

Roma UDA

Bowen Street, Roma

TRAFFIC IMPACT ASSESSMENT

Prepared for:
ULDA

August 2011

Reference: 27051

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A Conceptual Layout

1. Background

1.1 Introduction

TTM Consulting has been engaged by the Urban Land Development Authority (ULDA) to prepare a Traffic Impact Assessment (TIA) investigating the declared Roma Urban Development Area (UDA). The ULDA have established a 'Draft Structure Plan' to guide development on the Roma site. As the Plan does not include a definitive lot configuration indicative yields have been developed for the purposes of the traffic assessment.

1.2 Site Location

The Roma UDA is located at Bowen Street, Roma and is approximately 1.5km west of Roma Town Centre. The site covers approximately 20ha and is bounded to the north by McDowall Street, to the east by Cottell Street, to the south by Bowen Street and to the west by open space and farmland. Currey Street and Hanly Street (both running from north to south) dissect the subject site into three development parcels. The location of the site is illustrated in Figure 1.1 below.

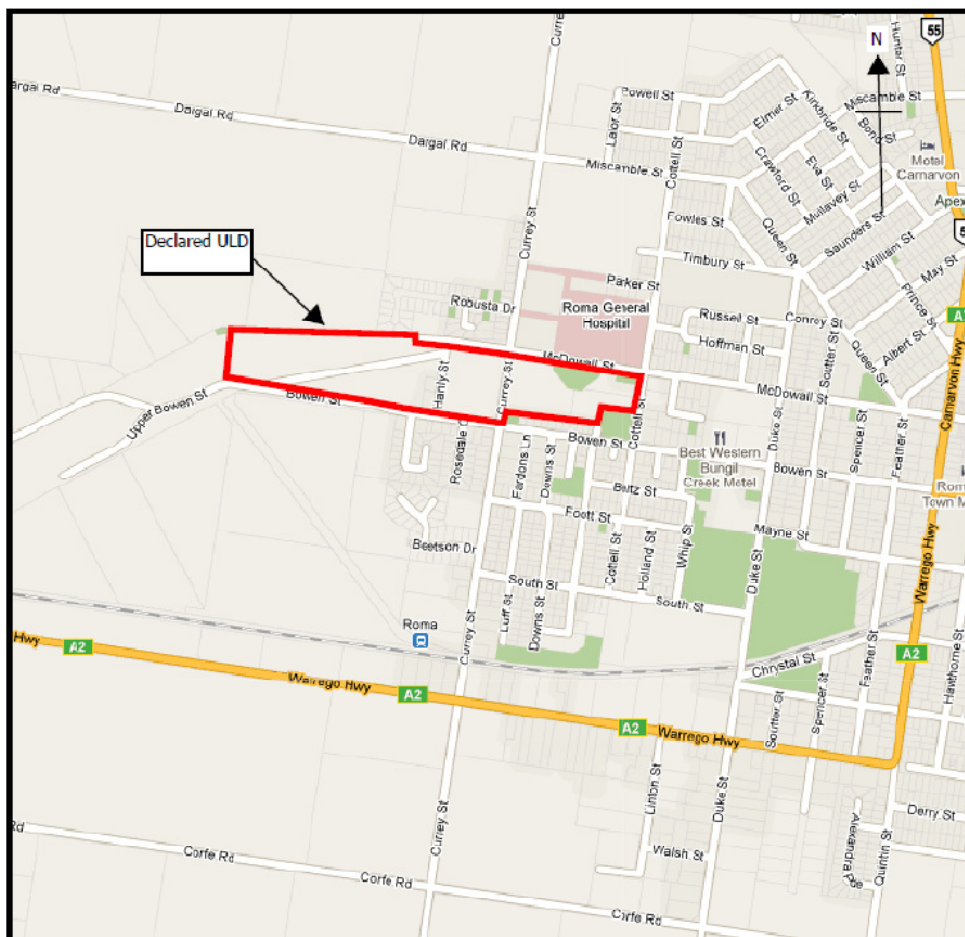


Figure 1.1: Site Location

2. Existing Transport Infrastructure

2.1 The Road Network

The majority of roads in the immediate vicinity of the site are administered by Maranoa Regional Council (MRC) with the exception of the Warrego Highway and Carnarvon Highway, which are both controlled by the Department of Transport and Main Roads (DTMR). The hierarchy and characteristics of the roads in the immediate vicinity of the site are shown below in Table 2.1.

Table 2.1: Local Road Hierarchy

Road	Speed Limit	Lanes	Classification	Management
McDowall Street	60kph	2 (undivided)	Collector	MRC
Bowen Street	60kph	2 (undivided)	Collector	MRC
Cottell Street	60kph	2 (undivided)	Collector	MRC
Currey Street	60kph	2 (undivided)	Collector	MRC
Hanly Street	60kph	2 (undivided)	Access	MRC
Duke Street	60kph	2 (undivided)	Collector	MRC
Warrego Highway	60-100kph	2 (undivided)	Arterial	DTMR
Carnarvon Highway	60-100kph	2 (undivided)	Arterial	DTMR

McDowall Street to the west of Currey Street (as illustrated in Figure 2.1 below) and Hanly Street are currently unsealed roads.



Figure 2.1: Unsealed Stretch of McDowall Street

McDowall Street to the east of Currey Street has an existing carriageway width of 14m (comprised of 2 no. 3.5m running lanes with 3m and 4m hard shoulders on either side). As illustrated in Figure 2.2 below, out-patients and visitors to the hospital utilise the hard shoulder on the northern side of the carriageway for on-street angled parking.



Figure 2.2: Angled Parking on McDowall Street

To the west of Currey Street the existing carriageway width narrows to 9m.

Bowen Street to the east of Currey Street has an existing carriageway width of 14m. Whilst there are no road markings designating the hard shoulders on-site observations confirmed that on-street parallel parking occurs on both sides of the carriageway. To the west of Currey Street the existing carriageway width narrows to 8.2m. As illustrated in Figure 2.3 direct access can be achieved to the adjoining residential lots along Bowen Street beyond its intersection with Currey Street.



Figure 2.3: Direct Access to the Residential Lots along Bowen Street

The designated speed limit on both McDowall Street and Bowen Street in the vicinity of the proposed site is generally 60kph, however, school zones have been introduced on both McDowall Street and Bowen Street. These school zones, where vehicular speed is restricted to 40kph between 07:30 and 09:30 and between 14:30 and 16:30 on school days, commence to the west of St John's Catholic School and finish just beyond Duke Street. A school zone is also in place on Cottell Street between Hoffman Street and Timbury Street.

The majority of the intersections in the vicinity of the proposed site operate under 4-way priority control with the exception of the McDowall Street/Queen Street/Feather Street intersection where a roundabout has been introduced and the Carnarvon Highway/McDowall Street intersection, which operates under signal control. Significant channelisation works have recently occurred at the Warrego Highway/Bowen Street/Carnarvon Highway intersection resulting in a number of traffic movements being prohibited in order to improve both road safety and intersection performance. On-site observations confirmed that the following traffic movements have been prohibited at the intersection:

- Ahead and right-turn from Bowen Street;
- Ahead from Warrego Highway onto Bowen Street; &
- Right-turn from Carnarvon Highway onto Bowen Street.

2.2 Public Transport

Preliminary investigation has established that no local bus services currently operate in Roma.

2.3 Pedestrian Facilities

As illustrated in Figure 2.4 below, a footpath is provided on the northern side of McDowall Street. This footpath runs from the hospital site towards the Town Centre.



Figure 2.4: Concrete Footpath on the Northern Side of McDowall Street

On-site observations have confirmed that there is lack of continuity with regard to the provision of pedestrian facilities in the vicinity of the subject site. For example, whilst pedestrian crossing facilities are provided on the eastern and western approaches to the McDowall Street/Cottell Street intersection neither facility fully connects with the existing pedestrian network. The lack of continuity with regard to the pedestrian facilities is illustrated in Figure 2.5 below, which indicates the absence of a connection between the crossing facility and the existing footpath on McDowall Street.



Figure 2.5: No Connection between Pedestrian Crossing and Footpath

It is evident from Figure 2.5 above that no dropped kerbs are provided at the pedestrian crossing facility, which results in a potential trip hazard.

No pedestrian facilities are currently in place on the southern side of McDowall Street. As such the pedestrian crossing facilities at the McDowall Street/Currey Street intersection do not connect with any existing infrastructure on the southern side of the carriageway.

Roma State School middle and senior campuses are located to the north of the subject site on Cottell Street. Whilst on-site observations confirmed that a footpath is in place for a short distance along the site frontage of the senior school there is a general lack of pedestrian facilities along Cottell Street between McDowall Street and the schools. Consequently school pupils are forced to either walk on the carriageway or on the verge.

On-site observations also confirmed that there is also a lack of continuity with regard to the provision of pedestrian facilities along Bowen Street. A footpath is provided for a short distance on Bowen Street running from just outside the Learning and Lifestyle Centre to the Bowen Street/Cottell Street intersection. A footpath is also provided on the western side of the southern approach to the aforementioned intersection. Whilst pedestrian crossing facilities are provided on both the northern and eastern approaches to the Bowen Street/Cottell Street intersection there is no footpath present on the northern side of Bowen Street to the east of the intersection. The lack of continuity in respect of pedestrian facilities at the intersection is illustrated in Figure 2.6 below.



Figure 2.6: Lack of Pedestrian Connectivity at the Bowen Street/Cottell Street Intersection

Pedestrian crossing facilities are provided at the Carnarvon Highway/McDowall Street signal controlled intersection. On-site observations revealed that a 2 phase method of control has been implemented at the intersection with right turn traffic from both the major and minor roads turning in gaps in the oncoming traffic. Given the 2 phase method of control implemented at the site both left and right turning have to give-way to pedestrians on the crossings. It is considered that whilst this may be desirable from an intersection performance stance it is totally unsuitable from a pedestrian safety viewpoint.

2.4 Cycle Facilities

On-street cycle lanes are provided on both sides of McDowall Street. The cycle lanes commence to the west of the McDowall Street/Queen Street/Feather Street roundabout and run until the Warrego Highway/Carnarvon Highway.

On-street cycle lanes are also provided on both sides of Bowen Street. The cycle lanes commence to the west of the Bowen Street/Cottell Street intersection and run until the Warrego Highway/Carnarvon Highway. As illustrated in Figure 2.7 below, on-site observations confirmed that the road markings designating the cycle lanes have worn-away in some locations.



Figure 2.7: Cycle Lane Markings Worn-Away

3. Existing Traffic Volumes

3.1 Peak-Hour Traffic Surveys

Traffic turning movements were recorded at key intersections in the vicinity of the subject site in order to understand the movement of traffic through the area and to provide a robust set of traffic flows to allow analysis of the existing situation.

Classified counts were undertaken on Wednesday 15 and Thursday 16 September 2010 between 07:00 and 09:00 in the AM period and between 15:00 and 18:00 in the PM period to establish baseline conditions at the following intersections:

- McDowall Street/Currey Street;
- McDowall Street/Cottell Street;
- Carnarvon Highway/McDowall Street;
- Bowen Street/Currey Street;
- Bowen Street/Cottell Street; &
- Warrego Highway/Bowen Street/Carnarvon Highway.

The data was collected in 15 minute intervals with full turning counts undertaken. The purpose of the classified counts was to fully assess the existing traffic conditions on the surrounding network.

It should be noted that information made available by the Department of Transport and Main Roads (DTMR) has been used to validate the survey data obtained from the count undertaken at the Carnarvon Highway/McDowall Street intersection.

The vehicular throughput at the junctions observed during the respective peak-hour periods is illustrated in Table 3.1.

