40.5	LOS D	9.0	62.7	1.00	0.88	35.5
9	R2	50	0.0	0.155	34.7	LOS C	1.6	11.2	0.88	0.73	37.4
Approach		287	0.0	0.736	39.5	LOS D	9.0	62.7	0.98	0.86	35.8
West: Chung Wah Terrace											
10	L2	49	0.0	0.655	23.1	LOS C	13.1	93.2	0.67	0.65	45.8
11	T1	1096	2.0	0.655	15.9	LOS B	13.8	98.3	0.69	0.63	47.4
Approach		1145	1.9	0.655	16.2	LOS B	13.8	98.3	0.69	0.63	47.4
All Vehicles		2158	1.3	0.800	19.2	LOS B	13.8	98.3	0.69	0.62	45.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P21	East Stage 1	50	31.8	LOS D	0.1	0.1	0.92	0.92
P22	East Stage 2	50	31.8	LOS D	0.1	0.1	0.92	0.92
P3	North Full Crossing	50	15.4	LOS B	0.1	0.1	0.64	0.64
All Pedestrians		150	26.3	LOS C			0.83	0.83

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 AM Background

BE140072 Palmerston City Centre
Chung Wah Terrace / The Boulevard
2016 AM Background Traffic
Signals - Fixed Time Cycle Time = 65 seconds (Optimum Cycle Time - Minimum Delay)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Chung Wah Terrace											
5	T1	817	1.0	0.343	6.5	LOS A	6.3	44.5	0.52	0.45	54.2
6	R2	219	0.0	0.766	38.2	LOS D	7.5	52.4	1.00	0.91	36.3
Approach		1036	0.8	0.766	13.2	LOS B	7.5	52.4	0.62	0.55	49.0
North: The Boulevard											
7	L2	69	0.0	0.186	29.5	LOS C	1.9	13.1	0.87	0.74	39.7
9	R2	12	0.0	0.032	28.4	LOS C	0.3	2.2	0.83	0.67	40.0
Approach		81	0.0	0.186	29.4	LOS C	1.9	13.1	0.86	0.73	39.7
West: Chung Wah Terrace											
10	L2	58	0.0	0.312	21.8	LOS C	4.2	30.8	0.60	0.61	46.0
11	T1	379	7.0	0.312	15.4	LOS B	4.2	30.8	0.62	0.57	47.5
Approach		437	6.1	0.312	16.3	LOS B	4.2	30.8	0.62	0.57	47.3
All Vehicles		1554	2.2	0.766	14.9	LOS B	7.5	52.4	0.63	0.57	47.9

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P21	East Stage 1	50	26.8	LOS C	0.1	0.1	0.91	0.91
P22	East Stage 2	50	26.8	LOS C	0.1	0.1	0.91	0.91
P3	North Full Crossing	50	17.8	LOS B	0.1	0.1	0.74	0.74
All Pedestrians		150	23.8	LOS C			0.85	0.85

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2026 PM Post

BE140072 Palmerston City Centre
Chung Wah Terrace / The Boulevard
2026 PM Post Development Traffic
Signals - Fixed Time Cycle Time = 115 seconds (Optimum Cycle Time - Minimum Delay)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Chung Wah Terrace											
5	T1	778	1.0	0.257	3.6	LOS A	5.8	40.8	0.29	0.26	56.7
6	R2	135	0.0	0.836	69.4	LOS E	8.3	58.4	1.00	0.93	27.7
Approach		913	0.9	0.836	13.3	LOS B	8.3	58.4	0.40	0.36	49.1
North: The Boulevard											
7	L2	154	0.0	0.734	62.6	LOS E	8.9	62.5	1.00	0.86	29.2
9	R2	72	0.0	0.343	57.8	LOS E	3.9	27.0	0.96	0.76	30.2
Approach		226	0.0	0.734	61.1	LOS E	8.9	62.5	0.99	0.83	29.5
West: Chung Wah Terrace											
10	L2	62	0.0	0.617	12.0	LOS B	11.1	78.6	0.29	0.32	53.2
11	T1	1465	2.0	0.617	6.1	LOS A	12.7	90.7	0.31	0.31	54.3
Approach		1527	1.9	0.617	6.4	LOS A	12.7	90.7	0.31	0.31	54.3
All Vehicles		2666	1.4	0.836	13.4	LOS B	12.7	90.7	0.40	0.37	49.0

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P21	East Stage 1	50	51.8	LOS E	0.2	0.2	0.95	0.95
P22	East Stage 2	50	51.8	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	50	10.0	LOS B	0.1	0.1	0.42	0.42
All Pedestrians		150	37.9	LOS D			0.77	0.77

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2026 AM Post

BE140072 Palmerston City Centre
Chung Wah Terrace / The Boulevard
2026 AM Post Development Traffic
Signals - Fixed Time Cycle Time = 95 seconds (Optimum Cycle Time - Minimum Delay)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Chung Wah Terrace											
5	T1	1203	1.0	0.421	5.0	LOS A	10.5	73.8	0.41	0.37	55.4
6	R2	141	0.0	0.721	53.9	LOS D	6.9	48.0	1.00	0.86	31.4
Approach		1344	0.9	0.721	10.2	LOS B	10.5	73.8	0.47	0.42	51.3
North: The Boulevard											
7	L2	62	0.0	0.244	46.2	LOS D	2.6	18.5	0.93	0.75	33.6
9	R2	45	0.0	0.177	45.6	LOS D	1.9	13.3	0.92	0.74	33.6
Approach		107	0.0	0.244	46.0	LOS D	2.6	18.5	0.93	0.74	33.6
West: Chung Wah Terrace											
10	L2	91	0.0	0.321	13.5	LOS B	4.5	32.6	0.31	0.41	51.3
11	T1	595	7.0	0.321	7.6	LOS A	5.0	37.1	0.33	0.35	52.8
Approach		686	6.1	0.321	8.4	LOS A	5.0	37.1	0.33	0.36	52.6
All Vehicles		2137	2.5	0.721	11.4	LOS B	10.5	73.8	0.45	0.42	50.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P21	East Stage 1	50	41.8	LOS E	0.1	0.1	0.94	0.94
P22	East Stage 2	50	41.8	LOS E	0.1	0.1	0.94	0.94
P3	North Full Crossing	50	12.2	LOS B	0.1	0.1	0.51	0.51
All Pedestrians		150	31.9	LOS D			0.79	0.79

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2046 AM Post

BE140072 Palmerston City Centre
Chung Wah Terrace / The Boulevard
2046 AM Post Development Traffic
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Minimum Delay)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Chung Wah Terrace											
5	T1	1615	1.0	0.531	4.2	LOS A	17.5	123.7	0.35	0.32	56.2
6	R2	67	0.0	0.487	73.2	LOS E	4.4	31.1	1.00	0.76	26.9
Approach		1682	1.0	0.531	6.9	LOS A	17.5	123.7	0.37	0.34	53.8
North: The Boulevard											
7	L2	58	0.0	0.324	68.7	LOS E	3.7	25.7	0.97	0.75	27.8
9	R2	65	0.0	0.363	68.9	LOS E	4.1	29.0	0.98	0.76	27.7
Approach		123	0.0	0.363	68.8	LOS E	4.1	29.0	0.97	0.76	27.8
West: Chung Wah Terrace											
10	L2	96	0.0	0.345	7.7	LOS A	2.2	15.8	0.08	0.21	56.2
11	T1	800	7.0	0.345	2.2	LOS A	3.0	22.5	0.10	0.15	57.4
Approach		896	6.3	0.345	2.8	LOS A	3.0	22.5	0.10	0.16	57.3
All Vehicles		2701	2.7	0.531	8.4	LOS A	17.5	123.7	0.31	0.30	52.6

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P21	East Stage 1	50	61.8	LOS F	0.2	0.2	0.96	0.96
P22	East Stage 2	50	61.8	LOS F	0.2	0.2	0.96	0.96
P3	North Full Crossing	50	8.6	LOS A	0.1	0.1	0.36	0.36
All Pedestrians		150	44.0	LOS E			0.76	0.76

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2046 PM Post

BE140072 Palmerston City Centre
Chung Wah Terrace / The Boulevard
2046 PM Post Development Traffic
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Chung Wah Terrace											
5	T1	1037	1.0	0.321	3.0	LOS A	8.4	59.1	0.25	0.22	57.2
6	R2	80	0.0	0.646	83.2	LOS F	6.0	42.2	1.00	0.80	25.1
Approach		1117	0.9	0.646	8.7	LOS A	8.4	59.1	0.30	0.26	52.4
North: The Boulevard											
7	L2	76	0.0	0.472	78.1	LOS E	5.5	38.3	0.99	0.77	26.0
9	R2	75	0.0	0.466	78.0	LOS E	5.4	37.8	0.99	0.77	25.9
Approach		151	0.0	0.472	78.1	LOS E	5.5	38.3	0.99	0.77	25.9
West: Chung Wah Terrace											
10	L2	60	0.0	0.709	6.9	LOS A	4.7	33.2	0.07	0.11	57.7
11	T1	1920	2.0	0.709	1.4	LOS A	7.1	50.4	0.09	0.11	58.5
Approach		1980	1.9	0.709	1.6	LOS A	7.1	50.4	0.09	0.11	58.4
All Vehicles		3248	1.5	0.709	7.6	LOS A	8.4	59.1	0.20	0.19	53.2

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P21	East Stage 1	50	69.3	LOS F	0.2	0.2	0.96	0.96
P22	East Stage 2	50	69.3	LOS F	0.2	0.2	0.96	0.96
P3	North Full Crossing	50	7.7	LOS A	0.1	0.1	0.32	0.32
All Pedestrians		150	48.7	LOS E			0.75	0.75

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 AM Background

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / University Avenue Intersection
2016 AM Background Traffic
Signals - Fixed Time Cycle Time = 50 seconds (Optimum Cycle Time - Minimum Delay)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: University Avenue											
1	L2	1074	2.0	0.587	15.3	LOS B	9.5	67.4	0.76	0.80	47.4
3	R2	86	4.0	0.397	29.4	LOS C	2.1	15.3	0.96	0.76	40.0
Approach		1160	2.1	0.587	16.4	LOS B	9.5	67.4	0.77	0.80	46.8
East: Roystonea Avenue											
4	L2	83	0.0	0.082	8.7	LOS A	0.7	4.6	0.46	0.66	51.8
5	T1	1099	5.0	0.746	21.2	LOS C	9.2	67.3	0.97	0.91	44.5
Approach		1182	4.6	0.746	20.4	LOS C	9.2	67.3	0.94	0.90	45.0
West: Roystonea Avenue											
11	T1	451	7.0	0.189	4.0	LOS A	2.3	16.8	0.43	0.36	56.3
12	R2	364	6.0	0.786	28.5	LOS C	9.6	70.9	0.99	0.96	40.3
Approach		815	6.6	0.786	15.0	LOS B	9.6	70.9	0.68	0.63	47.8
All Vehicles		3157	4.2	0.786	17.5	LOS B	9.6	70.9	0.81	0.79	46.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2016 AM Post

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / University Avenue Intersection
2016 AM Post Development Traffic
Signals - Fixed Time Cycle Time = 55 seconds (Optimum Cycle Time - Minimum Delay)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: University Avenue											
1	L2	1104	2.0	0.592	16.0	LOS B	10.6	75.3	0.75	0.80	47.0
3	R2	89	4.0	0.452	32.5	LOS C	2.4	17.6	0.98	0.76	38.7
Approach		1193	2.1	0.592	17.2	LOS B	10.6	75.3	0.77	0.80	46.3
East: Roystonea Avenue											
4	L2	91	0.0	0.089	8.7	LOS A	0.8	5.4	0.44	0.66	51.8
5	T1	1130	5.0	0.731	22.1	LOS C	10.1	73.8	0.97	0.89	44.1
Approach		1221	4.6	0.731	21.1	LOS C	10.1	73.8	0.93	0.87	44.6
West: Roystonea Avenue											
11	T1	467	7.0	0.186	3.6	LOS A	2.3	17.4	0.40	0.33	56.7
12	R2	385	6.0	0.743	27.5	LOS C	10.4	76.6	0.96	0.91	40.8
Approach		852	6.5	0.743	14.4	LOS B	10.4	76.6	0.65	0.59	48.2
All Vehicles		3266	4.2	0.743	17.9	LOS B	10.6	76.6	0.80	0.77	46.1

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2016 PM Background

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / University Avenue Intersection
2016 PM Background Traffic
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Minimum Delay)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: University Avenue											
1	L2	474	2.0	0.166	8.6	LOS A	2.9	20.3	0.27	0.63	52.0
3	R2	75	4.0	0.692	60.6	LOS E	4.0	28.6	1.00	0.83	29.9
Approach		549	2.3	0.692	15.7	LOS B	4.0	28.6	0.37	0.66	47.2
East: Roystonea Avenue											
4	L2	133	0.0	0.236	17.7	LOS B	3.3	23.4	0.60	0.72	46.0
5	T1	416	5.0	0.734	51.4	LOS D	7.1	52.0	1.00	0.87	32.6
Approach		549	3.8	0.734	43.2	LOS D	7.1	52.0	0.90	0.84	35.1
West: Roystonea Avenue											
11	T1	1313	7.0	0.429	2.6	LOS A	8.7	64.7	0.30	0.27	57.5
12	R2	934	6.0	0.795	18.6	LOS B	32.3	237.4	0.78	0.85	45.2
Approach		2247	6.6	0.795	9.3	LOS A	32.3	237.4	0.50	0.51	51.7
All Vehicles		3345	5.4	0.795	15.9	LOS B	32.3	237.4	0.54	0.59	47.3

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2016 PM Post

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / University Avenue Intersection
2016 PM Post Development Traffic
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Minimum Delay)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: University Avenue											
1	L2	495	2.0	0.173	8.6	LOS A	3.0	21.4	0.27	0.63	52.0
3	R2	80	4.0	0.738	61.4	LOS E	4.3	30.9	1.00	0.86	29.7
Approach		575	2.3	0.738	15.9	LOS B	4.3	30.9	0.37	0.66	47.1
East: Roystonea Avenue											
4	L2	137	0.0	0.252	19.5	LOS B	3.7	25.9	0.64	0.73	45.0
5	T1	434	5.0	0.766	52.3	LOS D	7.5	54.9	1.00	0.90	32.4
Approach		571	3.8	0.766	44.4	LOS D	7.5	54.9	0.91	0.86	34.7
West: Roystonea Avenue											
11	T1	1342	7.0	0.439	2.7	LOS A	9.0	67.0	0.30	0.28	57.5
12	R2	964	6.0	0.820	20.3	LOS C	35.6	261.8	0.81	0.86	44.3
Approach		2306	6.6	0.820	10.0	LOS B	35.6	261.8	0.51	0.52	51.1
All Vehicles		3452	5.4	0.820	16.7	LOS B	35.6	261.8	0.56	0.60	46.8

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2026 AM Post Upg Uni

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / University Avenue Intersection
2026 AM Post Development Traffic
Signals - Fixed Time Cycle Time = 55 seconds (Optimum Cycle Time - Minimum Delay)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: University Avenue											
1	L2	460	2.0	0.628	20.2	LOS C	10.1	72.2	0.86	0.82	44.6
3	R2	131	4.0	0.665	34.2	LOS C	3.8	27.4	1.00	0.85	37.9
Approach		591	2.4	0.665	23.3	LOS C	10.1	72.2	0.89	0.83	43.0
East: Roystonea Avenue											
4	L2	187	0.0	0.157	7.7	LOS A	1.3	9.0	0.39	0.66	52.6
5	T1	1564	5.0	0.723	17.3	LOS B	12.9	93.9	0.91	0.84	46.7
Approach		1751	4.5	0.723	16.3	LOS B	12.9	93.9	0.86	0.82	47.3
West: Roystonea Avenue											
11	T1	684	7.0	0.182	3.6	LOS A	2.3	16.9	0.40	0.33	56.6
12	R2	235	6.0	0.726	31.7	LOS C	6.7	49.0	0.99	0.90	38.8
Approach		919	6.7	0.726	10.8	LOS B	6.7	49.0	0.55	0.48	50.7
All Vehicles		3261	4.7	0.726	16.0	LOS B	12.9	93.9	0.78	0.73	47.3

