MOWBRAY ROAD PRECINCT STRATEGIC REVIEW

Traffic Study






November 2011

MOWBRAY ROAD PRECINCT STRATEGIC REVIEW

Traffic Study
Final Report

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EXECUTIVE SUMMARY

SMEC Australia Pty Ltd (SMEC) was commissioned by the Department of Planning and Infrastructure (DP&I) to undertake a traffic and transport study, as part of a strategic review of the Mowbray Road Precinct (Precinct).

The Precinct is bounded by Mowbray Road West to the north, Centennial Avenue to the east, Batten Reserve to the south and Willandra Street to the west, as shown in **Figure 1** -Section 1 of this report.

The Precinct was gazetted for high density residential, R4, as part of Lane Cove Council (Council) Local Environment Plan (LEP) 2010 in February 2010.

Following the rezoning, Council, has raised a number of concerns about the high density redevelopment with DP&I including the need for a traffic impact assessment and associated traffic emergency management in the event of emergency bushfire, from the Batten Reserve.

The Rural Fire Service (RFS) has also raised concerns about bushfire risks, as part of development application assessment of redevelopment proposals within the Precinct.

Council has applied to the Ministry for Planning for rezoning of the Precinct to a density lower than the current zoning.

The Joint Regional Planning Panel refused three development applications within the Precinct because of possible risk to residents during a bushfire emergency. However, the Land and Environment Court has approved four development applications based on the current zoning.

This study was commissioned to investigate the cumulative traffic impacts of an agreed developed option from a strategic land use perspective, under general traffic as well as emergency bushfire evacuation conditions. The study was jointly managed by a Project Control Group (PCG) made up of representatives of DP&I and Council, to ensure that the most appropriate planning outcomes are realised for the Precinct.

The traffic study has identified traffic/transport impacts of a maximum theoretical development yield on the existing road network and recommended traffic improvements to minimize the impacts. The study has also assessed a traffic management scheme for emergency bushfire evacuation.

Existing Road Network

Sections of Mowbray Road West and Centennial Avenue front the Precinct. These two roads provide the main arterial road access for the Precinct and dominate the road network likely to be affected by the redevelopment of the Precinct. Both roads are classified as 'Regional Roads' under the RTA's administrative road classification system.

Mowbray Road West is a road link between Epping Road and Pacific Highway. It forms part of the boundary between Willoughby City Council and Lane Cove Council, and is under the care and control of both Councils.

The section of Mowbray Road West fronting the Precinct is a two-lane two-way road, currently carrying an average westbound and eastbound traffic volumes of 735 veh/hr and 600 veh/hr during AM peak, and 710 veh/hr and 690 veh/hr during the PM peak respectively. Details of the current traffic volumes are provided in **Table 2**

Centennial Avenue is a part of a regional road link between Elizabeth Parade and Epping Road, and is under the care and control of Council.

The current northbound and southbound traffic volumes along Centennial Avenue, close to its intersection with Mowbray Road West are 525 veh/hr and 603 veh/hr during the AM peak and 587 veh/hr and 540 veh/hr during the PM peak period respectively. Details of the current traffic volumes are provided in **Table 3.**

As regional and sub-arterial roads, Mowbray Road West and Centennial Avenue are operating with a typical road capacity of 950 veh/hr per lane to 1100 veh/hr per lane. Hence the midblock sections of both roads are currently operating with acceptable Level of Services (LoS) B and C. Details of the current LoS are provided in **Table 4**.

The existing intersections off Mowbray Road West within the Precinct have single entry and exit lanes which require right turn exit movements to filter across traffic flow in both directions in Mowbray Road West.

In addition, currently, right turn movements (into the Precinct) are not permitted from Mowbray Road West at its intersection with Mindarie Street, Girraween Avenue, Kullah Parade and Willandra Street during the weekday AM peak.

Intersection performance analysis (using SIDRA, Version 5.0) indicates that key intersections off Mowbray Road West, providing access to the Precinct are currently operating with acceptable LoS. Details of the current intersection performance are provided in **Table 7.**

The performance of the midblock sections of Mowbray Road West and Centennial Avenue, as well as the key intersections, providing access to the Precinct, indicates that the existing road network has spare capacity to accommodate some additional traffic associated with redevelopment of the Precinct.

Development Potential

As part of the strategic review of the Precinct, DP&I commissioned JBA to reassess the development

potential and yield of the Precinct based on the current LEP zoning and Council's proposed rezoning to low density.

JBA's analysis indicates that under the current LEP zoning, the Precinct could be redevelopment to a net development yield of 1580 dwellings, with a maximum theoretical yield of 2329 high density dwellings, from the current 387 low density dwellings.

Traffic Impacts of the Development Potential

Traffic impacts of the redevelopment of the Precinct has been assessed using SMEC's TRINITY model for strategic modelling and PARAMICS micro-simulation modelling, to assess the performance of key existing intersections along the section of Mowbray Road West and Centennial Avenue fronting the Precinct.

An analysis of the Bureau of Transport Statistics (BTS) travel zone (TZ) that cover the Precinct (TZ 2423) and the adjoining travel zone to the north of Mowbray Road West (TZ 2396), indicates that these zones have trip generation rates of 0.36 trips per dwelling and 0.5 trips per dwelling during the AM and PM periods respectively.

For the redevelopment, a traffic generation rate of 0.5 trips per dwelling was adopted in consultation with the PCG, for the proposed medium/high density and expected higher incomes of the target residents of the Precinct.

The rate compares favourably with the traffic trip generation rates of 0.4-0.5 trips per dwelling for small units and townhouses and 0.5-0.65 trips per dwelling for large units with three or more bedrooms, specified in the *Guide to Traffic Generating Developments, RTA October 2002*.

The forecast theoretical maximum additional development yield of 2,088 dwellings is expected to generate 1,040 trips during the AM peak hour and 978 trips during the PM peak hour.

This traffic generation rate assumes that there will be no significant change to the existing mode split for the Precinct.

SMEC's TRINITY model is forecasting the following traffic growth patterns in the local area by 2021:

- 6.5% traffic growth during AM peak hour background traffic over the next 10-years;
- Modest 3% growth during PM Peak hour; background traffic over the next 10-years;
- Significant 36% growth in total AM peak hour traffic over the next 10-years, with full redevelopment of Precinct; and
- Significant 25% growth in total PM peak hour traffic over the next 10-years under the full redevelopment growth scenario.

The TRINITY model is also forecasting significant traffic growth on Mowbray Road and Centennial Avenue further to the east of the Precinct, but low traffic growth on Mowbray Road West in the AM and PM peak periods.

Micro-simulation modelling of the traffic impacts under the adopted growth scenario indicates that:

- Redevelopment of the Precinct under the current zoning will result in noticeable traffic volume increases along the section of Mowbray Road West and associated intersections, fronting the Precinct;
- The Mowbray Road West/Centennial Avenue intersection would be expected to experience long traffic delays and queues on its western and southern approaches, by 2021; and
- The other intersections providing access to Precinct off Mowbray Road West would be expected to operate with acceptable LoS.

Intersection performance analysis, using SIDRA, has identified that by 2021:

- Mowbray Road West/Centennial Avenue intersection would be expected to operate with poor LoS F during the AM peak and LoS D during the PM peak with or without the traffic impact of the Precinct redevelopment. This forecast intersection performance needs to be considered by the RTA for possible improvement, as it represents a major arterial road network constraint in the local area.
- With redevelopment, maintaining the current right turn bans, from Mowbray Road West at its intersection with Mindarie Street, Girraween Avenue, Kullah Parade and Willandra Street during the weekday AM peak, would affect the accessibility of the Precinct and is considered unacceptable.
- Increased traffic flow would also affect the pedestrian safety in crossing Mowbray Road West.
- The existing intersection configurations combined with forecast increased right turn exit movements, particularly during the AM peak, will result in unacceptable delays at the Willandra Street, Kullah Parade, Mindarie Street, and Girraween Avenue intersections.

Recommended Traffic Improvements

To address the abovementioned traffic impacts of the Precinct redevelopment, a traffic management scheme involving the following intersection treatments is recommended:

Table S1: Summary of Recommended Intersection Treatments

Intersection	Recommended Treatment
Mowbray Road West/ Willandra Street	Provide dedicated right bay for turning movements into Willandra Street, and reconfigure to prohibit right turn movements out of Willandra Street.
Mowbray Road West/Kullah Parade/ Hatfield Street	Install Traffic Control Signals including signalised pedestrian crossings, and dedicated right bays for movements into Hatfield Street and Kullah Parade.
Mowbray Road West/ Mindarie Street	Provide dedicated right bay for turning movements into Mindarie Street and prohibit right turn movements out of Mindarie Street
Mowbray Road West/ Girraween Avenue	Provide dedicated right turn bays for turning movements into Mooney Street and Girraween Avenue; and prohibit right turn movements out of Girraween Avenue, and Mooney Street.
Mowbray Road West/ Centennial Avenue	Localised road widening to provide a dedicated right turn bay for southbound traffic (into Centennial Avenue) and a dedicated left turn lane for turning movements into Mowbray Road West.

Details of the recommended upgrades are provided in **Table 31** and concept layouts of the upgrades are provided in **Appendix I.**

The recommended intersection upgrades, at Willandra Street, Kullah Parade, Mindarie Street, and Girraween Avenue intersections, are required to minimise the traffic impacts of the Precinct redevelopment.

The works are estimated at $1.84 million with milling and pavement overlay of the existing pavement or $1.10 million without milling and pavement overlay of the existing pavement, including 50% contingency.

These works are required as a result of the redevelopment and it is recommended they be funded by Section 94 developer contributions, and be implemented after approximately 50% of the redevelopment is occupied.

The recommended upgrade of the Mowbray Road West/Centennial Avenue intersection is predominantly due to background traffic growth and should be funded by the NSW Roads and Maritime Services.

The upgrade is estimated at $1.41 million with milling and pavement overlay of the existing pavement, or $1.175 million without milling and pavement overlay of the existing pavement including 51% contingency.

In addition to the traffic management improvement, 1,300 km of additional and upgrading of existing footpaths, at a strategic cost estimate of $182,000 is recommended to be funded under Section 94 developer contributions.

Emergency Bushfire Evacuation Scenario

Council's Bushland Plan of Management, indicates that due to its location, just north of Batten Reserve, a portion of the Precinct, particularly the properties north of Gordon Crescent and Kullah Parade are designated as bushfire prone land 'buffer area' in Council's June 2010 Bushfire Prone Land map. Batten Reserve is also classed as 'high risk' on the same map.

Traffic impact has therefore been carried out to assess the traffic implication and adequacy of the existing road network in the event of emergency bushfire evacuation, (with reference to *Planning for Bushfire Protection (PBP) 2006)*.

An assessment of the bushfire risk of the precinct has been addressed in a Bushfire Protection Assessment prepared by *JBA and Ecological* as part of the Strategic Review. This section of the report should therefore be read in conjunction with the assessment.

A meeting with North West Metropolitan Emergency Management and Fire & Rescue NSW representatives has identified that the two possible scenarios of emergency bushfires that could affect the Precinct may be due to:

- A large scale bushfire starting in Lane Cove Valley and being blown towards Batten Reserve by strong north-westerly winds; and
- An arsonist attack in Batten Reserve.

The meeting also identified that new dwellings to be built within the Precinct will comply with PBP and would be safe refuges during bushfire.

North West Metropolitan Emergency Management and Fire & Rescue NSW representatives have advised that due to likelihood and nature of bushfire in Batten Reserve, which could affect properties in the Mowbray Road Precinct, a specific management plan is not required and emergency bushfire is likely to be managed under the Hunters Hill, Ryde, Lane Cove, Willoughby Bushfire Risk Management Plan Disaster Plan (Displan).

The representatives have further advised that it is unlikely that the Precinct would be subject to a mandatory or forced mass evacuation.

However, bushfire awareness and preparedness for bushfire fighting by the Precinct's new residents is likely to be low.

Hence, while the agencies might not encourage evacuation during emergency bushfires, self-evacuations, particularly by residents along perimeter roads along Batten Reserve are more likely to occur.

A series of evacuation scenario assumptions, developed in consultation with the District Emergency Management and Fire & Rescue NSW representatives, to assist in developing a worst-case fire evacuation scenario for the Precinct, is presented in **Section 10** of this report.

The evacuation scenario assumed that:

- Self evacuations will peak 1-hour after a bushfire event has started when flames and smoke are readily visible and threatening properties;
- Evacuations will steadily decline in the last 3 to 4 hours of a bushfire event; and
- Traffic self evacuating the Precinct will exit in the following directions:
    - East to Pacific Highway (70%)
    - West to Epping Road (20%)
    - South to Epping Road and Centennial Avenue (10%)

Road Network Assessment during Emergency Bushfire Evacuation

An evacuation micro-simulation model was carried out to assess traffic conditions during emergency bushfire self evacuation.

The assessment indicates that the existing road network with emergency traffic management (including traffic control and road closure of Mowbray Road West at its intersection with Epping Road by the Police) would accommodate traffic conditions during emergency bushfire self evacuation.

Adequacy of the Existing Internal Road Network

The existing internal perimeter roads are two-lane two-way streets with carriageway width of approximately 6.5 -7.3 m. To ensure two way movements are possible, particularly during emergency bushfires, it is recommended that parking restrictions be installed along the southern side of Kullah Parade and Gordon Crescent as redevelopment of the properties along the two streets occurs.

Conclusion

Redevelopment of the Precinct by 2021, is expected to increase traffic flow on the section of Mowbray Road West fronting the Precinct.

The existing configuration of the intersections on Mowbray Road West, fronting the Precinct, will result in unacceptable delays at the Willandra Street, Kullah Parade, Mindarie Street, and Girraween Avenue intersections and require implementation of the recommended intersection treatments.

Should these treatments be implemented, the traffic impact of the redevelopment could be accommodated and minimised.

1 INTRODUCTION

Background

SMEC Australia Pty Ltd (SMEC) was commissioned by the Department of Planning and Infrastructure (DP&I) to undertake a traffic and transport study, as part of a strategic review of the Mowbray Road Precinct, referred to herein as 'Precinct'.

The strategic review involved land use master planning and traffic impact assessment to review current land use zoning of the Precinct, in view of local community concerns about the development density (of the current zoning) and the adequacy of the existing road network in the event of emergency bush fire evacuation.

The Precinct was gazetted for high density residential, R4, as part of Lane Cove Council (Council) Local Environment Plan (LEP) 2010 in February 2010. The rezoning supports residential growth forecast under the Metropolitan Strategy for Sydney (and the North Sydney Subregional Strategy), and was based on a number of factors including proximity to employment opportunities in the Chatswood Town Centre and high bus service frequencies along Epping Road and Mowbray Road.

Following the rezoning, the local community, has made representations to Council and DP&I, about the scale of the expected development and the adequacy of the existing road network to cater for emergency bushfire evacuations. In tend Council has raised a number of issues with DP&I including the need to review the general traffic impacts of the gazettal development and emergency management in the event of a bush fire, due to proximity to bushland within Batten Reserve and the associated bushfire risks.

The Rural Fire Service (RFS) has also raised concerns about bush fire risks, as part of development assessment processes. In particular the RFS notes that it needs to be satisfied that the existing network has adequate capacity to accommodate emergency bush fire evacuation from the Precinct.

A Lane Cove Bush Fire Accessibility Report by Urbanhorizon (commissioned by the DP&I) has been considered by Council with regards to the adequacy of the existing road network to accommodate the traffic impact of the current rezoning during emergency bush fire evacuations from the Precinct. This report was found to be inconclusive.

The Joint Regional Planning Panel has also refused three development applications within the Precinct because of the risk to residents during a bushfire emergency. However, the Land & Environment Court has approved four development applications based on the current zoning.

This traffic study was undertaken to investigate the above traffic related community concerns. It was jointly managed by DP&I and Council, as part of the strategic review to ensure that the most appropriate planning outcomes are realised for the Precinct.

Project Objectives

This traffic study has been carried out to

- assess the general traffic/transport impacts of an agreed development yield (from the JBA"s strategic review of the planning controls) on the existing road network;
- identify traffic related opportunities and constraints to accommodate an agreed development option within the medium or high density residential development in the Precinct;
- identify improvements required to accommodate the general traffic/transport impacts of the agreed development; and
- provide traffic management strategy for emergency bush fire evacuation, including identification of road network improvements and traffic related strategies required for emergency bush fire evacuation.

The study findings inform the strategic review of the land use development options and could also be used in traffic impact assessments for future development applications within the Precinct.

Study Area

The Precinct is bounded by Mowbray Road West to the north, Centennial Avenue to the east, Batten Reserve to the south and Willandra Street to the west. The study area, along with the existing road network in close proximity to the Precinct is shown in **Figure 1**.

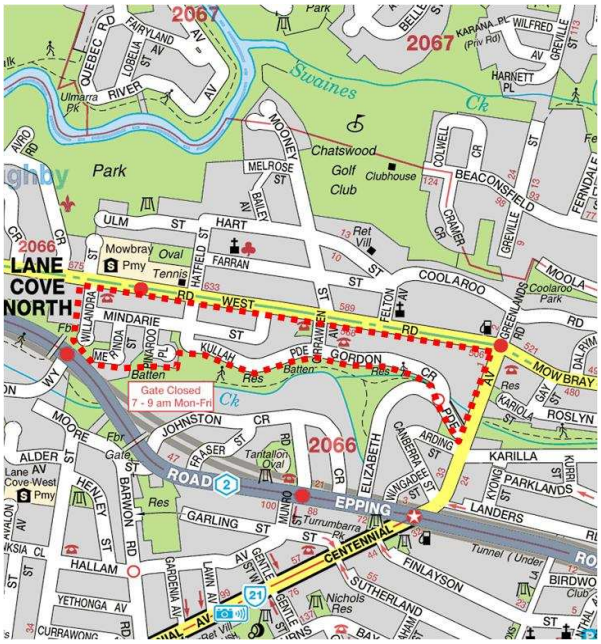


Figure 1: Mowbray Road Precinct Study Area

Study Approach

The study approach has considered the cumulative traffic impact of the development yield under the current LEP zoning.

This has involved the following activities:

- A review of the existing road network including traffic counts to assess the existing traffic conditions;
- An analysis of the trip generation potential of an agreed development option from JBA's strategic land use planning review;
- Forecast of future traffic volumes (and conditions) along Mowbray Road West using SMEC's strategic transport model named TRINITY;
- Micro-simulation modelling (PARAMICS) of the Precinct to assess the network performance under the 2021 forecast traffic impacts associated with the development;
- Intersection performance analyses (SIDRA) of the existing and future Mowbray Road West at its intersections with Centennial Avenue, Girraween Avenue, Mindarie Street, Kullah Parade and Willandra Street, under current and forecast traffic conditions;
- Assessment of the existing road to accommodate traffic from the agreed development potential;
- Investigation of traffic management schemes that can be implemented during emergency bush fire evacuation.

Scope of the Report

This report documents the approach and findings of the cumulative traffic impact of a development yield within the Precinct under the current LEP zoning.

It documents the traffic impact on the sections of Mowbray Road West and associated intersections fronting the Precinct, as well as the existing internal road network.

The rest of the report is structured as follows:

- **Section 2** provides information about the existing road network likely to be affected by the redevelopment of the Precinct;
- **Section 3** provides a description of maximum development yield in the Precinct given the current zoning controls;
- **Section 4** provides an overview of travel patterns in the Precinct;
- **Section 5** documents the development and calibration of the traffic forecasting models;
- **Section 6** documents the development and calibration of the micro-simulation models;
- **Section 7** provides a summary of future traffic growth in area, both background growth and that attributable to the Precinct;
- **Section 8** documents the impacts of the proposed Precinct development;
- **Section 9** outlines a series of potential traffic improvements that could be implemented to offset any negative impacts associated with the development;
- **Section 10** discusses bush fire evacuation scenarios and a performance assessment of the road network under an evacuation scenario;
- **Section 11** provides a summary of conclusions of the study.

2 EXISTING ROAD NETWORK

Road Network Classification

The Precinct fronts onto Mowbray Road West and Centennial Avenue. These two roads provide the main arterial road access for the Precinct. Both roads are classified as 'Regional Roads' under the RTA's administrative road classification system which includes:

- **State Classified Roads** are main roads, highways and motorways, under the care, control and management of the Roads and Traffic Authority (RTA);
- **Regional Roads** are typically secondary and sub-arterial roads, partly funded by the RTA, but under the care and control of relevant local councils; and
- **Other Roads** are under the care and management of relevant local councils.

Mowbray Road West forms part of the boundary between Willoughby Council and Lane Cove Council. Care and control of the road is jointly shared between the two Councils. Centennial Avenue falls wholly under the care and control of Lane Cove Council.

The remaining roads in the study area are local roads under Council's care and control.

In close proximity (and south of the existing residential developments to south of the Batten Reserve), is Epping Road, a state classified road.

In addition to its administrative classification, the RTA has also defined four road classes under its functional road hierarchy system, namely arterial, sub-arterial, collector and local streets.

The characteristics of the different road classes are summarised in **Table 1**.

The following sub-sections provide detailed descriptions of the key roads in the study area.

Table 1: Functional Road Hierarchy

Road Class	Description	Thru Traffic	Speed Limit (km/h)
Arterial Road	Regional road in urban areas, forming the principal corridor for transport movements. Typical traffic volumes greater than 15,000 vehicles per day (vpd)	Yes	70-100
Sub-arterial Road	Provide links from arterial roads to areas of development or carry traffic from one part of a subregion to all parts of the region. May relieve traffic on arterial roads in some circumstances. Typical traffic volumes between 5,000 and 20,000 vpd	Some	60-80
Collector roads	Provide links to sub-arterial or arterial roads, to the local road system in developed areas. Typical traffic volumes between 2,000 and 10,000 vpd.	Little	40-60
Local Roads	Provide direct vehicular access to the development or development Precinct and connect to the collector, sub-arterial or arterial road network. Low volumes, usually less than 2,000 vpd.	No	40

Sub-arterial Roads

Mowbray Road West is a road link between Epping Road and Pacific Highway. It is regional road (SR 7055) performing a collector road function.

The section fronting the Precinct is a two-lane two-way road within a 10.5m carriageway with kerb and guttering on both sides. The carriageway widens to 11.5m approaching the intersection of Centennial Avenue.

The existing carriageway has on-street parking along both sides of the road with the exception of a short section close to its intersection with Centennial Avenue.

During morning peak periods (7am to 9am) to maintain efficient traffic flow along Mowbray Road West, right turn movements are not permitted at its intersections with Mindarie Street and Willandra Street.

It is signposted at 50 km/h and is signal controlled at its intersection with Centennial Avenue. A pedestrian crossing is located immediately east of Willandra Street.

It has a 4.5m wide footway reserve along the southern section adjacent the Precinct, with a 1.2m wide concrete footpath.

In addition it contains the following features:

- Street lighting to 'Sub-Arterial' road standard;
- Pedestrian refuge to the east of Felton Avenue;
- Bus zones on each side of Mowbray Road at Girraween Avenue to the west and Felton Street to the east; and
- Bus shelter at the bus stop on the northern side.

Centennial Avenue is a secondary road (SR 2092) performing a collector road function. It is part of a regional road link between Elizabeth Parade and Epping Road.

The section fronting the eastern boundary is a two lane, two way road which is approximately 11.0 m wide with kerb and guttering (on both sides).

The existing carriageway permits on-street parking along both sides of the road with the exception of a short section close to intersection with the Mowbray Road West.

The sign posted speed limit is 60 km/h with an uncontrolled intersection with Elizabeth Parade.

Local Roads

The key local roads in the study area include Kullah Parade, Elizabeth Parade, Gordon Crescent, Mindarie Street, Willadra Street and Girraween Avenue.

These are local streets providing direct vehicular access from the arterial road network to residential properties throughout the Precinct.

The streets have a posted speed limit of 50kmh and carriageway widths of between 6.0 to 7.3 m.

Unrestricted parking exists on both sides of the majority of local streets with the exception of Gordon Crescent, Elizabeth Parade and Kullah Parade, which have parking restricted to one side only.

Existing Traffic Volumes

As part of the assessment of the existing traffic conditions, intersection traffic counts were carried out during weekday peak periods (7am to 9am) and (4pm to 6pm) and weekend peak period (9am to 1pm) at the following intersections:

- Mowbray Road West and Centennial Avenue
- Mowbray Road West and Girraween Avenue
- Mowbray Road West and Mindarie Street
- Mowbray Road West and Kullah Parade
- Mowbray Road West and Willandra Street
- Elizabeth Parade and Gordon Crescent

The traffic survey data is provided in **Appendix G**.

In addition to the intersection traffic counts, midblock traffic counts were carried by Council.

A summary of 2011 AM and PM peak mid-block flows and volume capacity estimates converted to Levels of Service (LOS) criteria, are presented in **Tables 2** to **5**.

These arterial roads generally operate with one traffic lane in each direction with a road shoulder capable of accommodating on-street parking.

As regional and sub-arterial roads, these roads are operating with a typical road capacity of the 950vph per lane to 1100vph per lane.

Table 2: Mowbray Road West AM Peak Hour Mid-Block Traffic Flows and LOS

Mid Block Location	EB Flows (veh)	WB Flows (veh)	EB LOS	WB LOS
Centennial Ave to Felton Ave	575	723	C	C
Felton Ave to Girraween Ave	619	735	C	C
Girraween Ave to Mindarie St	627	726	C	C
Mindarie St to Kullah Parade	599	746	C	C
Kullah Parade to Willandra St	607	728	C	C
Willandra St to Avian Cr.	594	727	C	C

Table 3: Mowbray Road West PM Peak Hour Mid-Block Traffic Flows and LOS

Mid Block Location	EB Flows (veh)	WB Flows (veh)	EB LOS	WB LOS
Centennial Ave to Felton Ave	678	770	C	C
Felton Ave to Girraween Ave	700	698	C	C
Girraween Ave to Mindarie St	706	691	C	C
Mindarie St to Kullah Parade	683	681	C	C
Kullah Parade to Willandra St	701	658	C	C
Willandra St to Avian Cr.	681	655	C	C

Table 4: Centennial Avenue AM Peak Hour Mid-Block Traffic Flows

Mid Block Location	NB Flows (veh)	SB Flows (veh)	NB LSO	SB LOS
Mowbray Road to Elizabeth Parade	522	603	C	C
Elizabeth Parade to Landers Road	455	342	B	B

Table 5: Centennial Avenue PM Peak Hour Mid-Block Traffic Flows

Mid Block Location	NB Flows (veh)	SB Flows (veh)	NB LSO	SB LOS
Mowbray Road to Elizabeth Parade	587	540	C	C
Elizabeth Parade to Landers Road	362	486	B	B

Using a road capacity of 1000 vph per lane the current traffic volumes indicate that sections of these two roads are operating at the LOS C or better in both peaks and have spare link capacity.

Redevelopment of the Precinct would have its most noticeable traffic impact on Mowbray Road West and to a lesser extent, Centennial Avenue. Analysis has therefore been carried out to assess the existing traffic conditions along these routes in the vicinity of the development Precinct.

Existing Intersections

Mowbray Road West and Centennial Avenue

The Mowbray Road West and Centennial Avenue intersection is a four-way signal controlled intersection located on the eastern side of the study area.

The western approach (along Mowbray Road West) consists of kerbside shared left and through traffic lanes and a shared inner lane, which permits right turn and through traffic movements.

The eastern approach (along Mowbray Road East) consists of a short dedicated left turn lane and an inner lane for through movements only, with no right turn permitted.

The southern approach (along Centennial Avenue) consists of a dedicated right turn lane and a kerb-side lane for all movement for left and through traffic movements.

The northern approach (along Greenland Road) consists of a shared kerb-side short left lane and through lanes and an inner lane which permits through and right movements. The intersection configuration is presented in **Figure 2.**

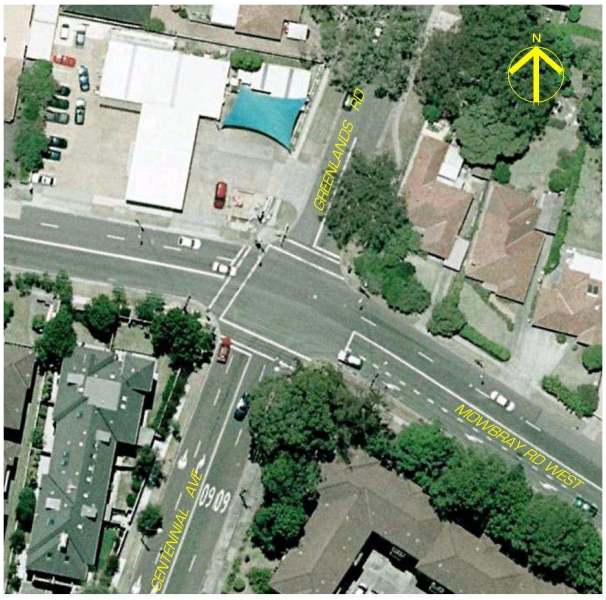


Figure 2: Mowbray Road West and Centennial Avenue

Mowbray Road and Girraween Avenue

The intersection at Mowbray Road and Girraween Avenue is a four-way yield intersection with the major movement along Mowbray Road.

The western approach (Mowbray Road West) consists of two lanes, a short left lane restricted by parking which allows for left and through movements and a centre lane which allows for through and right movements. The right turn is banned in the morning weekday peak.

The eastern approach (Mowbray Road East) consists of two lanes, a short left lane limited by parking which allows for left and through movements and a centre lane which allows for through and right movements.

The southern approach (Girraween Avenue) consists of a single lane which allows for all movements.

The northern approach (Mooney Street) consists of a single lane which allows for all movements.

Figure 3: Mowbray Road West and Girraween Avenue

Mowbray Road and Mindarie Street

The intersection at Mowbray Road West and Mindarie Avenue is a yield T-intersection with the major movement along Mowbray Road.

The western approach (Mowbray Road West) consists of a single lane that allows for through and right movements. The right turn is banned in the morning weekday peak.

The eastern approach (Mowbray Road East) consists of two lanes; a short left lane restricted by parking which allows for left and through movements and a centre lane which allows for through and right movements.

The southern approach (Mindarie Street) consists of a single lane which allows for left and right movements.

Figure 4: Mowbray Road West and Mindarie Street

Mowbray Road and Kullah Parade

The intersection at Mowbray Road and Kullah Parade is a four-way yield intersection with the priority movement along Mowbray Road.

The western approach (Mowbray Road West) consists of two lanes, a short left lane limited by parking which allows for left and through movements and a centre lane which allows for through and right movements. The right turn is banned in the morning weekday peak.

The eastern approach (Mowbray Road East) consists of two lanes, a short left lane restricted by parking which allows for left and through movements and a centre lane which allows for through and right movements.

The southern approach (Kullah Parade) consists of a single lane which allows for all movements.

The northern approach (Hatfield Street) consists of a single lane which allows for all movements.

Mowbray Road and Willandra Street

The intersection at Mowbray Road and Willandra Street is a four-way yield intersection with the priority movement along Mowbray Road.

The western approach (Mowbray Road West) consists of two lanes, a short left lane restricted by parking which allows for left and through movements and a centre lane which allows for through and right movements. The right turn is banned in the morning weekday peak.

The eastern approach (Mowbray Road East) consists of two lanes, a short left lane restricted by parking which allows for left and through movements and a centre lane which allows for through and right movements.

The southern approach (Willandra Street south) consists of a single lane which allows for all movements.

The north approach (Willandra Street north) consists of a single lane which allows for all movements.

Elizabeth Parade and Gordon Crescent

The intersection of Elizabeth Parade and Gordon Crescent is a 3 - way roundabout yield intersection with one circulating lane. All approaches consist of a single lane allowing for all movements.

Figure 5: Mowbray Road West and Kullah Parade

Figure 6: Mowbray Road West and Willandra Street

Intersection Performance

The current performance of the key intersections within the Precinct was assessed using aaSIDRA, version 5.0.

Intersection models were developed for:

- the AM and PM weekday peaks
- lunchtime weekend peak

The layout configurations and movement summaries for each of these intersections are provided in **Appendix F**.

The performance of the key intersection was assessed against the levels of service criteria (RTA method) listed in **Table 6**.

The current performance of the key intersections within the Precinct is summarised in **Table 7**.

Table 6: Intersection Level of Service Criteria (RTA Method)

LOS	Ave Delay/ vehicle (secs)	Traffic Signals, Roundabout	Give Way and Stop Signs
A	<14.5	Good operation	Good operation
B	14.5 to 28.5	Good operation with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	28.5 to 42.5	Satisfactory	Satisfactory, however a crash study is recommended
D	42.5 to 56.5	Operating near capacity	Operating near capacity and a crash study is required
E	56.5 to 70.5	At capacity and is likely to cause excessive delays at signals. Consider implementing alternative control method to roundabouts.	At capacity and requires alternative control method
F	70.5<	At capacity and small increases in traffic volumes are likely to cause disproportionately greater increases in delay.	At capacity and small increases in traffic volumes are likely to cause disproportionately greater increases in delay

Table 7: Current Performance of Mowbray Road Precinct Intersections

Location	Peak	LOS	Ave Delay (sec)	DOS	95% Queue Length (veh)
Mowbray Road and Centennial Avenue	AM	C	41.1	0.98	27.2
	PM	B	27.7	0.90	18.5
Mowbray Road and Girraween Avenue	AM	C	29.7	0.18	0.7
	PM	C	35.6	0.21	0.8
Mowbray Road and Mindarie Street	AM	D	45.6	0.14	0.5
	PM	D	46.1	0.04	0.2
Mowbray Road and Kullah Parade	AM	D	48	0.43	1.9
	PM	D	48.1	0.42	1.8
Mowbray Road and Willandra Street	AM	B	27.8	0.18	0.7
	PM	C	28.9	0.10	0.4
Elizabeth Parade and Gordon Crescent	AM	A	7.8	0.04	0.2
	PM	A	7.8	0.03	0.2

Note:
For give-way and stop sign controlled intersections the values of LOS and delay are for the worst movement.

Existing Crash History

As part of the traffic study, a review of the latest available crash history for the sections of Mowbray Road West and Centennial Avenue within the study area for the five year period, 2005 and 2009 was analysed to identify any existing road safety issues within the Precinct.

The analysis indicates that during this period, 23 reported crashes occurred, of which eight were injury crashes with the remaining 15 as non-injury (tow-away) crashes.

The highest proportion (six crashes, i.e. 26%) of the 23 crashes was attributed to vehicles travelling left off the carriageway and into an object. This crash type occurred at various locations within the Precinct. The second highest proportion (four crashes, i.e. 17%), were rear-end collisions, at no specific location.

The crash data does not therefore provide conclusive evidence of road safety issues within the Precinct.

Existing Bus Routes

The Precinct is served by bus services along Mowbray Road, Mowbray Road West and Epping Road.

Figure 7 shows the existing bus routes and bus stops, within and close to the study area.

Table 8 provides a description of the existing bus routes and **Table 9** summarises the existing service frequencies.

Table 8: Existing Bus Routes

Route No.	Service Description
534	Daily daytime and early evening service between Ryde, North Ryde, Mowbray Rd and Chatswood Selected weekday services extend to West Ryde
533	Monday to Friday peak hour service between service between Sydney Olympic Park, Rhodes, Ryde, North Ryde, Mowbray Rd and Chatswood
258	Monday to Friday limited peak hour service between Chatswood, Chatswood West and Lane Cove Industrial area
285	Monday to Friday peak hour service between Lane Cove Industrial area, Lane Cove and City-QVB
288	Daily full time service between Epping, Macquarie University, Macquarie Centre, Kent Road (288), North Ryde, Lane Cove and City - QVB via Freeway (288) or via North Sydney (290)
292	Daily full time service between Marsfield, Macquarie University, Macquarie Centre, Macquarie Park, North Ryde, Lane Cove and City – QVB
140	Monday to Friday peak hour limited stops service between Manly, Fairlight, Balgowlah, The Spit, Spit Jn, Cremorne, Neutral Bay, Crows Nest, St Leonards, Gore Hill, Artarmon, Lane Cove, North Ryde, Macquarie Centre, Macquarie University and Epping
286	Monday to Friday peak hour services between Denistone East (286), Ryde (287), North Ryde, Lane Cove, St Leonards, North Sydney, Milsons Point (287) and City – QVB (286)
287	Monday to Friday peak hour services between Denistone East (286), Ryde (287), North Ryde, Lane Cove, St Leonards, North Sydney, Milsons Point (287) and City – QVB (286)
290	Daily full time service between Epping, Macquarie University, Macquarie Centre, Kent Road (288), North Ryde, Lane Cove and City - QVB via Freeway (288) or via North Sydney (290)
294	Monday to Friday peak hour service between Macquarie Centre, Talavera Road, Lane Cove and City via Freeway

Source: Sydney Buses Timetables website, downloaded September 2011

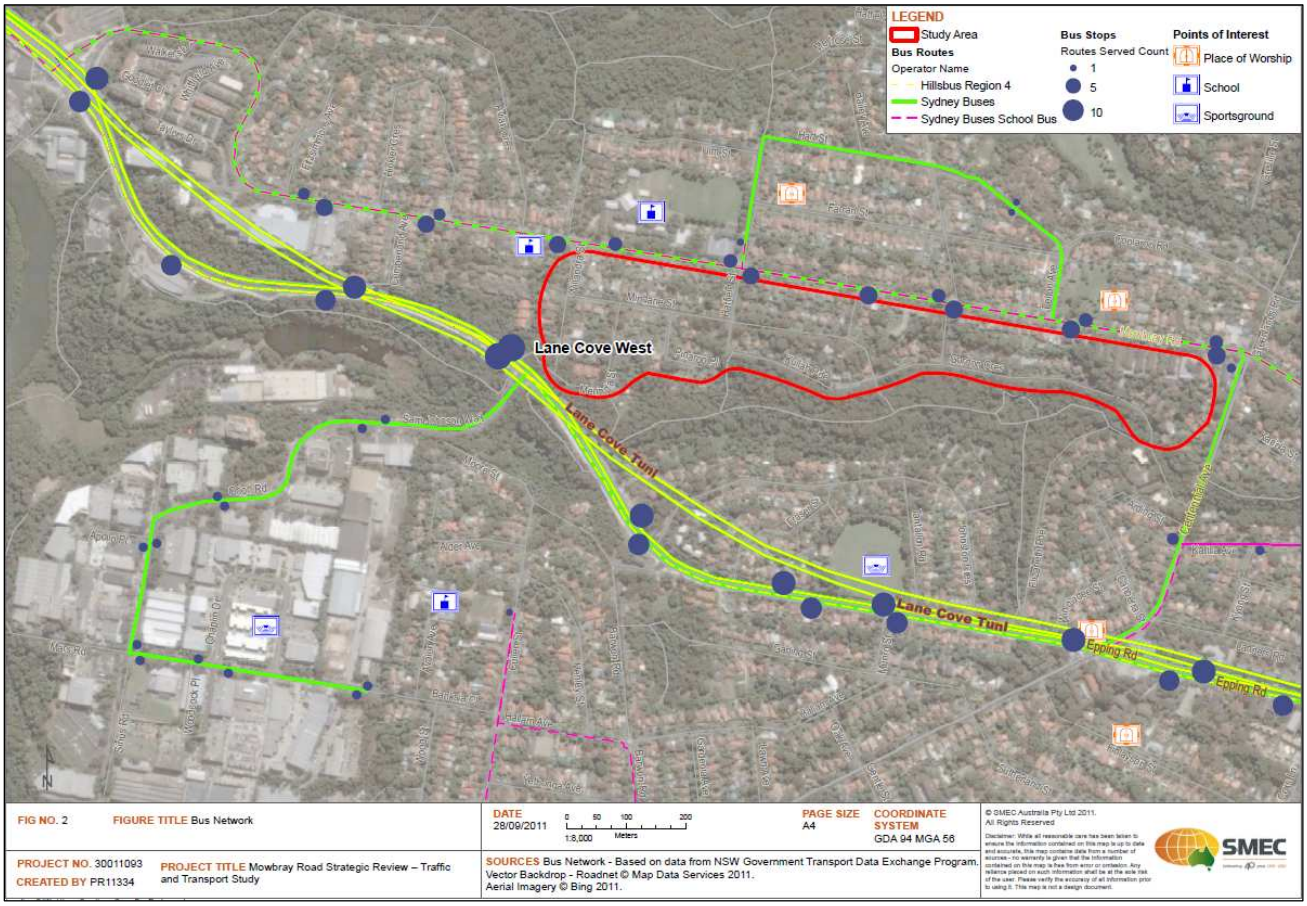


Figure 7: Current Bus Services in Vicinity of the Mowbray Road Precinct

Table 9: Existing Bus Route Service Frequencies

Route	AM	PM	Off Peak	Sat	Sun/ Public Holiday
533	15	15	-	-	-
534	15	15	40	40	60
258	x2	x2	-	-	-
285	30	25	-	-	-
288	8	10	15	15	60
292	10	10	30	60	60
140	x2	x2	-	-	-
286	15	30	-	-	-
287	15	30	-	-	-
290	15	20	60	60	60
294	7	-	-	-	-

3 DEVELOPMENT SCENARIO

Overview

This section provides a summary of the land use development potential modelled in the traffic impact assessment of the Precinct.

It includes a review of the strategic planning documents relevant to the zoning and redevelopment of the Precinct.

The documents reviewed include:

- *Metropolitan Plan for Sydney 2036* (NSW Government, December 2010)
- *Inner North Subregional Strategy* (NSW Government, December 2010)
- *Draft State Environment Planning Policy (SEPP) No. 66, Integrated Land Use and Transport* (Department of Urban Affairs and Planning, 2001)

Metropolitan Plan for Sydney 2036

The *Metropolitan Plan for Sydney 2036* (Metropolitan Plan) was released by the NSW Government in December 2010, superseding the Metropolitan Strategy for Sydney 2031 (NSW Department of Planning 2005). The Metropolitan Plan is based on the principles of the 2005 *Metropolitan Strategy – City of Cities* and the *Metropolitan Transport Plan 2010*, incorporating the feedback from the first five-yearly review of the Metropolitan Strategy.

The *Metropolitan Plan* outlines that Sydney's population is growing faster than estimated in the *Metropolitan Strategy*, with revised forecasts indicating Sydney's population growth will be an additional 1.7 million people between 2006 and 2036 to 6 million people.

To accommodate this growth, 770,000 additional residential dwellings and 760,000 additional jobs would be required by 2036.

The *Metropolitan Plan* provides strategies outlined to accommodate this population increase, including:

- Concentrate activities in centres, improving access to all services and facilities, reducing dependence on cars; and
- Encourage people to live in or around centres to allow more productive use of infrastructure and make public transport improvements more viable.

The land use strategies propose locating at least 80 percent of new housing within walking distance of existing and planned centres with good public transport and planning for urban renewal in centres where public transport capacity is available or is planned for expansion.

Sydney Inner North Subregional Strategy

Subregional strategies provide a planning tool for councils to implement the NSW Government's *Metropolitan Plan for Sydney 2036* and *NSW State Plan* at the local level.

The draft *Inner North Subregional Strategy* outlines the target developments and land use/transport strategies for Hunters Hill, Lane Cove, Mosman, North Sydney, Ryde and Willoughby Local Government Areas (LGA).

The *Inner North Subregional Strategy* has an employment capacity target of 60,000 additional jobs between 2001 and 2031, with 6,500 jobs for Lane Cove LGA and 30,000 additional dwellings with 3,900 dwellings for the Lane Cove LGA.

Lane Cove Local Environment Plan 2009

The comprehensive LEP for Lane Cove LGA outlines zonings for land use changes in the LGA, with objectives including economic development to meet the employment target set in the *Metropolitan Strategy*. It provides the current zoning, relevant to the Precinct.

Residential Development Targets

To meet its residential development target specified in the *Draft Inner North Sub-Regional Strategy*, Council and the DP&I have investigated redevelopment options in a number of development Precincts in the Lane Cove LGA.

It is understood significant redevelopment of the Precinct has been considered because it is in close proximity to the employment and activity centres of Chatswood and North Sydney, has good access to high frequency bus services and one major land owner, the NSW Housing which has an existing Estate, within the Precinct.

LEP Development Potential

As part of the strategic review of the redevelopment of the Precinct, JBA was commissioned to investigate and reassess the development potential and yield of the Precinct based on the current LEP zoning and the Council proposed rezoning to low density.

A detailed description of the two development options and assumptions used in forecasting additional development potential of the Precinct, are outlined in JBA's Land Use Planning Strategic Review. This section of the report should therefore be read in conjunction with JBA's report.

JBA's analysis indicates that under the current LEP zoning, the Precinct could be redevelopment to a net

yield of 1580 dwellings with a maximum theoretical total development potential of 2329 dwellings, from the existing 381 dwellings (by 2021). Earlier in the study the number of existing dwellings which were estimated not to be redeveloped was estimated at 241 dwelling as shown in Tables 11 and 12.

The recommended development yield from JBA's analysis is provided in **Table 10.**

Table 10: JBA's Recommended Residential Yields

Description of Development	Number of Dwellings
Potential redevelopment increased yield	973
Approved/Proposed Development Applications	224
Nett Increase	1200
Existing Dwellings	381
Total Dwellings	1580

The Study's Project Control Group (PCG) adopted the theoretical maximum development yield of 2088 dwellings (during the early stages of the strategic review) for this traffic investigation and associated impact assessment.

A distribution of the forecast theoretical maximum development yield into development Precincts is shown in **Tables 11** and **12.**

Table 11: JBA 2021 Dwelling Yield Forecasts For Mowbray Road Precinct

JBA Zone ID	2021 Gross Yield	Current Dwellings	2021 Net Yield
1	377	46	331
2	179	18	161
3	201	16	185
4	136	10	126
5	231	19	212
6	229	23	206
7	255	58	197
8	721	51	670
Totals	2329	241	2088

- **Table 12: Distribution of JBA 2021 Dwelling Yield Forecasts to SMEC zones**

SMEC Zone ID	JBA Zone ID	Current Dwellings	JBA 2021 Net Yield
17	1.1	18	132
18	1.2	28	199
	2	18	161
	3	16	185
	4	10	126
19	5.1	8	85
	7.1	17	59
20	5.2	11	127
	6	23	206
	7.2	41	138
21	8.1	15	201
22	8.2	26	335
23	8.3	10	134
	Totals	241	2088

4 TRAVEL PATTERNS

The NSW Government's Household Travel Survey (HTS) provides travel information for households surveyed across the Sydney Greater Metropolitan Area (GMA). These surveys tell us when, how, why and where the people in the surveyed households travelled on the day of the survey.

A major benefit of SMEC's first-principles approach to trip table development in traffic forecasting, is access to a wealth of land use and travel pattern data relevant to development planning and impact assessment, including:

- Socio economics of households in the region
- Trip purposes
- Trip direction
- Trip rates

The following sections summarise some this data for the Lane Cove LGA.

Socio- Economics

Our analysis of HTS data for the Sydney GMA indicated that the number of trips generated by each household is closely related to the income of that household.

Households with an income less than $25,000 per annum generate less than 5.8 trips per day. Conversely, households with an income in excess of $150,000 generate more than 14.9 trips per day.

Household income is, therefore, a major trip production variable. A comparison of the income distribution for the Precinct (Travel Zones 2396 and 2423), Lane Cove LGA and the Sydney GMA is provided in **Table 12**.

Table 12: Proportion of Households in Each Income Category

HH Income Categories (000's)	TZ2396	TZ2423	Lane Cove (A) LGA	GMA
<$25	4%	8%	6%	13%
$25 to $50	10%	19%	12%	22%
$50 to $75	14%	10%	11%	18%
$75 to $100	17%	19%	16%	18%
$100 to $150	29%	26%	28%	18%
>$150	26%	19%	27%	11%
TOTAL %	100%	100%	100%	100%
TOTAL HH	882	768	12851	1985175

Source: HTS, 2006

Whilst the average household income in TZ2423 is higher than the Sydney GMA average, it is marginally lower for the Lane Cove LGA and lower than the adjacent TZ2396 located on the northern side of Mowbray Road West.

Mode Share

The mode share patterns for Lane Cove LGA are presented in **Tables 13** to **15**. These patterns are derived from analysis of 2006 HTS data and are for all trip purposes. They have been broken down into outbound, inbound and internal trip purposes.

Table 13: Lane Cove LGA Mode Share for All AM Peak (2-hr) Trip Purposes

Mode	Trip Type		
	Outbound	Internal	Inbound
PT	36%	4%	15%
Car	60%	61%	80%
Bicycle	0%	0%	0%
Walk	3%	35%	5%
Other	1%	0%	0%
Totals %	100%	100%	100%
Totals Trips	13,685	8,410	11,066

Source: HTS, 2006

Table 14: Lane Cove LGA Mode Share for All PM Peak (2-hr) Trip Purposes

Mode	Trip Type		
	Outbound	Internal	Inbound
PT	18%	2%	31%
Car	78%	47%	64%
Bicycle	0%	0%	1%
Walk	4%	51%	2%
Other	0%	0%	1%
Totals %	100%	100%	100%
Totals Trips	10,388	7,915	9,725

Source: HTS, 2006

Table 15: Lane Cove LGA Mode Share for All Daily Trip Purposes

Mode	Trip Type		
	Outbound	Internal	Inbound
PT	18%	3%	17%
Car	75%	55%	75%
Bicycle	0%	0%	0%
Walk	6%	41%	6%
Other	1%	1%	1%
Totals %	100%	100%	100%
Totals Trips	64,224	56,373	64,358

Source: HTS, 2006

Trip Purpose

The purpose of daily trips within the Lane Cove LGA is summarised in **Table 16**.

These patterns are derived from analysis of 2006 HTS data and are for all trip purposes. They have been broken down into inbound, outbound and internal trip types.

Table 16: Summary of Top 20 Trip Purposes for Lane Cove LGA Daily Trips

Origin Purpose	Destination Purpose	In	Out	Int
Home	Work	12%	11%	1%
Social/Recrtn	Home	8%	8%	11%
Home	Social/Recrtn	6%	6%	10%
Work	Home	6%	8%	1%
Shopping	Home	5%	1%	9%
WR Business	WR Business	5%	6%	2%
Home	Serve Pax	5%	4%	8%
Return to work	Home	5%	3%	0%
Serve Pax	Home	4%	4%	8%
Home	WR Business	3%	3%	0%
WR Business	Home	3%	2%	0%
Edu/C'care	Home	3%	2%	2%
Serve Pax	Serve Pax	2%	2%	2%
Personal	Home	2%	2%	4%
Home	Edu/C'care	2%	4%	2%
Home	Personal	2%	4%	4%
Work	Social/Recrtn	2%	1%	1%
Social/Recrtn	Social/Recrtn	2%	2%	2%
WR Business	Return to work	1%	1%	0%
Serve Pax	Work	1%	1%	0%
Other	Other	23%	24%	32%
	TOTALS%	100%	100%	100%
	TOTAL TRIPS	64358	64224	56373

Source: HTS, 2006

Trip Direction

Analysis of the 2011 AM and PM peak sub-area matrices has been undertaken to identify the directionality of movements in/out and through the study area.

The results of the analysis are presented in **Figures 8** and **9.**

Figure 8: Directionality of Movements in, out and through the Mowbray Road Precinct in 2011 AM Peak

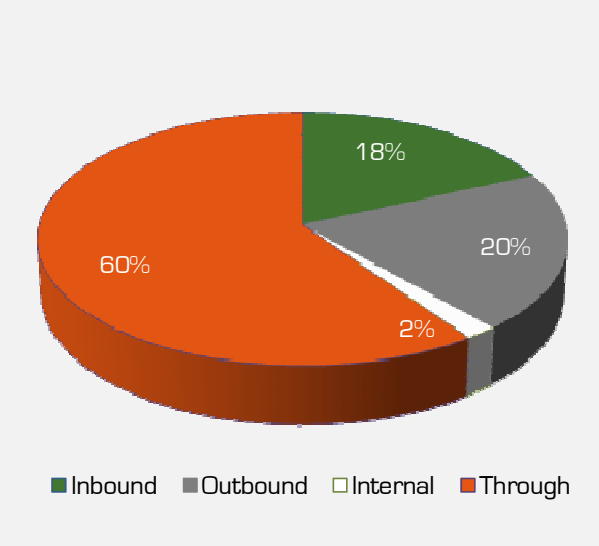
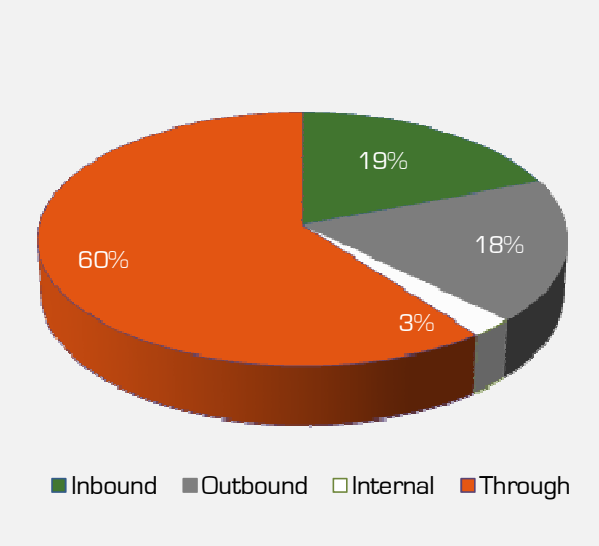


Figure 9: Directionality of Movements in, out and through the Mowbray Road Precinct in 2011 PM Peak



Existing and Adopted Trip Generation Rates

Existing trip generation rates for the Precinct have been derived by a first-principles approach using:

- Trip production and attraction estimates from SMEC's calibrated TRINITY transport model. This model is based on a widely accepted three-step modelling methodology involving a socio economic based trip generation process, a gravity model trip distribution process and a generalised cost trip assignment process
- Population, dwelling and employment data from Bureau of Transport Statistics (BTS)

The Precinct currently falls within a single travel zone (TZ2423), with an adjacent travel zone to the north (TZ2396), based on the BTS zonal system contained within TRINITY.

The current hourly trip production and attraction estimates for the Precinct, represented by TZ2423, and the adjacent Precinct to the north, TZ2396, are presented in **Table 17**.

The population, dwelling and employment estimates for the same two travel zones are presented in **Table 18**.

Finally, the resultant trip rates per dwelling are presented in **Table 19**. These rates compare favourably with RTA standard trip generation rates. The advantages of the TRINITY based approach to estimating trip rates are:

- The trip rates reflect the individual mode share characteristics of the area
- The trip rates reflect the individual socio-economics of each travel zone. For example, the average household income of TZ2423 is lower than the adjacent zone. This has resulted in lower trip production rates (i.e. 0.36 trip per dwellings versus 0.5 trips per dwelling for the zone with the higher average household income)
- Population and employment characteristics specific to each travel zone. During the TRINITY distribution process, the model introduces k-factors that reduce the 'attractiveness' of office jobs to low income category work trips and reduces the 'attractiveness' of primary industry jobs to high income category work trips

During discussion with the PCG and JBA Consultants it was identified that current household socio-economics of the Precinct would change significantly with the proposed luxury apartment style development. It is expected that the average socio economics of households in the new development will be higher than existing. This will result in higher trip rates. Accordingly, the PCG agreed that the higher trip rates of the adjacent development in TZ2396 should be adopted, to better reflect the style of development proposed in the Mowbray Road Precinct.