Table 3.1: Summary of Count Data by Location and Peak Period

Location	Total Vehicle Movement	
	AM Peak-Hour	PM Peak-Hour
• McDowall Street/Currey Street	243	267
• McDowall Street/Cottell Street	417	341
• Carnarvon Hwy/McDowall Street	1,160	1,069
• Bowen Street/Currey Street	283	304
• Bowen Street/Cottell Street	328	305
• Warrego Hwy/Bowen Street/Carnarvon Hwy	1,132	1,112

The existing traffic conditions observed in the weekday AM Peak-Hour period are illustrated in the Figure 3.1 below.

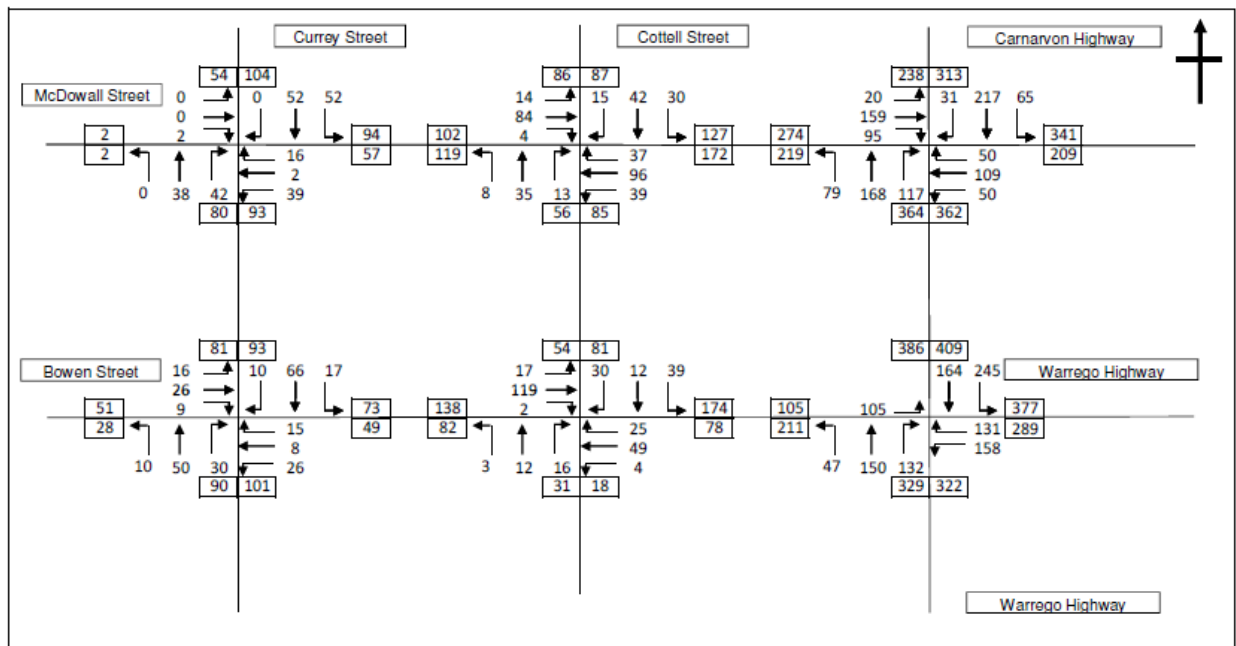


Figure 3.1: Existing 2010 Traffic Volumes – Weekday AM Peak-Hour

The existing traffic conditions observed in the weekday PM Peak-Hour period are illustrated in the Figure 3.2 below.

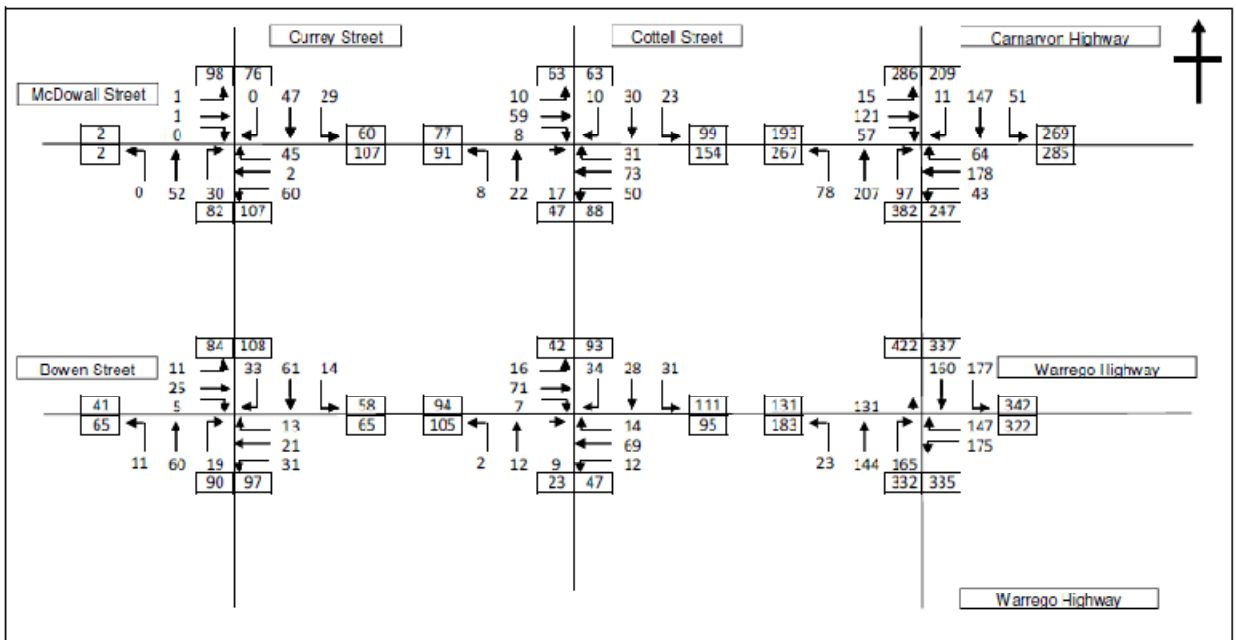


Figure 3.2: Existing 2010 Traffic Volumes – Weekday PM Peak-Hour

4. The Proposed Development

4.1 Development Description

The proposed development encompasses the following components;

- An indicative yield of 311 no. residential dwellings.
- Community shopping facilities; &
- Open space.

Whilst the conceptual layout of the proposed scheme has yet to be fully developed it is understood that vehicular access to the subject site will be achieved via a number of entrances at McDowall Street, Bowen Street, Currey Street and Cottell Street. As such it is understood that both McDowall Street and Bowen Street to the west of Currey Street will be upgraded.

The conceptual layout is included in Appendix A.

4.2 Development Timing

Whilst it is understood that the scheme will be developed in a number of stages, for the purposes of this preliminary assessment no staging has been assumed.

It is anticipated that the entire scheme will be completed by 2015.

5. Estimated Future Transport Demands

5.1 Estimated Development Traffic Generation

To assess the impact of the proposed development on the adjacent road network it is necessary to predict the likely number of vehicles that will be generated by the proposal.

The DTMR *'Road Planning and Design Manual'* recommends using specific generation rates, for planning purposes, for different development types. It is considered that the subject site will have a trip profile similar to that of medium density housing given the proximity of the Town Centre and the schools situated in the vicinity of the site. The peak-hour and daily trip generation rates as sourced from the *'Road Planning and Design Manual'* are detailed in Table 5.1.

Table 5.1: Predicted Trip Generation Rates for the Proposed Residential Subdivision

Time Frame	Trip Rate
Peak-Hour	0.6
Daily	6.0

Using the predicted peak-hour and daily trip generation rates provided above the estimated level of traffic generation for the proposed development has been predicted as shown in Table 5.2 below.

Table 5.2: Traffic Generation at Development Completion

Number of Dwellings	Peak-Hour Volumes	Daily Volumes
311	187	1,866

In relation to the community shopping facilities it is expected that the retail opportunities provided will primarily serve the residents of the subject side and as such will have a negligible impact on the adjacent highway network. Furthermore any additional trips attracted as a result of the provision of the community shopping facilities will be restricted and radiate to pass-by trips only.

5.2 Estimated Development Traffic Distribution

The traffic generated by the residential subdivision has been distributed and assigned to the network based on the likely draw of areas of employment within and around Roma. On-site observations and discussions with local representatives have confirmed that the main industries within Roma are located on the Warrego Highway either to the south-west or east of the town. Given that vehicular access to the proposed site will be achieved at a number of different locations the trip distribution methodology for the development parcel between Currey Street and Cottell Street (i.e. stages 3 and 8) slightly differs to the methodology applied for the development parcels west of Currey Street (i.e. stages 1, 2, 4, 5, 6 and 7).

The traffic generated by the proposed development has therefore been assigned to the road network in accordance with that illustrated in Figures 5.1 and 5.2.