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2026 PM Post Upg Uni

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / University Avenue Intersection
2026 PM Post Development Traffic
Signals - Fixed Time Cycle Time = 55 seconds (Optimum Cycle Time - Minimum Delay)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: University Avenue											
1	L2	247	2.0	0.225	11.1	LOS B	3.1	21.9	0.49	0.69	50.2
3	R2	129	4.0	0.655	34.0	LOS C	3.7	26.9	1.00	0.84	38.0
Approach		376	2.7	0.655	19.0	LOS B	3.7	26.9	0.67	0.75	45.2
East: Roystonea Avenue											
4	L2	194	0.0	0.208	9.4	LOS A	1.9	13.3	0.50	0.69	51.3
5	T1	649	5.0	0.630	24.2	LOS C	5.8	42.2	0.97	0.82	42.9
Approach		843	3.8	0.630	20.8	LOS C	5.8	42.2	0.87	0.79	44.6
West: Roystonea Avenue											
11	T1	1817	7.0	0.483	4.7	LOS A	7.9	58.7	0.52	0.47	55.7
12	R2	441	6.0	0.649	21.2	LOS C	10.1	74.0	0.88	0.83	43.7
Approach		2258	6.8	0.649	7.9	LOS A	10.1	74.0	0.59	0.54	52.8
All Vehicles		3477	5.6	0.655	12.2	LOS B	10.1	74.0	0.67	0.62	49.7

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2046 AM Post Upg2 Uni

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / University Avenue Intersection
2046 AM Post Development Traffic
Signals - Fixed Time Cycle Time = 110 seconds (Optimum Cycle Time - Minimum Delay)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: University Avenue											
1	L2	688	2.0	0.492	33.4	LOS C	14.0	99.8	0.81	0.81	38.5
3	R2	210	4.0	0.914	73.6	LOS E	13.6	98.5	1.00	1.07	27.0
Approach		898	2.5	0.914	42.8	LOS D	14.0	99.8	0.86	0.87	35.0
East: Roystonea Avenue											
4	L2	396	0.0	0.308	10.0	LOS A	6.6	46.0	0.39	0.67	50.9
5	T1	2417	5.0	0.895	37.6	LOS D	49.4	360.6	0.94	0.98	37.1
Approach		2813	4.3	0.895	33.8	LOS C	49.4	360.6	0.86	0.94	38.6
West: Roystonea Avenue											
11	T1	1085	7.0	0.254	0.4	LOS A	0.5	3.7	0.03	0.03	59.6
12	R2	448	6.0	0.907	59.9	LOS E	19.8	146.0	0.96	0.93	30.0
Approach		1533	6.7	0.907	17.8	LOS B	19.8	146.0	0.30	0.29	46.3
All Vehicles		5244	4.7	0.914	30.6	LOS C	49.4	360.6	0.70	0.74	39.8

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2046 PM Post Upg2 Uni

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / University Avenue Intersection
2046 PM Post Development Traffic
Signals - Fixed Time Cycle Time = 80 seconds (Optimum Cycle Time - Minimum Delay)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: University Avenue											
1	L2	419	2.0	0.179	11.9	LOS B	3.3	23.5	0.44	0.68	49.6
3	R2	271	4.0	0.924	59.4	LOS E	13.8	99.6	1.00	1.14	30.2
Approach		690	2.8	0.924	30.6	LOS C	13.8	99.6	0.66	0.86	39.6
East: Roystonea Avenue											
4	L2	351	0.0	0.375	11.3	LOS B	5.7	40.2	0.54	0.72	50.0
5	T1	1032	5.0	0.857	41.3	LOS D	15.2	111.3	1.00	1.04	35.8
Approach		1383	3.7	0.857	33.7	LOS C	15.2	111.3	0.88	0.96	38.6
West: Roystonea Avenue											
11	T1	2793	7.0	0.726	2.6	LOS A	9.0	66.9	0.27	0.25	57.6
12	R2	742	6.0	0.751	25.3	LOS C	17.0	125.0	0.77	0.81	41.8
Approach		3535	6.8	0.751	7.3	LOS A	17.0	125.0	0.37	0.37	53.3
All Vehicles		5608	5.5	0.924	16.7	LOS B	17.0	125.0	0.53	0.57	46.9

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2016 AM Background

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / The Boulevard Intersection
2016 AM Background Traffic
Signals - Fixed Time Cycle Time = 90 seconds (Optimum Cycle Time - Minimum Delay)

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: The Boulevard											
1	L2	134	6.0	0.151	6.2	LOS A	1.0	7.6	0.25	0.61	49.7
3	R2	73	33.0	0.336	43.8	LOS D	3.0	27.1	0.94	0.76	25.9
Approach		207	15.5	0.336	19.4	LOS B	3.0	27.1	0.50	0.67	37.6
East: Roystonea Avenue											
4	L2	131	2.0	0.085	5.7	LOS A	0.1	0.6	0.02	0.55	38.4
5	T1	1034	15.0	0.356	8.6	LOS A	5.6	43.9	0.40	0.34	52.6
Approach		1165	13.5	0.356	8.3	LOS A	5.6	43.9	0.35	0.37	51.3
West: Roystonea Avenue											
11	T1	398	1.0	0.189	7.7	LOS A	2.7	19.3	0.34	0.28	53.3
12	R2	61	39.0	0.378	48.5	LOS D	2.6	24.0	0.94	0.75	18.2
Approach		459	6.1	0.378	13.1	LOS B	2.7	24.0	0.42	0.35	46.0
All Vehicles		1831	11.9	0.378	10.7	LOS B	5.6	43.9	0.39	0.40	48.6

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	12.8	LOS B	0.1	0.1	0.53	0.53
P21	East Stage 1	50	25.7	LOS C	0.1	0.1	0.76	0.76
P22	East Stage 2	50	39.3	LOS D	0.1	0.1	0.94	0.94
P41	West Stage 1	50	39.3	LOS D	0.1	0.1	0.94	0.94
P42	West Stage 2	50	25.7	LOS C	0.1	0.1	0.76	0.76
All Pedestrians		250	28.6	LOS C			0.78	0.78

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 AM Post

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / The Boulevard Intersection
2016 AM Post Development Traffic
Signals - Fixed Time Cycle Time = 105 seconds (Optimum Cycle Time - Minimum Delay)

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: The Boulevard											
1	L2	138	6.0	0.161	6.0	LOS A	1.1	8.0	0.22	0.61	49.9
3	R2	73	33.0	0.392	52.5	LOS D	3.6	32.4	0.96	0.77	23.5
Approach		211	15.3	0.392	22.1	LOS C	3.6	32.4	0.48	0.66	35.9
East: Roystonea Avenue											
4	L2	131	2.0	0.084	5.7	LOS A	0.1	0.7	0.02	0.55	38.4
5	T1	1070	15.0	0.346	7.6	LOS A	5.6	43.9	0.33	0.29	53.4
Approach		1201	13.6	0.346	7.4	LOS A	5.6	43.9	0.30	0.32	52.0
West: Roystonea Avenue											
11	T1	414	1.0	0.184	6.7	LOS A	2.7	19.3	0.28	0.24	54.0
12	R2	65	39.0	0.361	53.6	LOS D	3.1	28.9	0.93	0.76	17.4
Approach		479	6.2	0.361	13.1	LOS B	3.1	28.9	0.37	0.31	46.0
All Vehicles		1891	11.9	0.392	10.5	LOS B	5.6	43.9	0.33	0.35	48.8

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	12.4	LOS B	0.1	0.1	0.49	0.49
P21	East Stage 1	50	30.5	LOS D	0.1	0.1	0.76	0.76
P22	East Stage 2	50	44.0	LOS E	0.1	0.1	0.92	0.92
P41	West Stage 1	50	46.8	LOS E	0.1	0.1	0.94	0.94
P42	West Stage 2	50	30.5	LOS D	0.1	0.1	0.76	0.76
All Pedestrians		250	32.8	LOS D			0.77	0.77

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 PM Background

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / The Boulevard Intersection
2016 PM Background Traffic
Signals - Fixed Time Cycle Time = 120 seconds (Optimum Cycle Time - Minimum Delay)

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: The Boulevard											
1	L2	142	11.0	0.127	5.2	LOS A	0.6	4.2	0.13	0.57	50.5
3	R2	73	33.0	0.448	61.3	LOS E	4.2	37.7	0.98	0.77	21.4
Approach		215	18.5	0.448	24.3	LOS C	4.2	37.7	0.42	0.64	34.6
East: Roystonea Avenue											
4	L2	192	15.0	0.131	5.9	LOS A	0.2	1.4	0.02	0.55	38.2
5	T1	392	2.0	0.103	3.2	LOS A	1.0	7.1	0.14	0.12	57.0
Approach		584	6.3	0.131	4.1	LOS A	1.0	7.1	0.10	0.26	51.4
West: Roystonea Avenue											
11	T1	1174	2.0	0.463	4.4	LOS A	6.9	49.5	0.22	0.20	56.0
12	R2	58	42.0	0.487	66.3	LOS E	3.4	32.3	0.98	0.76	15.8
Approach		1232	3.9	0.487	7.3	LOS A	6.9	49.5	0.26	0.23	52.3
All Vehicles		2031	6.1	0.487	8.2	LOS A	6.9	49.5	0.23	0.28	50.3

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	9.6	LOS A	0.1	0.1	0.40	0.40
P21	East Stage 1	50	40.1	LOS E	0.1	0.1	0.82	0.82
P22	East Stage 2	50	54.3	LOS E	0.2	0.2	0.95	0.95
P41	West Stage 1	50	54.3	LOS E	0.2	0.2	0.95	0.95
P42	West Stage 2	50	40.1	LOS E	0.1	0.1	0.82	0.82
All Pedestrians		250	39.7	LOS D			0.79	0.79

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 PM Post

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / The Boulevard Intersection
2016 PM Post Development Traffic
Signals - Fixed Time Cycle Time = 115 seconds (Optimum Cycle Time - Minimum Delay)

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: The Boulevard											
1	L2	145	11.0	0.131	5.2	LOS A	0.6	4.4	0.14	0.58	50.5
3	R2	73	33.0	0.430	58.3	LOS E	4.0	35.9	0.97	0.77	22.0
Approach		218	18.4	0.430	23.0	LOS C	4.0	35.9	0.42	0.64	35.3
East: Roystonea Avenue											
4	L2	192	15.0	0.132	5.9	LOS A	0.2	1.3	0.02	0.55	38.2
5	T1	412	2.0	0.111	3.8	LOS A	1.2	8.4	0.17	0.14	56.5
Approach		604	6.1	0.132	4.5	LOS A	1.2	8.4	0.12	0.27	51.2
West: Roystonea Avenue											
11	T1	1206	2.0	0.487	5.2	LOS A	8.1	57.8	0.26	0.24	55.3
12	R2	62	42.0	0.499	63.5	LOS E	3.5	33.1	0.98	0.76	16.1
Approach		1268	4.0	0.499	8.0	LOS A	8.1	57.8	0.30	0.26	51.7
All Vehicles		2090	6.1	0.499	8.6	LOS A	8.1	57.8	0.26	0.30	50.0

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	10.0	LOS B	0.1	0.1	0.42	0.42
P21	East Stage 1	50	37.7	LOS D	0.1	0.1	0.81	0.81
P22	East Stage 2	50	51.8	LOS E	0.2	0.2	0.95	0.95
P41	West Stage 1	50	51.8	LOS E	0.2	0.2	0.95	0.95
P42	West Stage 2	50	37.7	LOS D	0.1	0.1	0.81	0.81
All Pedestrians		250	37.8	LOS D			0.79	0.79

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2026 AM Post - EB 3Lane

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / The Boulevard Intersection
2026 AM Post Development Traffic
Signals - Fixed Time Cycle Time = 125 seconds (Optimum Cycle Time - Minimum Delay)

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: The Boulevard											
1	L2	116	6.0	0.167	6.7	LOS A	1.4	10.4	0.26	0.62	49.1
3	R2	44	33.0	0.244	60.2	LOS E	2.5	22.6	0.94	0.74	21.6
Approach		160	13.4	0.244	21.4	LOS C	2.5	22.6	0.45	0.65	36.4
East: Roystonea Avenue											
4	L2	78	2.0	0.050	5.8	LOS A	0.1	0.5	0.02	0.55	38.4
5	T1	1536	15.0	0.462	6.7	LOS A	8.4	66.2	0.29	0.26	54.0
Approach		1614	14.4	0.462	6.7	LOS A	8.4	66.2	0.28	0.28	53.4
West: Roystonea Avenue											
11	T1	611	1.0	0.168	5.3	LOS A	2.4	16.7	0.21	0.18	55.2
12	R2	80	39.0	0.492	64.7	LOS E	4.7	43.8	0.96	0.77	15.9
Approach		691	5.4	0.492	12.2	LOS B	4.7	43.8	0.30	0.25	47.0
All Vehicles		2465	11.8	0.492	9.2	LOS A	8.4	66.2	0.30	0.29	50.5

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	11.7	LOS B	0.1	0.1	0.43	0.43
P21	East Stage 1	50	37.7	LOS D	0.1	0.1	0.78	0.78
P22	East Stage 2	50	55.8	LOS E	0.2	0.2	0.95	0.95
P41	West Stage 1	50	56.8	LOS E	0.2	0.2	0.95	0.95
P42	West Stage 2	50	37.7	LOS D	0.1	0.1	0.78	0.78
All Pedestrians		250	39.9	LOS D			0.78	0.78

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2026 PM Post - EB 3Lane

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / The Boulevard Intersection
2026 PM Post Development Traffic
Signals - Fixed Time Cycle Time = 145 seconds (Optimum Cycle Time - Minimum Delay)

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: The Boulevard											
1	L2	116	11.0	0.117	5.2	LOS A	0.5	4.0	0.11	0.57	50.6
3	R2	44	33.0	0.283	71.5	LOS E	3.0	26.7	0.96	0.75	19.4
Approach		160	17.1	0.283	23.5	LOS C	3.0	26.7	0.35	0.62	35.1
East: Roystonea Avenue											
4	L2	115	15.0	0.078	5.9	LOS A	0.1	1.0	0.02	0.55	38.2
5	T1	633	2.0	0.166	3.9	LOS A	2.0	14.2	0.15	0.13	56.4
Approach		748	4.0	0.166	4.2	LOS A	2.0	14.2	0.13	0.19	53.9
West: Roystonea Avenue											
11	T1	1618	2.0	0.423	4.8	LOS A	7.0	49.6	0.20	0.18	55.6
12	R2	68	42.0	0.431	73.3	LOS E	4.5	43.3	0.95	0.77	15.0
Approach		1686	3.6	0.431	7.6	LOS A	7.0	49.6	0.23	0.21	52.2
All Vehicles		2594	4.6	0.431	7.6	LOS A	7.0	49.6	0.21	0.23	51.7

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	10.8	LOS B	0.1	0.1	0.39	0.39
P21	East Stage 1	50	45.7	LOS E	0.2	0.2	0.79	0.79
P22	East Stage 2	50	63.9	LOS F	0.2	0.2	0.94	0.94
P41	West Stage 1	50	66.8	LOS F	0.2	0.2	0.96	0.96
P42	West Stage 2	50	45.7	LOS E	0.2	0.2	0.79	0.79
All Pedestrians		250	46.6	LOS E			0.78	0.78

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2046 AM Post - EB 3Lane

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / The Boulevard Intersection
2046 AM Post Development Traffic
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

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: The Boulevard											
1	L2	103	6.0	0.198	13.1	LOS B	4.6	33.8	0.63	0.76	42.8
3	R2	16	33.0	0.106	72.4	LOS E	1.1	9.8	0.94	0.70	19.2
Approach		119	9.6	0.198	21.1	LOS C	4.6	33.8	0.67	0.75	36.8
East: Roystonea Avenue											
4	L2	28	2.0	0.018	5.8	LOS A	0.0	0.2	0.02	0.55	38.3
5	T1	2471	15.0	0.694	5.7	LOS A	16.2	127.8	0.29	0.27	54.9
Approach		2499	14.9	0.694	5.7	LOS A	16.2	127.8	0.29	0.27	54.7
West: Roystonea Avenue											
11	T1	991	1.0	0.253	3.6	LOS A	3.1	22.0	0.14	0.12	56.6
12	R2	105	39.0	0.677	79.2	LOS E	7.7	71.7	1.00	0.82	14.4
Approach		1096	4.6	0.677	10.9	LOS B	7.7	71.7	0.22	0.19	48.4
All Vehicles		3714	11.7	0.694	7.7	LOS A	16.2	127.8	0.28	0.27	52.3

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	10.5	LOS B	0.1	0.1	0.37	0.37
P21	East Stage 1	50	48.1	LOS E	0.2	0.2	0.80	0.80
P22	East Stage 2	50	66.4	LOS F	0.2	0.2	0.94	0.94
P41	West Stage 1	50	69.3	LOS F	0.2	0.2	0.96	0.96
P42	West Stage 2	50	48.1	LOS E	0.2	0.2	0.80	0.80
All Pedestrians		250	48.5	LOS E			0.78	0.78

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2046 PM Post - EB 3Lane

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / The Boulevard Intersection
2046 PM Post Development Traffic
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