Table 17: 2011 AM & PM Peak Hour Trip Generation

Direction	Peak	TZ2396	TZ2423	Combined
Outbound	AM	414	273	688
	PM	395	243	638
Inbound	AM	423	200	623
	PM	390	278	668

Source: TRINITY

Table 18: 2011 Population, Dwellings and Employment

Land Use	TZ2396	TZ2423	Combined
Population	2291	1783	4074
Dwellings	832	768	1600
Employment	698	915	1613

Source: BTS

Table 19: 2011 AM and PM Peak Hour Trip Rates

Direction	Peak	TZ2396	TZ2423	Combined
Outbound	AM Trips/ Dwelling	0.50	0.36	0.43
	PM Trips/ Employee	0.57	0.27	0.40
Inbound	AM Trips/ Employee	0.61	0.22	0.39
	PM Trips/ Dwelling	0.47	0.36	0.42

5 TRAFFIC FORECASTING

Background

The regional travel patterns contained within the Precinct models were derived from SMEC's TRINITY Transport Model (TRINITY).

TRINITY is a strategic transport model of the Sydney, Newcastle and Wollongong metropolitan areas. It is a series of geospatial information layers, databases and spreadsheets embedded within a transport modelling software package. These elements combined create a mathematical representation of land use and travel patterns in the Sydney GMA.

TRINITY is a software tool for forecasting traffic growth and planning of Sydney's future road infrastructure needs. It is unique in its socio-economic approach to travel demand, its geographic scope and the number (21) of trip purposes (work, shopping, recreational etc) it models.

TRINITY covers an area of 2.5 million hectares and contains 21,000km of road network and 20,500 intersections.

Modelling Overview

The TRINITY model relies heavily on sound transport engineering practices.

The trip patterns that make up the engine room for TRINITY were developed from first principles using a well documented and established three-step modelling process that includes:

- Trip generation
- Trip distribution
- Trip assignment

It is the first two steps in this process that have the biggest impact on model accuracy.

Trip Generation

In the trip generation phase, TRINITY predicts the number of trips originating from or destined to a particular geographic area (or travel zone). In Sydney there are over 2,690 travel zones ranging in size from 0.4Ha (a city block) to over 120,000Ha (Hawkesbury region).

Trip generation mainly focuses on households. The total trips produced or attracted by a household are a function of the social and economic attributes of that household.

SMEC undertook cross classification analysis of data from BTS's 170,000 HTS collected across the Sydney GMA. The analysis identified average trip rates for 100 possible trip purposes divided into six household income categories. The 20 most influential trip purposes are used in TRINITY.

The cross- classification method is widely used in transport planning. A 2007 survey of over 220 US Metropolitan Planning Organisations (MPOs) revealed that over 89% use this method for development of trip generation rates.

Trip Distribution

In trip distribution TRINITY matches trip makers' origins and destinations to develop an origin and destination matrix (or Trip Table) that displays the number of trips going from each origin to each destination. Historically, this component has been the least developed component of transport planning models.

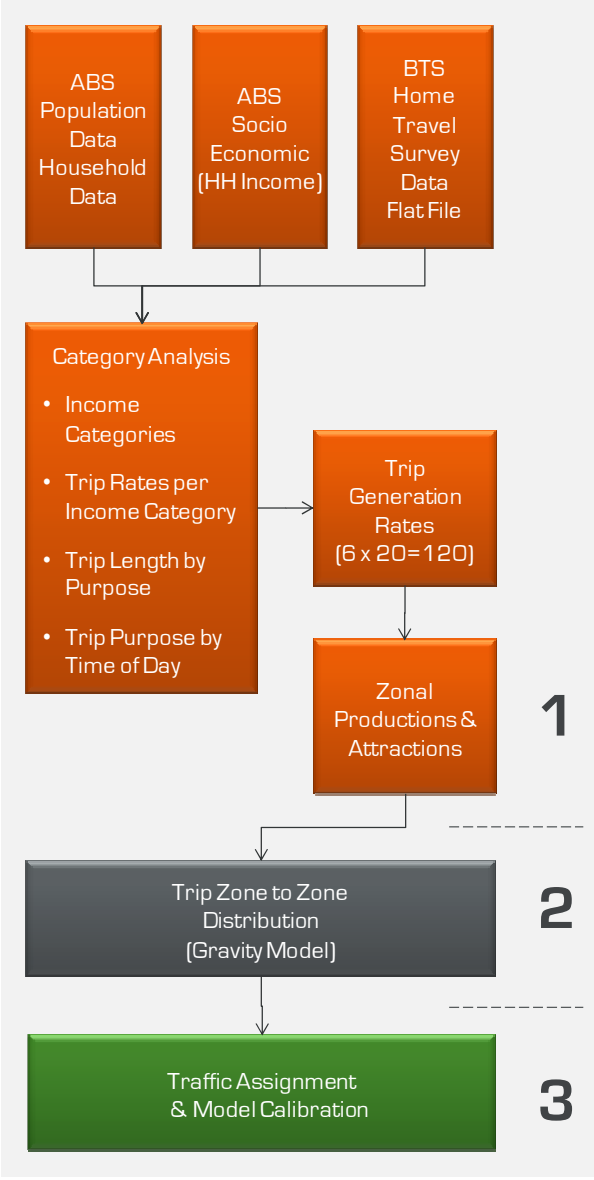


Figure 10: The 3-Step Modelling Process

Trip distribution in TRINITY is based on the 'gravity' model concept. As the name implies, this model adapts the gravitational concept, as advanced by Newton in 1686, to the problem of distributing traffic throughout an urban area.

The gravity model is one of the most widely used formulae in transportation planning, mainly because it is simple in concept and because it has been well documented. In essence, the gravity model says that trip interchange between zones is directly proportional to the relative attraction of each of the zones and inversely proportional to some function of the spatial separation between zones. This function of spatial separation adjusts the relative attraction of each zone for the ability, desire, or necessity of the trip maker to overcome the spatial separation involved.

TRINITY was calibrated for each trip purpose by comparing surveyed trip length profiles with the modelled profiles until we achieved a satisfactory match. For example, average trip lengths for shopping trips (11 minutes) are significantly lower than for work trips (27minutes).

The gravity model responds by limiting the distribution of shopping trips to predominantly local shopping destinations (within 11 minutes travel time) but permits distribution of work trips to a wider range of possible work destinations.

The TRINITY model incorporates the following innovations designed to refine the trip distribution process:

- K-factors
- Public transport accessibility factors

K-Factors

K-factors are a specific zone-to-zone adjustment factor for work trips which incorporates travel patterns not otherwise accounted for in the gravity model.

Our review of household travel survey data identified distinct socio-economic relationships between employment and income category e.g. people in high income households tend to work in high paying white collar industries.

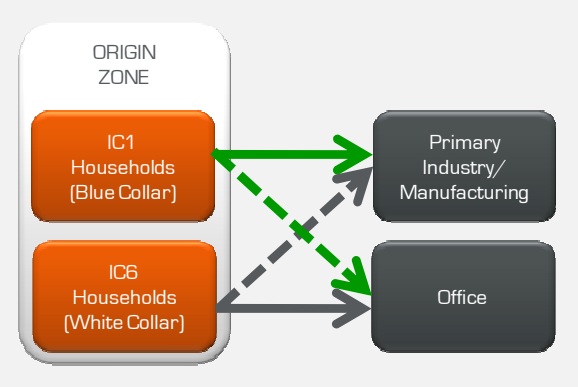


Figure 11: The K-Factor Concept

The K-factor:

- reduces the 'attractiveness' of office jobs to low income category work trips
- reduces the 'attractiveness' of primary industry jobs to high income category work trips

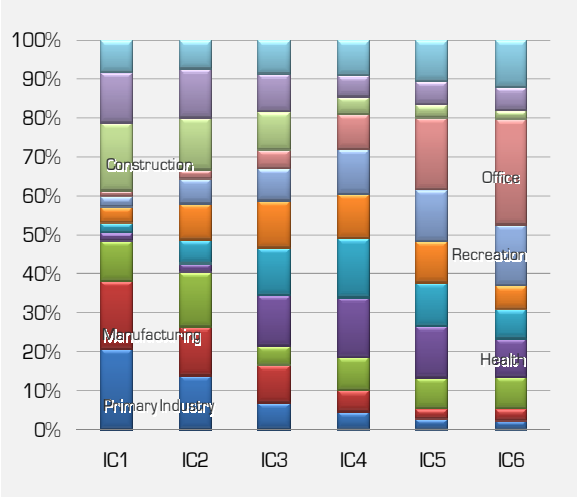


Figure 12: Socio-economic Relationship between Employment & Household Income Category (IC1 to IC6[1])

Public Transport Accessibility

The second innovation was the introduction of origin (O-car) and destination (D-car) public transport accessibility factors.

Whilst the earlier trip generation process develops 120 generic trip production profiles (6x 20 = 120), these profiles do not reflect the accessibility of public transport alternatives unique to each travel zone.

To address this issue, TRINITY factors the generic production and attraction profiles up or down based on the individual mode share profiles for each travel zone.

In essence, TRINITY generates close to 320,000 unique trip profiles (6 x 20 x 2,690 = 322,800).

These factors simulate the impacts of public transport and parking accessibility on car trip productions and attractions in each travel zone. For example, the D-car factor reduces the attractiveness of the Sydney CBD as a destination for car trips to reflect the excellent accessibility of public transport services and poor availability of car-parking.

[1] IC1 represents an annual household income less than $25,000. IC6 represents an annual household income more than $150,000.

Data Inputs

TRINITY incorporates the latest land use and travel data sets available. Key inputs include:

- 2006 Census data
- 170,000 HTS collected by the BTS
- RTA road networks and traffic counts
- BTS Freight Matrices

Calibration

The calibration (accuracy) of transport models such as TRINITY is determined by comparing observed (counted) traffic volumes with modelled traffic volumes.

TRINITY has been vigorously calibrated and validated against the data from more than 440 RTA traffic count sites spread throughout the Sydney road network.

TRINITY has also been calibrated along the major RTA screen-lines. Screen-lines were established by the RTA for modeling calibration purposes. They are used to ensure that the models accurately replicate the movement of vehicles along natural corridors within the network. A plot of the RTA screen-line locations is provided below in **Figure 13**.

TRINITY meets or exceeds the minimum calibration targets required by the RTA.

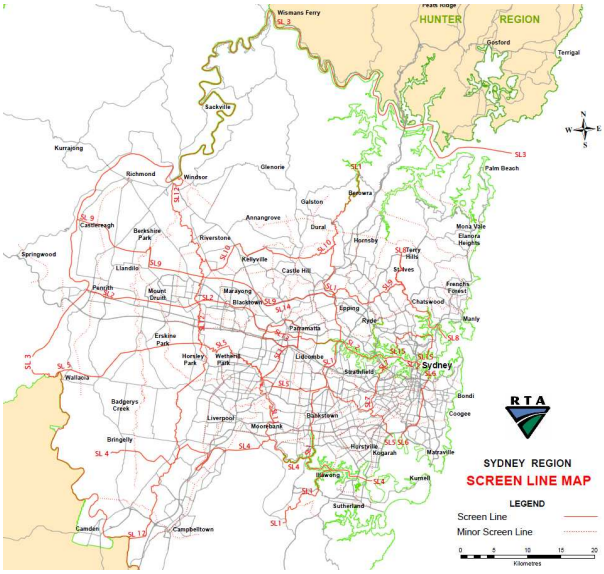


Figure 13: RTA Screen-Line Locations

The RTA has generally adopted the UK's DMRB[2] standards for model calibration. These rely heavily on a measure called the GEH statistic. The GEH statistic is a self-scaling empirical statistic with similarities to a chi-squared test. The desired target is to achieve a GEH value less than 5.0 at more than 85% of sites.

Because the GEH statistic is self-scaling, a single acceptance threshold based on GEH can be used over a fairly wide range of traffic volumes.

The formula for the "GEH Statistic" is shown below:

$$GEH = \sqrt{\frac{2(M-C)^2}{M+C}}$$

Where 'M' is the hourly traffic volume from the traffic model and 'C' is the real-world hourly traffic count.

Using the GEH Statistic avoids some difficulties that occur when using simple percentages to compare two sets of volumes.

For traffic calibration of the base year modelling the following is important:

- GEH of less than 5.0 is considered a good match between the modelled and observed hourly volumes. When 85% of the volumes on screen lines in a traffic model have a GEH less than 5.0 model one could assume that the model is sufficiently calibrated.
- If GEH values in the range of 5.0 to 10.0 are dominant this may warrant detail investigation.
- If the proportion of GEH greater than 10.0 is significant, there is a high probability that there is a problem with either the travel demand model or the data (this could something as simple as a data entry error, or as complicated as a serious model calibration problem)

[2] Design Manual for Roads & Bridges, Volume 12, Section 2, Traffic Appraisal Advice, May 1996

Calibration Results

In the 2006 AM peak, TRINITY has achieved the following excellent calibration results:

- 89% of sites achieved a GEH statistic less than 5.0
- 100% of major bridge crossings (for example, Sydney Harbour Bridge, Sydney Harbour Tunnel, Gladesville Bridge) achieved a GEH statistic less than 5.0
- 90% of sites on the major RTA screen-lines achieved a GEH statistic less than 5.0

In the 2006 PM peak, TRINITY has achieved the following excellent calibration results:

- 95% of sites achieved a GEH statistic less than 5.0
- 100% of major bridge crossings achieved a GEH statistic less than 5.0
- 94% of sites on the major RTA screen-lines achieved a GEH statistic less than 5.0.

The model matrices were also calibrated against household travel survey trip length data.

A scatter plot analysis of the modelled results for the major RTA screen-lines was undertaken to demonstrate the goodness of fit (R^2) of the modelled results compared to the observed. These scatter plots are presented in **Figures 14** to **17.**

Conclusion

Given the match between observed and modelled flows, favourable comparisons between the modelled and observed travel behaviour, it is concluded that the TRINITY models are sufficiently calibrated and replicate existing conditions to a level of accuracy acceptable for its intended use.

Table 20: 2006 AM Peak (7am to 9am) Calibration at All Count Sites

Road Type	Total	GEH Value			
		0-5	5-7.5	7.5-10	> 10
Freeway	39	27	5	2	5
Ramps	9	9	0	0	0
Main Roads (Arterial)	202	181	15	4	2
Secondary Roads (Sub-Arterial)	173	162	8	2	1
Secondary Roads (Collector)	18	15	1	2	0
Local Roads	2	2	0	0	0
TOTAL	443	396	29	10	8
	100%	**89%**	**7%**	**2%**	**2%**

Table 21: 2006 PM Peak (3pm to 6pm) Calibration at All Count Sites

Road Type	**Total**	GEH Value			
		0-5	5-7.5	7.5-10	> 10
Freeway	39	32	4	2	1
Ramps	9	9	0	0	0
Main Roads (Arterial)	202	193	5	1	3
Secondary Roads (Sub-Arterial)	173	165	7	1	0
Secondary Roads (Collector)	18	18	0	0	0
Local Roads	2	2	0	0	0
TOTAL	443	419	16	4	4
	100%	**95%**	**3%**	**1%**	**1%**

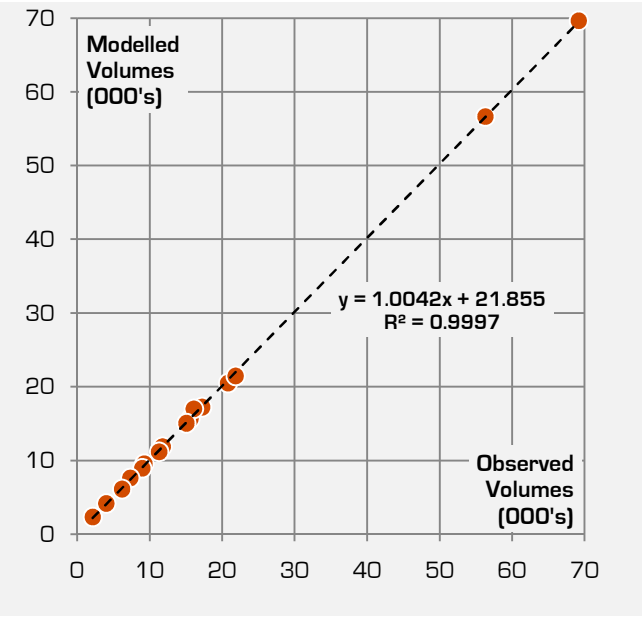


Figure 14: Comparison of Observed versus Modelled Screen-Line Flows during AM Peak (Link Direction A-B[3])

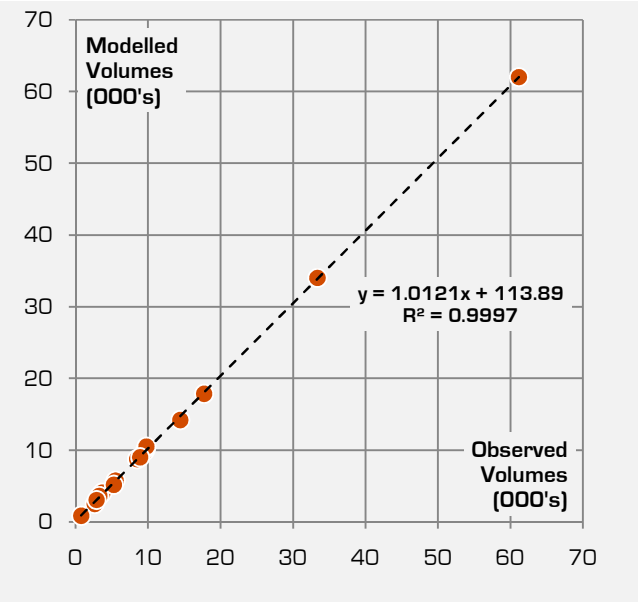


Figure 15: Comparison of Observed versus Modelled Screen-Line Flows during AM Peak (Link Direction B-A)

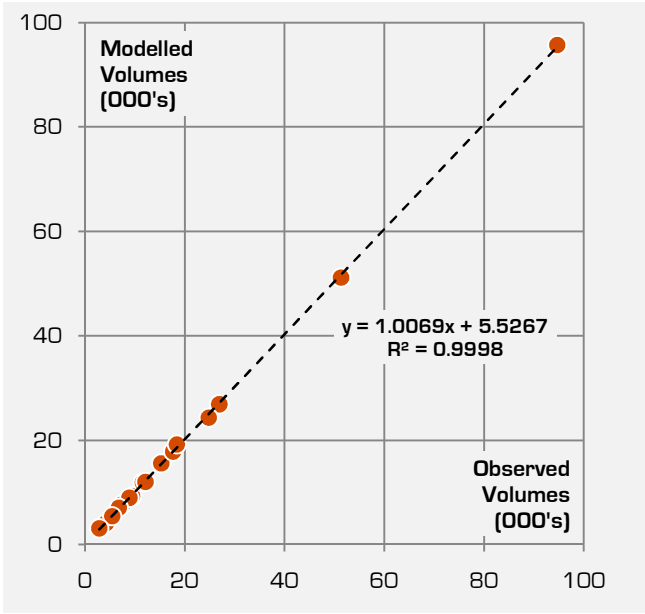


Figure 16: Comparison of Observed versus Modelled Screen-Line Flows during PM Peak (Link Direction A-B)

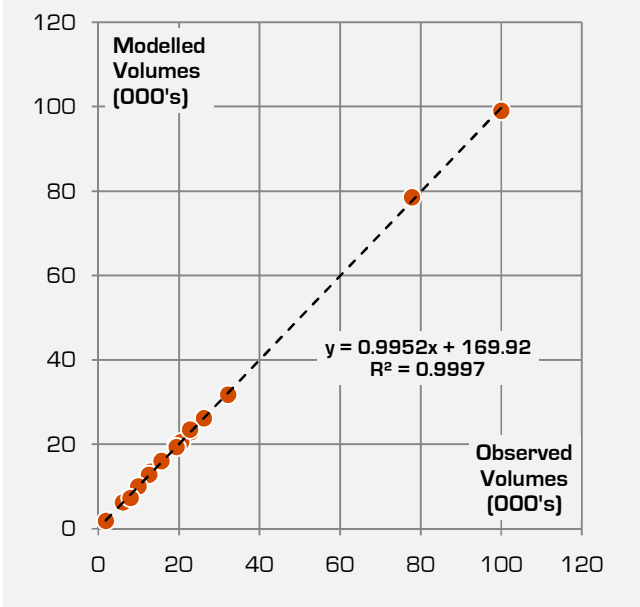


Figure 17: Comparison of Observed versus Modelled Screen-Line Flows during PM Peak (Link Direction B-A)

[3] In TransCAD each link is defined by two nodes (A and B). Each link also has two possible flow directions. The direction of flows on each link is defined by the two nodes, Node A to Node B (A-B) and the reverse movement Node B to Node A (B-A).

6 MICRO-SIMULATION MODEL DEVELOPMENT

Background

This section documents the development and calibration of 2011 AM and PM peak period micro-simulation models for the Precinct.

These models will be used to assess future land use traffic impacts and fire evacuation scenarios.

The Precinct micro-simulation models were built using PARAMICS software.

These 2011 base-case models have been calibrated to reflect the road network and traffic demands present in September 2011 based on traffic survey data.

Study Area

The Precinct models are primarily a corridor style model built around Mowbray Road West. The corridor extends from Whitfield Avenue in the west to Centennial Avenue in the east.

An illustration of the model network is provided in **Appendix 'B'**.

Time Periods

The model was set up to simulate the following peak hour periods:

- AM peak (7:45am to 8:45am)
- PM peak (5:00pm to 6:00pm)

A lead-in half hour is provided before each peak hour to load the models with traffic before traffic statistics are collected. The lead-in half hour will not contribute to model statistics.

Model Statistics

The Precinct models contain:

- 29 zones
- 23 intersections
- 1 set of signals
- 1 roundabout
- 21 give-way
- 152 nodes
- 328 links
- 19.6km of roadway
- 6 bus routes

The model has been coded with fixed time traffic signal control.

Software

The Mowbray Road Precinct models were built using PARAMICS version 6.7.2 software. No additional plug-ins or add-ons were required for this study.

Network Build

The models were coded using spatially accurate aerial photographs. This was supplemented by on-site inspections of the network. The road network includes the following details:

- Number of lanes on the carriageway, including parking lanes
- Turning bays
- Speed zones
- Clearways, and
- Bus routes (including stops)

Signal phasing, green-splits and inter-greens were coded based on site observations and RTA signal phasing plans.

These signal timings were initially coded into PARAMICS and then fine-tuned, where necessary, to maximise the efficiency of individual intersections.

Zone Definition

The models include 29 zones which are the origin and destinations for all movements within the models. These are divided into:

- 24 external zones linking the models to the wider road network, and
- 5 internal zones which are loading points for major retail, commercial, educational and residential land uses in the study area.

Road Categories

The standard RTA road categories file was used to define the network.

Each link in the model area was assigned an RTA road category that matched its number of lanes and speed limit.

Speed limits were initially based on commercially available GIS based road centre line data and confirmed by site audit.

Regional Patterns

The regional travel patterns contained within the models were derived from TRINITY.

As indicated previously in Section 4, the Precinct currently falls within a single travel zone (2423) in the TRINITY model, which is based on the BTS zonal system. For detailed micro-simulation modelling of the Precinct, this zonal system was too coarse and needed to be refined. Accordingly, the two travel zones TZ2423 and TZ2396 were broken down into

numerous sub-zones based on census mesh-block population, dwelling and employment data available from BTS.

Table 22: Distribution of Population & Employment (TZ2396 & TZ 2423)

Sub-Zone ID	Population	Dwellings	Employment
2396_1	0	0	580
2396_2	435	172	21
2396_3	145	55	4
2396_4	97	29	2
2396_5	237	76	6
2396_6	33	20	1
2396_7	523	155	23
2396_8	0	0	40
2396_9	79	23	2
2396_10	33	12	1
2396_11	203	95	5
2396_12	196	94	5
2396_13	113	33	3
2396_14	198	68	5
2423_1	0	0	610
2423_2	41	17	7
2423_3	39	14	7
2423_4	149	70	25
2423_5	30	12	5
2423_6	174	71	30
2423_7	79	30	14
2423_8	124	84	21
2423_9	271	130	46
2423_10	83	30	14
2423_11	91	50	16
2423_12	702	260	120
TOTALS	4074	1600	1613

Matrix Development

The travel demand matrices used in these micro-simulation models were derived from the following data:

- sub-area matrices extracted from the calibrated TRINITY strategic transport model of Sydney, Newcastle and Wollongong
- Manual counts at critical intersections within the Precinct. This was used to calibrate cordon and turn demands

The matrix development process involved:

- Refinement of the TRINITY zonal system in the study area
- Extraction of initial light and commercial vehicle sub-area matrices
- Sub-area matrix estimation to achieve a closer match to observed flows

Vehicle Profile

The following two vehicle matrices were developed for use in the micro-simulation models:

- A car and light commercial vehicle matrix containing up to 21 trip purposes (e.g. recreational, shopping and commuter)
- A heavy vehicle matrix derived from BTS commercial trip tables

These demand matrices have been distributed amongst 17 vehicle type categories. The categories, dimensions and proportions of each vehicle type are specified by the RTA and are meant to be representative of the average NSW vehicle fleet characteristics.

The standard RTA vehicle file includes the following categories:

- Car (6)
- Rigid truck (3)
- Semi-trailer (3)
- B-Double (3)
- Bus (2)

Profile Specification

The model was set up to simulate the following peak hour periods:

- AM peak (7:45am to 8:45am)
- PM peak (5:00pm to 6:00pm)

The 15-minute demand release profiles for traffic entering the road network during the lead-in and peak hour are based on observed traffic flows collected at six sites in September 2011.

The adopted 15-minute profiles are presented below in **Table 23**.

Table 23: Demand Profiles for 2011 Weekday and Weekend Peak Periods

Peak	Period Ending	15-Minute Demand Profile	Hourly Demand Profile
AM (WD)	0715	9.6%	47.1%
	0730	11.6%	
	0745	12.3%	
	0800	13.5%	
	0815	13.1%	52.9%
	0830	13.5%	
	0845	14.2%	
	0900	12.2%	
PM (WD)	1515	7.3%	28.7%
	1530	7.3%	
	1545	6.8%	
	1600	7.2%	
	1615	8.1%	31.5%
	1630	7.8%	
	1645	7.2%	
	1700	8.4%	
	1715	8.7%	39.7%
	1730	10.5%	
	1745	10.8%	
	1800	9.7%	
OP (WE)	0915	4.8%	21.7%
	0930	5.3%	
	0945	5.4%	
	1000	6.2%	
	1015	5.9%	25.2%
	1030	6.2%	
	1045	6.7%	
	1100	6.4%	
	1115	6.2%	26.1%
	1130	6.1%	
	1145	7.0%	
	1200	6.8%	
	1215	7.6%	27.0%
	1230	6.9%	
	1245	6.1%	
	1300	6.4%	

Bus Routes

Bus services are explicitly coded into the models and treated as fixed route demands. There are 6 bus routes coded into the models. The service schedules used in the model are listed in **Table 10** of **Section 2**.

Release times for bus services were estimated based on published time-table data for the stops closest to their entry point.

For the purposes of the micro-simulation, the team adopted bus stop dwell times ranging between 7 and 12 seconds.

Calibration Data

The principal data sources available for calibration were:

- Manual classified intersection counts collected at six key sites in September 2011
- Tube counts undertaken by Lane Cove Council

Model Adjustments

During the model calibration process, the following adjustments were made to the model, where appropriate:

- Link and node parameters adjusted
- Signal phase green-splits and offsets were revised

At both signalised and non-signalised intersections, the following features were applied to improve intersection operations, where appropriate:

- Node Blocking – Avoid vehicles staying at signalised intersections when congestion occurs
- Stacked Turns – Allow right-turning vehicles to move into the intersections and either wait for a suitable gap in the oncoming traffic before turning, or make the right-turn at the end of the green phase
- Force Merge / Across – Force right-turning vehicles to cross the oncoming traffic after they have been delayed for some time when oncoming traffic leaves a gap at non-signalised intersections.

The 'Nextlanes' function was used to force vehicle to travel on the correct lane whenever there is a decision point (e.g. stop-lines) within the micro-simulation model. These decision points do not exist in real life and therefore Nextlanes was implemented in the model to ensure that modelled behaviour was realistic.

The 'Signposting' function was implemented at some locations where immediate lane change just before the decision point has been identified. Signposting was used to encourage earlier lane changes to be made to prevent unrealistic congestion. Whenever the Signposting technique is not available due to the link attributes constraint, Lane Choice was used to force lane utilisation.

Seed Selection and Model Stability

The stability of the AM and PM peak models was tested using the first five seed values specified by the RTA (560, 28, 7771, 86524, 2849). The models were run and the results reported by link. The Co-efficient of Variance (CoV) was calculated for the link flows generated by the five model seeds. This

coefficient represents the ratio of the standard deviation to the mean of the five modelled flows for each link.

Figures 18 and **19** illustrate that the pattern of the five seeds is similar. These results suggest that the models are operating in a stable manner in the AM and PM peak periods.

The demand release curves of the AM and PM peak models were estimated using the first five seed values normally specified by the RTA (560, 28, 7771, 86524, 2849). The results were analysed to determine which of the five release curves was most representative of an average demand scenario. The demand curves for the AM and PM peaks are presented below in **Figures 18** and **19**, respectively.

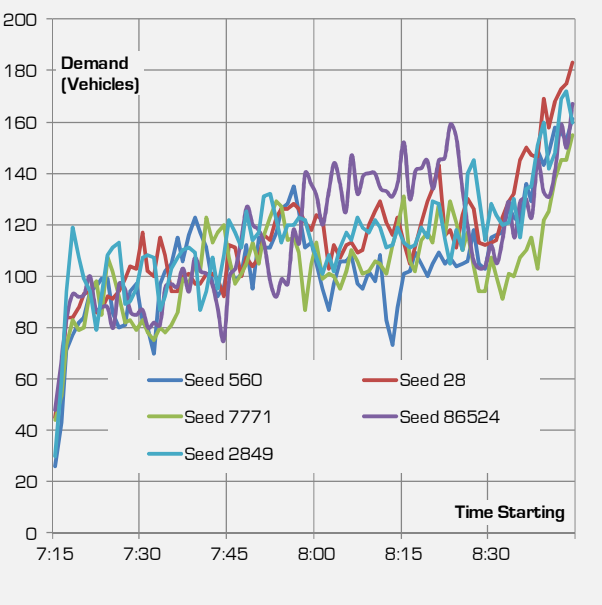


Figure 18: AM Peak Demand Release Profiles

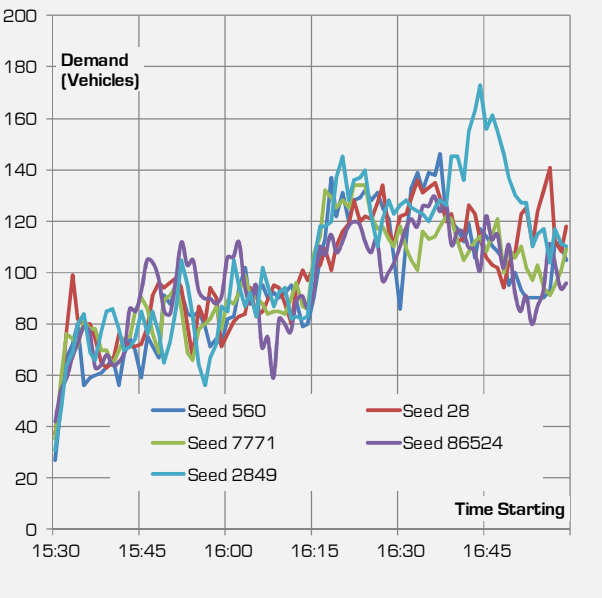


Figure 19: PM Peak Demand Release Profiles

The analysis suggests that the following seeds produced release curves most representative of an average demand scenario:

- AM peak = 2849
- PM peak = 7771

Calibration Measures

The calibration (accuracy) of the micro-simulation models is determined by comparing observed (counted) traffic volumes and intersection queue lengths with modelled traffic volumes and queuing.

The RTA has generally adopted the UK's DMRB standards for traffic flow calibration. These rely heavily on a measure called the GEH statistic. The GEH statistic is a self-scaling empirical statistic with similarities to a chi-squared test.

The following RTA acceptability targets were adopted for the micro-simulation model calibration assessments:

- Individual flows within 100vph (flows <700vph)
- Individual flows within 15% (flows between 700 and 2,700vph)
- Individual flows within 400vph (flows > 2,700vph)
- Individual flows achieve a GEH value less than 5.0 at more than 85% of sites

A review of observed and modelled queue lengths was also undertaken during the calibration process.

Calibration Results

The calibration results for the AM and PM peak models, using the selected average seed values, are presented in **Appendix 'C'**.

A summary of results is presented in **Table 24**.

Table 24: Summary of AM and PM Peak Link and Turn-Flow Calibration

GEH Values	AM		PM	
	No. Links	%	No. Links	%
< 5.0	43	100%	43	100%
5.0 to 7.5	0	0%	0	0%
7.5 to 10	0	0%	0	0%
10 to 15	0	0%	0	0%
TOTALS	43	100%	43	100%

The model achieved the following level of calibration:

- In AM peak, 100% of sites achieved a GEH statistic less than 5.0

- In PM peak, 100% of sites achieved a GEH statistic less than 5.0

Conclusion

Given the match between observed and modelled flows, the stability of the models, favourable comparisons between the modelled and observed behaviour, it is concluded that the Precinct micro-simulation models are sufficiently calibrated and replicate existing conditions to a level of accuracy acceptable for its intended use.

7 FUTURE TRAFFIC GROWTH

Regional Growth

The regional travel patterns contained within the Precinct models were derived from the TRINITY transport model.

The development and calibration of this model is covered in **Section 5**.

Plots of regional background traffic growth between 2011 and 2021 are presented in **Appendix 'D'**. The TRINITY model is forecasting very little traffic growth on Mowbray Road West in the AM and PM peak periods. Conversely, there is significant growth being forecast on Mowbray Road and Centennial Avenue further to the east of the Precinct.

These growth patterns are reflected in the sub-area matrices extracted from the TRINITY model and subsequently used in the PARAMICS models of the Precinct.

Precinct Growth

The overall traffic growth in and around the Precinct under various modelling scenarios is presented in **Table 25**. The sub-area matrices extracted from the TRINITY model forecast the following growth patterns:

- A modest 6.5% growth in AM peak hour background traffic over the next 10-years
- A modest 3% growth in PM Peak hour background traffic over the next 10-years
- A significant 36% growth in total AM peak hour traffic over the next 10-years under the full LEP growth scenario
- A significant 25% growth in total PM peak hour traffic over the next 10-years under the full LEP growth scenario.

Table 25: Forecast Peak Hour Traffic Growth in the Mowbray Road Precinct Sub-area Matrices

Scenario			Cars	Trucks	Total
AM	2011	DN	2876	38	2914
	2021	DN	3048	56	3104
	2021	LEP	3912	65	3977
PM	2011	DN	2792	52	2844
	2021	DN	2877	54	2931
	2021	LEP	3498	61	3559

Precinct Trip Generation

The total trip generation for the Precinct under the full LEP development scenario is presented in **Table 26**. These estimates are based on trip rates of 0.5 and 0.47 trips per dwelling in the AM and PM peaks, respectively. These rates are higher than the current trip rate of 0.36 trips per dwelling in both peaks. As discussed in **Section 4**, the PCG recommended that a higher trip rate of be adopted to better reflect the luxury apartment style of development being proposed. The adopted rates are also consistent with the RTA's generic trip generation rates for medium density flats of between 0.4 and 0.5 trips per dwelling.

The forecast additional peak hour trip generation from redevelopment of the Precinct (based on the maximum theoretical development yield of 2088 dwellings) is:

- 1,039 trips in the AM peak hour
- 978 trips in the PM peak hour

This traffic generation rate assumes that there will be no significant change to the existing mode split for the Precinct.

In addition, it is assumed that car parking provisions will be in accordance with Council's current development car parking code.

Table 26: Forecast Additional Peak Hour Trip Generation

SMEC Zone ID	No. Dwellings	AM Outbound Trips	AM Inbound Trips	PM Inbound Trips	PM Outbound Trips
13	0	0	0	0	0
14	0	0	0	0	0
15	0	0	0	0	0
16	0	0	0	0	0
17	132	59	7	56	6
18	671	300	33	283	31
19	144	64	7	61	7
20	471	211	23	199	22
21	201	90	10	85	9
22	335	150	17	141	16
23	134	60	7	56	6
24	0	0	0	0	0
Totals	2088	935	104	880	98

In addition to the forecast traffic generation, based on the existing mode share, and assuming the public transport trips with destination and origin in the Precinct, would be by bus, the redevelopment would be expected to generate approximately 260 trips during the PM peak.

8 TRAFFIC IMPACTS

The traffic impacts of the Precinct have been assessed in the following ways:

- Using PARAMICS micro-simulation software; and
- Intersection performance analysis using SIDRA intersection analysis software.

PARAMICS Network Analysis

2021 AM and PM peak trip matrices were extracted from the TRINITY transport model for use in the micro-simulation modelling. Trip matrices were developed for the following demand scenarios:

- 2021 AM and PM peak (No LEP development)
- 2021 AM and PM peak (Full LEP development)

Any calibration adjustments applied to the matrices during the 2011 base case model calibration process were also applied to the forecast matrices.

The operational impacts on the Precinct road network, with or without LEP development, are presented in **Tables 27** and **28**.

Table 27: AM Peak Network Performance Statistics

Measure	Scenario		
	2011	2021DN	2021LEP
Ave Travel Time (secs)	145.2	145.3	232.8
Ave Vehicle Speed (km/h)	39.6	38.6	23.8
VKT (km)	4652.7	4875.9	6135.7
VHT (hrs)	117.4	126.4	257.5
Unreleased	0	0	39
Unfinished	108	116	289
Finished	2806	2988	3688
Total Demand	2914	3104	3977

Table 28: PM Peak Network Performance Statistics

Measure	Scenario		
	2011	2021DN	2021LEP
Ave Travel Time (secs)	147.6	140.2	154.3
Ave Vehicle Speed (km/h)	40.5	39.9	35.7
VKT (km)	4643.2	4460.9	5478.2
VHT (hrs)	114.5	111.7	153.5
Unreleased	0	0	0
Unfinished	115	123	194
Finished	2729	2808	3365
Total Demand	2844	2931	3559

The micro-simulation network analysis suggests:

- That the LEP development scenario will reduce the average vehicle speeds on the 2021 road networks by 15 km/h in the AM peak and 4km/h in the PM peak
- The intersection of Mowbray Road West and Centennial Avenue experiences long traffic queues on its western and southern approaches, under both 2021 development scenarios
- Precinct access to/from Mowbray Road West is operating satisfactorily under both 2021 traffic conditions (with or without the redevelopment).

SIDRA Intersection Analysis

The intersection performance analysis was undertaken using SIDRA Version 5.0.

Forecast turning volumes at each location, under 2021 background growth and 2021 LEP growth scenarios, were extracted from the relevant PARAMICS models.

A summary of the results is presented in **Tables 29** and **30**.

The intersection analysis of the junctions suggests;

- The AM peak performance of Centennial Avenue and Mowbray Road West is poor (LOS F) regardless of whether LEP development is undertaken. This represents a major arterial road network constraint in the area.
- The single lane exits from the Precinct, combined with right turn exit movements being required to filter across both directions in Mowbray Road West, are resulting in some unreasonable delays for traffic exiting the Precinct via Girraween Avenue, Mindarie Street, Kullah Parade and Willandra Street. Although the movements are small and queues relatively short, the delays could be increase risk taking behaviour and result in increased crashes. The provision of additional approach lanes, banning of right turn movements, and/or signalisation of one or more of these intersections would address this issue.

Table 29: Intersection Performance under 2021 AM and PM Peak Background Growth Scenario

Location	Peak	LOS	Ave Delay (sec)	DOS	95% Queue Length (veh)
Mowbray Road and Centennial Avenue	AM	F	102.2	1.01	62.9
	PM	B	27.7	0.89	20.7
Mowbray Road and Girraween Avenue	AM	F	119.1	0.80	4.6
	PM	C	37	0.27	1.1
Mowbray Road and Mindarie Street	AM	C	35.8	0.1	0.4
	PM	C	33.8	0.03	0.1
Mowbray Road and Kullah Parade	AM	D	50.2	0.50	2.4
	PM	C	39.6	0.44	2.1
Mowbray Road and Willandra Street	AM	B	25.6	0.18	0.7
	PM	B	16	0.05	0.2
Elizabeth Parade and Gordon Crescent	AM	A	7.9	0.03	0.2
	PM	A	8.4	0.04	0.2

Note:
For give-way and stop sign controlled intersections the values of LOS and delay are for the worst movement.

The forecast 2021 LoS on the section of Mowbray Road West fronting the Precinct and the associated intersections performance would be similar or better than the LoS on most arterial roads in the Sydney Metropolitan Area.

Table 30: Intersection Performance under 2021 AM and PM Peak LEP Growth Scenario

Intersection	Peak	LOS	Ave Delay (sec)	DOS	95% Queue Length (veh)
Mowbray Road and Centennial Avenue	AM	F	277.2	1.39	158.4
	PM	D	45.8	0.99	36.6
Mowbray Road and Girraween Avenue	AM	F	369.3	1.02	11
	PM	F	125.6	0.75	3.8
Mowbray Road and Mindarie Street	AM	F	317.9	1.00	9.5
	PM	E	61.1	0.08	0.3
Mowbray Road and Kullah Parade	AM	F	356.9	1.06	13.4
	PM	E	63.5	0.54	2.4
Mowbray Road and Willandra Street	AM	C	39.4	0.69	4.3
	PM	F	73.9	0.12	0.4
Elizabeth Parade and Gordon Crescent	AM	A	7.7	0.09	0.6
	PM	A	8.6	0.06	0.4

Note:
For give-way and stop sign controlled intersections the values of LOS and delay are for the worst movement.

9 TRAFFIC IMPROVEMENTS

Mowbray Road West/ Centennial Avenue Intersection

SIDRA performance analysis indicates that the intersection is currently operating with acceptable l Level of Services, LoS C in the AM and LoS B in the PM peak.

Under future traffic conditions (by 2021) it is expected that even without the redevelopment of the Precinct, the intersection would operate with unacceptable LoS F (during the AM peak).

With redevelopment, the level of delays and congestion would increase to and the expected would continue to operate at LoS F (during the AM) and LoS D during PM).

Improvement option which would involve localised road widening to provide a dedicated right turn lane (approximately 40 m) for southbound traffic, and an additional dedicated left lane for westbound traffic are proposed , to improve the intersection performance.

As the forecast intersection performance is attributable to both background traffic growth and the traffic impact from redevelopment of the Precinct, it is recommended the need for intersection upgrading should be discussed with the RTA.

Intersections off Mowbray Road West

SIDRA performance analysis indicates that these intersections are currently operating with acceptable Level of Services, with the expectation of the xxx, which is operating at LoS D during the AM peak.

Under future traffic conditions (by 2021) it expected that with the redevelopment of the Precinct, these intersections would operate with unacceptable LoS F, during AM peak. This would be due to the unacceptable delays for right turn movements exiting the Precinct.

Right turn movements are not permitted at Mowbray Road West at its intersection with Mindarie Street, Girraween Avenue, Kullah Parade and Willandra Street during the weekday AM peak.

With redevelopment of the Precinct, maintaining this right turn ban would affect the accessibility of the Precinct and is considered unacceptable.

In addition, increased traffic flow would affect the safety of pedestrians in crossing Mowbray Road West.

To address these likely traffic impacts, a traffic management scheme involving the installation of traffic signals at Mowbray Road West/Kullah Parade intersection, with the provision of a dedicated right turn bay, to accommodate safe right turn opportunity

while maintaining and extending the existing right turn bans at the other nearby intersections is proposed.

This arrangement would allow the banned right movements to take place at the proposed signalised intersection.

Other aspects of the traffic management scheme are summarised in **Tables 31**.

The configuration showing these treatments are provided in **Appendix H.**

Table 31: Summary of Recommended Intersection Treatments

Intersection	Recommended Treatment	Comments
Mowbray Road West/ Willandra Street	Reconfigure intersection to prohibit right turn movements out of Willandra Street, with dedicated right bay for turning movements into Willandra Street	Treatment would require the removal of on-street car parking for approximately 30 m from either side of Mowbray Road West.
Existing Signalised Pedestrian Crossing in of the Mowbray Primary School	Maintain the existing signal crossing.	Possible relocation of the signal was considered. However, it was considered that the relocation would require significant changes to the existing access arrangement to the school.
Mowbray Road West/Kullah Parade/Hatfield Street	Install TICS with signalised pedestrian crossings, dedicated right bays for movements into Hatfield Street and Kullah Parade; and localized widening of the Kullah Parade approach to provide a dedicated right turn bay for exiting right movements.	With the proposed redevelopment the intersection would meet the warrant for the installation of traffic signals. The Treatment would require the removal of on-street car parking for approximately 60 m from either side of Mowbray Road West.
Mowbray Road West/Mindarie Street,	Reconfigure intersection to prohibit right turn movements out of Mindarie Street, and provide dedicated right bay for turning movements into Mindarie Street	Treatment would require the removal of on-street car parking for approximately 30 m from either side of Mowbray Road West
Mowbray Road West/ Girraween Avenue	Provide dedicated right turn bays for turning movements into Mooney Street and Girraween Avenue; and prohibit right turn movements out of Girraween Avenue, and Mooney Street.	Treatment would require the removal of on-street car parking for approximately 30 m from either side of Mowbray Road West. The restricted right movements out of Mooney Street can be accommodate at the proposed signalised Mowbray Road West/Kullah Parade/Hatfield Street intersection
Mowbray Road West/ Centennial Avenue	Localised road widening to provide a dedicated right turn bay for southbound traffic (into Centennial Avenue) and a dedicated left turn lane for turning movements into Mowbray Road West.	The treatment would require the removal of on-street car parking for approximately 50 m along the western side of Centennial Avenue and 60 m along the north side of Mowbray Road West.
Gordon Crescent /Elizabeth Parade	Existing roundabout to be maintained.	

The results of the SIDRA intersection performance of the recommended upgraded intersections are provided in **Tables 32**.

Tables 32 Performance of Intersections with Upgrades, 2021 LEP

Intersection	Peak	LOS	Ave Delay (sec)	DOS	95% Queue Length (veh)
Mowbray Road/ Centennial Avenue	AM	C	37.2	1	28.5
	PM	B	22.9	0.81	18.2

Intersection	Peak	LOS	Ave Delay (sec)	DOS	95% Queue Length (veh)
Mowbray Road/Girraween Avenue	AM	B	20.2	0.09	0.4
	PM	B	19.5	0.04	0.1
Mowbray Road/Mindarie Street	AM	B	18.7	0.01	0.1
	PM	A	1.0	0.32	0
Mowbray Road/Kullah Parade	AM	A	14.5	0.81	24.4
	PM	B	17.7	0.87	25.0
Mowbray Road/Willandra Street	AM	[1]C	34.1	0.11	0.4
	PM	B	15.6	0.08	0.3
Elizabeth Parade/Gordon Crescent	AM	A	7.7	0.09	0.6
	PM	A	8.6	0.06	0.4

Consultation with Road Authorities

The above intersection treatment includes the installation of a new set of traffic control signals (TCS) loss of existing on-street car parking provision along Mowbray Road West.

The installation of the traffic signals will require the RTA's approval. A representative of the RTA's Transport Planning Group has been consulted on the need for the upgrading of the Mowbray Road/Centennial Avenue intersection, as for its comments on the proposed new TCS. The new TCS would meet the RTA's traffic signal warrants.

The Authority's response has yet not been received. It is recommended that the RTA's approval be obtained as part of the Council preparation of a Section 94 Development Contrition Plan for Precinct.

On the loss of on-street car parking along the southern side of Mowbray Road, Council's Executive Manager, Open Space & Urban Services has advised that as all the new developments in the Precinct will be required to be adequate off- street parking, the loss of on-street parking, is considered acceptable.

Willoughby City Council needs to be consulted on any loss of parking and traffic impacts on the northern side of Mowbray Road West. It is recommended that such consultation is undertaken by Council as part of its adoption of the recommended treatments.

Internal Roads

The existing internal road network carries low traffic volumes (well within the environmental capacity of the streets).

With the redevelopment, and the recommended signalised of the Mowbray Road West/Hatfield Street intersection, traffic volumes is forecast to the increase to approximately 150 veh/hr for the southbound traffic along Willandra Street and 140 veh/hr northbound along Kullah Parade .

The forecast traffic volume will be within the environment capacity of 300 veh/hr.

Future Bus Services

As indicated in the Section 2 all parts of the Precinct are within the required 400 m from a bus route along either Mowbray Road West or Epping Road.

The existing bus routes would therefore continue to provide a good bus service to/from the Precinct.

The redevelopment is forecast to generate 260 bus passengers, during the PM peak. It is recommended that as the redevelopment progresses, Council makes representation to Transport for NSW, to re-assess the adequacy of the existing bus services.

Bus Shelter Provision

With the expected increase in population, to improve the existing bus service facilities, it is recommended that at least two bus shelters should be installed at two existing bus stops on the southern side of Mowbray Road West fronting the Precinct (i.e. one close to the Hatfield Street intersection and the other close to Girraween Street intersection).

Pedestrian and Cycle Facilities

The Precinct has existing concrete paths along both sides of Mowbray Road West, along one side of a number of the internal local streets and though the Batten Reserve to Epping Road.

The Precinct also has a school signalised pedestrian crossing (with a 40 km/hr school zone) in front the Mowbray Primary School as well as a pedestrian refuge close to the Mowbray Road West/ Girraween Street intersection.

With the forecast increase in traffic volumes, particularly along Mowbray Road West and a number of the local streets, an additional signalised pedestrian across Mowbray Road West at the recommended traffic control signal at the Mowbray Road West/Hatfield Street intersection is recommended.

In addition, paved footpaths on both sides of the north-south streets and along the northern sections of Kullah Parade and Gordon Crescent, which do not currently have paved footpaths, are recommended.

The existing paved footpath from the Willandra Street to Epping Road is also to be upgraded and lit to encourage its use by commute to access the existing bus services along Epping Road.

A map of the existing and recommended pedestrian footpaths is shown in Figure 19.

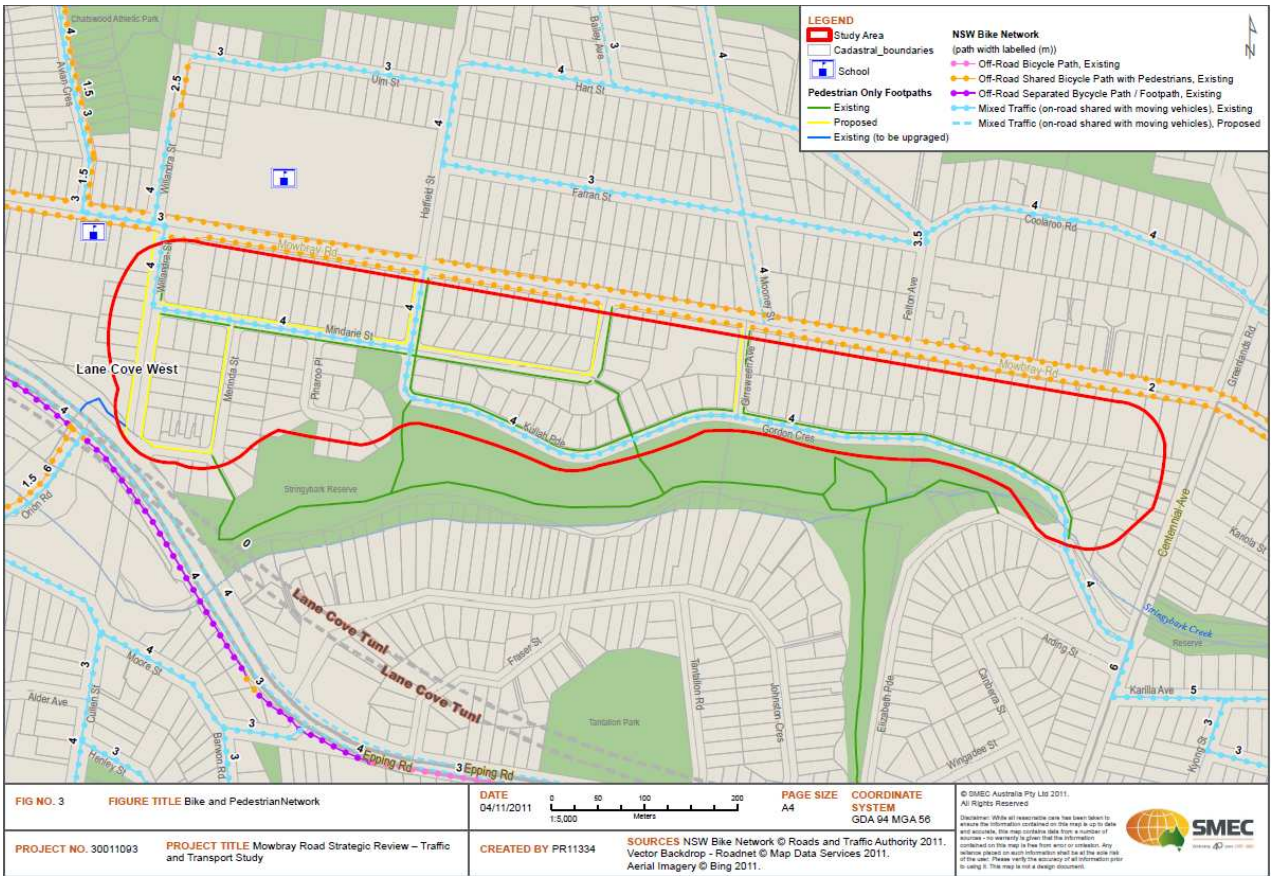


Figure 19: Existing and recommended pedestrian footpaths

Funding of Recommended Traffic Management Scheme

The recommended traffic management scheme, apart from the Mowbray Road/ Centennial Avenue intersection upgrade, is required to minimise the cumulative traffic impact and maintain the accessibility and resident amenity of the Precinct.

It is therefore recommended that the cost of the recommended treatment works (apart from the Mowbray Road/ Centennial Avenue intersection upgrade), should be funded under Section 94 Developer Contribution Scheme for the Precinct.

The Mowbray Road/ Centennial Avenue intersection upgrade is attributable to background traffic growth and partially as a result of the forecast additional traffic from the redevelopment.

The benefit and associated cost attributable to the redevelopment is small compared to the forecast increase in background traffic growth. It is therefore required that the intersection upgrade should be funded by the RTA.

Staged Implementation of the Recommend Improvement Works

The recommended traffic, pedestrian facilities and bus services facilities works are required for the fully redevelopment of the Precinct.

Considering the recommended funding arrangement and the need to minimised the impacts on existing residents it is recommended that the need for improvements works be by monitored by Council (as the redevelopments are occupied).

A recommended schedule is for the Mowbray Road West/Hatfield Street intersection TCS, and bus shelters along Mowbray Road West to be installed after 50% of the redevelopment has been occupied.

The additional footpaths are to be constructed as redevelopments that would use these facilities are occupied.

Strategic Cost Estimates of the Recommended Traffic Management Scheme

These recommended traffic improvements at the intersections fronting the Precinct off Mowbray Road West, are required to minimise the traffic impact of the Precinct redevelopment. These works are estimated at $1.84 million or $1.10 million including 50% contingency, with or without milling and pavement overlay of the existing pavement.