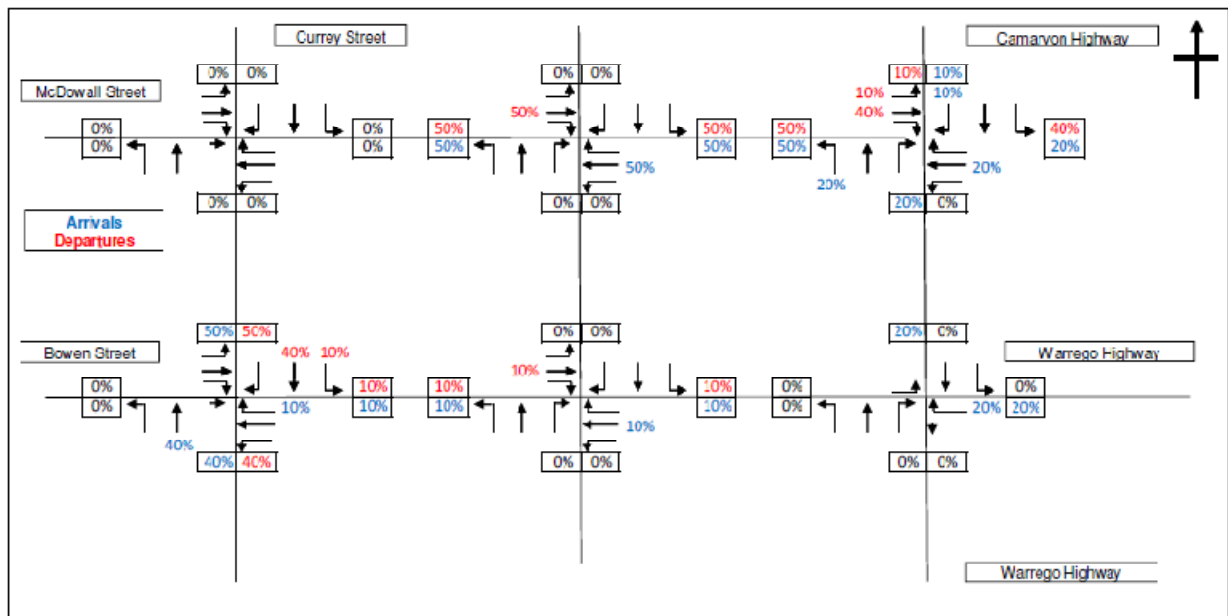


Figure 5.1: Trip Distribution – Stages 3 & 8

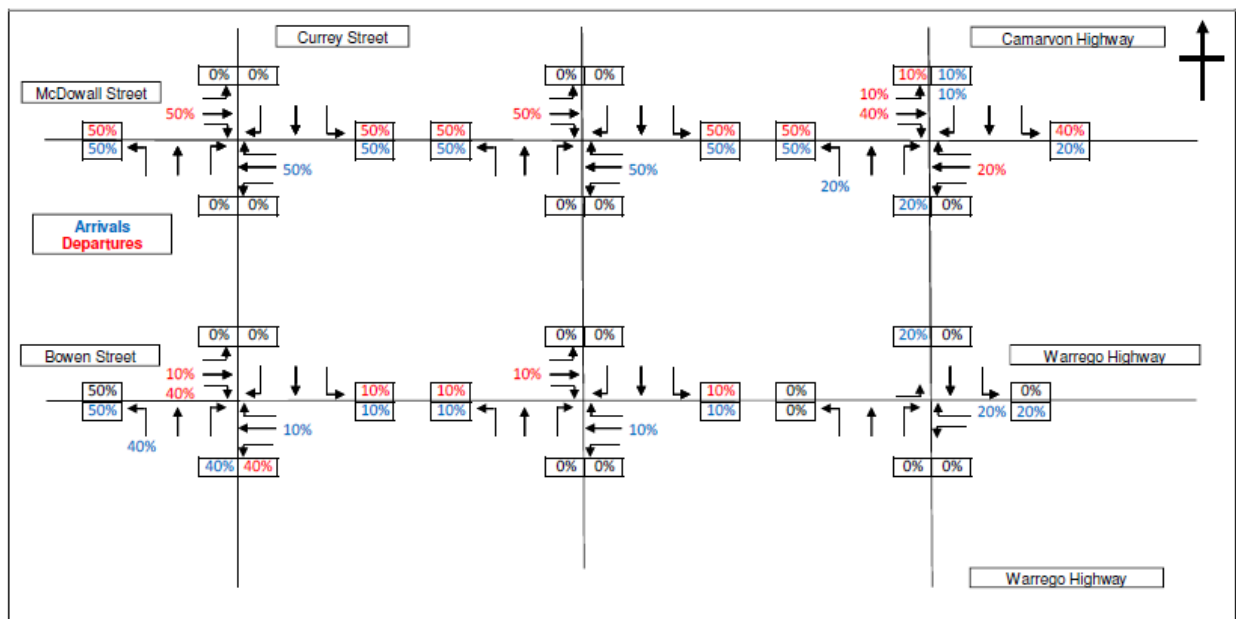


Figure 5.2: Trip Distribution – Stages 1, 2, 4, 5, 6 & 7

5.3 Proposed Development Traffic Demands

Based on the information provided in above, the traffic demands associated with the scheme at development completion 2015 in the weekday AM and PM peak-hour periods are shown in Figures 5.3 and 5.4 respectively.

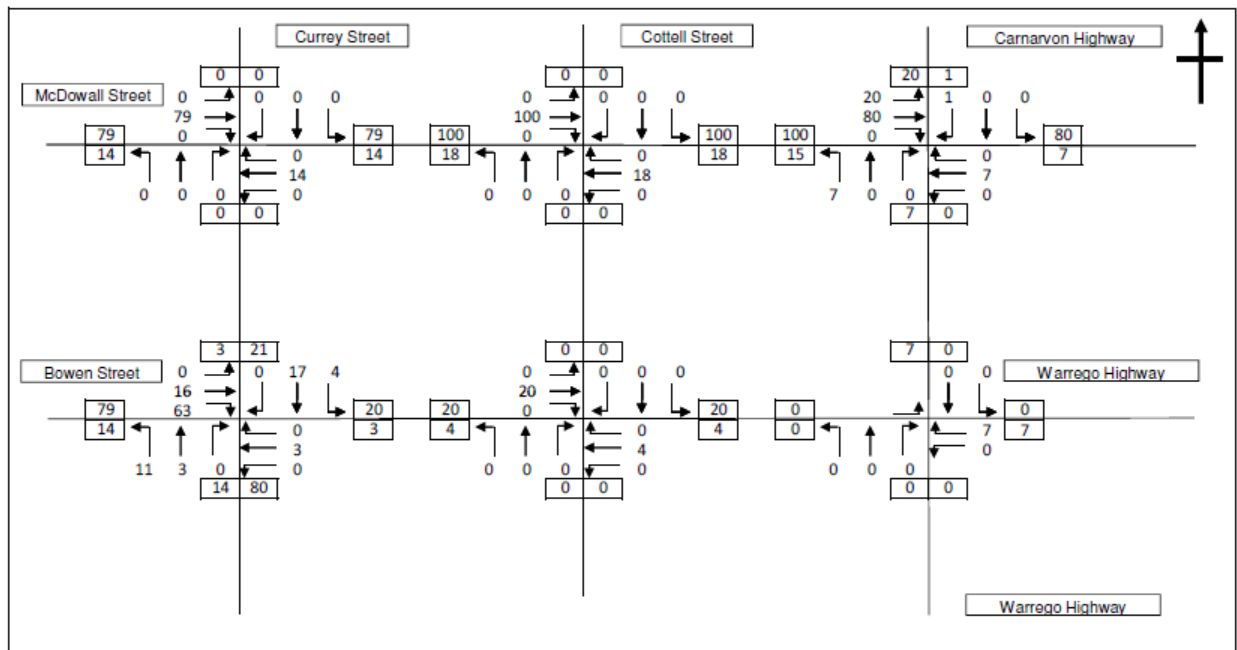


Figure 5.4: Proposed Traffic Demands at Development Completion 2015 – Weekday AM Peak-Hour

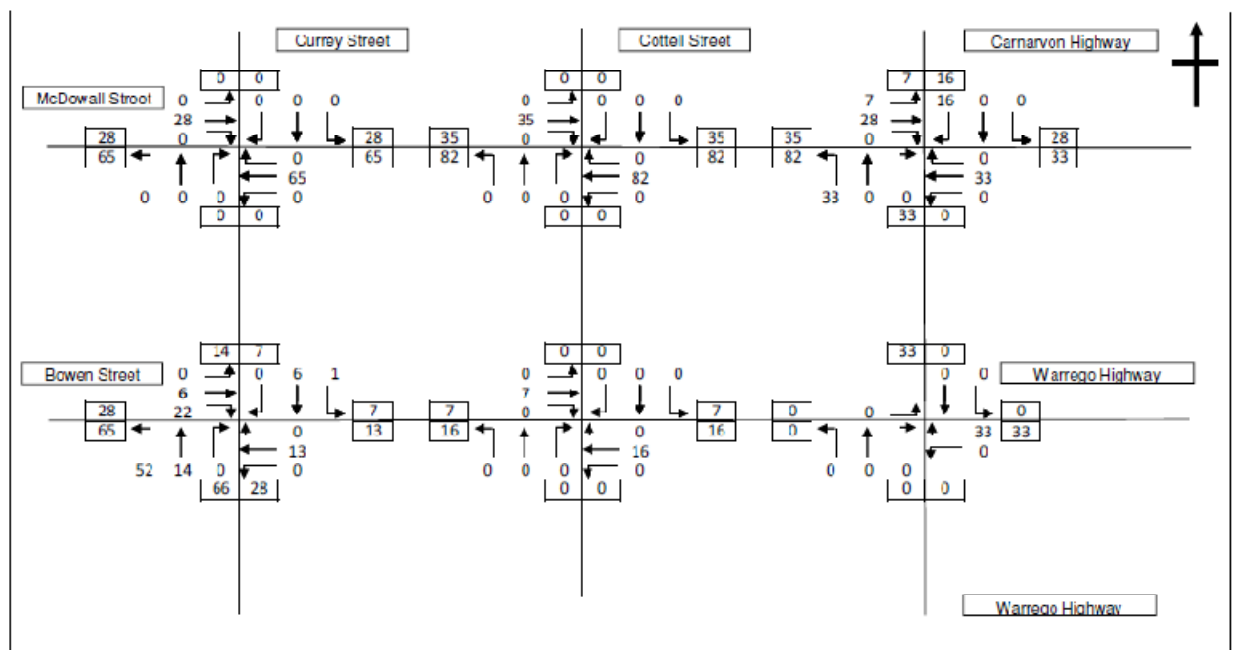


Figure 5.5: Proposed Traffic Demands at Development Completion 2015 – Weekday PM Peak-Hour

5.4 Assessment Years

In terms of this appraisal, it is intended that the following forecast years will be considered to assess the effects of proposed development traffic:

- 2015 - development completion; &
- 2025 - future year, (i.e. development completion plus 10 years).

It is considered that in order to obtain suitably robust development completion and future year scenarios, it is necessary to expand the current year traffic volumes to 2015 (i.e. development completion) and 2025 (i.e. future year).

There are two methods that are normally used for estimating traffic growth:

- The use of historical data from permanent ATC sites; &
- The use of Future Traffic or Population Forecasts.

In the absence of historical traffic growth data, for the purposes of this assessment medium population growth forecasts for Roma, (which are considered to be directly proportional to traffic growth), as sourced from the 'Queensland's Future Population - 2008 Edition' document published by the Department of Infrastructure and Planning have been used to determine the future traffic scenarios for the Marona Regional Council (MRC) controlled roads. This document suggests that the population of Roma will grow at an annual rate of 0.5% between 2008 and 2031.

With regard for the future traffic scenarios for the DTMR controlled roads (i.e. the Warrego Highway and Carnarvon Highway), discussions with representatives of the authority have established that an annual growth rate of 5.0% (based on historical traffic data) on these links is appropriate.

The resulting growth factors are shown in Table 5.1.

Table 5.1: Growth Factors

Assessment Years	Growth Rate on MRC Roads	Growth Rate on DTMR Roads
• 2010 Background Traffic to Development Completion 2015	1.025	1.276
• 2010 Background Traffic to Future Year 2025	1.078	2.079

The resulting background 2015 and 2025 traffic volumes are therefore provided below.

Figure 5.6 below shows the background 2015 traffic volumes in the weekday AM Peak-Hour.

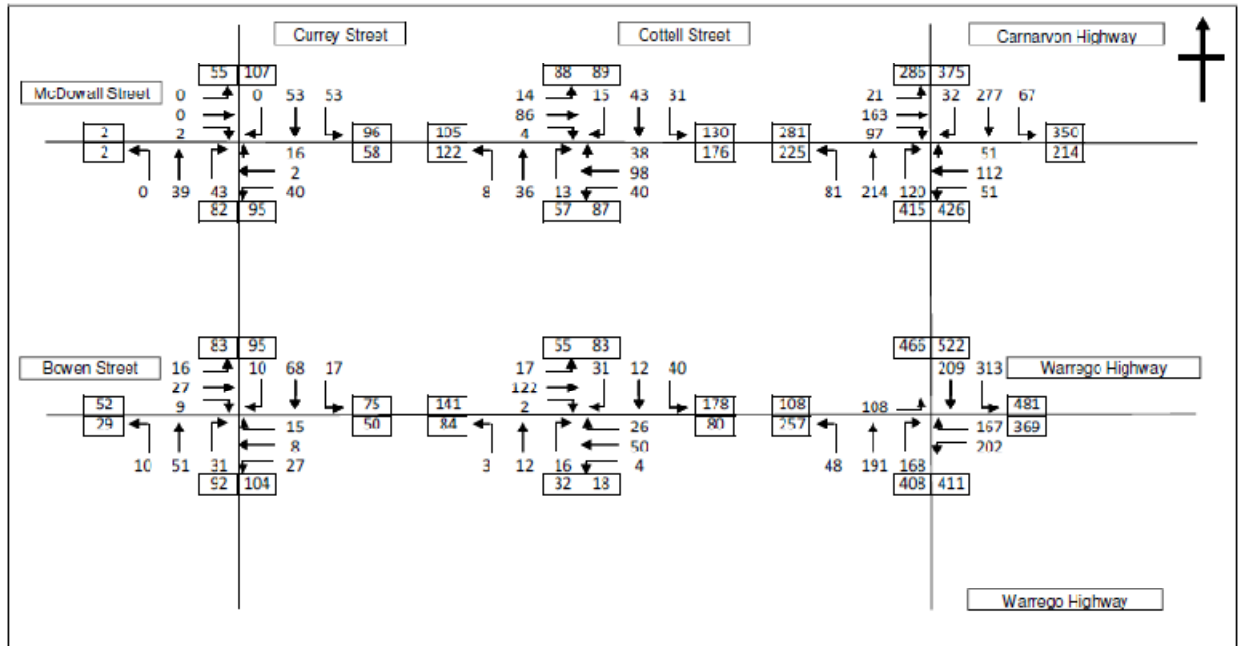


Figure 5.6: Background 2015 Traffic Volumes – Weekday AM Peak-Hour

Figure 5.7 below shows the background 2015 traffic volumes in the weekday PM Peak-Hour.

