



BETTER TRANSPORT FUTURES
MARK WAUGH



Proposed Mixed Use Rezoning, O'Connell Street, Tamworth, NSW

Charter Keck Cramer

Traffic Impact Assessment
February 2012



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Document History and Status

Issue	Rev.	Issued To	Qty	Date	Approved
Draft	Rev01	Mitchel Hanlon Consulting	1	30 th January 2012	C Thomas
Draft	Rev02	Mitchel Hanlon Consulting	1	15 th February 2012	C Thomas
Final	Rev03	Mitchel Hanlon Consulting	1	20 th February 2012	C Thomas

Printed: 1 March 2012
Last Saved: 1 March 2012
File Name: P0897 MH 83-89 Marius St Tamworth TIA
Author: Sean Morgan
Name of Organisation: Charter Keck Cramer
Name of Project: Proposed Mixed Use Development, O'Connell Street Tamworth NSW
Name of Document: Traffic and Parking Impact Statement
Document Version: Final Rev03
Project Number: P0897

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1. Introduction

Background

Better Transport Futures has been commissioned by Mitchel Hanlon Consulting Pty Ltd on behalf of Charter Keck Cramer to prepare a Traffic Impact Assessment for the proposed rezoning of land for a planning proposal which allows for future mixed use commercial development off O'Connell Street, Tamworth NSW. This work is required to support a Rezoning Application to Tamworth Regional Council. Due to the potential impact of the planning proposal upon the local road network and at the key intersections in the vicinity of the subject site on Peel Street (that forms part of the regional road network) the Roads and Maritime Services for NSW (RMS) will be required to review the proposal and provide concurrence for the proposed rezoning.

Scope of Report

The scope of this report is to review the traffic and parking implications for the proposed rezoning. The report will also provide advice on access issues, internal site layout and issues relating to service vehicles.

Issues and Objectives of the study

The issues relative to the proposal are:

- Assess impact on the arterial and local road network due to the additional traffic flows
- Assess the impact of the additional parking generated by the proposed rezoning
- Review the access arrangements for the planning proposal
- Review the service arrangement for the planning proposal; and
- Assess any other transport impacts associated with the planning proposal

The objective of the report is to document the impacts of the proposed rezoning and provide advice on any infrastructure work required as part of the planning proposal.

Planning Context

In preparing this document, the following guides and publications were used:

- RTA Guide to Traffic Generating Developments, Version 2.2 Dated October 2002;
- Tamworth Regional Council DCP Parking Guidelines;
- Australian / New Zealand Standard – Parking Facilities Part 1 : off-street car parking (AS2890.1:2004);

2 Existing Situation

2.1 Site Description and Proposed Activity

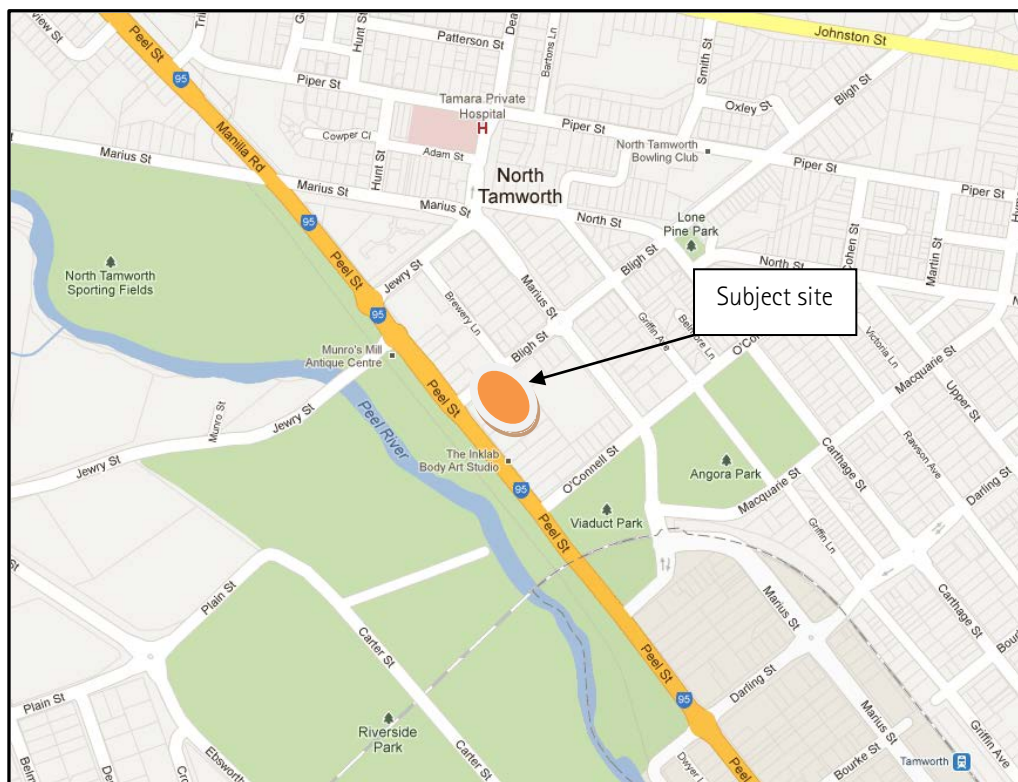
2.1.1 Site Location and Access

The subject site is located off O'Connell Street, North Tamworth between Peel Street (to the west) and Marius Street (to the east), to the north-west of the Tamworth city centre. The site currently has vehicle access to both O'Connell Street and Marius Street.

The site is currently used for operational purposes by Telstra with some administrative staff based on site as well as the storage of equipment.

The proposal for the site is to provide rezoning to suit a mixed use commercial / retail type development. The end user is not know at this stage but could include larger retailers such as furniture store, supermarket or office supplies, etc. Access can be provided via both Marius Street and O'Connell Street with internal parking provided to satisfy the parking requirements for the proposed rezoning.

The location of the site is shown below in Figure 2.1.



Source: Google maps

■ Figure 2-1 - Site Location

Existing land use adjacent to the site is a mixture of residential and light commercial together with open space on the opposite side of O'Connell Street from the site.

2.1.2 Zoning

The site is currently zoned IN1 allowing for light industrial use and this application is proposing a new zoning of B4 allowing for mixed use development. As part of the planning submission exemption is being sought from the gross floor area restriction of 2500m² stipulated in Clause 7.4 of the Tamworth

Regional LEP (2010) which will enable the planning proposal to be listed as exempt under Clause 7.4, subclause 3.

2.2 Existing Traffic Conditions

2.2.1 Road Hierarchy

It is usual to classify roads according to a road hierarchy, in order to determine their functional role within the road network. Changes to traffic flows on the roads can then be assessed within the context of the road hierarchy. Roads are classified according to the role they fulfil and the corresponding volume of traffic they should carry. The Roads and Traffic Authority of New South Wales (RTA) has set down the following guidelines for the functional classification of roads.

Arterial Road

Typically a main road carrying over 15,000 vehicles per day and fulfilling a role as a major inter-regional link with over 1,500 vehicles per hour during the peak hours. Peel Street is classified as an arterial road.

Sub-arterial Road

Defined as secondary inter-regional links, typically carrying volumes between 5,000 and 20,000 vehicles per day with between 500 and 2,000 vehicles per hour during the peak hours.

Collector Road

Provides a link between local areas and regional roads, typically carrying between 2,000 and 10,000 vehicles per day. At volumes greater than 5,000 vehicles per day, residential amenity begins to decline noticeably. Peak hour flows would be between 250 to 1,000 vehicles per hour. Marius Street and O'Connell Street provide the function of a collector road.

Local Road

Provides access to individual allotments, carrying low volumes, typically less than 2,000 vehicles per day with peak hour flows up to 250 vehicles per hour.

Peak hour volumes on all types of roads are typically within the range of eight to twelve per cent of the daily flows.

Peel Street

The major road through the locality is Peel Street to the west of the site. Peel Street connects with Manilla Road and forms part of the arterial road network (MR 63). It provides an important road link between Tamworth and Manilla and through to Warialda. As part of the state highway network, any new development or works that could impact on this road require review and concurrence from the Roads and Maritime Services (RMS).

Peel Street carries a reasonably high traffic, providing access to Tamworth for local traffic as well as more regional traffic movements providing an important road link.

Peel Street in the vicinity of the site provides a single lane of travel in both directions with an approximate width of 9.5 metres. Additional turn lanes are provided at intersections to maintain capacity and to cater safely for turning movements. There are kerbs and gutters provided along one side only adjacent to the existing development on the southern (river) side of the road for the majority of its length approaching Tamworth. Kerb side parking (mixture of angle and parallel) is permitted along much of its length with appropriate restrictions in the vicinity of intersections.

As a regional road it carries a reasonably high volume of heavy goods vehicles, for both local access and regional through movements. The posted speed limit in the vicinity of the site is 60 km/h.



- *Photo 1 View west along Peel Street showing typical cross section in the vicinity of the subject site.*

O'Connell Street

O'Connell Street intersects with Peel Street to the south-west of the subject site and provides access to the site. Whilst it provides a single lane of travel in each direction, it provides an overall width in the order of 15 metres with angle parking provided on both sides of the street adjacent to the subject site. There is a single footpath with a single lane of travel in both directions. As a local residential road, it operates under a posted speed limit of 50 km/h. Parking is permissible along both sides of the road, subject to normal parking controls at driveways and side roads. There is a mixture of commercial and specialist retail as well as residential development along the western side of O'Connell Street with Viaduct Park located opposite the site.

O'Connell Street, Marius Street and the remaining roads in the general locality of the subject site are all local roads under the control of Tamworth Regional Council.



- *Photo 2 View north along O'Connell Street showing typical cross section. Note subject site is to left of photograph.*

Marius Street

Marius Street runs along the northern edge of the site with a raised central median to separate the opposing traffic movements. There is also a significant difference in level between these two carriageways that further reduces traffic movements to left in and left out only along this length of Marius Street. There are footpaths to both sides of Marius Street and it operates under a posted speed limit of 50 km/h. Land use along Marius Street is residential.

Observations on site, together with a review of the road network, shows that Marius Street in this location provides a rat run route, that allows traffic to travel between Peel Street and the north-east sector of Tamworth and avoid delays through Tamworth as well as provide a shorter route (due to the railway line).



■ *Photo 3 View west along Marius Street with site access on left hand side of photograph*

2.2.2 Roadworks

There are no road works currently occurring in the general vicinity of the subject site. From discussions with the RMS and Council it is understood that other than routine maintenance by the road authorities there are no immediate plans for any major road network changes in the immediate vicinity of the subject site.

2.2.3 Traffic Management Works

It is understood that Council and the RMS have reviewed the operation of Peel Street / Manilla Road due to the relatively high traffic flows and the numerous intersections and are reviewing the traffic controls at a number of intersections. However there is no date for any road works to occur at any of the intersections in the immediate vicinity of the subject site.

Outside of the peak hours the flows along Manilla Road and Peel Street are reasonably low and accordingly there are minimal delays and congestion.

2.2.4 Pedestrian and Cycling Facilities

There are footpaths provided along the majority of the roads within the general vicinity of the subject site, with the only exception being along the western side of O'Connell Street adjacent to the subject site. The existing footpaths provide good connectivity to the local residential areas as well as to the south towards the centre of Tamworth. There is also a path along the top of the river bank on the southern side of Peel Street that provides a connection towards Tamworth as well as further west. Cyclists can use the shoulders of Peel Street and given the low overall vehicle volumes and wide width of the local roads can safely travel along the local road network in the general vicinity of the subject site.

2.3 Traffic Flows

The proposed rezoning will allow for a mixed use development which will typically generate peak traffic movements during the traditional morning and afternoon peak periods through the week as well as flows throughout the working day and possibly over the weekend. There will be minimal season variation in flows.

The key roads that could be affected by the planning proposal will be Peel Street, O'Connell Street and Marius Street and the connections between these roads.

2.3.1 Daily Traffic Flows

Traffic flow data has been sourced from Tamworth Regional Council and the RMS publication "Traffic Volumes Data for Western Region, 2004" has been reviewed. This RMS publication contains details on traffic volumes around the Western Region and includes flows along Peel Street. From the RMS data, the two-way traffic flow on Peel Street in 2008 was 9,745 vehicles per day (Annual Average Daily Traffic, AADT).

As part of the study work, traffic data has been collected on Peel Street and the two way flow on Peel Street was 1075 in the AM peak and 1215 in the PM peak. This gives an average of 1145vph and with peak hour flows typically representing 10% of the daily flows; this would represent approximately 11,450 vehicles per day at this location.

Daily traffic flows on both Marius Street and O'Connell Street are much lower, given their lower status in the road hierarchy. Based on peak hour surveys of these roads, the daily traffic flows would be in the order of 770 on O'Connell Street and 6,800 on Marius Street, adjacent to the subject site. Note that the value of 6,800 on Marius Street should be viewed as an absolute maximum, as it is considered that the rat running that occurs during the peak periods may not occur out of peaks and therefore the peak flows provide a misrepresentation of the daily flows. RMS advice shows that peak flows can represent between 8 and 12 % of daily flows, thus allowing for the peak flows to represent 12% of the daily flows at this location the daily flows could be nearer 5,600 vehicles per day.

2.3.2 Daily Traffic Flow Distribution

There is no data available from the RTA publication for the daily distribution in traffic flows however, it is considered that overall the daily traffic flows would be reasonably evenly distributed between eastbound and westbound. The peak hour surveys show some bias in flows towards Tamworth in the morning peak and the reverse directional peak in the afternoon peak period.

2.3.3 Vehicle Speeds

No vehicle speed measurements have been taken as part of the study work. Observations on site would indicate that traffic appears to travel within the posted speed limits, with no obvious signs of excessive speed.

2.3.4 Existing Site Flows

The site is currently used by Telstra as a maintenance storage yard and catering for some administrative tasks. The existing workforce based on the site is in the order of 10 and the existing site flows are therefore negligible.

2.3.5 Heavy Vehicle Flows

For the traffic movements along Peel Street, it can be seen that there is a reasonably high number of heavy goods vehicles, including trucks and buses. The volume of heavy goods vehicles however is considered to be less than 10% of the overall flows. There are limited heavy goods vehicles on both O'Connell Street and Marius Street, reflecting their status as local access roads only.

It is noted that Peel Street, O'Connell Street (adjacent to the subject site) as well as Marius Street all allow for 25 metre B-double access if required.

2.3.6 Current Road Network Operation

Observations on site during both the morning and afternoon peak periods show that there are little if any delays for through traffic movements along Peel Street at its intersection with O'Connell Street, due to the provision of a sheltered right turn lane for traffic turning into O'Connell Street. Traffic entering or exiting O'Connell Street also suffer from minimal delays, with the majority of the delay only caused by drivers having to slow down and negotiate the intersections.

Similarly, traffic at the intersection of Marius Street and O'Connell Street also suffer from minimal delays and congestion. There were some delays observed at times, created by a large platoon of vehicles, but overall the observed delays and congestion were minimal.

2.4 Traffic Safety and Accident History

Peel Street in this location provides a straight alignment offering good visibility for drivers as well as an easy to understand road layout. The overall width of Peel Street allows for ease of traffic movements with minimal interaction between through traffic movements and turning movements. Similarly, O'Connell Street offers a good safe environment, with a straight alignment and good visibility for drivers. Marius Street adjacent to the subject site has a split carriageway, restricting traffic to one direction between kerbs and minimal turning options.