While the recommended upgrading of the Mowbray Road West/Centennial Avenue which is predominantly due to background traffic growth is estimated at $1.41 million or $1.175 million including 51% contingency with or without milling and pavement overlay of the existing pavement.

In addition to the traffic management improvement, 1300 km of additional and upgrading of the existing footpaths is recommend at a strategic cost estimate of $182,000 is recommended.

The strategic cost estimates does not including provision for the services relocations.

A summary of the strategic cost estimates is provided in **Tables 33 to 36**, and details of the estimates including assumptions are **Appendix I.**

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Table 33: Strategic Cost Estimates of the Recommended Improvements (With No Milling and overlay of the Existing Pavement)

Item	Estimate	Contingency		Estimate	% of Total
	(excluding Contingency)	%	Amount	(including contingency)	
1. Project Development					
1 (a) Route/Concept	$10,930	25%	$2,733	$13,663	
1 (b) Project Management Services	$765	25%	$191	$956	
1(d) Community Consultation	$25,000	25%	$6,250	$31,250	
Sub Total	**$36,696**	25%	**$9,174**	**$45,869**	**4.2%**
2. Investigation and Design					
2 (a) Investigation and Design	$38,256	35%	$13,390	$51,646	
2 (b) Project Management Services	$2,678	35%	$937	$3,615	
Sub total	$40,934	35%	$14,327	$55,261	5.0%
3. Service Adjustments					
3. Property Acquisitions					
3 (a) Acquire Property	$60,000	60%	$36,000	$96,000	
3 (b) Professional Services for Property	$4,200	60%	$2,520	$6,720	
3 (c) Project Management Services	$1,200	60%	$720	$1,920	
Sub total	**$65,400**	**60%**	**$39,240**	**$104,640**	**9.5%**
5. Construction					
5 (a) Mowbray Rd West/ Willandra St *	$75,966	44%	$33,170	$109,136	
5 (b) Mowbray Rd West/ Kullah Pde/ Hatfield St	$417,954	53%	$222,543	$640,497	
5 (c) Mowbray Rd West/- Mindarie St	$27,725	50%	$13,874	$41,598	
5 (d) Mowbray Rd West/– Girraween St	$24,874	51%	$12,704	$37,577	
5 (d) Project Management Services	$38,256	52%	$19,760	$58,017	
Sub total	**$584,775**	**52%**	**$302,051**	**$886,826**	**80.6%**
6. Finalisation					
6 (b) Project data and performance	$5,465	30%	$1,640	$7,105	
6 (c) Project Management Services	$383	30%	$115	$497	
Sub total	**$5,848**	**30%**	**$1,754**	**$7,602**	**0.7%**
TOTAL	**$733,653**	**50%**	**$366,546**	**$1,100,198**	**100%**

* Includes the cost of a Bus Shelter

Table 34: Strategic Cost Estimates of the Recommended Improvements (With Milling and overlay of the Existing Pavement)

Item	Estimate	Contingency		Estimate	% of Total
	(excluding Contingency)	%	Amount	(including contingency)	
1. Project Development					
1 (a) Route/Concept	$18,827	25%	$4,707	$23,534	
1 (b) Project Management Services	$1,318	25%	$329	$1,647	
1(d) Community Consultation	$25,000	25%	$6,250	$31,250	
Sub Total	**$45,145**	25%	**$11,286**	**$56,431**	**3.1%**
2. Investigation and Design					
2 (a) Investigation and Design	$65,895	35%	$23,063	$88,958	
2 (b) Project Management Services	$4,613	35%	$1,614	$6,227	
Sub total	**$70,507**	**35%**	**$24,678**	**$95,185**	**5.2%**
3. Service Adjustments					
3. Property Acquisitions					
3 (a) Acquire Property	$60,000	60%	$36,000	$96,000	
3 (b) Professional Services for Property	$4,200	60%	$2,520	$6,720	
3 (c) Project Management Services	$1,200	60%	$720	$1,920	
Sub total	**$65,400**	**60%**	**$39,240**	**$104,640**	**5.8%**
5. Construction					
5 (a) Mowbray Rd West/ Willandra St *	$184,603	51%	$93,529	$278,132	
5 (b) Mowbray Rd West/ Kullah Pde/ Hatfield St	$528,467	54%	$284,384	$812,852	
5 (c) Mowbray Rd West/- Mindarie St	$117,324	54%	$63,918	$181,242	
5 (d) Mowbray Rd West/– Girraween St	$110,959	55%	$60,611	$171,570	
5 (d) Project Management Services	$65,895	53%	$35,171	$101,066	
Sub total	**$1,007,248**	**53%**	**$537,613**	**$1,544,861**	**85.2%**
6. Finalisation					
6 (b) Project data and performance	$9,414	30%	$2,824	$12,238	
6 (c) Project Management Services	$659	30%	$198	$857	
Sub total	**$10,072**	**30%**	**$3,022**	**$13,094**	**0.7%**
TOTAL	**$1,198,373**	**51%**	**$615,839**	**$1,814,212**	**100%**

*** Includes the cost of a Bus Shelter**

Table 35: Strategic Cost Estimates of the Recommended Mowbray Road West/Centennial Avenue Intersection Upgrade (With No Milling and overlay of the existing Pavement)

Item	Estimate	Contingency		Estimate	% of Total
	(excluding Contingency)	%	Amount	(including contingency)	
1. Project Development					
1 (a) Route/Concept	$10,457	25%	$2,614	$13,071	
1 (b) Project Management Services	$732	25%	$183	$915	
1(d) Community Consultation	$10,000	25%	$2,500	$12,500	
Sub Total	**$21,188**	25%	**$5,297**	**$26,486**	**2.3%**
2. Investigation and Design					
2 (a) Investigation and Design	$36,598	35%	$12,809	$49,407	
2 (b) Project Management Services	$2,562	35%	$897	$3,458	
Sub total	**$39,160**	**35%**	**$13,706**	**$52,866**	**4.5%**
3. Service Adjustments					
3. Property Acquisitions					
3 (a) Acquire Property	$137,500	60%	$82,500	$220,000	
3 (b) Professional Services for Property	$9,625	60%	$5,775	$15,400	
3 (c) Project Management Services	$2,750	60%	$1,650	$4,400	
Sub total	**$149,875**	**60%**	**$89,925**	**$239,800**	**20.4%**
5. Construction					
5 (e) Mowbray - Centennial-Greenfield*	$522,827	52%	$270,971	$793,797	
5 (d) Project Management Services	$36,598	52%	$18,968	$55,566	
Sub total	**$559,425**	**52%**	**$289,939**	**$849,363**	**72.2%**
6. Finalisation					
6 (b) Project data and performance	$5,228	30%	$1,568	$6,797	
6 (c) Project Management Services	$366	30%	$110	$476	
Sub total	**$5,594**	**30%**	**$1,678**	**$7,273**	**0.6%**
TOTAL	**$775,242**	**52%**	**$400,545**	**$1,175,787**	**100%**

* **Includes the cost of a Bus Shelter**

Table 36: Strategic Cost Estimates of the Recommended Mowbray Road West Intersection Upgrade (With Milling and overlay of the existing Pavement)

Item	Estimate	Contingency		Estimate	% of Total
	(excluding Contingency)	%	Amount	(including contingency)	
1. Project Development					
1 (a) Route/Concept	$13,224	25%	$3,306	$16,530	
1 (b) Project Management Services	$926	25%	$231	$1,157	
1(d) Community Consultation	$10,000	25%	$2,500	$12,500	
Sub Total	**$24,149**	25%	**$6,037**	**$30,187**	**2.1%**
2. Investigation and Design					
2 (a) Investigation and Design	$46,283	35%	$16,199	$62,482	
2 (b) Project Management Services	$3,240	35%	$1,134	$4,374	
Sub total	**$49,523**	**35%**	**$17,333**	**$66,855**	**4.7%**
3. Service Adjustments					
3. Property Acquisitions					
3 (a) Acquire Property	$137,500	60%	$82,500	$220,000	
3 (b) Professional Services for Property	$9,625	60%	$5,775	$15,400	
3 (c) Project Management Services	$2,750	60%	$1,650	$4,400	
Sub total	**$149,875**	**60%**	**$89,925**	**$239,800**	**16.9%**
5. Construction					
5 (e) Mowbray - Centennial-Greenfield*	$661,182	52%	$340,610	$1,001,791	
5 (d) Project Management Services	$46,283	52%	$23,843	$70,125	
Sub total	**$707,464**	**52%**	**$364,452**	**$1,071,917**	**75.6%**
6. Finalisation					
6 (b) Project data and performance	$6,612	30%	$1,984	$8,595	
6 (c) Project Management Services	$463	30%	$139	$602	
Sub total	**$7,075**	**30%**	**$2,122**	**$9,197**	**0.6%**
TOTAL	**$938,086**	**51%**	**$479,870**	**$1,417,956**	**100%**

* **Includes the cost of a Bus Shelter**

10 EMERGENCY BUSHFIRE EVACUATION SCENARIOS

Background

Due to its location, just north of Batten Reserve, a portion of the Precinct, particularly the properties north of Gordon Crescent and Kullah Parade are designated as bushfire prone land 'buffer area' in Council's June 2010 Bush Fire Prone Land map. Batten Reserve is also classed as 'high risk' on the same map.

Since the rezoning of the Precinct in February 2010, the existing residents in the Precinct have expressed concerns about the adequacy of the local road network to accommodate traffic movements during emergency bushfire evacuation.

In response to State Government Agency consultation for the rezoning of the Precinct (under Section 62 of the Environmental Planning and Assessment Act), as well as in response to advisory comments on development applications, NSW Rural Fire Services (RFS) representatives have advised Council, that it needs to be satisfied that the existing road network has adequate capacity to accommodate emergency bush fire evacuation from the Precinct.

Council has refused a number of development applications because of its concern about inadequate information demonstrating that the existing road network is able to safely accommodate emergency bushfire evacuation, with the cumulative redevelopment of the Precinct, in terms of increased population density.

Similarly, the Joint Regional Planning Panel has refused a number of development applications, within the Precinct. The Panel has stressed that it requires a credible independent opinion that shows confidence that the Precinct's road network can cope under an emergency bushfire evacuation once the Precinct has been redeveloped under the current rezoning.

This section of the report examines traffic related assumptions and strategies that would need to be implemented in the event of emergency bush fire evaluation, for redevelopment of the Precinct.

Bushfire Protection Policies

Land use planning of bushfire prone areas requires proposed developments to have regard to *Planning for Bushfire Protection 2006*. In addition, for a number of councils in the urban areas including Lane Cove Council, development proposals also have to be in accordance with *State Environmental Planning Policy No. 19 – Bushland in Urban Areas*.

In this regard, the Minister for Planning and Infrastructure has directed all NSW local councils (with bushfire prone land) to consult the RFS when preparing draft local environmental plans for land identified as being bush fire prone, and to comply with specific provisions in *Planning for Bushfire Protection*.

This directive requires that a council with bushfire prone areas, including the Lane Cove LGA, carries out the following activities in the preparation of a draft LEP:

- Consult with the Commissioner of the NSW Rural Fire Service (under section 62 of the Act), and take into account any comments so made;
- Have regard to Planning for Bushfire Protection 2001; and where development is proposed, comply with the following provisions, as appropriate to provide:

  Ann Asset Protection Zone (APZ) incorporating as a minimum an Inner Protection Area (IPZ) bounded by a perimeter road or reserve which goes round the hazard side of the development land intended for development; and has a building line consistent with the incorporation of an APZ, within the property;

  An Outer Protection Area (OPA) managed for hazard reduction and located on the bushland side of the perimeter road; and

  For infill development (that is development within an already subdivided area), where an appropriate APZ cannot be achieved, provide for an appropriate performance sstandard, in consultation withh the RFS.

The requirements and provision for APZ for the redevelopment of the Precinct has been addressed in JBA's land use planning report and this section, should be read in conjunction with JBA's report.

Roles and Responsibilities for Bushfire Protection of Residential Properties

The Rural Fires Act 1997 specifies the responsibilities and roles for managing bushfires. In particular, Section 44 of the Act outlines that Commissioner of Rural Bushfires is to take charge of bushfire fighting operations and prevention measures, and to take such measures considered necessary to control or suppress any bush fire in any part of the State if, in the opinion of the Commissioner:

- A bushfire has assumed, or is likely to assume, such proportions as to be incapable of control or suppression by the fire fighting authority or authorities in whose area or locality it is burning;
- The prevailing conditions are conducive to the outbreak of a bush fire likely to assume such proportions;
- A bushfire is not being effectively controlled or suppressed by the fire fighting authority or authorities in whose area or locality it is burning; and

- A bushfire is burning in a place that is not the responsibility of any fire fighting authority.

The Act therefore places statutory obligation on the RFS, to protect life, property and the natural environment through fire suppression and fire prevention. Improved land use planning decisions for developments in bushfire prone areas are therefore critical decisions to the fire management and environmental protection strategies of the RFS.

A meeting held with District Emergency Management Officer for the North West Metropolitan Emergency Management District (Daniel Kenner) and Fire & Rescue NSW's representative on the Willoughby Lane Cove Local Emergency Management Committee (Kel McNamara), has identified that the likelihood and nature of bushfire in Batten Reserve which could affect developments in the Mowbray Road Precinct, would not require a specific management plan and is likely be managed under the Hunters Hill, Ryde, Lane Cove, Willoughby Bush Fire Risk Management Plan Disaster Plan (Displan) prepared by the Hunters Hill, Ryde, Lane Cove, Willoughby Bushfire Management Committee.

The Displan details emergency preparedness, response and recovery arrangements between the different agencies involved in emergency agreements and arrangements management

The plan outlines the overall agreed roles and responsibilities of different agencies.

Emergency Bushfire Evacuation

The meeting with District Emergency Management Officer and Fire & Rescue NSW's representative considered the likelihood scenarios for emergency bushfire evacuations from the Precinct, and identified that two possible scenarios of bushfires could be expected, namely

- A large scale bushfire starting in Lane Cove National Park and being blown towards Batten Reserve by strong north-westerly winds; and
- An arsonist attack in Batten Reserve.

Under both scenarios, the officers, advised that a bushfire, which would require all residents to evacuate, is not likely, as such, a bushfire would come from Batten Reserve, which is relatively small and is accessible for bush fighting from the perimeter roads.

The new dwellings will be built to the Australian Standard, to be classified as "properly constructed dwellings" and most residents would be encouraged to remain inside buildings during a bushfire event.

Education and communication for emergency bushfire procedures could be included in strata plans. However, bushfire awareness and preparedness for bushfire fighting by new residents to the Precinct is likely to be low.

Self-evacuations, particularly by residents along perimeter roads running beside Batten Reserve are more likely to occur.

Evacuation Assumptions

To assess the likely traffic demand and conditions that may be present during a bushfire evacuation scenario, SMEC has considered:

- The findings of the Victorian Bush Fire Royal Commission;
- Recent Land and Environment Court Rulings associated with other developments in the Precinct; and
- Held ddiscussions with Emergency Management District Officer and Fire & Rescue NSW's representative.

The RFS as well as Fire & Rescue NSW's does not have detailed statistics or policies on traffic behaviour during bushfire evacuation scenarios.

In recent Land and Environment Court appeals on development applications within the Precinct, a Traffic Engineer for one of the applicants, made reference to traffic demand report in the 2009 Victoria Bushfires Royal Commission.

The traffic demand report is based on a Bushfire Cooperative Research Centre (CRC) mail survey of 1,350 households affected by the Kilmore East, Murrindindi, Churchill, Beechworth–Mudgegonga, Bendigo, Bunyip and Horsham fires of January 2010.

The report indicates that:

- 54.1% of respondents left their home during the bushfire, with the percentages leaving at different times as follows:

Table 37: Departure Times During the 2009 Victoria Bushfires

Departure Time before the fire arrived	Percentage of those who left during the bushfire
More than 8 hrs	11.8%
4 hrs – 8 hrs	7.4%
2 hrs – 4 hrs	12.7%
1 hr – 2 hrs	14.8%
20 min – 1 hr	17.4%
10 min – 20 min	8.8%
Less than 10 min	7.2%
Left when the fire had already arrived	19.9%

The reference to Victoria Bushfires Royal Commission reports was accepted by the Court and were also cited in another case.

The Commission examined policies for emergency bushfire evacuation and recommended that the current emergency bushfire evacuation of a number of Australian states, needs to be clarified, to adequately inform residents in bushfire prone areas.

Based on this data the traffic volume that evacuated in the last hour before the fire arrived was 33.40%.

However, this data is specific to a rural setting, where most residents would have a better appreciation of the bushfire risk and may be prepared to stay and protect their properties. The scale and ferocity of the fires in Victoria was beyond anything likely to occur in the isolated Batten Reserve located in an urban environment. The results of the CRC survey may not be an accurate guide to evacuation behaviour in urban Lane Cove.

SMEC has subsequently developed a series of evacuation scenario assumptions, in consultation with the District Emergency Management and Fire & Rescue NSW representatives, to assist in developing a worst-case fire evacuation scenario for the Precinct, as summarised below:

- Mowbray Road West would be closed by Police during a bushfire at the following locations to restrict access into the Precinct, namely
  - At the Pacific Highway
  - At Centennial Avenue
  - At Epping Road
- Self evacuation is more likely than a formal evacuation direction from emergency services. In this instance, it is assumed that the following self evacuation rates, dependent on the proximity of dwellings to Gordon Crescent, will apply:
  - **Zone A** - 70% of dwellings facing directly onto Gordon Crescent or Batten Reserve;
  - **Zone B** - 20% of remaining dwellings located south of Mowbray Road; and
  - **Zone C** - 5% of dwellings located to the north of Mowbray Road.

  The extent of evacuation zones, along with the number of dwellings in each, is presented in **Appendix 'E'**
- Arson attack in Batten Reserve is likely to result in a more intensive self evacuation scenario than a fire that originates further to the north in the Lane Cove National Park which may take an extended time to travel around to Batten Reserve.
- The duration of a fire event in Batten Reserve is unlikely to extend beyond 4-hours given the road access available to fire fighting crews and limited size of the reserve.
- A small proportion (20%) of self evacuating residents living in proximity to Gordon Crescent will leave on foot. The average occupancy rate in the Precinct is 2.4 persons per dwelling.
- Residents evacuating by car will take all their vehicles. The average car ownership in the Precinct is 1.4 cars per dwelling.
- The self evacuation exit demand profile will be consistent with **Table 38**. The exit profile reflects the following assumptions:
  - It will take 30 minutes to an hour for residents to assess the situation, make a decision and pack any belongings they wish to take;
  - Self evacuations will peak 1-hour after the fire event has started when the flames and smoke are readily visible and threatening their properties; and
  - Evacuations will steadily decline in the last 3 to 4 hours of the fire event.
- Traffic self evacuating the Precinct will exit in the following directions:
  - East to Pacific Highway 70%
  - West to Epping Road (20%)
  - South to Epping Road and Centennial Avenue (10%)

Table 38: Self Evacuation Exit Profile

Hour	Minutes Elapsed	15-min Release Profile
1	15	0%
	30	2%
	45	8%
	60	13%
2	75	18%
	90	16%
	105	12%
	120	9%
3	135	8%
	150	6%
	165	4%
	180	2%
4	195	1%
	210	1%
	225	0%
	240	0%

Evacuation Forecasts

An evacuation model was constructed to assess the volume of car trips involved in self evacuation and performance of the road network under this demand scenario. The model assumes full development of the Precinct.

Given the assumed closures of Mowbray Road West during a fire event, background traffic specific to a time of day or day of week becomes irrelevant. The focus is on getting evacuating vehicles out of the Precinct. A worst case scenario, that all residents will be at home at the time of the fire, has been adopted for this assessment.

The estimated number of dwellings that may self evacuate during a fire event is presented in **Table 39**.

The estimated number of walk and car trips during an evacuation is presented in **Table 40**.

The estimated number of car trips exiting the Precinct to the west, east and south is presented in **Table 41.**

Table 39: Estimated Number of Dwellings that will Self Evacuate

Zone ID	Zone A	Zone B	Zone C	TOTALS
1	0	0	9	9
2	0	0	3	3
3	0	0	1	1
4	0	0	4	4
5	0	0	1	1
6	0	0	8	8
7	0	0	0	0
8	0	0	1	1
9	0	0	1	1
10	0	0	5	5
11	0	0	5	5
12	0	0	2	2
13	0	0	0	0
14	7	1	0	9
15	0	3	0	3
16	34	4	0	39
17	0	30	0	30
18	156	104	0	260
19	0	34	0	34
20	191	55	0	246
21	0	43	0	43
22	252	0	0	252
23	40	17	0	58
Totals	681	291	38	1011

Table 40: Estimated Number of Walk and Car Trips

Zone ID	Total Dwellings Evacuated	Total Evacuation Population	Total Walk Trips	Total Car Trips
1	9	21	0	12
2	3	7	0	4
3	1	3	0	2
4	4	9	0	5
5	1	2	0	1
6	8	19	0	11
7	0	0	0	0
8	1	3	0	2
9	1	1	0	1
10	5	11	0	7
11	5	11	0	7
12	2	4	0	2
13	0	0	0	0
14	9	20	3	10
15	3	7	0	4
16	39	92	16	44
17	30	72	0	42
18	260	623	75	320
19	34	81	0	47
20	246	590	92	291
21	43	104	0	61
22	252	606	121	283
23	58	138	19	69
Totals	1011	2426	327	1224

Table 41: Assignment of Self Evacuating Car Trips to Exit Zones

Zone ID	WB Exit Zone 24	EB Exit Zone 26	SB Exit Zone 27	Total Car Trips
1	2	8	1	12
2	1	3	0	4
3	0	1	0	2
4	1	4	1	5
5	0	1	0	1
6	2	8	1	11
7	0	0	0	0
8	0	1	0	2
9	0	1	0	1
10	1	5	1	7
11	1	5	1	7
12	0	2	0	2
13	0	0	0	0
14	2	7	1	10
15	1	3	0	4
16	9	31	4	44
17	8	30	4	42
18	64	224	32	320
19	9	33	5	47
20	58	203	29	291
21	12	42	6	61
22	57	198	28	283
23	14	49	7	69
Totals	245	857	122	1224

Network Performance

The performance of the network under the fire evacuation scenario was assessed using SIDRA intersection analysis software and PARAMICS micro-simulation software.

The performance of the existing critical intersections accessing the Precinct, under the evacuation scenario, is summarised in **Table 39**.

The performance of the network was also assessed using PARAMICS. The networks performance statistics, under the 2021 evacuation scenario is presented in **Table 40**. Additionally, sensitivity tests were undertaken where the evacuation demand scenario was increased by 20% and 40%.

The intersection and network performance analysis revealed the following:

- The micro-simulation modelling indicates that the key intersections providing access to the Precinct, and would be used during evacuation would be expected to operate with acceptable LoS A or B (based on the assumptions above) as indicated in Tables 42 and 43.

Table 42: Intersection Performance under 2021 Evacuation Scenario (Heaviest Hour)

Location	LOS	Ave Delay (sec)	DOS	95% Queue Length (veh)
Mowbray Road and Centennial Avenue	B	18.2	0.49	5.5
Mowbray Road and Girraween Avenue	A	10.2	0.11	0.5
Mowbray Road and Mindarie Street	A	10.0	0.22	1.2
Mowbray Road and Kullah Parade	A	8.7	0.01	0
Mowbray Road and Willandra Street	A	8.7	0.10	0.5
Elizabeth Parade and Gordon Cres	A	9.2	0.02	0.1

Table 43: Network Performance Statistics Under 2021 Evacuation Scenario (Heaviest Hour)

Measure	2021 Evacuation	+20%	+40%
Ave Travel Time (secs)	174.5	173.7	170.6
Ave Vehicle Speed (km/h)	28	28	28
VKT (km)	942	1161	1375
VHT (hrs)	34	42	49
Unreleased	0	0	0
Unfinished	22	25	28
Finished	663	796	929
Total Demand	685	821	957

Bushfire Conclusions

Advice from North West Metropolitan Emergency Management and Fire & Rescue NSW's representatives has identified that the likelihood and nature of bushfire in Batten Reserve which could affect developments in the Mowbray Road Precinct, would not require a specific management plan and is likely to be managed under the Hunters Hill, Ryde, Lane Cove, Willoughby Bush Fire Risk Management Plan Disaster Plan (Displan).

The advice also indicated that due to the nature and scale of the emergency bushfire and the fact the new dwellings in the Precinct would be constructed to comply with PBP and would be safe refuges during bushfire, it is unlikely the Precinct would be subject to a mandatory or forced mass evacuation.

However, bushfire awareness and preparedness for bushfire fighting by new residents to the Precinct is likely to be low and hence, while the agencies might not encourage evacuation during emergency bushfires, self-evacuations, particularly by residents along perimeter roads running beside Batten Reserve are more likely to occur.

A concern was previously raised about the adequacy of the existing local road network to cope with emergency bushfire evacuation. Micro-simulation modelling carried out (based on the assumed emergency self evacuations) indicates that the local road network can accommodate emergency bushfire evacuation.

The concern about the narrow carriageway of the existing perimeter roads has also been investigated and it is recommended parking restrictions be installed along the southern side of Kullah Parade and Gordon Parade (after redevelopment of the most of the properties also the two streets).

11 CONCLUSIONS

Overview

This traffic study was undertaken to investigate the concerns expressed by Council and the local community regarding the cumulative traffic impacts that would result from redevelopment of the Precinct under high density residential, R4 zoning. The investigation also included the assessment of the adequacy of the road network to cope with an emergency bushfire evacuation.

Performance of the Existing Road Network

The traffic study has identified that the existing road network within the Precinct is dominated by Mowbray Road West and Centennial Avenue, both of which front the Precinct. Both roads are classified as 'Regional Roads' under the RTA's administrative road classification system.

Mowbray Road West and Centennial Avenue are operating with a typical road capacity of 950 veh/hr per lane to 1100 veh/hr per lane, and currently operating with acceptable Level of Services (LoS) B or C, as shown in Table 4.

The existing intersections off Mowbray Road West, providing access to the Precinct have single entry or exit lanes which are untreated.

In addition, currently right turn movements (into the Precinct) are not permitted from Mowbray Road West at its intersection with Mindarie Street, Girraween Avenue, Kullah Parade and Willandra Street during the weekday AM peak.

Intersection performance analysis also indicates that key intersections providing access to the Precinct are currently operating with acceptable LoS A, B, C or D, as shown in Table 7.

The performance of the midblock sections of Mowbray Road West and Centennial Avenue, as well as the key intersections (providing access to the Precinct), indicate that the existing road network has spare capacity to accommodate some additional redevelopment of the Precinct.

Traffic Impact of the Development Potential

Traffic impact assessment of the redevelopment of the Precinct (using SMEC's TRINITY Model for strategic modelling and PARAMICS for micro-simulation modelling) has identified that, assuming no significant changes to the modal split), the theoretical maximum development yield of 2088 dwellings, would be expected generate:

- 1,040 trips during the AM peak hour
- 978 trips during the PM peak hour

This traffic generation potential from the redevelopment as well as background traffic growth is expected to result in the following traffic condition along the section of the Mowbray West and Centennial Avenue fronting the Precinct:

- A 6.5% growth during AM peak hour background traffic over the next 10-years
- A modest 3% growth during PM Peak hour background traffic over the next 10-years
- A significant 36% growth in total AM peak hour traffic over the next 10-years, with full redevelopment growth scenario
- A significant 25% growth in total PM peak hour traffic over the next 10-years under the full redevelopment growth scenario.

Micro-simulation modeling of the traffic impacts indicates that the:

- Redevelopment of the Precinct under the current zoning will result in noticeable traffic volume increases along the section of Mowbray Road West fronting the Precinct and the associated intersections providing access to the Precinct;
- The traffic generation is expected to reduce the average traffic speeds on the 2021 road networks by 15 km/h in the AM peak and 4 km/h in the PM peak;
- The intersection of Mowbray Road West/Centennial Avenue will be expected to experience long traffic delays (and queues) on its western and southern approaches, by 2021; and
- The other intersections providing access to Precinct off Mowbray Road West will be expected to operate with acceptable LoS.

Intersection performance using SIDRA has identified that:

- The Mowbray Road West/Centennial Avenue intersection would be expected to operate with poor LOS F during the AM peak and LoS D during the PM peak, with or without traffic from redevelopment of the Precinct.
- The performance would worsen with traffic from the redevelopment. However the need for the intersection improvement is attributable to background traffic growth as well as impact from the redevelopment. The need for the intersection upgraded should be raised with the RTA.
- With redevelopment, to improve accessibility to the Precinct, the existing right bans into the Precinct (during the AM peak) would be need to be removed. In addition, increased traffic flow would result in unreasonable delays for traffic exiting the Precinct via Girraween Avenue,

Mindarie Street, Kullah Parade and Willandra Street, and affect the pedestrian safety in crossing Mowbray Road West. These delays could lead to increased risk taking behaviour and result in increased crashes.

- To address these likely traffic impacts, a traffic management scheme involving the installation of traffic control signals at Mowbray Road West/Kullah Parade/Hatfield Street intersection, with dedicated right turn bays, and signalised pedestrian crossing; and other traffic management schemes including provision of right turn storage bays for turning movements into the Precinct, as detailed in **Table 32 and Appendix H,** are recommended.
- These treatments, along with the recommended additional footpath paving and bus shelters are to be funded by a Section 94 Developer Contribution Scheme (for the Precinct) and constructed after approximately 50% of the redevelopment has been occupied.

Traffic Management Scheme for Emergency Bushfire Evacuation

An assessment of the bushfire risk of the precinct has been addressed in a Bushfire Protection Assessment prepared by Ecological as part of the Strategic Review.

This assessment as well as advice from the North West Metropolitan Emergency Management and Fire & Rescue NSW's representatives has identified that the likelihood and nature of a bushfire in Batten Reserve which could affect developments in the Mowbray Road Precinct, would not require a specific management plan and is likely to be managed under the Hunters Hill, Ryde, Lane Cove, Willoughby Bush Fire Risk Management Plan Disaster Plan (Displan).

The advice also indicated that due to the nature and scale of the emergency bushfire and the fact the new dwellings in the Precinct would be constructed to comply with PBP and would be safe refuges during bushfire, it is unlikely the Precinct would be subject to a mandatory or forced mass evacuation.

However, bushfire awareness and preparedness for bushfire fighting by new residents to the Precinct is likely to be low and hence, while the agencies might not encourage evacuation during emergency bushfires, self-evacuations, particularly by residents along perimeter roads running beside Batten Reserve are more likely to occur.

Evacuation scenario assumptions, include the likely traffic demand during emergency self evacuation has identified that

- Self evacuations will peak 1-hour after the fire event has started when the flames and smoke are readily visible and threatening their properties; and
- Evacuations will steadily decline in the last 3 to 4 hours of the fire event.
- Traffic self evacuating the Precinct will exit in the following directions:
  - East to Pacific Highway 70%
  - West to Epping Road (20%)
  - South to Epping Road and Centennial Avenue (10%)

Under these scenarios, the recommended upgraded intersection treatments, along with temporary traffic management and control (including road closure of Mowbray Road West at its intersection with Epping Road by the Police) would provide adequate capacity for the emergency bushfire self evacuation.

The existing internal perimeter roads are two lane two ways street with carriageway width of approximately 6.5 -7.3 m kerb to kerb. To ensure two movements can be permitted, at all times particularly during emergency bushfires, it is recommended that parking restrictions be installed along the southern side of Kullah Parade and Gordon Parade, as redevelopment proceeds and 50% of the redevelopment is occupied.

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APPENDIX A

TRINITY Model Calibration Results

Table 1: Calibration of Major Bridge & Tunnel Crossings

Bridge-Tunnel Crossings	AM (2hrs)				PM(3hrs)			
	Count	Model	GEH	Ratio	Count	Model	GEH	Ratio
James Ruse Dr, N	5,089	5,060	0.41	0.9943	7,868	8,073	2.30	1.0260
James Ruse Dr, S	5,850	6,215	4.69	1.0623	7,525	7,785	2.98	1.0346
Silverwater Rd, N	6,639	6,814	2.13	1.0263	6,608	6,807	2.42	1.0300
Silverwater Rd, S	4,284	4,494	3.16	1.0489	8,793	9,063	2.86	1.0307
Homebush Bay, N	5,766	5,939	2.26	1.0299	9,726	9,785	0.59	1.0060
Homebush Bay, S	7,687	7,993	3.45	1.0397	10,549	10,761	2.05	1.0201
Victoria Rd, Gladesville Bridge, N	7,845	8,070	2.53	1.0288	10,192	10,437	2.41	1.0240
Victoria Rd, Gladesville Bridge, S	7,006	6,647	4.34	0.9488	10,456	10,656	1.95	1.0192
Victoria Rd, Iron Cove Bridge, N	5,118	5,269	2.09	1.0295	9,775	9,765	0.10	0.9990
Victoria Rd, Iron Cove Bridge, S	6,159	5,996	2.09	0.9736	7,943	7,987	0.49	1.0055
Sydney Harbour Bridge N	10,166	9,830	3.36	0.9669	20,465	20,424	0.29	0.9980
Sydney Harbour Bridge S	16,588	16,067	4.08	0.9685	15,552	15,614	0.50	1.0040
Sydney Harbour Tunnel, N	7,254	7,418	1.92	1.0226	10,240	9,644	5.79	0.9436
Sydney Harbour Tunnel, S	6,967	7,216	2.96	1.0358	8,650	8,724	0.80	1.0086
Total N	47,877	48,400	2.38	1.0109	74,875	74,934	0.28	1.0010
Total S	54,542	54,628	0.36	1.0016	69,467	70,590	4.24	1.0162

Table 2: Calibration of Major RTA Screen-lines AM Peak (2-hr)

SL AM (2hrs)	Observed Flow			Modelled			Difference			GEH	
	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT
01	20,816	17,734	38,550	20,491	17,844	38,335	325	-110	214	2.3	0.8
02	69,195	61,162	130,357	69,626	62,009	131,635	-430	-847	-1,277	1.6	3.4
03	9,262	3,694	12,956	9,549	4,075	13,624	-288	-380	-668	3.0	6.1
04	15,634	5,511	21,145	15,645	5,750	21,395	-10	-239	-250	0.1	3.2
05	56,309	33,365	89,673	56,640	34,011	90,651	-332	-646	-978	1.4	3.5
06	17,234	14,434	31,668	17,227	14,190	31,417	7	244	251	0.1	2.0
07	11,787	9,548	21,335	11,860	9,866	21,726	-73	-318	-391	0.7	3.2
08	11,304	8,497	19,801	11,174	8,733	19,907	130	-236	-106	1.2	2.5
09	21,864	9,721	31,585	21,439	10,285	31,724	425	-565	-139	2.9	5.6
10	4,026	2,628	6,654	4,164	2,468	6,633	-139	160	21	2.2	3.2
11	16,094	9,782	25,877	16,970	10,516	27,486	-875	-734	-1,609	6.8	7.3
12	8,963	5,269	14,231	8,923	5,155	14,078	39	114	153	0.4	1.6
13	7,317	3,255	10,572	7,608	3,590	11,198	-291	-335	-626	3.4	5.7
14	6,195	2,902	9,098	6,112	3,044	9,156	83	-141	-58	1.1	2.6
15	15,058	8,903	23,961	15,033	9,004	24,037	25	-101	-76	0.2	1.1
16	2,144	782	2,926	2,326	845	3,171	-182	-63	-245	3.9	2.2
TOTAL	293,203	197,185	490,389	294,789	201,384	496,173	-1,585	-4,199	-5,784	2.9	9.4

Table 3: Calibration of Major RTA Screen-lines PM Peak (3-hr)

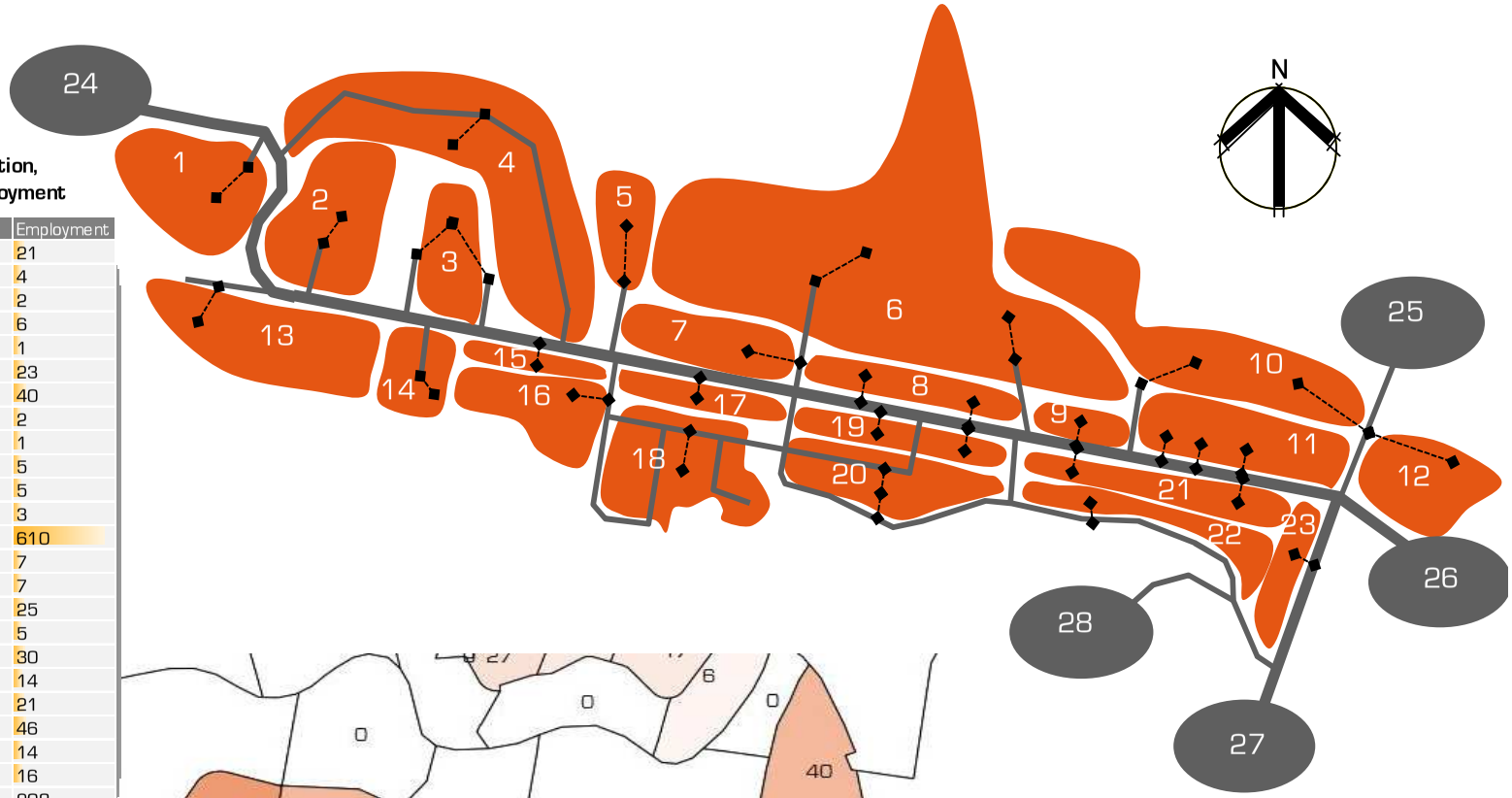
SL PM (3hrs)	Observed Flow			Modelled			Difference O-M			GEH	
	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT
01	26,915	32,179	59,094	26,876	31,728	58,604	39	451	490	0.2	2.5
02	94,669	100,024	194,693	95,700	99,008	194,708	-1,030	1,015	-15	3.3	3.2
03	7,472	13,008	20,480	7,710	13,478	21,188	-239	-469	-708	2.7	4.1
04	9,447	19,369	28,816	9,275	19,767	29,042	171	-398	-226	1.8	2.8
05	51,328	77,822	129,150	51,132	78,516	129,648	196	-694	-498	0.9	2.5
06	24,789	22,904	47,693	24,306	22,827	47,133	483	76	560	3.1	0.5
07	15,286	20,529	35,814	15,576	20,505	36,081	-290	24	-266	2.3	0.2
08	11,608	15,642	27,250	11,905	16,017	27,922	-297	-375	-672	2.7	3.0
09	17,641	26,178	43,819	17,843	26,147	43,990	-202	31	-171	1.5	0.2
10	4,248	6,089	10,337	4,108	6,248	10,356	140	-159	-19	2.2	2.0
11	18,425	22,743	41,168	19,187	23,470	42,657	-762	-727	-1,489	5.6	4.8
12	8,896	12,565	21,461	8,976	12,787	21,763	-80	-222	-302	0.8	2.0
13	6,775	9,932	16,707	7,067	10,011	17,079	-292	-79	-372	3.5	0.8
14	5,455	7,962	13,417	5,444	7,244	12,688	11	717	728	0.2	8.2
15	12,133	19,379	31,512	12,002	19,356	31,358	131	23	154	1.2	0.2
16	2,875	1,846	4,721	3,137	1,815	4,952	-263	31	-231	4.8	0.7
TOTAL	317,963	408,170	726,133	320,243	408,926	729,169	-2,281	-756	-3,036	4.0	1.2

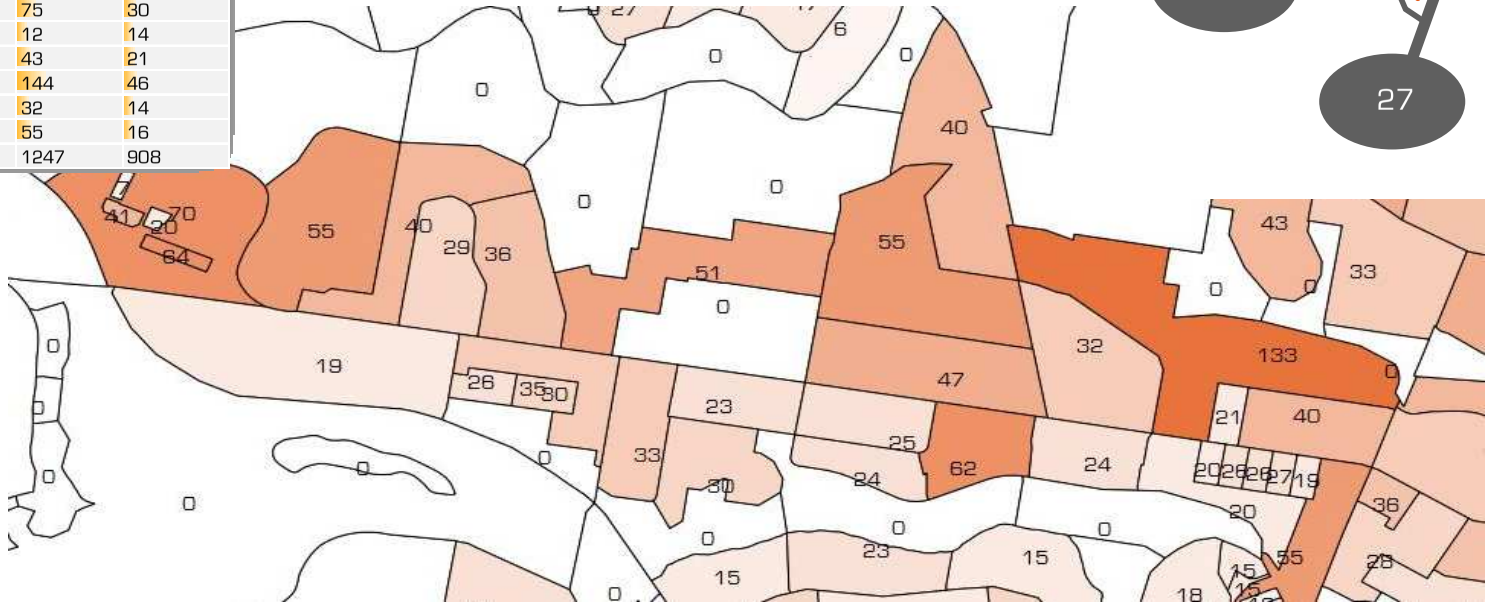
APPENDIX B

Mowbray Road Precinct PARAMICS Model Network

Table 1: Distribution of Population, Households and Employment

Zone	Population	Dwellings	Employment
1	435	172	21
2	145	55	4
3	97	29	2
4	237	76	6
5	33	20	1
6	523	155	23
7	0	0	40
8	79	23	2
9	33	12	1
10	203	95	5
11	196	94	5
12	113	33	3
13	0	0	610
14	41	19	7
15	39	15	7
16	149	76	25
17	30	12	5
18	174	75	30
19	79	12	14
20	124	43	21
21	271	144	46
22	83	32	14
23	91	55	16
TOTALS	3174	1247	908





APPENDIX C

Mowbray Road Precinct PARAMICS Model Calibration Results

Table C1: Comparison of AM Peak Hour Modelled and Observed Turn Flows

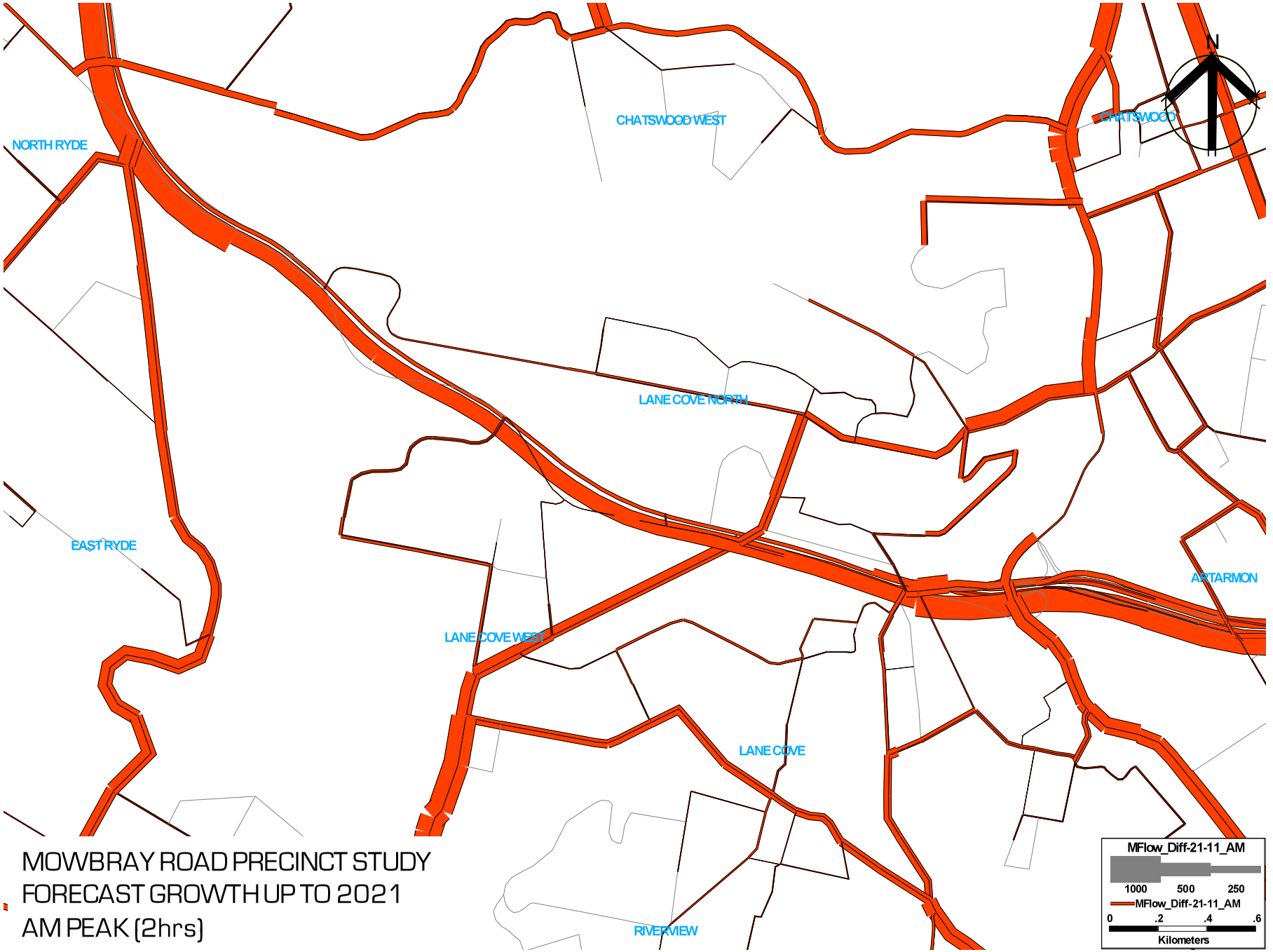
Junction	Dir	Turn ref:	Observed	Modelled	GEH
Mowbray Road West, Centennial Avenue and Greenlands Road	L	1117:1033: 1039	10	8	0.7
	T	1117:1033: 1125	189	187	0.1
	R	1117:1033: 1038	38	30	1.4
	L	1038:1033: 1117	9	14	1.5
	T	1038:1033: 1039	466	460	0.3
	R	1038:1033: 1125	100	111	1.1
	L	1125:1033: 1038	92	99	0.7
	T	1125:1033: 1117	44	38	0.9
	R	1125:1033: 1039	493	481	0.5
	L	1034:1033: 1125	246	245	0.1
	T	1039:1033: 1038	593	590	0.1
Mowbray Road West, Kullah Parade and Hatfield Street	L	1087:1022: 1023	22	16	1.4
	T	1087:1022: 1093	3	1	1.4
	R	1087:1022: 1021	26	24	0.4
	L	1021:1022: 1087	20	13	1.7
	T	1021:1022: 1023	583	589	0.2
	R	1021:1022: 1093	0	0	0
	L	1093:1022: 1021	10	6	1.4
	T	1093:1022: 1087	1	0	1.4
	R	1093:1022: 1023	2	0	2.0
	L	1023:1022: 1093	3	0	2.4
	T	1023:1022: 1021	716	707	0.3
	R	1023:1022: 1087	27	20	1.4
Mowbray Road West and Mindarie Street	T	1023:1024: 1025	594	607	0.5
	R	1023:1024: 1097	0	0	0
	L	1097:1024: 1023	5	0	3.2
	R	1097:1024: 1025	8	15	2.1
	L	1025:1024: 1097	4	2	1.2
	T	1025:1024: 1023	722	723	0.0
Mowbray Road West and Willandra Street	L	1074:1019: 1020	4	4	0.0
	R	1074:1019: 1018	3	8	2.1
	L	1018:1019: 1074	6	8	0.8
	T	1018:1019: 1020	588	593	0.2
	L	1076:1020: 1019	22	49	4.5
	R	1076:1020: 1151	12	8	1.3
	L	1151:1020: 1076	8	1	3.3
	T	1151:1020: 1019	720	731	0.4
	R	1019:1020: 1076	0	0	0
	R	1020:1019: 1074	18	11	1.8
Mowbray Road West and Girraween Avenue	T	1025:1026: 1027	619	627	0.3
	R	1025:1026: 1099	0	0	0
	L	1099:1026: 1025	4	17	4.0
	R	1099:1026: 1027	3	2	0.6
	L	1027:1026: 1099	11	4	2.6
	T	1027:1026: 1025	724	711	0.5
Elizabeth Parade and Gordon Crescent	L	1123:1130: 1131:1129	61	56	0.7
	R	1123:1130: 1132:1133	3	1	1.4
	L	1133:1132: 1130:1123	3	4	0.5
	T	1133:1132: 1131:1129	9	12	0.9
	T	1129:1131: 1132:1133	8	9	0.3
	R	1129:1131: 1130:1123	27	40	2.2

Table C2: Comparison of PM Peak Hour Modelled and Observed Turn Flows

Junction	Dir	Link ref:	Observed	Modelled	GEH
Mowbray Road West, Centennial Avenue and Greenlands Road	L	1117:1033: 1039	13	19	1.5
	T	1117:1033: 1125	94	104	1.0
	R	1117:1033: 1038	43	39	0.6
	L	1038:1033: 1117	12	32	4.3
	T	1038:1033: 1039	586	570	0.7
	R	1038:1033: 1125	81	102	2.2
	L	1125:1033: 1038	128	155	2.3
	T	1125:1033: 1117	46	45	0.1
	R	1125:1033: 1039	372	369	0.2
	L	1034:1033: 1125	384	368	0.8
	T	1039:1033: 1038	599	620	0.9
Mowbray Road West, Kullah Parade and Hatfield Street	L	1087:1022: 1023	21	20	0.2
	T	1087:1022: 1093	5	5	0.0
	R	1087:1022: 1021	24	18	1.3
	L	1021:1022: 1087	33	28	0.9
	T	1021:1022: 1023	662	670	0.3
	R	1021:1022: 1093	6	0	3.5
	L	1093:1022: 1021	1	0	1.4
	T	1093:1022: 1087	3	1	1.4
	R	1093:1022: 1023	6	9	1.1
	L	1023:1022: 1093	4	0	2.8
	T	1023:1022: 1021	643	643	0.0
	R	1023:1022: 1087	34	34	0.0
Mowbray Road West and Mindarie Street	T	1023:1024: 1025	683	699	0.6
	R	1023:1024: 1097	0	0	-
	L	1097:1024: 1023	0	0	-
	R	1097:1024: 1025	3	16	4.2
	L	1025:1024: 1097	9	5	1.5
	T	1025:1024: 1023	682	684	0.1
Mowbray Road West and Willandra Street	L	1074:1019: 1020	7	6	0.4
	R	1074:1019: 1018	2	0	2.0
	L	1018:1019: 1074	3	1	1.4
	T	1018:1019: 1020	678	698	0.8
	L	1076:1020: 1019	10	12	0.6
	R	1076:1020: 1151	6	7	0.4
	L	1151:1020: 1076	6	4	0.9
	T	1151:1020: 1019	652	649	0.1
	R	1019:1020: 1076	22	39	3.1
	R	1020:1019: 1074	9	9	0.0
Mowbray Road West and Girraween Avenue	T	1025:1026: 1027	700	702	0.1
	R	1025:1026: 1099	6	15	2.8
	L	1099:1026: 1025	4	6	0.9
	R	1099:1026: 1027	1	3	1.4
	L	1027:1026: 1099	3	2	0.6
	T	1027:1026: 1025	695	709	0.5
Elizabeth Parade and Gordon Crescent	L	1123:1130: 1131:1129	42	34	1.3
	R	1123:1130: 1132:1133	2	3	0.6
	L	1133:1132: 1130:1123	2	1	0.8
	T	1133:1132: 1131:1129	4	5	0.5
	T	1129:1131: 1132:1133	8	11	1.0
	R	1129:1131: 1130:1123	28	16	2.6