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: The Boulevard											
1	L2	96	11.0	0.124	5.2	LOS A	0.5	3.5	0.11	0.57	50.6
3	R2	16	33.0	0.106	72.4	LOS E	1.1	9.8	0.94	0.70	19.2
Approach		112	14.1	0.124	14.8	LOS B	1.1	9.8	0.23	0.59	41.0
East: Roystonea Avenue											
4	L2	41	15.0	0.028	5.9	LOS A	0.0	0.4	0.02	0.55	38.2
5	T1	1046	2.0	0.261	2.6	LOS A	2.5	17.6	0.11	0.09	57.6
Approach		1087	2.5	0.261	2.7	LOS A	2.5	17.6	0.10	0.11	56.9
West: Roystonea Avenue											
11	T1	2660	2.0	0.664	3.9	LOS A	12.4	88.5	0.21	0.20	56.4
12	R2	82	42.0	0.662	81.9	LOS F	6.1	58.1	1.00	0.81	14.1
Approach		2742	3.2	0.664	6.2	LOS A	12.4	88.5	0.24	0.22	53.6
All Vehicles		3941	3.3	0.664	5.5	LOS A	12.4	88.5	0.20	0.20	54.2

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	9.4	LOS A	0.1	0.1	0.35	0.35
P21	East Stage 1	50	50.5	LOS E	0.2	0.2	0.82	0.82
P22	East Stage 2	50	69.3	LOS F	0.2	0.2	0.96	0.96
P41	West Stage 1	50	69.3	LOS F	0.2	0.2	0.96	0.96
P42	West Stage 2	50	50.5	LOS E	0.2	0.2	0.82	0.82
All Pedestrians		250	49.8	LOS E			0.78	0.78

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 AM Background Upg

BE140072 Palmerstone City Centre Masterplan
Roystonea Avenue / Temple Terrace Intersection
2016 AM Background Traffic
Signals - Fixed Time Cycle Time = 80 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Temple Terrace											
1	L2	618	1.0	0.335	5.7	LOS A	0.0	0.0	0.00	0.53	54.9
2	T1	303	0.0	0.296	25.8	LOS C	4.8	33.6	0.84	0.68	42.3
3	R2	58	3.0	0.425	46.7	LOS D	2.3	16.8	0.99	0.75	33.7
Approach		979	0.8	0.425	14.3	LOS B	4.8	33.6	0.32	0.59	48.6
East: Roystonea Avenue											
4	L2	74	2.0	0.055	6.6	LOS A	0.4	2.7	0.22	0.60	53.4
5	T1	333	6.0	0.338	26.1	LOS C	5.4	39.4	0.85	0.70	42.1
6	R2	438	6.0	0.894	49.6	LOS D	21.0	154.2	1.00	1.06	32.9
Approach		845	5.6	0.894	36.6	LOS D	21.0	154.2	0.87	0.87	37.4
North: Temple Terrace											
7	L2	36	4.0	0.026	7.3	LOS A	0.3	1.9	0.26	0.60	52.8
8	T1	171	1.0	0.168	24.7	LOS C	2.6	18.4	0.81	0.63	42.8
9	R2	174	2.0	0.634	48.2	LOS D	3.6	25.8	1.00	0.81	33.2
Approach		381	1.7	0.634	33.8	LOS C	3.6	25.8	0.84	0.71	38.4
West: Roystonea Avenue											
10	L2	166	2.0	0.161	9.9	LOS A	1.5	11.0	0.30	0.63	50.9
11	T1	277	4.0	0.833	44.9	LOS D	6.0	43.4	1.00	0.92	34.7
12	R2	35	11.0	0.203	43.4	LOS D	1.3	9.9	0.92	0.72	34.7
Approach		478	3.8	0.833	32.6	LOS C	6.0	43.4	0.75	0.81	39.0
All Vehicles		2683	3.0	0.894	27.4	LOS C	21.0	154.2	0.65	0.74	41.3

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	34.3	LOS D	0.1	0.1	0.93	0.93
P2	East Full Crossing	50	34.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		100	34.3	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 AM Post Upg

BE140072 Palmerstone City Centre Masterplan
Roystonea Avenue / Temple Terrace Intersection
2016 AM Post Development Traffic
Signals - Fixed Time Cycle Time = 80 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Temple Terrace											
1	L2	643	1.0	0.349	5.7	LOS A	0.0	0.0	0.00	0.53	54.9
2	T1	316	0.0	0.309	25.9	LOS C	5.0	35.2	0.85	0.69	42.3
3	R2	62	3.0	0.455	46.9	LOS D	2.5	18.0	1.00	0.75	33.6
Approach		1021	0.8	0.455	14.4	LOS B	5.0	35.2	0.32	0.59	48.5
East: Roystonea Avenue											
4	L2	82	2.0	0.061	6.6	LOS A	0.4	3.0	0.22	0.60	53.4
5	T1	342	6.0	0.347	26.2	LOS C	5.5	40.6	0.86	0.70	42.1
6	R2	438	6.0	0.894	49.6	LOS D	21.0	154.2	1.00	1.06	32.9
Approach		862	5.6	0.894	36.3	LOS D	21.0	154.2	0.87	0.87	37.5
North: Temple Terrace											
7	L2	36	4.0	0.026	7.3	LOS A	0.3	1.9	0.26	0.60	52.8
8	T1	185	1.0	0.182	24.9	LOS C	2.8	20.0	0.81	0.64	42.7
9	R2	176	2.0	0.641	48.3	LOS D	3.7	26.1	1.00	0.81	33.2
Approach		397	1.7	0.641	33.6	LOS C	3.7	26.1	0.85	0.71	38.5
West: Roystonea Avenue											
10	L2	167	2.0	0.166	10.4	LOS B	1.7	11.9	0.32	0.64	50.6
11	T1	281	4.0	0.845	45.4	LOS D	6.1	44.4	1.00	0.94	34.5
12	R2	46	11.0	0.267	43.8	LOS D	1.7	13.1	0.93	0.73	34.6
Approach		494	4.0	0.845	33.4	LOS C	6.1	44.4	0.76	0.82	38.7
All Vehicles		2774	3.0	0.894	27.3	LOS C	21.0	154.2	0.65	0.74	41.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	34.3	LOS D	0.1	0.1	0.93	0.93
P2	East Full Crossing	50	34.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		100	34.3	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 PM Background Upg

BE140072 Palmerstone City Centre Masterplan
Roystonea Avenue / Temple Terrace Intersection
2016 PM Background Traffic
Signals - Fixed Time Cycle Time = 85 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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: Temple Terrace											
1	L2	231	1.0	0.125	5.6	LOS A	0.0	0.0	0.00	0.53	54.9
2	T1	326	0.0	0.410	28.9	LOS C	7.0	48.9	0.87	0.71	40.9
3	R2	88	3.0	0.686	51.8	LOS D	3.9	28.3	1.00	0.83	32.2
Approach		645	0.8	0.686	23.7	LOS C	7.0	48.9	0.58	0.66	43.3
East: Roystonea Avenue											
4	L2	94	2.0	0.083	8.6	LOS A	1.0	7.1	0.34	0.64	51.8
5	T1	183	6.0	0.197	27.6	LOS C	3.0	22.4	0.83	0.65	41.4
6	R2	85	6.0	0.676	51.8	LOS D	3.8	28.0	1.00	0.83	32.3
Approach		362	5.0	0.676	28.3	LOS C	3.8	28.0	0.74	0.69	40.8
North: Temple Terrace											
7	L2	138	4.0	0.135	10.2	LOS B	1.9	13.7	0.42	0.66	50.7
8	T1	379	1.0	0.396	29.2	LOS C	6.7	47.1	0.88	0.72	40.7
9	R2	169	2.0	0.654	51.3	LOS D	3.8	26.7	1.00	0.82	32.3
Approach		686	1.8	0.654	30.8	LOS C	6.7	47.1	0.82	0.73	39.7
West: Roystonea Avenue											
10	L2	270	2.0	0.213	5.8	LOS A	0.2	1.5	0.03	0.56	54.1
11	T1	815	4.0	0.651	25.5	LOS C	13.4	97.2	0.84	0.73	42.4
12	R2	170	11.0	0.645	44.3	LOS D	6.8	52.4	0.97	0.82	34.4
Approach		1255	4.5	0.651	23.8	LOS C	13.4	97.2	0.68	0.70	43.1
All Vehicles		2948	3.1	0.686	26.0	LOS C	13.4	97.2	0.70	0.70	42.0

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	36.8	LOS D	0.1	0.1	0.93	0.93
P2	East Full Crossing	50	36.8	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		100	36.8	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 PM Post Upg

BE140072 Palmerstone City Centre Masterplan
Roystonea Avenue / Temple Terrace Intersection
2016 PM Post Development Traffic
Signals - Fixed Time Cycle Time = 85 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Temple Terrace											
1	L2	244	1.0	0.132	5.6	LOS A	0.0	0.0	0.00	0.53	54.9
2	T1	338	0.0	0.434	29.0	LOS C	7.4	52.0	0.87	0.71	40.8
3	R2	95	3.0	0.740	52.7	LOS D	4.3	31.0	1.00	0.87	31.9
Approach		677	0.8	0.740	23.9	LOS C	7.4	52.0	0.58	0.67	43.1
East: Roystonea Avenue											
4	L2	99	2.0	0.090	9.2	LOS A	1.2	8.3	0.37	0.64	51.4
5	T1	188	6.0	0.203	27.6	LOS C	3.1	23.0	0.83	0.66	41.4
6	R2	85	6.0	0.676	51.8	LOS D	3.8	28.0	1.00	0.83	32.3
Approach		372	4.9	0.676	28.3	LOS C	3.8	28.0	0.75	0.69	40.9
North: Temple Terrace											
7	L2	138	4.0	0.136	10.2	LOS B	1.9	13.7	0.42	0.66	50.7
8	T1	391	1.0	0.408	29.3	LOS C	6.9	48.8	0.88	0.73	40.6
9	R2	170	2.0	0.658	51.4	LOS D	3.8	26.9	1.00	0.82	32.3
Approach		699	1.8	0.658	30.9	LOS C	6.9	48.8	0.82	0.74	39.7
West: Roystonea Avenue											
10	L2	271	2.0	0.214	5.8	LOS A	0.2	1.6	0.03	0.56	54.0
11	T1	823	4.0	0.657	25.6	LOS C	13.6	98.6	0.84	0.73	42.4
12	R2	192	11.0	0.729	45.9	LOS D	8.0	61.5	0.99	0.86	33.9
Approach		1286	4.6	0.729	24.4	LOS C	13.6	98.6	0.69	0.71	42.8
All Vehicles		3034	3.2	0.740	26.3	LOS C	13.6	98.6	0.70	0.71	41.9

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	36.8	LOS D	0.1	0.1	0.93	0.93
P2	East Full Crossing	50	36.8	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		100	36.8	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2026 AM Post Upg 3L EB

BE140072 Palmerstone City Centre Masterplan
Roystonea Avenue / Temple Terrace Intersection
2026 AM Post Development Traffic
Signals - Fixed Time Cycle Time = 90 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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: Temple Terrace											
1	L2	851	1.0	0.461	5.7	LOS A	0.0	0.0	0.00	0.53	54.8
2	T1	451	0.0	0.737	37.0	LOS D	13.8	96.6	0.96	0.86	37.5
3	R2	100	3.0	0.825	58.0	LOS E	5.0	35.7	1.00	0.94	30.6
Approach		1402	0.8	0.825	19.5	LOS B	13.8	96.6	0.38	0.66	45.5
East: Roystonea Avenue											
4	L2	175	2.0	0.150	8.1	LOS A	1.8	12.8	0.32	0.64	52.2
5	T1	499	6.0	0.570	33.5	LOS C	9.9	72.8	0.94	0.78	38.9
6	R2	534	6.0	0.843	52.2	LOS D	13.1	96.1	1.00	0.98	32.2
Approach		1208	5.4	0.843	38.1	LOS D	13.1	96.1	0.88	0.85	36.8
North: Temple Terrace											
7	L2	53	4.0	0.043	7.7	LOS A	0.5	3.4	0.28	0.61	52.5
8	T1	382	1.0	0.386	30.2	LOS C	7.0	49.5	0.87	0.72	40.3
9	R2	272	2.0	0.743	52.6	LOS D	6.4	45.4	1.00	0.88	32.0
Approach		707	1.6	0.743	37.1	LOS D	7.0	49.5	0.88	0.77	37.2
West: Roystonea Avenue											
10	L2	209	2.0	0.203	8.8	LOS A	1.7	11.9	0.22	0.61	51.8
11	T1	376	4.0	0.424	32.2	LOS C	6.7	48.3	0.84	0.69	39.4
12	R2	125	11.0	0.408	42.2	LOS D	4.8	36.7	0.89	0.77	35.1
Approach		710	4.6	0.424	27.0	LOS C	6.7	48.3	0.67	0.68	41.4
All Vehicles		4027	3.0	0.843	29.5	LOS C	13.8	96.6	0.67	0.74	40.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	39.3	LOS D	0.1	0.1	0.94	0.94
P2	East Full Crossing	50	39.3	LOS D	0.1	0.1	0.94	0.94
All Pedestrians		100	39.3	LOS D			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2026 PM Post Upg 3L EB

BE140072 Palmerstone City Centre Masterplan
Roystonea Avenue / Temple Terrace Intersection
2026 PM Post Development Traffic
Signals - Fixed Time Cycle Time = 110 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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: Temple Terrace											
1	L2	348	1.0	0.189	5.6	LOS A	0.0	0.0	0.00	0.53	54.9
2	T1	471	0.0	0.769	46.1	LOS D	17.4	121.9	0.97	0.88	34.3
3	R2	168	3.0	0.924	76.8	LOS E	11.0	79.2	1.00	1.11	26.5
Approach		987	0.9	0.924	37.0	LOS D	17.4	121.9	0.63	0.80	37.4
East: Roystonea Avenue											
4	L2	164	2.0	0.187	19.0	LOS B	4.5	31.9	0.58	0.71	45.3
5	T1	277	6.0	0.387	42.5	LOS D	6.6	48.5	0.92	0.74	35.5
6	R2	103	6.0	0.530	64.6	LOS E	2.9	21.4	1.00	0.75	29.0
Approach		544	4.8	0.530	39.6	LOS D	6.6	48.5	0.83	0.73	36.3
North: Temple Terrace											
7	L2	205	4.0	0.252	17.9	LOS B	5.7	41.4	0.59	0.73	45.8
8	T1	680	1.0	0.915	63.0	LOS E	25.1	177.4	0.99	1.12	29.7
9	R2	258	2.0	0.705	61.1	LOS E	7.2	51.1	1.00	0.85	29.8
Approach		1143	1.8	0.915	54.4	LOS D	25.1	177.4	0.92	0.99	31.7
West: Roystonea Avenue											
10	L2	341	2.0	0.269	6.6	LOS A	1.2	8.4	0.08	0.57	53.4
11	T1	1071	4.0	0.775	26.7	LOS C	25.7	186.3	0.79	0.72	41.8
12	R2	364	11.0	0.775	48.0	LOS D	18.2	139.3	0.95	0.88	33.3
Approach		1776	5.1	0.775	27.2	LOS C	25.7	186.3	0.69	0.73	41.4
All Vehicles		4450	3.2	0.924	37.9	LOS D	25.7	186.3	0.75	0.81	37.0

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	49.3	LOS E	0.1	0.1	0.95	0.95
P2	East Full Crossing	50	48.3	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		100	48.8	LOS E			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2046 AM Post Upg2 3L EB

BE140072 Palmerstone City Centre Masterplan
Roystonea Avenue / Temple Terrace Intersection
2046 AM Post Development Traffic
Signals - Fixed Time Cycle Time = 115 seconds (Optimum Cycle Time - Minimum Delay)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Temple Terrace											
1	L2	1157	1.0	0.627	5.7	LOS A	0.0	0.0	0.00	0.53	54.7
2	T1	738	0.0	0.936	69.5	LOS E	21.4	150.1	0.98	1.09	28.3
3	R2	124	3.0	0.196	49.9	LOS D	2.8	20.4	0.84	0.73	33.1
Approach		2019	0.8	0.936	31.7	LOS C	21.4	150.1	0.41	0.75	39.6
East: Roystonea Avenue											
4	L2	186	2.0	0.154	11.5	LOS B	3.3	23.8	0.40	0.66	49.8
5	T1	733	6.0	0.850	59.1	LOS E	15.3	112.6	1.00	0.99	30.7
6	R2	793	6.0	0.914	70.1	LOS E	27.0	199.0	1.00	1.05	28.0
Approach		1712	5.6	0.914	59.0	LOS E	27.0	199.0	0.93	0.99	30.6
North: Temple Terrace											
7	L2	116	4.0	0.090	8.1	LOS A	1.3	9.5	0.27	0.62	52.2
8	T1	1142	1.0	0.904	62.3	LOS E	25.0	176.8	1.00	1.09	30.0
9	R2	709	2.0	0.891	66.0	LOS E	22.9	162.9	1.00	1.01	28.9
Approach		1967	1.5	0.904	60.4	LOS E	25.0	176.8	0.96	1.04	30.3
West: Roystonea Avenue											
10	L2	357	2.0	0.195	5.7	LOS A	0.0	0.0	0.00	0.53	54.8
11	T1	551	4.0	0.758	52.0	LOS D	12.5	90.8	0.98	0.84	32.6
12	R2	229	11.0	0.273	43.9	LOS D	4.8	36.7	0.78	0.74	35.0
Approach		1137	4.8	0.758	35.8	LOS D	12.5	90.8	0.63	0.72	38.0
All Vehicles		6835	2.9	0.936	47.5	LOS D	27.0	199.0	0.74	0.89	33.9