At the intersections between these roads, sight visibility lines are good and the intersections provide a clear layout that can be easily understood by drivers. There is a sheltered right turn lane for traffic turning into O'Connell Street allowing through traffic movements to safely continue along Peel Street with minimal delay.



■ *Photo 4 Photo shows the sheltered right turn lane on Peel Street at O'Connell Street*

Overall, it is considered that the intersections in the immediate vicinity of the subject site are well laid out and offer a safe environment for road users.

Traffic data has been provided by the RMS in the locality of the site and in the last 5 years there have been no recorded accidents along Peel Street in the vicinity of O'Connell Street. There have been a number of accidents further west on Peel Street, but these appear to be linked with a number of access driveways at this location. There have been 4 accidents in the immediate vicinity of the intersection of O'Connell Street with Marius Street, with 2 being rear end type accidents for the through traffic movements and 2 being a through traffic movements colliding with a vehicle turning out of the side road.

2.5 Parking Supply and Demand

2.5.1 On-street Parking Provision

Currently, vehicles can be parked on both sides of Peel Street, O'Connell Street and Marius Street in the vicinity of the site. On-site observations indicate that current on street demands are reasonably low, with some parking observed adjacent to the commercial developments along Peel Street and O'Connell Street.

2.5.2 Off-Street Parking Provision

There is ample off-street parking in the general locality of the subject site. The commercial developments in the vicinity of the subject site all provide off street parking areas for use by staff and visitors as required. Spill over parking occurs on the road adjacent to these properties.

2.5.3 Parking Demand and Utilisation

Limited on street parking noted in general vicinity of subject site.

2.5.4 Set down or pick up areas

There are no set down or pick up areas in the locality of the site.

2.6 Public Transport

2.6.1 Rail Station Locations

Tamworth railway station is approximately 800 metres to the east of the site and provides a limited service.

2.6.2 Bus Stops and Associated Facilities

Tamworth Buslines operates regular weekday services in the vicinity of the site with less frequent services of a Saturday. Route 430 (Oxley Vale) runs along Peel Street whilst Route 431 (North and East Tamworth) runs north of the site, both within 400 metres of the site. (Refer Appendix D for details)

2.7 Other Proposed Developments

It is understood that there are no other developments of significance in the general locality of the subject site.

3 Proposed Rezoning

3.1 The Planning Proposal

The proposal could allow for approximately 5000 square metres of floor area to be developed, providing a mixed use commercial development that could allow for a supermarket, furniture store or office supplies type development. Access can be provided via the existing access points on Marius Street and O'Connell Street. Parking for the proposed use will be contained within the overall site area to minimise any impact upon the local road network in the general vicinity of the subject site

3.1.1 Phasing and Timing

Whilst the rezoning could provide a number of separate units allowing for a build-up of users and associated parking / traffic demands, for the purposes of this assessment it has been assumed that the rezoning will all be constructed in one stage with no phased construction.

3.1.2 Access and Circulation Requirements

The rezoning will generally need to accommodate both light vehicles and heavy vehicles, typically semi-trailers, associated with deliveries to the site. All vehicles will be able to enter and exit the site in a forward direction.

3.2 Access

3.2.1 Driveway Location

All vehicle access to the subject site will be via the existing access points on Marius Street and O'Connell Street. (refer to site plan in **Appendix A**). The access points will be designed and constructed in accordance with Council design requirements.

Both of these driveways are located on a straight section of road and as such offer good visibility for drivers entering and exiting the site. The access on O'Connell Street currently allows for exit traffic movements only but with this proposal this will change to allow vehicles to enter and exit at this location. This will help to reduce the impact along Marius Street.

The access on Marius Street will remain as per the existing with restricted movements due to the difference in levels for the opposing traffic lanes as well as the raised central median. This access will allow for left in and left out movements only.



■ *Photo 5 - Existing site access. Note allows for exit movement only*

3.2.2 Service Vehicle Access

The rezoning will require service vehicle access, for inbound deliveries (and potentially outbound deliveries dependent upon the end user) as well as waste collection etc. The largest service vehicle would be a 19 metres semi-trailer with smaller delivery van and refuse vehicles also requiring access. The refuse will be collected by a private contractor with vehicles typically 12.5 metres long, similar to Council refuse collection vehicles.

3.2.3 Access to Public Transport

There will be no need for public transport to access the site.

3.3 Circulation

3.3.1 Pattern of circulation

Traffic will be able to enter and exit the site in a forward direction.

3.3.2 Road width

The width of the internal roads and access roads will be in accordance with Councils' Design Guide. This can be determined and agreed at the detailed design stage of the process and will need to take into account the swept path requirements for semi-trailers.

3.3.3 Internal Bus Movements

It is considered that there will be neither internal bus movements nor a requirement for a bus to travel within the rezoned site.

3.3.4 Service Area Layout

A dedicated service area will be provided in conjunction with the future development of the site to allow for the delivery of supplies etc to the end user. The design of the site will allow for the service area to be in accordance with Council requirements and accommodate the swept path requirements of the delivery vehicles. This is not required for the proposed rezoning application.

3.4 Parking

3.4.1 Proposed Supply

All parking for this planning proposal will be contained within the site.

Dependent upon the end user, the parking provision could vary considerably. Parking will need to be provided in accordance with the Council DCP to ensure minimal impact upon the adjacent road network.

However, it is noted that there is sufficient spare capacity on the adjacent road network, with angle parking permitted along both sides of O'Connell Street in the vicinity of the subject site. This could safely accommodate any additional parking during peak events e.g. Christmas time when excess parking demands could occur.

3.4.2 Parking Layout

The site layout will allow for the safe parking of vehicles within the site. This will include the loading dock area. The parking layout and access aisles will all be designed and constructed in accordance with Council requirements and will be developed during the detailed design phase of future projects.

3.4.3 Service Vehicle Parking

The largest service vehicle will be a semi trailer associated with delivery of materials and supplies to the site. A dedicated service dock area will be provided to accommodate these vehicles.

3.4.4 Pedestrian and Bicycle Facilities

It is recommended that pedestrian access to the site will be provided with connections to the street frontages on Marius Street and O'Connell Street as part of the future redevelopment of the site. These connections will allow for safe movement of pedestrians through the site and to connect with existing facilities on the adjacent roads. A path should be provided to connect between the access to the site on O'Connell Street and Peel Street. Similarly, a path should be provided to allow pedestrians to cross the central reserve on Marius Street to connect between the site and the existing footpath on the northern side of Marius Street. These connections however are not required to support the rezoning application.

Cyclists will be able to access the site via the existing road network. Given the width of the local roads and the low overall flows this is considered acceptable. There is adequate space that bicycle parking facilities can be provided within the site and can be determined as part of a future development application.

4 Transport Analysis

4.1 Traffic Generation

The planning proposal is to rezone the land to suit a mixed use development that could cater for a variety of end users. Discussion with the study team indicates that the site could cater for a supermarket development, office supplies shop or bulky goods such as furniture sales. It can be seen that these could provide a variety of future flows, and a summary of the potential flows is given below:

■ **Table 4-1 Land Use and potential traffic generation**

Land use	Trip Generation Rate*	Peak hour flows
Supermarket	155 vph/1000 m2 GFA	775
Bulky goods retail	25 vph/1000 m2 GFA	125
Commercial space	20 vph/1000 m2 GFA	100
Specialist retail	25 vph/1000 m2 GFA	125

*Source: RTA Guide to Traffic Generating Developing

The above table shows a variety of potential future flows. To ensure a robust design, it is proposed to use the highest generator i.e. supermarket on the basis that if the other land uses were adopted in the future then this study provides an over assessment of the potential impacts and meets the requirements of the worst case scenario.

4.1.1 Daily and Seasonal Factors

The nature of the proposal is based around retail outlets of some description, which leads to traffic flows generally 6 days per week and some increased demand during peak periods e.g. Christmas and sales periods. However, these peaks are not significant and the rates provided by the RTA guide are considered appropriate for this assessment.

4.1.2 Sight Distances

The sight distances have been assessed at the driveways as well as at the key intersections at both ends of O'Connell Street. The access points are located on straight sections of road and as such, offer good visibility in both directions. In accordance with AS2890.1 (Off Street car parking) the sight requirements for driveways in a 50 km/h zone are 69 metres. The available visibility has been measured at both of the driveways and exceeds 100 metres in both directions at both access points.

At the intersection of O'Connell Street and Peel Street, the posted speed limit of Peel Street is 60 km/h. From the RTA Road Design Guide, the required visibility distance is 105 metres. The visibility has been checked on site and exceeds 150 metres in both directions. This will ensure the intersection can continue to operate in a safe manner.

For the intersection of O'Connell Street with Marius Street, the posted speed limit is 50 km/h and from the RTA Road Design Guide the visibility requirement is 80 metres. The visibility has been measured on site and exceeds 120 metres in both directions. It is noted that visibility to the right is partially obscured by the line of trees, but the canopy of these trees is located above the sight line and the gaps in the tree trunks allows for drivers to observe approaching vehicles. It is therefore considered that the visibility at this location is acceptable.



■ *Photo 6 - view left from driveway on O'Connell Street*



■ *Photo 7 - view right from driveway on O'Connell Street*



■ *Photo 8 – visibility splay to right from O'Connell Street onto Peel Street*



■ *Photo 9 – visibility splay to left from O'Connell Street onto Peel Street*



■ *Photo 10 – view to right for drivers exiting O'Connell Street onto Marius Street*



■ *Photo 11 – view to left for drivers exiting O'Connell Street onto Marius Street*

4.1.3 Queuing at entrance to site

Given the overall low traffic flows along both Marius Street and O'Connell Street, it is considered that there will be minimal queuing associated with the traffic movements into the subject site. The width of both of these roads allows through traffic movements to pass a vehicle slowing down to enter the subject site.

4.1.4 Comparison with existing site access

The proposed site access is located in the same position as the existing access points. However, it is proposed to alter the access on O'Connell Street to allow for both entry and exit movements. This will reduce the flows at Marius Street and allow for any delivery vehicles to use this access point and avoid using the access on Marius Street. The access on Marius Street can allow for left in and left out movements only due to the raised central median and it is proposed that this access has a weight limit imposed on it to restrict access by larger vehicles.

4.1.5 Pedestrian Movements

Pedestrian access to the site will be available using the local road and footpath network. Pedestrian access will be required to both Marius Street and O'Connell Street from the subject site. A footpath should be considered along O'Connell Street to connect with Peel Street to the south of the site. There are existing footpaths on both Marius Street and Peel Street that can service the future development of the site. These can be determined and assessed during the detailed design stage of a future development application and are not required to support a rezoning application.

4.2 Traffic Distribution and Assignments

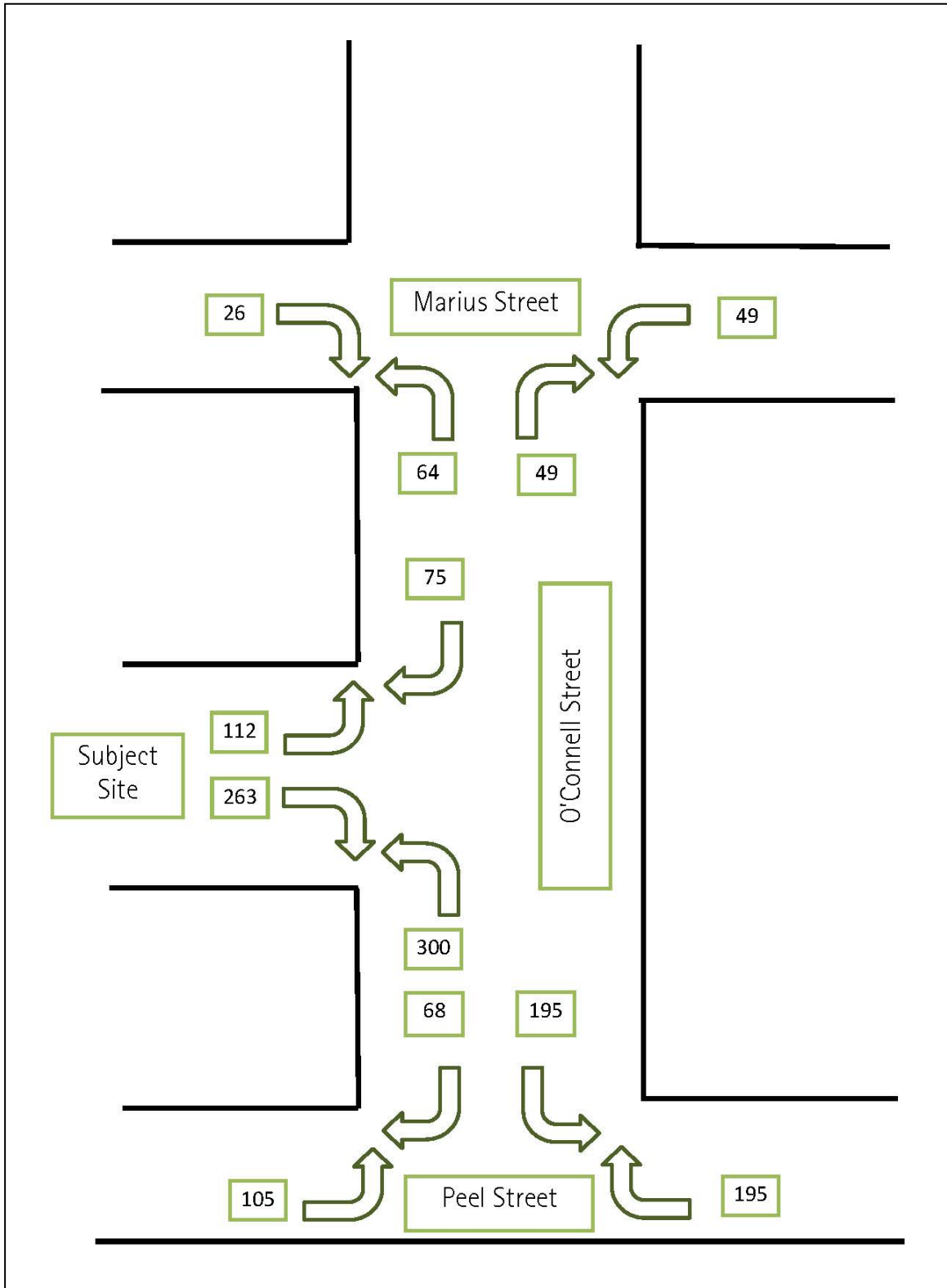
4.2.1 Origin / destinations assignment

The traffic distribution has been based on 750 vehicles per hour, split equally inbound and outbound, to reflect a supermarket type development. It is expected that the majority of the traffic would have an origin / destination towards the centre of Tamworth. For the purpose of this assessment, it has been assumed that 65% of the traffic leaving the site will have an origin / destination towards the centre of Tamworth and that 80% of this traffic will use Peel Street.

With 35% of traffic having an origin / destination towards the west and north-west of the site, a high proportion of these could use Marius Street then Bligh Street or Jewry Street to access Peel Street and then access to the west. For the purposes of this assessment, it has been assumed that 80% of traffic from the west would gain access via the intersection of Peel Street and O'Connell Street whilst 50% of west bound traffic would turn right out of O'Connell Street onto Peel Street to then head west along Peel Street. The projected traffic volumes associated with the planning proposal are shown below.