APPENDIX D

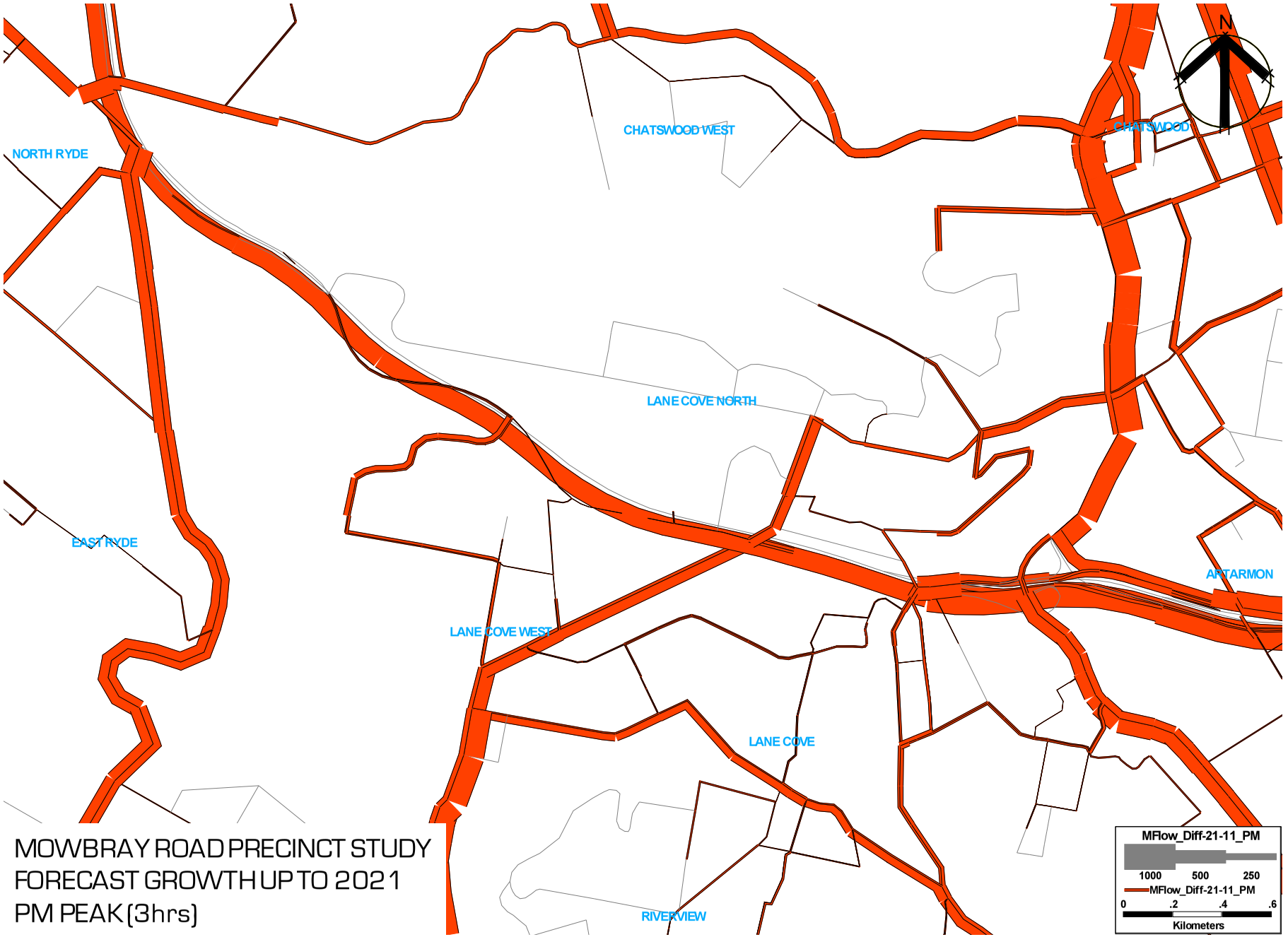
Mowbray Road Precinct Regional Growth Forecasts



MOWBRAY ROAD PRECINCT STUDY
FORECAST GROWTH UP TO 2021
AM PEAK (2hrs)

SMEC

Mowbray Road Precinct Strategic Review – Traffic Study



MOWBRAY ROAD PRECINCT STUDY
FORECAST GROWTH UP TO 2021
PM PEAK (3hrs)

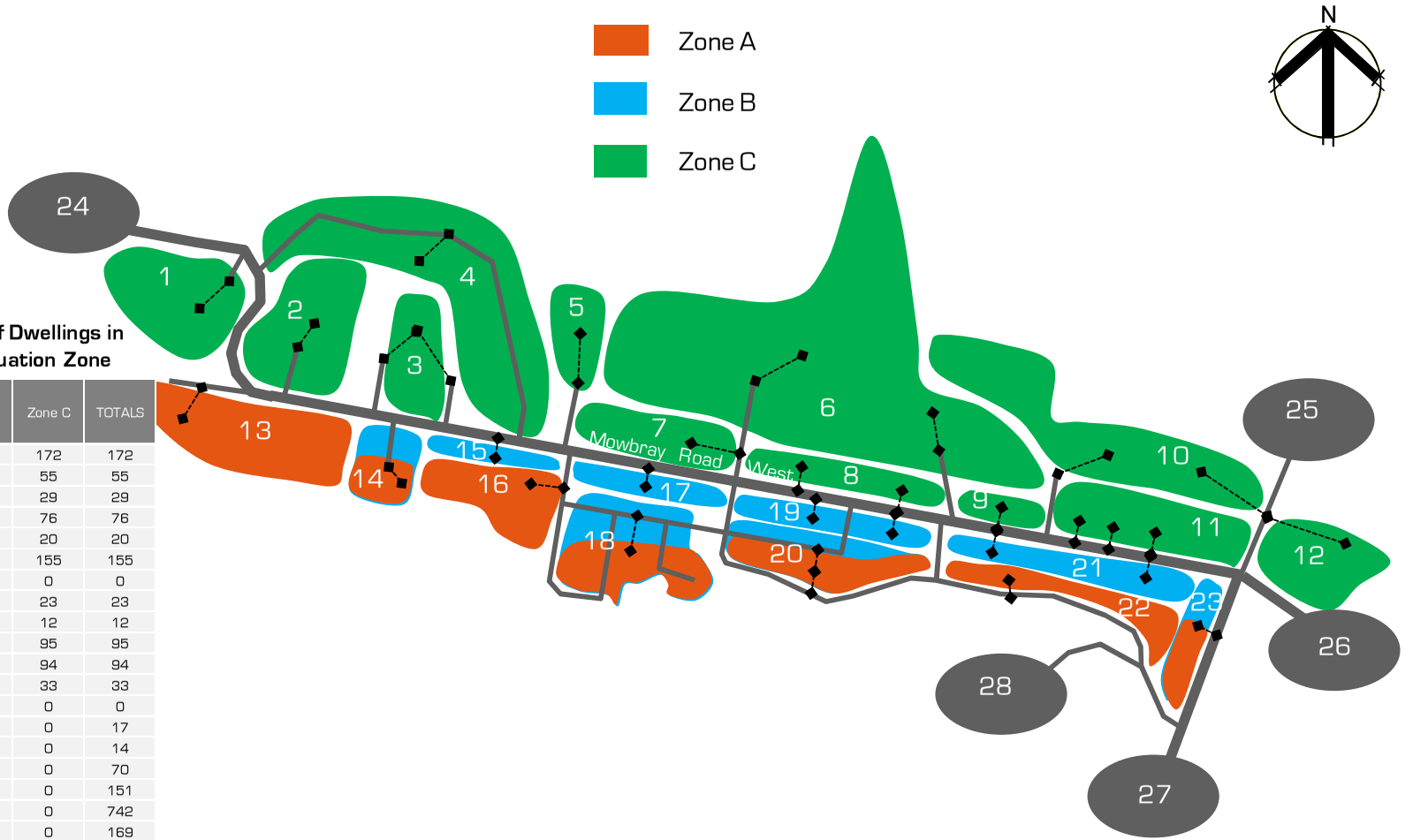
SMEC

APPENDIX E

Mowbray Road Precinct Self Evacuation Zones

Table 1: Number of Dwellings in Each Evacuation Zone

Zone ID	Zone A	Zone B	Zone C	TOTALS
1	0	0	172	172
2	0	0	55	55
3	0	0	29	29
4	0	0	76	76
5	0	0	20	20
6	0	0	155	155
7	0	0	0	0
8	0	0	23	23
9	0	0	12	12
10	0	0	95	95
11	0	0	94	94
12	0	0	33	33
13	0	0	0	0
14	10	7	0	17
15	0	14	0	14
16	49	21	0	70
17	0	151	0	151
18	223	520	0	742
19	0	169	0	169
20	273	273	0	546
21	0	216	0	216
22	361	0	0	361
23	58	87	0	144
Totals	973	1457	764	3194



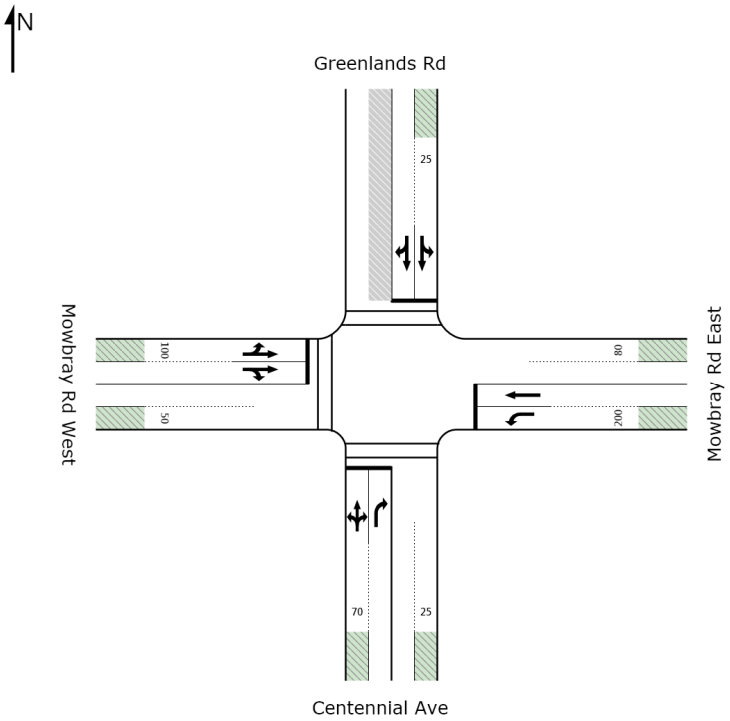
MOWBRAY ROAD PRECINCT STUDY
SELF EVACUATION ZONES

APPENDIX 'F'

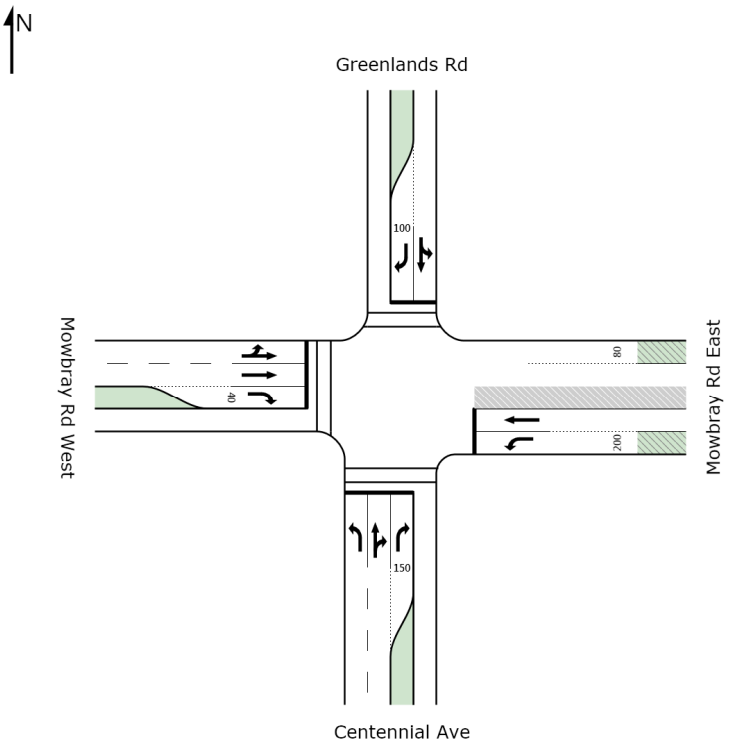
Mowbray Road Precinct SIDRA Analysis

Intersection –Site 1: Mowbray Road/Centennial Ave

Existing



Upgraded



MOVEMENT SUMMARY

Site: Site 1 - 2011 Wed AM
Mowbray Rd/Centennial Ave

Mowbray Rd/Centennial Ave
Signals - Fixed Time Cycle Time = 70 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Centennial Ave											
1	L	109	1.8	0.447	33.2	LOS C	7.7	54.3	0.90	0.81	31.7
2	T	40	0.0	0.446	24.9	LOS B	7.7	54.3	0.90	0.74	32.2
3	R	494	0.4	0.981	77.1	LOS F	27.2	191.2	0.99	1.27	19.2
Approach		643	0.6	0.981	66.4	LOS E	27.2	191.2	0.97	1.16	21.2
East: Mowbray Rd East											
4	L	242	0.8	0.180	11.4	LOS A	3.7	25.8	0.33	0.73	45.7
5	T	584	1.7	0.757	21.4	LOS B	19.3	137.2	0.92	0.86	35.7
Approach		826	1.5	0.757	18.5	LOS B	19.3	137.2	0.75	0.82	38.2
North: Greenlands Rd											
7	L	11	0.0	0.224	41.1	LOS C	1.8	12.9	0.95	0.74	29.2
8	T	178	0.0	0.969	58.6	LOS E	11.2	78.6	0.99	1.23	21.9
9	R	35	0.0	0.970	71.2	LOS F	11.2	78.6	1.00	1.32	20.9
Approach		224	0.0	0.969	59.7	LOS E	11.2	78.6	0.99	1.22	22.0
West: Mowbray Rd West											
10	L	9	0.0	0.433	24.5	LOS B	9.3	66.1	0.76	0.90	37.8
11	T	463	1.9	0.950	31.9	LOS C	15.2	107.5	0.84	0.89	30.3
12	R	99	0.0	0.951	68.5	LOS E	15.2	107.5	1.00	1.33	21.3
Approach		571	1.6	0.950	38.1	LOS C	15.2	107.5	0.87	0.96	28.3
All Vehicles		2264	1.1	0.981	41.1	LOS C	27.2	191.2	0.87	0.99	27.5

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	Across S approach	16	19.3	LOS B	0.0	0.0	0.74	0.74
P5	Across N approach	16	17.2	LOS B	0.0	0.0	0.70	0.70
P7	Across W approach	16	6.0	LOS A	0.0	0.0	0.41	0.41
All Pedestrians		48	14.2				0.62	0.62

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual pedestrian movements: Delay (HCM).

MOVEMENT SUMMARY

Site: Site 1 - 2011 Wed PM
Mowbray Rd/Centennial Ave

Mowbray Rd/Centennial Ave
Signals - Fixed Time Cycle Time = 70 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Centennial Ave											
1	L	128	0.0	0.405	33.6	LOS C	6.8	47.6	0.90	0.81	31.6
2	T	46	0.0	0.405	25.5	LOS B	6.8	47.6	0.90	0.73	32.1
3	R	372	0.3	0.878	47.0	LOS D	16.5	115.8	1.00	1.02	26.1
Approach		546	0.2	0.878	42.0	LOS C	16.5	115.8	0.97	0.95	27.7
East: Mowbray Rd East											
4	L	384	0.3	0.279	11.3	LOS A	5.7	39.9	0.35	0.74	45.7
5	T	599	1.3	0.723	18.6	LOS B	18.5	131.2	0.89	0.80	37.6
Approach		983	0.9	0.723	15.7	LOS B	18.5	131.2	0.68	0.78	40.4
North: Greenlands Rd											
7	L	13	0.0	0.172	42.2	LOS C	1.5	10.2	0.96	0.72	28.5
8	T	94	0.0	0.742	37.6	LOS C	6.1	42.6	0.99	0.85	27.5
9	R	43	0.0	0.742	46.5	LOS D	6.1	42.6	1.00	0.88	27.2
Approach		150	0.0	0.742	40.5	LOS C	6.1	42.6	0.99	0.85	27.5
West: Mowbray Rd West											
10	L	11	0.0	0.414	22.8	LOS B	8.7	61.6	0.72	0.91	38.8
11	T	586	1.2	0.895	28.3	LOS B	17.8	125.5	0.86	0.88	32.0
12	R	81	0.0	0.896	49.9	LOS D	17.8	125.5	1.00	1.15	26.3
Approach		678	1.0	0.895	30.8	LOS C	17.8	125.5	0.88	0.92	31.2
All Vehicles		2357	0.7	0.895	27.7	LOS B	18.5	131.2	0.82	0.86	33.1

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	Across S approach	16	17.9	LOS B	0.0	0.0	0.71	0.71
P5	Across N approach	16	15.8	LOS B	0.0	0.0	0.67	0.67
P7	Across W approach	16	29.3	LOS C	0.0	0.0	0.91	0.91
All Pedestrians		48	21.0				0.77	0.77

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS C. LOS Method for individual pedestrian movements: Delay (HCM).

Processed: Thursday, 6 October 2011 2:11:47 PM
SIDRA INTERSECTION 5.0.5.1510

Project: I:\projects\30011093 - Mowbray Road Precinct Strategic Review\MODELLING\SIDRA\Mowbray Rd_Base2011.sip
8000783, SMEC AUSTRALIA PTY LTD, SINGLE

MOVEMENT SUMMARY

Site: Site 1 - 2021DN Wed AM
Mowbray Rd/Centennial Ave

Mowbray Rd/Centennial Ave
Signals - Fixed Time Cycle Time = 70 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Centennial Ave											
1	L	116	12.1	0.494	32.0	LOS C	8.2	60.7	0.88	0.82	32.5
2	T	64	0.0	0.494	23.5	LOS B	8.2	60.7	0.88	0.73	33.2
3	R	587	1.0	1.086	205.7	LOS F	62.9	444.4	0.99	1.89	9.0
Approach		767	2.6	1.086	164.3	LOS F	62.9	444.4	0.97	1.63	10.8
East: Mowbray Rd East											
4	L	291	2.7	0.219	11.5	LOS A	4.4	31.9	0.34	0.73	45.6
5	T	540	2.6	0.758	23.0	LOS B	18.4	131.7	0.94	0.87	34.8
Approach		831	2.6	0.758	19.0	LOS B	18.4	131.7	0.73	0.82	38.0
North: Greenlands Rd											
7	L	9	0.0	0.254	41.2	LOS C	2.1	14.6	0.95	0.74	29.3
8	T	205	0.0	1.095	193.4	LOS F	25.1	175.6	0.99	1.85	9.3
9	R	39	0.0	1.096	232.0	LOS F	25.1	175.6	1.00	2.07	8.2
Approach		253	0.0	1.095	194.0	LOS F	25.1	175.6	0.99	1.84	9.3
West: Mowbray Rd West											
10	L	7	0.0	0.496	26.7	LOS B	11.2	79.1	0.82	0.90	36.6
11	T	497	1.4	1.081	74.5	LOS F	29.4	207.5	0.87	1.12	19.0
12	R	112	0.0	1.081	215.0	LOS F	29.4	207.5	1.00	2.12	8.7
Approach		616	1.1	1.081	99.5	LOS F	29.4	207.5	0.90	1.30	15.8
All Vehicles		2467	2.0	1.095	102.2	LOS F	62.9	444.4	0.87	1.30	15.5

Level of Service (Aver. Int. Delay): LOS F. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	Across S approach	16	20.8	LOS C	0.0	0.0	0.77	0.77
P5	Across N approach	16	18.6	LOS B	0.0	0.0	0.73	0.73
P7	Across W approach	16	6.0	LOS A	0.0	0.0	0.41	0.41
All Pedestrians		48	15.1				0.64	0.64

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS C. LOS Method for individual pedestrian movements: Delay (HCM).

Project: I:\projects\30011093 - Mowbray Road Precinct Strategic Review\MODELLING\SIDRA\Mowbray Rd_2021DN.sip
8000783, SMEC AUSTRALIA PTY LTD, SINGLE

MOVEMENT SUMMARY

Site: Site 1 - 2021DN Wed PM
Mowbray Rd/Centennial Ave

Mowbray Rd/Centennial Ave
Signals - Fixed Time Cycle Time = 75 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Centennial Ave											
1	L	137	0.0	0.448	33.0	LOS C	7.9	55.3	0.87	0.82	31.9
2	T	66	0.0	0.448	24.8	LOS B	7.9	55.3	0.87	0.72	32.6
3	R	441	0.5	0.893	49.9	LOS D	20.7	145.7	1.00	1.03	25.2
Approach		644	0.3	0.893	43.7	LOS D	20.7	145.7	0.96	0.95	27.1
East: Mowbray Rd East											
4	L	525	1.5	0.385	11.5	LOS A	8.1	57.2	0.36	0.75	45.6
5	T	512	0.8	0.639	19.0	LOS B	16.3	115.2	0.85	0.75	37.3
Approach		1037	1.2	0.638	15.2	LOS B	16.3	115.2	0.60	0.75	41.1
North: Greenlands Rd											
7	L	16	0.0	0.141	44.9	LOS D	1.2	8.3	0.96	0.70	27.1
8	T	80	0.0	0.608	39.1	LOS C	5.0	35.0	1.00	0.79	27.2
9	R	19	0.0	0.607	47.6	LOS D	5.0	35.0	1.00	0.80	27.1
Approach		115	0.0	0.608	41.3	LOS C	5.0	35.0	0.99	0.78	27.2
West: Mowbray Rd West											
10	L	9	0.0	0.389	24.4	LOS B	8.5	60.0	0.72	0.91	37.8
11	T	534	1.5	0.853	27.0	LOS B	16.4	115.7	0.87	0.84	32.5
12	R	81	0.0	0.853	45.5	LOS D	16.4	115.7	1.00	1.06	27.7
Approach		624	1.3	0.853	29.4	LOS C	16.4	115.7	0.88	0.87	31.9
All Vehicles		2420	0.9	0.893	27.7	LOS B	20.7	145.7	0.79	0.84	33.2

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	Across S approach	16	19.4	LOS B	0.0	0.0	0.72	0.72
P5	Across N approach	16	17.3	LOS B	0.0	0.0	0.68	0.68
P7	Across W approach	16	28.2	LOS C	0.0	0.0	0.87	0.87
All Pedestrians		48	21.6				0.76	0.76

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS C. LOS Method for individual pedestrian movements: Delay (HCM).

MOVEMENT SUMMARY

Site: Site 1 - 2021LEP Wed AM
Mowbray Rd/Centennial Ave

Mowbray Rd/Centennial Ave
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Centennial Ave											
1	L	186	6.5	0.807	55.0	LOS D	15.1	110.3	0.85	0.91	24.1
2	T	55	0.0	0.805	46.6	LOS D	15.1	110.3	0.85	0.80	24.5
3	R	680	0.6	1.195	434.9	LOS F	144.4	1015.9	1.00	1.92	4.6
Approach		921	1.7	1.195	335.0	LOS F	144.4	1015.9	0.96	1.65	5.9
East: Mowbray Rd East											
4	L	286	2.8	0.229	11.0	LOS A	5.3	37.8	0.23	0.71	46.1
5	T	563	2.7	0.636	28.4	LOS B	27.4	196.0	0.82	0.74	32.3
Approach		849	2.7	0.636	22.5	LOS B	27.4	196.0	0.62	0.73	35.9
North: Greenlands Rd											
7	L	13	0.0	0.282	68.1	LOS E	2.4	16.5	0.95	0.72	21.3
8	T	186	0.0	1.215	439.0	LOS F	47.2	330.7	1.00	2.14	4.5
9	R	44	0.0	1.216	476.7	LOS F	47.2	330.7	1.00	2.26	4.3
Approach		243	0.0	1.215	426.0	LOS F	47.2	330.7	0.99	2.09	4.7
West: Mowbray Rd West											
10	L	11	0.0	0.554	35.1	LOS C	23.3	164.2	0.78	0.93	32.0
11	T	575	0.9	1.212	94.9	LOS F	60.7	426.0	0.81	0.96	16.2
12	R	181	0.0	1.213	477.7	LOS F	60.7	426.0	1.00	2.41	4.2
Approach		767	0.7	1.212	184.4	LOS F	60.7	426.0	0.86	1.30	9.8
All Vehicles		2780	1.6	1.215	206.0	LOS F	144.4	1015.9	0.83	1.31	8.9

Level of Service (Aver. Int. Delay): LOS F. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	Across S approach	16	24.6	LOS C	0.0	0.0	0.62	0.62
P5	Across N approach	16	22.8	LOS C	0.0	0.0	0.59	0.59
P7	Across W approach	16	38.5	LOS D	0.0	0.0	0.77	0.77
All Pedestrians		48	28.6				0.66	0.66

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual pedestrian movements: Delay (HCM).

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MOVEMENT SUMMARY

Site: Site 1 - 2021LEP Wed PM
Mowbray Rd/Centennial Ave

Mowbray Rd/Centennial Ave
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Centennial Ave											
1	L	138	0.0	0.648	45.2	LOS D	11.5	80.5	0.93	0.83	27.2
2	T	88	0.0	0.647	37.0	LOS C	11.5	80.5	0.93	0.77	27.5
3	R	413	0.5	0.970	90.2	LOS F	30.7	216.0	1.00	1.17	17.2
Approach		639	0.3	0.970	73.2	LOS F	30.7	216.0	0.97	1.04	19.8
East: Mowbray Rd East											
4	L	545	2.0	0.400	10.7	LOS A	8.4	59.6	0.28	0.73	46.4
5	T	593	1.0	0.578	17.0	LOS B	20.4	143.7	0.73	0.65	39.0
Approach		1138	1.5	0.578	14.0	LOS A	20.4	143.7	0.51	0.69	42.2
North: Greenlands Rd											
7	L	16	0.0	0.206	59.4	LOS E	1.8	12.3	0.98	0.71	23.0
8	T	82	0.0	0.890	60.9	LOS E	7.5	52.5	1.00	0.98	21.3
9	R	28	0.0	0.889	70.1	LOS E	7.5	52.5	1.00	1.01	21.0
Approach		126	0.0	0.890	62.8	LOS E	7.5	52.5	1.00	0.96	21.5
West: Mowbray Rd West											
10	L	13	0.0	0.454	22.1	LOS B	9.9	70.0	0.60	0.94	38.9
11	T	565	1.4	0.991	60.3	LOS E	36.6	258.6	0.79	1.00	21.8
12	R	122	0.0	0.991	117.9	LOS F	36.6	258.6	1.00	1.53	14.4
Approach		700	1.1	0.990	69.7	LOS E	36.6	258.6	0.82	1.09	20.1
All Vehicles		2603	1.0	0.990	45.8	LOS D	36.6	258.6	0.73	0.90	26.1

Level of Service (Aver. Int. Delay): LOS D. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	Across S approach	16	16.2	LOS B	0.0	0.0	0.57	0.57
P5	Across N approach	16	14.6	LOS B	0.0	0.0	0.54	0.54
P7	Across W approach	16	37.8	LOS D	0.0	0.0	0.87	0.87
All Pedestrians		48	22.9				0.66	0.66

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual pedestrian movements: Delay (HCM).

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MOVEMENT SUMMARY

Site: UPGRADE Site 1 - 2021LEP Wed AM Mowbray Rd/Centennial Ave

Mowbray Rd/Centennial Ave
Signals - Fixed Time Cycle Time = 90 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Centennial Ave											
1	L	186	6.5	0.349	35.2	LOS C	8.1	60.1	0.83	0.80	30.5
2	T	55	0.0	0.406	27.3	LOS B	9.8	68.6	0.84	0.71	31.3
3	R	680	0.6	0.914	53.0	LOS D	28.5	200.5	0.96	0.98	24.4
Approach		921	1.7	0.914	47.9	LOS D	28.5	200.5	0.93	0.93	25.8
East: Mowbray Rd East											
4	L	286	2.8	0.226	12.0	LOS A	5.1	36.8	0.32	0.73	45.2
5	T	563	2.7	0.777	28.7	LOS C	23.6	169.2	0.95	0.88	31.9
Approach		849	2.7	0.777	23.1	LOS B	23.6	169.2	0.74	0.83	35.4
North: Greenlands Rd											
7	L	13	0.0	0.838	57.1	LOS E	11.4	79.6	1.00	0.98	24.4
8	T	186	0.0	0.838	48.9	LOS D	11.4	79.6	1.00	0.98	24.5
9	R	44	0.0	0.194	47.8	LOS D	2.7	18.6	0.93	0.74	25.9
Approach		243	0.0	0.838	49.1	LOS D	11.4	79.6	0.99	0.93	24.7
West: Mowbray Rd West											
10	L	11	0.0	0.272	29.1	LOS C	7.7	54.5	0.74	0.89	34.9
11	T	622	0.9	0.595	23.2	LOS B	16.6	116.9	0.82	0.71	34.7
12	R	134	0.0	1.000[3]	98.1	LOS F	11.0	77.0	1.00	1.22	16.2
Approach		767	0.7	1.000	36.4	LOS C	16.6	116.9	0.85	0.80	28.9
All Vehicles		2780	1.6	1.000	37.2	LOS C	28.5	200.5	0.85	0.86	29.0

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	Across S approach	16	24.2	LOS C	0.0	0.0	0.73	0.73
P5	Across N approach	16	22.1	LOS C	0.0	0.0	0.70	0.70
P7	Across W approach	16	29.6	LOS C	0.0	0.0	0.81	0.81
All Pedestrians		48	25.3				0.75	0.75

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS C. LOS Method for individual pedestrian movements: Delay (HCM).

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MOVEMENT SUMMARY

Site: UPGRADE Site 1 - 2021LEP Wed PM Mowbray Rd/Centennial Ave

Mowbray Rd/Centennial Ave
Signals - Fixed Time Cycle Time = 70 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Centennial Ave											
1	L	138	0.0	0.325	33.1	LOS C	5.5	38.4	0.88	0.79	31.4
2	T	88	0.0	0.361	25.1	LOS B	6.2	43.3	0.89	0.72	32.8
3	R	413	0.5	0.813	40.1	LOS C	14.2	99.8	0.98	0.92	28.6
Approach		639	0.3	0.813	36.5	LOS C	14.2	99.8	0.94	0.86	29.7
East: Mowbray Rd East											
4	L	545	2.0	0.401	11.8	LOS A	8.5	60.3	0.39	0.76	45.4
5	T	593	1.0	0.714	18.3	LOS B	18.2	128.3	0.88	0.79	37.8
Approach		1138	1.5	0.714	15.2	LOS B	18.2	128.3	0.65	0.78	41.1
North: Greenlands Rd											
7	L	16	0.0	0.591	44.4	LOS D	4.9	34.0	1.00	0.80	28.2
8	T	82	0.0	0.591	36.2	LOS C	4.9	34.0	1.00	0.80	28.4
9	R	28	0.0	0.176	42.3	LOS C	1.5	10.2	0.96	0.71	27.7
Approach		126	0.0	0.591	38.6	LOS C	4.9	34.0	0.99	0.78	28.2
West: Mowbray Rd West											
10	L	13	0.0	0.220	21.8	LOS B	5.3	37.8	0.67	0.90	39.3
11	T	565	1.4	0.479	15.0	LOS B	11.5	81.2	0.74	0.63	40.4
12	R	122	0.0	0.765	44.8	LOS D	6.3	44.1	1.00	0.95	26.9
Approach		700	1.1	0.764	20.3	LOS B	11.5	81.2	0.78	0.69	37.1
All Vehicles		2603	1.0	0.813	22.9	LOS B	18.2	128.3	0.77	0.77	35.9

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	Across S approach	16	17.9	LOS B	0.0	0.0	0.71	0.71
P5	Across N approach	16	15.8	LOS B	0.0	0.0	0.67	0.67
P7	Across W approach	16	29.3	LOS C	0.0	0.0	0.91	0.91
All Pedestrians		48	21.0				0.77	0.77

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS C. LOS Method for individual pedestrian movements: Delay (HCM).

Processed: Thursday, 13 October 2011 11:12:23 AM
SIDRA INTERSECTION 5.0.5.1510

SIDRA INTERSECTION

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MOVEMENT SUMMARY

Site: Site 1 - Evacuation Wed AM Mowbray Rd/Centennial Ave

Mowbray Rd/Centennial Ave
Signals - Fixed Time Cycle Time = 46 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Centennial Ave											
1	L	16	0.0	0.221	29.0	LOS C	1.7	12.4	0.93	0.74	33.4
2	T	1	0.0	0.219	20.8	LOS B	1.7	12.4	0.93	0.69	33.8
3	R	152	2.0	0.486	29.8	LOS C	3.8	26.8	0.96	0.77	33.0
Approach		169	1.8	0.485	29.7	LOS C	3.8	26.8	0.96	0.76	33.0
East: Mowbray Rd East											
4	L	1	0.0	0.001	11.9	LOS A	0.0	0.1	0.40	0.64	45.2
5	T	3	66.7	0.006	10.7	LOS A	0.1	0.8	0.67	0.43	44.2
Approach		4	50.0	0.006	11.0	LOS A	0.1	0.8	0.60	0.49	44.4
North: Greenlands Rd											
7	L	1	0.0	0.004	27.4	LOS B	0.0	0.2	0.89	0.60	34.1
8	T	1	0.0	0.008	19.4	LOS B	0.1	0.5	0.89	0.54	35.7
9	R	1	0.0	0.008	27.7	LOS B	0.1	0.5	0.89	0.64	35.0
Approach		3	0.0	0.008	24.8	LOS B	0.1	0.5	0.89	0.59	35.0
West: Mowbray Rd West											
10	L	1	0.0	0.169	19.6	LOS B	2.6	18.5	0.73	0.87	41.3
11	T	323	0.0	0.361	12.1	LOS A	5.5	38.6	0.77	0.63	42.4
12	R	23	0.0	0.361	20.6	LOS B	5.5	38.6	0.79	0.87	40.4
Approach		347	0.0	0.361	12.7	LOS A	5.5	38.6	0.77	0.64	42.3
All Vehicles		523	1.0	0.485	18.2	LOS B	5.5	38.6	0.83	0.68	38.7

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	Across S approach	16	17.4	LOS B	0.0	0.0	0.87	0.87
P5	Across N approach	16	14.9	LOS B	0.0	0.0	0.80	0.80
P7	Across W approach	16	8.5	LOS A	0.0	0.0	0.61	0.61
All Pedestrians		48	13.6				0.76	0.76

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual pedestrian movements: Delay (HCM).

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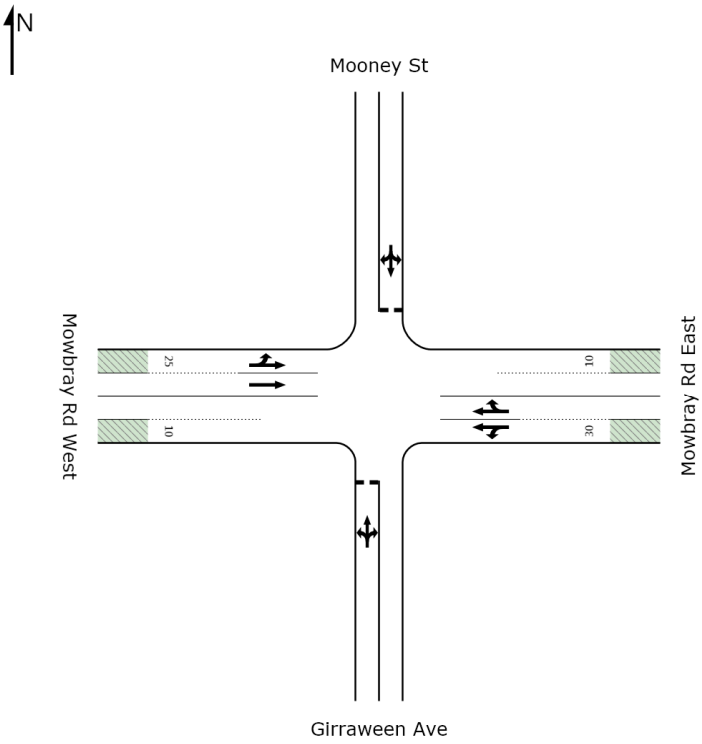
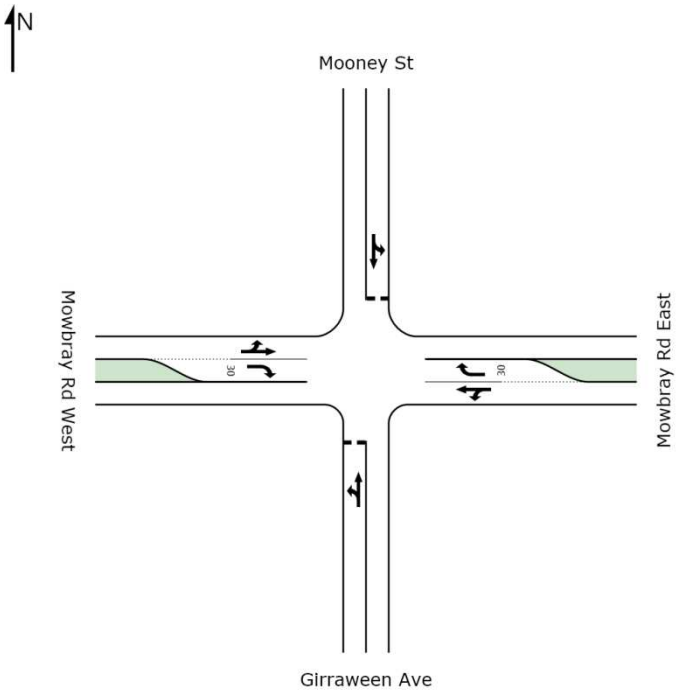
Intersection – Site 2: Mowbray Road/Girraween Avenue

Existing



Upgraded



MOVEMENT SUMMARY

Site: Site 2 - 2011 Wed AM
Mowbray Rd/Girraween Ave

Mowbray Rd/Girraween Ave
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Girraween Ave											
1	L	4	0.0	0.071	35.2	LOS C	0.3	1.9	0.86	0.94	30.5
2	T	1	0.0	0.071	33.9	LOS C	0.3	1.9	0.86	0.94	30.7
3	R	4	0.0	0.071	35.3	LOS C	0.3	1.9	0.86	0.96	30.4
Approach		9	0.0	0.071	35.1	LOS C	0.3	1.9	0.86	0.95	30.5
East: Mowbray Rd East											
4	L	13	0.0	0.065	8.2	LOS A	0.0	0.0	0.00	1.02	49.0
5	T	728	1.8	0.325	4.2	LOS A	5.6	40.0	0.67	0.00	49.1
6	R	4	0.0	0.333	13.3	LOS A	5.6	40.0	0.79	1.07	47.3
Approach		745	1.7	0.325	4.4	LOS A	5.6	40.0	0.66	0.02	49.1
North: Mooney St											
7	L	17	0.0	0.179	29.7	LOS C	0.7	4.8	0.82	0.94	33.0
8	T	1	0.0	0.167	28.4	LOS B	0.7	4.8	0.82	0.92	33.3
9	R	11	0.0	0.180	29.8	LOS C	0.7	4.8	0.82	0.94	33.0
Approach		29	0.0	0.179	29.7	LOS C	0.7	4.8	0.82	0.94	33.0
West: Mowbray Rd West											
10	L	4	0.0	0.053	8.2	LOS A	0.0	0.0	0.00	1.06	49.0
11	T	602	1.8	0.262	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		606	1.8	0.262	0.1	LOS A	0.0	0.0	0.00	0.01	59.9
All Vehicles		1389	1.7	0.325	3.2	NA	5.6	40.0	0.37	0.04	52.5

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: Site 2 - 2011 Wed PM
Mowbray Rd/Girraween Ave

Mowbray Rd/Girraween Ave
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Girraween Ave											
1	L	4	0.0	0.035	27.2	LOS B	0.1	0.9	0.80	0.86	34.3
2	T	1	0.0	0.034	26.0	LOS B	0.1	0.9	0.80	0.91	34.6
3	R	1	0.0	0.034	27.4	LOS B	0.1	0.9	0.80	0.94	34.3
Approach		6	0.0	0.035	27.1	LOS B	0.1	0.9	0.80	0.88	34.4
East: Mowbray Rd East											
4	L	3	0.0	0.061	8.2	LOS A	0.0	0.0	0.00	1.07	49.0
5	T	702	1.0	0.308	5.2	LOS A	5.9	41.6	0.69	0.00	48.7
6	R	4	0.0	0.308	14.5	LOS B	5.9	41.6	0.83	1.06	46.3
Approach		709	1.0	0.308	5.2	LOS B	5.9	41.6	0.69	0.01	48.7
North: Mooney St											
7	L	17	0.0	0.215	35.6	LOS C	0.8	5.8	0.86	0.97	30.3
8	T	1	0.0	0.200	34.3	LOS C	0.8	5.8	0.86	0.95	30.5
9	R	11	0.0	0.216	35.7	LOS C	0.8	5.8	0.86	0.97	30.3
Approach		29	0.0	0.214	35.6	LOS C	0.8	5.8	0.86	0.97	30.3
West: Mowbray Rd West											
10	L	4	0.0	0.062	8.2	LOS A	0.0	0.0	0.00	1.07	49.0
11	T	707	1.0	0.307	5.1	LOS A	5.8	41.2	0.70	0.00	48.7
12	R	1	0.0	0.333	14.4	LOS A	5.8	41.2	0.83	1.06	46.4
Approach		712	1.0	0.307	5.1	LOS A	5.8	41.2	0.69	0.01	48.7
All Vehicles		1456	1.0	0.308	5.9	NA	5.9	41.6	0.70	0.03	48.0

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: Site 1 - 2021DN Wed AM
Mowbray Rd/Centennial Ave

Mowbray Rd/Centennial Ave
Signals - Fixed Time Cycle Time = 70 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Centennial Ave											
1	L	116	12.1	0.494	32.0	LOS C	8.2	60.7	0.88	0.82	32.5
2	T	64	0.0	0.494	23.5	LOS B	8.2	60.7	0.88	0.73	33.2
3	R	587	1.0	1.086	205.7	LOS F	62.9	444.4	0.99	1.89	9.0
Approach		767	2.6	1.086	164.3	LOS F	62.9	444.4	0.97	1.63	10.8
East: Mowbray Rd East											
4	L	291	2.7	0.219	11.5	LOS A	4.4	31.9	0.34	0.73	45.6
5	T	540	2.6	0.758	23.0	LOS B	18.4	131.7	0.94	0.87	34.8
Approach		831	2.6	0.758	19.0	LOS B	18.4	131.7	0.73	0.82	38.0
North: Greenlands Rd											
7	L	9	0.0	0.254	41.2	LOS C	2.1	14.6	0.95	0.74	29.3
8	T	205	0.0	1.095	193.4	LOS F	25.1	175.6	0.99	1.85	9.3
9	R	39	0.0	1.096	232.0	LOS F	25.1	175.6	1.00	2.07	8.2
Approach		253	0.0	1.095	194.0	LOS F	25.1	175.6	0.99	1.84	9.3
West: Mowbray Rd West											
10	L	7	0.0	0.496	26.7	LOS B	11.2	79.1	0.82	0.90	36.6
11	T	497	1.4	1.081	74.5	LOS F	29.4	207.5	0.87	1.12	19.0
12	R	112	0.0	1.081	215.0	LOS F	29.4	207.5	1.00	2.12	8.7
Approach		616	1.1	1.081	99.5	LOS F	29.4	207.5	0.90	1.30	15.8
All Vehicles		2467	2.0	1.095	102.2	LOS F	62.9	444.4	0.87	1.30	15.5

Level of Service (Aver. Int. Delay): LOS F. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	Across S approach	16	20.8	LOS C	0.0	0.0	0.77	0.77
P5	Across N approach	16	18.6	LOS B	0.0	0.0	0.73	0.73
P7	Across W approach	16	6.0	LOS A	0.0	0.0	0.41	0.41
All Pedestrians		48	15.1				0.64	0.64

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS C. LOS Method for individual pedestrian movements: Delay (HCM).

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MOVEMENT SUMMARY

Site: Site 2 - 2021DN Wed PM
Mowbray Rd/Girraween Ave

Mowbray Rd/Girraween Ave
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Girraween Ave											
1	L	4	0.0	0.028	23.0	LOS B	0.1	0.8	0.75	0.79	36.7
2	T	1	0.0	0.028	21.8	LOS B	0.1	0.8	0.75	0.89	37.1
3	R	1	0.0	0.028	23.2	LOS B	0.1	0.8	0.75	0.93	36.7
Approach		6	0.0	0.028	22.8	LOS B	0.1	0.8	0.75	0.83	36.8
East: Mowbray Rd East											
4	L	3	0.0	0.067	8.2	LOS A	0.0	0.0	0.00	1.07	49.0
5	T	601	1.0	0.332	4.4	LOS A	5.4	37.8	0.61	0.00	49.4
6	R	64	1.6	0.332	13.9	LOS A	5.4	37.8	0.77	1.07	46.3
Approach		668	1.0	0.332	5.3	LOS A	5.4	37.8	0.63	0.11	49.1
North: Mooney St											
7	L	24	4.2	0.273	36.9	LOS C	1.1	8.3	0.85	0.98	29.8
8	T	1	0.0	0.250	35.5	LOS C	1.1	8.3	0.85	0.96	30.0
9	R	13	15.4	0.271	37.3	LOS C	1.1	8.3	0.85	0.98	29.8
Approach		38	7.9	0.272	37.0	LOS C	1.1	8.3	0.85	0.98	29.8
West: Mowbray Rd West											
10	L	4	0.0	0.056	8.2	LOS A	0.0	0.0	0.00	1.06	49.0
11	T	628	1.1	0.279	3.7	LOS A	4.1	29.1	0.62	0.00	49.6
12	R	6	0.0	0.273	12.7	LOS A	4.1	29.1	0.75	1.03	47.7
Approach		638	1.1	0.279	3.8	LOS A	4.1	29.1	0.62	0.02	49.6
All Vehicles		1350	1.3	0.332	5.6	NA	5.4	37.8	0.63	0.09	48.4

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: Site 2 - 2021LEP Wed AM
Mowbray Rd/Girraween Ave

Mowbray Rd/Girraween Ave
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Girraween Ave											
1	L	24	0.0	0.571	90.7	LOS F	2.4	17.0	0.95	1.09	17.1
2	T	1	0.0	0.500	89.5	LOS F	2.4	17.0	0.95	1.06	17.2
3	R	16	0.0	0.571	90.8	LOS F	2.4	17.0	0.95	1.07	17.1
Approach		41	0.0	0.570	90.7	LOS F	2.4	17.0	0.95	1.08	17.1
East: Mowbray Rd East											
4	L	44	0.0	0.092	8.2	LOS A	0.0	0.0	0.00	0.93	49.0
5	T	842	3.6	0.460	8.4	LOS A	11.0	79.7	0.85	0.00	45.4
6	R	53	3.8	0.461	18.4	LOS B	11.0	79.7	1.00	1.16	43.2
Approach		939	3.4	0.460	9.0	LOS B	11.0	79.7	0.81	0.11	45.4
North: Mooney St											
7	L	12	8.3	1.000[4]	369.3	LOS F	10.8	78.8	1.00	1.99	5.4
8	T	1	0.0	1.000[4]	367.8	LOS F	10.8	78.8	1.00	1.76	5.4
9	R	48	4.2	1.021	369.3	LOS F	10.8	78.8	1.00	1.74	5.4
Approach		61	4.9	1.017	369.3	LOS F	10.8	78.8	1.00	1.79	5.4
West: Mowbray Rd West											
10	L	1	0.0	0.067	8.2	LOS A	0.0	0.0	0.00	1.09	49.0
11	T	767	1.6	0.332	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		768	1.6	0.332	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
All Vehicles		1809	2.6	1.017	19.2	NA	11.0	79.7	0.48	0.14	38.3

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

4 x = 1.00 due to minimum capacity

Processed: Monday, 10 October 2011 3:35:12 PM
SIDRA INTERSECTION 5.0.5.1510

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MOVEMENT SUMMARY

Site: Site 2 - 2021LEP Wed PM
Mowbray Rd/Girraween Ave

Mowbray Rd/Girraween Ave
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Girraween Ave											
1	L	9	0.0	0.083	31.1	LOS C	0.3	2.1	0.83	0.94	32.3
2	T	1	0.0	0.083	29.9	LOS C	0.3	2.1	0.83	0.92	32.6
3	R	2	0.0	0.083	31.3	LOS C	0.3	2.1	0.83	0.95	32.3
Approach		12	0.0	0.083	31.1	LOS C	0.3	2.1	0.83	0.94	32.3
East: Mowbray Rd East											
4	L	33	0.0	0.082	8.2	LOS A	0.0	0.0	0.00	0.96	49.0
5	T	711	1.0	0.408	7.1	LOS A	8.8	62.3	0.79	0.00	46.7
6	R	66	4.5	0.407	17.1	LOS B	8.8	62.3	0.96	1.12	44.1
Approach		810	1.2	0.408	8.0	LOS B	8.8	62.3	0.78	0.13	46.6
North: Mooney St											
7	L	25	4.0	0.758	125.5	LOS F	3.8	27.9	0.96	1.22	13.5
8	T	1	0.0	1.000	124.1	LOS F	3.8	27.9	0.96	1.16	13.5
9	R	27	7.4	0.750	125.7	LOS F	3.8	27.9	0.96	1.16	13.4
Approach		53	5.7	0.747	125.6	LOS F	3.8	27.9	0.96	1.19	13.4
West: Mowbray Rd West											
10	L	4	0.0	0.075	8.2	LOS A	0.0	0.0	0.00	1.07	49.0
11	T	751	0.8	0.374	6.3	LOS A	8.0	56.5	0.73	0.00	47.9
12	R	38	0.0	0.373	16.1	LOS B	8.0	56.5	0.90	1.11	44.8
Approach		793	0.8	0.374	6.8	LOS B	8.0	56.5	0.73	0.06	47.8
All Vehicles		1668	1.1	0.747	11.3	NA	8.8	62.3	0.76	0.14	43.6

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: UPGRADE Site 2 - 2021LEP Wed AM Mowbray Rd/Girraween Ave

Mowbray Rd/Girraween Ave
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Girraween Ave											
1	L	24	0.0	0.095	20.4	LOS B	0.4	2.6	0.78	0.93	38.4
2	T	1	0.0	0.091	19.1	LOS B	0.4	2.6	0.78	0.90	38.9
Approach		25	0.0	0.095	20.3	LOS B	0.4	2.6	0.78	0.93	38.5
East: Mowbray Rd East											
4	L	44	0.0	0.463	8.2	LOS A	0.0	0.0	0.00	1.06	49.0
5	T	842	3.6	0.465	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R	53	3.8	0.099	14.1	LOS A	0.4	3.1	0.65	0.90	43.3
Approach		939	3.4	0.465	1.2	LOS A	0.4	3.1	0.04	0.10	58.1
North: Mooney St											
7	L	12	8.3	0.055	21.7	LOS B	0.2	1.6	0.77	0.93	37.7
8	T	1	0.0	0.056	20.2	LOS B	0.2	1.6	0.77	0.90	38.1
Approach		13	7.7	0.055	21.6	LOS B	0.2	1.6	0.77	0.92	37.8
West: Mowbray Rd West											
10	L	1	0.0	0.333	8.2	LOS A	0.0	0.0	0.00	1.09	49.0
11	T	767	1.6	0.398	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	16	0.0	0.038	15.6	LOS B	0.2	1.1	0.71	0.91	41.9
Approach		784	1.5	0.398	0.3	LOS B	0.2	1.1	0.01	0.02	59.5
All Vehicles		1761	2.6	0.465	1.2	NA	0.4	3.1	0.04	0.08	58.1

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: UPGRADE Site 2 - 2021LEP Wed PM Mowbray Rd/Girraween Ave

Mowbray Rd/Girraween Ave
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Girraween Ave											
1	L	9	0.0	0.037	19.6	LOS B	0.1	1.0	0.74	0.89	39.0
2	T	1	0.0	0.037	18.4	LOS B	0.1	1.0	0.74	0.89	39.4
Approach		10	0.0	0.037	19.5	LOS B	0.1	1.0	0.74	0.89	39.0
East: Mowbray Rd East											
4	L	33	0.0	0.384	8.2	LOS A	0.0	0.0	0.00	1.06	49.0
5	T	711	1.0	0.385	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R	66	4.5	0.121	14.0	LOS A	0.5	3.9	0.65	0.90	43.3
Approach		810	1.2	0.385	1.5	LOS A	0.5	3.9	0.05	0.12	57.7
North: Mooney St											
7	L	25	4.0	0.077	17.3	LOS B	0.3	2.2	0.71	0.91	40.7
8	T	1	0.0	0.077	15.9	LOS B	0.3	2.2	0.71	0.87	41.2
Approach		26	3.8	0.077	17.2	LOS B	0.3	2.2	0.71	0.90	40.8
West: Mowbray Rd West											
10	L	4	0.0	0.400	8.2	LOS A	0.0	0.0	0.00	1.09	49.0
11	T	751	0.8	0.389	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	38	0.0	0.068	13.5	LOS A	0.3	2.1	0.63	0.88	43.7
Approach		793	0.8	0.389	0.7	LOS A	0.3	2.1	0.03	0.05	58.9
All Vehicles		1639	1.0	0.389	1.5	NA	0.5	3.9	0.06	0.10	57.7

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: Site 2 - Evacuation Wed AM Mowbray Rd/Girraween Ave

Mowbray Rd/Girraween Ave
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Girraween Ave											
1	L	35	2.9	0.109	10.2	LOS A	0.5	3.8	0.14	0.61	46.9
2	T	1	0.0	0.111	8.8	LOS A	0.5	3.8	0.14	0.58	48.1
3	R	45	0.0	0.109	10.2	LOS A	0.5	3.8	0.14	0.70	46.8
Approach		81	1.2	0.109	10.2	LOS A	0.5	3.8	0.14	0.66	46.9
East: Mowbray Rd East											
4	L	3	66.7	0.003	10.1	LOS A	0.0	0.0	0.00	0.75	49.0
5	T	28	0.0	0.015	0.9	LOS A	0.1	0.8	0.36	0.00	53.5
6	R	1	0.0	0.015	9.3	LOS A	0.1	0.8	0.38	0.90	49.1
Approach		32	6.3	0.015	2.1	LOS A	0.1	0.8	0.33	0.10	52.9
North: Mooney St											
7	L	4	0.0	0.008	9.9	LOS A	0.0	0.2	0.38	0.62	47.2
8	T	1	0.0	0.008	8.7	LOS A	0.0	0.2	0.38	0.57	48.0
9	R	1	0.0	0.008	10.0	LOS A	0.0	0.2	0.38	0.68	47.1
Approach		6	0.0	0.008	9.7	LOS A	0.0	0.2	0.38	0.62	47.3
West: Mowbray Rd West											
10	L	1	0.0	0.022	8.2	LOS A	0.0	0.0	0.00	1.07	49.0
11	T	259	0.0	0.111	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		260	0.0	0.111	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
All Vehicles		379	0.8	0.111	2.5	NA	0.5	3.8	0.06	0.16	55.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