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P11	South Stage 1	50	51.8	LOS E	0.2	0.2	0.95	0.95
P12	South Stage 2	50	47.1	LOS E	0.1	0.1	0.91	0.91
P21	East Stage 1	50	45.3	LOS E	0.1	0.1	0.89	0.89
P22	East Stage 2	50	41.0	LOS E	0.1	0.1	0.85	0.85
All Pedestrians		200	46.3	LOS E			0.90	0.90

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2046 PM Post Upg2 3L EB

BE140072 Palmerstone City Centre Masterplan
Roystonea Avenue / Temple Terrace Intersection
2046 PM Post Development Traffic
Signals - Fixed Time Cycle Time = 125 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Temple Terrace											
1	L2	497	1.0	0.270	5.6	LOS A	0.0	0.0	0.00	0.53	54.9
2	T1	860	0.0	0.931	70.3	LOS E	27.0	189.2	0.97	1.07	28.2
3	R2	218	3.0	0.833	74.6	LOS E	7.2	51.7	1.00	0.90	27.1
Approach		1575	0.7	0.931	50.5	LOS D	27.0	189.2	0.67	0.88	33.0
East: Roystonea Avenue											
4	L2	198	2.0	0.215	21.0	LOS C	6.1	43.4	0.59	0.72	44.2
5	T1	402	6.0	0.496	54.3	LOS D	7.7	56.7	0.97	0.78	32.0
6	R2	154	6.0	0.901	83.7	LOS F	5.5	40.3	1.00	1.01	25.4
Approach		754	4.9	0.901	51.5	LOS D	7.7	56.7	0.88	0.81	32.6
North: Temple Terrace											
7	L2	449	4.0	0.495	26.1	LOS C	15.7	113.9	0.71	0.87	41.6
8	T1	1573	1.0	0.846	48.5	LOS D	32.4	228.6	1.00	0.97	33.7
9	R2	625	2.0	0.928	81.4	LOS F	23.5	167.1	1.00	1.08	25.8
Approach		2647	1.7	0.928	52.5	LOS D	32.4	228.6	0.95	0.98	32.4
West: Roystonea Avenue											
10	L2	611	6.0	0.343	5.7	LOS A	0.0	0.0	0.00	0.53	54.7
11	T1	1585	4.0	0.935	51.7	LOS D	46.5	336.5	0.94	1.00	32.7
12	R2	610	11.0	0.651	49.3	LOS D	15.6	119.7	0.89	0.82	33.3
Approach		2806	6.0	0.935	41.2	LOS D	46.5	336.5	0.72	0.86	36.0
All Vehicles		7782	3.4	0.935	47.9	LOS D	46.5	336.5	0.81	0.90	33.8

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P11	South Stage 1	50	56.8	LOS E	0.2	0.2	0.95	0.95
P12	South Stage 2	50	52.1	LOS E	0.2	0.2	0.91	0.91
P21	East Stage 1	50	37.7	LOS D	0.1	0.1	0.78	0.78
P22	East Stage 2	50	33.9	LOS D	0.1	0.1	0.74	0.74
All Pedestrians		200	45.1	LOS E			0.85	0.85

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 AM Post

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / Yarrawonga Road Intersection
2016 AM Post Development Traffic
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Packard Avenue											
1	L2	37	2.0	0.050	16.2	LOS B	1.0	6.9	0.55	0.63	47.4
2	T1	7	2.0	0.050	10.6	LOS B	1.0	6.9	0.55	0.63	48.0
3	R2	24	2.0	0.284	74.4	LOS E	1.6	11.2	1.00	0.71	26.9
Approach		68	2.0	0.284	36.2	LOS D	1.6	11.2	0.71	0.66	37.4
East: Roystonea Avenue											
4	L2	201	0.0	0.188	19.3	LOS B	5.9	41.4	0.51	0.70	45.2
5	T1	2083	0.0	0.651	19.1	LOS B	30.9	216.5	0.71	0.65	45.6
6	R2	37	2.0	0.263	68.9	LOS E	2.3	16.4	0.98	0.73	27.8
Approach		2321	0.0	0.651	19.9	LOS B	30.9	216.5	0.70	0.65	45.1
North: Yarrawonga Road											
7	L2	37	0.0	0.259	68.8	LOS E	2.3	16.1	0.98	0.73	27.8
8	T1	8	2.0	0.684	67.1	LOS E	6.4	45.2	1.00	0.83	27.5
9	R2	90	0.0	0.684	72.7	LOS E	6.4	45.2	1.00	0.83	27.3
Approach		135	0.1	0.684	71.3	LOS E	6.4	45.2	0.99	0.80	27.4
West: Roystonea Avenue											
10	L2	42	0.0	0.294	69.0	LOS E	2.6	18.3	0.98	0.74	27.8
11	T1	751	0.0	0.338	8.4	LOS A	7.6	53.2	0.57	0.49	52.7
12	R2	31	2.0	0.147	62.3	LOS E	1.8	12.8	0.93	0.72	29.4
Approach		824	0.1	0.338	13.5	LOS B	7.6	53.2	0.60	0.51	49.0
All Vehicles		3348	0.1	0.684	20.8	LOS C	30.9	216.5	0.69	0.63	44.6

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P21	East Stage 1	50	35.5	LOS D	0.1	0.1	0.74	0.74
P22	East Stage 2	50	59.3	LOS E	0.2	0.2	0.96	0.96
P3	North Full Crossing	50	10.8	LOS B	0.1	0.1	0.57	0.57
All Pedestrians		150	35.2	LOS D			0.76	0.76

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 PM Background

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / Yarrawonga Road Intersection
2016 PM Background Traffic
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Packard Avenue											
1	L2	33	2.0	0.058	8.6	LOS A	0.2	1.6	0.14	0.59	49.6
2	T1	5	2.0	0.058	0.7	LOS A	0.2	1.6	0.14	0.59	49.6
3	R2	48	2.0	0.655	90.9	LOS F	3.8	26.8	1.00	0.79	17.2
Approach		86	2.0	0.655	54.1	LOS D	3.8	26.8	0.62	0.70	24.2
East: Roystonea Avenue											
4	L2	81	2.0	0.091	29.5	LOS C	3.1	22.1	0.57	0.72	33.2
5	T1	813	0.0	0.286	24.2	LOS C	11.6	80.9	0.64	0.55	34.8
6	R2	34	0.0	0.275	82.6	LOS F	2.5	17.2	0.99	0.73	18.3
Approach		928	0.2	0.286	26.8	LOS C	11.6	80.9	0.64	0.57	33.5
North: Yarrawonga Road											
7	L2	135	0.0	0.839	89.4	LOS F	10.7	74.7	1.00	0.91	17.3
8	T1	23	2.0	0.349	71.5	LOS E	4.0	28.5	0.98	0.75	19.1
9	R2	34	0.0	0.349	79.5	LOS E	4.0	28.5	0.98	0.75	19.1
Approach		192	0.2	0.839	85.5	LOS F	10.7	74.7	0.99	0.86	17.8
West: Roystonea Avenue											
10	L2	15	0.0	0.093	77.3	LOS E	1.0	7.2	0.95	0.70	19.2
11	T1	2062	0.0	0.872	14.1	LOS B	39.2	274.2	0.91	0.84	40.7
12	R2	18	2.0	0.043	56.1	LOS E	1.0	7.2	0.81	0.71	23.6
Approach		2095	0.0	0.872	14.9	LOS B	39.2	274.2	0.91	0.83	40.1
All Vehicles		3301	0.1	0.872	23.3	LOS C	39.2	274.2	0.83	0.76	35.0

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P21	East Stage 1	50	29.5	LOS C	0.1	0.1	0.63	0.63
P22	East Stage 2	50	69.3	LOS F	0.2	0.2	0.96	0.96
P3	North Full Crossing	50	10.3	LOS B	0.1	0.1	0.51	0.51
All Pedestrians		150	36.4	LOS D			0.70	0.70

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 PM Post

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / Yarrawonga Road Intersection
2016 PM Post Development Traffic
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Packard Avenue											
1	L2	36	2.0	0.046	18.3	LOS B	1.2	8.5	0.52	0.62	46.2
2	T1	6	2.0	0.046	12.7	LOS B	1.2	8.5	0.52	0.62	46.7
3	R2	55	2.0	0.751	90.3	LOS F	4.4	31.1	1.00	0.84	24.1
Approach		97	2.0	0.751	58.7	LOS E	4.4	31.1	0.79	0.74	30.4
East: Roystonea Avenue											
4	L2	87	2.0	0.098	27.4	LOS C	3.3	23.8	0.57	0.69	41.1
5	T1	842	0.0	0.296	24.3	LOS C	12.0	84.3	0.64	0.55	42.9
6	R2	35	0.0	0.283	80.0	LOS F	2.5	17.7	0.99	0.73	25.6
Approach		964	0.2	0.296	26.6	LOS C	12.0	84.3	0.65	0.57	41.7
North: Yarrawonga Road											
7	L2	136	0.0	0.845	87.2	LOS F	10.8	75.5	1.00	0.92	24.4
8	T1	25	2.0	0.361	71.6	LOS E	4.2	29.6	0.98	0.75	27.0
9	R2	34	0.0	0.361	77.2	LOS E	4.2	29.6	0.98	0.75	26.8
Approach		195	0.3	0.845	83.5	LOS F	10.8	75.5	0.99	0.87	25.1
West: Roystonea Avenue											
10	L2	15	0.0	0.093	74.6	LOS E	1.0	7.2	0.95	0.69	26.6
11	T1	2108	0.0	0.893	17.7	LOS B	44.4	310.8	0.93	0.88	46.4
12	R2	22	2.0	0.053	53.8	LOS D	1.2	8.9	0.81	0.70	31.5
Approach		2145	0.0	0.893	18.5	LOS B	44.4	310.8	0.93	0.88	46.0
All Vehicles		3401	0.1	0.893	25.7	LOS C	44.4	310.8	0.85	0.79	42.1

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P21	East Stage 1	50	29.5	LOS C	0.1	0.1	0.63	0.63
P22	East Stage 2	50	69.3	LOS F	0.2	0.2	0.96	0.96
P3	North Full Crossing	50	10.3	LOS B	0.1	0.1	0.51	0.51
All Pedestrians		150	36.4	LOS D			0.70	0.70

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 AM Background

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / Yarrawonga Road Intersection
2016 AM Background Traffic
Signals - Fixed Time Cycle Time = 120 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Packard Avenue											
1	L2	33	2.0	0.041	14.8	LOS B	0.8	5.7	0.51	0.62	48.3
2	T1	6	2.0	0.041	9.2	LOS A	0.8	5.7	0.51	0.62	48.9
3	R2	20	2.0	0.218	68.4	LOS E	1.2	8.5	0.99	0.70	28.2
Approach		59	2.0	0.218	32.4	LOS C	1.2	8.5	0.68	0.65	38.9
East: Roystonea Avenue											
4	L2	192	0.0	0.188	19.9	LOS B	5.5	38.7	0.53	0.71	44.9
5	T1	2032	0.0	0.663	19.8	LOS B	29.1	203.6	0.75	0.68	45.3
6	R2	36	2.0	0.236	63.1	LOS E	2.1	14.6	0.97	0.73	29.0
Approach		2260	0.0	0.663	20.5	LOS C	29.1	203.6	0.73	0.68	44.8
North: Yarrawonga Road											
7	L2	36	0.0	0.258	64.4	LOS E	2.1	14.5	0.98	0.73	28.8
8	T1	6	2.0	0.688	62.7	LOS E	5.9	41.2	1.00	0.83	28.4
9	R2	90	0.0	0.688	68.2	LOS E	5.9	41.2	1.00	0.83	28.2
Approach		132	0.1	0.688	67.0	LOS E	5.9	41.2	0.99	0.80	28.3
West: Roystonea Avenue											
10	L2	42	0.0	0.302	64.7	LOS E	2.4	17.1	0.98	0.74	28.7
11	T1	719	0.0	0.340	8.7	LOS A	7.0	49.2	0.60	0.52	52.5
12	R2	28	2.0	0.122	56.7	LOS E	1.5	10.6	0.92	0.72	30.7
Approach		789	0.1	0.340	13.4	LOS B	7.0	49.2	0.63	0.53	49.1
All Vehicles		3240	0.1	0.688	20.9	LOS C	29.1	203.6	0.72	0.65	44.6

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P21	East Stage 1	50	31.6	LOS D	0.1	0.1	0.73	0.73
P22	East Stage 2	50	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	50	11.4	LOS B	0.1	0.1	0.61	0.61
All Pedestrians		150	32.4	LOS D			0.76	0.76

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2026 AM Post Upg 3ln EB

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / Yarrawonga Road Intersection
2026 AM Post Development Traffic
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Packard Avenue											
1	L2	993	2.0	0.813	41.6	LOS D	26.8	190.8	0.98	0.90	35.4
2	T1	124	2.0	0.358	58.2	LOS E	8.0	56.8	0.92	0.74	30.9
3	R2	30	2.0	0.091	60.6	LOS E	1.8	13.0	0.87	0.72	30.0
Approach		1147	2.0	0.813	43.9	LOS D	26.8	190.8	0.97	0.88	34.7
East: Roystonea Avenue											
4	L2	254	0.0	0.306	29.2	LOS C	9.0	63.2	0.53	0.71	40.3
5	T1	1949	0.0	0.813	31.3	LOS C	40.0	280.1	0.80	0.72	39.7
6	R2	50	2.0	0.293	75.6	LOS E	3.4	24.3	0.95	0.74	26.6
Approach		2253	0.0	0.813	32.0	LOS C	40.0	280.1	0.77	0.72	39.4
North: Yarrawonga Road											
7	L2	62	0.0	0.063	8.0	LOS A	0.8	5.5	0.22	0.61	52.4
8	T1	77	2.0	0.462	72.3	LOS E	5.5	39.4	0.99	0.77	27.7
9	R2	121	0.0	0.752	82.6	LOS F	9.2	64.4	1.00	0.86	25.5
Approach		260	0.6	0.752	61.8	LOS E	9.2	64.4	0.81	0.77	29.9
West: Roystonea Avenue											
10	L2	51	0.0	0.058	18.8	LOS B	1.4	9.9	0.57	0.68	44.9
11	T1	1112	0.0	0.402	16.2	LOS B	12.5	87.5	0.69	0.60	47.5
12	R2	447	2.0	0.796	76.3	LOS E	16.7	119.1	1.00	0.90	27.3
Approach		1610	0.6	0.796	33.0	LOS C	16.7	119.1	0.77	0.69	39.2
All Vehicles		5270	0.7	0.813	36.4	LOS D	40.0	280.1	0.82	0.75	37.6

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P21	East Stage 1	50	58.2	LOS E	0.2	0.2	0.88	0.88
P22	East Stage 2	50	69.3	LOS F	0.2	0.2	0.96	0.96
P3	North Full Crossing	50	17.3	LOS B	0.1	0.1	0.65	0.65
All Pedestrians		150	48.3	LOS E			0.83	0.83

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2026 PM Post Upg 3ln EB

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / Yarrawonga Road Intersection
2026 PM Post Development Traffic
Signals - Fixed Time Cycle Time = 140 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Packard Avenue											
1	L2	505	2.0	0.261	16.5	LOS B	6.4	45.5	0.58	0.72	46.7
2	T1	76	2.0	0.368	64.0	LOS E	4.9	35.2	0.97	0.75	29.5
3	R2	70	2.0	0.357	69.7	LOS E	4.6	32.4	0.97	0.76	27.9
Approach		651	2.0	0.368	27.8	LOS C	6.4	45.5	0.67	0.73	41.0
East: Roystonea Avenue											
4	L2	111	0.0	0.254	52.3	LOS D	5.6	39.4	0.78	0.75	32.2
5	T1	826	0.0	0.599	51.3	LOS D	15.9	111.4	0.90	0.76	32.7
6	R2	53	2.0	0.675	82.9	LOS F	3.9	27.5	1.00	0.79	25.3
Approach		990	0.1	0.675	53.1	LOS D	15.9	111.4	0.89	0.76	32.1
North: Yarrawonga Road											
7	L2	189	0.0	0.314	26.2	LOS C	7.4	52.0	0.65	0.75	41.6
8	T1	148	2.0	0.828	74.7	LOS E	10.9	77.3	1.00	0.94	27.2
9	R2	46	0.0	0.267	71.0	LOS E	3.0	21.0	0.97	0.74	27.8
Approach		383	0.8	0.828	50.3	LOS D	10.9	77.3	0.82	0.82	32.9
West: Roystonea Avenue											
10	L2	19	0.0	0.018	13.5	LOS B	0.4	2.7	0.44	0.64	48.0
11	T1	2852	0.0	0.844	15.7	LOS B	38.7	270.7	0.89	0.82	47.8
12	R2	945	2.0	0.612	39.1	LOS D	24.9	177.1	0.84	0.82	37.4
Approach		3816	0.5	0.844	21.5	LOS C	38.7	270.7	0.88	0.82	44.7
All Vehicles		5840	0.6	0.844	29.4	LOS C	38.7	270.7	0.85	0.80	40.6