As a worst case scenario it has been assumed that all traffic will enter and exit the site via the access on O'Connell Street, as advice from the study team indicates that the access on Marius Street may be restricted for general vehicle entry and exit.

For the AM peak, it has been assumed that the traffic flows would be 50% of the above flows. This ensures a robust assessment of the future network operations.



■ *Figure 4-1 Future PM peak traffic flows associated with development of site as Supermarket.*

4.3 Modal Split

Given the location of the site and the type of planning proposal, it is considered that the majority of people visiting the site would drive in motor vehicles and that there would be very few customers accessing the site by public transport, cycling or walking.

However, it is considered that workers associated with the future development could access the site via walking or cycling which would reduce the demand for vehicles to access the site and the associated parking impacts. For the purposes of this assessment no discount has been applied for modal split.

4.4 Impact of Generated Traffic (Capacity and Level of service)

4.4.1 Impact on daily and peak hour traffic flows

The existing daily traffic flows are well within acceptable limits for their classifications. Peel Street is classified as a regional road acting as an arterial road. Through the urban centre of Tamworth, the capacity of Peel Street is given as 900 vehicles per hour as a minimum with potential for growth upto 1200 vehicles per hour in each direction (source RTA Guide to Traffic Generating Developments). Current traffic flows are in the order of 500 vehicles per hour per direction on Peel Street based on the traffic surveys completed as part of this study. Assuming some 65% of flows could impact on Peel Street to the east of O'Connell Street this could increase the peak hour flows in the PM peak from around 500 to 700 vehicles per hour. This will remain well within the capacity of the road and indicates there will be minimal impact upon the operation of this road.

This is a worst case scenario, as it can be seen that with a development such as a supermarket there will be a considerable amount of existing traffic on Peel Street that could divert to the site and incorporate shopping with the commute home. This could further reduce the impact of the traffic associated with the development of the subject site.

For both Marius Street and O'Connell Street, the traffic flows are much lower but the capacity is the same. The existing two-way traffic flows along Marius Street is in the order of 750 vehicles during the morning peak and 585 in the afternoon peak. The peak directional flow in the PM peak is 320 westbound and this would increase to around 390 vehicles per hour, well within acceptable limits. Similarly, during the PM peak the peak directional flow southbound on O'Connell Street was 28 vehicles per hour and this would increase to around 300 vehicles per hour, well within the acceptable limit of 900 vehicles per hour.

4.4.2 Peak Hour Impacts on Intersections

As part of the assessment for the planning proposal, the intersection capacity analysis program Sidra has been used. The Sidra analysis has reviewed the impact of the generated traffic plus background traffic at the key intersection of O'Connell Street with Peel Street and O'Connell Street with Marius Street. This analysis has been completed for both the morning and afternoon peak periods.

The Sidra analysis shows that both of these intersections will continue to operate in an acceptable manner with minimal delays and congestion for road users. The results of the Sidra analysis for the current observed traffic flows together with the potential development traffic is summarised below.

■ **Table 4-2 – Sidra results, Intersection of Peel Street with O’Connell Street, existing traffic flows AM and PM peak**

Approach	Level of service	Delay (seconds)	Queue (metres)
Peel St east	A / A	0.4 / 0.3	0.8 / 0.8
O’Connell St	A / A	13.0 / 11.7	1.1 / 0.7
Peel St west	A / A	0.3 / 0.4	0.0 / 0.0

Note : AM / PM peak results

■ **Table 4-3 Sidra results, Intersection of O’Connell Street and Marius Street existing traffic flows, AM and PM peak**

Approach	Level of service	Delay (seconds)	Queue (metres)
O’Connell St south	A / A	9.2 / 8.8	0.6 / 0.8
Marius St east	A / A	0.3 / 0.2	0.1 / 0.1
O’Connell St north	A / A	10.6 / 9.1	0.4 / 0.6
Marius St west	A / A	0.2 / 0.4	0.3 / 0.2

Note: AM / PM peak results

The above results confirm the on-site observations that there are minimal delays and congestion for the existing road users in the immediate vicinity of the subject site.

■ **Table 4-4 - Sidra results, Intersection of Peel Street with O’Connell Street, existing traffic flows plus development flows, AM and PM peak**

Approach	Level of service	Delay (seconds)	Queue (metres)
Peel St east	A / A	2.4 / 3.7	6.4 / 16.7
O’Connell St	A / B	12.9 / 15.7	4.5 / 11.3
Peel St west	A / A	0.8 / 1.4	0.0 / 0.0

Note : AM / PM peak results

■ **Table 4-5 Sidra results, Intersection of O’Connell Street and Marius Street existing traffic flows plus development, AM and PM peak**

Approach	Level of service	Delay (seconds)	Queue (metres)
O’Connell St south	A / A	9.7 / 9.7	2.0 / 3.1
Marius St east	A / A	0.9 / 1.0	0.1 / 0.1
O’Connell St north	A / A	10.8 / 9.8	0.4 / 0.6
Marius St west	A / A	0.3 / 1.1	0.4 / 1.0

Note : AM / PM peak results

4.4.3 Background traffic and other developments

In accordance with normal RTA requirements, the impact of the additional traffic has been assessed allowing for 10 years background growth along the Peel Street and Marius Street. An allowance of 1.5% per annum, giving 15% overall growth, has been used. This provides an absolute worst case scenario, as the historic growth along the Peel Street has been considerably less than 1.5% per annum over the last 10 years or more.

The Sidra analysis has been repeated for both intersections at the end of O’Connell Street and the results of the analysis are presented below for both the morning and afternoon peak periods.

■ **Table 4-6 - Sidra results, 2022 traffic flows AM and PM peak, O'Connell Street and Peel Street**

Approach	Level of service	Delay (seconds)	Queue (metres)
Peel St east	A / A	0.4 / 0.3	0.9 / 0.9
O'Connell St	B / A	15.1 / 13.4	1.3 / 0.8
Peel St west	A / A	0.2 / 0.3	0.0 / 0.0

Note : AM / PM peak results

■ **Table 4-7 Sidra results, 2022 traffic AM and PM peak, O'Connell Street and Marius Street**

Approach	Level of service	Delay (seconds)	Queue (metres)
O'Connell St south	A / A	9.9 / 9.4	0.8 / 1.0
Marius St east	A / A	0.3 / 0.2	0.1 / 0.1
O'Connell St north	A / A	11.8 / 10.1	0.6 / 0.7
Marius St west	A / A	0.3 / 1.1	0.4 / 0.3

Note : AM / PM peak results

The above results confirm that the intersections in the immediate vicinity of the subject site have adequate capacity to cater for the projected growth in background traffic flows in the vicinity of the subject site.

■ **Table 4-8 Sidra results, 2022 traffic flows plus development AM and PM peak, O'Connell Street and Peel Street**

Approach	Level of service	Delay (seconds)	Queue (metres)
Peel St east	A / A	2.4 / 3.7	7.2 / 18.8
O'Connell St	B / B	15.3 / 20.9	5.8 / 15.8
Peel St west	A / A	0.7 / 1.3	0.0 / 0.0

Note : AM / PM peak results

■ **Table 4-9 Sidra results, 2022 traffic flows plus development AM and PM peak, O'Connell Street and Marius Street**

Approach	Level of service	Delay (seconds)	Queue (metres)
O'Connell St south	A / A	10.9 / 10.4	4.0 / 3.5
Marius St east	A / A	1.2 / 0.9	0.1 / 0.1
O'Connell St north	A / A	12.5 / 10.8	0.7 / 0.8
Marius St west	A / A	0.6 / 1.1	1.1 / 1.1

Note : AM / PM peak results

The above analysis shows that the road network has adequate capacity to cater for the traffic flows associated with the rezoning of the subject site as well as future background growth on the road network in the immediate vicinity of the subject site. The two key intersections that could be impacted upon by the rezoning have adequate capacity to ensure delays and congestion are acceptable to existing road users.

4.4.4 Impact of Construction Traffic

The construction work will require a number of trucks to deliver materials, including concrete to the site. This will occur over a number of months as the site is developed, thereby reducing the impact of this traffic during the peak periods. There will also be a number of construction workers on the site, however typically the work will commence on site at 7.30 AM and finish at around 3.30 PM.

Larger machinery may need to be used on site during construction e.g. crane and this will be delivered early in the construction process and remain on site until the construction work is complete.

Access for construction work on the site will be via the existing access points on Marius Street and O'Connell Street. All heavy vehicle access will be via O'Connell Street to reduce the impact upon the adjacent residents on Marius Street. The majority of the work will be completed on site with minimal impact upon the external road network. The driveway access points will be upgraded as part of the future development and this will need to be controlled to reduce the interaction with road users and to maintain road safety.

All works on site will be governed by the relevant EP&A rules and as stipulated within any development consent granted by Tamworth Regional Council. This will include hours of work.

4.5 Impact on Road Safety

The additional traffic flows associated with the planning proposal of the subject site will have a minimal impact upon road safety in the immediate vicinity of the subject site. Both of the site access points are located on a straight section of road and offer good sight lines in both directions for drivers entering and exiting the site. It is considered that these access points will be able to operate in a safe and acceptable manner with the traffic associated with the future development.

The key intersection impacted upon by the planning proposal will be O'Connell Street with Peel Street. This intersection provides a high level of control and access, with a sheltered right turn lane in the westbound direction, allowing through traffic movements to continue unhindered by traffic waiting to turn right into O'Connell Street. In addition, this intersection is located on a straight section of road, offering good visibility in both directions, to allow for safe traffic movements in and out of O'Connell Street. The accident data for the intersection does not highlight any particular issues.

For the intersection of Marius Street with O'Connell Street, the existing layout provides a safe and easy to understand layout. The width of the central median allows a vehicle to prop in the centre of the road, allowing through traffic movements to continue as well as allowing turning traffic from the side roads to turn right in two movements, helping to reduce delays and improve safety.

4.6 Parking Analysis

There is a need for adequate parking for both light and heavy vehicles. The peak parking demand will coincide with the operation hours of the site, generally being between 9:00AM and 5.30 PM with potential longer hours if a supermarket is provided on the site.

A summary of the potential parking demands, based upon the projected floor area of 5,000 square metres and advice provided by the Tamworth Regional DCP 2010 is detailed below:

■ *Table 4-10 – Projected Parking Demands*

Development	Rate	Parking Requirement
Supermarket	1 per 16 m ²	312
Bulky goods retail	1 per 45 m ²	111
Commercial space	1 per 25 m ²	200
Specialist retail	1 per 45 m ²	111

The above table shows that the parking demand could vary considerably and will be dependent upon the end user. As part of the development application stage for the site a detailed assessment will be required for the parking requirements associated with the end user at that time.

4.7 Public Transport

4.7.1 Options for improving services

Minimal, if any, demand for public transport will be generated by the new site proposal.

4.7.2 Pedestrian Access to Bus Stops

No specific pedestrian access to any new bus stops will be required. Provision of a footpath along O'Connell Street as part of the future development can allow for access to existing bus routes if required.

4.8 Pedestrian and Cyclists

Although not required for rezoning, recommendations for pedestrian and cycling facilities should be determined and assessed as part of a future development application.

At this stage a new footpath should be provided along O'Connell Street on the western side adjacent to the subject site that will allow for connections with existing footpaths to the north and south of the site. A pedestrian path within the site will also be required to connect between the two site frontages.

No off site cyclist facilities will be required as part of the rezoning of the subject site. However cyclist parking will be required within the future development to cater for on-site parking demands associated with users on the site. This cycle parking will be required for staff as well as customers and should be provided in accordance with the Council DCP.

5. Improvement Analysis

5.1 Improvements to Accommodate Existing Traffic

From the Sidra analysis together with on-site observations there are no upgrades required to accommodate the existing traffic flows on the road network in the immediate vicinity of the subject site.

5.2 Improvements to Accommodate Background Traffic

The Sidra analysis shows that there are no upgrades required to accommodate the background growth in traffic flows on the road network in the immediate vicinity of the subject site.

5.3 Additional Improvements to Accommodate Development Traffic

The Sidra analysis shows that there are no upgrades required to accommodate the future development traffic associated with the re-zoning of the site on the road network in the immediate vicinity of the subject site.

5.4 Alternative Improvements

It is considered that the proposed works will not have any impact on the adjacent developments in the general locality of the subject site.

5.5 Status of Improvements Already Funded, Programmed or Planned

The road authority has indicated that there are currently no works identified for upgrading the road network in the immediate vicinity of the subject site.

6. Summary and Recommendations

6.1 Summary

The following summary is provided from the investigations into the proposed rezoning of the land off O'Connell Street, Tamworth NSW:

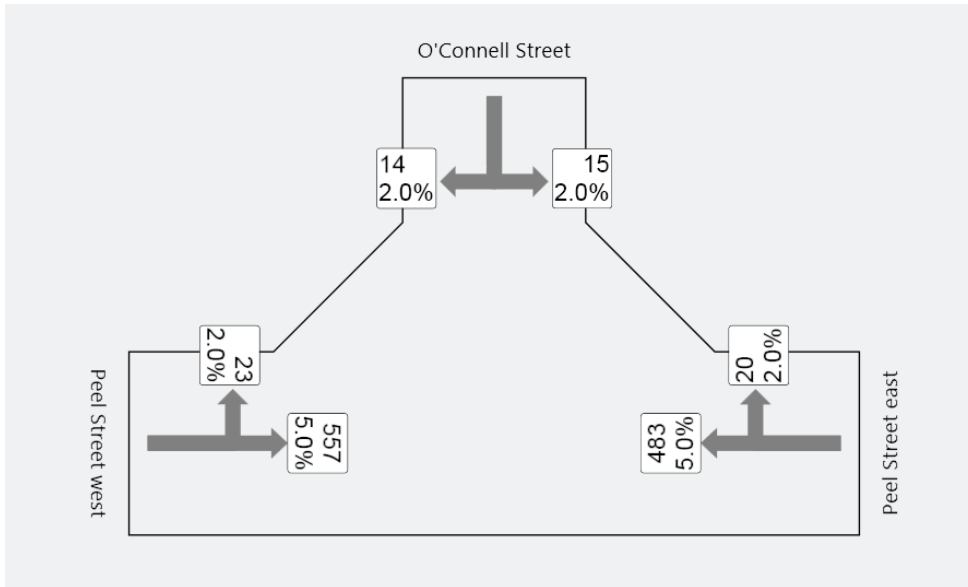
1. The proposal is to rezone the land to suit a mixed use development that could potentially allow for a supermarket, specialist retail / bulky goods or commercial development. The site is currently used by Telstra and generates minimal traffic movements.
2. The site is bounded by O'Connell Street to the east and has road access to Marius Street to the north. The main road through the locality is Peel Street to the south of the site. The future redevelopment of the site could have an impact upon the operation of the intersection of Peel Street with O'Connell Street as well as O'Connell Street with Marius Street.
3. As part of the rezoning assessment, traffic survey data has been collected at the two key intersections identified above during a traditional morning and afternoon peak period. The surveys on site indicated that there are minimal delays for existing road users in the immediate vicinity of the subject site and the Sidra analysis of these two intersections confirms this, with the intersection operating well within acceptable limits, with minimal delays and congestion for road users.
4. The additional traffic flows potentially generated by the future development could be in the order of 750 vehicle for the most intense use on the site i.e. supermarket. The impact of these additional traffic flows has been assessed for the morning and afternoon peak period and the Sidra analysis shows that these additional flows will have an acceptable impact upon the operation of the two key intersections in the immediate vicinity of the subject site.
5. All parking will need to be accommodated within the proposed site in accordance with the Council DCP and this will need to be assessed in detail during the development application stage once the end user is known.
6. The future development could increase pedestrian demands in the vicinity of the site and it is considered that a footpath should be provided along the western side of O'Connell Street as part of the redevelopment of the site.