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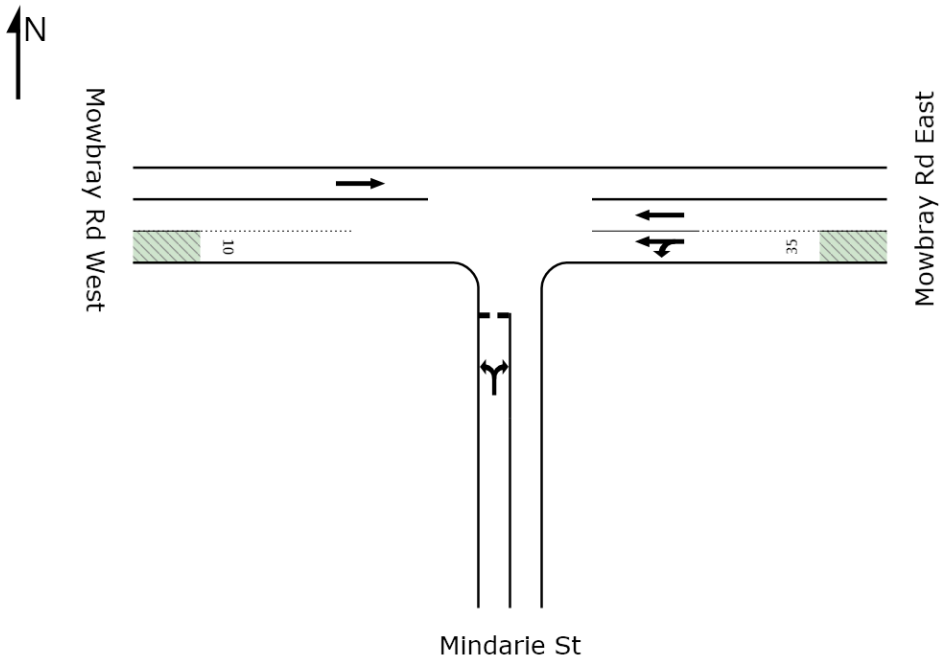
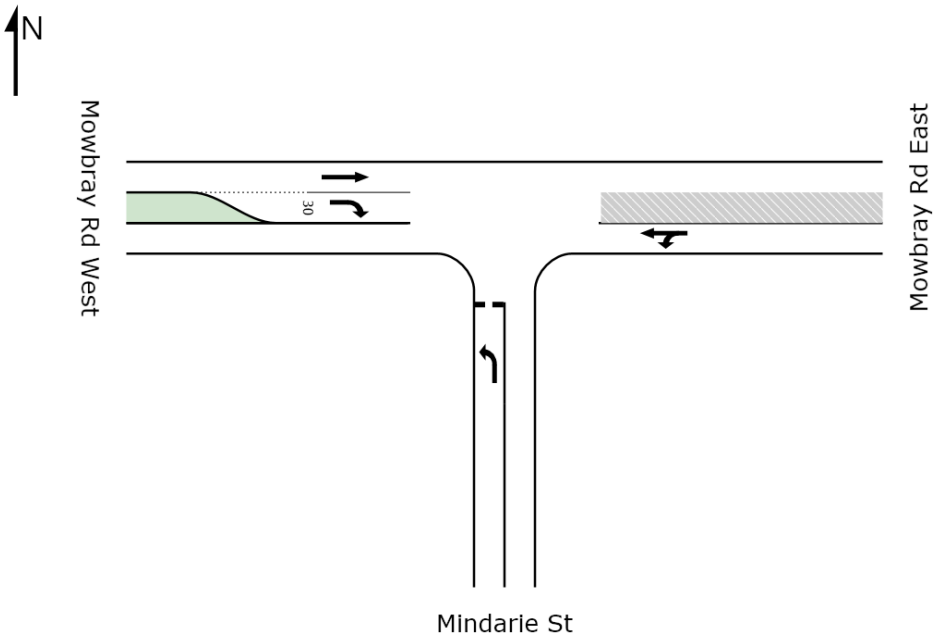
Intersection – Site 3: Mowbray Road/Mindarie Street

Existing



Upgraded



MOVEMENT SUMMARY

Site: Site 3 - 2011 Wed AM
Mowbray Rd/Mindarie St

Mowbray Rd/Mindarie St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Mindarie St											
1	L	4	0.0	0.138	45.6	LOS D	0.5	3.6	0.90	0.97	26.6
3	R	9	0.0	0.138	45.7	LOS D	0.5	3.6	0.90	0.97	26.5
Approach		13	0.0	0.139	45.6	LOS D	0.5	3.6	0.90	0.97	26.5
East: Mowbray Rd East											
4	L	4	0.0	0.063	8.2	LOS A	0.0	0.0	0.00	1.07	49.0
5	T	719	1.8	0.313	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		723	1.8	0.313	0.0	LOS A	0.0	0.0	0.00	0.01	59.9
West: Mowbray Rd West											
11	T	674	1.5	0.349	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		674	1.5	0.349	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
All Vehicles		1410	1.6	0.349	0.4	NA	0.5	3.6	0.01	0.01	59.3

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: Site 3 - 2011 Wed PM
Mowbray Rd/Mindarie St

Mowbray Rd/Mindarie St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Mindarie St											
1	L	1	0.0	0.045	46.0	LOS D	0.2	1.1	0.90	0.89	26.4
3	R	3	0.0	0.045	46.1	LOS D	0.2	1.1	0.90	0.97	26.4
Approach		4	0.0	0.044	46.1	LOS D	0.2	1.1	0.90	0.95	26.4
East: Mowbray Rd East											
4	L	9	0.0	0.060	8.2	LOS A	0.0	0.0	0.00	1.04	49.0
5	T	689	1.0	0.300	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		698	1.0	0.300	0.1	LOS A	0.0	0.0	0.00	0.01	59.8
West: Mowbray Rd West											
11	T	690	1.0	0.358	6.8	LOS A	7.7	54.5	0.87	0.00	46.5
12	R	1	0.0	0.333	15.1	LOS B	7.7	54.5	0.87	1.09	46.0
Approach		691	1.0	0.358	6.8	LOS B	7.7	54.5	0.87	0.00	46.5
All Vehicles		1393	1.0	0.358	3.5	NA	7.7	54.5	0.44	0.01	52.2

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

Project: I:\projects\30011093 - Mowbray Road Precinct Strategic Review\MODELLING\SIDRA\Mowbray Rd_Base2011.sip
8000783, SMEC AUSTRALIA PTY LTD, SINGLE

MOVEMENT SUMMARY

Site: Site 3 - 2021DN Wed AM
Mowbray Rd/Mindarie St

Mowbray Rd/Mindarie St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Mindarie St											
1	L	4	0.0	0.095	35.7	LOS C	0.4	2.5	0.86	0.94	30.2
3	R	8	0.0	0.095	35.8	LOS C	0.4	2.5	0.86	0.96	30.2
Approach		12	0.0	0.096	35.8	LOS C	0.4	2.5	0.86	0.95	30.2
East: Mowbray Rd East											
4	L	6	0.0	0.061	8.2	LOS A	0.0	0.0	0.00	1.05	49.0
5	T	684	4.2	0.303	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		690	4.2	0.303	0.1	LOS A	0.0	0.0	0.00	0.01	59.9
West: Mowbray Rd West											
11	T	586	1.9	0.304	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		586	1.9	0.304	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
All Vehicles		1288	3.1	0.304	0.4	NA	0.4	2.5	0.01	0.01	59.4

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

Project: I:\projects\30011093 - Mowbray Road Precinct Strategic Review\MODELLING\SIDRA\Mowbray Rd_2021DN.sip
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MOVEMENT SUMMARY

Site: Site 3 - 2021DN Wed PM
Mowbray Rd/Mindarie St

Mowbray Rd/Mindarie St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Mindarie St											
1	L	1	0.0	0.030	33.7	LOS C	0.1	0.8	0.85	0.81	31.0
3	R	3	0.0	0.030	33.8	LOS C	0.1	0.8	0.85	0.95	31.0
Approach		4	0.0	0.030	33.8	LOS C	0.1	0.8	0.85	0.92	31.0
East: Mowbray Rd East											
4	L	11	0.0	0.052	8.2	LOS A	0.0	0.0	0.00	1.02	49.0
5	T	594	1.0	0.260	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		605	1.0	0.260	0.1	LOS A	0.0	0.0	0.00	0.02	59.8
West: Mowbray Rd West											
11	T	610	1.1	0.316	4.9	LOS A	5.4	38.0	0.78	0.00	47.6
12	R	1	0.0	0.333	13.2	LOS A	5.4	38.0	0.78	1.06	47.4
Approach		611	1.1	0.316	4.9	LOS A	5.4	38.0	0.78	0.00	47.6
All Vehicles		1220	1.1	0.316	2.6	NA	5.4	38.0	0.39	0.01	52.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

Processed: Thursday, 6 October 2011 2:00:10 PM
SIDRA INTERSECTION 5.0.5.1510

SIDRA INTERSECTION

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MOVEMENT SUMMARY

Site: Site 3 - 2021LEP Wed AM
Mowbray Rd/Mindarie St

Mowbray Rd/Mindarie St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Mindarie St											
1	L	4	0.0	1.000[4]	317.8	LOS F	9.5	66.3	1.00	1.79	6.1
3	R	56	0.0	1.000[4]	317.9	LOS F	9.5	66.3	1.00	1.64	6.1
Approach		60	0.0	1.000	317.9	LOS F	9.5	66.3	1.00	1.65	6.1
East: Mowbray Rd East											
4	L	64	0.0	0.084	8.2	LOS A	0.0	0.0	0.00	0.86	49.0
5	T	890	3.5	0.418	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		954	3.2	0.418	0.5	LOS A	0.0	0.0	0.00	0.06	59.1
West: Mowbray Rd West											
11	T	662	1.7	0.343	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		662	1.7	0.343	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
All Vehicles		1676	2.5	1.000	11.7	NA	9.5	66.3	0.04	0.09	45.4

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

4 x = 1.00 due to minimum capacity

Processed: Monday, 10 October 2011 3:35:12 PM
SIDRA INTERSECTION 5.0.5.1510

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MOVEMENT SUMMARY

Site: Site 3 - 2021LEP Wed PM
Mowbray Rd/Mindarie St

Mowbray Rd/Mindarie St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Mindarie St											
1	L	1	0.0	0.077	61.0	LOS E	0.3	1.9	0.93	0.95	22.3
3	R	4	0.0	0.077	61.1	LOS E	0.3	1.9	0.93	0.98	22.3
Approach		5	0.0	0.077	61.1	LOS E	0.3	1.9	0.93	0.97	22.3
East: Mowbray Rd East											
4	L	92	0.0	0.065	8.2	LOS A	0.0	0.0	0.00	0.73	49.0
5	T	653	1.2	0.323	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		745	1.1	0.323	1.0	LOS A	0.0	0.0	0.00	0.09	58.4
West: Mowbray Rd West											
11	T	803	0.9	0.416	8.6	LOS A	10.8	76.4	0.96	0.00	45.1
12	R	1	0.0	0.500	16.9	LOS B	10.8	76.4	0.96	1.13	44.6
Approach		804	0.9	0.416	8.6	LOS B	10.8	76.4	0.96	0.00	45.1
All Vehicles		1554	1.0	0.416	5.1	NA	10.8	76.4	0.50	0.05	50.4

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS E. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: UPGRADE Site 3 - 2021LEP Wed AM Mowbray Rd/Mindarie St

Mowbray Rd/Mindarie St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Mindarie St											
1	L	4	0.0	0.014	18.7	LOS B	0.1	0.4	0.77	0.89	39.6
Approach		4	0.0	0.014	18.7	LOS B	0.1	0.4	0.77	0.89	39.6
East: Mowbray Rd East											
4	L	64	0.0	0.500	8.2	LOS A	0.0	0.0	0.00	1.04	49.0
5	T	890	3.5	0.501	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		954	3.2	0.501	0.5	LOS A	0.0	0.0	0.00	0.07	59.1
West: Mowbray Rd West											
11	T	662	1.7	0.343	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	10	0.0	0.028	17.0	LOS B	0.1	0.8	0.75	0.92	40.8
Approach		672	1.6	0.343	0.3	LOS B	0.1	0.8	0.01	0.01	59.6
All Vehicles		1630	2.6	0.501	0.5	NA	0.1	0.8	0.01	0.05	59.2

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

Processed: Tuesday, 1 November 2011 2:09:49 PM
SIDRA INTERSECTION 5.0.5.1510

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MOVEMENT SUMMARY

Site: UPGRADE Site 3 - 2021LEP Wed PM Mowbray Rd/Mindarie St

Mowbray Rd/Mindarie St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Mindarie St											
1	L	1	0.0	0.002	13.5	LOS A	0.0	0.1	0.61	0.70	43.7
Approach		1	0.0	0.002	13.5	LOS A	0.0	0.1	0.61	0.70	43.7
East: Mowbray Rd East											
4	L	92	0.0	0.387	8.2	LOS A	0.0	0.0	0.00	1.01	49.0
5	T	653	1.2	0.387	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		745	1.1	0.387	1.0	LOS A	0.0	0.0	0.00	0.12	58.4
West: Mowbray Rd West											
11	T	803	0.9	0.414	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	30	0.0	0.054	13.4	LOS A	0.2	1.6	0.63	0.86	43.7
Approach		833	0.8	0.414	0.5	LOS A	0.2	1.6	0.02	0.03	59.2
All Vehicles		1579	0.9	0.414	0.7	NA	0.2	1.6	0.01	0.08	58.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

Project: I:\projects\30011093 - Mowbray Road Precinct Strategic Review\MODELLING\SIDRA\Mowbray Rd_2021LEP_final.sip
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MOVEMENT SUMMARY

Site: Site 3 - Evacuation Wed AM Mowbray Rd/Mindarie St

Mowbray Rd/Mindarie St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Mindarie St											
1	L	1	0.0	0.200	9.9	LOS A	1.2	8.5	0.37	0.58	47.0
3	R	157	0.0	0.219	10.0	LOS A	1.2	8.5	0.37	0.68	47.0
Approach		158	0.0	0.219	10.0	LOS A	1.2	8.5	0.37	0.68	47.0
East: Mowbray Rd East											
4	L	1	0.0	0.006	8.2	LOS A	0.0	0.0	0.00	1.03	49.0
5	T	65	1.5	0.029	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		66	1.5	0.029	0.1	LOS A	0.0	0.0	0.00	0.02	59.8
West: Mowbray Rd West											
11	T	90	0.0	0.046	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		90	0.0	0.046	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
All Vehicles		314	0.3	0.219	5.1	NA	1.2	8.5	0.19	0.35	52.6

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

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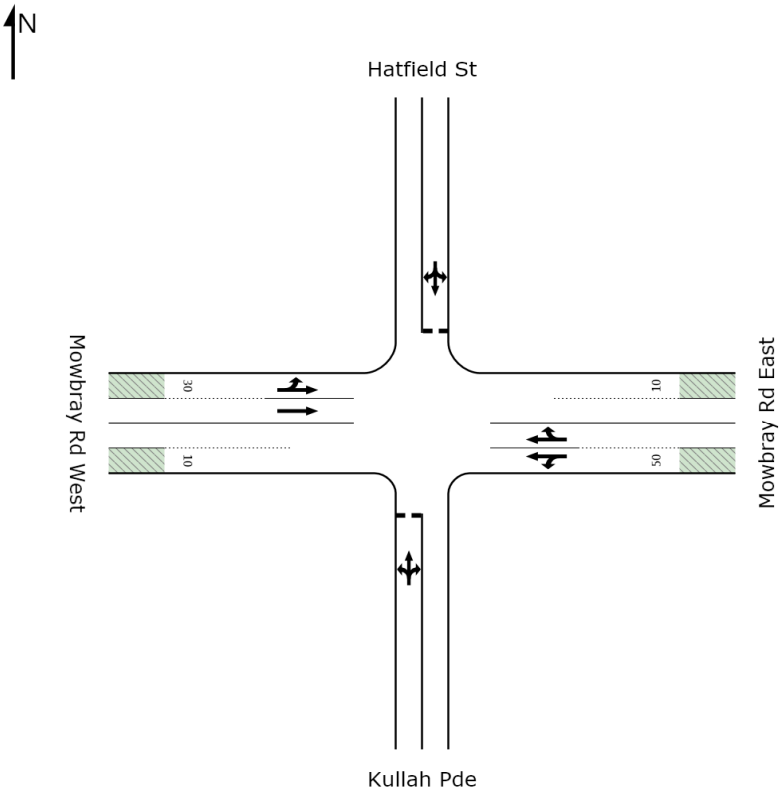
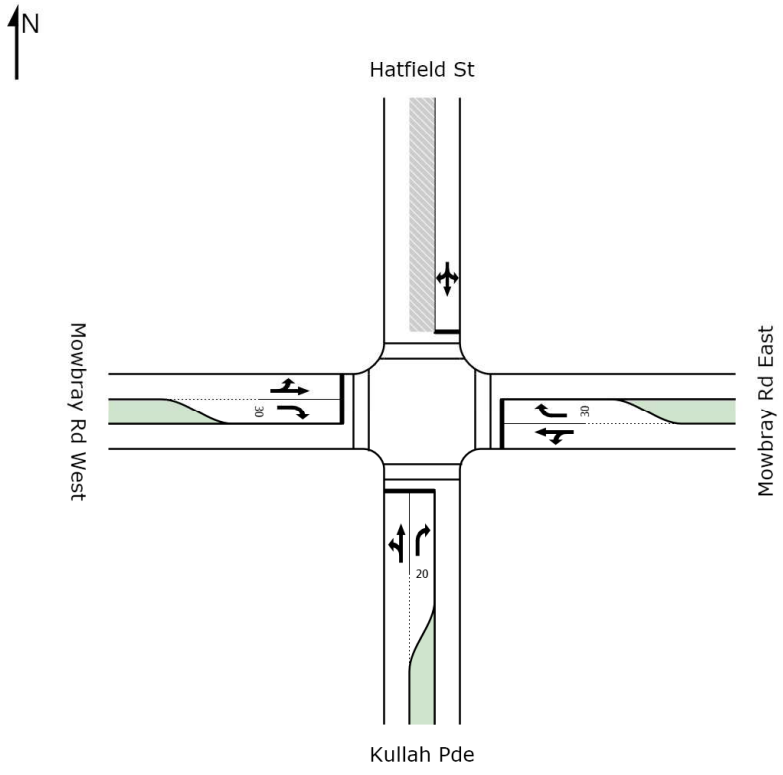
Intersection – Site 4: Mowbray Road/Kullah Pde



Upgraded



MOVEMENT SUMMARY

Site: Site 4 - 2011 Wed AM
Mowbray Rd/Kullah Pde

Mowbray Rd/Hatfield St
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 Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Kullah Pde											
1	L	5	0.0	0.044	26.2	LOS B	0.2	1.2	0.80	0.87	34.9
2	T	1	0.0	0.043	24.9	LOS B	0.2	1.2	0.80	0.91	35.2
3	R	2	0.0	0.043	26.3	LOS B	0.2	1.2	0.80	0.94	34.9
Approach		8	0.0	0.044	26.0	LOS B	0.2	1.2	0.80	0.89	34.9
East: Mowbray Rd East											
4	L	2	0.0	0.069	8.2	LOS A	0.0	0.0	0.00	1.08	49.0
5	T	701	1.7	0.342	4.1	LOS A	5.8	41.2	0.63	0.00	49.3
6	R	36	2.8	0.343	13.5	LOS A	5.8	41.2	0.78	1.07	47.0
Approach		739	1.8	0.342	4.6	LOS A	5.8	41.2	0.64	0.06	49.2
North: Hatfield St											
7	L	20	0.0	0.435	48.0	LOS D	1.9	13.6	0.89	1.05	25.8
8	T	2	0.0	0.400	46.8	LOS D	1.9	13.6	0.89	1.02	25.9
9	R	31	0.0	0.431	48.1	LOS D	1.9	13.6	0.89	1.03	25.8
Approach		53	0.0	0.430	48.0	LOS D	1.9	13.6	0.89	1.04	25.8
West: Mowbray Rd West											
10	L	22	0.0	0.051	8.2	LOS A	0.0	0.0	0.00	0.95	49.0
11	T	567	1.8	0.255	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		589	1.7	0.255	0.3	LOS A	0.0	0.0	0.00	0.04	59.5
All Vehicles		1389	1.7	0.430	4.6	NA	5.8	41.2	0.38	0.09	51.1

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: Site 4 - 2011 Wed PM
Mowbray Rd/Kullah Pde

Mowbray Rd/Hatfield St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Kullah Pde											
1	L	1	0.0	0.111	49.2	LOS D	0.4	3.0	0.91	0.96	25.5
2	T	3	0.0	0.115	48.0	LOS D	0.4	3.0	0.91	0.96	25.6
3	R	6	0.0	0.115	49.3	LOS D	0.4	3.0	0.91	0.97	25.5
Approach		10	0.0	0.116	48.9	LOS D	0.4	3.0	0.91	0.97	25.5
East: Mowbray Rd East											
4	L	4	0.0	0.065	8.2	LOS A	0.0	0.0	0.00	1.07	49.0
5	T	643	1.1	0.320	5.1	LOS A	5.7	40.6	0.66	0.00	48.9
6	R	34	0.0	0.321	14.5	LOS B	5.7	40.6	0.81	1.07	46.0
Approach		681	1.0	0.320	5.5	LOS B	5.7	40.6	0.66	0.06	48.8
North: Hatfield St											
7	L	21	0.0	0.412	48.1	LOS D	1.8	12.9	0.90	1.04	25.8
8	T	5	0.0	0.417	46.9	LOS D	1.8	12.9	0.90	1.02	25.9
9	R	24	0.0	0.414	48.2	LOS D	1.8	12.9	0.90	1.03	25.8
Approach		50	0.0	0.415	48.1	LOS D	1.8	12.9	0.90	1.03	25.8
West: Mowbray Rd West											
10	L	33	0.0	0.061	8.2	LOS A	0.0	0.0	0.00	0.92	49.0
11	T	662	1.1	0.307	4.6	LOS A	5.3	37.6	0.69	0.00	48.7
12	R	6	0.0	0.300	13.6	LOS A	5.3	37.6	0.80	1.06	47.0
Approach		701	1.0	0.307	4.9	LOS A	5.3	37.6	0.66	0.05	48.7
All Vehicles		1442	1.0	0.415	7.0	NA	5.7	40.6	0.67	0.10	47.0

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: Site 4 - 2021DN Wed AM
Mowbray Rd/Kullah Pde

Mowbray Rd/Hatfield St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Kullah Pde											
1	L	1	0.0	0.036	38.4	LOS C	0.1	0.9	0.88	0.87	29.2
2	T	1	0.0	0.036	37.1	LOS C	0.1	0.9	0.88	0.94	29.4
3	R	2	0.0	0.036	38.5	LOS C	0.1	0.9	0.88	0.96	29.2
Approach		4	0.0	0.035	38.1	LOS C	0.1	0.9	0.88	0.93	29.2
East: Mowbray Rd East											
4	L	2	0.0	0.067	8.2	LOS A	0.0	0.0	0.00	1.08	49.0
5	T	683	3.5	0.331	4.2	LOS A	5.6	40.1	0.64	0.00	49.3
6	R	29	3.4	0.330	13.6	LOS A	5.6	40.1	0.78	1.07	46.9
Approach		714	3.5	0.331	4.6	LOS A	5.6	40.1	0.64	0.05	49.2
North: Hatfield St											
7	L	24	0.0	0.500	50.2	LOS D	2.4	16.5	0.90	1.08	25.1
8	T	2	0.0	0.500	48.9	LOS D	2.4	16.5	0.90	1.04	25.3
9	R	37	0.0	0.500	50.3	LOS D	2.4	16.5	0.90	1.05	25.1
Approach		63	0.0	0.497	50.2	LOS D	2.4	16.5	0.90	1.06	25.1
West: Mowbray Rd West											
10	L	26	0.0	0.052	8.2	LOS A	0.0	0.0	0.00	0.93	49.0
11	T	580	1.7	0.262	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		606	1.7	0.262	0.4	LOS A	0.0	0.0	0.00	0.04	59.4
All Vehicles		1387	2.5	0.497	4.9	NA	5.6	40.1	0.37	0.09	50.7

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: Site 4 - 2021DN Wed PM
Mowbray Rd/Kullah Pde

Mowbray Rd/Hatfield St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Kullah Pde											
1	L	1	0.0	0.083	37.7	LOS C	0.3	2.3	0.88	0.88	29.5
2	T	3	0.0	0.083	36.4	LOS C	0.3	2.3	0.88	0.95	29.7
3	R	6	0.0	0.083	37.8	LOS C	0.3	2.3	0.88	0.96	29.5
Approach		10	0.0	0.084	37.4	LOS C	0.3	2.3	0.88	0.95	29.5
East: Mowbray Rd East											
4	L	4	0.0	0.056	8.2	LOS A	0.0	0.0	0.00	1.06	49.0
5	T	566	1.1	0.276	3.9	LOS A	4.1	28.9	0.61	0.00	49.7
6	R	27	0.0	0.276	13.1	LOS A	4.1	28.9	0.75	1.04	47.1
Approach		597	1.0	0.276	4.4	LOS A	4.1	28.9	0.61	0.05	49.5
North: Hatfield St											
7	L	27	0.0	0.443	39.7	LOS C	2.1	15.0	0.87	1.06	28.6
8	T	7	0.0	0.438	38.4	LOS C	2.1	15.0	0.87	1.02	28.8
9	R	36	0.0	0.444	39.8	LOS C	2.1	15.0	0.87	1.04	28.6
Approach		70	0.0	0.444	39.6	LOS C	2.1	15.0	0.87	1.04	28.6
West: Mowbray Rd West											
10	L	43	0.0	0.056	8.2	LOS A	0.0	0.0	0.00	0.86	49.0
11	T	590	1.2	0.280	3.6	LOS A	4.0	28.0	0.65	0.00	49.3
12	R	6	0.0	0.286	12.3	LOS A	4.0	28.0	0.73	1.01	48.0
Approach		639	1.1	0.280	4.0	LOS A	4.0	28.0	0.61	0.07	49.2
All Vehicles		1316	1.0	0.444	6.3	NA	4.1	28.9	0.63	0.12	47.3

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

Processed: Thursday, 6 October 2011 2:00:11 PM
SIDRA INTERSECTION 5.0.5.1510

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MOVEMENT SUMMARY

Site: Site 4 - 2021LEP Wed AM
Mowbray Rd/Kullah Pde

Mowbray Rd/Hatfield St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Kullah Pde											
1	L	4	0.0	0.080	46.7	LOS D	0.3	2.0	0.91	0.97	26.2
2	T	1	0.0	0.077	45.4	LOS D	0.3	2.0	0.91	0.96	26.4
3	R	2	0.0	0.080	46.8	LOS D	0.3	2.0	0.91	0.97	26.2
Approach		7	0.0	0.080	46.5	LOS D	0.3	2.0	0.91	0.97	26.3
East: Mowbray Rd East											
4	L	2	0.0	0.091	8.2	LOS A	0.0	0.0	0.00	1.08	49.0
5	T	899	3.3	0.445	6.5	LOS A	10.4	75.1	0.77	0.00	47.5
6	R	43	2.3	0.443	16.4	LOS B	10.4	75.1	0.95	1.14	44.8
Approach		944	3.3	0.445	7.0	LOS B	10.4	75.1	0.78	0.05	47.4
North: Hatfield St											
7	L	28	0.0	1.037	356.9	LOS F	13.4	93.5	1.00	2.17	5.5
8	T	2	0.0	1.000	355.7	LOS F	13.4	93.5	1.00	1.86	5.5
9	R	39	0.0	1.054	357.0	LOS F	13.4	93.5	1.00	1.84	5.5
Approach		69	0.0	1.055	356.9	LOS F	13.4	93.5	1.00	1.97	5.5
West: Mowbray Rd West											
10	L	28	0.0	0.059	8.2	LOS A	0.0	0.0	0.00	0.94	49.0
11	T	654	1.5	0.295	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		682	1.5	0.295	0.3	LOS A	0.0	0.0	0.00	0.04	59.5
All Vehicles		1702	2.4	1.055	18.7	NA	13.4	93.5	0.48	0.13	38.6

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: Site 4 - 2021LEP Wed PM
Mowbray Rd/Kullah Pde

Mowbray Rd/Hatfield St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Kullah Pde											
1	L	1	0.0	0.143	58.5	LOS E	0.5	3.6	0.93	0.95	23.0
2	T	3	0.0	0.143	57.2	LOS E	0.5	3.6	0.93	0.97	23.1
3	R	6	0.0	0.143	58.6	LOS E	0.5	3.6	0.93	0.98	23.0
Approach		10	0.0	0.142	58.2	LOS E	0.5	3.6	0.93	0.97	23.0
East: Mowbray Rd East											
4	L	4	0.0	0.063	8.2	LOS A	0.0	0.0	0.00	1.07	49.0
5	T	590	1.5	0.310	6.7	LOS A	6.2	43.8	0.72	0.00	47.5
6	R	36	0.0	0.310	16.7	LOS B	6.2	43.8	0.89	1.07	44.2
Approach		630	1.4	0.310	7.3	LOS B	6.2	43.8	0.72	0.07	47.3
North: Hatfield St											
7	L	25	0.0	0.532	63.5	LOS E	2.4	17.0	0.93	1.09	21.8
8	T	2	0.0	0.500	62.3	LOS E	2.4	17.0	0.93	1.06	21.9
9	R	27	0.0	0.540	63.6	LOS E	2.4	17.0	0.93	1.06	21.8
Approach		54	0.0	0.536	63.5	LOS E	2.4	17.0	0.93	1.07	21.8
West: Mowbray Rd West											
10	L	42	0.0	0.074	8.2	LOS A	0.0	0.0	0.00	0.91	49.0
11	T	800	0.9	0.369	4.8	LOS A	7.2	50.5	0.72	0.00	48.4
12	R	6	0.0	0.375	13.7	LOS A	7.2	50.5	0.82	1.09	47.0
Approach		848	0.8	0.369	5.0	LOS A	7.2	50.5	0.69	0.05	48.4
All Vehicles		1542	1.0	0.536	8.3	NA	7.2	50.5	0.71	0.10	45.7

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS E. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: UPGRADE Site 4 - 2021LEP Wed AM Mowbray Rd/Kullah Pde

Mowbray Rd/Hatfield St
Signals - Fixed Time Cycle Time = 60 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Kullah Pde											
1	L	4	0.0	0.012	28.2	LOS B	0.2	1.3	0.81	0.67	34.1
2	T	1	0.0	0.012	20.0	LOS B	0.2	1.3	0.81	0.53	35.1
3	R	86	0.0	0.498	30.3	LOS C	3.2	22.3	0.87	0.76	32.7
Approach		91	0.0	0.498	30.1	LOS C	3.2	22.3	0.86	0.76	32.7
East: Mowbray Rd East											
4	L	2	0.0	0.857	22.5	LOS B	24.4	176.0	0.85	1.01	39.6
5	T	899	3.3	0.809	14.3	LOS A	24.4	176.0	0.85	0.85	40.6
6	R	43	2.3	0.172	22.8	LOS B	1.4	9.7	0.70	0.75	36.8
Approach		944	3.3	0.809	14.7	LOS B	24.4	176.0	0.85	0.85	40.4
North: Hatfield St											
7	L	28	0.0	0.321	30.4	LOS C	4.2	29.3	0.88	0.78	32.6
8	T	2	0.0	0.318	22.3	LOS B	4.2	29.3	0.88	0.70	33.2
9	R	85	0.0	0.321	30.6	LOS C	4.2	29.3	0.88	0.78	32.6
Approach		115	0.0	0.321	30.4	LOS C	4.2	29.3	0.88	0.78	32.6
West: Mowbray Rd West											
10	L	28	0.0	0.608	16.9	LOS B	14.4	102.1	0.69	0.95	43.3
11	T	654	1.5	0.606	8.7	LOS A	14.4	102.1	0.69	0.62	45.7
12	R	13	0.0	0.066	29.7	LOS C	0.5	3.6	0.82	0.71	33.0
Approach		695	1.4	0.607	9.5	LOS A	14.4	102.1	0.70	0.64	45.3
All Vehicles		1845	2.2	0.809	14.5	LOS A	24.4	176.0	0.79	0.76	41.0

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	Across S approach	16	8.5	LOS A	0.0	0.0	0.53	0.53
P3	Across E approach	16	24.3	LOS C	0.0	0.0	0.90	0.90
P5	Across N approach	16	7.5	LOS A	0.0	0.0	0.50	0.50
P7	Across W approach	16	24.3	LOS C	0.0	0.0	0.90	0.90
All Pedestrians		64	16.2				0.71	0.71

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS C. LOS Method for individual pedestrian movements: Delay (HCM).

MOVEMENT SUMMARY

Site: UPGRADE Site 4 - 2021LEP Wed PM Mowbray Rd/Kullah Pde

Mowbray Rd/Hatfield St
Signals - Fixed Time Cycle Time = 50 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Kullah Pde											
1	L	1	0.0	0.008	23.0	LOS B	0.1	0.8	0.76	0.72	38.3
2	T	3	0.0	0.008	14.8	LOS B	0.1	0.8	0.76	0.49	39.8
3	R	18	0.0	0.083	23.6	LOS B	0.5	3.7	0.77	0.70	36.3
Approach		22	0.0	0.083	22.4	LOS B	0.5	3.7	0.77	0.67	36.8
East: Mowbray Rd East											
4	L	4	0.0	0.615	18.1	LOS B	12.3	87.0	0.77	0.93	42.7
5	T	590	1.5	0.616	9.9	LOS A	12.3	87.0	0.77	0.68	44.5
6	R	36	0.0	0.197	31.7	LOS C	1.3	9.3	0.93	0.73	31.9
Approach		630	1.4	0.615	11.2	LOS A	12.3	87.0	0.78	0.69	43.5
North: Hatfield St											
7	L	25	0.0	0.183	24.3	LOS B	2.3	16.3	0.81	0.76	35.9
8	T	2	0.0	0.183	16.1	LOS B	2.3	16.3	0.81	0.63	37.0
9	R	52	0.0	0.183	24.4	LOS B	2.3	16.3	0.81	0.76	35.9
Approach		79	0.0	0.183	24.2	LOS B	2.3	16.3	0.81	0.76	35.9
West: Mowbray Rd West											
10	L	42	0.0	0.866	29.5	LOS C	25.0	176.6	0.95	1.11	35.2
11	T	800	0.9	0.871	21.4	LOS B	25.0	176.6	0.95	1.07	35.6
12	R	6	0.0	0.021	22.8	LOS B	0.2	1.2	0.74	0.68	36.8
Approach		848	0.8	0.870	21.8	LOS B	25.0	176.6	0.95	1.07	35.6
All Vehicles		1579	1.0	0.870	17.7	LOS B	25.0	176.6	0.88	0.89	38.4

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	Across S approach	16	10.2	LOS B	0.0	0.0	0.64	0.64
P3	Across E approach	16	19.4	LOS B	0.0	0.0	0.88	0.88
P5	Across N approach	16	9.0	LOS A	0.0	0.0	0.60	0.60
P7	Across W approach	16	19.4	LOS B	0.0	0.0	0.88	0.88
All Pedestrians		64	14.5				0.75	0.75

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual pedestrian movements: Delay (HCM).

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MOVEMENT SUMMARY

Site: Site 3 - Evacuation Wed AM Mowbray Rd/Mindarie St

Mowbray Rd/Mindarie St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Mindarie St											
1	L	1	0.0	0.200	9.9	LOS A	1.2	8.5	0.37	0.58	47.0
3	R	157	0.0	0.219	10.0	LOS A	1.2	8.5	0.37	0.68	47.0
Approach		158	0.0	0.219	10.0	LOS A	1.2	8.5	0.37	0.68	47.0
East: Mowbray Rd East											
4	L	1	0.0	0.006	8.2	LOS A	0.0	0.0	0.00	1.03	49.0
5	T	65	1.5	0.029	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		66	1.5	0.029	0.1	LOS A	0.0	0.0	0.00	0.02	59.8
West: Mowbray Rd West											
11	T	90	0.0	0.046	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		90	0.0	0.046	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
All Vehicles		314	0.3	0.219	5.1	NA	1.2	8.5	0.19	0.35	52.6

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

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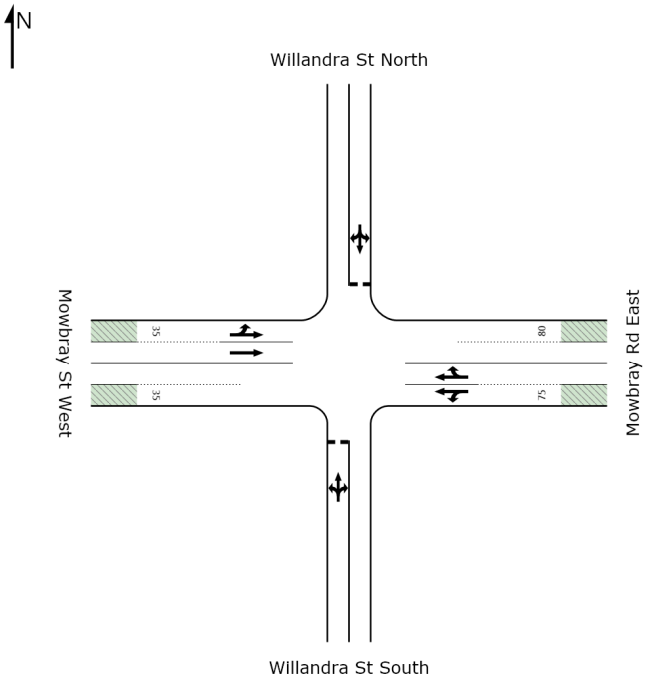
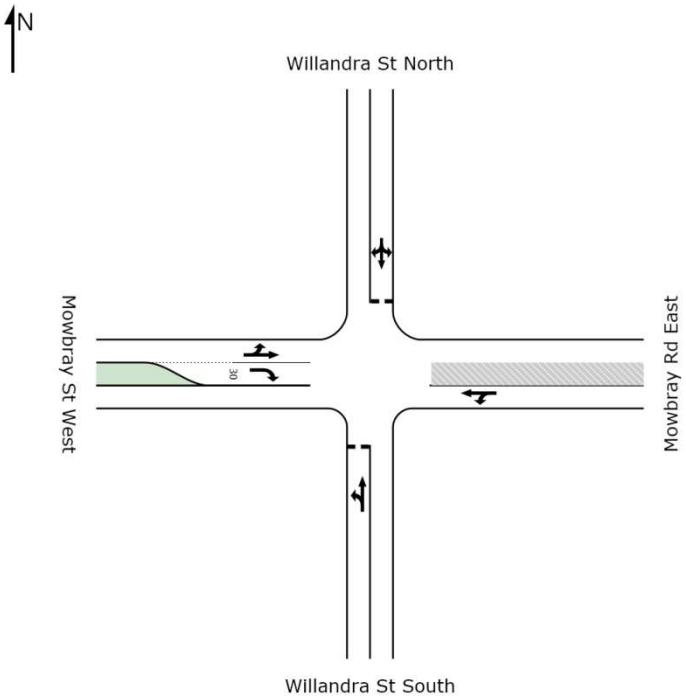
Intersection – Site 5: Mowbray Road/Willandra Street

Existing



Upgraded



Site: Site 5 - 2011 Wed AM
Mowbray Rd/Willandra St

MOVEMENT SUMMARY

Mowbray Rd/Willandra St
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
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Willandra St South											
1	L	19	0.0	0.179	27.8	LOS B	0.7	4.9	0.82	0.94	33.9
2	T	1	0.0	0.167	26.6	LOS B	0.7	4.9	0.82	0.92	34.2
3	R	12	0.0	0.179	27.9	LOS B	0.7	4.9	0.82	0.95	33.9
Approach		32	0.0	0.180	27.8	LOS B	0.7	4.9	0.82	0.94	33.9
East: Mowbray Rd East											
4	L	9	0.0	0.075	8.2	LOS A	0.0	0.0	0.00	1.05	49.0
5	T	685	1.9	0.309	3.6	LOS A	4.8	33.8	0.60	0.00	49.9
6	R	19	0.0	0.311	12.7	LOS A	4.8	33.8	0.75	1.04	47.6
Approach		713	1.8	0.309	3.9	LOS A	4.8	33.8	0.60	0.04	49.8
North: Willandra St North											
7	L	7	0.0	0.043	21.8	LOS B	0.2	1.2	0.72	0.80	37.5
8	T	1	0.0	0.043	20.5	LOS B	0.2	1.2	0.72	0.88	37.9
9	R	2	0.0	0.043	21.9	LOS B	0.2	1.2	0.72	0.92	37.5
Approach		10	0.0	0.043	21.7	LOS B	0.2	1.2	0.72	0.83	37.6
West: Mowbray St West											
10	L	4	0.0	0.089	8.2	LOS A	0.0	0.0	0.00	1.07	49.0
11	T	569	1.8	0.208	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		573	1.7	0.208	0.1	LOS A	0.0	0.0	0.00	0.01	59.9
All Vehicles		1328	1.7	0.309	2.9	NA	4.8	33.8	0.34	0.05	52.9

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: Site 5 - 2011 Wed PM
Mowbray Rd/Willandra St

Mowbray Rd/Willandra St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Willandra St South											
1	L	10	0.0	0.104	28.9	LOS C	0.4	2.8	0.81	0.92	33.4
2	T	1	0.0	0.100	27.7	LOS B	0.4	2.8	0.81	0.92	33.6
3	R	6	0.0	0.103	29.1	LOS C	0.4	2.8	0.81	0.94	33.3
Approach		17	0.0	0.104	28.9	LOS C	0.4	2.8	0.81	0.93	33.4
East: Mowbray Rd East											
4	L	6	0.0	0.068	8.2	LOS A	0.0	0.0	0.00	1.06	49.0
5	T	643	1.4	0.280	4.1	LOS A	4.5	32.0	0.62	0.00	49.6
6	R	9	0.0	0.281	13.4	LOS A	4.5	32.0	0.78	1.04	47.1
Approach		658	1.4	0.280	4.3	LOS A	4.5	32.0	0.62	0.02	49.6
North: Willandra St North											
7	L	7	0.0	0.048	23.6	LOS B	0.2	1.3	0.76	0.85	36.3
8	T	1	0.0	0.048	22.4	LOS B	0.2	1.3	0.76	0.90	36.7
9	R	2	0.0	0.048	23.8	LOS B	0.2	1.3	0.76	0.93	36.3
Approach		10	0.0	0.048	23.5	LOS B	0.2	1.3	0.76	0.87	36.4
West: Mowbray St West											
10	L	3	0.0	0.111	8.2	LOS A	0.0	0.0	0.00	1.08	49.0
11	T	656	1.1	0.259	3.2	LOS A	3.7	26.5	0.50	0.00	51.3
12	R	22	0.0	0.259	13.1	LOS A	3.7	26.5	0.74	1.03	47.1
Approach		681	1.0	0.260	3.6	LOS A	3.7	26.5	0.51	0.04	51.1
All Vehicles		1366	1.2	0.280	4.4	NA	4.5	32.0	0.57	0.05	49.9

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

Project: I:\projects\30011093 - Mowbray Road Precinct Strategic Review\MODELLING\SIDRA\Mowbray Rd_Base2011.sip
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MOVEMENT SUMMARY

Site: Site 5 - 2021DN Wed AM
Mowbray Rd/Willandra St

Mowbray Rd/Willandra St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Willandra St South											
1	L	24	0.0	0.182	25.6	LOS B	0.7	5.0	0.80	0.93	35.2
2	T	1	0.0	0.167	24.3	LOS B	0.7	5.0	0.80	0.91	35.5
3	R	11	0.0	0.180	25.7	LOS B	0.7	5.0	0.80	0.94	35.2
Approach		36	0.0	0.182	25.6	LOS B	0.7	5.0	0.80	0.93	35.2
East: Mowbray Rd East											
4	L	9	0.0	0.076	8.2	LOS A	0.0	0.0	0.00	1.05	49.0
5	T	677	3.8	0.312	3.8	LOS A	4.9	35.5	0.61	0.00	49.8
6	R	21	0.0	0.313	13.0	LOS A	4.9	35.5	0.76	1.05	47.3
Approach		707	3.7	0.312	4.1	LOS A	4.9	35.5	0.60	0.04	49.7
North: Willandra St North											
7	L	7	0.0	0.044	22.3	LOS B	0.2	1.2	0.74	0.82	37.1
8	T	1	0.0	0.043	21.1	LOS B	0.2	1.2	0.74	0.88	37.6
9	R	2	0.0	0.044	22.5	LOS B	0.2	1.2	0.74	0.92	37.1
Approach		10	0.0	0.044	22.2	LOS B	0.2	1.2	0.74	0.84	37.2
West: Mowbray St West											
10	L	4	0.0	0.093	8.2	LOS A	0.0	0.0	0.00	1.08	49.0
11	T	589	1.7	0.215	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		593	1.7	0.215	0.1	LOS A	0.0	0.0	0.00	0.01	59.9
All Vehicles		1346	2.7	0.312	3.0	NA	4.9	35.5	0.34	0.06	53.0

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: Site 5 - 2021DN Wed PM
Mowbray Rd/Willandra St

Mowbray Rd/Willandra St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Willandra St South											
1	L	16	0.0	0.052	16.0	LOS B	0.2	1.5	0.62	0.79	41.6
2	T	1	0.0	0.053	14.8	LOS B	0.2	1.5	0.62	0.83	42.2
3	R	2	0.0	0.051	16.2	LOS B	0.2	1.5	0.62	0.89	41.6
Approach		19	0.0	0.052	16.0	LOS B	0.2	1.5	0.62	0.81	41.6
East: Mowbray Rd East											
4	L	11	0.0	0.060	8.2	LOS A	0.0	0.0	0.00	1.03	49.0
5	T	566	1.4	0.248	3.5	LOS A	3.5	24.9	0.59	0.00	50.1
6	R	7	0.0	0.250	12.5	LOS A	3.5	24.9	0.72	1.02	47.8
Approach		584	1.4	0.248	3.7	LOS A	3.5	24.9	0.58	0.03	50.0
North: Willandra St North											
7	L	4	0.0	0.033	23.5	LOS B	0.1	0.9	0.76	0.81	36.4
8	T	1	0.0	0.033	22.3	LOS B	0.1	0.9	0.76	0.89	36.8
9	R	2	0.0	0.033	23.6	LOS B	0.1	0.9	0.76	0.93	36.4
Approach		7	0.0	0.033	23.4	LOS B	0.1	0.9	0.76	0.85	36.5
West: Mowbray St West											
10	L	12	0.0	0.103	8.2	LOS A	0.0	0.0	0.00	1.05	49.0
11	T	596	0.8	0.239	2.7	LOS A	3.1	22.0	0.47	0.00	51.7
12	R	22	0.0	0.239	12.2	LOS A	3.1	22.0	0.69	1.00	47.8
Approach		630	0.8	0.239	3.1	LOS A	3.1	22.0	0.47	0.06	51.5
All Vehicles		1240	1.0	0.248	3.7	NA	3.5	24.9	0.53	0.06	50.5

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: Site 5 - 2021LEP Wed AM
Mowbray Rd/Willandra St

Mowbray Rd/Willandra St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Willandra St South											
1	L	138	0.0	0.690	39.4	LOS C	4.3	30.2	0.90	1.20	28.7
2	T	1	0.0	1.000	38.2	LOS C	4.3	30.2	0.90	1.15	28.9
3	R	12	0.0	0.706	39.5	LOS C	4.3	30.2	0.90	1.16	28.7
Approach		151	0.0	0.689	39.4	LOS C	4.3	30.2	0.90	1.20	28.7
East: Mowbray Rd East											
4	L	9	0.0	0.100	8.2	LOS A	0.0	0.0	0.00	1.06	49.0
5	T	925	3.9	0.411	5.7	LOS A	9.3	67.1	0.73	0.00	48.2
6	R	14	0.0	0.412	15.4	LOS B	9.3	67.1	0.90	1.12	45.7
Approach		948	3.8	0.411	5.9	LOS B	9.3	67.1	0.72	0.03	48.2
North: Willandra St North											
7	L	11	0.0	0.106	33.1	LOS C	0.4	2.6	0.83	0.93	31.4
8	T	1	0.0	0.111	31.8	LOS C	0.4	2.6	0.83	0.92	31.6
9	R	2	0.0	0.105	33.2	LOS C	0.4	2.6	0.83	0.95	31.4
Approach		14	0.0	0.106	33.0	LOS C	0.4	2.6	0.83	0.93	31.4
West: Mowbray St West											
10	L	4	0.0	0.103	8.2	LOS A	0.0	0.0	0.00	1.08	49.0
11	T	660	1.5	0.241	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		664	1.5	0.241	0.0	LOS A	0.0	0.0	0.00	0.01	59.9
All Vehicles		1777	2.6	0.689	6.8	NA	9.3	67.1	0.47	0.13	48.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

Processed: Monday, 10 October 2011 3:35:13 PM
SIDRA INTERSECTION 5.0.5.1510

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MOVEMENT SUMMARY

Site: Site 5 - 2021LEP Wed PM
Mowbray Rd/Willandra St

Mowbray Rd/Willandra St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Willandra St South											
1	L	28	0.0	0.301	43.3	LOS D	1.2	8.2	0.85	0.99	27.3
2	T	1	0.0	0.333	42.1	LOS C	1.2	8.2	0.85	0.96	27.5
3	R	6	0.0	0.300	43.4	LOS D	1.2	8.2	0.85	0.98	27.3
Approach		35	0.0	0.302	43.3	LOS D	1.2	8.2	0.85	0.99	27.3
East: Mowbray Rd East											
4	L	8	0.0	0.062	8.2	LOS A	0.0	0.0	0.00	1.04	49.0
5	T	586	1.5	0.253	9.1	LOS A	6.5	46.2	0.77	0.00	45.2
6	R	3	0.0	0.250	19.6	LOS B	6.5	46.2	0.95	1.04	42.2
Approach		597	1.5	0.253	9.2	LOS B	6.5	46.2	0.76	0.02	45.2
North: Willandra St North											
7	L	3	0.0	0.120	74.1	LOS F	0.4	2.8	0.95	0.98	19.7
8	T	1	0.0	0.125	72.8	LOS F	0.4	2.8	0.95	0.98	19.8
9	R	2	0.0	0.118	74.2	LOS F	0.4	2.8	0.95	0.98	19.7
Approach		6	0.0	0.118	73.9	LOS F	0.4	2.8	0.95	0.98	19.7
West: Mowbray St West											
10	L	6	0.0	0.222	8.2	LOS A	0.0	0.0	0.00	1.08	49.0
11	T	1038	0.6	0.509	4.5	LOS A	10.7	75.5	0.57	0.00	49.8
12	R	146	0.0	0.509	15.9	LOS B	10.7	75.5	0.95	1.16	44.6
Approach		1190	0.5	0.509	5.9	LOS B	10.7	75.5	0.61	0.15	49.1
All Vehicles		1828	0.8	0.509	7.9	NA	10.7	75.5	0.67	0.12	46.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: UPGRADE Site 5 - 2021LEP Wed AM Mowbray Rd/Willandra St

Mowbray Rd/Willandra St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Willandra St South											
1	L	138	0.0	0.513	26.1	LOS B	2.6	18.4	0.87	1.06	34.9
2	T	1	0.0	0.500	24.8	LOS B	2.6	18.4	0.87	1.04	35.2
Approach		139	0.0	0.514	26.0	LOS B	2.6	18.4	0.87	1.06	34.9
East: Mowbray Rd East											
4	L	9	0.0	0.500	8.2	LOS A	0.0	0.0	0.00	1.08	49.0
5	T	925	3.9	0.491	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		934	3.9	0.491	0.1	LOS A	0.0	0.0	0.00	0.01	59.9
North: Willandra St North											
7	L	11	0.0	0.110	34.1	LOS C	0.4	2.7	0.85	0.95	30.9
8	T	1	0.0	0.111	32.9	LOS C	0.4	2.7	0.85	0.93	31.1
9	R	2	0.0	0.111	34.3	LOS C	0.4	2.7	0.85	0.95	30.9
Approach		14	0.0	0.110	34.1	LOS C	0.4	2.7	0.85	0.95	30.9
West: Mowbray St West											
10	L	4	0.0	0.333	8.2	LOS A	0.0	0.0	0.00	1.09	49.0
11	T	660	1.5	0.344	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	23	0.0	0.061	16.7	LOS B	0.2	1.7	0.75	0.92	41.0
Approach		687	1.5	0.344	0.6	LOS B	0.2	1.7	0.03	0.04	59.0
All Vehicles		1774	2.6	0.514	2.6	NA	2.6	18.4	0.08	0.11	56.0

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

Processed: Tuesday, 1 November 2011 2:09:50 PM
SIDRA INTERSECTION 5.0.5.1510

Project: I:\projects\30011093 - Mowbray Road Precinct Strategic Review\MODELLING\SIDRA\Mowbray Rd_2021LEP_final.sip
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MOVEMENT SUMMARY

Site: UPGRADE Site 5 - 2021LEP Wed PM Mowbray Rd/Willandra St

Mowbray Rd/Willandra St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Willandra St South											
1	L	28	0.0	0.076	15.6	LOS B	0.3	2.1	0.63	0.85	41.9
2	T	1	0.0	0.077	14.4	LOS A	0.3	2.1	0.63	0.84	42.5
Approach		29	0.0	0.076	15.6	LOS B	0.3	2.1	0.63	0.85	42.0
East: Mowbray Rd East											
4	L	8	0.0	0.308	8.2	LOS A	0.0	0.0	0.00	1.08	49.0
5	T	586	1.5	0.308	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		594	1.5	0.308	0.1	LOS A	0.0	0.0	0.00	0.01	59.8
North: Willandra St North											
7	L	3	0.0	0.120	76.4	LOS F	0.4	2.9	0.95	0.99	19.3
8	T	1	0.0	0.125	75.1	LOS F	0.4	2.9	0.95	0.98	19.4
9	R	2	0.0	0.125	76.5	LOS F	0.4	2.9	0.95	0.99	19.3
Approach		6	0.0	0.122	76.2	LOS F	0.4	2.9	0.95	0.98	19.3
West: Mowbray St West											
10	L	6	0.0	0.545	8.2	LOS A	0.0	0.0	0.00	1.09	49.0
11	T	1038	0.6	0.538	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	146	0.0	0.204	12.2	LOS A	1.0	6.9	0.58	0.87	44.8
Approach		1190	0.5	0.538	1.5	LOS A	1.0	6.9	0.07	0.11	57.6
All Vehicles		1819	0.8	0.538	1.5	NA	1.0	6.9	0.06	0.10	57.6

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: Site 5 - Evacuation Wed AM Mowbray Rd/Willandra St

Mowbray Rd/Willandra St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Willandra St South											
1	L	79	0.0	0.101	8.6	LOS A	0.5	3.4	0.19	0.62	48.1
2	T	1	0.0	0.100	7.4	LOS A	0.5	3.4	0.19	0.54	49.2
3	R	23	0.0	0.101	8.8	LOS A	0.5	3.4	0.19	0.66	48.1
Approach		103	0.0	0.101	8.7	LOS A	0.5	3.4	0.19	0.63	48.1
East: Mowbray Rd East											
4	L	1	0.0	0.007	8.2	LOS A	0.0	0.0	0.00	1.04	49.0
5	T	69	1.4	0.030	0.1	LOS A	0.2	1.4	0.07	0.00	58.6
6	R	1	0.0	0.029	8.4	LOS A	0.2	1.4	0.09	1.05	48.9
Approach		71	1.4	0.030	0.3	LOS A	0.2	1.4	0.07	0.03	58.3
North: Willandra St North											
7	L	1	0.0	0.003	8.9	LOS A	0.0	0.1	0.12	0.62	48.2
8	T	1	0.0	0.003	7.7	LOS A	0.0	0.1	0.12	0.54	49.4
9	R	1	0.0	0.003	9.0	LOS A	0.0	0.1	0.12	0.68	48.1
Approach		3	0.0	0.003	8.5	LOS A	0.0	0.1	0.12	0.61	48.6
West: Mowbray St West											
10	L	1	0.0	0.003	8.2	LOS A	0.0	0.0	0.00	0.99	49.0
11	T	20	5.0	0.008	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		21	4.8	0.008	0.4	LOS A	0.0	0.0	0.00	0.05	59.4
All Vehicles		198	1.0	0.101	4.8	NA	0.5	3.4	0.12	0.35	52.5

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

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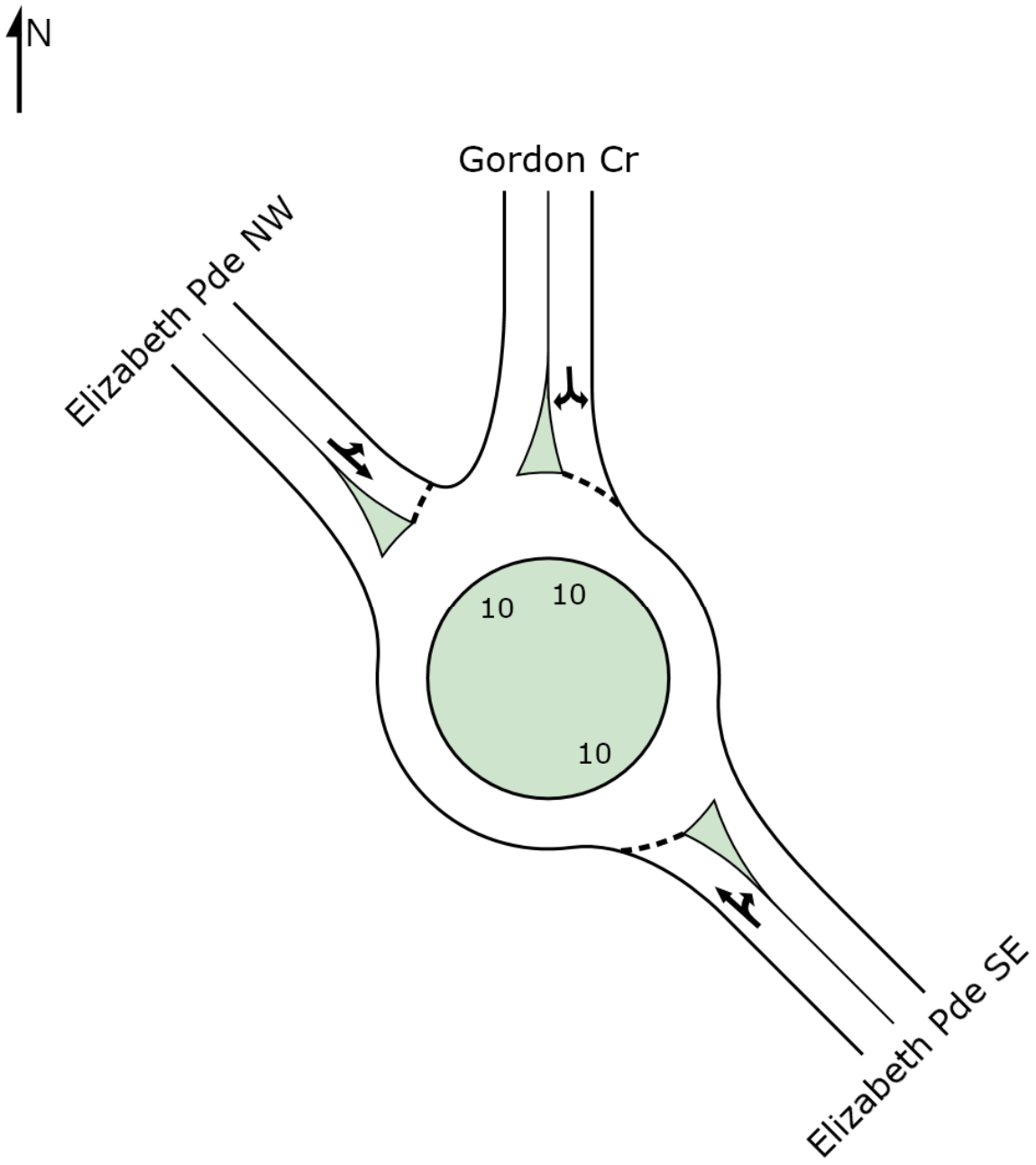
Intersection – Elizabeth Parade/Willandra Street



MOVEMENT SUMMARY

Site: Site 6 - 2011 Wed AM
Elizabeth Pde/Gordon Cr

Elizabeth Pde/Gordon Cr
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South East: Elizabeth Pde SE											
22	T	5	0.0	0.020	6.7	LOS A	0.1	0.8	0.03	0.51	50.4
23	R	25	0.0	0.021	10.0	LOS A	0.1	0.8	0.03	0.74	47.1
Approach		30	0.0	0.021	9.5	LOS A	0.1	0.8	0.03	0.70	47.6
North: Gordon Cr											
7	L	50	0.0	0.037	6.7	LOS A	0.2	1.5	0.05	0.55	50.3
9	R	3	0.0	0.037	11.6	LOS A	0.2	1.5	0.05	0.89	45.8
Approach		53	0.0	0.037	7.0	LOS A	0.2	1.5	0.05	0.57	50.0
North West: Elizabeth Pde NW											
27	L	3	0.0	0.008	8.1	LOS A	0.0	0.3	0.11	0.67	48.8
28	T	7	0.0	0.008	6.8	LOS A	0.0	0.3	0.11	0.52	50.0
Approach		10	0.0	0.008	7.2	LOS A	0.0	0.3	0.11	0.56	49.6
All Vehicles		93	0.0	0.037	7.8	LOS A	0.2	1.5	0.05	0.61	49.2

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout Capacity Model: SIDRA Standard.