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P21	East Stage 1	50	64.3	LOS F	0.2	0.2	0.96	0.96
P22	East Stage 2	50	64.3	LOS F	0.2	0.2	0.96	0.96
P3	North Full Crossing	50	11.9	LOS B	0.1	0.1	0.55	0.55
All Pedestrians		150	46.8	LOS E			0.82	0.82

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2046 AM Post Upg2 4ln WB

BE140072 Palmerston City Centre Masterplan
Roystonea Avenue / Yarrawonga Road Intersection
2046 AM Post Development Traffic
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Packard Avenue											
1	L2	1319	2.0	0.720	5.8	LOS A	0.0	0.0	0.00	0.53	54.6
2	T1	212	2.0	0.826	82.6	LOS F	8.4	59.6	1.00	0.92	25.9
3	R2	38	2.0	0.259	85.6	LOS F	1.4	10.2	1.00	0.70	25.0
Approach		1569	2.0	0.826	18.1	LOS B	8.4	59.6	0.16	0.58	46.3
East: Roystonea Avenue											
4	L2	376	0.0	0.295	8.2	LOS A	3.0	20.7	0.12	0.59	52.3
5	T1	3059	0.0	0.882	31.2	LOS C	53.0	370.9	0.80	0.77	39.8
6	R2	89	2.0	0.384	71.5	LOS E	5.9	41.9	0.93	0.77	27.7
Approach		3524	0.1	0.882	29.8	LOS C	53.0	370.9	0.73	0.75	40.4
North: Yarrawonga Road											
7	L2	145	0.0	0.196	9.0	LOS A	2.6	18.4	0.30	0.64	51.6
8	T1	242	2.0	0.629	71.9	LOS E	8.8	62.4	1.00	0.80	27.9
9	R2	219	0.0	0.804	86.5	LOS F	8.6	59.9	1.00	0.90	25.0
Approach		606	0.8	0.804	62.2	LOS E	8.8	62.4	0.83	0.80	29.9
West: Roystonea Avenue											
10	L2	76	0.0	0.054	7.0	LOS A	0.8	5.3	0.18	0.62	52.4
11	T1	1785	0.0	0.393	16.3	LOS B	17.2	120.2	0.56	0.50	47.4
12	R2	727	2.0	0.876	76.5	LOS E	28.7	204.6	1.00	0.98	27.3
Approach		2588	0.6	0.876	33.0	LOS C	28.7	204.6	0.67	0.64	39.3
All Vehicles		8287	0.6	0.882	30.9	LOS C	53.0	370.9	0.61	0.69	40.0

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P21	East Stage 1	50	61.8	LOS F	0.2	0.2	0.91	0.91
P22	East Stage 2	50	69.3	LOS F	0.2	0.2	0.96	0.96
P3	North Full Crossing	50	19.8	LOS B	0.1	0.1	0.51	0.51
All Pedestrians		150	50.3	LOS E			0.79	0.79

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2046 PM Post Upg2 3L EB

BE140072 Palmerstone City Centre Masterplan
Roystonea Avenue / Temple Terrace Intersection
2046 PM Post Development Traffic
Signals - Fixed Time Cycle Time = 125 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Temple Terrace											
1	L2	497	1.0	0.270	5.6	LOS A	0.0	0.0	0.00	0.53	54.9
2	T1	860	0.0	0.931	70.3	LOS E	27.0	189.2	0.97	1.07	28.2
3	R2	218	3.0	0.833	74.6	LOS E	7.2	51.7	1.00	0.90	27.1
Approach		1575	0.7	0.931	50.5	LOS D	27.0	189.2	0.67	0.88	33.0
East: Roystonea Avenue											
4	L2	198	2.0	0.215	21.0	LOS C	6.1	43.4	0.59	0.72	44.2
5	T1	402	6.0	0.496	54.3	LOS D	7.7	56.7	0.97	0.78	32.0
6	R2	154	6.0	0.901	83.7	LOS F	5.5	40.3	1.00	1.01	25.4
Approach		754	4.9	0.901	51.5	LOS D	7.7	56.7	0.88	0.81	32.6
North: Temple Terrace											
7	L2	449	4.0	0.495	26.1	LOS C	15.7	113.9	0.71	0.87	41.6
8	T1	1573	1.0	0.846	48.5	LOS D	32.4	228.6	1.00	0.97	33.7
9	R2	625	2.0	0.928	81.4	LOS F	23.5	167.1	1.00	1.08	25.8
Approach		2647	1.7	0.928	52.5	LOS D	32.4	228.6	0.95	0.98	32.4
West: Roystonea Avenue											
10	L2	611	6.0	0.343	5.7	LOS A	0.0	0.0	0.00	0.53	54.7
11	T1	1585	4.0	0.935	51.7	LOS D	46.5	336.5	0.94	1.00	32.7
12	R2	610	11.0	0.651	49.3	LOS D	15.6	119.7	0.89	0.82	33.3
Approach		2806	6.0	0.935	41.2	LOS D	46.5	336.5	0.72	0.86	36.0
All Vehicles		7782	3.4	0.935	47.9	LOS D	46.5	336.5	0.81	0.90	33.8

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P11	South Stage 1	50	56.8	LOS E	0.2	0.2	0.95	0.95
P12	South Stage 2	50	52.1	LOS E	0.2	0.2	0.91	0.91
P21	East Stage 1	50	37.7	LOS D	0.1	0.1	0.78	0.78
P22	East Stage 2	50	33.9	LOS D	0.1	0.1	0.74	0.74
All Pedestrians		200	45.1	LOS E			0.85	0.85

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 AM Background

BE140072 Palmerston City Centre Masterplan
Temple Terrace / Maluka Street Intersection
2016 AM Background Traffic Volumes
Signals - Fixed Time Cycle Time = 80 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Temple Terrace											
1	L2	340	0.0	0.885	49.7	LOS D	17.3	121.1	1.00	1.03	32.7
2	T1	411	2.0	0.885	43.8	LOS D	17.6	125.4	1.00	1.09	34.8
3	R2	9	0.0	0.043	40.6	LOS D	0.3	2.3	0.92	0.67	35.4
Approach		760	1.1	0.885	46.4	LOS D	17.6	125.4	1.00	1.06	33.8
East: Maluka Street											
4	L2	17	0.0	0.127	30.0	LOS C	1.9	13.4	0.80	0.65	41.3
5	T1	47	0.0	0.127	24.4	LOS C	1.9	13.4	0.80	0.65	42.1
6	R2	155	6.0	0.870	53.7	LOS D	7.1	52.3	1.00	1.03	31.5
Approach		219	4.2	0.870	45.6	LOS D	7.1	52.3	0.94	0.92	34.0
North: Temple Terrace											
7	L2	213	4.0	0.524	35.8	LOS D	7.1	51.5	0.88	0.80	37.1
8	T1	101	7.0	0.241	27.9	LOS C	3.0	22.5	0.79	0.63	41.2
9	R2	57	5.0	0.283	42.5	LOS D	2.1	15.2	0.92	0.74	34.7
Approach		371	5.0	0.524	34.6	LOS C	7.1	51.5	0.86	0.74	37.7
West: Shoppin Centre											
10	L2	46	0.0	0.094	29.7	LOS C	1.4	9.6	0.79	0.72	39.6
11	T1	56	0.0	0.151	39.6	LOS D	2.4	17.1	0.86	0.70	36.3
12	R2	3	0.0	0.151	45.2	LOS D	2.4	17.1	0.86	0.70	35.8
Approach		105	0.0	0.151	35.4	LOS D	2.4	17.1	0.83	0.71	37.7
All Vehicles		1455	2.5	0.885	42.5	LOS D	17.6	125.4	0.94	0.93	35.0

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	34.3	LOS D	0.1	0.1	0.93	0.93
P2	East Full Crossing	50	34.3	LOS D	0.1	0.1	0.93	0.93
P3	North Full Crossing	50	34.3	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	50	34.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		200	34.3	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 AM Post Upg

BE140072 Palmerston City Centre Masterplan
Temple Terrace / Maluka Street Intersection
2016 AM Post Development Traffic Volumes
Signals - Fixed Time Cycle Time = 80 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Temple Terrace											
1	L2	340	0.0	0.243	6.6	LOS A	1.9	13.5	0.25	0.63	53.4
2	T1	440	2.0	0.542	27.2	LOS C	9.4	66.7	0.89	0.74	41.6
3	R2	9	0.0	0.065	44.5	LOS D	0.3	2.4	0.95	0.66	34.1
Approach		789	1.1	0.542	18.5	LOS B	9.4	66.7	0.61	0.69	45.8
East: Maluka Street											
4	L2	17	0.0	0.121	28.3	LOS C	1.9	13.6	0.77	0.63	42.2
5	T1	50	0.0	0.121	22.8	LOS C	1.9	13.6	0.77	0.63	43.0
6	R2	155	6.0	0.870	53.7	LOS D	7.1	52.3	1.00	1.03	31.5
Approach		222	4.2	0.870	44.8	LOS D	7.1	52.3	0.93	0.91	34.2
North: Temple Terrace											
7	L2	213	4.0	0.449	32.7	LOS C	6.6	47.4	0.82	0.78	38.3
8	T1	121	7.0	0.247	25.4	LOS C	3.4	25.3	0.75	0.60	42.4
9	R2	57	5.0	0.424	46.8	LOS D	2.3	16.5	0.98	0.74	33.5
Approach		391	5.1	0.449	32.5	LOS C	6.6	47.4	0.82	0.72	38.6
West: Shoppin Centre											
10	L2	46	0.0	0.094	29.7	LOS C	1.4	9.6	0.79	0.72	39.6
11	T1	57	0.0	0.111	24.3	LOS C	1.7	11.9	0.79	0.61	43.0
12	R2	3	0.0	0.022	44.0	LOS D	0.1	0.8	0.95	0.62	34.6
Approach		106	0.0	0.111	27.2	LOS C	1.7	11.9	0.80	0.66	41.2
All Vehicles		1508	2.5	0.870	26.6	LOS C	9.4	66.7	0.73	0.73	41.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	32.5	LOS D	0.1	0.1	0.90	0.90
P2	East Full Crossing	50	31.6	LOS D	0.1	0.1	0.89	0.89
P3	North Full Crossing	50	34.3	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	50	34.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		200	33.2	LOS D			0.91	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 PM Background FAIL

BE140072 Palmerston City Centre Masterplan
Temple Terrace / Maluka Street Intersection
2016 PM Background Traffic Volumes
Signals - Fixed Time Cycle Time = 85 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Temple Terrace											
1	L2	141	0.0	0.298	30.8	LOS C	5.3	37.2	0.82	0.76	39.5
2	T1	191	2.0	0.298	25.2	LOS C	5.5	38.8	0.82	0.68	42.2
3	R2	72	0.0	0.549	50.2	LOS D	3.1	21.9	1.00	0.77	32.4
Approach		404	0.9	0.549	31.6	LOS C	5.5	38.8	0.85	0.72	39.1
East: Maluka Street											
4	L2	28	0.0	0.244	33.5	LOS C	3.9	27.3	0.84	0.69	39.8
5	T1	88	0.0	0.244	27.9	LOS C	3.9	27.3	0.84	0.69	40.6
6	R2	158	6.0	0.838	53.6	LOS D	7.4	54.6	1.00	0.98	31.5
Approach		274	3.5	0.838	43.3	LOS D	7.4	54.6	0.93	0.86	34.7
North: Temple Terrace											
7	L2	473	4.0	0.891	46.5	LOS D	22.0	159.6	1.00	0.98	33.5
8	T1	211	7.0	0.385	25.8	LOS C	6.3	47.0	0.76	0.63	42.2
9	R2	101	5.0	0.798	53.5	LOS D	4.6	33.7	1.00	0.88	31.4
Approach		785	4.9	0.891	41.8	LOS D	22.0	159.6	0.93	0.87	35.1
West: Shoppin Centre											
10	L2	163	0.0	0.355	34.5	LOS C	5.7	39.7	0.87	0.78	37.7
11	T1	120	0.0	1.764	1397.1	LOS F	72.2	505.1	1.00	2.64	2.5
12	R2	62	0.0	1.764	1402.7	LOS F	72.2	505.1	1.00	2.64	2.5
Approach		345	0.0	1.764	754.3	LOS F	72.2	505.1	0.94	1.76	4.5
All Vehicles		1808	2.9	1.764	175.7	LOS F	72.2	505.1	0.92	1.01	15.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	36.8	LOS D	0.1	0.1	0.93	0.93
P2	East Full Crossing	50	30.6	LOS D	0.1	0.1	0.85	0.85
P3	North Full Crossing	50	36.8	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	50	30.6	LOS D	0.1	0.1	0.85	0.85
All Pedestrians		200	33.7	LOS D			0.89	0.89

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 PM Post Upg

BE140072 Palmerston City Centre Masterplan
Temple Terrace / Maluka Street Intersection
2016 PM Post Development Traffic Volumes
Signals - Fixed Time Cycle Time = 90 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Temple Terrace											
1	L2	141	0.0	0.106	7.0	LOS A	1.0	6.9	0.24	0.62	53.1
2	T1	212	2.0	0.236	30.5	LOS C	3.8	27.2	0.85	0.68	40.0
3	R2	72	0.0	0.582	53.3	LOS D	3.3	23.4	1.00	0.78	31.5
Approach		425	1.0	0.582	26.5	LOS C	3.8	27.2	0.68	0.67	41.6
East: Maluka Street											
4	L2	28	0.0	0.262	36.3	LOS D	4.3	30.0	0.86	0.71	38.7
5	T1	90	0.0	0.262	30.7	LOS C	4.3	30.0	0.86	0.71	39.4
6	R2	158	6.0	0.887	60.5	LOS E	8.2	60.4	1.00	1.05	29.7
Approach		276	3.4	0.887	48.3	LOS D	8.2	60.4	0.94	0.90	33.2
North: Temple Terrace											
7	L2	473	4.0	0.786	36.2	LOS D	18.9	136.7	0.91	0.88	36.9
8	T1	238	7.0	0.383	23.8	LOS C	7.0	52.2	0.71	0.60	43.2
9	R2	101	5.0	0.338	42.4	LOS D	3.8	28.1	0.88	0.76	34.9
Approach		812	5.0	0.786	33.3	LOS C	18.9	136.7	0.85	0.78	38.3
West: Shoppin Centre											
10	L2	163	0.0	0.376	37.3	LOS D	6.1	42.9	0.89	0.79	36.6
11	T1	122	0.0	0.268	30.8	LOS C	4.4	31.1	0.86	0.69	40.0
12	R2	62	0.0	0.334	48.3	LOS D	2.7	18.7	0.97	0.75	33.2
Approach		347	0.0	0.376	37.0	LOS D	6.1	42.9	0.89	0.75	37.0
All Vehicles		1860	2.9	0.887	34.7	LOS C	18.9	136.7	0.83	0.77	37.9

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	39.3	LOS D	0.1	0.1	0.94	0.94
P2	East Full Crossing	50	28.9	LOS C	0.1	0.1	0.80	0.80
P3	North Full Crossing	50	39.3	LOS D	0.1	0.1	0.94	0.94
P4	West Full Crossing	50	39.3	LOS D	0.1	0.1	0.94	0.94
All Pedestrians		200	36.7	LOS D			0.90	0.90