6.2 Recommendations

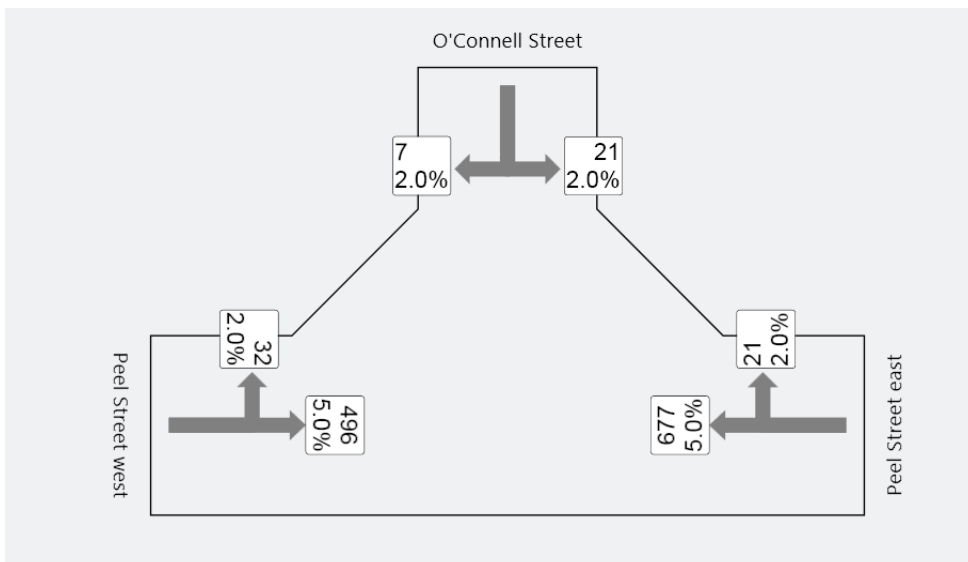
1. Although not required for rezoning it is recommended as part of the detailed design stage of a future redevelopment of the site, that the existing driveways be upgraded in accordance with Council requirements.
2. Similarly a pedestrian path should be provided along the western side of O'Connell Street to provide a pedestrian linkage to and from both Marius Street and Peel Street as part of a future redevelopment.
3. Parking for the future redevelopment will need to be assessed during the development application stage of the redevelopment to ensure parking is provided on site in accordance with Council's DCP.

Appendix A Survey Data

Traffic surveys completed on Monday 30th, Tuesday 31st January and Wednesday 1st February 2012.

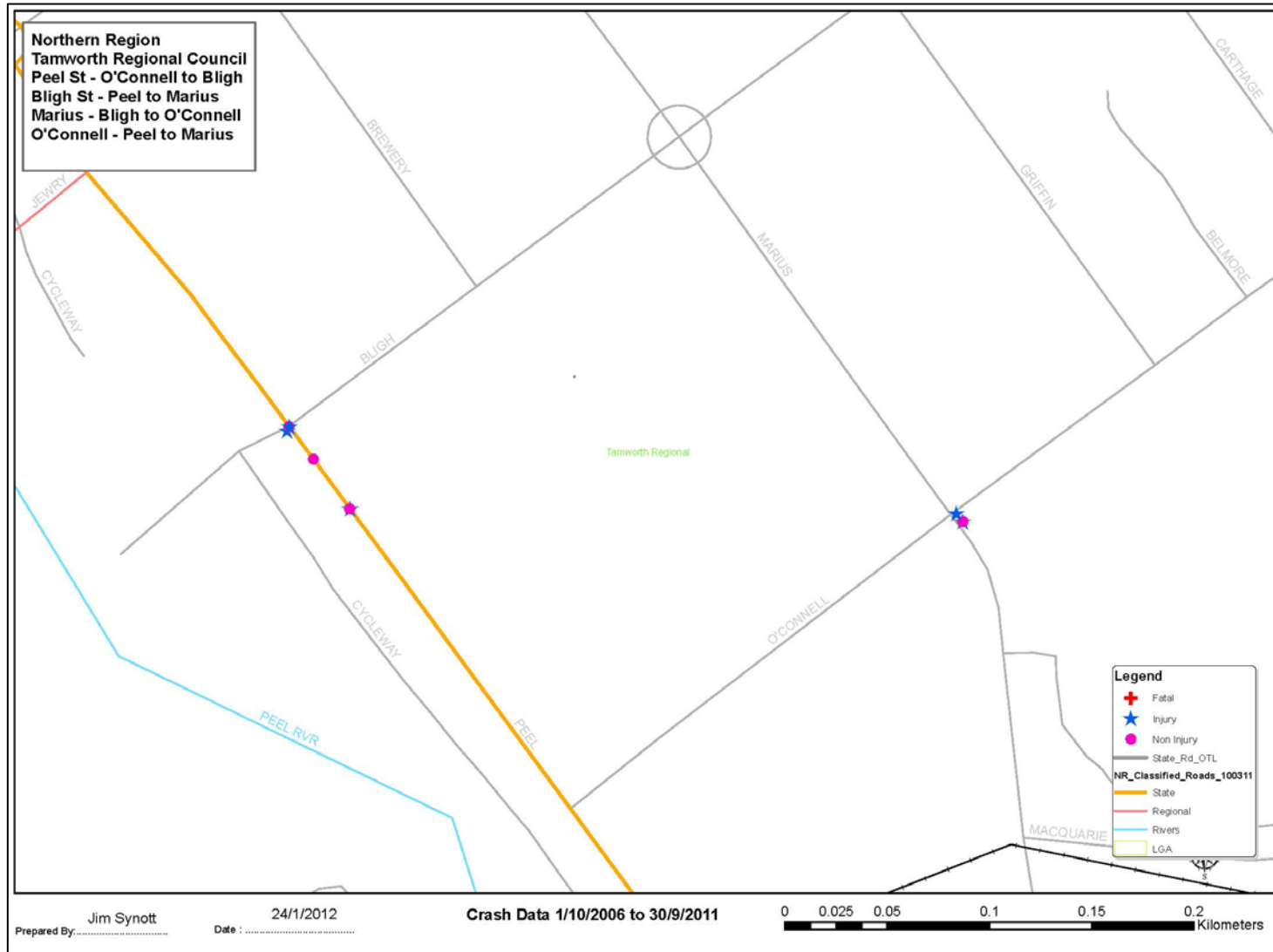


Traffic Volumes – AM peak intersection of Peel Street and O'Connell Street.



Traffic Volumes – PM peak intersection of Peel Street and O'Connell Street

Appendix B Accident Data



Brief Crash Report



Crash No	Date	Day	Time	Dist	ID Feature	Loc	Alg	Lgt	Wth	Sfc	SL	RUM	Tus	TU1	S1	D	Manoeuvre1	TU2	S2	D	Manoeuvre2	K	I	Fac	
																								S	F

Northern Region

Tamworth City LGA

Tamworth

Marius St

625675	03/06/2008	Tue	14:50		at OCONNELL ST	XJN	STR	Off	Raining	Wet	50	30	2	WAG	1	N	Proceeding in lane	WAG	1	N	Stationary	0	0	
695764	13/01/2010	Wed	13:00		at OCONNELL ST	XJN	STR	Off	Fine	Dry	50	10	2	4WD	2	E	Proceeding in lane	CAR	1	S	Proceeding in lane	0	1	
730007	03/11/2010	Wed	08:05		at OCONNELL ST	XJN	STR	Off	Fine	Dry	60	10	2	4WD	2	E	Proceeding in lane	CAR	1	S	Proceeding in lane	0	0	
732398	17/11/2010	Wed	08:05	5 m	N OCONNELL ST	XJN	STR	Off	Fine	Wet	60	30	2	CAR	1	S	Proceeding in lane	CAR	1	S	Stationary	0	1	

Peel St

601409	13/12/2007	Thu	06:50		at BLIGH ST	TJN	STR	Off	Fine	Dry	60	10	2	TRK	2	W	Proceeding in lane	M/C	1	S	Proceeding in lane	0	1	
636241	04/09/2008	Thu	17:15		at BLIGH ST	TJN	STR	On	Overcast	Dry	50	13	2	CAR	2	W	Turning right	CAR	1	S	Proceeding in lane	0	1	
647810	20/11/2008	Thu	15:40		at BLIGH ST	XJN	STR	Off	Overcast	Wet	60	10	2	CAR	2	W	Proceeding in lane	UTE	1	N	Proceeding in lane	0	0	
683279	25/09/2009	Fri	15:50		at BLIGH ST	XJN	STR	Off	Fine	Dry	60	36	2	CAR	1	S	Turning right	TRK	1	S	Proceeding in lane	0	1	
735289	08/11/2010	Mon	11:35	20 m	S BLIGH ST	2WY	STR	Off	Fine	Dry	50	30	3	LOR	1	S	Proceeding in lane	CAR	1	S	Stationary	0	0	
625780	17/04/2008	Thu	18:35	50 m	S BLIGH ST	2WY	STR	On	Fine	Dry	60	30	3	CAR	1	S	Proceeding in lane	UTE	1	S	Stationary	0	3	
642020	23/10/2008	Thu	17:05	50 m	S BLIGH ST	2WY	STR	Nil	Fine	Dry	60	30	2	CAR	1	S	Proceeding in lane	CAR	1	S	Stationary	0	0	

Report Totals: Crashes: 11 Fatal Crashes: 0 Injury Crashes: 6 Non-Casualty Crashes: 5 Traffic Units: 24 Killed: 0 Injured: 8

Crashid dataset Peel St, Bligh St, Marius St, O'connell St, Tamworth Crash Data 1/10/2006 to 30/9/2011

Note: Data for the 9 month period prior to the generated date of this report are incomplete and are subject to change.

Summary Crash Report

# Crash Type	Contributing Factors	Crash Movement	CRASHES	CASUALTIES
Car Crash 10 90.9%	Speeding 0 0.0%	Intersection, adjacent approaches 5 45.5%	Fatal crash 0 0.0%	Killed 0 0.0%
Light Truck Crash 3 27.3%	Fatigue 0 0.0%	Head-on (not overtaking) 0 0.0%	Injury crash 6 54.5%	Injured 8 100.0%
Rigid Truck Crash 1 9.1%	Alcohol 0 0.0%	Opposing vehicles; turning 0 0.0%	Non-casualty crash 5 45.5%	^ Unrestrained 0 0.0%
Articulated Truck Crash 0 0.0%		U-turn 0 0.0%	^ Belt fitted but not worn. No restraint fitted to position OR No helmet worn	
'Heavy Truck Crash (1) (9.1%)	Weather	Rear-end 5 45.5%	Time Group	% of Day
Bus Crash 0 0.0%	Fine 8 72.7%	Lane change 0 0.0%	00:01 - 02:59 0 0.0% 12.5%	Crashes
"Heavy Vehicle Crash (1) (9.1%)	Rain 1 9.1%	Parallel lanes; turning 1 9.1%	03:00 - 04:59 0 0.0% 8.3%	4 2010 2
Emergency Vehicle Crash 0 0.0%	Overcast 2 18.2%	Vehicle leaving driveway 0 0.0%	05:00 - 05:59 0 0.0% 4.2%	1 2009 1
Motorcycle Crash 1 9.1%	Fog or mist 0 0.0%	Overtaking; same direction 0 0.0%	06:00 - 06:59 1 9.1% 4.2%	5 2008 4
Pedal Cycle Crash 0 0.0%	Other 0 0.0%	Hit parked vehicle 0 0.0%	07:00 - 07:59 0 0.0% 4.2%	1 2007 1
Pedestrian Crash 0 0.0%	Road Surface Condition	Hit railway train 0 0.0%	08:00 - 08:59 2 18.2% 4.2%	
	Wet 3 27.3%	Hit pedestrian 0 0.0%	09:00 - 09:59 0 0.0% 4.2%	
	Dry 8 72.7%	Permanent obstruction on road 0 0.0%	10:00 - 10:59 0 0.0% 4.2%	
	Snow or ice 0 0.0%	Hit animal 0 0.0%	11:00 - 11:59 1 9.1% 4.2%	
Location Type	Natural Lighting	Off road, on straight 0 0.0%	12:00 - 12:59 0 0.0% 4.2%	~ School Travel Time
*Intersection 8 72.7%	Dawn 0 0.0%	Off road on straight, hit object 0 0.0%	13:00 - 13:59 1 9.1% 4.2%	Involvement 5 45.5%
Non intersection 3 27.3%	Daylight 9 81.8%	Out of control on straight 0 0.0%	14:00 - 14:59 1 9.1% 4.2%	
* Up to 10 metres from an intersection	Dusk 1 9.1%	Off road, on curve 0 0.0%	15:00 - 15:59 2 18.2% 4.2%	McLean Periods
~ 07:30-09:30 or 14:30-17:00 on school days	Darkness 1 9.1%	Out of control on curve 0 0.0%	16:00 - 16:59 0 0.0% 4.2%	% Week
Collision Type	Speed Limit	Other crash type 0 0.0%	17:00 - 17:59 2 18.2% 4.2%	A 3 27.3% 17.9%
Single Vehicle 0 0.0%	40 km/h or less 0 0.0%		18:00 - 18:59 1 9.1% 4.2%	B 0 0.0% 7.1%
Multi Vehicle 11 100.0%	50 km/h zone 4 36.4%	~ 40km/h or less 0 0.0%	19:00 - 19:59 0 0.0% 4.2%	C 3 27.3% 17.9%
	60 km/h zone 7 63.6%	80 km/h zone 0 0.0%	20:00 - 21:59 0 0.0% 8.3%	D 0 0.0% 3.5%
	70 km/h zone 0 0.0%	90 km/h zone 0 0.0%	22:00 - 24:00 0 0.0% 8.3%	E 0 0.0% 3.6%
Road Classification		100 km/h zone 0 0.0%		F 0 0.0% 10.7%
Freeway/Motorway 0 0.0%		110 km/h zone 0 0.0%	Street Lighting Off/Nil	G 5 45.5% 7.1%
State Highway 0 0.0%			0 of 1 in Dark 0.0%	H 0 0.0% 7.1%
Other Classified Road 7 63.6%				I 0 0.0% 12.5%
Unclassified Road 4 36.4%				J 0 0.0% 10.7%
Day of the Week	# Holiday Periods	New Year 0 0.0%	Queen's BD 0 0.0%	Easter SH 1 9.1%
Monday 1 9.1%	Thursday 5 45.5%	Aust. Day 0 0.0%	Labour Day 0 0.0%	June/July SH 0 0.0%
Tuesday 1 9.1%	Friday 1 9.1%	Easter 0 0.0%	Christmas 0 0.0%	Sept./Oct. SH 0 0.0%
Wednesday 3 27.3%	Saturday 0 0.0%	Anzac Day 0 0.0%	January SH 1 9.1%	December SH 0 0.0%
	Sunday 0 0.0%			
	WEEKDAY 11 100.0%			
	WEEKEND 0 0.0%			

Crashid dataset Peel St, Bligh St, Marius St, O'connell St, Tamworth Crash Data 1/10/2006 to 30/9/2011
Note: Data for the 9 month period prior to the generated date of this report are incomplete and are subject to change.