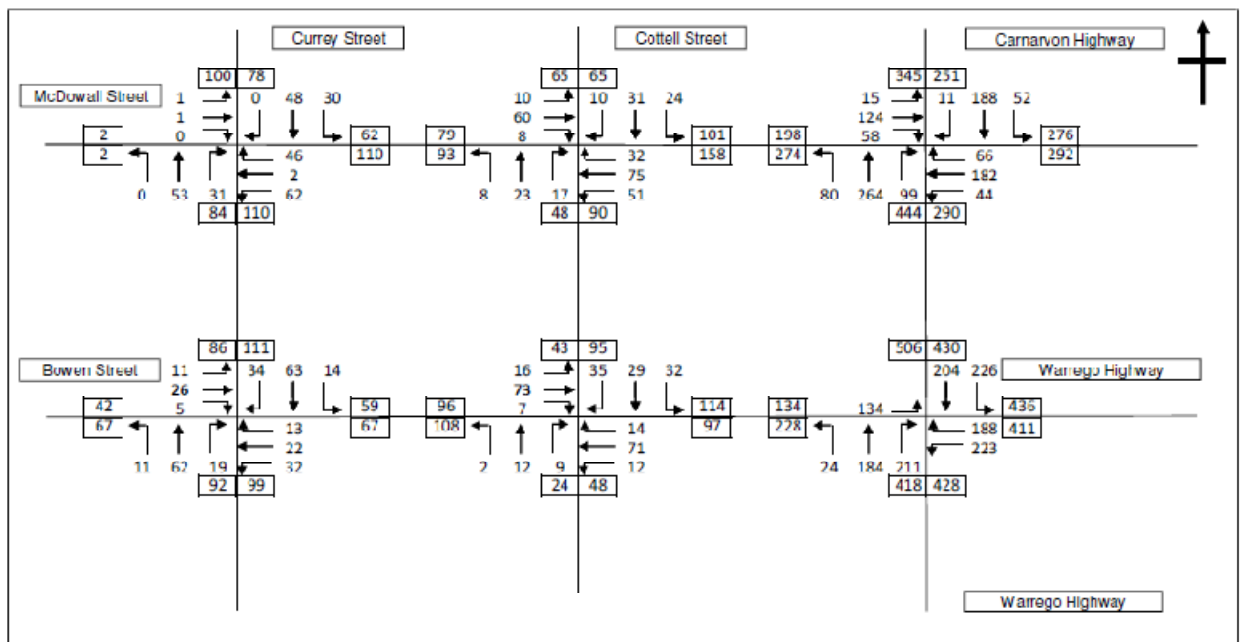


Figure 5.7: Background 2015 Traffic Volumes – Weekday PM Peak-Hour

Figure 5.8 below shows the background 2025 traffic volumes in the weekday AM Peak-Hour.

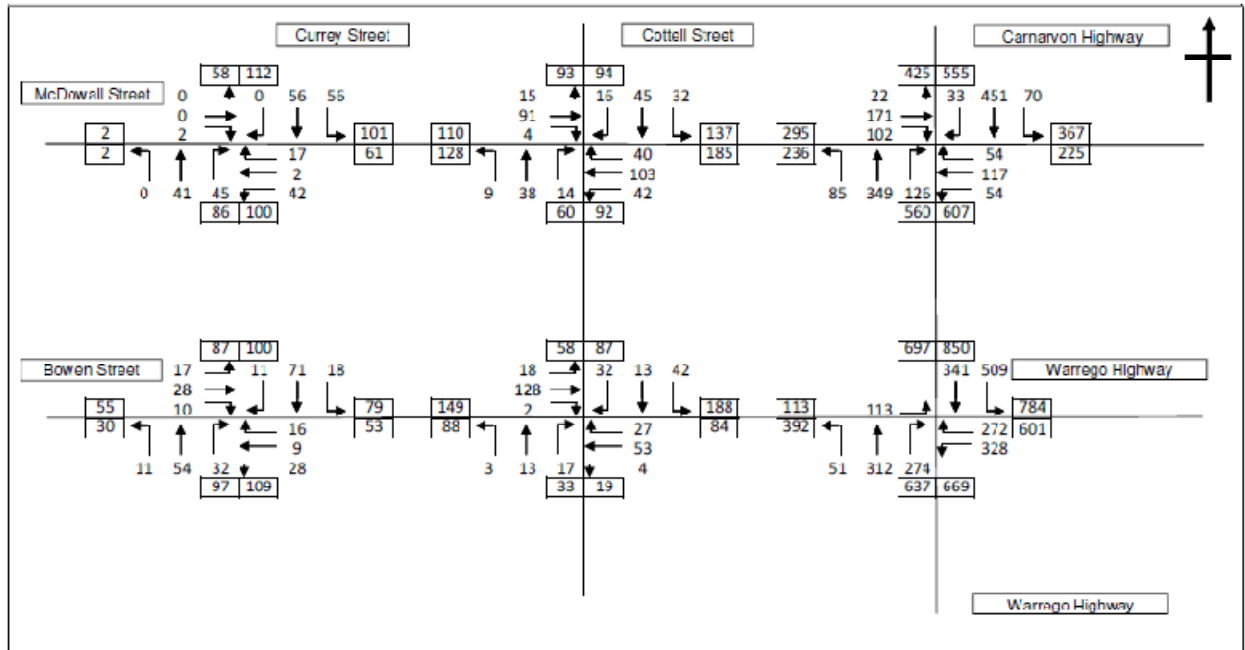


Figure 5.8: Background 2025 Traffic Volumes – Weekday AM Peak-Hour

Figure 5.9 below shows the background 2025 traffic volumes in the weekday PM Peak-Hour.

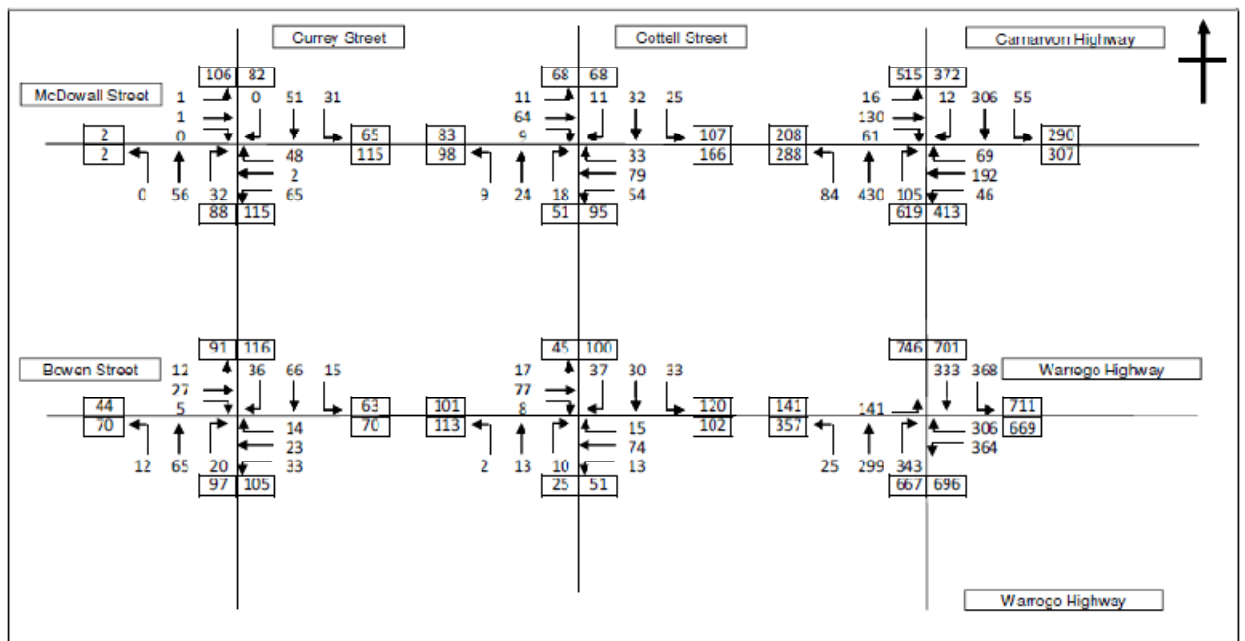


Figure 5.9: Background 2025 Traffic Volumes – Weekday PM Peak-Hour

5.5 Development Completion 2015 Project Traffic Demands

Development completion 2015 project traffic demands are obtained by the addition of generated traffic to the background 2015 traffic volumes.

Figure 5.10 shows the development completion 2015 project traffic demands in the weekday AM Peak-Hour.

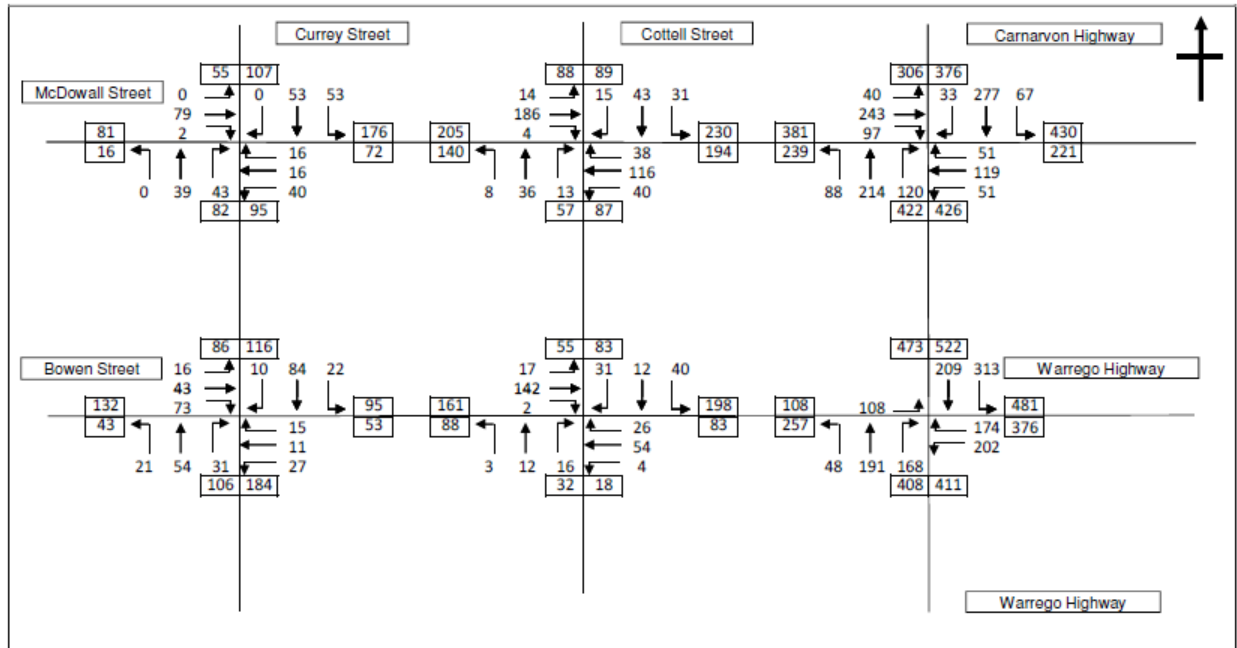


Figure 5.10: Development Completion 2015 Traffic Demands - Weekday AM Peak-Hour

Figure 5.11 shows the development completion 2015 project traffic demands in the weekday PM Peak-Hour.