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2026 AM Post Upg

BE140072 Palmerston City Centre Masterplan
Temple Terrace / Maluka Street Intersection
2026 AM Post Development Traffic Volumes
Signals - Fixed Time Cycle Time = 90 seconds (Practical Cycle Time)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Temple Terrace											
1	L2	375	0.0	0.272	6.8	LOS A	2.7	18.8	0.26	0.63	53.2
2	T1	665	2.0	0.885	46.5	LOS D	22.9	163.3	0.96	1.05	34.1
3	R2	10	0.0	0.035	40.7	LOS D	0.4	2.6	0.87	0.67	35.4
Approach		1050	1.3	0.885	32.3	LOS C	22.9	163.3	0.71	0.90	39.1
East: Maluka Street											
4	L2	18	0.0	0.192	33.2	LOS C	3.4	23.7	0.81	0.66	40.1
5	T1	81	0.0	0.192	27.6	LOS C	3.4	23.7	0.81	0.66	40.9
6	R2	172	6.0	0.869	58.2	LOS E	8.7	64.3	1.00	1.01	30.3
Approach		271	3.8	0.869	47.4	LOS D	8.7	64.3	0.93	0.89	33.5
North: Temple Terrace											
7	L2	236	4.0	0.569	38.4	LOS D	9.3	67.7	0.88	0.80	36.3
8	T1	275	7.0	0.569	32.7	LOS C	9.6	71.3	0.88	0.74	39.0
9	R2	63	5.0	0.263	44.8	LOS D	2.5	18.1	0.90	0.74	34.1
Approach		574	5.5	0.569	36.4	LOS D	9.6	71.3	0.88	0.77	37.2
West: Shoppin Centre											
10	L2	42	0.0	0.102	35.8	LOS D	1.5	10.4	0.83	0.72	37.2
11	T1	62	0.0	0.143	30.5	LOS C	2.2	15.4	0.84	0.64	40.1
12	R2	3	0.0	0.024	49.6	LOS D	0.1	0.9	0.96	0.62	32.9
Approach		107	0.0	0.143	33.1	LOS C	2.2	15.4	0.84	0.67	38.6
All Vehicles		2002	2.8	0.885	35.5	LOS D	22.9	163.3	0.80	0.85	37.7

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	36.5	LOS D	0.1	0.1	0.90	0.90
P2	East Full Crossing	50	35.6	LOS D	0.1	0.1	0.89	0.89
P3	North Full Crossing	50	40.2	LOS E	0.1	0.1	0.95	0.95
P4	West Full Crossing	50	36.5	LOS D	0.1	0.1	0.90	0.90
All Pedestrians		200	37.2	LOS D			0.91	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2026 PM Post Upg

BE140072 Palmerston City Centre Masterplan
Temple Terrace / Maluka Street Intersection
2026 PM Post Development Traffic Volumes
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Temple Terrace											
1	L2	156	0.0	0.114	7.6	LOS A	1.5	10.2	0.27	0.62	52.7
2	T1	372	2.0	0.292	24.3	LOS C	7.0	50.1	0.75	0.62	42.9
3	R2	80	0.0	0.538	56.2	LOS E	4.0	27.9	1.00	0.77	30.8
Approach		608	1.2	0.538	24.2	LOS C	7.0	50.1	0.66	0.64	42.8
East: Maluka Street											
4	L2	30	0.0	0.355	42.4	LOS D	6.1	42.6	0.90	0.74	36.4
5	T1	114	0.0	0.355	36.8	LOS D	6.1	42.6	0.90	0.74	37.0
6	R2	174	6.0	0.888	65.3	LOS E	9.9	73.2	1.00	1.03	28.6
Approach		318	3.3	0.888	52.9	LOS D	9.9	73.2	0.95	0.90	31.9
North: Temple Terrace											
7	L2	523	4.0	0.805	37.5	LOS D	23.0	166.3	0.91	0.88	36.5
8	T1	422	7.0	0.736	27.5	LOS C	15.7	116.6	0.80	0.71	41.4
9	R2	112	5.0	0.781	59.7	LOS E	5.9	42.8	1.00	0.87	29.9
Approach		1057	5.3	0.805	35.9	LOS D	23.0	166.3	0.87	0.81	37.4
West: Shoppin Centre											
10	L2	147	0.0	0.377	42.6	LOS D	6.3	43.8	0.90	0.79	34.7
11	T1	132	0.0	0.340	36.5	LOS D	5.5	38.7	0.89	0.72	37.6
12	R2	56	0.0	0.274	51.3	LOS D	2.6	18.2	0.96	0.75	32.4
Approach		335	0.0	0.377	41.7	LOS D	6.3	43.8	0.91	0.75	35.4
All Vehicles		2318	3.2	0.888	36.0	LOS D	23.0	166.3	0.83	0.77	37.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	44.3	LOS E	0.1	0.1	0.94	0.94
P2	East Full Crossing	50	28.9	LOS C	0.1	0.1	0.76	0.76
P3	North Full Crossing	50	44.3	LOS E	0.1	0.1	0.94	0.94
P4	West Full Crossing	50	31.3	LOS D	0.1	0.1	0.79	0.79
All Pedestrians		200	37.2	LOS D			0.86	0.86

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2046 AM Post Upg

BE140072 Palmerston City Centre Masterplan
Temple Terrace / Maluka Street Intersection
2046 AM Post Development Traffic Volumes
Signals - Fixed Time Cycle Time = 115 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Temple Terrace											
1	L2	458	0.0	0.328	7.8	LOS A	5.4	38.1	0.30	0.64	52.5
2	T1	942	2.0	0.886	47.3	LOS D	39.9	283.9	0.93	0.98	33.9
3	R2	12	0.0	0.124	64.7	LOS E	0.7	4.8	0.98	0.68	28.7
Approach		1412	1.3	0.886	34.6	LOS C	39.9	283.9	0.72	0.87	38.2
East: Maluka Street											
4	L2	22	0.0	0.410	50.9	LOS D	7.3	51.0	0.93	0.76	33.7
5	T1	123	0.0	0.410	45.3	LOS D	7.3	51.0	0.93	0.76	34.2
6	R2	210	6.0	0.904	74.2	LOS E	13.9	102.6	1.00	1.03	26.8
Approach		355	3.5	0.904	62.7	LOS E	13.9	102.6	0.97	0.92	29.4
North: Temple Terrace											
7	L2	287	4.0	0.606	29.2	LOS C	17.3	126.8	0.71	0.73	40.7
8	T1	608	7.0	0.606	23.0	LOS C	17.3	126.8	0.68	0.63	43.1
9	R2	77	5.0	0.494	62.3	LOS E	4.3	31.1	0.98	0.77	29.3
Approach		972	6.0	0.606	27.9	LOS C	17.3	126.8	0.71	0.67	40.9
West: Shoppin Centre											
10	L2	37	0.0	0.109	48.0	LOS D	1.7	12.2	0.87	0.72	33.1
11	T1	69	0.0	0.194	43.2	LOS D	3.3	23.1	0.89	0.69	35.2
12	R2	2	0.0	0.008	52.3	LOS D	0.1	0.7	0.89	0.61	32.1
Approach		108	0.0	0.194	45.0	LOS D	3.3	23.1	0.88	0.70	34.4
All Vehicles		2847	3.1	0.904	36.2	LOS D	39.9	283.9	0.75	0.80	37.5

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	51.8	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	50	26.5	LOS C	0.1	0.1	0.68	0.68
P3	North Full Crossing	50	51.8	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	50	31.5	LOS D	0.1	0.1	0.74	0.74
All Pedestrians		200	40.4	LOS E			0.83	0.83

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2046 PM Post Upg

BE140072 Palmerston City Centre Masterplan
Temple Terrace / Maluka Street Intersection
2046 PM Post Development Traffic Volumes
Signals - Fixed Time Cycle Time = 120 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Temple Terrace											
1	L2	190	0.0	0.146	8.1	LOS A	2.2	15.7	0.27	0.63	52.3
2	T1	609	2.0	0.889	60.1	LOS E	23.4	166.6	0.97	1.04	30.3
3	R2	98	0.0	0.905	80.2	LOS F	6.7	46.9	1.00	1.03	25.6
Approach		897	1.4	0.905	51.3	LOS D	23.4	166.6	0.82	0.95	32.5
East: Maluka Street											
4	L2	37	0.0	0.556	55.1	LOS E	10.2	71.6	0.97	0.80	32.4
5	T1	151	0.0	0.556	49.5	LOS D	10.2	71.6	0.97	0.80	32.9
6	R2	212	6.0	0.893	74.5	LOS E	14.4	105.7	1.00	1.00	26.7
Approach		400	3.2	0.893	63.3	LOS E	14.4	105.7	0.98	0.91	29.3
North: Temple Terrace											
7	L2	638	4.0	0.868	40.0	LOS D	37.0	268.7	0.91	0.91	35.7
8	T1	640	7.0	0.868	33.5	LOS C	37.0	268.7	0.80	0.80	38.6
9	R2	136	5.0	0.303	45.1	LOS D	5.9	43.3	0.78	0.76	34.0
Approach		1414	5.5	0.868	37.5	LOS D	37.0	268.7	0.85	0.85	36.8
West: Shoppin Centre											
10	L2	133	0.0	0.409	53.6	LOS D	7.0	49.2	0.94	0.79	31.4
11	T1	148	0.0	0.490	48.2	LOS D	7.8	54.9	0.94	0.76	33.6
12	R2	50	0.0	0.202	56.4	LOS E	2.7	18.6	0.93	0.74	31.0
Approach		331	0.0	0.490	51.6	LOS D	7.8	54.9	0.94	0.77	32.3
All Vehicles		3042	3.4	0.905	46.5	LOS D	37.0	268.7	0.87	0.88	33.8

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	50	26.7	LOS C	0.1	0.1	0.67	0.67
P3	North Full Crossing	50	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	50	46.9	LOS E	0.2	0.2	0.89	0.89
All Pedestrians		200	45.5	LOS E			0.86	0.86

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 AM Background

BE140072 Palmerston City Centre Masterplan
Temple Terrace / Chung Wah Terrace Intersection
2016 AM Background Traffic Volumes
Roundabout

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: Temple Terrace											
1	L2	352	1.0	0.567	9.4	LOS A	3.7	26.1	0.82	0.98	51.6
2	T1	389	2.0	0.567	10.8	LOS B	3.7	26.1	0.81	0.97	52.0
3	R2	23	23.0	0.567	16.6	LOS B	3.3	24.0	0.81	0.97	51.1
Approach		764	2.2	0.567	10.3	LOS B	3.7	26.1	0.81	0.98	51.8
East: Chung Wah Terrace											
4	L2	51	2.0	0.530	5.0	LOS A	3.4	24.1	0.47	0.49	53.7
5	T1	951	1.0	0.530	5.0	LOS A	3.4	24.1	0.48	0.53	54.8
6	R2	331	2.0	0.530	10.3	LOS B	3.4	23.9	0.49	0.62	53.8
Approach		1333	1.3	0.530	6.3	LOS A	3.4	24.1	0.48	0.55	54.5
North: Temple Terrace											
7	L2	93	16.0	0.118	4.7	LOS A	0.5	4.2	0.34	0.49	54.1
8	T1	93	9.0	0.118	4.6	LOS A	0.5	4.2	0.34	0.54	54.8
9	R2	87	10.0	0.118	9.9	LOS A	0.5	4.0	0.34	0.59	53.6
Approach		273	11.7	0.118	6.3	LOS A	0.5	4.2	0.34	0.54	54.2
West: Chung Wah Terrace											
10	L2	120	6.0	0.177	6.5	LOS A	0.9	6.6	0.63	0.70	53.3
11	T1	128	7.0	0.177	6.9	LOS A	0.9	6.6	0.63	0.73	53.9
12	R2	42	20.0	0.177	12.4	LOS B	0.8	6.5	0.63	0.74	53.0
Approach		290	8.5	0.177	7.5	LOS A	0.9	6.6	0.63	0.72	53.5
All Vehicles		2660	3.4	0.567	7.6	LOS A	3.7	26.1	0.58	0.69	53.6

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2016 AM Post

BE140072 Palmerston City Centre Masterplan
Temple Terrace / Chung Wah Terrace Intersection
2016 AM Post Development Traffic Volumes
Roundabout

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: Temple Terrace											
1	L2	359	1.0	0.595	9.9	LOS A	4.0	28.5	0.84	1.00	51.3
2	T1	396	2.0	0.595	11.4	LOS B	4.0	28.5	0.83	1.00	51.6
3	R2	23	23.0	0.595	17.3	LOS B	3.6	26.0	0.83	0.99	50.7
Approach		778	2.2	0.595	10.9	LOS B	4.0	28.5	0.83	1.00	51.4
East: Chung Wah Terrace											
4	L2	51	2.0	0.548	5.1	LOS A	3.6	25.2	0.50	0.50	53.5
5	T1	965	1.0	0.548	5.1	LOS A	3.6	25.2	0.51	0.55	54.7
6	R2	339	2.0	0.548	10.5	LOS B	3.5	24.9	0.52	0.63	53.7
Approach		1355	1.3	0.548	6.5	LOS A	3.6	25.2	0.51	0.57	54.4
North: Temple Terrace											
7	L2	96	16.0	0.127	4.7	LOS A	0.6	4.5	0.35	0.49	54.0
8	T1	96	9.0	0.127	4.7	LOS A	0.6	4.5	0.35	0.54	54.8
9	R2	100	10.0	0.127	9.9	LOS A	0.6	4.4	0.35	0.60	53.4
Approach		292	11.6	0.127	6.5	LOS A	0.6	4.5	0.35	0.55	54.1
West: Chung Wah Terrace											
10	L2	133	6.0	0.195	6.6	LOS A	1.0	7.4	0.64	0.71	53.3
11	T1	135	7.0	0.195	7.0	LOS A	1.0	7.4	0.64	0.74	53.8
12	R2	47	20.0	0.195	12.5	LOS B	0.9	7.2	0.65	0.75	52.9
Approach		315	8.5	0.195	7.6	LOS A	1.0	7.4	0.64	0.73	53.4
All Vehicles		2740	3.5	0.595	7.9	LOS A	4.0	28.5	0.60	0.71	53.4

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2016 PM Background

BE140072 Palmerston City Centre Masterplan
Temple Terrace / Chung Wah Terrace Intersection
2016 PM Background Traffic Volumes
Roundabout

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: Temple Terrace											
1	L2	180	0.0	0.198	5.7	LOS A	0.9	6.5	0.57	0.67	53.8
2	T1	149	1.0	0.198	6.1	LOS A	0.9	6.5	0.58	0.66	54.3
3	R2	37	8.0	0.198	11.4	LOS B	0.9	6.3	0.58	0.66	54.0
Approach		366	1.2	0.198	6.4	LOS A	0.9	6.5	0.57	0.66	54.0
East: Chung Wah Terrace											
4	L2	48	0.0	0.317	6.6	LOS A	1.7	11.7	0.67	0.66	52.9
5	T1	341	1.0	0.317	6.7	LOS A	1.7	11.7	0.67	0.71	53.8
6	R2	142	4.0	0.317	12.4	LOS B	1.6	11.1	0.68	0.82	52.5
Approach		531	1.7	0.317	8.2	LOS A	1.7	11.7	0.67	0.74	53.4
North: Temple Terrace											
7	L2	65	8.0	0.369	7.3	LOS A	2.0	14.0	0.74	0.75	52.3
8	T1	254	1.0	0.369	7.3	LOS A	2.0	14.0	0.74	0.77	53.7
9	R2	202	2.0	0.369	13.4	LOS B	1.8	13.1	0.74	0.92	51.1
Approach		521	2.3	0.369	9.6	LOS A	2.0	14.0	0.74	0.83	52.5
West: Chung Wah Terrace											
10	L2	151	6.0	0.554	5.7	LOS A	3.8	27.3	0.58	0.58	53.1
11	T1	729	2.0	0.554	5.8	LOS A	3.8	27.4	0.59	0.62	54.3
12	R2	394	3.0	0.554	11.2	LOS B	3.8	27.4	0.60	0.72	53.0
Approach		1274	2.8	0.554	7.4	LOS A	3.8	27.4	0.59	0.65	53.7
All Vehicles		2692	2.3	0.554	7.9	LOS A	3.8	27.4	0.63	0.70	53.4

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2016 PM Post

BE140072 Palmerston City Centre Masterplan
Temple Terrace / Chung Wah Terrace Intersection
2016 PM Post Development Traffic Volumes
Roundabout

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: Temple Terrace											
1	L2	185	0.0	0.206	5.8	LOS A	1.0	6.8	0.58	0.68	53.7
2	T1	153	1.0	0.206	6.2	LOS A	1.0	6.8	0.59	0.67	54.2
3	R2	37	8.0	0.206	11.5	LOS B	0.9	6.6	0.59	0.67	54.0
Approach		375	1.2	0.206	6.5	LOS A	1.0	6.8	0.58	0.67	54.0
East: Chung Wah Terrace											
4	L2	48	0.0	0.331	6.7	LOS A	1.7	12.3	0.68	0.68	52.8
5	T1	348	1.0	0.331	6.8	LOS A	1.7	12.3	0.69	0.72	53.8
6	R2	147	4.0	0.331	12.5	LOS B	1.6	11.7	0.69	0.83	52.4
Approach		543	1.7	0.331	8.4	LOS A	1.7	12.3	0.69	0.75	53.3
North: Temple Terrace											
7	L2	72	8.0	0.394	7.5	LOS A	2.2	15.5	0.76	0.78	52.3
8	T1	260	1.0	0.394	7.5	LOS A	2.2	15.5	0.76	0.80	53.7
9	R2	215	2.0	0.394	13.7	LOS B	2.0	14.4	0.76	0.94	50.8
Approach		547	2.3	0.394	9.9	LOS A	2.2	15.5	0.76	0.85	52.3
West: Chung Wah Terrace											
10	L2	162	6.0	0.570	5.9	LOS A	4.1	29.3	0.60	0.60	53.1
11	T1	738	2.0	0.570	5.9	LOS A	4.1	29.3	0.60	0.64	54.2
12	R2	401	3.0	0.570	11.4	LOS B	4.1	29.3	0.61	0.74	52.9
Approach		1301	2.8	0.570	7.6	LOS A	4.1	29.3	0.61	0.67	53.6
All Vehicles		2766	2.3	0.570	8.1	LOS A	4.1	29.3	0.65	0.72	53.3