Percentages are percentages of all crashes. Unknown values for each category are not shown on this report.

Rep ID: REG01 Office: Grafton User ID: synottj

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Appendix C Sidra Analysis

Criteria for interpreting results of SIDRA

1-Level of Service (LoS)

LoS	Traffic Signals and Roundabouts	Give Way and Stop Signs
A	Good	Good
B	Good, with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	Satisfactory	Satisfactory, but requires accident study
D	Operating near capacity	Near capacity and requires accident study
E	At capacity, excessive delay: roundabout requires other control method	At capacity, requires other control mode
F	Unsatisfactory, requires other control mode or additional capacity	Unsatisfactory, requires other control mode

2-Average Vehicle Delay (AVD)

The AVD is a measure of operational performance of an intersection relating to its LoS. The average delay should be taken as a guide only for an average intersection. Longer delays may be tolerated at some intersections where delays are expected by motorists (e.g. those in inner city areas or major arterial roads).

LoS	Average Delay / Vehicle (secs)	Traffic Signals and Roundabouts	Give Way and Stop Signs
A	Less than 15	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	28 to 42	Satisfactory	Satisfactory but accident study required
D	42 to 56	Operating near capacity	Near capacity, accident study required
E	56 to 70	At capacity, excessive delays: roundabout requires other control mode	At capacity; requires other control mode
F	Exceeding 70	Unsatisfactory, requires additional capacity	Unsatisfactory, requires other control mode

3-Degree of Saturation (D/S)

The D/S of an intersection is usually taken as the highest ratio of traffic volumes on an approach to an intersection compared with the theoretical capacity, and is a measure of the utilisation of available green time. For intersections controlled by traffic signals, both queues and delays increase rapidly as DS approaches 1.0. An intersection operates satisfactorily when its D/S is kept below 0.75. When D/S exceeds 0.9, queues are expected.

INTERSECTION SUMMARY

Site: Peel - O'Connell AM
base

Peel Street and O'Connell Street
AM 2012 base flows
Giveaway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1171 veh/h	1405 pers/h
Percent Heavy Vehicles	4.8%	
Degree of Saturation	0.310	
Practical Spare Capacity	157.7%	
Effective Intersection Capacity	3770 veh/h	
Control Delay (Total)	0.21 veh-h/h	0.26 pers-h/h
Control Delay (Average)	0.7 sec	0.7 sec
Control Delay (Worst Lane)	16.7 sec	
Control Delay (Worst Movement)	16.7 sec	16.7 sec
Geometric Delay (Average)	P sec	
Stop-Line Delay (Average)	P sec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	0.2 veh	
95% Back of Queue - Distance (Worst Lane)	1.1 m	
Total Effective Stops	55 veh/h	66 pers/h
Effective Stop Rate	0.05 per veh	0.05 per pers
Proportion Queued	0.03	0.03
Performance Index	14.1	14.1
Travel Distance (Total)	671.4 veh-km/h	805.7 pers-km/h
Travel Distance (Average)	574 m	574 m
Travel Time (Total)	13.6 veh-h/h	16.4 pers-h/h
Travel Time (Average)	42.0 sec	42.0 sec
Travel Speed	49.2 km/h	49.2 km/h
Cost (Total)	451.28\$/h	451.28\$/h
Fuel Consumption (Total)	54.3 L/h	
Carbon Dioxide (Total)	136.1 kg/h	
Hydrocarbons (Total)	0.185 kg/h	
Carbon Monoxide (Total)	4.80 kg/h	
NOx (Total)	0.205 kg/h	

P: You need to Process this Site (F9) for this variable to be computed.

MOVEMENT SUMMARY

Site: Peel - O'Connell AM
base

Peel Street and O'Connell Street
AM 2012 base flows
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
East: Peel Street east											
5	T	508	5.0	0.269	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R	21	2.0	0.035	10.3	LOS A	0.1	0.8	0.52	0.74	40.0
Approach		529	4.9	0.269	0.4	NA	0.1	0.8	0.02	0.03	49.5
North: O'Connell Street											
7	L	16	2.0	0.022	9.6	LOS A	0.1	0.6	0.53	0.71	40.6
9	R	15	2.0	0.047	16.7	LOS B	0.2	1.1	0.75	0.91	35.7
Approach		31	2.0	0.047	13.0	LOS A	0.2	1.1	0.64	0.81	38.1
West: Peel Street west											
10	L	24	2.0	0.013	6.5	LOS A	0.0	0.0	0.00	0.61	43.3
11	T	586	5.0	0.310	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		611	4.9	0.310	0.3	NA	0.0	0.0	0.00	0.02	49.7
All Vehicles		1171	4.8	0.310	0.7	NA	0.2	1.1	0.03	0.05	49.2

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

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8000290, MARK WAUGH PTY LTD, SINGLE

INTERSECTION SUMMARY

Site: Peel - O'Connell PM
base

Peel Street and O'Connell Street
PM 2012 base flows
Giveaway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1320veh/h	1584pers/h
Percent Heavy Vehicles	4.8%	
Degree of Saturation	0.377	
Practical Spare Capacity	112.0%	
Effective Intersection Capacity	3498veh/h	
Control Delay (Total)	0.22veh-h/h	0.26pers-h/h
Control Delay (Average)	0.6sec	0.6sec
Control Delay (Worst Lane)	19.3sec	
Control Delay (Worst Movement)	19.3sec	19.3sec
Geometric Delay (Average)	Psec	
Stop-Line Delay (Average)	Psec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	0.1veh	
95% Back of Queue - Distance (Worst Lane)	0.8m	
Total Effective Stops	59veh/h	71pers/h
Effective Stop Rate	0.04per veh	0.04per pers
Proportion Queued	0.02	0.02
Performance Index	15.8	15.8
Travel Distance (Total)	757.1veh-km/h	908.6pers-km/h
Travel Distance (Average)	574m	574m
Travel Time (Total)	15.4veh-h/h	18.4pers-h/h
Travel Time (Average)	41.9sec	41.9sec
Travel Speed	49.3km/h	49.3km/h
Cost (Total)	508.18\$/h	508.18\$/h
Fuel Consumption (Total)	61.2L/h	
Carbon Dioxide (Total)	153.3kg/h	
Hydrocarbons (Total)	0.208kg/h	
Carbon Monoxide (Total)	5.41kg/h	
NOx (Total)	0.231kg/h	

P: You need to Process this Site (F9) for this variable to be computed.

MOVEMENT SUMMARY

Site: Peel - O'Connell PM
base

Peel Street and O'Connell Street
PM 2012 base flows
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV Deg.	Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c			sec	Vehicles			
East: Peel Street east											
5	T	713	5.0	0.377	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R	22	2.0	0.034	9.9	LOS A	0.1	0.8	0.50	0.73	40.4
Approach		735	4.9	0.377	0.3	NA	0.1	0.8	0.02	0.02	49.6
North: O'Connell Street											
7	L	22	2.0	0.028	9.1	LOS A	0.1	0.7	0.50	0.70	41.0
9	R	7	2.0	0.029	19.3	LOS B	0.1	0.6	0.80	0.92	34.1
Approach		29	2.0	0.029	11.7	LOS A	0.1	0.7	0.58	0.75	39.1
West: Peel Street west											
10	L	34	2.0	0.018	6.5	LOS A	0.0	0.0	0.00	0.61	43.3
11	T	522	5.0	0.276	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		556	4.8	0.276	0.4	NA	0.0	0.0	0.00	0.04	49.5
All Vehicles		1320	4.8	0.377	0.6	NA	0.1	0.8	0.02	0.04	49.3

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

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INTERSECTION SUMMARY

Site: Marius - O'Connell AM
base

Marius and O'Connell 4-way give way
2012 AM base flows
Giveaway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	842veh/h	1011pers/h
Percent Heavy Vehicles	0.0%	
Degree of Saturation	0.277	
Practical Spare Capacity	188.7%	
Effective Intersection Capacity	3039veh/h	
Control Delay (Total)	0.18veh-h/h	0.22pers-h/h
Control Delay (Average)	0.8sec	0.8sec
Control Delay (Worst Lane)	11.6sec	
Control Delay (Worst Movement)	11.9sec	11.9sec
Geometric Delay (Average)	Psec	
Stop-Line Delay (Average)	Psec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	0.1veh	
95% Back of Queue - Distance (Worst Lane)	0.6m	
Total Effective Stops	53veh/h	64pers/h
Effective Stop Rate	0.06per veh	0.06per pers
Proportion Queued	0.03	0.03
Performance Index	10.3	10.3
Travel Distance (Total)	483.1veh-km/h	579.7pers-km/h
Travel Distance (Average)	574m	574m
Travel Time (Total)	9.8veh-h/h	11.8pers-h/h
Travel Time (Average)	42.1sec	42.1sec
Travel Speed	49.1km/h	49.1km/h
Cost (Total)	317.96\$/h	317.96\$/h
Fuel Consumption (Total)	35.8L/h	
Carbon Dioxide (Total)	89.6kg/h	
Hydrocarbons (Total)	0.133kg/h	
Carbon Monoxide (Total)	3.48kg/h	
NOx (Total)	0.147kg/h	

P: You need to Process this Site (F9) for this variable to be computed.

MOVEMENT SUMMARY

Site: Marius - O'Connell AM
base

Marius and O'Connell 4-way give way
2012 AM base flows
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: O'Connell Street south											
1	L	18	0.0	0.019	7.6	LOS A	0.1	0.5	0.33	0.60	42.1
2	T	3	0.0	0.026	10.5	LOS A	0.1	0.6	0.60	0.73	39.5
3	R	9	0.0	0.026	11.9	LOS A	0.1	0.6	0.60	0.79	38.9
Approach		31	0.0	0.026	9.2	LOS A	0.1	0.6	0.44	0.67	40.8
East: Marius St east											
4	L	7	0.0	0.124	6.4	LOS A	0.0	0.0	0.00	0.91	43.3
5	T	234	0.0	0.124	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R	2	0.0	0.004	9.2	LOS A	0.0	0.1	0.51	0.63	40.9
Approach		243	0.0	0.124	0.3	NA	0.0	0.1	0.00	0.03	49.7
North: O'Connell St north											
7	L	7	0.0	0.012	9.9	LOS A	0.0	0.3	0.51	0.69	40.4
8	T	4	0.0	0.017	10.5	LOS A	0.1	0.4	0.60	0.71	39.7
9	R	4	0.0	0.017	11.9	LOS A	0.1	0.4	0.60	0.78	39.1
Approach		16	0.0	0.017	10.6	LOS A	0.1	0.4	0.56	0.72	39.8
West: Marius St west											
10	L	6	0.0	0.277	6.4	LOS A	0.0	0.0	0.00	0.92	43.3
11	T	534	0.0	0.277	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
12	R	13	0.0	0.021	7.5	LOS A	0.0	0.3	0.33	0.59	42.0
Approach		553	0.0	0.277	0.2	NA	0.0	0.3	0.01	0.02	49.7
All Vehicles		842	0.0	0.277	0.8	NA	0.1	0.6	0.03	0.06	49.1

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

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INTERSECTION SUMMARY

Site: Marius - O'Connell PM
base

Marius and O'Connell 4-way give way
2012 PM base flows
Giveaway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	705veh/h	846pers/h
Percent Heavy Vehicles	0.0%	
Degree of Saturation	0.176	
Practical Spare Capacity	354.2%	
Effective Intersection Capacity	4004veh/h	
Control Delay (Total)	0.21veh-h/h	0.25pers-h/h
Control Delay (Average)	1.1sec	1.1sec
Control Delay (Worst Lane)	9.7sec	
Control Delay (Worst Movement)	10.5sec	10.5sec
Geometric Delay (Average)	Psec	
Stop-Line Delay (Average)	Psec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	0.1veh	
95% Back of Queue - Distance (Worst Lane)	0.8m	
Total Effective Stops	63veh/h	75pers/h
Effective Stop Rate	0.09per veh	0.09per pers
Proportion Queued	0.05	0.05
Performance Index	8.8	8.8
Travel Distance (Total)	404.6veh-km/h	485.5pers-km/h
Travel Distance (Average)	574m	574m
Travel Time (Total)	8.3veh-h/h	10.0pers-h/h
Travel Time (Average)	42.4sec	42.4sec
Travel Speed	48.7km/h	48.7km/h
Cost (Total)	268.58\$/h	268.58\$/h
Fuel Consumption (Total)	30.5L/h	
Carbon Dioxide (Total)	76.2kg/h	
Hydrocarbons (Total)	0.114kg/h	
Carbon Monoxide (Total)	3.10kg/h	
NOx (Total)	0.127kg/h	

P: You need to Process this Site (F9) for this variable to be computed.

MOVEMENT SUMMARY

Site: Marius - O'Connell PM
base

Marius and O'Connell 4-way give way
2012 PM base flows
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow		HV Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%				veh	Distance			
			v/c		sec		veh	m		per veh	km/h
South: O'Connell Street south											
1	L	26	0.0	0.032	8.3	LOS A	0.1	0.8	0.41	0.65	41.7
2	T	8	0.0	0.029	9.0	LOS A	0.1	0.7	0.53	0.67	40.8
3	R	8	0.0	0.029	10.5	LOS A	0.1	0.7	0.53	0.76	40.1
Approach		43	0.0	0.032	8.8	LOS A	0.1	0.8	0.45	0.68	41.2
East: Marius St east											
4	L	6	0.0	0.176	6.4	LOS A	0.0	0.0	0.00	0.91	43.3
5	T	337	0.0	0.176	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R	4	0.0	0.007	7.7	LOS A	0.0	0.1	0.36	0.58	41.9
Approach		347	0.0	0.176	0.2	NA	0.0	0.1	0.00	0.02	49.7
North: O'Connell St north											
7	L	3	0.0	0.005	8.2	LOS A	0.0	0.1	0.38	0.59	41.8
8	T	11	0.0	0.024	8.9	LOS A	0.1	0.6	0.52	0.66	41.0
9	R	4	0.0	0.024	10.5	LOS A	0.1	0.6	0.53	0.76	40.2
Approach		18	0.0	0.024	9.1	LOS A	0.1	0.6	0.50	0.67	40.9
West: Marius St west											
10	L	8	0.0	0.148	6.4	LOS A	0.0	0.0	0.00	0.91	43.3
11	T	279	0.0	0.148	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
12	R	9	0.0	0.016	8.0	LOS A	0.0	0.2	0.40	0.61	41.8
Approach		297	0.0	0.148	0.4	NA	0.0	0.2	0.01	0.05	49.5
All Vehicles		705	0.0	0.176	1.1	NA	0.1	0.8	0.05	0.09	48.7

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

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INTERSECTION SUMMARY

Site: Peel - O'Connell AM
base +dev

Peel Street and O'Connell Street
AM 2012 base flows
Plus 50% development flows
Giveaway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1468veh/h	1762pers/h
Percent Heavy Vehicles	4.2%	
Degree of Saturation	0.310	
Practical Spare Capacity	157.7%	
Effective Intersection Capacity	4730veh/h	
Control Delay (Total)	1.18veh-h/h	1.41pers-h/h
Control Delay (Average)	2.9sec	2.9sec
Control Delay (Worst Lane)	19.7sec	
Control Delay (Worst Movement)	19.7sec	19.7sec
Geometric Delay (Average)	Psec	
Stop-Line Delay (Average)	Psec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	0.9veh	
95% Back of Queue - Distance (Worst Lane)	6.4m	
Total Effective Stops	302veh/h	362pers/h
Effective Stop Rate	0.21 per veh	0.21 per pers
Proportion Queued	0.13	0.13
Performance Index	20.6	20.6
Travel Distance (Total)	842.8veh-km/h	1011.4pers-km/h
Travel Distance (Average)	574m	574m
Travel Time (Total)	18.0veh-h/h	21.6pers-h/h
Travel Time (Average)	44.2sec	44.2sec
Travel Speed	46.8km/h	46.8km/h
Cost (Total)	598.89\$/h	598.89\$/h
Fuel Consumption (Total)	73.2L/h	
Carbon Dioxide (Total)	183.3kg/h	
Hydrocarbons (Total)	0.263kg/h	
Carbon Monoxide (Total)	8.22kg/h	
NOx (Total)	0.305kg/h	

P: You need to Process this Site (F9) for this variable to be computed.