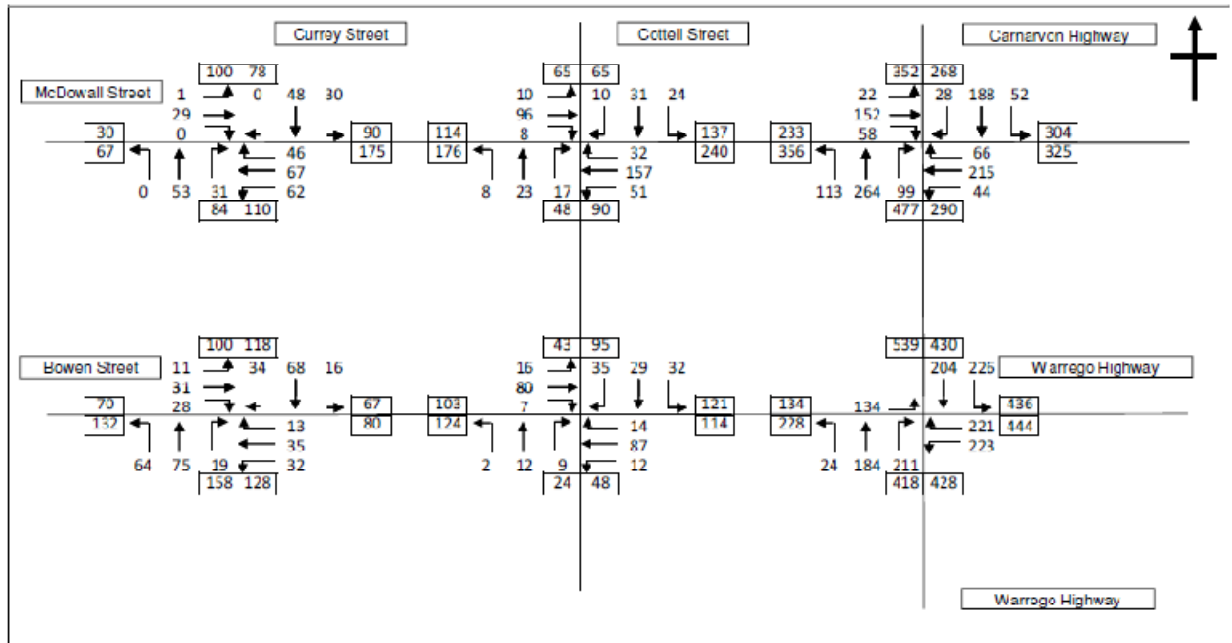


Figure 5.11: Development Completion 2015 Traffic Demands - Weekday PM Peak-Hour

5.6 Future Year 2025 Project Traffic Demands

Future year 2025 project traffic demands are obtained by the addition of generated traffic to the background 2025 traffic volumes.

Figure 5.12 shows the future year 2025 project traffic demands in the weekday AM Peak-Hour.

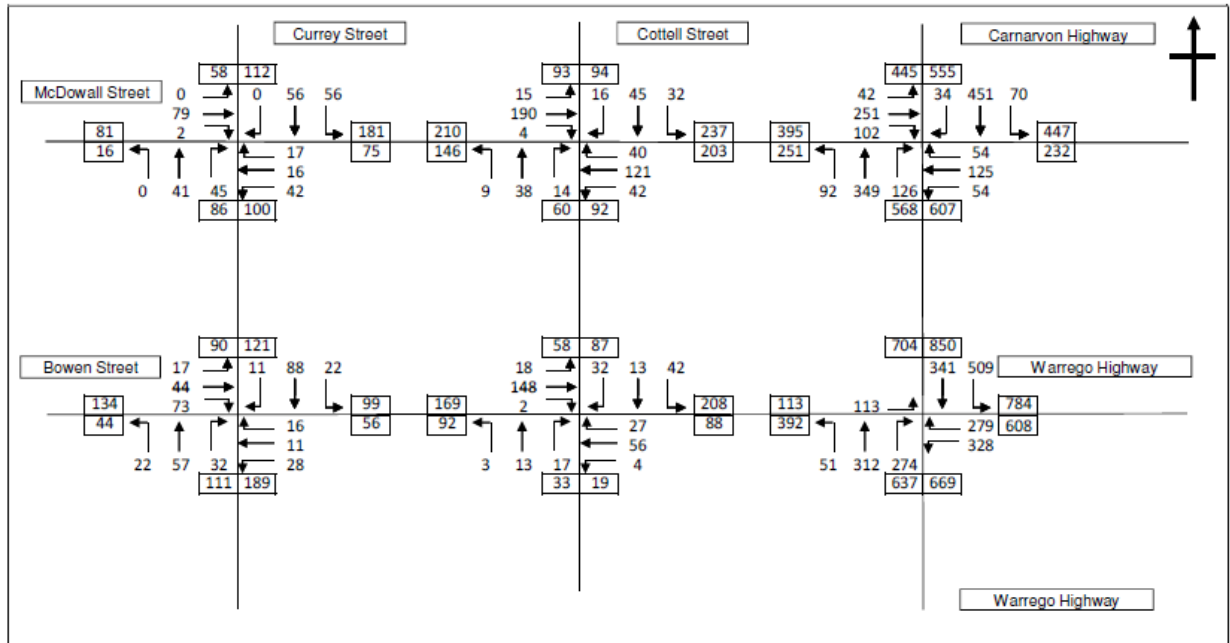


Figure 5.12: Future Year 2025 Traffic Demands - Weekday AM Peak-Hour

Figure 5.13 shows the future year 2025 project traffic demands in the weekday PM Peak-Hour.

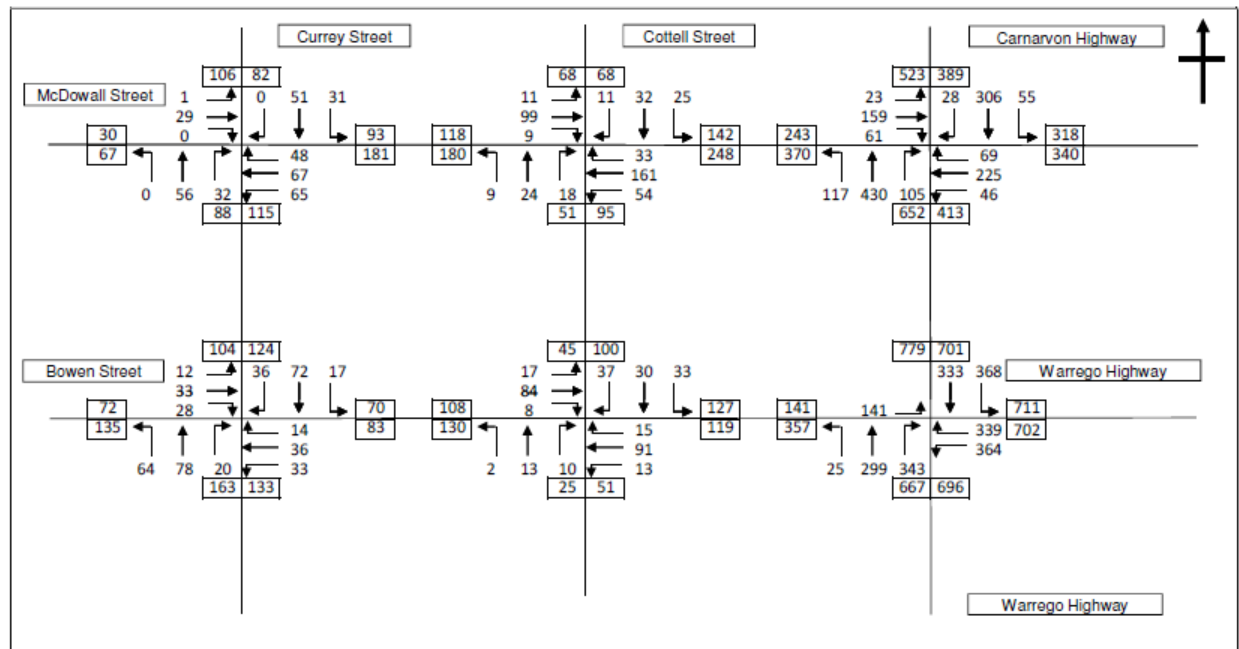


Figure 5.13: Future Year 2025 Traffic Demands - Weekday AM Peak-Hour

6. Road Network Performance

6.1 Highway Impact

Section 3.2 of the DTMR's 'Guidelines for Assessment of Road Impacts of Development Proposals' states the following criteria for Traffic Operation Assessment:

"Traffic operation impacts need to be considered for any section of a SCR where the construction or operational traffic generated by the development equals or exceeds 5% of the existing AADT on the road section, intersection movements or turning movements".

This traffic report has applied the 5% threshold for the network in the vicinity of the proposed development. Therefore the difference in two-way link flows between background 2015 traffic volumes and the development completion 2015 traffic volumes has been analysed for the weekday AM and PM peak-hour periods.

Figure 6.1 below illustrates the two-way link flows and percentage increases due to the proposed development traffic at development completion 2015 in the weekday AM peak-hour period on the adjoining road network.

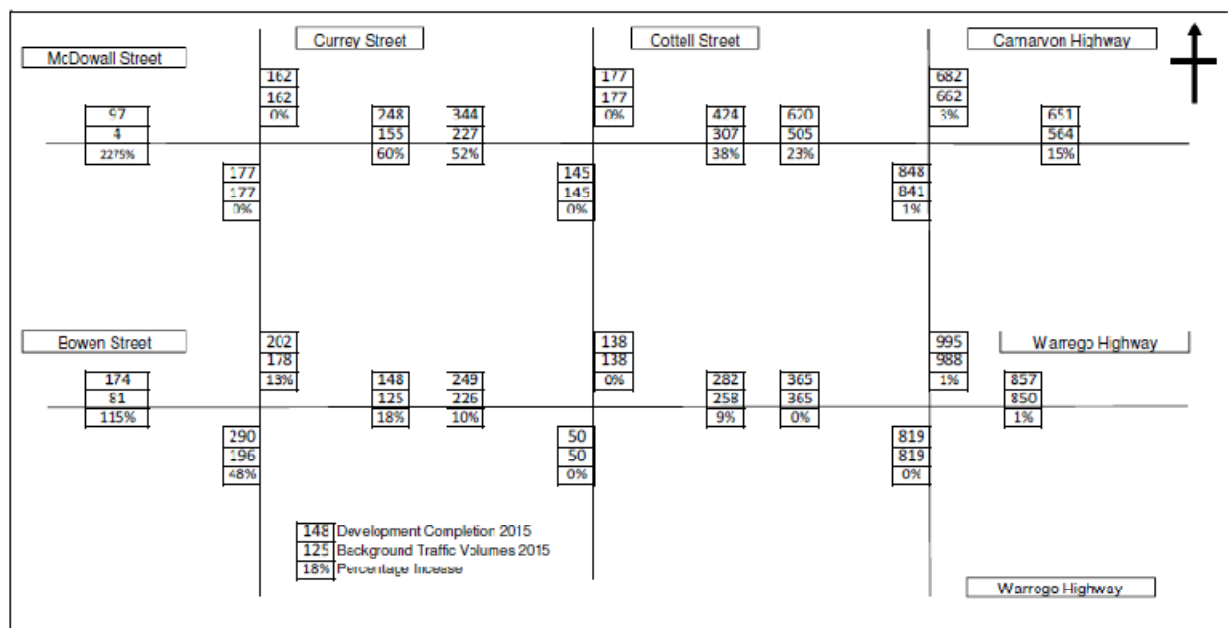


Figure 6.1: Link Threshold Analysis 2015 - Weekday AM Peak-Hour

Figure 6.2 below illustrates the two-way link flows and percentage increases due to the proposed development traffic at development completion 2015 in the weekday PM peak-hour period on the adjoining road network.