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2026 AM Post Upg

BE140072 Palmerston City Centre Masterplan
Temple Terrace / Chung Wah Terrace Intersection
2026 AM Post Development Traffic Volumes
Signals - Fixed Time Cycle Time = 100 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Temple Terrace											
1	L2	521	1.0	0.273	5.6	LOS A	0.0	0.0	0.00	0.53	54.9
2	T1	479	2.0	0.445	32.8	LOS C	9.8	69.5	0.88	0.74	39.2
3	R2	25	23.0	0.216	56.2	LOS E	1.2	10.3	0.98	0.71	31.1
Approach		1025	2.0	0.445	19.6	LOS B	9.8	69.5	0.43	0.63	45.5
East: Chung Wah Terrace											
4	L2	56	2.0	0.039	6.5	LOS A	0.3	2.2	0.18	0.59	53.5
5	T1	1216	1.0	0.911	48.7	LOS D	35.0	247.2	0.99	1.11	33.6
6	R2	415	2.0	0.729	52.5	LOS D	10.3	73.3	1.00	0.87	32.4
Approach		1687	1.3	0.911	48.2	LOS D	35.0	247.2	0.96	1.04	33.7
North: Temple Terrace											
7	L2	128	16.0	0.108	6.0	LOS A	0.1	0.9	0.02	0.55	53.5
8	T1	126	9.0	0.122	29.6	LOS C	2.1	15.5	0.70	0.54	40.6
9	R2	199	10.0	0.791	61.0	LOS E	5.3	40.1	1.00	0.87	29.9
Approach		453	11.4	0.791	36.8	LOS D	5.3	40.1	0.64	0.69	37.3
West: Chung Wah Terrace											
10	L2	235	6.0	0.293	7.5	LOS A	1.8	13.2	0.15	0.49	53.6
11	T1	222	7.0	0.293	22.1	LOS C	5.4	39.8	0.57	0.58	43.5
12	R2	109	20.0	0.539	59.3	LOS E	2.8	22.8	1.00	0.76	30.3
Approach		566	9.1	0.539	23.2	LOS C	5.4	39.8	0.48	0.58	43.2
All Vehicles		3731	3.9	0.911	35.2	LOS D	35.0	247.2	0.70	0.81	38.1

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P2	East Full Crossing	50	44.3	LOS E	0.1	0.1	0.94	0.94
P3	North Full Crossing	50	44.3	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		100	44.3	LOS E			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2026 PM Post Upg

BE140072 Palmerston City Centre Masterplan
Temple Terrace / Chung Wah Terrace Intersection
2026 PM Post Development Traffic Volumes
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Temple Terrace											
1	L2	282	0.0	0.147	5.6	LOS A	0.0	0.0	0.00	0.53	54.9
2	T1	196	1.0	0.813	57.2	LOS E	5.3	37.5	1.00	0.91	31.2
3	R2	41	8.0	0.375	58.0	LOS E	2.1	15.5	1.00	0.73	30.8
Approach		519	1.0	0.813	29.2	LOS C	5.3	37.5	0.46	0.69	40.7
East: Chung Wah Terrace											
4	L2	53	0.0	0.054	8.6	LOS A	0.6	4.2	0.31	0.62	52.0
5	T1	482	1.0	0.911	60.8	LOS E	15.0	106.2	1.00	1.11	30.3
6	R2	190	4.0	0.846	64.6	LOS E	5.3	38.1	1.00	0.95	29.2
Approach		725	1.7	0.911	58.0	LOS E	15.0	106.2	0.95	1.03	30.9
North: Temple Terrace											
7	L2	144	8.0	0.150	8.2	LOS A	1.0	7.4	0.17	0.59	52.0
8	T1	322	1.0	0.297	31.3	LOS C	5.6	39.9	0.76	0.62	39.9
9	R2	328	2.0	0.320	37.2	LOS D	5.8	41.5	0.76	0.75	37.1
Approach		794	2.7	0.320	29.6	LOS C	5.8	41.5	0.65	0.67	40.3
West: Chung Wah Terrace											
10	L2	263	6.0	0.725	22.7	LOS C	17.3	124.6	0.71	0.82	45.2
11	T1	946	2.0	0.725	22.7	LOS C	20.6	146.9	0.79	0.78	43.4
12	R2	548	3.0	0.501	37.4	LOS D	10.3	73.6	0.81	0.79	37.2
Approach		1757	2.9	0.725	27.3	LOS C	20.6	146.9	0.78	0.79	41.5
All Vehicles		3795	2.4	0.911	33.9	LOS C	20.6	146.9	0.74	0.80	38.6

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P2	East Full Crossing	50	44.3	LOS E	0.1	0.1	0.94	0.94
P3	North Full Crossing	50	35.4	LOS D	0.1	0.1	0.84	0.84
All Pedestrians		100	39.8	LOS D			0.89	0.89

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2046 AM Post Upg

BE140072 Palmerston City Centre Masterplan
Temple Terrace / Chung Wah Terrace Intersection
2046 AM Post Development Traffic Volumes
Signals - Fixed Time Cycle Time = 145 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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: Temple Terrace											
1	L2	661	1.0	0.346	5.7	LOS A	0.0	0.0	0.00	0.53	54.9
2	T1	593	2.0	0.898	77.6	LOS E	23.6	168.0	1.00	1.05	26.6
3	R2	31	23.0	0.136	65.6	LOS E	1.9	16.3	0.91	0.72	28.9
Approach		1285	2.0	0.898	40.3	LOS D	23.6	168.0	0.48	0.77	36.3
East: Chung Wah Terrace											
4	L2	69	2.0	0.046	6.9	LOS A	0.6	4.3	0.17	0.59	53.2
5	T1	1471	1.0	0.905	48.9	LOS D	55.1	388.8	0.92	0.94	33.5
6	R2	516	2.0	0.419	46.5	LOS D	14.1	100.7	0.83	0.80	34.1
Approach		2056	1.3	0.905	46.9	LOS D	55.1	388.8	0.87	0.89	34.1
North: Temple Terrace											
7	L2	164	16.0	0.131	6.1	LOS A	0.2	1.8	0.02	0.55	53.4
8	T1	160	9.0	0.225	54.0	LOS D	4.5	34.0	0.83	0.66	32.0
9	R2	515	10.0	0.904	82.9	LOS F	20.2	153.3	1.00	0.97	25.4
Approach		839	11.0	0.904	62.3	LOS E	20.2	153.3	0.78	0.83	29.6
West: Chung Wah Terrace											
10	L2	410	6.0	0.478	12.8	LOS B	9.6	70.5	0.37	0.61	49.7
11	T1	272	7.0	0.478	38.7	LOS D	10.5	77.6	0.71	0.69	36.3
12	R2	146	20.0	0.898	92.6	LOS F	5.8	47.9	1.00	0.96	23.8
Approach		828	8.8	0.898	35.4	LOS D	10.5	77.6	0.59	0.70	37.8
All Vehicles		5008	4.3	0.905	45.9	LOS D	55.1	388.8	0.71	0.82	34.3

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P2	East Full Crossing	50	66.8	LOS F	0.2	0.2	0.96	0.96
P3	North Full Crossing	50	66.8	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		100	66.8	LOS F			0.96	0.96

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2046 PM Post Upg

BE140072 Palmerston City Centre Masterplan
Temple Terrace / Chung Wah Terrace Intersection
2046 PM Post Development Traffic Volumes
Signals - Fixed Time Cycle Time = 120 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Temple Terrace											
1	L2	359	0.0	0.187	5.6	LOS A	0.0	0.0	0.00	0.53	54.9
2	T1	245	1.0	0.915	75.0	LOS E	8.4	59.5	1.00	1.06	27.1
3	R2	50	8.0	0.549	70.5	LOS E	3.1	23.1	1.00	0.76	27.9
Approach		654	1.0	0.915	36.6	LOS D	8.4	59.5	0.45	0.74	37.7
East: Chung Wah Terrace											
4	L2	65	0.0	0.070	10.8	LOS B	1.1	7.7	0.36	0.64	50.4
5	T1	584	1.0	0.917	69.4	LOS E	23.6	166.4	0.99	1.11	28.3
6	R2	239	4.0	0.851	74.0	LOS E	7.8	56.4	1.00	0.96	27.2
Approach		888	1.7	0.917	66.4	LOS E	23.6	166.4	0.95	1.04	28.9
North: Temple Terrace											
7	L2	149	8.0	0.185	12.0	LOS B	2.2	16.2	0.28	0.63	49.4
8	T1	401	1.0	0.444	43.3	LOS D	9.5	67.3	0.85	0.71	35.3
9	R2	506	2.0	0.640	52.9	LOS D	13.2	93.8	0.93	0.82	32.1
Approach		1056	2.5	0.640	43.5	LOS D	13.2	93.8	0.81	0.75	35.0
West: Chung Wah Terrace											
10	L2	462	6.0	0.803	18.0	LOS B	24.7	179.1	0.63	0.80	47.4
11	T1	1147	2.0	0.803	20.9	LOS C	32.6	232.4	0.76	0.78	44.3
12	R2	692	3.0	0.537	38.2	LOS D	14.6	104.5	0.77	0.79	36.9
Approach		2301	3.1	0.803	25.5	LOS C	32.6	232.4	0.73	0.79	42.3
All Vehicles		4899	2.4	0.917	38.3	LOS D	32.6	232.4	0.75	0.82	36.9

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P2	East Full Crossing	50	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	50	31.6	LOS D	0.1	0.1	0.73	0.73
All Pedestrians		100	42.9	LOS E			0.84	0.84

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2026 AM Post Upg Uni

BE140072 Palmerston City Centre Masterplan
University Avenue / Frances Drive Intersection
2026 AM Post Development Traffic
Stop (Two-Way)

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: University Avenue											
2	T1	483	1.0	0.269	1.0	LOS A	1.9	13.8	0.41	0.03	58.0
3	R2	28	0.0	0.269	6.5	LOS A	1.9	13.8	0.41	0.03	55.8
Approach		511	0.9	0.269	1.3	NA	1.9	13.8	0.41	0.03	57.8
East: Frances Drive											
4	L2	19	16.0	0.146	11.9	LOS B	0.5	4.3	0.50	0.72	49.3
6	R2	46	39.0	0.146	12.0	LOS B	0.5	4.3	0.50	0.72	47.4
Approach		65	32.3	0.146	12.0	LOS B	0.5	4.3	0.50	0.72	47.9
North: University Avenue											
7	L2	46	0.0	0.122	5.6	LOS A	0.0	0.0	0.00	0.12	57.3
8	T1	182	6.0	0.122	0.0	LOS A	0.0	0.0	0.00	0.12	58.8
Approach		228	4.8	0.122	1.1	NA	0.0	0.0	0.00	0.12	58.5
All Vehicles		804	4.6	0.269	2.1	NA	1.9	13.8	0.30	0.11	57.1

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2026 PM Post Upg Uni

BE140072 Palmerston City Centre Masterplan
University Avenue / Frances Drive Intersection
2026 PM Post Development Traffic
Stop (Two-Way)

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: University Avenue											
2	T1	232	1.0	0.134	1.1	LOS A	0.9	6.2	0.41	0.05	57.9
3	R2	19	0.0	0.134	6.6	LOS A	0.9	6.2	0.41	0.05	55.8
Approach		251	0.9	0.134	1.5	NA	0.9	6.2	0.41	0.05	57.7
East: Frances Drive											
4	L2	134	5.0	0.177	7.4	LOS A	0.7	5.2	0.40	0.64	52.7
6	R2	40	18.0	0.177	7.4	LOS A	0.7	5.2	0.40	0.64	51.0
Approach		174	8.0	0.177	7.4	LOS A	0.7	5.2	0.40	0.64	52.3
North: University Avenue											
7	L2	28	4.0	0.154	5.6	LOS A	0.0	0.0	0.00	0.06	57.6
8	T1	262	5.0	0.154	0.0	LOS A	0.0	0.0	0.00	0.06	59.4
Approach		290	4.9	0.154	0.6	NA	0.0	0.0	0.00	0.06	59.3
All Vehicles		715	4.3	0.177	2.6	NA	0.9	6.2	0.24	0.19	56.9

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2046 AM Post Upg Uni

BE140072 Palmerston City Centre Masterplan
University Avenue / Frances Drive Intersection
2046 AM Post Development Traffic
Stop (Two-Way)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: University Avenue											
2	T1	622	1.0	0.328	1.3	LOS A	2.6	18.7	0.47	0.01	57.9
3	R2	10	0.0	0.328	6.8	LOS A	2.6	18.7	0.47	0.01	55.8
Approach		632	1.0	0.328	1.4	NA	2.6	18.7	0.47	0.01	57.9
East: Frances Drive											
4	L2	7	16.0	0.074	14.6	LOS B	0.2	2.0	0.61	0.75	47.5
6	R2	17	39.0	0.074	14.8	LOS B	0.2	2.0	0.61	0.75	45.7
Approach		24	32.3	0.074	14.7	LOS B	0.2	2.0	0.61	0.75	46.2
North: University Avenue											
7	L2	17	0.0	0.139	5.6	LOS A	0.0	0.0	0.00	0.04	58.0
8	T1	244	6.0	0.139	0.0	LOS A	0.0	0.0	0.00	0.04	59.6
Approach		261	5.6	0.139	0.4	NA	0.0	0.0	0.00	0.04	59.5
All Vehicles		917	3.1	0.328	1.5	NA	2.6	18.7	0.34	0.04	57.9

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2046 PM Post Upg Uni

BE140072 Palmerston City Centre Masterplan
University Avenue / Frances Drive Intersection
2046 PM Post Development Traffic
Stop (Two-Way)

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: University Avenue											
2	T1	292	1.0	0.156	1.5	LOS A	1.1	8.0	0.47	0.02	57.9
3	R2	7	0.0	0.156	7.0	LOS A	1.1	8.0	0.47	0.02	55.8
Approach		299	1.0	0.156	1.6	NA	1.1	8.0	0.47	0.02	57.8
East: Frances Drive											
4	L2	48	5.0	0.071	7.8	LOS A	0.3	1.9	0.44	0.65	52.4
6	R2	14	18.0	0.071	7.8	LOS A	0.3	1.9	0.44	0.65	50.7
Approach		62	7.9	0.071	7.8	LOS A	0.3	1.9	0.44	0.65	52.0
North: University Avenue											
7	L2	10	4.0	0.189	5.6	LOS A	0.0	0.0	0.00	0.02	58.0
8	T1	346	5.0	0.189	0.0	LOS A	0.0	0.0	0.00	0.02	59.8
Approach		356	5.0	0.189	0.2	NA	0.0	0.0	0.00	0.02	59.8
All Vehicles		717	3.6	0.189	1.4	NA	1.1	8.0	0.23	0.07	58.2

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2016 AM Background

BE140072 Palmerston City Centre Masterplan
University Avenue / Chung Wah Terrace Intersection
2016 AM Background Traffic
Signals - Fixed Time Cycle Time = 70 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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: University Avenue											
2	T1	384	1.0	0.302	19.1	LOS B	5.0	35.0	0.79	0.65	45.7
3	R2	107	3.0	0.343	40.6	LOS D	1.9	13.3	0.98	0.74	35.2
Approach		491	1.4	0.343	23.8	LOS C	5.0	35.0	0.83	0.67	42.9
East: Chung Wah Terrace											
4	L2	190	1.0	0.139	7.2	LOS A	1.3	9.0	0.30	0.63	52.9
6	R2	745	0.0	0.802	24.7	LOS C	23.6	165.1	0.90	0.91	41.8
Approach		935	0.2	0.802	21.2	LOS C	23.6	165.1	0.78	0.85	43.7
North: University Avenue											
7	L2	227	7.0	0.817	42.7	LOS D	8.7	64.3	1.00	0.98	35.0
8	T1	171	9.0	0.591	31.2	LOS C	5.7	43.3	0.98	0.80	39.7
Approach		398	7.9	0.817	37.7	LOS D	8.7	64.3	0.99	0.90	36.9
All Vehicles		1824	2.2	0.817	25.5	LOS C	23.6	165.1	0.84	0.81	41.8