MOVEMENT SUMMARY

Site: Peel - O'Connell AM
base +dev

Peel Street and O'Connell Street
AM 2012 base flows
Plus 50% development flows
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV Deg.	Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c			sec	Vehicles			
East: Peel Street east											
5	T	508	5.0	0.269	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R	124	2.0	0.234	12.2	LOS A	0.9	6.4	0.62	0.87	38.6
Approach		633	4.4	0.269	2.4	NA	0.9	6.4	0.12	0.17	47.3
North: O'Connell Street											
7	L	119	2.0	0.165	10.1	LOS A	0.6	4.5	0.57	0.82	40.3
9	R	51	2.0	0.189	19.7	LOS B	0.6	4.5	0.81	0.94	33.9
Approach		169	2.0	0.189	12.9	LOS A	0.6	4.5	0.64	0.85	38.1
West: Peel Street west											
10	L	80	2.0	0.044	6.5	LOS A	0.0	0.0	0.00	0.61	43.3
11	T	586	5.0	0.310	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		666	4.6	0.310	0.8	NA	0.0	0.0	0.00	0.07	49.1
All Vehicles		1468	4.2	0.310	2.9	NA	0.9	6.4	0.13	0.21	46.8

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

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INTERSECTION SUMMARY

Site: Peel - O"Connell PM
base +dev

Peel Street and O;Connell Street
PM 2012 base flows
Plus development flows for supermarket
Giveaway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1913 veh/h	2295 pers/h
Percent Heavy Vehicles	3.9%	
Degree of Saturation	0.458	
Practical Spare Capacity	74.5%	
Effective Intersection Capacity	4172 veh/h	
Control Delay (Total)	2.56 veh-h/h	3.07 pers-h/h
Control Delay (Average)	4.8 sec	4.8 sec
Control Delay (Worst Lane)	32.3 sec	
Control Delay (Worst Movement)	32.3 sec	32.3 sec
Geometric Delay (Average)	P sec	
Stop-Line Delay (Average)	P sec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	2.3 veh	
95% Back of Queue - Distance (Worst Lane)	16.7 m	
Total Effective Stops	593 veh/h	712 pers/h
Effective Stop Rate	0.31 per veh	0.31 per pers
Proportion Queued	0.19	0.19
Performance Index	29.9	29.9
Travel Distance (Total)	1098.2 veh-km/h	1317.8 pers-km/h
Travel Distance (Average)	574 m	574 m
Travel Time (Total)	24.5 veh-h/h	29.4 pers-h/h
Travel Time (Average)	46.1 sec	46.1 sec
Travel Speed	44.8 km/h	44.8 km/h
Cost (Total)	814.52 \$/h	814.52 \$/h
Fuel Consumption (Total)	99.6 L/h	
Carbon Dioxide (Total)	249.2 kg/h	
Hydrocarbons (Total)	0.369 kg/h	
Carbon Monoxide (Total)	12.32 kg/h	
NOx (Total)	0.433 kg/h	

P: You need to Process this Site (F9) for this variable to be computed.

MOVEMENT SUMMARY

Site: Peel - O'Connell PM
base +dev

Peel Street and O'Connell Street
PM 2012 base flows
Plus development flows for supermarket
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV Deg.	Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c			sec	Vehicles			
							veh	m		per veh	km/h
East: Peel Street east											
5	T	713	5.0	0.377	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R	227	2.0	0.458	15.2	LOS B	2.3	16.7	0.72	1.01	36.6
Approach		940	4.3	0.458	3.7	NA	2.3	16.7	0.18	0.24	45.9
North: O'Connell Street											
7	L	227	2.0	0.286	10.0	LOS A	1.3	9.1	0.58	0.85	40.3
9	R	79	2.0	0.435	32.3	LOS C	1.6	11.3	0.91	1.04	28.1
Approach		306	2.0	0.435	15.7	LOS B	1.6	11.3	0.66	0.90	36.3
West: Peel Street west											
10	L	144	2.0	0.079	6.5	LOS A	0.0	0.0	0.00	0.61	43.3
11	T	522	5.0	0.276	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		666	4.4	0.276	1.4	NA	0.0	0.0	0.00	0.13	48.4
All Vehicles		1913	3.9	0.458	4.8	NA	2.3	16.7	0.19	0.31	44.8

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

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INTERSECTION SUMMARY

Site: Marius - O'Connell AM
base+dev

Marius and O'Connell 4-way give way
2012 AM base flows plus 50% development flows
Giveaway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	932veh/h	1118pers/h
Percent Heavy Vehicles	0.0%	
Degree of Saturation	0.277	
Practical Spare Capacity	188.7%	
Effective Intersection Capacity	3362veh/h	
Control Delay (Total)	0.40veh-h/h	0.48pers-h/h
Control Delay (Average)	1.5sec	1.5sec
Control Delay (Worst Lane)	12.3sec	
Control Delay (Worst Movement)	12.4sec	12.4sec
Geometric Delay (Average)	Psec	
Stop-Line Delay (Average)	Psec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	0.3veh	
95% Back of Queue - Distance (Worst Lane)	2.0m	
Total Effective Stops	123veh/h	148pers/h
Effective Stop Rate	0.13per veh	0.13per pers
Proportion Queued	0.06	0.06
Performance Index	12.0	12.0
Travel Distance (Total)	534.6veh-km/h	641.5pers-km/h
Travel Distance (Average)	574m	574m
Travel Time (Total)	11.1veh-h/h	13.3pers-h/h
Travel Time (Average)	42.9sec	42.9sec
Travel Speed	48.2km/h	48.2km/h
Cost (Total)	359.73\$/h	359.73\$/h
Fuel Consumption (Total)	41.1L/h	
Carbon Dioxide (Total)	102.7kg/h	
Hydrocarbons (Total)	0.155kg/h	
Carbon Monoxide (Total)	4.43kg/h	
NOx (Total)	0.175kg/h	

P: You need to Process this Site (F9) for this variable to be computed.

MOVEMENT SUMMARY

Site: Marius - O'Connell AM
base+dev

Marius and O'Connell 4-way give way
2012 AM base flows plus 50% development flows
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: O'Connell Street south											
1	L	52	0.0	0.056	7.7	LOS A	0.2	1.4	0.35	0.63	42.1
2	T	3	0.0	0.082	11.0	LOS A	0.3	2.0	0.62	0.80	39.1
3	R	36	0.0	0.082	12.4	LOS A	0.3	2.0	0.62	0.86	38.5
Approach		91	0.0	0.082	9.7	LOS A	0.3	2.0	0.47	0.73	40.5
East: Marius St east											
4	L	34	0.0	0.138	6.4	LOS A	0.0	0.0	0.00	0.86	43.3
5	T	234	0.0	0.138	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R	2	0.0	0.004	9.2	LOS A	0.0	0.1	0.51	0.63	40.9
Approach		269	0.0	0.138	0.9	NA	0.0	0.1	0.00	0.11	49.0
North: O'Connell St north											
7	L	7	0.0	0.012	9.9	LOS A	0.0	0.3	0.51	0.69	40.4
8	T	4	0.0	0.018	10.8	LOS A	0.1	0.4	0.62	0.72	39.4
9	R	4	0.0	0.018	12.3	LOS A	0.1	0.4	0.62	0.80	38.8
Approach		16	0.0	0.018	10.8	LOS A	0.1	0.4	0.57	0.73	39.7
West: Marius St west											
10	L	6	0.0	0.277	6.4	LOS A	0.0	0.0	0.00	0.92	43.3
11	T	534	0.0	0.277	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
12	R	16	0.0	0.026	7.6	LOS A	0.1	0.4	0.35	0.60	42.0
Approach		556	0.0	0.277	0.3	NA	0.1	0.4	0.01	0.03	49.6
All Vehicles		932	0.0	0.277	1.5	NA	0.3	2.0	0.06	0.13	48.2

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

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INTERSECTION SUMMARY

Site: Marius - O'Connell PM
base+dev

Marius and O'Connell 4-way give way
2012 PM base flows plus development flows
Giveaway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	903veh/h	1084pers/h
Percent Heavy Vehicles	0.0%	
Degree of Saturation	0.204	
Practical Spare Capacity	292.3%	
Effective Intersection Capacity	4429veh/h	
Control Delay (Total)	0.70veh-h/h	0.84pers-h/h
Control Delay (Average)	2.8sec	2.8sec
Control Delay (Worst Lane)	11.2sec	
Control Delay (Worst Movement)	11.3sec	11.3sec
Geometric Delay (Average)	Psec	
Stop-Line Delay (Average)	Psec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	0.4veh	
95% Back of Queue - Distance (Worst Lane)	3.1m	
Total Effective Stops	220veh/h	264pers/h
Effective Stop Rate	0.24per veh	0.24per pers
Proportion Queued	0.12	0.12
Performance Index	12.7	12.7
Travel Distance (Total)	518.5veh-km/h	622.2pers-km/h
Travel Distance (Average)	574m	574m
Travel Time (Total)	11.1veh-h/h	13.3pers-h/h
Travel Time (Average)	44.1sec	44.1sec
Travel Speed	46.8km/h	46.8km/h
Cost (Total)	361.05\$/h	361.05\$/h
Fuel Consumption (Total)	42.1L/h	
Carbon Dioxide (Total)	105.3kg/h	
Hydrocarbons (Total)	0.163kg/h	
Carbon Monoxide (Total)	5.19kg/h	
NOx (Total)	0.188kg/h	

P: You need to Process this Site (F9) for this variable to be computed.

MOVEMENT SUMMARY

Site: Marius - O'Connell PM
base+dev

Marius and O'Connell 4-way give way
2012 PM base flows plus development flows
GiveWay / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow		HV Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%				veh	Distance			
			v/c		sec		veh	m		per veh	km/h
South: O'Connell Street south											
1	L	94	0.0	0.119	8.6	LOS A	0.4	3.0	0.44	0.71	41.4
2	T	8	0.0	0.124	9.9	LOS A	0.4	3.1	0.57	0.77	39.9
3	R	60	0.0	0.124	11.3	LOS A	0.4	3.1	0.57	0.85	39.3
Approach		162	0.0	0.124	9.7	LOS A	0.4	3.1	0.50	0.76	40.5
East: Marius St east											
4	L	58	0.0	0.204	6.4	LOS A	0.0	0.0	0.00	0.86	43.3
5	T	337	0.0	0.204	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R	4	0.0	0.007	7.7	LOS A	0.0	0.1	0.36	0.58	41.9
Approach		399	0.0	0.204	1.0	NA	0.0	0.1	0.00	0.13	48.8
North: O'Connell St north											
7	L	3	0.0	0.005	8.5	LOS A	0.0	0.1	0.39	0.59	41.6
8	T	11	0.0	0.026	9.6	LOS A	0.1	0.6	0.55	0.70	40.4
9	R	4	0.0	0.026	11.3	LOS A	0.1	0.6	0.57	0.79	39.6
Approach		18	0.0	0.026	9.8	LOS A	0.1	0.6	0.53	0.70	40.4
West: Marius St west											
10	L	8	0.0	0.148	6.4	LOS A	0.0	0.0	0.00	0.91	43.3
11	T	279	0.0	0.148	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
12	R	37	0.0	0.066	8.4	LOS A	0.1	1.0	0.44	0.67	41.6
Approach		324	0.0	0.148	1.1	NA	0.1	1.0	0.05	0.10	48.7
All Vehicles		903	0.0	0.204	2.8	NA	0.4	3.1	0.12	0.24	46.8

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

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INTERSECTION SUMMARY

Site: Peel - O'Connell 2022
AM base

Peel Street and O'Connell Street
AM 2022 base flows
Giveaway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1334 veh/h	1600 pers/h
Percent Heavy Vehicles	4.8%	
Degree of Saturation	0.357	
Practical Spare Capacity	124.3%	
Effective Intersection Capacity	3739 veh/h	
Control Delay (Total)	0.24 veh-h/h	0.28 pers-h/h
Control Delay (Average)	0.6 sec	0.6 sec
Control Delay (Worst Lane)	20.1 sec	
Control Delay (Worst Movement)	20.1 sec	20.1 sec
Geometric Delay (Average)	P sec	
Stop-Line Delay (Average)	P sec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	0.2 veh	
95% Back of Queue - Distance (Worst Lane)	1.3 m	
Total Effective Stops	57 veh/h	68 pers/h
Effective Stop Rate	0.04 per veh	0.04 per pers
Proportion Queued	0.02	0.02
Performance Index	16.0	16.0
Travel Distance (Total)	765.0 veh-km/h	917.9 pers-km/h
Travel Distance (Average)	574 m	574 m
Travel Time (Total)	15.5 veh-h/h	18.6 pers-h/h
Travel Time (Average)	41.9 sec	41.9 sec
Travel Speed	49.2 km/h	49.2 km/h
Cost (Total)	513.72\$/h	513.72\$/h
Fuel Consumption (Total)	61.8 L/h	
Carbon Dioxide (Total)	154.7 kg/h	
Hydrocarbons (Total)	0.209 kg/h	
Carbon Monoxide (Total)	5.40 kg/h	
NOx (Total)	0.232 kg/h	

P: You need to Process this Site (F9) for this variable to be computed.