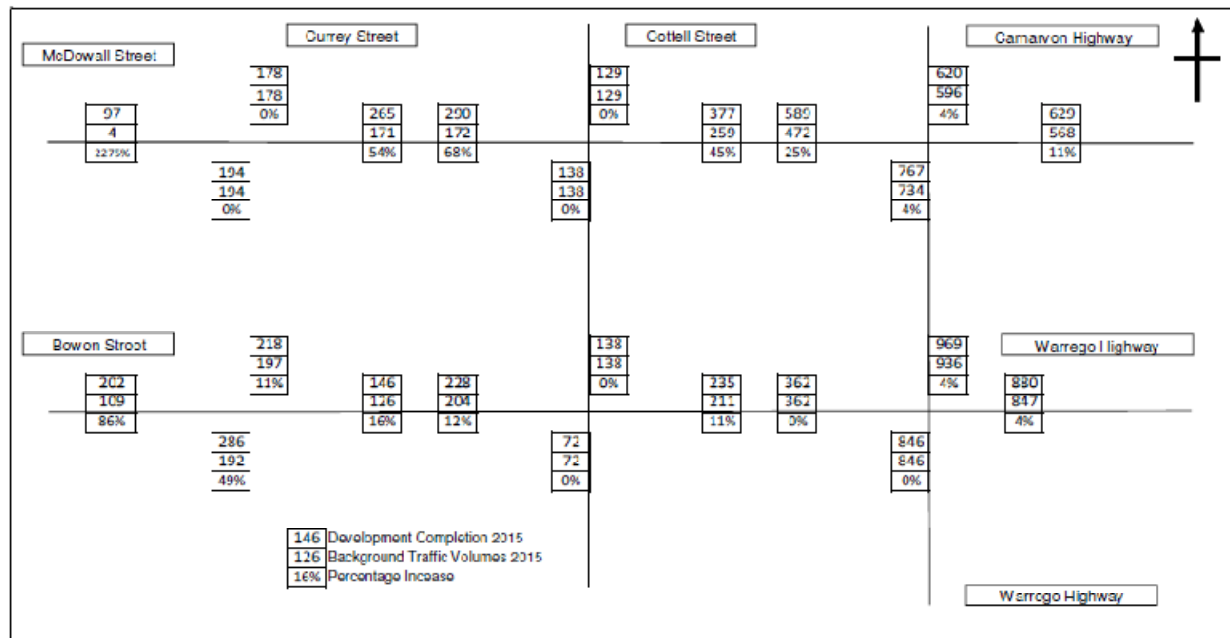


Figure 6.2: Link Threshold Analysis 2015 - Weekday PM Peak-Hour

It is considered in this instance that the perceptible significant percentage increases in traffic volumes are due to the relatively low background traffic volumes observed during the manual classified counts. Notwithstanding this, as a result of the link threshold analysis undertaken further testing was deemed necessary at the following intersections in the noted assessment periods:

- McDowall Street/Currey Street (AM/PM peak-hour);
- McDowall Street/Cottell Street (AM/PM peak-hour);
- Carnarvon Highway/McDowall Street (AM/PM peak-hour);
- Bowen Street/Currey Street (AM/PM peak-hour); &
- Bowen Street/Cottell Street (AM/PM peak-hour).

For the purposes of this assessment TTM has conducted modelling of the 5 no. key intersections, using the SIDRA Intersection Analysis Software for the future year 2025 scenario.

McDowall Street/Currey Street

As intimated previously it is understood that McDowall Street to the west of Currey Street will be upgraded as part of the works to facilitate the proposed scheme. It is anticipated that these upgrades will take the form of a duplication of McDowall Street to the west of its intersection with Currey Street.

As such TTM has conducted modelling of the intersection as shown in Figure 6.3, using the SIDRA Intersection Analysis Software.

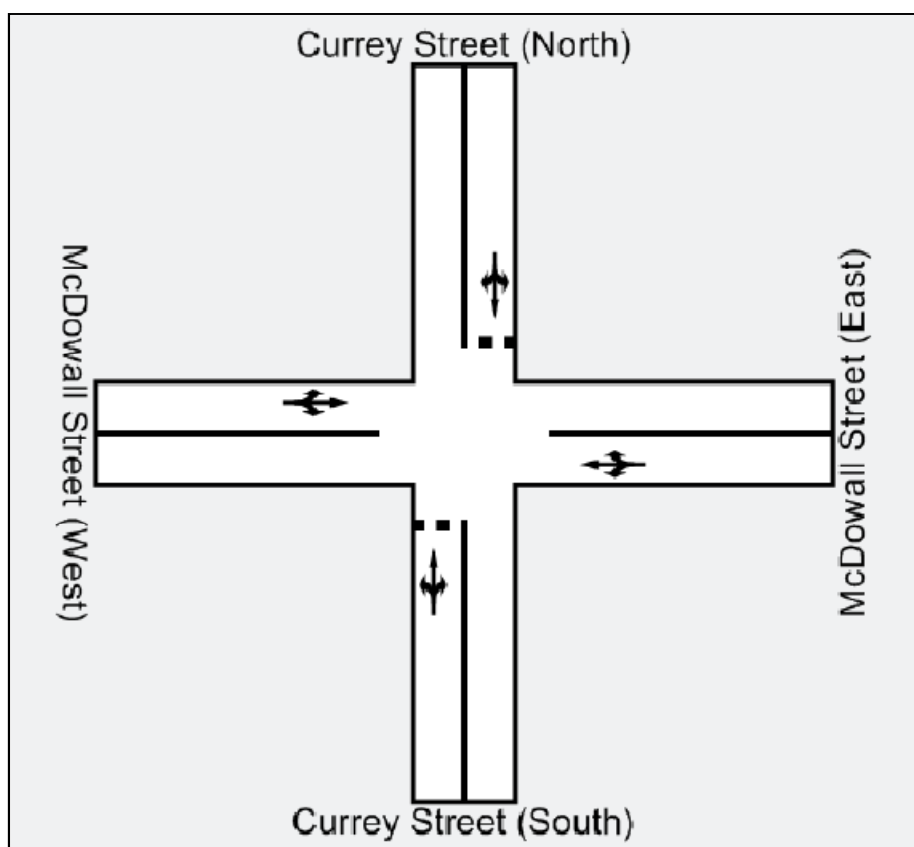


Figure 6.3: Indicative Configuration of the McDowall Street/Currey Street Intersection

Electronic copies of the models are available for inspection upon request. However, the SIDRA movement results have been summarised and presented in Table 6.1. These are expressed in terms of the Degree of Saturation, (DOS), the Maximum Average Delay at the intersection measured in seconds, the Level of Service and the Critical Queue on each approach measured in metres.

Table 6.1: Summary of SIDRA Results for the McDowall Street/Currey Street Intersection

Case Scenario	Degree of Saturation	Maximum Average Delay (Seconds)	Level of Service	95 th Percentile Critical Queue (m)			
				South	East	North	West
Future Year 2025 AM	9.7%	9.8 (Left & Right Turn from McDowall Street, East)	N/A	3	4	4	4
Future Year 2025 PM	13.8%	9.5 (Left & Right Turn from McDowall Street, West)	N/A	3	9	3	2

It can be seen from Table 6.1 above that the intersection will operate well within the desired 80% threshold in terms of Degree of Saturation (DOS) in the weekday AM and PM peak-hour periods at future year 2025.

Given the SIDRA modelling results highlighted above it is considered that the intersection can facilitate the projected development completion and future year traffic flows.

McDowall Street/Cottell Street

TTM has conducted modelling of the existing intersection as shown in Figure 6.4 below, using the SIDRA Intersection Analysis Software.

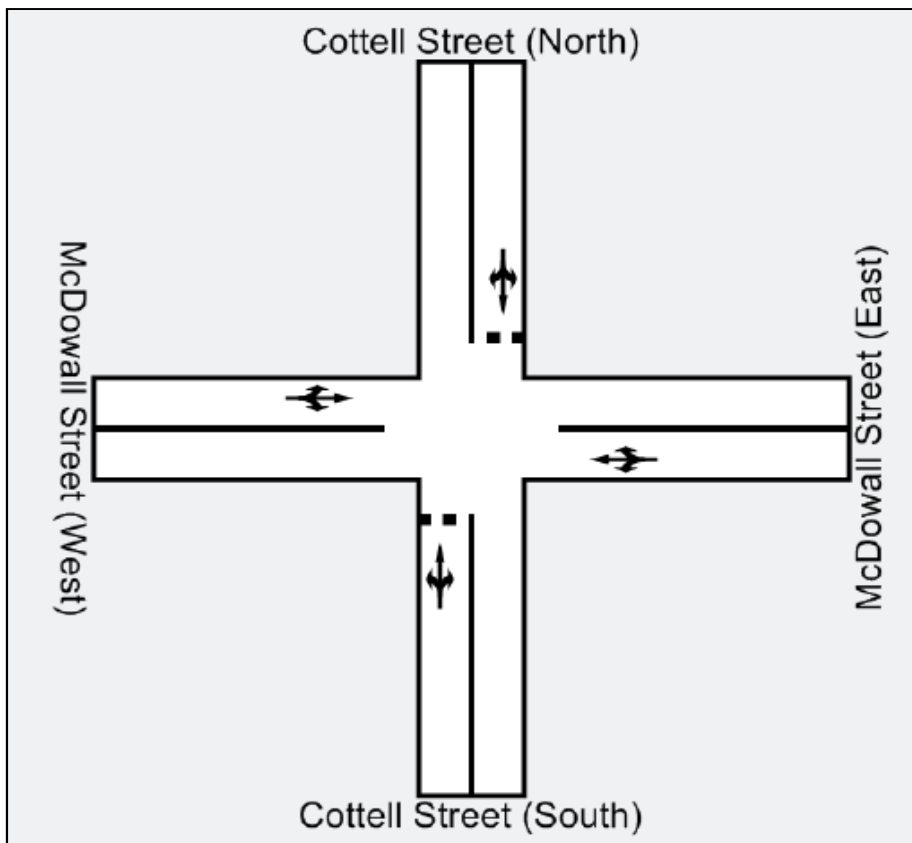


Figure 6.4: Existing Configuration of the McDowall Street/Cottell Street Intersection

Electronic copies of the models are available for inspection upon request. However, the SIDRA movement results have been summarised and presented in Table 6.2. These are expressed in terms of the Degree of Saturation, (DOS), the Maximum Average Delay at the intersection measured in seconds, the Level of Service and the Critical Queue on each approach measured in metres.

Table 6.2: Summary of SIDRA Results for the McDowall Street/Cottell Street Intersection

Case Scenario	Degree of Saturation	Maximum Average Delay (Seconds)	Level of Service	95 th Percentile Critical Queue (m)			
				South	East	North	West
Future Year 2025 AM	16.0%	11.5 (Left & Right Turn from McDowall Street, East)	N/A	2	14	4	13
Future Year 2025 PM	17.4%	11.1 (Left & Right Turn from McDowall Street, West)	N/A	2	15	2	8

It can be seen from Table 6.2 above that the intersection will operate well within the desired 80% threshold in terms of Degree of Saturation (DOS) in the weekday AM and PM peak-hour periods at future year 2025.