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P11	South Stage 1	50	13.9	LOS B	0.1	0.1	0.63	0.63
P12	South Stage 2	50	4.5	LOS A	0.0	0.0	0.36	0.36
P21	East Stage 1	50	17.2	LOS B	0.1	0.1	0.70	0.70
P22	East Stage 2	50	3.5	LOS A	0.0	0.0	0.31	0.31
P3S	North Slip/Bypass Lane Crossing	50	4.5	LOS A	0.0	0.0	0.36	0.36
All Pedestrians		250	8.7	LOS A			0.47	0.47

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 AM Post

BE140072 Palmerston City Centre Masterplan
University Avenue / Chung Wah Terrace Intersection
2016 AM Post Development Traffic
Signals - Fixed Time Cycle Time = 75 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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: University Avenue											
2	T1	390	1.0	0.302	20.1	LOS C	5.3	37.7	0.78	0.65	45.1
3	R2	119	3.0	0.409	43.7	LOS D	2.2	16.1	0.99	0.75	34.2
Approach		509	1.5	0.409	25.6	LOS C	5.3	37.7	0.83	0.67	42.0
East: Chung Wah Terrace											
4	L2	196	1.0	0.140	7.1	LOS A	1.3	9.3	0.28	0.63	53.0
6	R2	770	0.0	0.818	26.5	LOS C	26.6	186.3	0.91	0.91	41.0
Approach		966	0.2	0.818	22.6	LOS C	26.6	186.3	0.78	0.86	43.0
North: University Avenue											
7	L2	244	7.0	0.796	43.0	LOS D	9.7	71.8	1.00	0.94	34.9
8	T1	175	9.0	0.548	31.8	LOS C	6.1	46.0	0.96	0.78	39.4
Approach		419	7.8	0.796	38.3	LOS D	9.7	71.8	0.98	0.88	36.7
All Vehicles		1894	2.2	0.818	26.9	LOS C	26.6	186.3	0.84	0.81	41.1

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P11	South Stage 1	50	14.1	LOS B	0.1	0.1	0.61	0.61
P12	South Stage 2	50	4.9	LOS A	0.0	0.0	0.36	0.36
P21	East Stage 1	50	18.1	LOS B	0.1	0.1	0.69	0.69
P22	East Stage 2	50	3.2	LOS A	0.0	0.0	0.29	0.29
P3S	North Slip/Bypass Lane Crossing	50	4.9	LOS A	0.0	0.0	0.36	0.36
All Pedestrians		250	9.0	LOS A			0.46	0.46

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 PM Post

BE140072 Palmerston City Centre Masterplan
University Avenue / Chung Wah Terrace Intersection
2016 PM Post Development Traffic
Signals - Fixed Time Cycle Time = 85 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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: University Avenue											
2	T1	259	1.0	0.100	5.2	LOS A	1.9	13.1	0.37	0.31	55.3
3	R2	320	1.0	0.819	52.3	LOS D	7.4	52.1	1.00	0.94	31.7
Approach		579	1.0	0.819	31.3	LOS C	7.4	52.1	0.72	0.65	39.2
East: Chung Wah Terrace											
4	L2	202	1.0	0.153	8.2	LOS A	2.0	13.9	0.34	0.65	52.2
6	R2	271	1.0	0.781	45.3	LOS D	11.8	83.0	1.00	0.91	33.8
Approach		473	1.0	0.781	29.5	LOS C	11.8	83.0	0.72	0.79	39.9
North: University Avenue											
7	L2	736	2.0	0.813	28.8	LOS C	28.1	200.4	0.91	0.91	40.5
8	T1	402	9.0	0.442	14.9	LOS B	10.8	81.2	0.69	0.60	48.2
Approach		1138	4.5	0.813	23.9	LOS C	28.1	200.4	0.84	0.80	42.9
All Vehicles		2190	2.8	0.819	27.0	LOS C	28.1	200.4	0.78	0.76	41.2

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P11	South Stage 1	50	35.9	LOS D	0.1	0.1	0.92	0.92
P12	South Stage 2	50	18.5	LOS B	0.1	0.1	0.66	0.66
P21	East Stage 1	50	5.3	LOS A	0.0	0.0	0.35	0.35
P22	East Stage 2	50	3.7	LOS A	0.0	0.0	0.29	0.29
P3S	North Slip/Bypass Lane Crossing	50	18.5	LOS B	0.1	0.1	0.66	0.66
All Pedestrians		250	16.4	LOS B			0.58	0.58

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2016 PM Background

BE140072 Palmerston City Centre Masterplan
University Avenue / Chung Wah Terrace Intersection
2016 PM Background Traffic
Signals - Fixed Time Cycle Time = 85 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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: University Avenue											
2	T1	255	1.0	0.096	4.8	LOS A	1.8	12.4	0.36	0.29	55.6
3	R2	314	1.0	0.724	48.3	LOS D	6.8	48.3	1.00	0.86	32.8
Approach		569	1.0	0.724	28.8	LOS C	6.8	48.3	0.71	0.61	40.2
East: Chung Wah Terrace											
4	L2	195	1.0	0.145	7.9	LOS A	1.8	12.6	0.32	0.64	52.4
6	R2	259	1.0	0.796	46.8	LOS D	11.4	80.8	1.00	0.92	33.4
Approach		454	1.0	0.796	30.1	LOS C	11.4	80.8	0.71	0.80	39.6
North: University Avenue											
7	L2	717	2.0	0.792	27.1	LOS C	26.2	186.7	0.90	0.89	41.2
8	T1	397	9.0	0.436	14.9	LOS B	10.6	79.9	0.69	0.60	48.2
Approach		1114	4.5	0.792	22.8	LOS C	26.2	186.7	0.82	0.79	43.4
All Vehicles		2137	2.8	0.796	25.9	LOS C	26.2	186.7	0.77	0.74	41.7

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P11	South Stage 1	50	36.8	LOS D	0.1	0.1	0.93	0.93
P12	South Stage 2	50	18.5	LOS B	0.1	0.1	0.66	0.66
P21	East Stage 1	50	5.0	LOS A	0.0	0.0	0.34	0.34
P22	East Stage 2	50	4.0	LOS A	0.0	0.0	0.31	0.31
P3S	North Slip/Bypass Lane Crossing	50	18.5	LOS B	0.1	0.1	0.66	0.66
All Pedestrians		250	16.5	LOS B			0.58	0.58

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2026 AM Post (With Ext.)

BE140072 Palmerston City Centre Masterplan
University Avenue / Chung Wah Terrace Intersection
2026 AM Post Development Traffic
Signals - Fixed Time Cycle Time = 65 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: University Avenue											
1	L2	323	0.0	0.501	10.2	LOS B	6.8	47.8	0.60	0.67	52.2
2	T1	260	1.0	0.501	14.2	LOS B	6.8	47.8	0.74	0.70	47.1
3	R2	238	3.0	0.532	36.4	LOS D	3.8	27.2	0.98	0.78	37.1
Approach		821	1.2	0.532	19.1	LOS B	6.8	47.8	0.75	0.71	45.3
East: Chung Wah Terrace											
4	L2	272	1.0	0.204	7.4	LOS A	2.0	13.9	0.34	0.65	52.7
5	T1	768	0.0	0.610	20.4	LOS C	10.5	73.5	0.90	0.77	45.0
6	R2	372	0.0	0.651	27.3	LOS C	10.6	73.9	0.92	0.84	40.8
Approach		1412	0.2	0.651	19.7	LOS B	10.6	73.9	0.80	0.76	45.1
North: University Avenue											
7	L2	149	7.0	0.304	26.2	LOS C	3.8	28.4	0.83	0.77	41.5
8	T1	68	9.0	0.400	32.4	LOS C	2.2	16.6	0.98	0.74	39.3
9	R2	10	0.0	0.044	33.7	LOS C	0.3	2.0	0.91	0.67	38.3
Approach		227	7.3	0.400	28.4	LOS C	3.8	28.4	0.88	0.75	40.7
West: Chung Wah Terrace											
10	L2	10	0.0	0.751	40.1	LOS D	5.4	38.1	1.00	0.90	37.5
11	T1	305	0.0	0.751	34.6	LOS C	5.5	38.2	1.00	0.90	38.3
12	R2	153	0.0	0.744	40.4	LOS D	4.5	31.2	0.99	0.86	35.8
Approach		468	0.0	0.751	36.6	LOS D	5.5	38.2	1.00	0.88	37.4
All Vehicles		2928	1.0	0.751	22.9	LOS C	10.6	73.9	0.82	0.77	43.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P11	South Stage 1	50	13.0	LOS B	0.1	0.1	0.63	0.63
P12	South Stage 2	50	16.3	LOS B	0.1	0.1	0.71	0.71
P21	East Stage 1	50	20.8	LOS C	0.1	0.1	0.80	0.80
P22	East Stage 2	50	10.6	LOS B	0.1	0.1	0.57	0.57
P3S	North Slip/Bypass Lane Crossing	50	11.3	LOS B	0.0	0.0	0.82	0.82
All Pedestrians		250	14.4	LOS B			0.71	0.71

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2026 PM Post (With Ext)

BE140072 Palmerston City Centre Masterplan
University Avenue / Chung Wah Terrace Intersection
2026 PM Post Development Traffic
Signals - Fixed Time Cycle Time = 70 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: University Avenue											
1	L2	209	0.0	0.274	7.8	LOS A	2.4	17.1	0.40	0.57	54.0
2	T1	168	1.0	0.274	13.1	LOS B	2.4	17.1	0.60	0.62	47.9
3	R2	409	1.0	0.863	46.6	LOS D	8.2	57.9	1.00	1.03	33.7
Approach		786	0.7	0.863	29.1	LOS C	8.2	57.9	0.75	0.82	40.3
East: Chung Wah Terrace											
4	L2	292	1.0	0.258	10.2	LOS B	3.7	26.4	0.49	0.69	50.7
5	T1	310	0.0	0.348	25.0	LOS C	4.6	31.9	0.88	0.71	42.6
6	R2	154	1.0	0.450	34.0	LOS C	4.9	34.4	0.93	0.79	38.0
Approach		756	0.6	0.450	21.1	LOS C	4.9	34.4	0.74	0.72	44.2
North: University Avenue											
7	L2	346	2.0	0.490	23.4	LOS C	9.1	64.6	0.81	0.80	43.0
8	T1	167	9.0	0.801	38.2	LOS D	6.4	47.9	1.00	0.95	37.0
9	R2	10	0.0	0.042	35.3	LOS D	0.3	2.2	0.90	0.67	37.7
Approach		523	4.2	0.801	28.4	LOS C	9.1	64.6	0.87	0.84	40.8
West: Chung Wah Terrace											
10	L2	10	0.0	0.828	39.4	LOS D	13.9	97.0	1.00	1.00	37.9
11	T1	728	0.0	0.828	33.8	LOS C	13.9	97.1	1.00	1.00	38.6
12	R2	325	0.0	0.785	38.2	LOS D	9.9	69.3	0.98	0.90	36.6
Approach		1063	0.0	0.828	35.2	LOS D	13.9	97.1	0.99	0.97	38.0
All Vehicles		3128	1.0	0.863	29.1	LOS C	13.9	97.1	0.85	0.85	40.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P11	South Stage 1	50	13.9	LOS B	0.1	0.1	0.63	0.63
P12	South Stage 2	50	22.4	LOS C	0.1	0.1	0.80	0.80
P21	East Stage 1	50	20.9	LOS C	0.1	0.1	0.77	0.77
P22	East Stage 2	50	15.8	LOS B	0.1	0.1	0.67	0.67
P3S	North Slip/Bypass Lane Crossing	50	28.4	LOS C	0.1	0.1	0.90	0.90
All Pedestrians		250	20.3	LOS C			0.76	0.76

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2046 AM Post (With Ext.)

BE140072 Palmerston City Centre Masterplan
University Avenue / Chung Wah Terrace Intersection
2046 AM Post Development Traffic
Signals - Fixed Time Cycle Time = 70 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: University Avenue											
1	L2	398	0.0	0.546	13.2	LOS B	10.0	69.9	0.69	0.73	49.5
2	T1	208	1.0	0.546	19.9	LOS B	10.0	69.9	0.82	0.75	43.9
3	R2	315	3.0	0.758	42.6	LOS D	5.9	42.1	1.00	0.91	34.9
Approach		921	1.3	0.758	24.8	LOS C	10.0	69.9	0.82	0.79	42.3
East: Chung Wah Terrace											
4	L2	349	1.0	0.270	8.2	LOS A	3.4	23.8	0.39	0.66	52.1
5	T1	1040	0.0	0.791	25.0	LOS C	18.6	130.3	0.94	0.91	42.6
6	R2	478	0.0	0.885	42.5	LOS D	19.7	138.0	1.00	1.03	34.9
Approach		1867	0.2	0.885	26.4	LOS C	19.7	138.0	0.85	0.89	41.7
North: University Avenue											
7	L2	198	7.0	0.412	28.8	LOS C	5.7	42.3	0.87	0.79	40.3
8	T1	88	9.0	0.557	36.1	LOS D	3.1	23.7	1.00	0.79	37.8
9	R2	12	0.0	0.057	36.5	LOS D	0.4	2.7	0.92	0.67	37.2
Approach		298	7.3	0.557	31.3	LOS C	5.7	42.3	0.91	0.78	39.4
West: Chung Wah Terrace											
10	L2	22	0.0	0.806	41.6	LOS D	9.2	64.5	1.00	0.96	36.9
11	T1	471	0.0	0.806	36.0	LOS D	9.3	64.8	1.00	0.96	37.7
12	R2	188	0.0	0.844	45.1	LOS D	6.2	43.3	0.99	0.94	34.2
Approach		681	0.0	0.844	38.7	LOS D	9.3	64.8	1.00	0.96	36.6
All Vehicles		3767	1.0	0.885	28.6	LOS C	19.7	138.0	0.88	0.87	40.6

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P11	South Stage 1	50	12.0	LOS B	0.1	0.1	0.59	0.59
P12	South Stage 2	50	15.8	LOS B	0.1	0.1	0.67	0.67
P21	East Stage 1	50	23.3	LOS C	0.1	0.1	0.82	0.82
P22	East Stage 2	50	12.0	LOS B	0.1	0.1	0.59	0.59
P3S	North Slip/Bypass Lane Crossing	50	12.3	LOS B	0.0	0.0	0.83	0.83
All Pedestrians		250	15.1	LOS B			0.70	0.70

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 2046 PM Post (With Ext.)

BE140072 Palmerston City Centre Masterplan
University Avenue / Chung Wah Terrace Intersection
2046 PM Post Development Traffic
Signals - Fixed Time Cycle Time = 95 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: University Avenue											
1	L2	258	0.0	0.259	9.0	LOS A	4.4	30.8	0.36	0.58	52.5
2	T1	144	1.0	0.259	21.2	LOS C	4.4	30.8	0.64	0.64	43.4
3	R2	515	1.0	0.884	59.6	LOS E	13.9	98.4	1.00	1.02	30.1
Approach		917	0.7	0.884	39.3	LOS D	13.9	98.4	0.76	0.84	36.2
East: Chung Wah Terrace											
4	L2	374	1.0	0.327	12.4	LOS B	7.0	49.3	0.51	0.71	49.3
5	T1	454	0.0	0.851	51.3	LOS D	11.7	82.1	1.00	1.00	32.6
6	R2	191	1.0	0.895	63.0	LOS E	10.5	74.1	1.00	1.04	29.2
Approach		1019	0.6	0.895	39.2	LOS D	11.7	82.1	0.82	0.90	36.4
North: University Avenue											
7	L2	441	2.0	0.763	39.5	LOS D	19.4	138.1	0.96	0.89	36.2
8	T1	212	9.0	0.865	52.9	LOS D	11.2	84.2	1.00	1.03	32.2
9	R2	12	0.0	0.041	42.4	LOS D	0.5	3.3	0.87	0.68	35.1
Approach		665	4.2	0.865	43.8	LOS D	19.4	138.1	0.97	0.93	34.8
West: Chung Wah Terrace											
10	L2	12	0.0	0.782	38.6	LOS D	22.6	158.3	0.96	0.90	38.2
11	T1	1015	0.0	0.782	33.0	LOS C	22.6	158.5	0.96	0.90	38.9
12	R2	400	0.0	0.568	34.2	LOS C	13.0	91.0	0.86	0.81	38.1
Approach		1427	0.0	0.782	33.4	LOS C	22.6	158.5	0.94	0.87	38.7
All Vehicles		4028	1.0	0.895	37.9	LOS D	22.6	158.5	0.87	0.88	36.8

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P11	South Stage 1	50	16.0	LOS B	0.1	0.1	0.58	0.58
P12	South Stage 2	50	37.2	LOS D	0.1	0.1	0.89	0.89
P21	East Stage 1	50	10.1	LOS B	0.0	0.0	0.65	0.65
P22	East Stage 2	50	25.1	LOS C	0.1	0.1	0.73	0.73
P3S	North Slip/Bypass Lane Crossing	50	35.5	LOS D	0.1	0.1	0.86	0.86
All Pedestrians		250	24.8	LOS C			0.74	0.74

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.