MOVEMENT SUMMARY

Site: Peel - O'Connell 2022
AM base

Peel Street and O'Connell Street
AM 2022 base flows
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
East: Peel Street east											
5	T	584	5.0	0.309	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R	21	2.0	0.039	11.2	LOS A	0.1	0.9	0.56	0.78	39.4
Approach		605	4.9	0.309	0.4	NA	0.1	0.9	0.02	0.03	49.5
North: O'Connell Street											
7	L	16	2.0	0.025	10.5	LOS A	0.1	0.6	0.57	0.75	39.9
9	R	15	2.0	0.061	20.1	LOS B	0.2	1.3	0.81	0.93	33.7
Approach		31	2.0	0.061	15.1	LOS B	0.2	1.3	0.68	0.84	36.7
West: Peel Street west											
10	L	24	2.0	0.013	6.5	LOS A	0.0	0.0	0.00	0.61	43.3
11	T	674	5.0	0.357	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		698	4.9	0.357	0.2	NA	0.0	0.0	0.00	0.02	49.7
All Vehicles		1334	4.8	0.357	0.6	NA	0.2	1.3	0.02	0.04	49.2

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

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INTERSECTION SUMMARY

Site: Peel - O'Connell 2022
PM base

Peel Street and O'Connell Street
PM 2022 base flows
Giveaway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1504 veh/h	1805 pers/h
Percent Heavy Vehicles	4.8%	
Degree of Saturation	0.434	
Practical Spare Capacity	84.5%	
Effective Intersection Capacity	3469 veh/h	
Control Delay (Total)	0.24 veh-h/h	0.28 pers-h/h
Control Delay (Average)	0.6 sec	0.6 sec
Control Delay (Worst Lane)	24.3 sec	
Control Delay (Worst Movement)	24.3 sec	24.3 sec
Geometric Delay (Average)	P sec	
Stop-Line Delay (Average)	P sec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	0.1 veh	
95% Back of Queue - Distance (Worst Lane)	0.9 m	
Total Effective Stops	60 veh/h	72 pers/h
Effective Stop Rate	0.04 per veh	0.04 per pers
Proportion Queued	0.02	0.02
Performance Index	18.0	18.0
Travel Distance (Total)	862.8 veh-km/h	1035.3 pers-km/h
Travel Distance (Average)	574 m	574 m
Travel Time (Total)	17.5 veh-h/h	21.0 pers-h/h
Travel Time (Average)	41.9 sec	41.9 sec
Travel Speed	49.3 km/h	49.3 km/h
Cost (Total)	578.47 \$/h	578.47 \$/h
Fuel Consumption (Total)	69.6 L/h	
Carbon Dioxide (Total)	174.3 kg/h	
Hydrocarbons (Total)	0.236 kg/h	
Carbon Monoxide (Total)	6.07 kg/h	
NOx (Total)	0.261 kg/h	

P: You need to Process this Site (F9) for this variable to be computed.

MOVEMENT SUMMARY

Site: Peel - O'Connell 2022
PM base

Peel Street and O'Connell Street
PM 2022 base flows
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV Deg. %	Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
East: Peel Street east											
5	T	819	5.0	0.434	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R	22	2.0	0.038	10.6	LOS A	0.1	0.9	0.53	0.75	39.9
Approach		841	4.9	0.434	0.3	NA	0.1	0.9	0.01	0.02	49.7
North: O'Connell Street											
7	L	22	2.0	0.031	9.8	LOS A	0.1	0.8	0.54	0.73	40.5
9	R	7	2.0	0.039	24.3	LOS B	0.1	0.8	0.85	0.94	31.5
Approach		29	2.0	0.039	13.4	LOS A	0.1	0.8	0.62	0.78	37.8
West: Peel Street west											
10	L	34	2.0	0.018	6.5	LOS A	0.0	0.0	0.00	0.61	43.3
11	T	600	5.0	0.318	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		634	4.8	0.318	0.3	NA	0.0	0.0	0.00	0.03	49.6
All Vehicles		1504	4.8	0.434	0.6	NA	0.1	0.9	0.02	0.04	49.3

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

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INTERSECTION SUMMARY

Site: Marius - O'Connell 2022
AM base

Marius and O'Connell 4-way give way
2022 AM base flows
Giveaway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	967veh/h	1161pers/h
Percent Heavy Vehicles	0.0%	
Degree of Saturation	0.319	
Practical Spare Capacity	151.0%	
Effective Intersection Capacity	3036veh/h	
Control Delay (Total)	0.22veh-h/h	0.26pers-h/h
Control Delay (Average)	0.8sec	0.8sec
Control Delay (Worst Lane)	13.1sec	
Control Delay (Worst Movement)	13.4sec	13.4sec
Geometric Delay (Average)	Psec	
Stop-Line Delay (Average)	Psec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	0.1veh	
95% Back of Queue - Distance (Worst Lane)	0.8m	
Total Effective Stops	63veh/h	76pers/h
Effective Stop Rate	0.07per veh	0.07per pers
Proportion Queued	0.04	0.04
Performance Index	11.8	11.8
Travel Distance (Total)	554.9veh-km/h	665.9pers-km/h
Travel Distance (Average)	574m	574m
Travel Time (Total)	11.3veh-h/h	13.6pers-h/h
Travel Time (Average)	42.1sec	42.1sec
Travel Speed	49.0km/h	49.0km/h
Cost (Total)	365.59\$/h	365.59\$/h
Fuel Consumption (Total)	41.2L/h	
Carbon Dioxide (Total)	103.0kg/h	
Hydrocarbons (Total)	0.153kg/h	
Carbon Monoxide (Total)	4.00kg/h	
NOx (Total)	0.169kg/h	

P: You need to Process this Site (F9) for this variable to be computed.

MOVEMENT SUMMARY

Site: Marius - O'Connell 2022
AM base

Marius and O'Connell 4-way give way
2022 AM base flows
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow		HV Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%				veh	Distance			
			v/c		sec		veh	m		per veh	km/h
South: O'Connell Street south											
1	L	20	0.0	0.022	7.8	LOS A	0.1	0.5	0.36	0.62	42.0
2	T	3	0.0	0.033	11.9	LOS A	0.1	0.8	0.66	0.79	38.4
3	R	11	0.0	0.033	13.4	LOS A	0.1	0.8	0.66	0.85	37.9
Approach		34	0.0	0.033	9.9	LOS A	0.1	0.8	0.48	0.71	40.3
East: Marius St east											
4	L	8	0.0	0.142	6.4	LOS A	0.0	0.0	0.00	0.91	43.3
5	T	268	0.0	0.142	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R	2	0.0	0.004	9.9	LOS A	0.0	0.1	0.54	0.65	40.4
Approach		279	0.0	0.142	0.3	NA	0.0	0.1	0.00	0.03	49.7
North: O'Connell St north											
7	L	8	0.0	0.016	10.8	LOS A	0.1	0.4	0.56	0.73	39.7
8	T	5	0.0	0.025	11.9	LOS A	0.1	0.6	0.66	0.78	38.5
9	R	5	0.0	0.025	13.4	LOS A	0.1	0.6	0.66	0.84	38.0
Approach		19	0.0	0.025	11.8	LOS A	0.1	0.6	0.61	0.78	38.9
West: Marius St west											
10	L	7	0.0	0.319	6.4	LOS A	0.0	0.0	0.00	0.92	43.3
11	T	614	0.0	0.319	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
12	R	15	0.0	0.024	7.7	LOS A	0.1	0.4	0.36	0.60	41.9
Approach		636	0.0	0.319	0.3	NA	0.1	0.4	0.01	0.02	49.7
All Vehicles		967	0.0	0.319	0.8	NA	0.1	0.8	0.04	0.07	49.0

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

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INTERSECTION SUMMARY

Site: Marius - O'Connell 2022
PM base

Marius and O'Connell 4-way give way
2022 PM base flows
Giveaway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	811 veh/h	973 pers/h
Percent Heavy Vehicles	0.0%	
Degree of Saturation	0.203	
Practical Spare Capacity	294.8%	
Effective Intersection Capacity	4000 veh/h	
Control Delay (Total)	0.25 veh-h/h	0.30 pers-h/h
Control Delay (Average)	1.1 sec	1.1 sec
Control Delay (Worst Lane)	10.7 sec	
Control Delay (Worst Movement)	11.4 sec	11.4 sec
Geometric Delay (Average)	P sec	
Stop-Line Delay (Average)	P sec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	0.1 veh	
95% Back of Queue - Distance (Worst Lane)	1.0 m	
Total Effective Stops	75 veh/h	89 pers/h
Effective Stop Rate	0.09 per veh	0.09 per pers
Proportion Queued	0.05	0.05
Performance Index	10.1	10.1
Travel Distance (Total)	465.0 veh-km/h	558.0 pers-km/h
Travel Distance (Average)	574 m	574 m
Travel Time (Total)	9.6 veh-h/h	11.5 pers-h/h
Travel Time (Average)	42.4 sec	42.4 sec
Travel Speed	48.7 km/h	48.7 km/h
Cost (Total)	309.00\$/h	309.00\$/h
Fuel Consumption (Total)	35.0 L/h	
Carbon Dioxide (Total)	87.6 kg/h	
Hydrocarbons (Total)	0.131 kg/h	
Carbon Monoxide (Total)	3.56 kg/h	
NOx (Total)	0.146 kg/h	

P: You need to Process this Site (F9) for this variable to be computed.

MOVEMENT SUMMARY

Site: Marius - O'Connell 2022
PM base

Marius and O'Connell 4-way give way
2022 PM base flows
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow		HV Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%				veh	Distance			
			v/c		sec		veh	m		per veh	km/h
South: O'Connell Street south											
1	L	31	0.0	0.040	8.7	LOS A	0.1	1.0	0.44	0.68	41.4
2	T	9	0.0	0.036	10.0	LOS A	0.1	0.9	0.57	0.72	40.1
3	R	9	0.0	0.036	11.4	LOS A	0.1	0.9	0.57	0.80	39.4
Approach		49	0.0	0.040	9.4	LOS A	0.1	1.0	0.49	0.71	40.7
East: Marius St east											
4	L	7	0.0	0.203	6.4	LOS A	0.0	0.0	0.00	0.91	43.3
5	T	387	0.0	0.203	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R	5	0.0	0.009	7.9	LOS A	0.0	0.1	0.39	0.60	41.8
Approach		400	0.0	0.203	0.2	NA	0.0	0.1	0.01	0.02	49.7
North: O'Connell St north											
7	L	3	0.0	0.006	8.9	LOS A	0.0	0.1	0.43	0.61	41.3
8	T	12	0.0	0.030	9.8	LOS A	0.1	0.7	0.56	0.71	40.3
9	R	5	0.0	0.030	11.4	LOS A	0.1	0.7	0.58	0.80	39.5
Approach		20	0.0	0.030	10.1	LOS A	0.1	0.7	0.54	0.72	40.2
West: Marius St west											
10	L	9	0.0	0.170	6.4	LOS A	0.0	0.0	0.00	0.91	43.3
11	T	321	0.0	0.170	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
12	R	11	0.0	0.019	8.3	LOS A	0.0	0.3	0.43	0.63	41.7
Approach		341	0.0	0.170	0.4	NA	0.0	0.3	0.01	0.04	49.5
All Vehicles		811	0.0	0.203	1.1	NA	0.1	1.0	0.05	0.09	48.7

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

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INTERSECTION SUMMARY

Site: Peel - O'Connell 2022
AM base+dev

Peel Street and O'Connell Street
AM 2022 base flows plus development
Giveaway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1628veh/h	1954pers/h
Percent Heavy Vehicles	4.3%	
Degree of Saturation	0.357	
Practical Spare Capacity	124.3%	
Effective Intersection Capacity	4565veh/h	
Control Delay (Total)	1.32veh-h/h	1.58pers-h/h
Control Delay (Average)	2.9sec	2.9sec
Control Delay (Worst Lane)	25.1sec	
Control Delay (Worst Movement)	25.1sec	25.1sec
Geometric Delay (Average)	Psec	
Stop-Line Delay (Average)	Psec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	1.0veh	
95% Back of Queue - Distance (Worst Lane)	7.2m	
Total Effective Stops	309veh/h	371pers/h
Effective Stop Rate	0.19per veh	0.19per pers
Proportion Queued	0.12	0.12
Performance Index	22.7	22.7
Travel Distance (Total)	934.6veh-km/h	1121.5pers-km/h
Travel Distance (Average)	574m	574m
Travel Time (Total)	20.0veh-h/h	24.0pers-h/h
Travel Time (Average)	44.2sec	44.2sec
Travel Speed	46.7 km/h	46.7 km/h
Cost (Total)	663.52\$/h	663.52\$/h
Fuel Consumption (Total)	80.6L/h	
Carbon Dioxide (Total)	201.9kg/h	
Hydrocarbons (Total)	0.289kg/h	
Carbon Monoxide (Total)	8.80kg/h	
NOx (Total)	0.331kg/h	

P: You need to Process this Site (F9) for this variable to be computed.

MOVEMENT SUMMARY

Site: Peel - O'Connell 2022
AM base+dev

Peel Street and O'Connell Street
AM 2022 base flows plus development
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
East: Peel Street east											
5	T	584	5.0	0.309	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R	123	2.0	0.259	13.5	LOS A	1.0	7.2	0.67	0.91	37.7
Approach		707	4.5	0.309	2.4	NA	1.0	7.2	0.12	0.16	47.3
North: O'Connell Street											
7	L	118	2.0	0.188	11.0	LOS A	0.7	5.0	0.61	0.85	39.5
9	R	51	2.0	0.244	25.1	LOS B	0.8	5.8	0.86	0.98	31.2
Approach		168	2.0	0.244	15.3	LOS B	0.8	5.8	0.69	0.89	36.6
West: Peel Street west											
10	L	79	2.0	0.043	6.5	LOS A	0.0	0.0	0.00	0.61	43.3
11	T	674	5.0	0.357	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		753	4.7	0.357	0.7	NA	0.0	0.0	0.00	0.06	49.2
All Vehicles		1628	4.3	0.357	2.9	NA	1.0	7.2	0.12	0.19	46.7

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

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INTERSECTION SUMMARY

Site: Peel - O"Connell 2022
PM base+dev

Peel Street and O;Connell Street
PM 2022 base flows plus development flows
Giveaway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	2097veh/h	2516pers/h
Percent Heavy Vehicles	4.0%	
Degree of Saturation	0.595	
Practical Spare Capacity	34.4%	
Effective Intersection Capacity	3522veh/h	
Control Delay (Total)	3.12veh-h/h	3.74pers-h/h
Control Delay (Average)	5.4sec	5.4sec
Control Delay (Worst Lane)	49.0sec	
Control Delay (Worst Movement)	49.0sec	49.0sec
Geometric Delay (Average)	Psec	
Stop-Line Delay (Average)	Psec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	2.6veh	
95% Back of Queue - Distance (Worst Lane)	18.8m	
Total Effective Stops	619veh/h	743pers/h
Effective Stop Rate	0.30per veh	0.30per pers
Proportion Queued	0.19	0.19
Performance Index	33.2	33.2
Travel Distance (Total)	1203.8veh-km/h	1444.6pers-km/h
Travel Distance (Average)	574m	574m
Travel Time (Total)	27.2veh-h/h	32.6pers-h/h
Travel Time (Average)	46.7sec	46.7sec
Travel Speed	44.3km/h	44.3km/h
Cost (Total)	900.12\$/h	900.12\$/h
Fuel Consumption (Total)	108.8L/h	
Carbon Dioxide (Total)	272.3kg/h	
Hydrocarbons (Total)	0.402kg/h	
Carbon Monoxide (Total)	13.06kg/h	
NOx (Total)	0.465kg/h	

P: You need to Process this Site (F9) for this variable to be computed.