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MOVEMENT SUMMARY

Site: Site 6 - 2011 Wed PM
Elizabeth Pde/Gordon Cr

Elizabeth Pde/Gordon Cr
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South East: Elizabeth Pde SE											
22	T	8	0.0	0.020	6.7	LOS A	0.1	0.8	0.02	0.52	50.5
23	R	22	0.0	0.020	10.0	LOS A	0.1	0.8	0.02	0.75	47.1
Approach		30	0.0	0.020	9.1	LOS A	0.1	0.8	0.02	0.69	47.9
North: Gordon Cr											
7	L	42	0.0	0.029	6.7	LOS A	0.2	1.2	0.03	0.56	50.5
9	R	2	0.0	0.029	11.6	LOS A	0.2	1.2	0.03	0.91	45.8
Approach		44	0.0	0.029	6.9	LOS A	0.2	1.2	0.03	0.57	50.2
North West: Elizabeth Pde NW											
27	L	2	0.0	0.004	8.1	LOS A	0.0	0.2	0.10	0.66	48.8
28	T	3	0.0	0.004	6.8	LOS A	0.0	0.2	0.10	0.52	50.0
Approach		5	0.0	0.004	7.3	LOS A	0.0	0.2	0.10	0.57	49.5
All Vehicles		79	0.0	0.029	7.8	LOS A	0.2	1.2	0.03	0.62	49.3

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout Capacity Model: SIDRA Standard.

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MOVEMENT SUMMARY

Site: Site 6 - 2021DN Wed AM
Elizabeth Pde/Gordon Cr

Elizabeth Pde/Gordon Cr
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South East: Elizabeth Pde SE											
22	T	9	0.0	0.024	6.7	LOS A	0.1	1.0	0.03	0.51	50.4
23	R	27	0.0	0.024	10.0	LOS A	0.1	1.0	0.03	0.75	47.1
Approach		36	0.0	0.024	9.2	LOS A	0.1	1.0	0.03	0.69	47.9
North: Gordon Cr											
7	L	46	0.0	0.034	6.7	LOS A	0.2	1.4	0.05	0.55	50.3
9	R	3	0.0	0.034	11.6	LOS A	0.2	1.4	0.05	0.89	45.8
Approach		49	0.0	0.034	7.0	LOS A	0.2	1.4	0.05	0.57	50.0
North West: Elizabeth Pde NW											
27	L	3	0.0	0.008	8.1	LOS A	0.0	0.3	0.11	0.67	48.8
28	T	7	0.0	0.008	6.8	LOS A	0.0	0.3	0.11	0.52	49.9
Approach		10	0.0	0.008	7.2	LOS A	0.0	0.3	0.11	0.56	49.6
All Vehicles		95	0.0	0.034	7.9	LOS A	0.2	1.4	0.05	0.61	49.1

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout Capacity Model: SIDRA Standard.

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MOVEMENT SUMMARY

Site: Site 6 - 2021DN Wed PM
Elizabeth Pde/Gordon Cr

Elizabeth Pde/Gordon Cr
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South East: Elizabeth Pde SE											
22	T	6	0.0	0.035	6.7	LOS A	0.2	1.4	0.03	0.51	50.4
23	R	46	0.0	0.035	10.0	LOS A	0.2	1.4	0.03	0.73	47.0
Approach		52	0.0	0.035	9.6	LOS A	0.2	1.4	0.03	0.70	47.4
North: Gordon Cr											
7	L	42	0.0	0.030	6.7	LOS A	0.2	1.2	0.02	0.56	50.5
9	R	4	0.0	0.030	11.6	LOS A	0.2	1.2	0.02	0.91	45.8
Approach		46	0.0	0.030	7.1	LOS A	0.2	1.2	0.02	0.59	50.0
North West: Elizabeth Pde NW											
27	L	4	0.0	0.005	8.2	LOS A	0.0	0.2	0.15	0.63	48.5
28	T	2	0.0	0.005	6.9	LOS A	0.0	0.2	0.15	0.50	49.6
Approach		6	0.0	0.005	7.8	LOS A	0.0	0.2	0.15	0.58	48.9
All Vehicles		104	0.0	0.035	8.4	LOS A	0.2	1.4	0.04	0.64	48.6

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout Capacity Model: SIDRA Standard.

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MOVEMENT SUMMARY

Site: Site 6 - 2021LEP Wed AM
Elizabeth Pde/Gordon Cr

Elizabeth Pde/Gordon Cr
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South East: Elizabeth Pde SE											
22	T	5	0.0	0.037	6.7	LOS A	0.2	1.5	0.01	0.51	50.5
23	R	55	0.0	0.037	10.0	LOS A	0.2	1.5	0.01	0.73	47.1
Approach		60	0.0	0.037	9.7	LOS A	0.2	1.5	0.01	0.72	47.4
North: Gordon Cr											
7	L	137	0.0	0.090	6.7	LOS A	0.6	3.9	0.05	0.55	50.3
9	R	1	0.0	0.091	11.6	LOS A	0.6	3.9	0.05	0.91	45.8
Approach		138	0.0	0.090	6.8	LOS A	0.6	3.9	0.05	0.56	50.3
North West: Elizabeth Pde NW											
27	L	4	0.0	0.008	8.2	LOS A	0.0	0.3	0.17	0.64	48.5
28	T	6	0.0	0.008	7.0	LOS A	0.0	0.3	0.17	0.51	49.6
Approach		10	0.0	0.008	7.5	LOS A	0.0	0.3	0.17	0.56	49.1
All Vehicles		208	0.0	0.090	7.7	LOS A	0.6	3.9	0.04	0.60	49.4

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout Capacity Model: SIDRA Standard.

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SIDRA INTERSECTION

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MOVEMENT SUMMARY

Site: Site 6 - 2021LEP Wed PM
Elizabeth Pde/Gordon Cr

Elizabeth Pde/Gordon Cr
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South East: Elizabeth Pde SE											
22	T	6	0.0	0.064	6.7	LOS A	0.4	2.6	0.02	0.51	50.5
23	R	97	0.0	0.064	10.0	LOS A	0.4	2.6	0.02	0.73	47.1
Approach		103	0.0	0.064	9.8	LOS A	0.4	2.6	0.02	0.71	47.3
North: Gordon Cr											
7	L	61	0.0	0.042	6.7	LOS A	0.3	1.8	0.04	0.56	50.4
9	R	2	0.0	0.042	11.6	LOS A	0.3	1.8	0.04	0.91	45.8
Approach		63	0.0	0.042	6.9	LOS A	0.3	1.8	0.04	0.57	50.2
North West: Elizabeth Pde NW											
27	L	14	0.0	0.015	8.4	LOS A	0.1	0.6	0.23	0.62	48.2
28	T	4	0.0	0.015	7.2	LOS A	0.1	0.6	0.23	0.50	49.0
Approach		18	0.0	0.015	8.2	LOS A	0.1	0.6	0.23	0.59	48.4
All Vehicles		184	0.0	0.064	8.6	LOS A	0.4	2.6	0.05	0.65	48.3

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout Capacity Model: SIDRA Standard.

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SIDRA INTERSECTION 5.0.5.1510

SIDRA INTERSECTION

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MOVEMENT SUMMARY

Site: Site 6 - Evacuation Wed AM Elizabeth Pde/Gordon Cr

Elizabeth Pde/Gordon Cr
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South East: Elizabeth Pde SE											
22	T	30	6.7	0.020	6.9	LOS A	0.1	0.9	0.02	0.56	50.5
23	R	1	0.0	0.020	10.0	LOS A	0.1	0.9	0.02	0.86	47.1
Approach		31	6.5	0.020	7.0	LOS A	0.1	0.9	0.02	0.57	50.4
North: Gordon Cr											
7	L	4	0.0	0.005	8.2	LOS A	0.0	0.2	0.42	0.54	48.2
9	R	1	0.0	0.005	13.1	LOS A	0.0	0.2	0.42	0.74	44.9
Approach		5	0.0	0.005	9.2	LOS A	0.0	0.2	0.42	0.58	47.4
North West: Elizabeth Pde NW											
27	L	1	0.0	0.200	8.0	LOS A	1.2	8.3	0.02	0.74	49.1
28	T	304	0.0	0.182	6.7	LOS A	1.2	8.3	0.02	0.57	50.5
Approach		305	0.0	0.182	6.7	LOS A	1.2	8.3	0.02	0.57	50.5
All Vehicles		341	0.6	0.182	6.8	LOS A	1.2	8.3	0.02	0.57	50.5

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout Capacity Model: SIDRA Standard.

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APPENDIX 'G'

Mowbray Road Precinct Intersection Survey Data

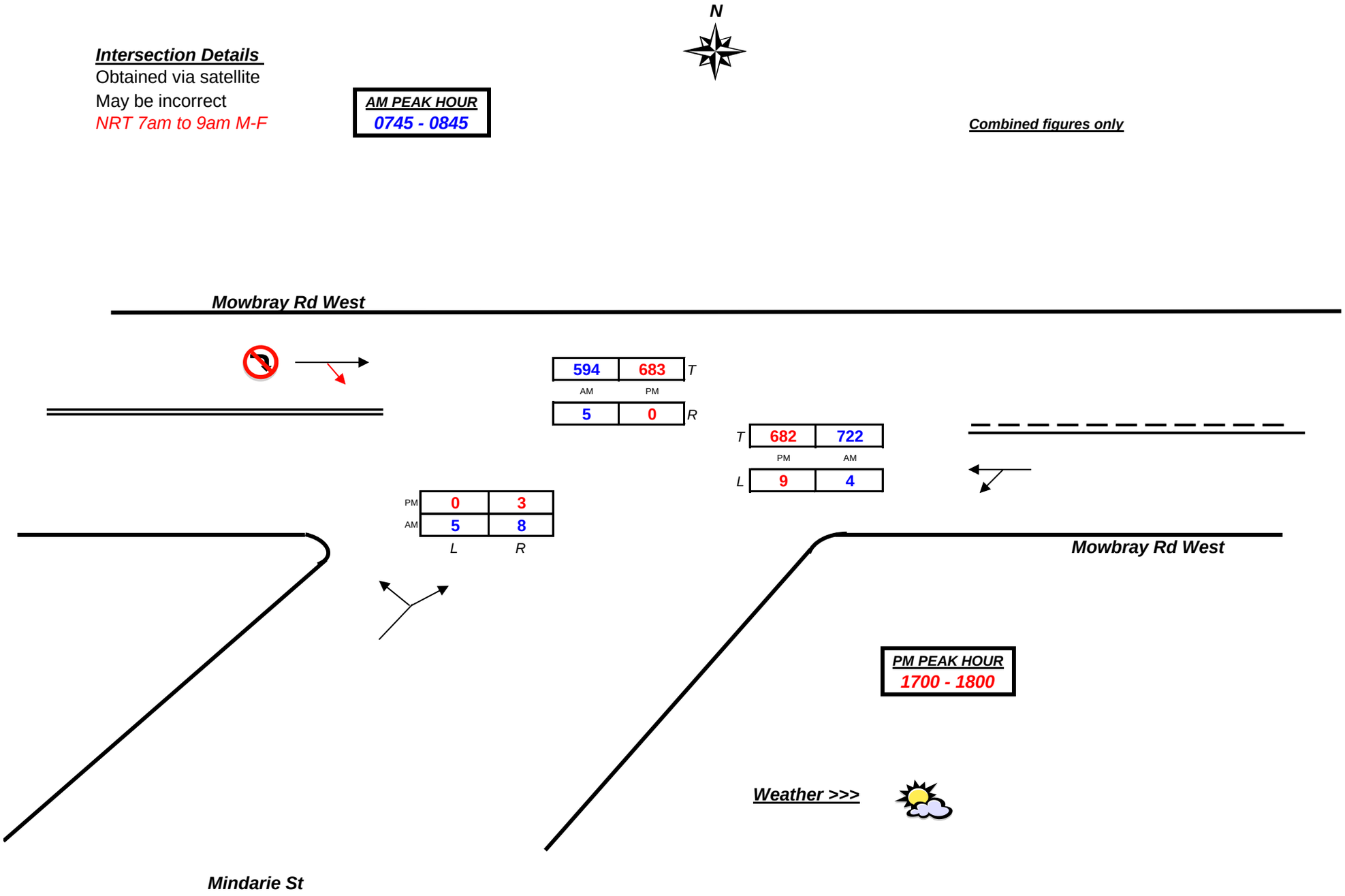
R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : SMEC Australia
Job No/Name : 3770 Lane Cove North Mowbray Rd Precint
Day/Date : Wednesday 14th September 2011

Intersection Details
Obtained via satellite
May be incorrect
NRT 7am to 9am M-F

AM PEAK HOUR
0745 - 0845

Combined figures only



R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849.

Mobile.0418239019

Client : SMEC Australia

Job No/Name : 3770 Lane Cove North Mowbray Rd

Day/Date : Wednesday 14th September 2011

PEDS	WEST	SOUTH	EAST	
Time Per	*Mowbray Rd*	*Mindarie St*	*Mowbray Rd*	TOT
1500 - 1515				**0**
1515 - 1530				**0**
1530 - 1545	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	**0**
1545 - 1600				**0**
1600 - 1615				**0**
1615 - 1630				**0**
1630 - 1645				**0**
1645 - 1700				**0**
1700 - 1715				**0**
1715 - 1730				**0**
1730 - 1745				**0**
1745 - 1800				**0**
Per End	**0**	**0**	**0**	**0**

PEDS	WEST	SOUTH	EAST	
Peak Per	*Mowbray Rd*	*Mindarie St*	*Mowbray Rd*	TOT
1500 - 1600	0	0	0	**0**
1515 - 1615	0	0	0	**0**
1530 - 1630	0	0	0	**0**
1545 - 1645	0	0	0	**0**
1600 - 1700	0	0	0	**0**
1615 - 1715	0	0	0	**0**
1630 - 1730	0	0	0	**0**
1645 - 1745	0	0	0	**0**
1700 - 1800	0	0	0	**0**
PEAK HR	**0**	**0**	**0**	**0**

Lights	WEST		SOUTH		EAST		
	Mowbray Rd		*Mindarie St*		*Mowbray Rd*		
Time Per	T	R	L	R	L	T	TOT
1500 - 1515	96	0	2	0	1	157	**256**
1515 - 1530	108	0	0	0	3	128	**239**
1530 - 1545	76	1	0	2	2	143	**224**
1545 - 1600	101	1	0	1	3	151	**257**
1600 - 1615	106	0	1	4	1	143	**255**
1615 - 1630	104	2	0	0	2	155	**263**
1630 - 1645	100	0	0	2	1	135	**238**
1645 - 1700	141	0	0	1	2	146	**290**
1700 - 1715	143	0	0	0	2	134	**279**
1715 - 1730	179	0	0	0	3	190	**372**
1730 - 1745	191	0	0	1	3	195	**390**
1745 - 1800	163	0	0	2	1	156	**322**
Per End	**1508**	**4**	**3**	**13**	**24**	**1833**	**3385**

Heavies	WEST		SOUTH		EAST		
	Mowbray Rd		*Mindarie St*		*Mowbray Rd*		
Time Per	T	R	L	R	L	T	TOT
1500 - 1515	3	0	0	0	0	1	**4**
1515 - 1530	4	0	0	0	0	2	**6**
1530 - 1545	1	0	0	0	0	2	**3**
1545 - 1600	1	0	0	0	0	2	**3**
1600 - 1615	3	0	0	0	0	2	**5**
1615 - 1630	1	0	0	0	0	2	**3**
1630 - 1645	3	0	0	0	0	1	**4**
1645 - 1700	1	0	0	0	0	3	**4**
1700 - 1715	2	0	0	0	0	2	**4**
1715 - 1730	0	0	0	0	0	1	**1**
1730 - 1745	3	0	0	0	0	1	**4**
1745 - 1800	2	0	0	0	0	3	**5**
Per End	**24**	**0**	**0**	**0**	**0**	**22**	**46**

Combined	WEST		SOUTH		EAST		
	Mowbray Rd		*Mindarie St*		*Mowbray Rd*		
Time Per	T	R	L	R	L	T	TOT
1500 - 1515	99	0	2	0	1	158	**260**
1515 - 1530	112	0	0	0	3	130	**245**
1530 - 1545	77	1	0	2	2	145	**227**
1545 - 1600	102	1	0	1	3	153	**260**
1600 - 1615	109	0	1	4	1	145	**260**
1615 - 1630	105	2	0	0	2	157	**266**
1630 - 1645	103	0	0	2	1	136	**242**
1645 - 1700	142	0	0	1	2	149	**294**
1700 - 1715	145	0	0	0	2	136	**283**
1715 - 1730	179	0	0	0	3	191	**373**
1730 - 1745	194	0	0	1	3	196	**394**
1745 - 1800	165	0	0	2	1	159	**327**
Per End	**1532**	**4**	**3**	**13**	**24**	**1855**	**3431**

Lights	WEST		SOUTH		EAST		
	Mowbray Rd		*Mindarie St*		*Mowbray Rd*		
Peak Per	T	R	L	R	L	T	TOT
1500 - 1600	381	2	2	3	9	579	**976**
1515 - 1615	391	2	1	7	9	565	**975**
1530 - 1630	387	4	1	7	8	592	**999**
1545 - 1645	411	3	1	7	7	584	**1013**
1600 - 1700	451	2	1	7	6	579	**1046**
1615 - 1715	488	2	0	3	7	570	**1070**
1630 - 1730	563	0	0	3	8	605	**1179**
1645 - 1745	654	0	0	2	10	665	**1331**
1700 - 1800	676	0	0	3	9	675	**1363**
PEAK HR	**676**	**0**	**0**	**3**	**9**	**675**	**1363**

Heavies	WEST		SOUTH		EAST		
	Mowbray Rd		*Mindarie St*		*Mowbray Rd*		
Peak Per	T	R	L	R	L	T	TOT
1500 - 1600	9	0	0	0	0	7	**16**
1515 - 1615	9	0	0	0	0	8	**17**
1530 - 1630	6	0	0	0	0	8	**14**
1545 - 1645	8	0	0	0	0	7	**15**
1600 - 1700	8	0	0	0	0	8	**16**
1615 - 1715	7	0	0	0	0	8	**15**
1630 - 1730	6	0	0	0	0	7	**13**
1645 - 1745	6	0	0	0	0	7	**13**
1700 - 1800	7	0	0	0	0	7	**14**
PEAK HR	**7**	**0**	**0**	**0**	**0**	**7**	**14**

Combined	WEST		SOUTH		EAST		
	Mowbray Rd		*Mindarie St*		*Mowbray Rd*		
Peak Per	T	R	L	R	L	T	TOT
1500 - 1600	390	2	2	3	9	586	**992**
1515 - 1615	400	2	1	7	9	573	**992**
1530 - 1630	393	4	1	7	8	600	**1013**
1545 - 1645	419	3	1	7	7	591	**1028**
1600 - 1700	459	2	1	7	6	587	**1062**
1615 - 1715	495	2	0	3	7	578	**1085**
1630 - 1730	569	0	0	3	8	612	**1192**
1645 - 1745	660	0	0	2	10	672	**1344**
1700 - 1800	683	0	0	3	9	682	**1377**
PEAK HR	**683**	**0**	**0**	**3**	**9**	**682**	**1377**

R.O.A.R. DATA
Reliable, Original & Authentic Results
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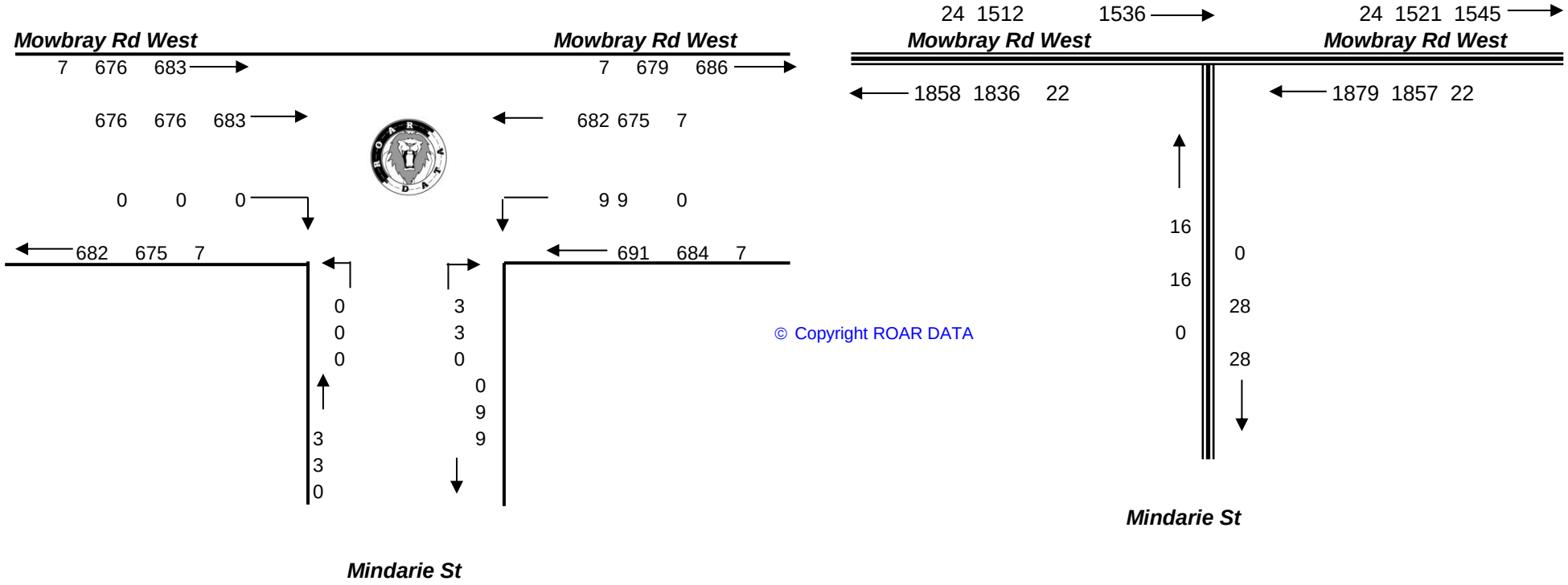
Client : SMEC Australia
Job No/Name : 3770 Lane Cove North Mowbray Rd
Day/Date : Wednesday 14th September 2011

PM PEAK
1700 - 1800

N

TOTAL VOLUMES FOR COUNT PERIOD



R.O.A.R. DATA

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Mobile.0418239019

Client : SMEC Australia

Job No/Name : 3770 Lane Cove North Mowbray Rd

Day/Date : Wednesday 14th September 2011

PEDS	WEST	SOUTH	EAST	
Time Per	*Mowbray Rd*	*Mindarie St*	*Mowbray Rd*	TOT
0700 - 0715				**0**
0715 - 0730				**0**
0730 - 0745	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	**0**
0745 - 0800				**0**
0800 - 0815				**0**
0815 - 0830				**0**
0830 - 0845				**0**
0845 - 0900				**0**
Per End	**0**	**0**	**0**	**0**

PEDS	WEST	SOUTH	EAST	
Peak Per	*Mowbray Rd*	*Mindarie St*	*Mowbray Rd*	TOT
0700 - 0800	0	0	0	**0**
0715 - 0815	0	0	0	**0**
0730 - 0830	0	0	0	**0**
0745 - 0845	0	0	0	**0**
0800 - 0900	0	0	0	**0**
PEAK HR	**0**	**0**	**0**	**0**

Lights	WEST		SOUTH		EAST		
	Mowbray Rd		*Mindarie St*		*Mowbray Rd*		
Time Per	T	R	L	R	L	T	TOT
0700 - 0715	146	0	0	0	0	87	**233**
0715 - 0730	161	0	1	0	0	105	**267**
0730 - 0745	169	1	0	1	0	141	**312**
0745 - 0800	151	1	1	3	1	181	**338**
0800 - 0815	133	2	1	1	0	165	**302**
0815 - 0830	150	1	3	1	1	188	**344**
0830 - 0845	151	1	0	3	2	176	**333**
0845 - 0900	115	1	0	4	1	164	**285**
Per End	**1176**	**7**	**6**	**13**	**5**	**1207**	**2414**

Heavies	WEST		SOUTH		EAST		
	Mowbray Rd		*Mindarie St*		*Mowbray Rd*		
Time Per	T	R	L	R	L	T	TOT
0700 - 0715	2	0	0	0	0	5	**7**
0715 - 0730	4	0	0	0	0	2	**6**
0730 - 0745	2	0	0	0	0	6	**8**
0745 - 0800	3	0	0	0	0	3	**6**
0800 - 0815	1	0	0	0	0	4	**5**
0815 - 0830	2	0	0	0	0	2	**4**
0830 - 0845	3	0	0	0	0	3	**6**
0845 - 0900	4	0	0	0	0	4	**8**
Per End	**21**	**0**	**0**	**0**	**0**	**29**	**50**

Combined	WEST		SOUTH		EAST		
	Mowbray Rd		*Mindarie St*		*Mowbray Rd*		
Time Per	T	R	L	R	L	T	TOT
0700 - 0715	148	0	0	0	0	92	**240**
0715 - 0730	165	0	1	0	0	107	**273**
0730 - 0745	171	1	0	1	0	147	**320**
0745 - 0800	154	1	1	3	1	184	**344**
0800 - 0815	134	2	1	1	0	169	**307**
0815 - 0830	152	1	3	1	1	190	**348**
0830 - 0845	154	1	0	3	2	179	**339**
0845 - 0900	119	1	0	4	1	168	**293**
Per End	**1197**	**7**	**6**	**13**	**5**	**1236**	**2464**

Lights	WEST		SOUTH		EAST		
	Mowbray Rd		*Mindarie St*		*Mowbray Rd*		
Peak Per	T	R	L	R	L	T	TOT
0700 - 0800	627	2	2	4	1	514	**1150**
0715 - 0815	614	4	3	5	1	592	**1219**
0730 - 0830	603	5	5	6	2	675	**1296**
0745 - 0845	585	5	5	8	4	710	**1317**
0800 - 0900	549	5	4	9	4	693	**1264**
PEAK HR	**585**	**5**	**5**	**8**	**4**	**710**	**1317**

Heavies	WEST		SOUTH		EAST		
	Mowbray Rd		*Mindarie St*		*Mowbray Rd*		
Peak Per	T	R	L	R	L	T	TOT
0700 - 0800	11	0	0	0	0	16	**27**
0715 - 0815	10	0	0	0	0	15	**25**
0730 - 0830	8	0	0	0	0	15	**23**
0745 - 0845	9	0	0	0	0	12	**21**
0800 - 0900	10	0	0	0	0	13	**23**
PEAK HR	**9**	**0**	**0**	**0**	**0**	**12**	**21**

Combined	WEST		SOUTH		EAST		
	Mowbray Rd		*Mindarie St*		*Mowbray Rd*		
Peak Per	T	R	L	R	L	T	TOT
0700 - 0800	638	2	2	4	1	530	**1177**
0715 - 0815	624	4	3	5	1	607	**1244**
0730 - 0830	611	5	5	6	2	690	**1319**
0745 - 0845	594	5	5	8	4	722	**1338**
0800 - 0900	559	5	4	9	4	706	**1287**
PEAK HR	**594**	**5**	**5**	**8**	**4**	**722**	**1338**

R.O.A.R. DATA

Client : SMEC Australia

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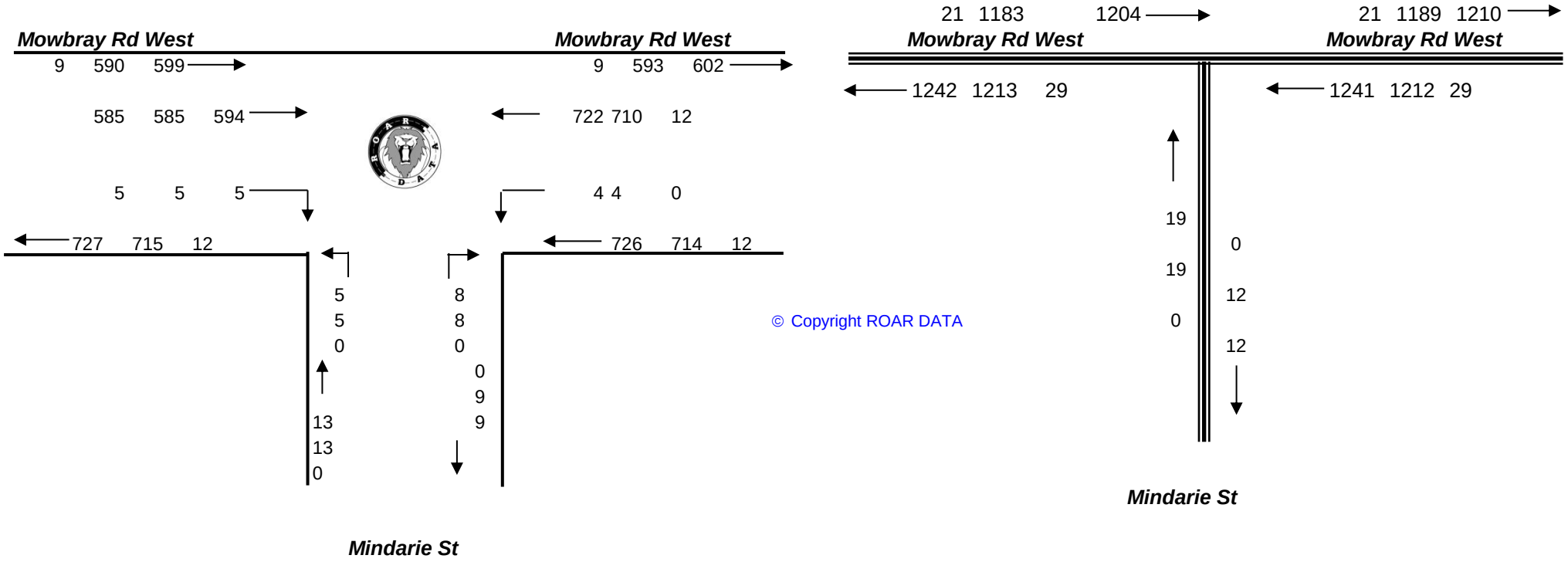
Job No/Name : 3770 Lane Cove North Mowbray Rd
Day/Date : Wednesday 14th September 2011

AM PEAK
0745 - 0845

N

TOTAL VOLUMES FOR COUNT PERIOD



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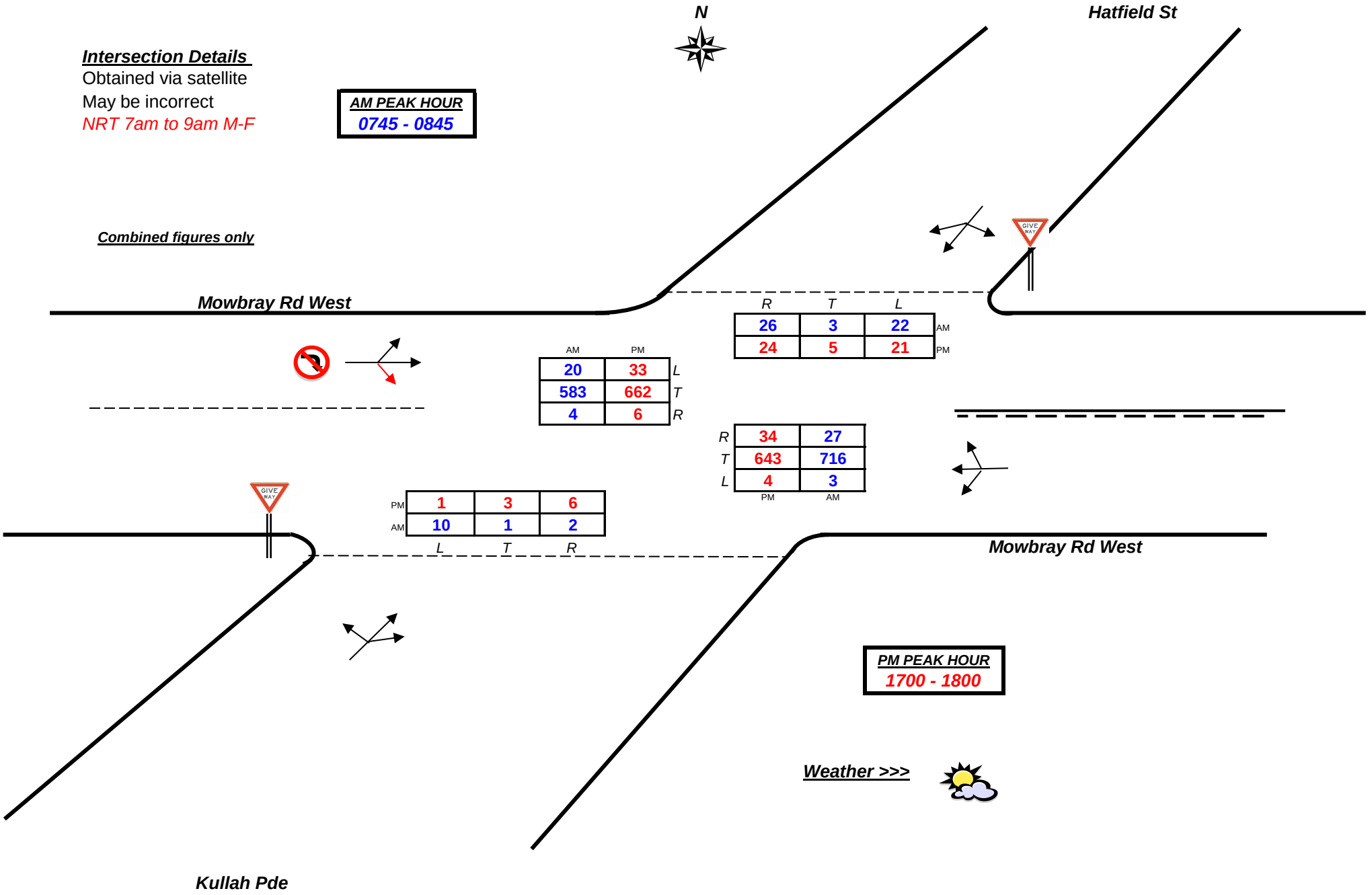
Day/Date : Wednesday 14th September 2011



R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849, Mob.0418-239019

Client : SMEC Australia
Job No/Name : 3770 Lane Cove North Mowbray Rd Precint
Day/Date : Wednesday 14th September 2011

Lights

Time Per	NORTH Hatfield St L	NORTH Hatfield St T	NORTH Hatfield St R	WEST Mowbray Rd West L	WEST Mowbray Rd West T	WEST Mowbray Rd West R	SOUTH Kullah pde L	SOUTH Kullah pde T	SOUTH Kullah pde R	EAST Mowbray Rd West L	EAST Mowbray Rd West T	EAST Mowbray Rd West R	TOT
1500 - 1515	4	0	6	4	87	3	4	1	0	2	142	15	**268**
1515 - 1530	17	1	4	4	102	3	4	0	1	3	124	5	**268**
1530 - 1545	5	0	2	3	73	1	1	0	1	1	148	0	**235**
1545 - 1600	8	0	5	4	83	3	1	1	2	2	135	5	**249**
1600 - 1615	4	0	3	6	116	4	2	0	1	2	147	6	**291**
1615 - 1630	9	3	3	5	88	0	2	1	1	0	173	0	**285**
1630 - 1645	2	1	2	7	111	1	1	0	0	3	130	5	**263**
1645 - 1700	5	0	3	11	148	5	0	0	2	0	141	5	**320**
1700 - 1715	6	1	9	9	146	0	1	1	1	1	134	4	**313**
1715 - 1730	5	3	9	9	178	4	0	0	1	0	176	7	**392**
1730 - 1745	4	0	5	7	176	2	0	1	3	3	174	11	**386**
1745 - 1800	6	1	1	8	155	0	0	1	1	0	152	12	**337**
Period End	**75**	**10**	**52**	**77**	**1463**	**26**	**16**	**6**	**14**	**17**	**1776**	**75**	**3607**

Lights

Peak Time	NORTH Hatfield St L	NORTH Hatfield St T	NORTH Hatfield St R	WEST Mowbray Rd West L	WEST Mowbray Rd West T	WEST Mowbray Rd West R	SOUTH Kullah pde L	SOUTH Kullah pde T	SOUTH Kullah pde R	EAST Mowbray Rd West L	EAST Mowbray Rd West T	EAST Mowbray Rd West R	TOT
1500 - 1600	34	1	17	15	345	10	10	2	4	8	549	25	**1020**
1515 - 1615	34	1	14	17	374	11	8	1	5	8	554	16	**1043**
1530 - 1630	26	3	13	18	360	8	6	2	5	5	603	11	**1060**
1545 - 1645	23	4	13	22	398	8	6	2	4	7	585	16	**1088**
1600 - 1700	20	4	11	29	463	10	5	1	4	5	591	16	**1159**
1615 - 1715	22	5	17	32	493	6	4	2	4	4	578	14	**1181**
1630 - 1730	18	5	23	36	583	10	2	1	4	4	581	21	**1288**
1645 - 1745	20	4	26	36	648	11	1	2	7	4	625	27	**1411**
1700 - 1800	21	5	24	33	655	6	1	3	6	4	636	34	**1428**
PEAK HOUR	**21**	**5**	**24**	**33**	**655**	**6**	**1**	**3**	**6**	**4**	**636**	**34**	**1428**

Heavies

Time Per	NORTH Hatfield St L	NORTH Hatfield St T	NORTH Hatfield St R	WEST Mowbray Rd West L	WEST Mowbray Rd West T	WEST Mowbray Rd West R	SOUTH Kullah pde L	SOUTH Kullah pde T	SOUTH Kullah pde R	EAST Mowbray Rd West L	EAST Mowbray Rd West T	EAST Mowbray Rd West R	TOT
1500 - 1515	0	0	0	0	3	0	0	0	0	0	1	0	**4**
1515 - 1530	0	0	0	0	3	0	0	0	0	0	3	0	**6**
1530 - 1545	0	0	0	0	0	0	0	0	0	0	2	0	**2**
1545 - 1600	1	0	0	0	0	0	0	0	0	0	2	0	**3**
1600 - 1615	1	0	0	0	2	0	0	0	0	0	2	1	**6**
1615 - 1630	0	0	0	0	1	0	0	0	0	0	2	0	**3**
1630 - 1645	0	0	0	0	3	0	0	0	0	0	1	0	**4**
1645 - 1700	0	0	0	0	1	0	0	0	0	0	3	0	**4**
1700 - 1715	0	0	0	0	2	0	0	0	0	0	2	0	**4**
1715 - 1730	0	0	0	0	1	0	0	0	0	0	1	0	**2**
1730 - 1745	0	0	0	0	3	0	0	0	0	0	1	0	**4**
1745 - 1800	0	0	0	0	1	0	0	0	0	0	3	0	**4**
Period End	**2**	**0**	**0**	**0**	**20**	**0**	**0**	**0**	**0**	**0**	**23**	**1**	**46**

Heavies

Peak Per	NORTH Hatfield St L	NORTH Hatfield St T	NORTH Hatfield St R	WEST Mowbray Rd West L	WEST Mowbray Rd West T	WEST Mowbray Rd West R	SOUTH Kullah pde L	SOUTH Kullah pde T	SOUTH Kullah pde R	EAST Mowbray Rd West L	EAST Mowbray Rd West T	EAST Mowbray Rd West R	TOT
1500 - 1600	1	0	0	0	6	0	0	0	0	0	8	0	**15**
1515 - 1615	2	0	0	0	5	0	0	0	0	0	9	1	**17**
1530 - 1630	2	0	0	0	3	0	0	0	0	0	8	1	**14**
1545 - 1645	2	0	0	0	6	0	0	0	0	0	7	1	**16**
1600 - 1700	1	0	0	0	7	0	0	0	0	0	8	1	**17**
1615 - 1715	0	0	0	0	7	0	0	0	0	0	8	0	**15**
1630 - 1730	0	0	0	0	7	0	0	0	0	0	7	0	**14**
1645 - 1745	0	0	0	0	7	0	0	0	0	0	7	0	**14**
1700 - 1800	0	0	0	0	7	0	0	0	0	0	7	0	**14**
PEAK HOUR	**0**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**14**

Combined

Time Per	NORTH Hatfield St L	NORTH Hatfield St T	NORTH Hatfield St R	WEST Mowbray Rd West L	WEST Mowbray Rd West T	WEST Mowbray Rd West R	SOUTH Kullah pde L	SOUTH Kullah pde T	SOUTH Kullah pde R	EAST Mowbray Rd West L	EAST Mowbray Rd West T	EAST Mowbray Rd West R	TOT
1500 - 1515	4	0	6	4	90	3	4	1	0	2	143	15	**272**
1515 - 1530	17	1	4	4	105	3	4	0	1	3	127	5	**274**
1530 - 1545	5	0	2	3	73	1	1	0	1	1	150	0	**237**
1545 - 1600	9	0	5	4	83	3	1	1	2	2	137	5	**252**
1600 - 1615	5	0	3	6	118	4	2	0	1	2	149	7	**297**
1615 - 1630	9	3	3	5	89	0	2	1	1	0	175	0	**288**
1630 - 1645	2	1	2	7	114	1	1	0	0	3	131	5	**267**
1645 - 1700	5	0	3	11	149	5	0	0	2	0	144	5	**324**
1700 - 1715	6	1	9	9	148	0	1	1	1	1	136	4	**317**
1715 - 1730	5	3	9	9	179	4	0	0	1	0	177	7	**394**
1730 - 1745	4	0	5	7	179	2	0	1	3	3	175	11	**390**
1745 - 1800	6	1	1	8	156	0	0	1	1	0	155	12	**341**
Period End	**77**	**10**	**52**	**77**	**1483**	**26**	**16**	**6**	**14**	**17**	**1799**	**76**	**3653**

Combined

Peak Per	NORTH Hatfield St L	NORTH Hatfield St T	NORTH Hatfield St R	WEST Mowbray Rd West L	WEST Mowbray Rd West T	WEST Mowbray Rd West R	SOUTH Kullah pde L	SOUTH Kullah pde T	SOUTH Kullah pde R	EAST Mowbray Rd West L	EAST Mowbray Rd West T	EAST Mowbray Rd West R	TOT
1500 - 1600	35	1	17	15	351	10	10	2	4	8	557	25	**1035**
1515 - 1615	36	1	14	17	379	11	8	1	5	8	563	17	**1060**
1530 - 1630	28	3	13	18	363	8	6	2	5	5	611	12	**1074**
1545 - 1645	25	4	13	22	404	8	6	2	4	7	592	17	**1104**
1600 - 1700	21	4	11	29	470	10	5	1	4	5	599	17	**1176**
1615 - 1715	22	5	17	32	500	6	4	2	4	4	586	14	**1196**
1630 - 1730	18	5	23	36	590	10	2	1	4	4	588	21	**1302**
1645 - 1745	20	4	26	36	655	11	1	2	7	4	632	27	**1425**
1700 - 1800	21	5	24	33	662	6	1	3	6	4	643	34	**1442**
PEAK HOUR	**21**	**5**	**24**	**33**	**662**	**6**	**1**	**3**	**6**	**4**	**643**	**34**	**1442**

R.O.A.R DATA

Reliable, Original & Authentic Results

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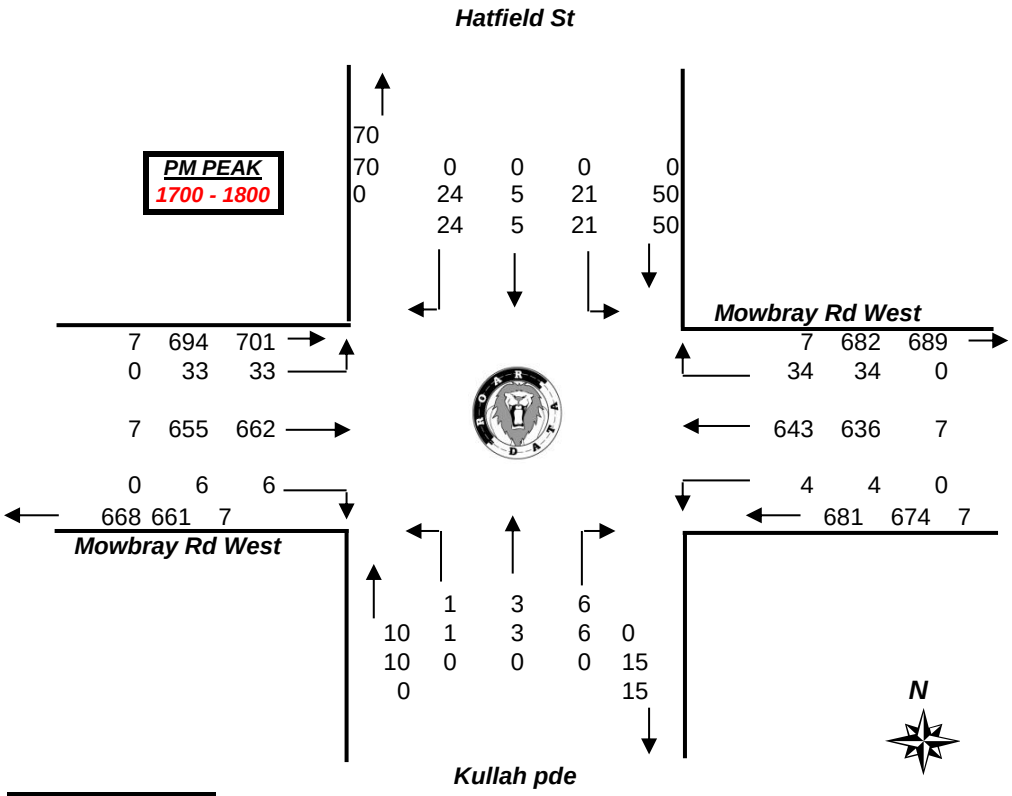
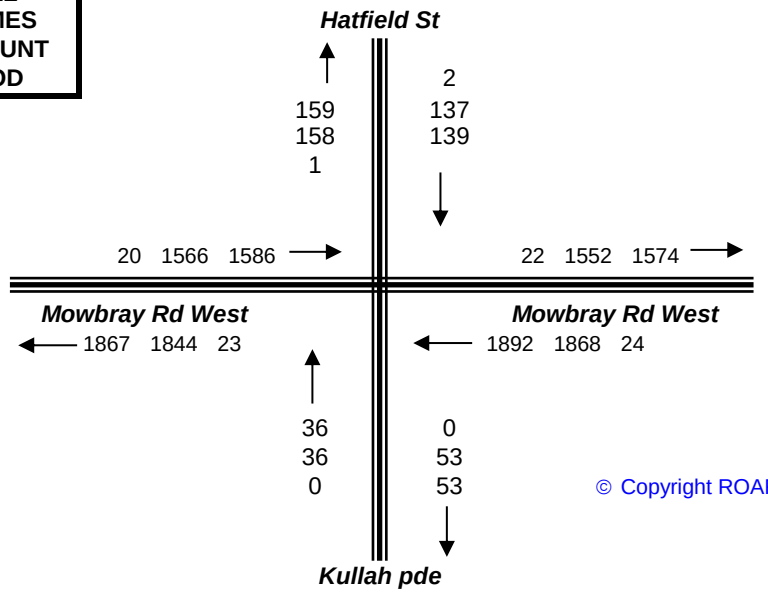
Client : SMEC Australi
Job No/Name : 3770 Lane Cove North Mowbray Rd Precint
Day/Date : Wednesday 14th September 2011

Peds	NORTH	WEST	SOUTH	EAST	
	Hatfield St	*Mowbray Rd*	*Kullah pde*	*Mowbray Rd*	
Time Per	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	TOT
1500 - 1515					0
1515 - 1530					0
1530 - 1545					0
1545 - 1600					0
1600 - 1615					0
1615 - 1630					0
1630 - 1645					0
1645 - 1700					0
1700 - 1715					0
1715 - 1730					0
1730 - 1745					0
1745 - 1800					0
Period End	0	0	0	0	0

Peds	NORTH	WEST	SOUTH	EAST	
	Hatfield St	*Mowbray Rd*	*Kullah pde*	*Mowbray Rd*	
Peak Per	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	TOT
1500 - 1600	0	0	0	0	0
1515 - 1615	0	0	0	0	0
1530 - 1630	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	0
1545 - 1645					0
1600 - 1700	0	0	0	0	0
1615 - 1715	0	0	0	0	0
1630 - 1730	0	0	0	0	0
1645 - 1745	0	0	0	0	0
1700 - 1800	0	0	0	0	0
PEAK HR	0	0	0	0	0



TOTAL VOLUMES FOR COUNT PERIOD



R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849, Mob.0418-239019

Client : SMEC Australia
Job No/Name : 3770 Lane Cove North Mowbray Rd Precint
Day/Date : Wednesday 14th September 2011

Lights

Time Per	NORTH Hatfield St L	T	R	WEST Mowbray Rd West L	T	R	SOUTH Kullah pde L	T	R	EAST Mowbray Rd West L	T	R	TOT
0700 - 0715	3	2	2	2	152	1	1	0	0	0	85	2	**250**
0715 - 0730	0	2	4	5	160	0	3	1	2	0	102	6	**285**
0730 - 0745	4	1	7	4	153	1	4	1	2	2	145	4	**328**
0745 - 0800	5	1	6	7	149	1	6	0	0	2	165	5	**347**
0800 - 0815	8	0	9	4	128	0	1	0	2	0	168	9	**329**
0815 - 0830	3	2	6	4	154	1	1	0	0	1	206	2	**380**
0830 - 0845	6	0	5	5	143	2	2	1	0	0	165	11	**340**
0845 - 0900	3	0	11	9	126	3	1	0	0	1	150	13	**317**
Period End	**32**	**8**	**50**	**40**	**1165**	**9**	**19**	**3**	**6**	**6**	**1186**	**52**	**2576**