Given the SIDRA modelling results highlighted above it is considered that the intersection can facilitate the projected development completion and future year traffic flows.

Carnarvon Highway/McDowall Street

TTM has conducted modelling of the existing intersection as shown in Figure 6.5 below, using the SIDRA Intersection Analysis Software.

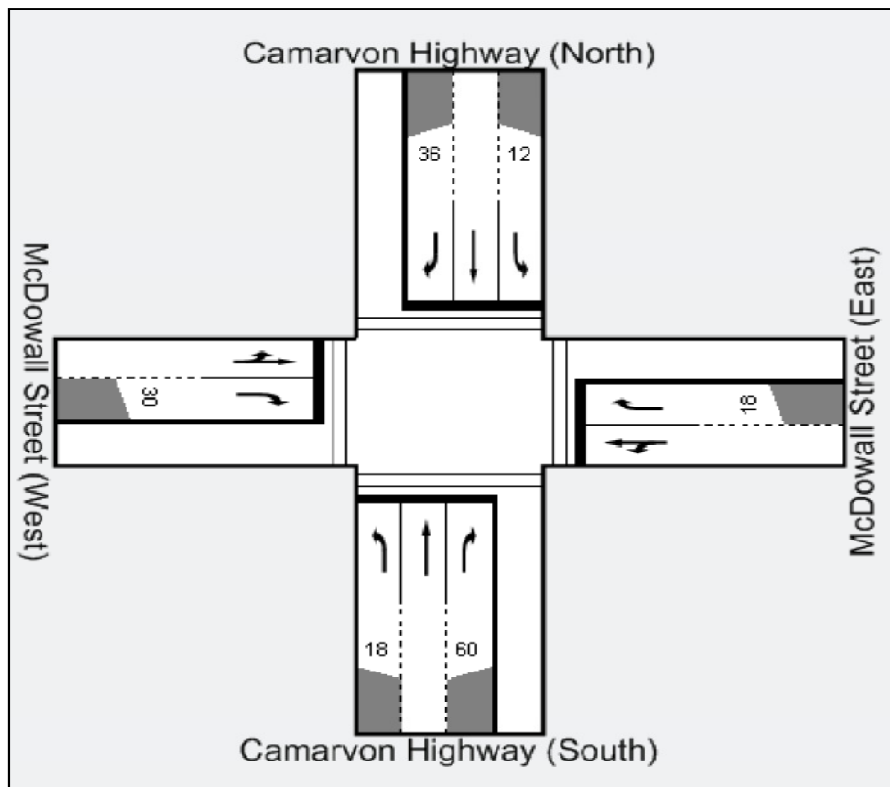


Figure 6.5: Existing Configuration of the Carnarvon Highway/McDowall Street Intersection

As per on-site observations and discussions with representatives of the DTMR the intersection has been modelled with a 2 phase method of control.

Electronic copies of the models are available for inspection upon request. However, the SIDRA movement results have been summarised and presented in Table 6.3. These are expressed in terms of the Degree of Saturation, (DOS), the Maximum Average Delay at the intersection measured in seconds, the Level of Service and the Critical Queue on each approach measured in metres.

Table 6.3: Summary of SIDRA Results for the Carnarvon Highway/McDowall Street Intersection

Case Scenario	Degree of Saturation	Maximum Average Delay (Seconds)	Level of Service	95 th Percentile Critical Queue (m)			
				South	East	North	West
Future Year 2025 AM	74.5%	23.2 (Right Turn from McDowall Street, East)	B	60	30	85	53
Future Year 2025 PM	71.1%	23.2 (Right Turn from McDowall Street, West)	B	79	47	52	32

It can be seen from Table 6.3 above that the intersection will operate within the desired 90% threshold in terms of Degree of Saturation (DOS) in the weekday AM and PM peak-hour periods at future year 2025.

As intimated previously it is considered that the current method of control used at the intersection is unsatisfactory from a pedestrian safety viewpoint given the convoluted nature of traffic movements when pedestrians are crossing the road. For instance, when a pedestrian is crossing McDowall Street (East) traffic turning left and right from Carnarvon Highway (North and South) has to give-way. It is considered that it would be more desirable in respect to pedestrian safety that a 3 phase method of control be implemented at the intersection with the adoption of an 'all red' to traffic pedestrian strategy.

TTM has conducted modelling of this proposal using the SIDRA Intersection Analysis Software.

Electronic copies of the models are available for inspection upon request. However, the SIDRA movement results have been summarised and presented in Table 6.4. These are expressed in terms of the Degree of Saturation, (DOS), the Maximum Average Delay at the intersection measured in seconds, the Level of Service and the Critical Queue on each approach measured in metres.

Table 6.4: Summary of SIDRA Results for the Carnarvon Highway/McDowall Street Intersection – 3 Phase Method of Control

Case Scenario	Degree of Saturation	Maximum Average Delay (Seconds)	Level of Service	95 th Percentile Critical Queue (m)			
				South	East	North	West
Future Year 2025 AM	83.0%	45.7 (Right Turn from McDowall Street, East)	C	100	57	143	101
Future Year 2025 PM	87.8%	44.0 (Right Turn from McDowall Street, West)	C	133	91	78	56

It can be seen from Table 6.4 above that the intersection will operate within the desired 90% threshold in terms of Degree of Saturation (DOS) in the weekday AM and PM peak-hour periods at future year 2025. It is evident from the results; however, that should an 'all red' to traffic pedestrian strategy be adopted intersection performance will deteriorate with both maximum average delay and critical queue lengths increasing significantly. It should be noted that SIDRA has assumed that the pedestrian phase will be initiated every cycle, which is viewed as a 'worst case' scenario portraying a somewhat pessimistic picture of how intersection is likely to operate on-street. Given the low pedestrian volumes observed on-site it is considered that it is more likely that the pedestrian phase will be initiated every second or third cycle and as such the delays to traffic at the intersection as a result of the pedestrian phase being 'called' will not be overly onerous.

Bowen Street/Currey Street

As intimated previously it is understood that Bowen Street to the west of Currey Street will be upgraded as part of the works to facilitate the proposed scheme. It is anticipated that these upgrades will take the form of a duplication of Bowen Street to the west of its intersection with Currey Street.

As such TTM has conducted modelling of the intersection as shown in Figure 6.6, using the SIDRA Intersection Analysis Software.

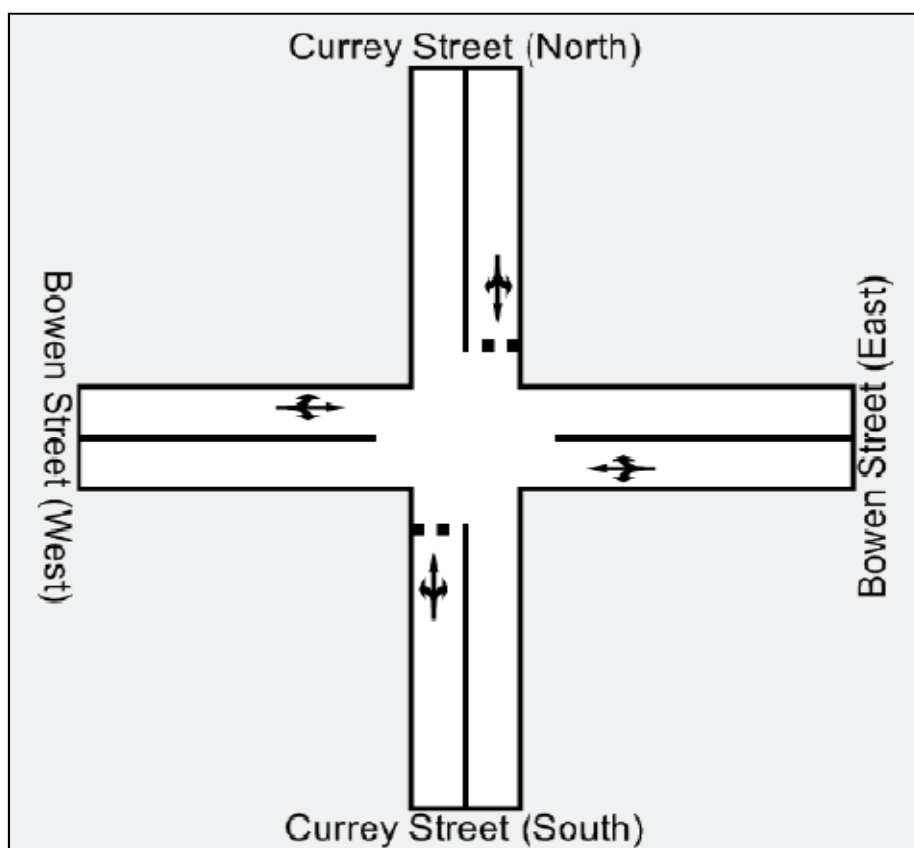


Figure 6.6: Indicative Configuration of the Bowen Street/Currey Street Intersection

Electronic copies of the models are available for inspection upon request. However, the SIDRA movement results have been summarised and presented in Table 6.5. These are expressed in terms of the Degree of Saturation, (DOS), the Maximum Average Delay at the intersection measured in seconds, the Level of Service and the Critical Queue on each approach measured in metres.

Table 6.5: Summary of SIDRA Results for the Bowen Street/Currey Street Intersection

Case Scenario	Degree of Saturation	Maximum Average Delay (Seconds)	Level of Service	95 th Percentile Critical Queue (m)			
				South	East	North	West
Future Year 2025 AM	13.9%	9.5 (Left & Right Turn from Bowen Street, East)	N/A	4	3	5	8
Future Year 2025 PM	13.9%	9.5 (Left Turn from Bowen Street, West)	N/A	6	4	4	4

It can be seen from Table 6.5 above that the intersection will operate well within the desired 80% threshold in terms of Degree of Saturation (DOS) in the weekday AM and PM peak-hour periods at future year 2025.

Given the SIDRA modelling results highlighted above it is considered that the intersection can facilitate the projected development completion and future year traffic flows.

Bowen Street/Cottell Street

TTM has conducted modelling of the existing intersection as shown in Figure 6.7 below, using the SIDRA Intersection Analysis Software.