MOVEMENT SUMMARY

Site: Peel - O'Connell 2022
PM base+dev

Peel Street and O'Connell Street
PM 2022 base flows plus development flows
GiveWay / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
East: Peel Street east											
5	T	819	5.0	0.434	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R	227	2.0	0.508	17.1	LOS B	2.6	18.8	0.77	1.06	35.4
Approach		1046	4.3	0.508	3.7	NA	2.6	18.8	0.17	0.23	45.9
North: O'Connell Street											
7	L	227	2.0	0.321	11.1	LOS A	1.5	10.6	0.62	0.90	39.5
9	R	79	2.0	0.595	49.0	LOS D	2.2	15.8	0.95	1.10	22.9
Approach		306	2.0	0.595	20.9	LOS B	2.2	15.8	0.70	0.95	33.3
West: Peel Street west											
10	L	144	2.0	0.079	6.5	LOS A	0.0	0.0	0.00	0.61	43.3
11	T	600	5.0	0.318	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		744	4.4	0.318	1.3	NA	0.0	0.0	0.00	0.12	48.5
All Vehicles		2097	4.0	0.595	5.4	NA	2.6	18.8	0.19	0.30	44.3

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

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INTERSECTION SUMMARY

Site: Marius - O'Connell 2022
AM base+dev

Marius and O'Connell 4-way give way
2022 AM base flows plus development flows
Giveaway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1165veh/h	1398pers/h
Percent Heavy Vehicles	0.0%	
Degree of Saturation	0.319	
Practical Spare Capacity	151.0%	
Effective Intersection Capacity	3657veh/h	
Control Delay (Total)	0.75veh-h/h	0.90pers-h/h
Control Delay (Average)	2.3sec	2.3sec
Control Delay (Worst Lane)	14.7sec	
Control Delay (Worst Movement)	14.8sec	14.8sec
Geometric Delay (Average)	Psec	
Stop-Line Delay (Average)	Psec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	0.6veh	
95% Back of Queue - Distance (Worst Lane)	4.0m	
Total Effective Stops	217veh/h	261pers/h
Effective Stop Rate	0.19per veh	0.19per pers
Proportion Queued	0.10	0.10
Performance Index	15.8	15.8
Travel Distance (Total)	668.8veh-km/h	802.6pers-km/h
Travel Distance (Average)	574m	574m
Travel Time (Total)	14.1veh-h/h	17.0pers-h/h
Travel Time (Average)	43.6sec	43.6sec
Travel Speed	47.3km/h	47.3km/h
Cost (Total)	459.11\$/h	459.11\$/h
Fuel Consumption (Total)	52.9L/h	
Carbon Dioxide (Total)	132.2kg/h	
Hydrocarbons (Total)	0.203kg/h	
Carbon Monoxide (Total)	6.10kg/h	
NOx (Total)	0.230kg/h	

P: You need to Process this Site (F9) for this variable to be computed.

MOVEMENT SUMMARY

Site: Marius - O'Connell 2022
AM base+dev

Marius and O'Connell 4-way give way
2022 AM base flows plus development flows
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV Deg. %	Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: O'Connell Street south											
1	L	87	0.0	0.101	8.1	LOS A	0.4	2.6	0.39	0.67	41.8
2	T	3	0.0	0.170	13.4	LOS A	0.6	4.0	0.72	0.85	37.3
3	R	62	0.0	0.170	14.8	LOS B	0.6	4.0	0.72	0.90	36.8
Approach		153	0.0	0.170	10.9	LOS A	0.6	4.0	0.53	0.76	39.6
East: Marius St east											
4	L	60	0.0	0.170	6.4	LOS A	0.0	0.0	0.00	0.84	43.3
5	T	268	0.0	0.170	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R	2	0.0	0.004	9.9	LOS A	0.0	0.1	0.54	0.65	40.4
Approach		331	0.0	0.170	1.2	NA	0.0	0.1	0.00	0.16	48.6
North: O'Connell St north											
7	L	8	0.0	0.016	10.8	LOS A	0.1	0.4	0.56	0.73	39.7
8	T	5	0.0	0.029	13.2	LOS A	0.1	0.7	0.70	0.82	37.7
9	R	5	0.0	0.029	14.6	LOS B	0.1	0.7	0.70	0.88	37.2
Approach		19	0.0	0.029	12.5	LOS A	0.1	0.7	0.64	0.80	38.4
West: Marius St west											
10	L	7	0.0	0.319	6.4	LOS A	0.0	0.0	0.00	0.92	43.3
11	T	614	0.0	0.319	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
12	R	42	0.0	0.072	8.0	LOS A	0.2	1.1	0.40	0.64	41.8
Approach		663	0.0	0.319	0.6	NA	0.2	1.1	0.03	0.05	49.3
All Vehicles		1165	0.0	0.319	2.3	NA	0.6	4.0	0.10	0.19	47.3

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

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INTERSECTION SUMMARY

Site: Marius - O'Connell 2022
PM base+dev

Marius and O'Connell 4-way give way
2022 PM base flows plus development flows
Giveaway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1008veh/h	1210pers/h
Percent Heavy Vehicles	0.0%	
Degree of Saturation	0.230	
Practical Spare Capacity	247.2%	
Effective Intersection Capacity	4377veh/h	
Control Delay (Total)	0.77veh-h/h	0.93pers-h/h
Control Delay (Average)	2.8sec	2.8sec
Control Delay (Worst Lane)	12.2sec	
Control Delay (Worst Movement)	12.4sec	12.4sec
Geometric Delay (Average)	Psec	
Stop-Line Delay (Average)	Psec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	0.5veh	
95% Back of Queue - Distance (Worst Lane)	3.5m	
Total Effective Stops	237veh/h	284pers/h
Effective Stop Rate	0.23per veh	0.23per pers
Proportion Queued	0.12	0.12
Performance Index	14.2	14.2
Travel Distance (Total)	578.9veh-km/h	694.7pers-km/h
Travel Distance (Average)	574m	574m
Travel Time (Total)	12.4veh-h/h	14.8pers-h/h
Travel Time (Average)	44.1sec	44.1sec
Travel Speed	46.9km/h	46.9km/h
Cost (Total)	402.36\$/h	402.36\$/h
Fuel Consumption (Total)	46.7L/h	
Carbon Dioxide (Total)	116.8kg/h	
Hydrocarbons (Total)	0.181kg/h	
Carbon Monoxide (Total)	5.67kg/h	
NOx (Total)	0.207kg/h	

P: You need to Process this Site (F9) for this variable to be computed.

MOVEMENT SUMMARY

Site: Marius - O'Connell 2022
PM base+dev

Marius and O'Connell 4-way give way
2022 PM base flows plus development flows
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV Deg. %	Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: O'Connell Street south											
1	L	98	0.0	0.133	9.1	LOS A	0.5	3.4	0.48	0.74	41.0
2	T	9	0.0	0.145	11.0	LOS A	0.5	3.5	0.63	0.81	39.1
3	R	61	0.0	0.145	12.4	LOS A	0.5	3.5	0.63	0.87	38.5
Approach		168	0.0	0.145	10.4	LOS A	0.5	3.5	0.54	0.79	39.9
East: Marius St east											
4	L	59	0.0	0.230	6.4	LOS A	0.0	0.0	0.00	0.86	43.3
5	T	387	0.0	0.230	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R	5	0.0	0.009	7.9	LOS A	0.0	0.1	0.39	0.60	41.8
Approach		452	0.0	0.230	0.9	NA	0.0	0.1	0.00	0.12	48.9
North: O'Connell St north											
7	L	3	0.0	0.007	9.2	LOS A	0.0	0.2	0.44	0.61	41.0
8	T	12	0.0	0.033	10.6	LOS A	0.1	0.8	0.60	0.74	39.6
9	R	5	0.0	0.033	12.4	LOS A	0.1	0.8	0.62	0.84	38.8
Approach		20	0.0	0.033	10.8	LOS A	0.1	0.8	0.58	0.75	39.6
West: Marius St west											
10	L	9	0.0	0.170	6.4	LOS A	0.0	0.0	0.00	0.91	43.3
11	T	321	0.0	0.170	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
12	R	38	0.0	0.070	8.7	LOS A	0.2	1.1	0.47	0.69	41.3
Approach		368	0.0	0.170	1.1	NA	0.2	1.1	0.05	0.09	48.7
All Vehicles		1008	0.0	0.230	2.8	NA	0.5	3.5	0.12	0.23	46.9

Level of Service (LOS) Method: Delay (RTA NSW).

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 used.

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Appendix D Public Transport Data



Route 430

Oxley Vale via Hospital

Effective from 6th September 2010

Oxley Vale via Hospital															Route 430			
	Monday to Friday														Saturday			
	am	am ^A	am	am	am	am	pm	pm	pm	pm	pm	pm	pm	pm	pm	am	am	pm
1 Kable Ave Atrium Centre	-	-	9:05	9:45	10:35	11:15	12:00	12:45	1:15	2:00	3:00	3:50	4:15	5:00	5:45	8:45	9:45	12:45
2 White St Stand	-	-	9:07	9:47	10:37	11:17	12:02	12:47	1:17	2:02	3:01	3:51	4:17	5:02	5:47	8:47	9:47	12:47
6 Tamworth Base Hospital Loop	-	-	9:15	9:55	10:45	11:25	12:10	12:55	1:25	2:10	-	4:05	4:25	5:10	5:55	8:55	9:55	12:55
7 Piper / Dean (Tamara)	-	8:30	9:19	9:59	10:49	11:27	12:14	12:59	1:29	2:14	3:15	4:10	4:29	5:14	5:59	8:59	9:59	12:59
8 Piper / Tribe (St Andrews)	-	-	9:20	10:00	10:50	11:30	12:15	1:00	1:30	2:15	3:17	4:12	4:30	5:15	6:00	9:00	10:00	1:00
9 Sunny Cove Ret. Village	-	8:36	9:21	10:01	10:51	11:31	12:16	1:01	1:31	2:16	3:18	-	4:31	5:16	6:01	9:01	10:01	1:01
10 Manilla / Yarmouth	7:30	8:40	9:24	10:04	10:54	11:34	12:19	1:04	1:34	2:19	3:21	4:16	4:34	5:19	6:04	9:04	10:04	1:04
11 Lemongums / Manilla	7:35	8:41	9:29	10:09	10:59	11:39	12:24	1:09	1:39	2:24	3:28	4:21	4:39	5:24	6:09	9:09	10:09	1:09
12 Kirkham / Manilla	7:39	8:45	9:33	10:13	11:03	11:43	12:28	1:13	1:43	2:28	3:36	4:25	4:43	5:28	6:13	9:13	10:13	1:13
13 Nazareth House	7:40	8:47	9:34	10:14	11:04	11:44	12:29	1:14	1:44	2:29	3:37	4:26	4:44	5:29	6:14	9:14	10:14	1:14
8 St Andrews Ret. Village	7:45	-	9:38	10:18	11:08	11:48	12:33	1:18	1:48	2:33	-	4:31	4:48	5:33	6:18	9:18	10:18	1:18
1 Kable Ave Atrium Centre	-	9:01	9:43	10:23	11:13	11:53	12:38	1:23	1:53	2:38	4:13	4:34	4:53	5:38	6:23	9:23	10:23	1:23
3 Brisbane St (Adairs)	7:54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SERVICE NOTES:

All services operate as Hail & Ride. Simply stand on the side of the road where it is safe for the bus to stop and hail the bus driver as the bus approaches.

Buses do not operate on Public Holidays.



Routes so marked will generally be serviced by a fully wheelchair accessible bus. Periodic maintenance may affect availability, please check prior to journey.

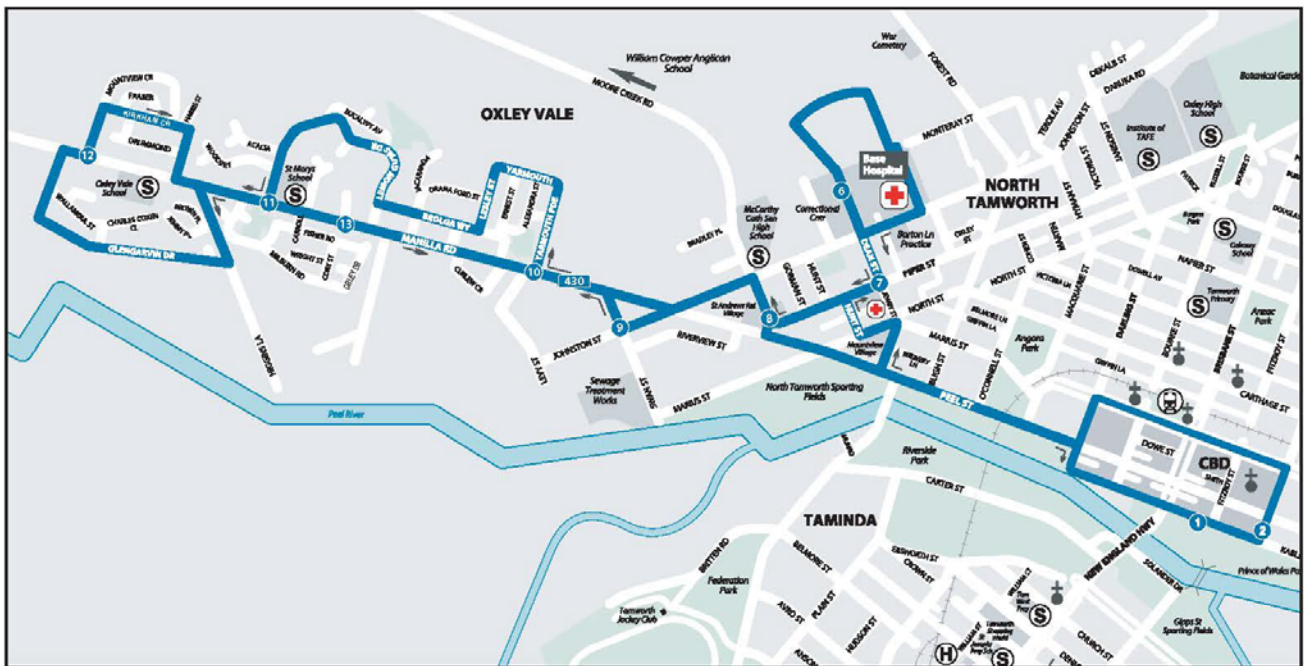


School Day Diversion, travels same route as School Days during School Holidays.



Does not travel up Yarmouth Pde or Kirkham Cres. Catch bus in Manilla Road.

For additional timetable information please contact: Tamworth Buslines phone 6762 3999



North & East via Hospital		Monday to Friday					Saturday	
		am	am	pm	pm	pm	am	am
1	Kable Ave Atrium Centre	9:10	11:05	12:45	2:20	5:05	9:15	11:30
2	White St Stand	9:12	11:07	12:47	2:22	5:07	9:17	11:32
27	Carthage / Bligh	9:18	11:13	12:53	2:28	5:13	9:23	11:38
6	Tamworth Base Hospital Loop	9:21	11:16	12:56	2:31	5:16	9:26	11:41
28	Johnston St (Tamwell)	9:24	11:19	12:59	2:34	5:19	9:29	11:44
29	Piper / Janison (TAFE)	9:26	11:21	1:01	2:36	5:21	9:31	11:46
30	Brisbane / Napier	9:29	11:24	1:04	2:39	5:24	9:34	11:49
31	Napier / Roderick	9:31	11:26	1:06	2:41	5:26	9:36	11:51
32	Chelmsford / Carthage	9:32	11:27	1:07	2:42	5:27	9:37	11:52
33	Carthage / White	9:35	11:30	1:10	2:45	5:30	9:40	11:55
1	Kable Ave Atrium Centre	9:38	11:33	1:13	2:48	5:33	9:43	11:58

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