Lights

Peak Time	NORTH Hatfield St L	T	R	WEST Mowbray Rd West L	T	R	SOUTH Kullah pde L	T	R	EAST Mowbray Rd West L	T	R	TOT
0700 - 0800	12	6	19	18	614	3	14	2	4	4	497	17	**1210**
0715 - 0815	17	4	26	20	590	2	14	2	6	4	580	24	**1289**
0730 - 0830	20	4	28	19	584	3	12	1	4	5	684	20	**1384**
0745 - 0845	22	3	26	20	574	4	10	1	2	3	704	27	**1396**
0800 - 0900	20	2	31	22	551	6	5	1	2	2	689	35	**1366**
PEAK HOUR	**22**	**3**	**26**	**20**	**574**	**4**	**10**	**1**	**2**	**3**	**704**	**27**	**1396**

Heavies

Time Per	NORTH Hatfield St L	T	R	WEST Mowbray Rd West L	T	R	SOUTH Kullah pde L	T	R	EAST Mowbray Rd West L	T	R	TOT
0700 - 0715	0	0	0	0	3	0	0	0	0	0	5	0	**8**
0715 - 0730	0	0	0	0	4	0	0	0	0	0	2	0	**6**
0730 - 0745	0	0	0	0	2	0	0	0	0	0	6	0	**8**
0745 - 0800	0	0	0	0	3	0	0	0	0	0	3	0	**6**
0800 - 0815	0	0	0	0	1	0	0	0	0	0	4	0	**5**
0815 - 0830	0	0	0	0	2	0	0	0	0	0	2	0	**4**
0830 - 0845	0	0	0	0	3	0	0	0	0	0	3	0	**6**
0845 - 0900	0	0	0	0	4	0	0	0	0	0	3	1	**8**
Period End	**0**	**0**	**0**	**0**	**22**	**0**	**0**	**0**	**0**	**0**	**28**	**1**	**51**

Heavies

Peak Per	NORTH Hatfield St L	T	R	WEST Mowbray Rd West L	T	R	SOUTH Kullah pde L	T	R	EAST Mowbray Rd West L	T	R	TOT
0700 - 0800	0	0	0	0	12	0	0	0	0	0	16	0	**28**
0715 - 0815	0	0	0	0	10	0	0	0	0	0	15	0	**25**
0730 - 0830	0	0	0	0	8	0	0	0	0	0	15	0	**23**
0745 - 0845	0	0	0	0	9	0	0	0	0	0	12	0	**21**
0800 - 0900	0	0	0	0	10	0	0	0	0	0	12	1	**23**
PEAK HOUR	**0**	**0**	**0**	**0**	**9**	**0**	**0**	**0**	**0**	**0**	**12**	**0**	**21**

Combined

Time Per	NORTH Hatfield St L	T	R	WEST Mowbray Rd West L	T	R	SOUTH Kullah pde L	T	R	EAST Mowbray Rd West L	T	R	TOT
0700 - 0715	3	2	2	2	155	1	1	0	0	0	90	2	**258**
0715 - 0730	0	2	4	5	164	0	3	1	2	0	104	6	**291**
0730 - 0745	4	1	7	4	155	1	4	1	2	2	151	4	**336**
0745 - 0800	5	1	6	7	152	1	6	0	0	2	168	5	**353**
0800 - 0815	8	0	9	4	129	0	1	0	2	0	172	9	**334**
0815 - 0830	3	2	6	4	156	1	1	0	0	1	208	2	**384**
0830 - 0845	6	0	5	5	146	2	2	1	0	0	168	11	**346**
0845 - 0900	3	0	11	9	130	3	1	0	0	1	153	14	**325**
Period End	**32**	**8**	**50**	**40**	**1187**	**9**	**19**	**3**	**6**	**6**	**1214**	**53**	**2627**

Combined

Peak Per	NORTH Hatfield St L	T	R	WEST Mowbray Rd West L	T	R	SOUTH Kullah pde L	T	R	EAST Mowbray Rd West L	T	R	TOT
0700 - 0800	12	6	19	18	626	3	14	2	4	4	513	17	**1238**
0715 - 0815	17	4	26	20	600	2	14	2	6	4	595	24	**1314**
0730 - 0830	20	4	28	19	592	3	12	1	4	5	699	20	**1407**
0745 - 0845	22	3	26	20	583	4	10	1	2	3	716	27	**1417**
0800 - 0900	20	2	31	22	561	6	5	1	2	2	701	36	**1389**
PEAK HOUR	**22**	**3**	**26**	**20**	**583**	**4**	**10**	**1**	**2**	**3**	**716**	**27**	**1417**

R.O.A.R DATA

Reliable, Original & Authentic Results

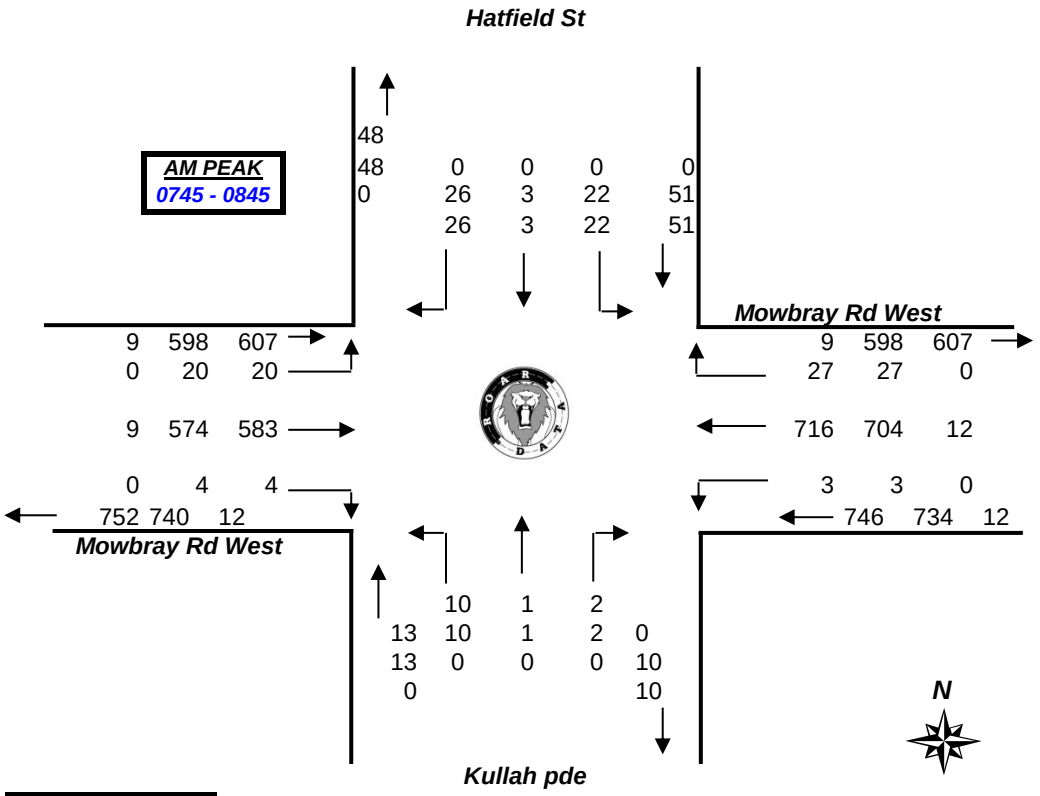
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : SMEC Australia
Job No/Name : 3770 Lane Cove North Mowbray Rd Precint
Day/Date : Wednesday 14th September 2011

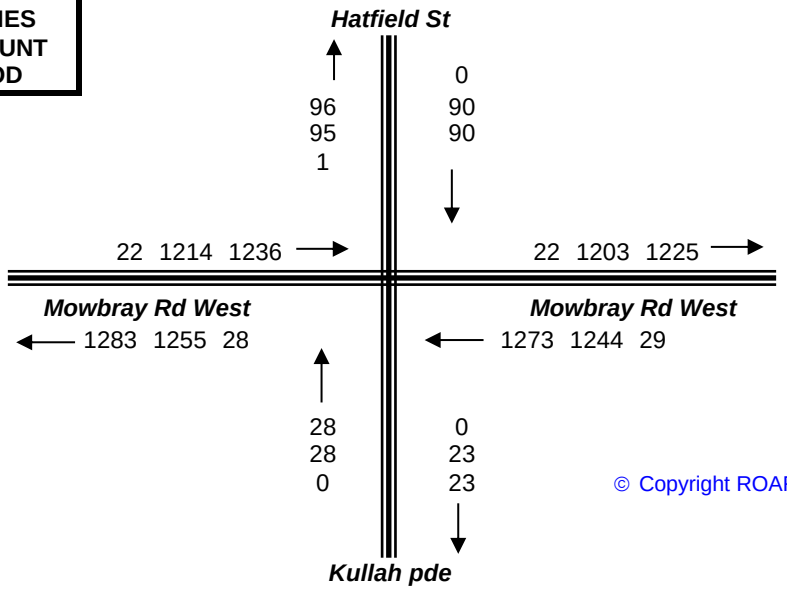
Peds	NORTH	WEST	SOUTH	EAST	
	Hatfield St	*Mowbray Rd West*	*Kullah pde*	*Mowbray Rd West*	
Time Per	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	TOT
0700 - 0715					0
0715 - 0730					0
0730 - 0745	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	0
0745 - 0800					0
0800 - 0815					0
0815 - 0830					0
0830 - 0845					0
0845 - 0900					0
Period End	0	0	0	0	0

Peds	NORTH	WEST	SOUTH	EAST	
	Hatfield St	*Mowbray Rd West*	*Kullah pde*	*Mowbray Rd West*	
Peak Per	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	TOT
0700 - 0800	0	0	0	0	0
0715 - 0815	0	0	0	0	0
0730 - 0830	0	0	0	0	0
0745 - 0845	0	0	0	0	0
0800 - 0900	0	0	0	0	0

PEAK HR	0	0	0	0	0



TOTAL VOLUMES FOR COUNT PERIOD



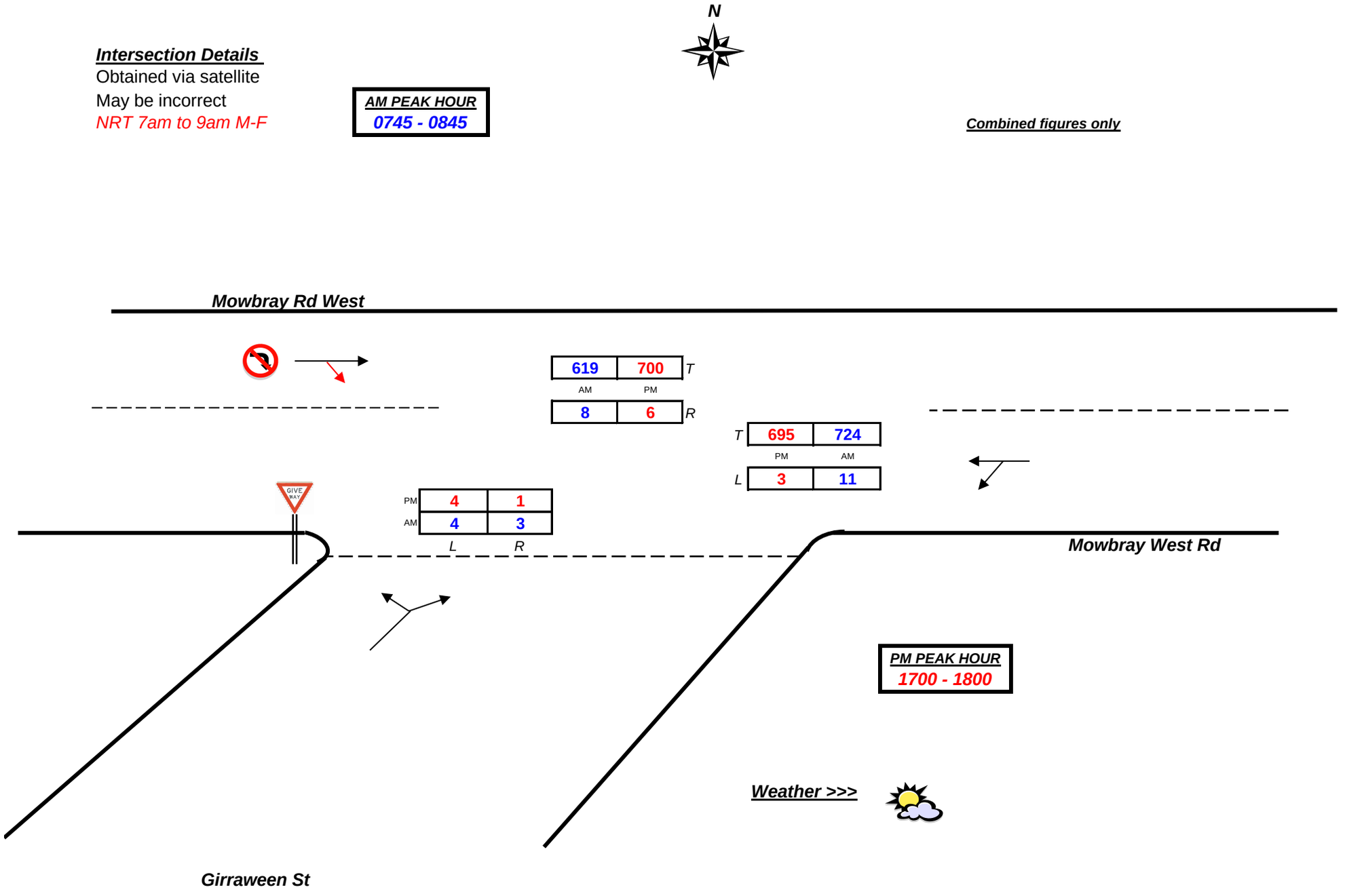
R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : SMEC Australia
Job No/Name : 3770 Lane Cove North Mowbray Rd Precint
Day/Date : Wednesday 14th September 2011

Intersection Details
Obtained via satellite
May be incorrect
NRT 7am to 9am M-F

AM PEAK HOUR
0745 - 0845

Combined figures only



R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849.
Mobile.0418239019

Client : SMEC Australia
Job No/Name : 3770 Lane Cove North Mowbray Rd
Day/Date : Wednesday 14th September 2011

PEDS	WEST	SOUTH	EAST	
Time Per	*Mowbray Rd*	*Girraween St*	*Mowbray Rd*	TOT
1500 - 1515				**0**
1515 - 1530				**0**
1530 - 1545	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	**0**
1545 - 1600				**0**
1600 - 1615				**0**
1615 - 1630				**0**
1630 - 1645				**0**
1645 - 1700				**0**
1700 - 1715				**0**
1715 - 1730				**0**
1730 - 1745				**0**
1745 - 1800				**0**
Per End	**0**	**0**	**0**	**0**

PEDS	WEST	SOUTH	EAST	
Peak Per	*Mowbray Rd*	*Girraween St*	*Mowbray Rd*	TOT
1500 - 1600	0	0	0	**0**
1515 - 1615	0	0	0	**0**
1530 - 1630	0	0	0	**0**
1545 - 1645	0	0	0	**0**
1600 - 1700	0	0	0	**0**
1615 - 1715	0	0	0	**0**
1630 - 1730	0	0	0	**0**
1645 - 1745	0	0	0	**0**
1700 - 1800	0	0	0	**0**
PEAK HR	**0**	**0**	**0**	**0**

Lights	WEST		SOUTH		EAST		
	Mowbray Rd		*Girraween St*		*Mowbray Rd*		
Time Per	T	R	L	R	L	T	TOT
1500 - 1515	96	1	1	1	3	160	**262**
1515 - 1530	120	0	1	1	2	132	**256**
1530 - 1545	79	1	0	2	0	149	**231**
1545 - 1600	106	1	2	0	3	152	**264**
1600 - 1615	114	1	0	0	0	147	**262**
1615 - 1630	99	2	0	0	1	172	**274**
1630 - 1645	106	4	0	0	2	130	**242**
1645 - 1700	141	2	2	0	2	128	**275**
1700 - 1715	150	1	1	0	1	153	**306**
1715 - 1730	185	3	1	1	1	184	**375**
1730 - 1745	187	1	2	0	0	192	**382**
1745 - 1800	171	1	0	0	1	159	**332**
Per End	**1554**	**18**	**10**	**5**	**16**	**1858**	**3461**

Heavies	WEST		SOUTH		EAST		
	Mowbray Rd		*Girraween St*		*Mowbray Rd*		
Time Per	T	R	L	R	L	T	TOT
1500 - 1515	3	0	0	0	0	1	**4**
1515 - 1530	2	0	0	0	0	3	**5**
1530 - 1545	1	0	0	0	0	2	**3**
1545 - 1600	1	0	0	0	0	2	**3**
1600 - 1615	3	0	0	0	0	2	**5**
1615 - 1630	1	0	0	0	0	2	**3**
1630 - 1645	3	0	0	0	0	1	**4**
1645 - 1700	1	0	0	0	0	2	**3**
1700 - 1715	2	0	0	0	0	1	**3**
1715 - 1730	0	0	0	0	0	1	**1**
1730 - 1745	3	0	0	0	0	1	**4**
1745 - 1800	2	0	0	0	0	4	**6**
Per End	**22**	**0**	**0**	**0**	**0**	**22**	**44**

Combined	WEST		SOUTH		EAST		
	Mowbray Rd		*Girraween St*		*Mowbray Rd*		
Time Per	T	R	L	R	L	T	TOT
1500 - 1515	99	1	1	1	3	161	**266**
1515 - 1530	122	0	1	1	2	135	**261**
1530 - 1545	80	1	0	2	0	151	**234**
1545 - 1600	107	1	2	0	3	154	**267**
1600 - 1615	117	1	0	0	0	149	**267**
1615 - 1630	100	2	0	0	1	174	**277**
1630 - 1645	109	4	0	0	2	131	**246**
1645 - 1700	142	2	2	0	2	130	**278**
1700 - 1715	152	1	1	0	1	154	**309**
1715 - 1730	185	3	1	1	1	185	**376**
1730 - 1745	190	1	2	0	0	193	**386**
1745 - 1800	173	1	0	0	1	163	**338**
Per End	**1576**	**18**	**10**	**5**	**16**	**1880**	**3505**

Lights	WEST		SOUTH		EAST		
	Mowbray Rd		*Girraween St*		*Mowbray Rd*		
Peak Per	T	R	L	R	L	T	TOT
1500 - 1600	401	3	4	4	8	593	**1013**
1515 - 1615	419	3	3	3	5	580	**1013**
1530 - 1630	398	5	2	2	4	620	**1031**
1545 - 1645	425	8	2	0	6	601	**1042**
1600 - 1700	460	9	2	0	5	577	**1053**
1615 - 1715	496	9	3	0	6	583	**1097**
1630 - 1730	582	10	4	1	6	595	**1198**
1645 - 1745	663	7	6	1	4	657	**1338**
1700 - 1800	693	6	4	1	3	688	**1395**
2021DN	0.895	0.867	0.833	0.667	0	0.865	
2021DN	620.3	5.2	3.333	0.667	0	594.9	

Heavies	WEST		SOUTH		EAST		
	Mowbray Rd		*Girraween St*		*Mowbray Rd*		
Peak Per	T	R	L	R	L	T	TOT
1500 - 1600	7	0	0	0	0	8	**15**
1515 - 1615	7	0	0	0	0	9	**16**
1530 - 1630	6	0	0	0	0	8	**14**
1545 - 1645	8	0	0	0	0	7	**15**
1600 - 1700	8	0	0	0	0	7	**15**
1615 - 1715	7	0	0	0	0	6	**13**
1630 - 1730	6	0	0	0	0	5	**11**
1645 - 1745	6	0	0	0	0	5	**11**
1700 - 1800	7	0	0	0	0	7	**14**
2021DN	0.938	1	1	1	1	0.857	
2021DN	6.563	0	0	0	0	6	

Combined	WEST		SOUTH		EAST		
	Mowbray Rd		*Girraween St*		*Mowbray Rd*		
Peak Per	T	R	L	R	L	T	TOT
1500 - 1600	408	3	4	4	8	601	**1028**
1515 - 1615	426	3	3	3	5	589	**1029**
1530 - 1630	404	5	2	2	4	628	**1045**
1545 - 1645	433	8	2	0	6	608	**1057**
1600 - 1700	468	9	2	0	5	584	**1068**
1615 - 1715	503	9	3	0	6	589	**1110**
1630 - 1730	588	10	4	1	6	600	**1209**
1645 - 1745	669	7	6	1	4	662	**1349**
1700 - 1800	700	6	4	1	3	695	**1409**

2021LEP	1.07	6.2	2.17	1.33	11	1.02
2021LEP	745	37.2	8.67	1.33	33	704

2021LEP	0.75	1	1	1	0	0.93
2021LEP	5.25	0	0	0	0	6.5

PEAK HR	693	6	4	1	3	688	1395

PEAK HR	7	0	0	0	0	7	14

PEAK HR	700	6	4	1	3	695	1409

R.O.A.R. DATA

Reliable, Original & Authentic Results

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Client : SMEC Australia

Job No/Name : 3770 Lane Cove North Mowbray Rd

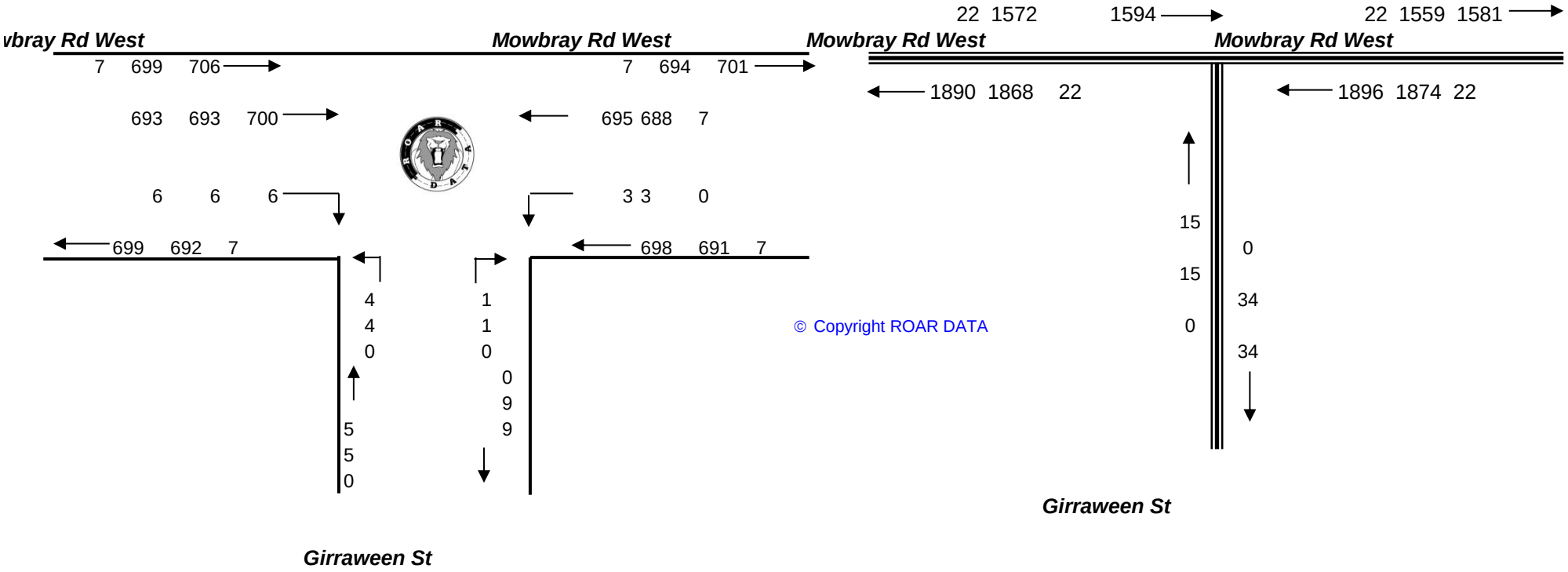
Day/Date : Wednesday 14th September 2011

PM PEAK

1700 - 1800

N

TOTAL VOLUMES FOR COUNT PERIOD



R.O.A.R. DATA

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Ph.88196847, Fax 88196849.
Mobile.0418239019

Client : SMEC Australia
Job No/Name : 3770 Lane Cove North Mowbray Rd
Day/Date : Wednesday 14th September 2011

PEDS	WEST	SOUTH	EAST	
Time Per	*Mowbray Rd*	*Girraween St*	*Mowbray Rd*	TOT
0700 - 0715				**0**
0715 - 0730				**0**
0730 - 0745	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	**0**
0745 - 0800				**0**
0800 - 0815				**0**
0815 - 0830				**0**
0830 - 0845				**0**
0845 - 0900				**0**
Per End	**0**	**0**	**0**	**0**

PEDS	WEST	SOUTH	EAST	
Peak Per	*Mowbray Rd*	*Girraween St*	*Mowbray Rd*	TOT
0700 - 0800	0	0	0	**0**
0715 - 0815	0	0	0	**0**
0730 - 0830	0	0	0	**0**
0745 - 0845	0	0	0	**0**
0800 - 0900	0	0	0	**0**
PEAK HR	**0**	**0**	**0**	**0**

Lights	WEST		SOUTH		EAST		
	Mowbray Rd		*Girraween St*		*Mowbray Rd*		
Time Per	T	R	L	R	L	T	TOT
0700 - 0715	164	0	0	0	0	83	**247**
0715 - 0730	147	2	0	0	1	107	**257**
0730 - 0745	181	2	0	0	6	144	**333**
0745 - 0800	161	2	2	0	1	181	**347**
0800 - 0815	135	3	2	1	2	157	**300**
0815 - 0830	142	1	0	0	4	181	**328**
0830 - 0845	172	2	0	2	4	193	**373**
0845 - 0900	123	2	2	1	3	171	**302**
Per End	**1225**	**14**	**6**	**4**	**21**	**1217**	**2487**

Heavies	WEST		SOUTH		EAST		
	Mowbray Rd		*Girraween St*		*Mowbray Rd*		
Time Per	T	R	L	R	L	T	TOT
0700 - 0715	3	0	0	0	0	5	**8**
0715 - 0730	4	0	0	0	0	2	**6**
0730 - 0745	2	0	0	0	0	6	**8**
0745 - 0800	3	0	0	0	0	3	**6**
0800 - 0815	1	0	0	0	0	4	**5**
0815 - 0830	2	0	0	0	0	2	**4**
0830 - 0845	3	0	0	0	0	3	**6**
0845 - 0900	5	0	0	0	0	4	**9**
Per End	**23**	**0**	**0**	**0**	**0**	**29**	**52**

Combined	WEST		SOUTH		EAST		
	Mowbray Rd		*Girraween St*		*Mowbray Rd*		
Time Per	T	R	L	R	L	T	TOT
0700 - 0715	167	0	0	0	0	88	**255**
0715 - 0730	151	2	0	0	1	109	**263**
0730 - 0745	183	2	0	0	6	150	**341**
0745 - 0800	164	2	2	0	1	184	**353**
0800 - 0815	136	3	2	1	2	161	**305**
0815 - 0830	144	1	0	0	4	183	**332**
0830 - 0845	175	2	0	2	4	196	**379**
0845 - 0900	128	2	2	1	3	175	**311**
Per End	**1248**	**14**	**6**	**4**	**21**	**1246**	**2539**

Lights	WEST		SOUTH		EAST		
	Mowbray Rd		*Girraween St*		*Mowbray Rd*		
Peak Per	T	R	L	R	L	T	TOT
0700 - 0800	653	6	2	0	8	515	**1184**
0715 - 0815	624	9	4	1	10	589	**1237**
0730 - 0830	619	8	4	1	13	663	**1308**
0745 - 0845	610	8	4	3	11	712	**1348**
0800 - 0900	572	8	4	4	13	702	**1303**
2021DN	1.044	#N/A	0.765	0.5	1	0.943	
2021Dn	597	#N/A	3.059	2	13	662.1	
2021LEP	1.319	#N/A	5.882	4	3.333	1.156	
2021LEP	754.6	#N/A	23.53	16	43.33	811.8	
PEAK HR	**610**	**8**	**4**	**3**	**11**	**712**	**1348**

Heavies	WEST		SOUTH		EAST		
	Mowbray Rd		*Girraween St*		*Mowbray Rd*		
Peak Per	T	R	L	R	L	T	TOT
0700 - 0800	12	0	0	0	0	16	**28**
0715 - 0815	10	0	0	0	0	15	**25**
0730 - 0830	8	0	0	0	0	15	**23**
0745 - 0845	9	0	0	0	0	12	**21**
0800 - 0900	11	0	0	0	0	13	**24**
	1.1	#N/A	1	1	1	2.25	
	12.1	#N/A	0	0	0	29.25	
	0.018	#N/A	0.059	0	0	0.026	
	0.196	#N/A	0	0	0	0.333	
PEAK HR	**9**	**0**	**0**	**0**	**0**	**12**	**21**

Combined	WEST		SOUTH		EAST		
	Mowbray Rd		*Girraween St*		*Mowbray Rd*		
Peak Per	T	R	L	R	L	T	TOT
0700 - 0800	665	6	2	0	8	531	**1212**
0715 - 0815	634	9	4	1	10	604	**1262**
0730 - 0830	627	8	4	1	13	678	**1331**
0745 - 0845	619	8	4	3	11	724	**1369**
0800 - 0900	583	8	4	4	13	715	**1327**
PEAK HR	**619**	**8**	**4**	**3**	**11**	**724**	**1369**

R.O.A.R. DATA

Client : SMEC Australia

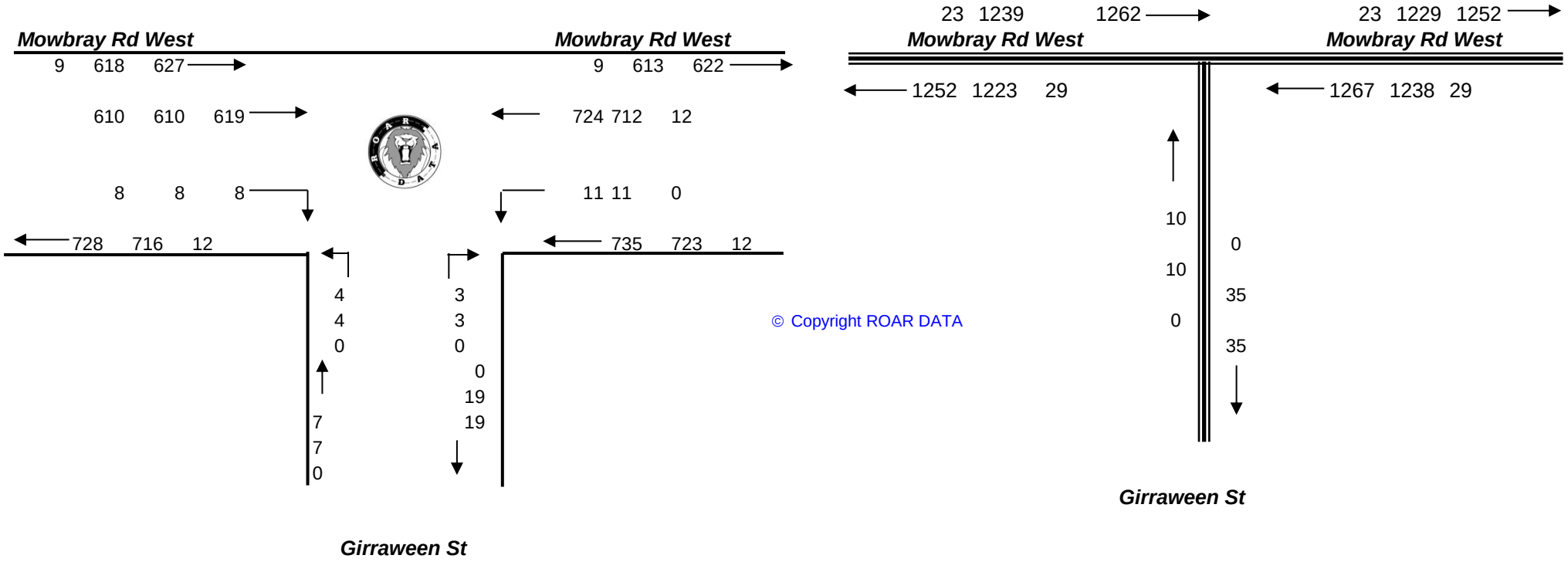
Reliable, Original & Authentic Results
Ph.88196847, Fax 88196849, Mob.0418-239019

Job No/Name : 3770 Lane Cove North Mowbray Rd
Day/Date : Wednesday 14th September 2011

AM PEAK
0745 - 0845

N

TOTAL VOLUMES FOR COUNT PERIOD



R.O.A.R. DATA
Reliable, Original & Authentic Results
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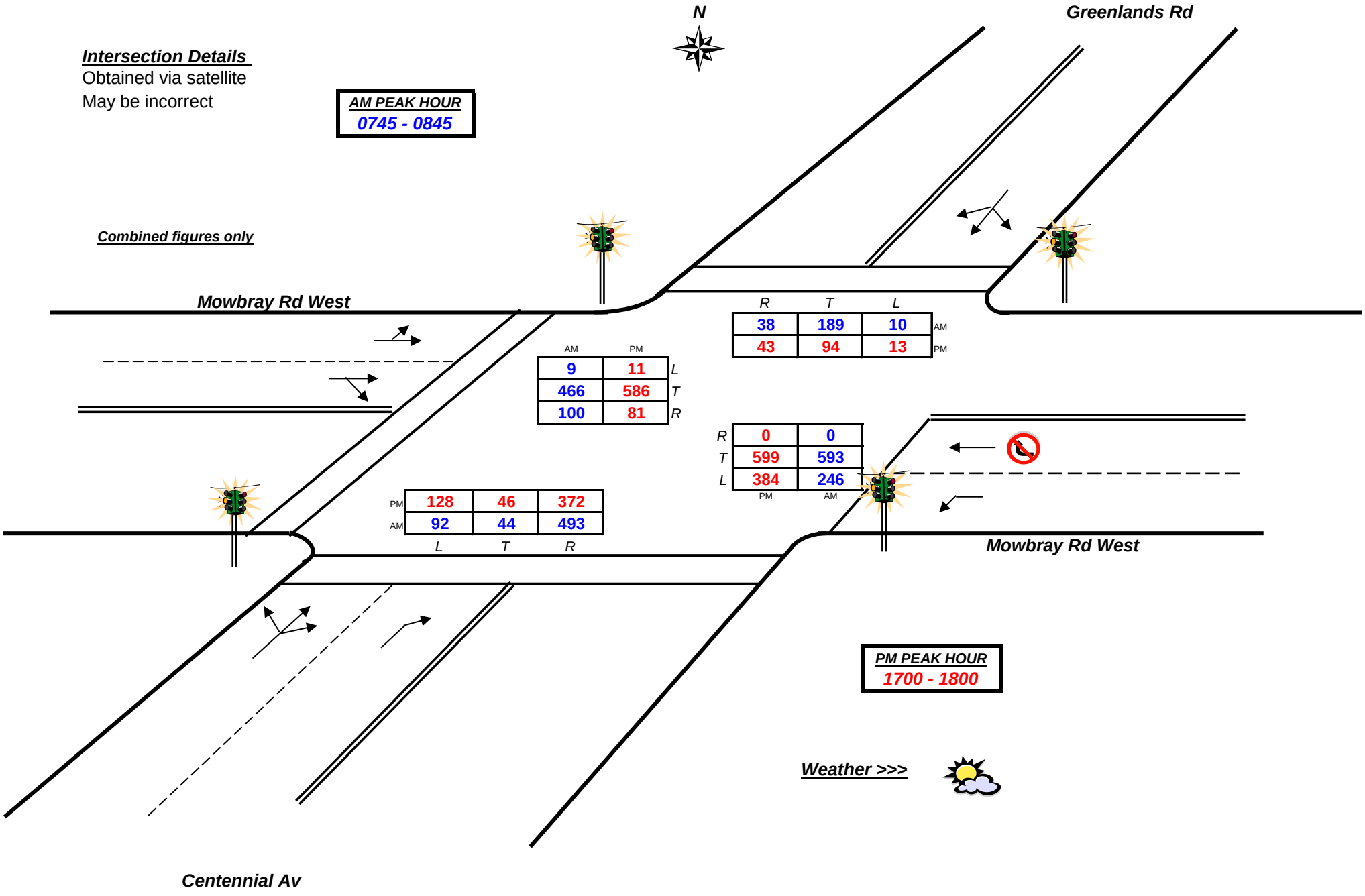


R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849, Mob.0418-239019

Client : SMEC Australia
Job No/Name : 3770 Lane Cove North Mowbray Rd Precint
Day/Date : Wednesday 14th September 2011

Lights

Time Per	NORTH *Greenlands Rd*			WEST *Mowbray Rd West*			SOUTH *Centennial Av*			EAST *Mowbray Rd West*			
	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1500 - 1515	1	15	6	2	74	26	30	3	71	65	131	0	**424**
1515 - 1530	5	23	6	6	107	15	27	3	64	58	126	0	**440**
1530 - 1545	1	25	5	2	70	16	14	4	92	81	127	0	**437**
1545 - 1600	3	17	7	1	86	14	25	8	65	73	144	0	**443**
1600 - 1615	1	10	8	0	97	15	35	8	78	92	136	0	**480**
1615 - 1630	0	12	8	1	90	15	24	9	80	81	143	0	**463**
1630 - 1645	3	20	11	2	93	14	28	10	77	85	122	0	**465**
1645 - 1700	1	12	3	3	116	16	32	9	79	75	114	0	**460**
1700 - 1715	3	19	9	2	134	21	33	15	100	94	137	0	**567**
1715 - 1730	4	25	17	2	142	15	25	8	96	97	152	0	**583**
1730 - 1745	3	33	8	5	156	20	32	14	98	87	155	0	**611**
1745 - 1800	3	17	9	2	147	25	38	9	77	105	147	0	**579**
Period End	**28**	**228**	**97**	**28**	**1312**	**212**	**343**	**100**	**977**	**993**	**1634**	**0**	**5952**

Lights

Peak Time	NORTH *Greenlands Rd*			WEST *Mowbray Rd West*			SOUTH *Centennial Av*			EAST *Mowbray Rd West*			
	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1500 - 1600	10	80	24	11	337	71	96	18	292	277	528	0	**1744**
1515 - 1615	10	75	26	9	360	60	101	23	299	304	533	0	**1800**
1530 - 1630	5	64	28	4	343	60	98	29	315	327	550	0	**1823**
1545 - 1645	7	59	34	4	366	58	112	35	300	331	545	0	**1851**
1600 - 1700	5	54	30	6	396	60	119	36	314	333	515	0	**1868**
1615 - 1715	7	63	31	8	433	66	117	43	336	335	516	0	**1955**
1630 - 1730	11	76	40	9	485	66	118	42	352	351	525	0	**2075**
1645 - 1745	11	89	37	12	548	72	122	46	373	353	558	0	**2221**
1700 - 1800	13	94	43	11	579	81	128	46	371	383	591	0	**2340**
PEAK HOUR	**13**	**94**	**43**	**11**	**579**	**81**	**128**	**46**	**371**	**383**	**591**	**0**	**2340**

Heavies

Time Per	NORTH *Greenlands Rd*			WEST *Mowbray Rd West*			SOUTH *Centennial Av*			EAST *Mowbray Rd West*			
	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1500 - 1515	0	0	0	0	3	0	0	0	2	0	2	0	**7**
1515 - 1530	0	0	0	0	3	0	0	0	1	0	2	0	**6**
1530 - 1545	0	0	0	0	1	0	0	0	0	0	3	0	**4**
1545 - 1600	0	0	0	0	0	0	0	0	0	0	2	0	**2**
1600 - 1615	0	0	0	0	2	1	1	0	0	0	1	0	**5**
1615 - 1630	0	0	0	0	0	0	0	0	2	0	1	0	**3**
1630 - 1645	0	0	0	0	3	1	0	0	0	0	1	0	**5**
1645 - 1700	0	0	0	0	1	0	0	0	0	1	3	0	**5**
1700 - 1715	0	0	0	0	2	0	0	0	1	0	2	0	**5**
1715 - 1730	0	0	0	0	0	0	0	0	0	0	2	0	**2**
1730 - 1745	0	0	0	0	3	0	0	0	0	0	1	0	**4**
1745 - 1800	0	0	0	0	2	0	0	0	0	1	3	0	**6**
Period End	**0**	**0**	**0**	**0**	**20**	**2**	**1**	**0**	**6**	**2**	**23**	**0**	**54**

Heavies

Peak Per	NORTH *Greenlands Rd*			WEST *Mowbray Rd West*			SOUTH *Centennial Av*			EAST *Mowbray Rd West*			
	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1500 - 1600	0	0	0	0	7	0	0	0	3	0	9	0	**19**
1515 - 1615	0	0	0	0	6	1	1	0	1	0	8	0	**17**
1530 - 1630	0	0	0	0	3	1	1	0	2	0	7	0	**14**
1545 - 1645	0	0	0	0	5	2	1	0	2	0	5	0	**15**
1600 - 1700	0	0	0	0	6	2	1	0	2	1	6	0	**18**
1615 - 1715	0	0	0	0	6	1	0	0	3	1	7	0	**18**
1630 - 1730	0	0	0	0	6	1	0	0	1	1	8	0	**17**
1645 - 1745	0	0	0	0	6	0	0	0	1	1	8	0	**16**
1700 - 1800	0	0	0	0	7	0	0	0	1	1	8	0	**17**
PEAK HOUR	**0**	**0**	**0**	**1**	**7**	**0**	**0**	**0**	**1**	**1**	**8**	**0**	**17**

Combined

Time Per	NORTH *Greenlands Rd*			WEST *Mowbray Rd West*			SOUTH *Centennial Av*			EAST *Mowbray Rd West*			
	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1500 - 1515	1	15	6	2	77	26	30	3	73	65	133	0	**431**
1515 - 1530	5	23	6	6	110	15	27	3	65	58	128	0	**446**
1530 - 1545	1	25	5	2	71	16	14	4	92	81	130	0	**441**
1545 - 1600	3	17	7	1	86	14	25	8	65	73	146	0	**445**
1600 - 1615	1	10	8	0	99	16	36	8	78	92	137	0	**485**
1615 - 1630	0	12	8	1	90	15	24	9	82	81	144	0	**466**
1630 - 1645	3	20	11	2	96	15	28	10	77	85	123	0	**470**
1645 - 1700	1	12	3	3	117	16	32	9	79	76	117	0	**465**
1700 - 1715	3	19	9	2	136	21	33	15	101	94	139	0	**572**
1715 - 1730	4	25	17	2	142	15	25	8	96	97	154	0	**585**
1730 - 1745	3	33	8	5	159	20	32	14	98	87	156	0	**615**
1745 - 1800	3	17	9	2	149	25	38	9	77	106	150	0	**585**
Period End	**28**	**228**	**97**	**28**	**1332**	**214**	**344**	**100**	**983**	**995**	**1657**	**0**	**6006**

Combined

Peak Per	NORTH *Greenlands Rd*			WEST *Mowbray Rd West*			SOUTH *Centennial Av*			EAST *Mowbray Rd West*			
	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1500 - 1600	10	80	24	11	344	71	96	18	295	277	537	0	**1763**
1515 - 1615	10	75	26	9	366	61	102	23	300	304	541	0	**1817**
1530 - 1630	5	64	28	4	346	61	99	29	317	327	557	0	**1837**
1545 - 1645	7	59	34	4	371	60	113	35	302	331	550	0	**1866**
1600 - 1700	5	54	30	6	402	62	120	36	316	334	521	0	**1886**
1615 - 1715	7	63	31	8	439	67	117	43	339	336	523	0	**1973**
1630 - 1730	11	76	40	9	491	67	118	42	353	352	533	0	**2092**
1645 - 1745	11	89	37	12	554	72	122	46	374	354	566	0	**2237**
1700 - 1800	13	94	43	11	586	81	128	46	372	384	599	0	**2357**
PEAK HOUR	**13**	**94**	**43**	**11**	**586**	**81**	**128**	**46**	**372**	**384**	**599**	**0**	**2357**

R.O.A.R DATA

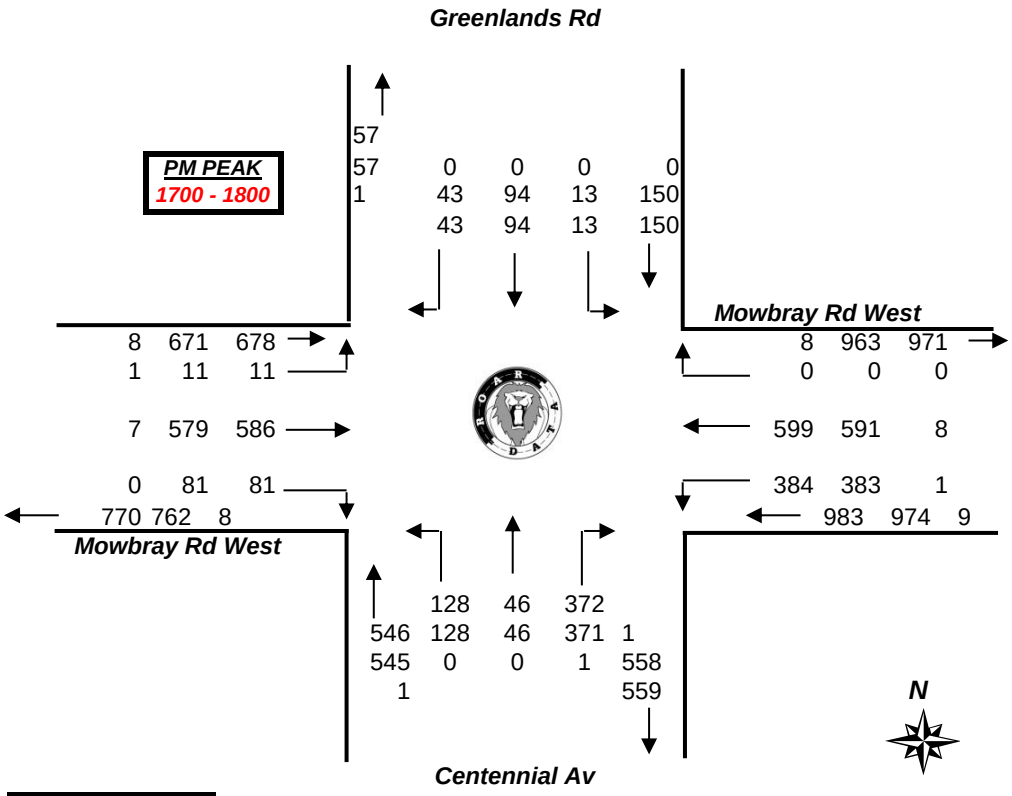
Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849, Mob.0418-239019

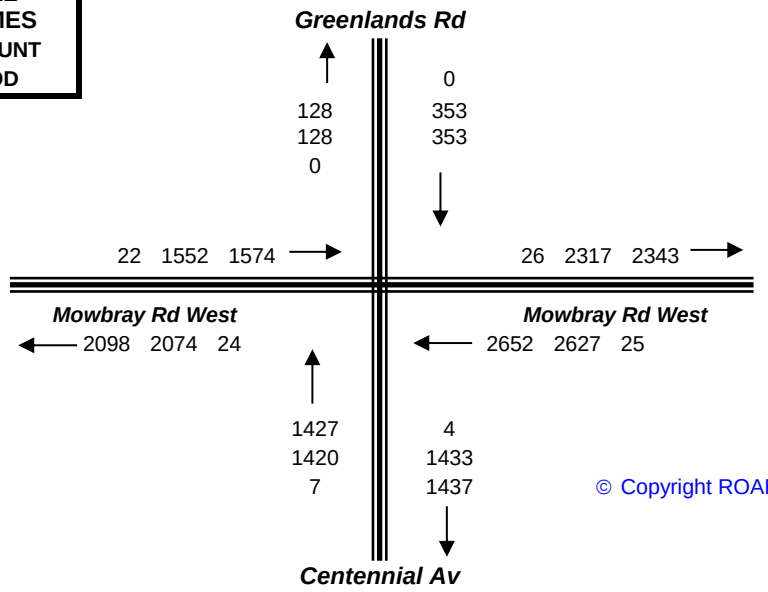
Client : SMEC Australi
Job No/Name : 3770 Lane Cove North Mowbray Rd Precint
Day/Date : Wednesday 14th September 2011

Peds	NORTH	WEST	SOUTH	EAST	
	Greenlands Rd	*Mowbray Rd*	*Centennial Av*	*Mowbray Rd*	
Time Per	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	TOT
1500 - 1515					0
1515 - 1530					0
1530 - 1545	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	0
1545 - 1600					0
1600 - 1615					0
1615 - 1630					0
1630 - 1645					0
1645 - 1700					0
1700 - 1715					0
1715 - 1730					0
1730 - 1745					0
1745 - 1800					0
Period End	0	0	0	0	0

Peds	NORTH	WEST	SOUTH	EAST	
	Greenlands Rd	*Mowbray Rd*	*Centennial Av*	*Mowbray Rd*	
Peak Per	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	TOT
1500 - 1600	0	0	0	0	0
1515 - 1615	0	0	0	0	0
1530 - 1630	0	0	0	0	0
1545 - 1645	0	0	0	0	0
1600 - 1700	0	0	0	0	0
1615 - 1715	0	0	0	0	0
1630 - 1730	0	0	0	0	0
1645 - 1745	0	0	0	0	0
1700 - 1800	0	0	0	0	0
PEAK HR	0	0	0	0	0



TOTAL VOLUMES FOR COUNT PERIOD



R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849, Mob.0418-239019

Client : SMEC Australia
Job No/Name : 3770 Lane Cove North Mowbray Rd Precint
Day/Date : Wednesday 14th September 2011

Lights

Time Per	NORTH *Greenlands Rd*			WEST *Mowbray Rd West*			SOUTH *Centennial Av*			EAST *Mowbray Rd West*			
	L	T	R	L	T	R	L	T	R	L	T	R	TOT
0700 - 0715	1	10	4	1	115	24	11	3	74	53	62	0	**358**
0715 - 0730	1	26	5	3	174	28	14	6	139	66	111	0	**573**
0730 - 0745	1	35	9	1	102	16	10	10	107	57	107	0	**455**
0745 - 0800	1	34	10	2	115	26	16	9	100	59	142	0	**514**
0800 - 0815	5	56	10	3	129	27	19	11	139	58	161	0	**618**
0815 - 0830	1	49	10	0	87	22	32	9	115	60	129	0	**514**
0830 - 0845	3	50	8	4	127	25	23	15	137	67	150	0	**609**
0845 - 0900	2	23	7	2	111	25	33	5	101	55	134	0	**498**
Period End	**15**	**283**	**63**	**16**	**960**	**193**	**158**	**68**	**912**	**475**	**996**	**0**	**4139**

Lights

Peak Time	NORTH *Greenlands Rd*			WEST *Mowbray Rd West*			SOUTH *Centennial Av*			EAST *Mowbray Rd West*			
	L	T	R	L	T	R	L	T	R	L	T	R	TOT
0700 - 0800	4	105	28	7	506	94	51	28	420	235	422	0	**1900**
0715 - 0815	8	151	34	9	520	97	59	36	485	240	521	0	**2160**
0730 - 0830	8	174	39	6	433	91	77	39	461	234	539	0	**2101**
0745 - 0845	10	189	38	9	458	100	90	44	491	244	582	0	**2255**
0800 - 0900	11	178	35	9	454	99	107	40	492	240	574	0	**2239**
PEAK HOUR	**10**	**189**	**38**	**9**	**458**	**100**	**90**	**44**	**491**	**244**	**582**	**0**	**2255**

Heavies

Time Per	NORTH *Greenlands Rd*			WEST *Mowbray Rd West*			SOUTH *Centennial Av*			EAST *Mowbray Rd West*			
	L	T	R	L	T	R	L	T	R	L	T	R	TOT
0700 - 0715	0	0	0	0	3	0	0	0	0	1	5	0	**9**
0715 - 0730	0	0	0	0	5	0	0	0	0	2	5	0	**12**
0730 - 0745	0	0	0	0	2	0	0	0	0	1	3	0	**6**
0745 - 0800	0	0	0	0	3	0	1	0	0	0	2	0	**6**
0800 - 0815	0	0	0	0	1	0	1	0	0	1	3	0	**6**
0815 - 0830	0	0	0	0	2	0	0	0	0	0	2	0	**4**
0830 - 0845	0	0	0	0	2	0	0	0	2	1	4	0	**9**
0845 - 0900	0	0	0	0	4	0	1	0	0	0	1	0	**6**
Period End	**0**	**0**	**0**	**0**	**22**	**0**	**3**	**0**	**2**	**6**	**25**	**0**	**58**

Heavies

Peak Per	NORTH *Greenlands Rd*			WEST *Mowbray Rd West*			SOUTH *Centennial Av*			EAST *Mowbray Rd West*			
	L	T	R	L	T	R	L	T	R	L	T	R	TOT
0700 - 0800	0	0	0	0	13	0	1	0	0	4	15	0	**33**
0715 - 0815	0	0	0	0	11	0	2	0	0	4	13	0	**30**
0730 - 0830	0	0	0	0	8	0	2	0	0	2	10	0	**22**
0745 - 0845	0	0	0	0	8	0	2	0	2	2	11	0	**25**
0800 - 0900	0	0	0	0	9	0	2	0	2	2	10	0	**25**
PEAK HOUR	**0**	**0**	**0**	**0**	**8**	**0**	**2**	**0**	**2**	**2**	**11**	**0**	**25**

Combined

Time Per	NORTH *Greenlands Rd*			WEST *Mowbray Rd West*			SOUTH *Centennial Av*			EAST *Mowbray Rd West*			
	L	T	R	L	T	R	L	T	R	L	T	R	TOT
0700 - 0715	1	10	4	1	118	24	11	3	74	54	67	0	**367**
0715 - 0730	1	26	5	3	179	28	14	6	139	68	116	0	**585**
0730 - 0745	1	35	9	1	104	16	10	10	107	58	110	0	**461**
0745 - 0800	1	34	10	2	118	26	17	9	100	59	144	0	**520**
0800 - 0815	5	56	10	3	130	27	20	11	139	59	164	0	**624**
0815 - 0830	1	49	10	0	89	22	32	9	115	60	131	0	**518**
0830 - 0845	3	50	8	4	129	25	23	15	139	68	154	0	**618**
0845 - 0900	2	23	7	2	115	25	34	5	101	55	135	0	**504**
Period End	**15**	**283**	**63**	**16**	**982**	**193**	**161**	**68**	**914**	**481**	**1021**	**0**	**4197**

Combined

Peak Per	NORTH *Greenlands Rd*			WEST *Mowbray Rd West*			SOUTH *Centennial Av*			EAST *Mowbray Rd West*			
	L	T	R	L	T	R	L	T	R	L	T	R	TOT
0700 - 0800	4	105	28	7	519	94	52	28	420	239	437	0	**1933**
0715 - 0815	8	151	34	9	531	97	61	36	485	244	534	0	**2190**
0730 - 0830	8	174	39	6	441	91	79	39	461	236	549	0	**2123**
0745 - 0845	10	189	38	9	466	100	92	44	493	246	593	0	**2280**
0800 - 0900	11	178	35	9	463	99	109	40	494	242	584	0	**2264**
PEAK HOUR	**10**	**189**	**38**	**9**	**466**	**100**	**92**	**44**	**493**	**246**	**593**	**0**	**2280**