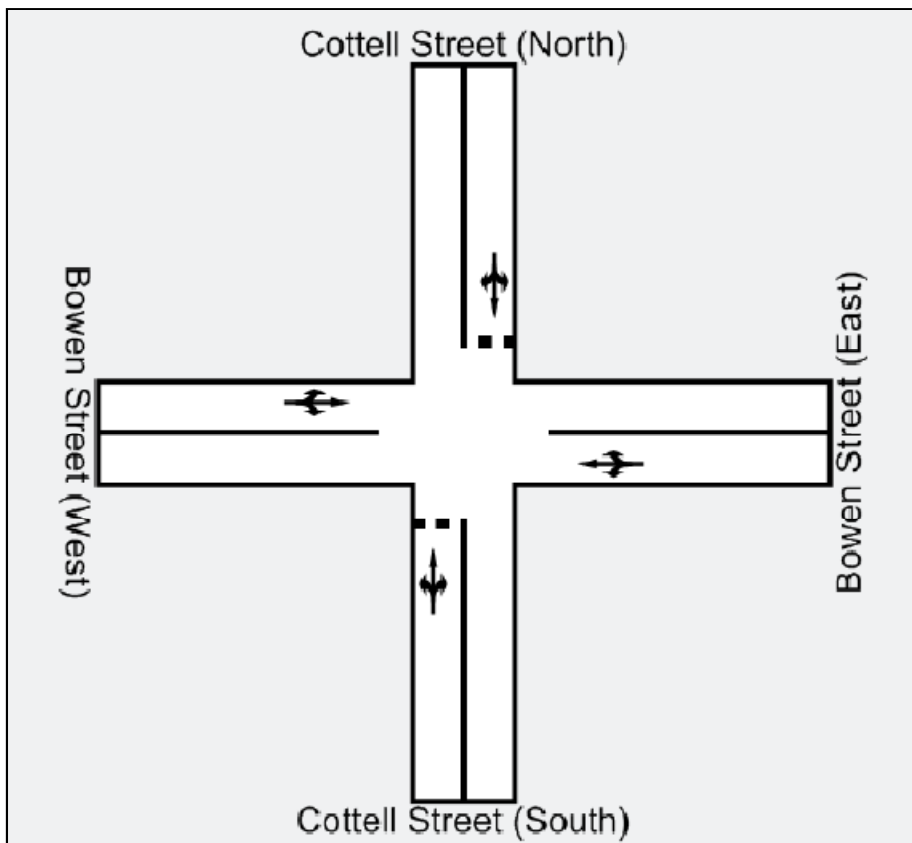


Figure 6.7: Existing Configuration of the Bowen Street/Cottell Street Intersection

Electronic copies of the models are available for inspection upon request. However, the SIDRA movement results have been summarised and presented in Table 6.6. These are expressed in terms of the Degree of Saturation, (DOS), the Maximum Average Delay at the intersection measured in seconds, the Level of Service and the Critical Queue on each approach measured in metres.

Table 6.6: Summary of SIDRA Results for the Bowen Street/Cottell Street Intersection

Case Scenario	Degree of Saturation	Maximum Average Delay (Seconds)	Level of Service	95 th Percentile Critical Queue (m)			
				South	East	North	West
Future Year 2025 AM	9.7%	10.5 (Left & Right Turn from Bowen Street, East)	N/A	1	5	3	8
Future Year 2025 PM	8.7%	9.6 (Left & Right Turn from Bowen Street, West)	N/A	1	6	3	5

It can be seen from Table 6.6 above that the intersection will operate well within the desired 80% threshold in terms of Degree of Saturation (DOS) in the weekday AM and PM peak-hour periods at future year 2025.

Given the SIDRA modelling results highlighted above it is considered that the intersection can facilitate the projected development completion and future year traffic flows.

7. Internal Road Network

7.1 Access Configuration

Whilst the conceptual layout of the proposed scheme has yet to be fully developed it is understood that vehicular access to the subject site will be achieved via a number of entrances at McDowall Street, Bowen Street, Currey Street and Cottell Street. As such it is understood that both McDowall Street and Bowen Street to the west of Currey Street will be upgraded.

7.2 Internal Street Network

It is understood that all internal roads within the proposed site will be designed to either a collector or local access standard.

The proposed configuration of the access streets, minor collectors and major collectors will satisfy the minimum requirements of Maroon Regional Council. This includes suitable road reserve, verge and carriageway widths to cater for the anticipated traffic volumes.

7.3 Internal Configuration

All internal roads within the proposed site are either designed to a collector or local access standard. As such, all internal intersections are between roads of either the same classification or within one road classification level.

In accordance with 'Queensland Streets 2010 – Complete Streets' in order to make the development more permeable, and to ensure more legible neighbourhoods it is proposed that priority controlled 4-way intersections will be employed at a number of locations throughout the site. A number of priority controlled T intersections will also be provided where the layout permits.

To ensure that an acceptable level of safety is maintained throughout the development it is recommended that the suitability of priority controlled 4-way intersections be assessed in accordance with the following criteria:

Intersection Capacity : Delays on right turn and cross movements from minor approaches not to exceed 40 seconds (which equates to a Level of Service C) based on a capacity analysis applying Austroads analysis principles;

Sight Distance: Sight distance on all approaches to comply with the requirements specified in Austroads Guide to Road Design Part 4a Section 3.

8. Other Road Users

8.1 Pedestrians

Walking is a socially beneficial activity because it is cheap; it allows people to appreciate their local environment; it promotes social contacts; it is non polluting and environmentally sustainable and it is healthy. Consequently, measures that successfully encourage walking foster a caring attitude towards peoples' local environment; strengthen local identity and community; purify the air and the atmosphere and save non-renewable resources; and allow people to lead healthy lives, which reduces the cost to society of caring for the sick.

It is recognised that providing for pedestrians and improving the attractiveness of walking is not just about providing and maintaining pedestrian facilities but is also about reducing the unpleasantness, inconvenience and danger caused by motor vehicles, and by land uses and highway designs that are unsympathetic.

It is acknowledged that good quality infrastructure is required to encourage walking. The design process offers the opportunity to have good quality pedestrian measures incorporated into the urban and rural walking environment and into developments and redevelopments.

On-site observations revealed that there is a lack of continuity with regard to the provision of pedestrian facilities in the vicinity of the subject site particularly in respect to the connectivity to the existing schools on both Cottell Street and on McDowall Street/Bowen Street. Consequently it is considered that footpaths should be introduced for a length of approximately 300m on Cottell Street to address the pedestrian desire line between the subject site and Roma State School middle and senior campuses. Whilst further investigation is required it is considered that the footpath may be best positioned on the western side of the carriageway with a pedestrian crossing introduced in the vicinity of the senior school to facilitate the safe and orderly passage of school children across the road.

Furthermore it is considered that a footpath should be introduced for a length of approximately 300m on McDowall Street and a length of approximately 230m on Bowen Street to address the pedestrian desire lines between the subject site and St John's Catholic School. In order to facilitate the safe and orderly passage of school children it is considered that pedestrian crossings should be introduced on the southern approach to the McDowall Street/Cottell Street intersection and the northern approach to the Bowen Street/Cottell Street intersection.

Figure 8.1 illustrates the location of the proposed footpaths and pedestrian crossings.

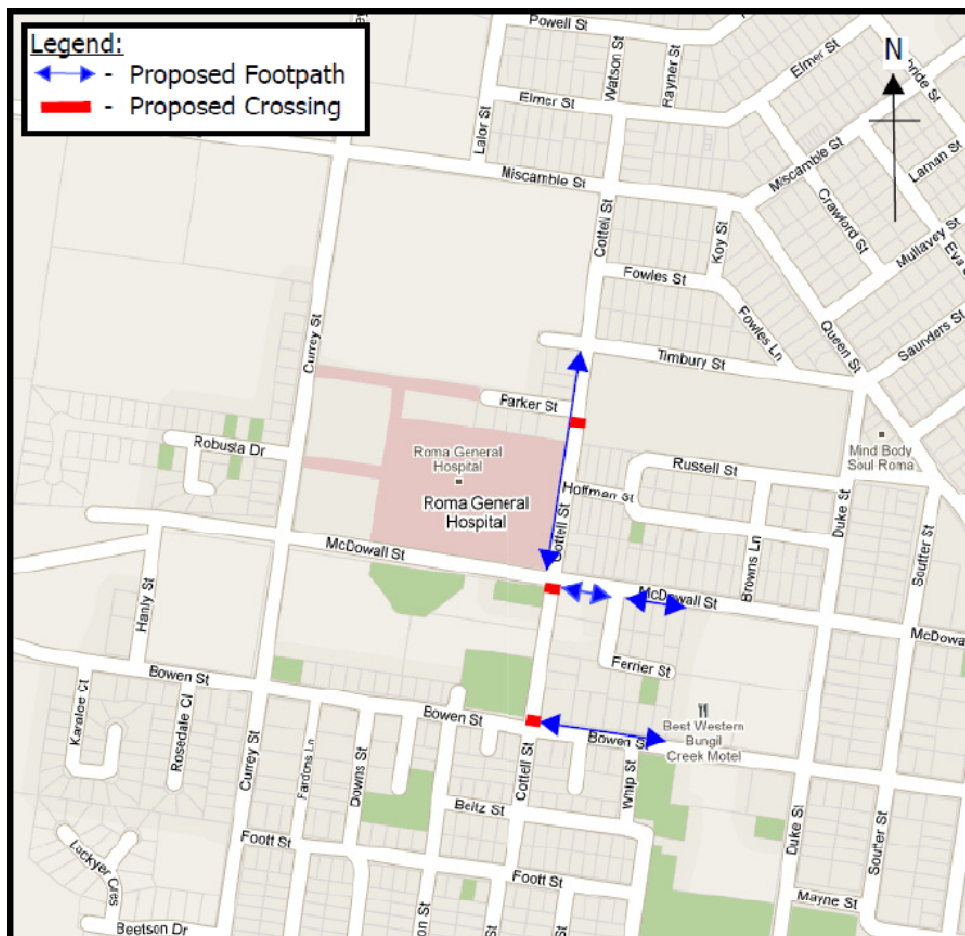


Figure 8.1: Pedestrian Network Improvements

It is recommended that dropped kerbs should be introduced at the existing pedestrian crossings in the vicinity of the proposed site in order to remove the potential trip hazards.

Cyclists

It is proposed that the worn-away road markings indicating the cycle lanes on Bowen Street should be re-instated at the earliest opportunity in order to inform road users of the cycle provision along the link.

It is understood that off-road cycle facilities will be introduced adjacent to the spine road running through the development.

It is proposed that secure cycle parking will be provided adjacent to the community shopping facilities.

9. Conclusions

9.1 Development Access

Whilst the conceptual layout of the proposed scheme has yet to be fully developed it is understood that vehicular access to the subject site will be achieved via a number of entrances at McDowall Street, Bowen Street, Currey Street and Cottell Street. As such it is understood that both McDowall Street and Bowen Street to the west of Currey Street will be upgraded.

9.2 Road Network Performance

Computer modelling has demonstrated that the adjacent road network can adequately facilitate the projected traffic volumes associated with the proposed development.

9.3 Internal Layout

All internal roads within the proposed site are either designed to a collector or local access standard. As such, all internal intersections are between roads of either the same classification or within one road classification level.

In accordance with '*Queensland Streets 2010 - Streets for People*' in order to make the development more permeable, and to ensure more legible neighbourhoods it is proposed that priority controlled 4-way intersections will be employed at a number of locations throughout the site. A number of priority controlled T intersections will also be provided where the layout permits.

9.4 Other Road Users

On-site observations revealed that there is a lack of continuity with regard to the provision of pedestrian facilities in the vicinity of the subject site particularly in respect to the connectivity to the existing schools on both Cottell Street and on McDowall Street/Bowen Street. Consequently it is considered that footpaths should be introduced for a length of approximately 300m on Cottell Street to address the pedestrian desire line between the subject site and Roma State School middle and senior campuses. Whilst further investigation is required it is considered that the footpath may be best positioned on the western side of the carriageway with a pedestrian crossing introduced in the vicinity of the senior school to facilitate the safe and orderly passage of school children across the road.

Furthermore it is considered that a footpath should be introduced for a length of approximately 300m on McDowall Street and a length of approximately 230m on Bowen Street to address the pedestrian desire lines between the subject site and St John's Catholic School. In order to facilitate the safe and orderly passage of school children it is considered that pedestrian crossings should be introduced on the southern approach to the McDowall Street/Cottell Street intersection and the northern approach to the Bowen Street/Cottell Street intersection.

It is recommended that dropped kerbs should be introduced at the existing pedestrian crossings in the vicinity of the proposed site in order to remove the potential trip hazards.

It is proposed that the worn-away road markings indicating the cycle lanes on Bowen Street should be re-instated at the earliest opportunity in order to inform road users of the cycle provision along the link.

It is understood that off-road cycle facilities will be introduced adjacent to the spine road running through the development.

It is proposed that secure cycle parking will be provided adjacent to the community shopping facilities.

Appendix A

CONCEPTUAL LAYOUT