R.O.A.R DATA

Reliable, Original & Authentic Results

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Client : SMEC Australia
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Day/Date : Wednesday 14th September 2011

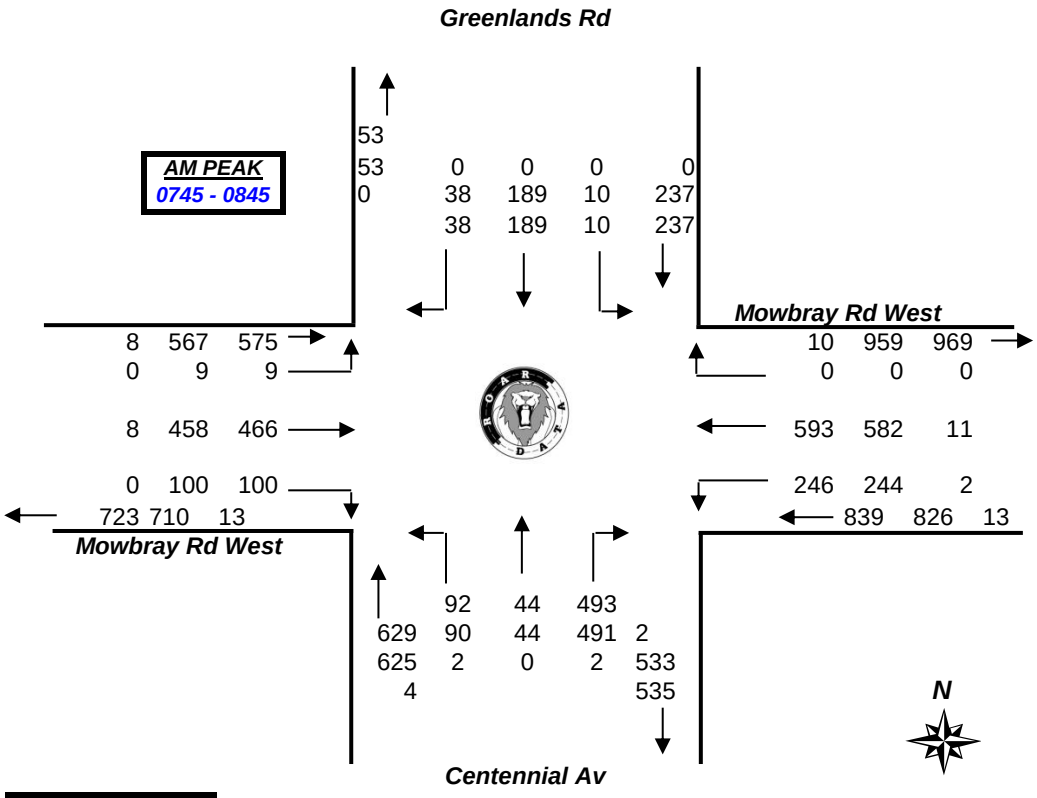
Peds

Time Per	NORTH *Greenlands Rd* UNCLASSIFIED	WEST *Mowbray Rd West* UNCLASSIFIED	SOUTH *Centennial Av* UNCLASSIFIED	EAST *Mowbray Rd West* UNCLASSIFIED	TOT
0700 - 0715					0
0715 - 0730					0
0730 - 0745	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	0
0745 - 0800					0
0800 - 0815					0
0815 - 0830					0
0830 - 0845					0
0845 - 0900					0
Period End	**0**	**0**	**0**	**0**	**0**

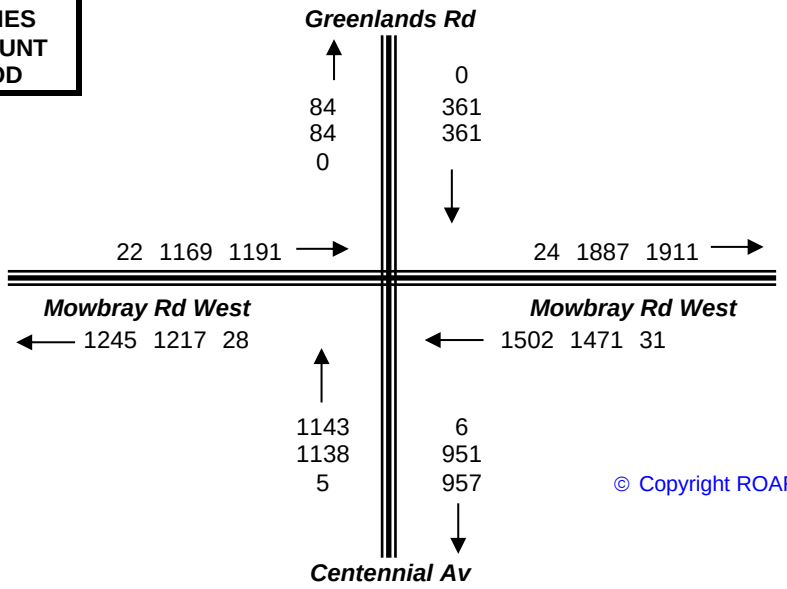
Peds

Peak Per	NORTH *Greenlands Rd* UNCLASSIFIED	WEST *Mowbray Rd West* UNCLASSIFIED	SOUTH *Centennial Av* UNCLASSIFIED	EAST *Mowbray Rd West* UNCLASSIFIED	TOT
0700 - 0800	0	0	0	0	0
0715 - 0815	0	0	0	0	0
0730 - 0830	0	0	0	0	0
0745 - 0845	0	0	0	0	0
0800 - 0900	0	0	0	0	0

PEAK HR	0	0	0	0	0



TOTAL VOLUMES FOR COUNT PERIOD



R.O.A.R. DATA
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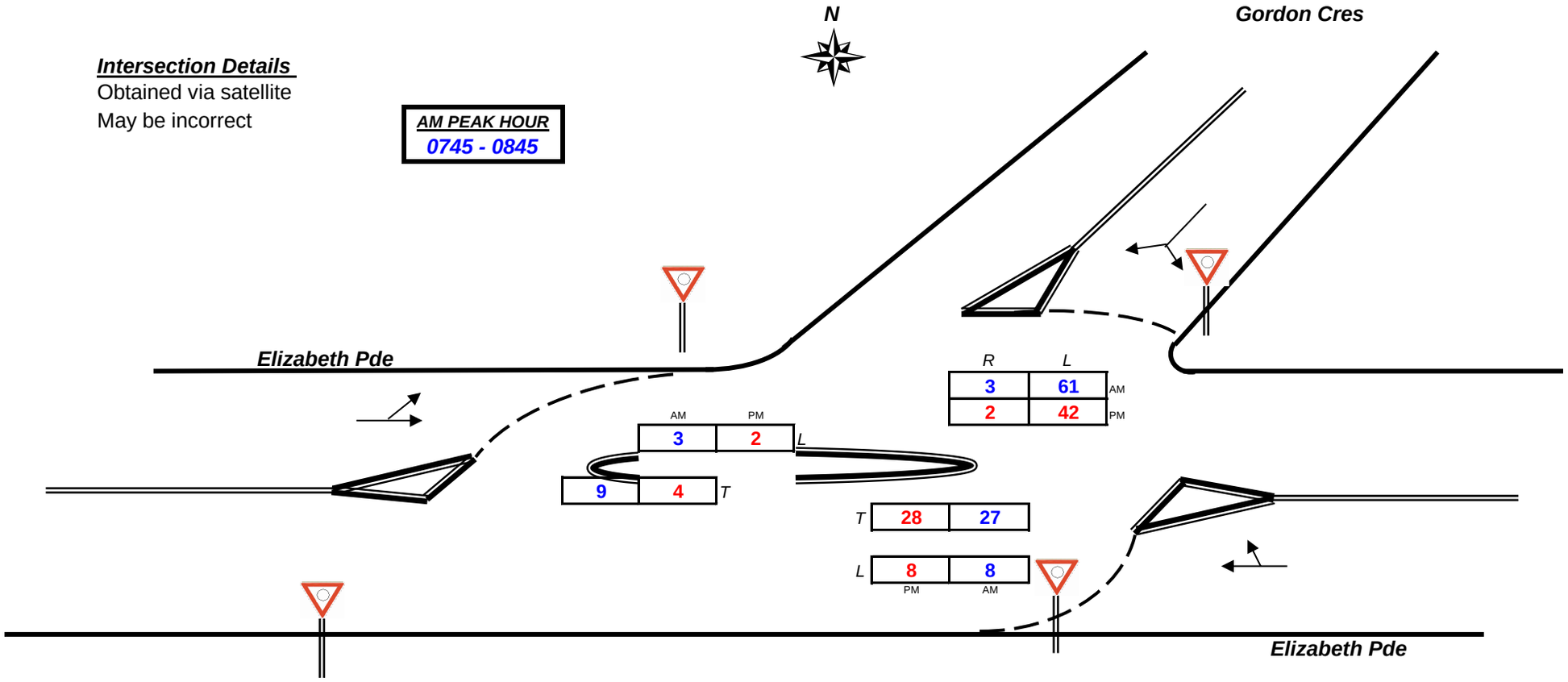
Client : SMEC Australia
Job No/Name : 3770 Lane Cove North Mowbray Rd
Day/Date : Wednesday 14th September 2011

Intersection Details
Obtained via satellite
May be incorrect

AM PEAK HOUR
0745 - 0845



PM PEAK HOUR
1645 - 1745

Weather >>>

C

R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849.

Mobile.0418239019

Client : SMEC Australia

Job No/Name : 3770 Lane Cove North Mowbray Rd

Day/Date : Wednesday 14th September 2011

PEDS	WEST	NORTH	EAST	
Time Per	*Elizabeth*	*Gordon Cr*	*Elizabeth*	TOT
1500 - 1515				0
1515 - 1530				0
1530 - 1545	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	0
1545 - 1600				0
1600 - 1615				0
1615 - 1630				0
1630 - 1645				0
1645 - 1700				0
1700 - 1715				0
1715 - 1730				0
1730 - 1745				0
1745 - 1800				0
Per End	**0**	**0**	**0**	**0**

PEDS	WEST	NORTH	EAST	
Peak Per	*Elizabeth*	*Gordon Cr*	*Elizabeth*	TOT
1500 - 1600	0	0	0	0
1515 - 1615	0	0	0	0
1530 - 1630	0	0	0	0
1545 - 1645	0	0	0	0
1600 - 1700	0	0	0	0
1615 - 1715	0	0	0	0
1630 - 1730	0	0	0	0
1645 - 1745	0	0	0	0
1700 - 1800	0	0	0	0
PEAK HR	**0**	**0**	**0**	**0**

Lights	WEST		NORTH		EAST		
	Elizabeth		*Gordon Cr*		*Elizabeth*		
Time Per	T	L	R	L	R	T	TOT
1500 - 1515	2	0	1	10	4	2	**19**
1515 - 1530	1	0	1	10	6	1	**19**
1530 - 1545	1	0	0	9	9	2	**21**
1545 - 1600	0	0	1	8	6	1	**16**
1600 - 1615	1	0	0	9	5	2	**17**
1615 - 1630	2	0	1	8	7	2	**20**
1630 - 1645	1	0	1	6	5	4	**17**
1645 - 1700	1	0	0	11	12	2	**26**
1700 - 1715	1	1	1	7	6	1	**17**
1715 - 1730	1	1	1	10	5	2	**20**
1730 - 1745	1	0	0	14	5	3	**23**
1745 - 1800	0	0	0	11	6	2	**19**
Per End	**12**	**2**	**7**	**113**	**76**	**24**	**234**

Heavies	WEST		NORTH		EAST		
	Elizabeth		*Gordon Cr*		*Elizabeth*		
Time Per	T	L	R	L	R	T	TOT
1500 - 1515	0	0	0	0	0	0	**0**
1515 - 1530	0	0	0	0	0	0	**0**
1530 - 1545	0	0	0	0	0	0	**0**
1545 - 1600	0	0	0	0	0	0	**0**
1600 - 1615	0	0	0	0	0	0	**0**
1615 - 1630	0	0	0	0	0	0	**0**
1630 - 1645	0	0	0	0	0	0	**0**
1645 - 1700	0	0	0	0	0	0	**0**
1700 - 1715	0	0	0	0	0	0	**0**
1715 - 1730	0	0	0	0	0	0	**0**
1730 - 1745	0	0	0	0	0	0	**0**
1745 - 1800	0	0	0	0	0	0	**0**
Per End	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Combined	WEST		NORTH		EAST		
	Elizabeth		*Gordon Cr*		*Elizabeth*		
Time Per	T	L	R	L	R	T	TOT
1500 - 1515	2	0	1	10	4	2	**19**
1515 - 1530	1	0	1	10	6	1	**19**
1530 - 1545	1	0	0	9	9	2	**21**
1545 - 1600	0	0	1	8	6	1	**16**
1600 - 1615	1	0	0	9	5	2	**17**
1615 - 1630	2	0	1	8	7	2	**20**
1630 - 1645	1	0	1	6	5	4	**17**
1645 - 1700	1	0	0	11	12	2	**26**
1700 - 1715	1	1	1	7	6	1	**17**
1715 - 1730	1	1	1	10	5	2	**20**
1730 - 1745	1	0	0	14	5	3	**23**
1745 - 1800	0	0	0	11	6	2	**19**
Per End	**12**	**2**	**7**	**113**	**76**	**24**	**234**

Lights	WEST		NORTH		EAST		
	Elizabeth		*Gordon Cr*		*Elizabeth*		
Peak Per	T	L	R	L	R	T	TOT
1500 - 1600	4	0	3	37	25	6	**75**
1515 - 1615	3	0	2	36	26	6	**73**
1530 - 1630	4	0	2	34	27	7	**74**
1545 - 1645	4	0	3	31	23	9	**70**
1600 - 1700	5	0	2	34	29	10	**80**
1615 - 1715	5	1	3	32	30	9	**80**
1630 - 1730	4	2	3	34	28	9	**80**
1645 - 1745	4	2	2	42	28	8	**86**
1700 - 1800	3	2	2	42	22	8	**79**
PEAK HR	**4**	**2**	**2**	**42**	**28**	**8**	**86**

Heavies	WEST		NORTH		EAST		
	Elizabeth		*Gordon Cr*		*Elizabeth*		
Peak Per	T	L	R	L	R	T	TOT
1500 - 1600	0	0	0	0	0	0	**0**
1515 - 1615	0	0	0	0	0	0	**0**
1530 - 1630	0	0	0	0	0	0	**0**
1545 - 1645	0	0	0	0	0	0	**0**
1600 - 1700	0	0	0	0	0	0	**0**
1615 - 1715	0	0	0	0	0	0	**0**
1630 - 1730	0	0	0	0	0	0	**0**
1645 - 1745	0	0	0	0	0	0	**0**
1700 - 1800	0	0	0	0	0	0	**0**
PEAK HR	**0**	**0**	**0**	**0**	**0**	**0**	**0**

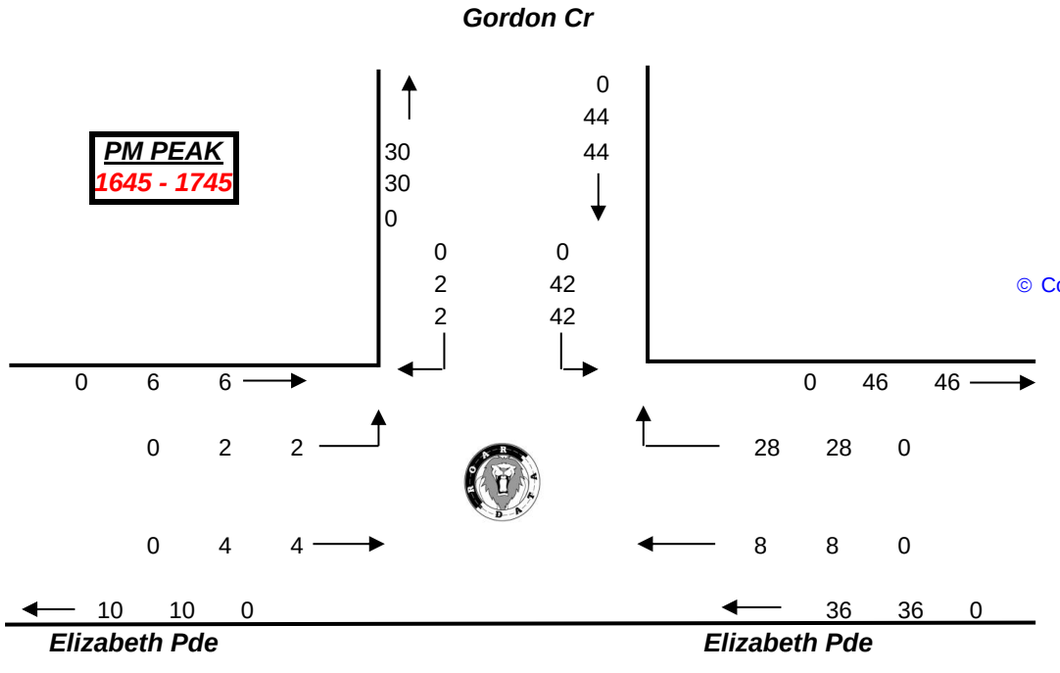
Combined	WEST		NORTH		EAST		
	Elizabeth		*Gordon Cr*		*Elizabeth*		
Peak Per	T	L	R	L	R	T	TOT
1500 - 1600	4	0	3	37	25	6	**75**
1515 - 1615	3	0	2	36	26	6	**73**
1530 - 1630	4	0	2	34	27	7	**74**
1545 - 1645	4	0	3	31	23	9	**70**
1600 - 1700	5	0	2	34	29	10	**80**
1615 - 1715	5	1	3	32	30	9	**80**
1630 - 1730	4	2	3	34	28	9	**80**
1645 - 1745	4	2	2	42	28	8	**86**
1700 - 1800	3	2	2	42	22	8	**79**
PEAK HR	**4**	**2**	**2**	**42**	**28**	**8**	**86**

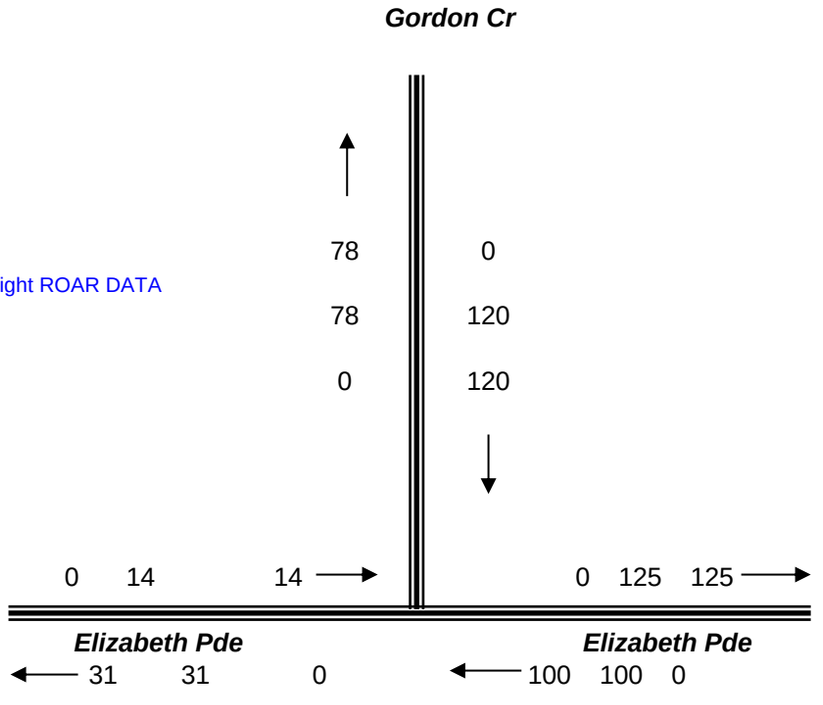
R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : SMEC Australia
Job No/Name : 3770 Lane Cove North Mowbray Rd
Day/Date : Wednesday 14th September 2011

TOTAL VOLUMES FOR COUNT PERIOD

N





R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849.
Mobile.0418239019

Client : SMEC Australia
Job No/Name : 3770 Lane Cove North Mowbray Rd
Day/Date : Wednesday 14th September 2011

PEDS	WEST	NORTH	EAST	
Time Per	*Elizabeth Pde*	*Gordon Cr*	*Elizabeth Pde*	TOT
0700 - 0715				0
0715 - 0730				0
0730 - 0745	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED	0
0745 - 0800				0
0800 - 0815				0
0815 - 0830				0
0830 - 0845				0
0845 - 0900				0
Per End	**0**	**0**	**0**	**0**

PEDS	WEST	NORTH	EAST	
Peak Per	*Elizabeth Pde*	*Gordon Cr*	*Elizabeth Pde*	TOT
0700 - 0800	0	0	0	0
0715 - 0815	0	0	0	0
0730 - 0830	0	0	0	0
0745 - 0845	0	0	0	0
0800 - 0900	0	0	0	0
PEAK HR	**0**	**0**	**0**	**0**

Lights	WEST		NORTH		EAST		
	Elizabeth Pde		*Gordon Cr*		*Elizabeth Pde*		
Time Per	T	L	R	L	R	T	TOT
0700 - 0715	3	0	1	8	2	0	14
0715 - 0730	2	0	0	14	4	0	20
0730 - 0745	1	1	0	14	5	2	23
0745 - 0800	2	1	0	16	7	4	30
0800 - 0815	3	2	0	8	6	1	20
0815 - 0830	3	0	2	20	5	1	31
0830 - 0845	1	0	1	17	9	2	30
0845 - 0900	0	1	0	5	5	1	12
Per End	**15**	**5**	**4**	**102**	**43**	**11**	**180**

Heavies	WEST		NORTH		EAST		
	Elizabeth Pde		*Gordon Cr*		*Elizabeth Pde*		
Time Per	T	L	R	L	R	T	TOT
0700 - 0715	0	0	0	0	0	0	0
0715 - 0730	0	0	0	0	0	0	0
0730 - 0745	0	0	0	0	0	0	0
0745 - 0800	0	0	0	0	0	0	0
0800 - 0815	0	0	0	0	0	0	0
0815 - 0830	0	0	0	0	0	0	0
0830 - 0845	0	0	0	0	0	0	0
0845 - 0900	0	0	0	0	0	0	0
Per End	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Combined	WEST		NORTH		EAST		
	Elizabeth Pde		*Gordon Cr*		*Elizabeth Pde*		
Time Per	T	L	R	L	R	T	TOT
0700 - 0715	3	0	1	8	2	0	14
0715 - 0730	2	0	0	14	4	0	20
0730 - 0745	1	1	0	14	5	2	23
0745 - 0800	2	1	0	16	7	4	30
0800 - 0815	3	2	0	8	6	1	20
0815 - 0830	3	0	2	20	5	1	31
0830 - 0845	1	0	1	17	9	2	30
0845 - 0900	0	1	0	5	5	1	12
Per End	**15**	**5**	**4**	**102**	**43**	**11**	**180**

Lights	WEST		NORTH		EAST		
	Elizabeth Pde		*Gordon Cr*		*Elizabeth Pde*		
Peak Per	T	L	R	L	R	T	TOT
0700 - 0800	8	2	1	52	18	6	87
0715 - 0815	8	4	0	52	22	7	93
0730 - 0830	9	4	2	58	23	8	104
0745 - 0845	9	3	3	61	27	8	111
0800 - 0900	7	3	3	50	25	5	93
PEAK HR	**9**	**3**	**3**	**61**	**27**	**8**	**111**

Heavies	WEST		NORTH		EAST		
	Elizabeth Pde		*Gordon Cr*		*Elizabeth Pde*		
Peak Per	T	L	R	L	R	T	TOT
0700 - 0800	0	0	0	0	0	0	0
0715 - 0815	0	0	0	0	0	0	0
0730 - 0830	0	0	0	0	0	0	0
0745 - 0845	0	0	0	0	0	0	0
0800 - 0900	0	0	0	0	0	0	0
PEAK HR	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Combined	WEST		NORTH		EAST		
	Elizabeth Pde		*Gordon Cr*		*Elizabeth Pde*		
Peak Per	T	L	R	L	R	T	TOT
0700 - 0800	8	2	1	52	18	6	87
0715 - 0815	8	4	0	52	22	7	93
0730 - 0830	9	4	2	58	23	8	104
0745 - 0845	9	3	3	61	27	8	111
0800 - 0900	7	3	3	50	25	5	93
PEAK HR	**9**	**3**	**3**	**61**	**27**	**8**	**111**

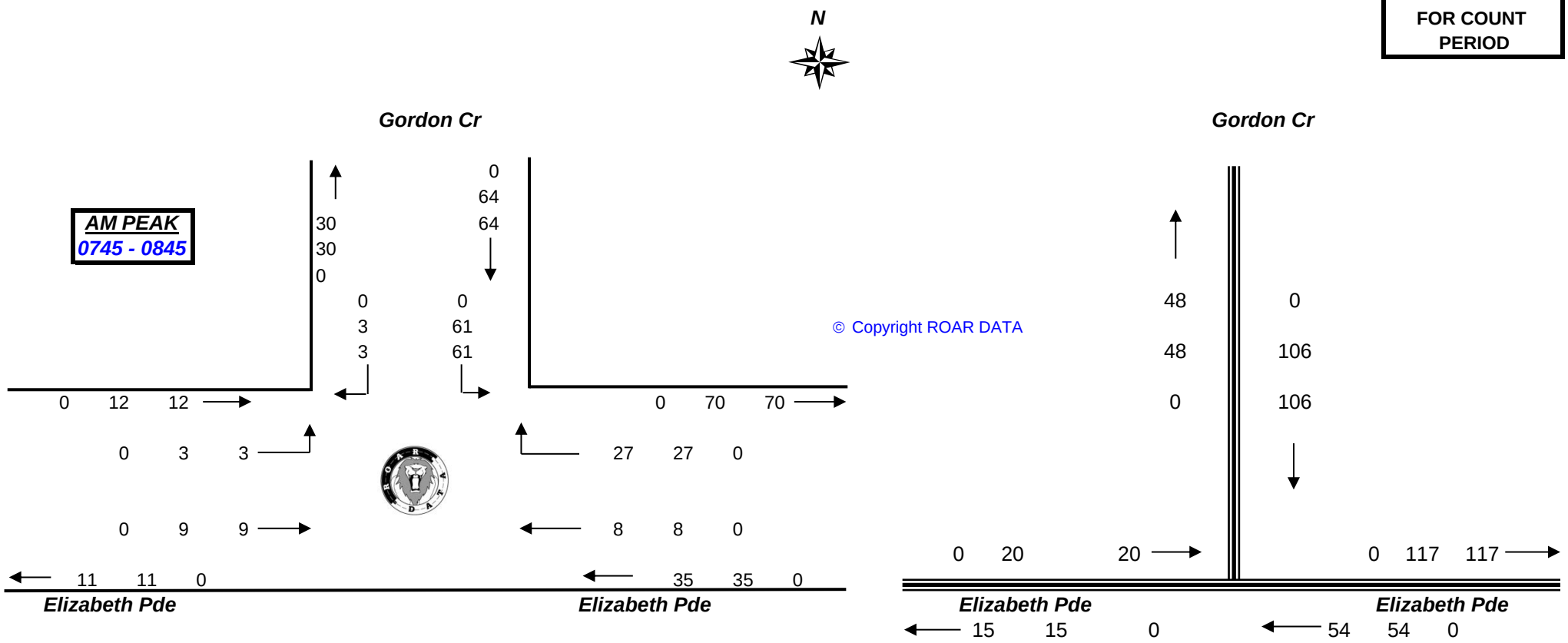
R.O.A.R. DATA

Client : SMEC Australia

Reliable, Original & Authentic Results
Ph.88196847, Fax 88196849, Mob.0418-239019

Job No/Name : 3770 Lane Cove North Mowbray Rd
Day/Date : Wednesday 14th September 2011

TOTAL VOLUMES FOR COUNT PERIOD



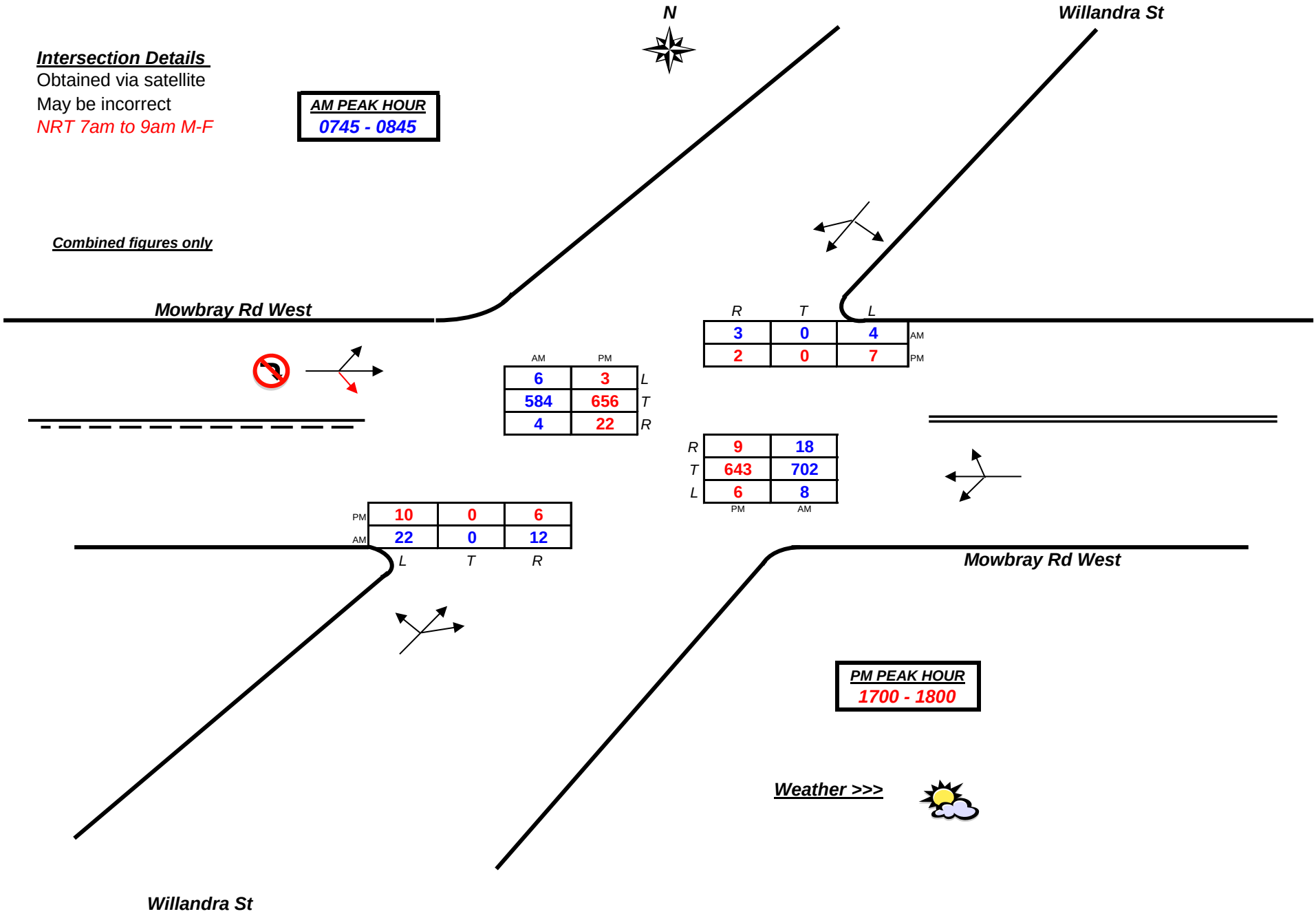
R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : SMEC Australia
Job No/Name : 3770 Lane Cove North Mowbray Rd Precint
Day/Date : Wednesday 14th September 2011

Intersection Details
Obtained via satellite
May be incorrect
NRT 7am to 9am M-F

AM PEAK HOUR
0745 - 0845

Combined figures only



	AM	PM	
	6	3	L
	584	656	T
	4	22	R

	R	T	L	
	3	0	4	AM
	2	0	7	PM

R	9	18	
T	643	702	
L	6	8	
	PM	AM	

PM	10	0	6	
AM	22	0	12	
	L	T	R	

PM PEAK HOUR
1700 - 1800

Weather >>>

R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849, Mob.0418-239019

Client : SMEC Australia
Job No/Name : 3770 Lane Cove North Mowbray Rd Precint
Day/Date : Wednesday 14th September 2011

Lights

Time Per	NORTH Willandra St			WEST Mowbray Rd West			SOUTH Willandra St			EAST Mowbray Rd West			
	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1500 - 1515	4	1	3	5	86	1	3	0	0	3	110	10	**226**
1515 - 1530	7	0	5	0	89	5	1	0	2	3	116	6	**234**
1530 - 1545	7	0	4	0	63	2	3	0	2	0	137	3	**221**
1545 - 1600	4	0	0	0	74	3	5	0	0	2	124	1	**213**
1600 - 1615	3	0	2	0	111	2	3	0	4	4	171	3	**303**
1615 - 1630	4	0	0	1	90	0	3	0	0	3	157	2	**260**
1630 - 1645	1	1	1	0	90	3	3	0	0	3	111	1	**214**
1645 - 1700	1	1	0	1	160	2	3	0	0	1	138	0	**307**
1700 - 1715	1	0	0	0	124	1	2	0	2	1	115	4	**250**
1715 - 1730	2	0	1	3	177	2	4	0	2	2	187	0	**380**
1730 - 1745	2	0	1	0	187	10	1	0	1	1	170	4	**377**
1745 - 1800	2	0	0	0	161	9	3	0	1	2	162	1	**341**
Period End	**38**	**3**	**17**	**10**	**1412**	**40**	**34**	**0**	**14**	**25**	**1698**	**35**	**3326**

Lights

Peak Time	NORTH Willandra St			WEST Mowbray Rd West			SOUTH Willandra St			EAST Mowbray Rd West			
	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1500 - 1600	22	1	12	5	312	11	12	0	4	8	487	20	**894**
1515 - 1615	21	0	11	0	337	12	12	0	8	9	548	13	**971**
1530 - 1630	18	0	6	1	338	7	14	0	6	9	589	9	**997**
1545 - 1645	12	1	3	1	365	8	14	0	4	12	563	7	**990**
1600 - 1700	9	2	3	2	451	7	12	0	4	11	577	6	**1084**
1615 - 1715	7	2	1	2	464	6	11	0	2	8	521	7	**1031**
1630 - 1730	5	2	2	4	551	8	12	0	4	7	551	5	**1151**
1645 - 1745	6	1	2	4	648	15	10	0	5	5	610	8	**1314**
1700 - 1800	7	0	2	3	649	22	10	0	6	6	634	9	**1348**
PEAK HOUR	**7**	**0**	**2**	**3**	**649**	**22**	**10**	**0**	**6**	**6**	**634**	**9**	**1348**

Heavies

Time Per	NORTH Willandra St			WEST Mowbray Rd West			SOUTH Willandra St			EAST Mowbray Rd West			
	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1500 - 1515	0	0	0	0	4	0	0	0	0	0	2	0	**6**
1515 - 1530	0	0	0	0	2	0	0	0	0	0	2	0	**4**
1530 - 1545	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1545 - 1600	0	0	0	0	0	0	0	0	0	0	4	0	**4**
1600 - 1615	0	0	0	0	2	0	0	0	0	0	1	0	**3**
1615 - 1630	0	0	0	0	1	0	0	0	0	0	2	0	**3**
1630 - 1645	0	0	0	0	3	0	0	0	0	0	0	0	**3**
1645 - 1700	0	0	0	0	1	0	0	0	0	0	2	0	**3**
1700 - 1715	0	0	0	0	2	0	0	0	0	0	2	0	**4**
1715 - 1730	0	0	0	0	0	0	0	0	0	0	2	0	**2**
1730 - 1745	0	0	0	0	3	0	0	0	0	0	1	0	**4**
1745 - 1800	0	0	0	0	2	0	0	0	0	0	4	0	**6**
Period End	**0**	**0**	**0**	**0**	**20**	**0**	**0**	**0**	**0**	**0**	**22**	**0**	**42**

Heavies

Peak Per	NORTH Willandra St			WEST Mowbray Rd West			SOUTH Willandra St			EAST Mowbray Rd West			
	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1500 - 1600	0	0	0	0	6	0	0	0	0	0	8	0	**14**
1515 - 1615	0	0	0	0	4	0	0	0	0	0	7	0	**11**
1530 - 1630	0	0	0	0	3	0	0	0	0	0	7	0	**10**
1545 - 1645	0	0	0	0	6	0	0	0	0	0	7	0	**13**
1600 - 1700	0	0	0	0	7	0	0	0	0	0	5	0	**12**
1615 - 1715	0	0	0	0	7	0	0	0	0	0	6	0	**13**
1630 - 1730	0	0	0	0	6	0	0	0	0	0	6	0	**12**
1645 - 1745	0	0	0	0	6	0	0	0	0	0	7	0	**13**
1700 - 1800	0	0	0	0	7	0	0	0	0	0	9	0	**16**
PEAK HOUR	**0**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**9**	**0**	**16**

Combined

Time Per	NORTH Willandra St			WEST Mowbray Rd West			SOUTH Willandra St			EAST Mowbray Rd West			
	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1500 - 1515	4	1	3	5	90	1	3	0	0	3	112	10	**232**
1515 - 1530	7	0	5	0	91	5	1	0	2	3	118	6	**238**
1530 - 1545	7	0	4	0	63	2	3	0	2	0	137	3	**221**
1545 - 1600	4	0	0	0	74	3	5	0	0	2	128	1	**217**
1600 - 1615	3	0	2	0	113	2	3	0	4	4	172	3	**306**
1615 - 1630	4	0	0	1	91	0	3	0	0	3	159	2	**263**
1630 - 1645	1	1	1	0	93	3	3	0	0	3	111	1	**217**
1645 - 1700	1	1	0	1	161	2	3	0	0	1	140	0	**310**
1700 - 1715	1	0	0	0	126	1	2	0	2	1	117	4	**254**
1715 - 1730	2	0	1	3	177	2	4	0	2	2	189	0	**382**
1730 - 1745	2	0	1	0	190	10	1	0	1	1	171	4	**381**
1745 - 1800	2	0	0	0	163	9	3	0	1	2	166	1	**347**
Period End	**38**	**3**	**17**	**10**	**1432**	**40**	**34**	**0**	**14**	**25**	**1720**	**35**	**3368**

Combined

Peak Per	NORTH Willandra St			WEST Mowbray Rd West			SOUTH Willandra St			EAST Mowbray Rd West			
	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1500 - 1600	22	1	12	5	318	11	12	0	4	8	495	20	**908**
1515 - 1615	21	0	11	0	341	12	12	0	8	9	555	13	**982**
1530 - 1630	18	0	6	1	341	7	14	0	6	9	596	9	**1007**
1545 - 1645	12	1	3	1	371	8	14	0	4	12	570	7	**1003**
1600 - 1700	9	2	3	2	458	7	12	0	4	11	582	6	**1096**
1615 - 1715	7	2	1	2	471	6	11	0	2	8	527	7	**1044**
1630 - 1730	5	2	2	4	557	8	12	0	4	7	557	5	**1163**
1645 - 1745	6	1	2	4	654	15	10	0	5	5	617	8	**1327**
1700 - 1800	7	0	2	3	656	22	10	0	6	6	643	9	**1364**
PEAK HOUR	**7**	**0**	**2**	**3**	**656**	**22**	**10**	**0**	**6**	**6**	**643**	**9**	**1364**

R.O.A.R DATA

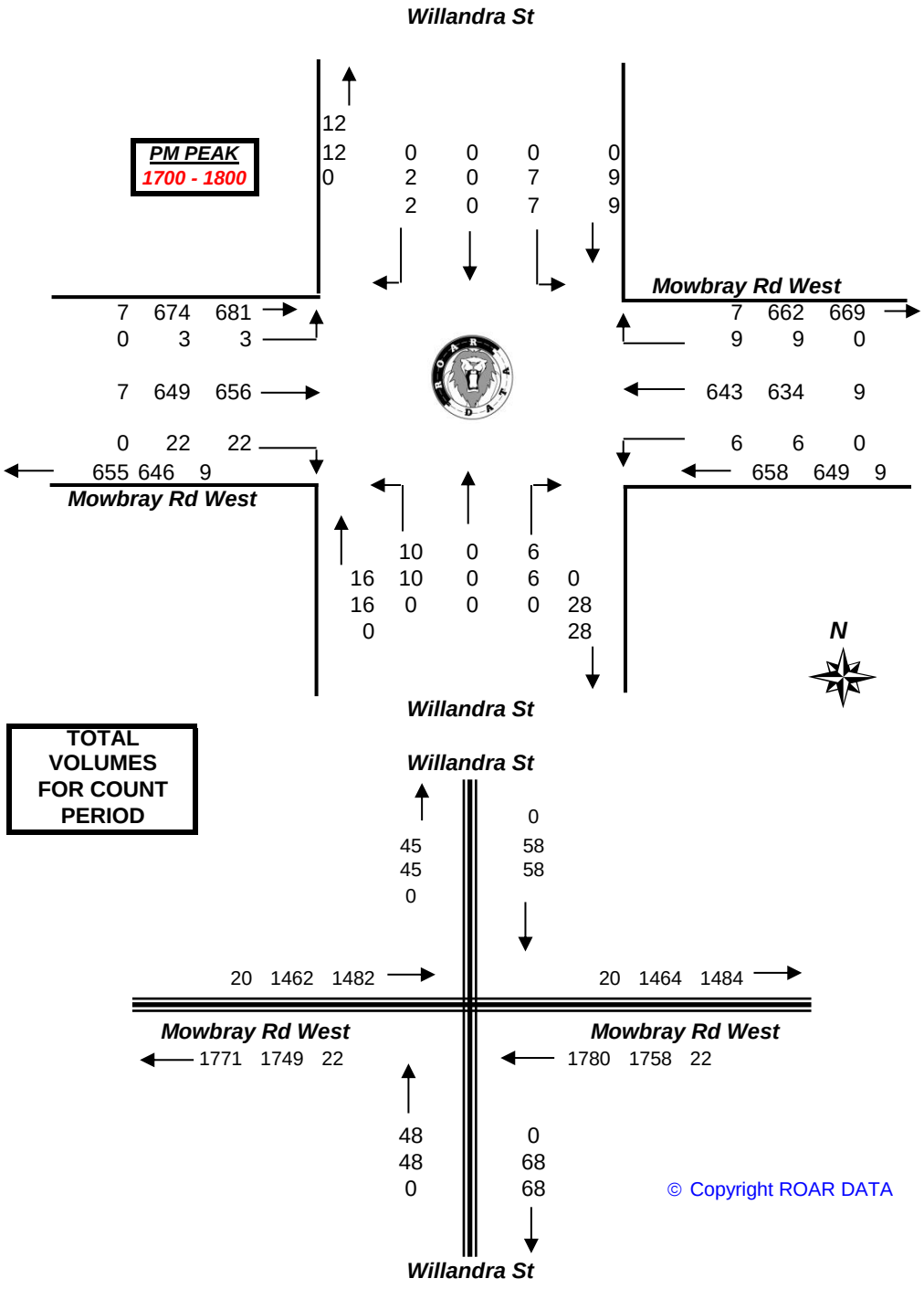
Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849, Mob.0418-239019

Client : SMEC Australi
Job No/Name : 3770 Lane Cove North Mowbray Rd Precint
Day/Date : Wednesday 14th September 2011

Peds	NORTH	WEST	SOUTH	EAST	
	Willandra St	*Mowbray Rd*	*Willandra St*	*Mowbray Rd*	
Time Per	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	TOT
1500 - 1515					0
1515 - 1530					0
1530 - 1545					0
1545 - 1600					0
1600 - 1615					0
1615 - 1630					0
1630 - 1645					0
1645 - 1700					0
1700 - 1715					0
1715 - 1730					0
1730 - 1745					0
1745 - 1800					0
Period End	0	0	0	0	0

Peds	NORTH	WEST	SOUTH	EAST	
	Willandra St	*Mowbray Rd*	*Willandra St*	*Mowbray Rd*	
Peak Per	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	TOT
1500 - 1600	0	0	0	0	0
1515 - 1615	0	0	0	0	0
1530 - 1630	0	0	0	0	0
1545 - 1645	0	0	0	0	0
1600 - 1700	0	0	0	0	0
1615 - 1715	0	0	0	0	0
1630 - 1730	0	0	0	0	0
1645 - 1745	0	0	0	0	0
1700 - 1800	0	0	0	0	0
PEAK HR	0	0	0	0	0



R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849, Mob.0418-239019

Client : SMEC Australia
Job No/Name : 3770 Lane Cove North Mowbray Rd Precint
Day/Date : Wednesday 14th September 2011

Lights

Time Per	NORTH Willandra St			WEST Mowbray Rd West			SOUTH Willandra St			EAST Mowbray Rd West			TOT
	L	T	R	L	T	R	L	T	R	L	T	R	
0700 - 0715	1	0	2	1	157	3	2	0	1	0	85	1	**253**
0715 - 0730	1	0	0	0	149	1	1	0	0	0	98	1	**251**
0730 - 0745	1	0	0	0	153	0	5	0	1	5	129	0	**294**
0745 - 0800	0	0	2	2	156	2	7	0	3	3	180	4	**359**
0800 - 0815	0	0	0	0	129	1	4	0	3	0	158	3	**298**
0815 - 0830	2	0	0	3	134	0	6	0	3	0	181	7	**336**
0830 - 0845	2	0	1	1	156	1	5	0	3	5	171	4	**349**
0845 - 0900	3	0	1	0	135	3	4	0	3	4	162	5	**320**
Period End	**10**	**0**	**6**	**7**	**1169**	**11**	**34**	**0**	**17**	**17**	**1164**	**25**	**2460**

Lights

Peak Time	NORTH Willandra St			WEST Mowbray Rd West			SOUTH Willandra St			EAST Mowbray Rd West			TOT
	L	T	R	L	T	R	L	T	R	L	T	R	
0700 - 0800	3	0	4	3	615	6	15	0	5	8	492	6	**1157**
0715 - 0815	2	0	2	2	587	4	17	0	7	8	565	8	**1202**
0730 - 0830	3	0	2	5	572	3	22	0	10	8	648	14	**1287**
0745 - 0845	4	0	3	6	575	4	22	0	12	8	690	18	**1342**
0800 - 0900	7	0	2	4	554	5	19	0	12	9	672	19	**1303**
PEAK HOUR	**4**	**0**	**3**	**6**	**575**	**4**	**22**	**0**	**12**	**8**	**690**	**18**	**1342**

Heavies

Time Per	NORTH Willandra St			WEST Mowbray Rd West			SOUTH Willandra St			EAST Mowbray Rd West			TOT
	L	T	R	L	T	R	L	T	R	L	T	R	
0700 - 0715	0	0	0	0	3	0	0	0	0	0	5	0	**8**
0715 - 0730	0	0	0	0	4	0	0	0	0	0	2	0	**6**
0730 - 0745	0	0	0	0	2	0	0	0	0	0	6	0	**8**
0745 - 0800	0	0	0	0	3	0	0	0	0	0	1	0	**4**
0800 - 0815	0	0	0	0	1	0	0	0	0	0	6	0	**7**
0815 - 0830	0	0	0	0	2	0	0	0	0	0	2	0	**4**
0830 - 0845	0	0	0	0	3	0	0	0	0	0	3	0	**6**
0845 - 0900	0	0	0	0	4	0	0	0	0	0	2	0	**6**
Period End	**0**	**0**	**0**	**0**	**22**	**0**	**0**	**0**	**0**	**0**	**27**	**0**	**49**

Heavies

Peak Per	NORTH Willandra St			WEST Mowbray Rd West			SOUTH Willandra St			EAST Mowbray Rd West			TOT
	L	T	R	L	T	R	L	T	R	L	T	R	
0700 - 0800	0	0	0	0	12	0	0	0	0	0	14	0	**26**
0715 - 0815	0	0	0	0	10	0	0	0	0	0	15	0	**25**
0730 - 0830	0	0	0	0	8	0	0	0	0	0	15	0	**23**
0745 - 0845	0	0	0	0	9	0	0	0	0	0	12	0	**21**
0800 - 0900	0	0	0	0	10	0	0	0	0	0	13	0	**23**
PEAK HOUR	**0**	**0**	**0**	**0**	**9**	**0**	**0**	**0**	**0**	**0**	**12**	**0**	**21**

Combined

Time Per	NORTH Willandra St			WEST Mowbray Rd West			SOUTH Willandra St			EAST Mowbray Rd West			TOT
	L	T	R	L	T	R	L	T	R	L	T	R	
0700 - 0715	1	0	2	1	160	3	2	0	1	0	90	1	**261**
0715 - 0730	1	0	0	0	153	1	1	0	0	0	100	1	**257**
0730 - 0745	1	0	0	0	155	0	5	0	1	5	135	0	**302**
0745 - 0800	0	0	2	2	159	2	7	0	3	3	181	4	**363**
0800 - 0815	0	0	0	0	130	1	4	0	3	0	164	3	**305**
0815 - 0830	2	0	0	3	136	0	6	0	3	0	183	7	**340**
0830 - 0845	2	0	1	1	159	1	5	0	3	5	174	4	**355**
0845 - 0900	3	0	1	0	139	3	4	0	3	4	164	5	**326**
Period End	**10**	**0**	**6**	**7**	**1191**	**11**	**34**	**0**	**17**	**17**	**1191**	**25**	**2509**

Combined

Peak Per	NORTH Willandra St			WEST Mowbray Rd West			SOUTH Willandra St			EAST Mowbray Rd West			TOT
	L	T	R	L	T	R	L	T	R	L	T	R	
0700 - 0800	3	0	4	3	627	6	15	0	5	8	506	6	**1183**
0715 - 0815	2	0	2	2	597	4	17	0	7	8	580	8	**1227**
0730 - 0830	3	0	2	5	580	3	22	0	10	8	663	14	**1310**
0745 - 0845	4	0	3	6	584	4	22	0	12	8	702	18	**1363**
0800 - 0900	7	0	2	4	564	5	19	0	12	9	685	19	**1326**
PEAK HOUR	**4**	**0**	**3**	**6**	**584**	**4**	**22**	**0**	**12**	**8**	**702**	**18**	**1363**

R.O.A.R DATA

Reliable, Original & Authentic Results

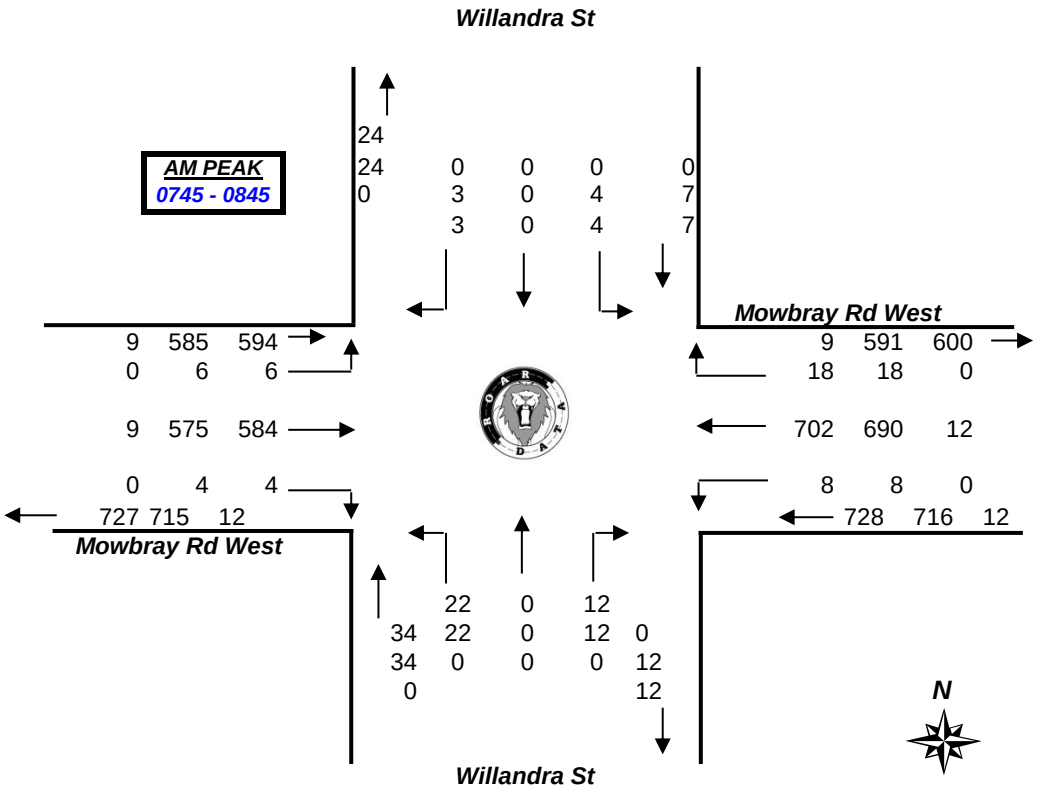
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : SMEC Australia
Job No/Name : 3770 Lane Cove North Mowbray Rd Precint
Day/Date : Wednesday 14th September 2011

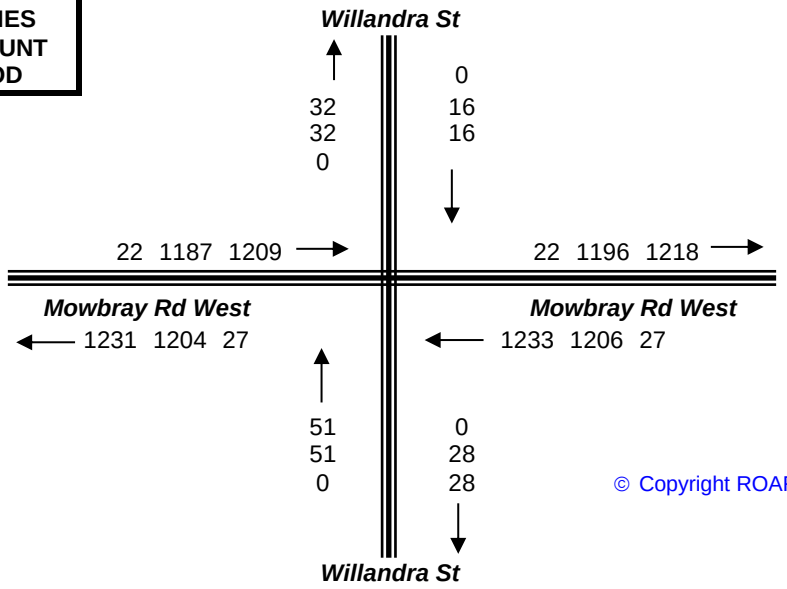
Peds	NORTH	WEST	SOUTH	EAST	
	Willandra St	*Mowbray Rd West*	*Willandra St*	*Mowbray Rd West*	
Time Per	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	TOT
0700 - 0715					0
0715 - 0730					0
0730 - 0745					0
0745 - 0800					0
0800 - 0815					0
0815 - 0830					0
0830 - 0845					0
0845 - 0900					0
Period End	0	0	0	0	0

Peds	NORTH	WEST	SOUTH	EAST	
	Willandra St	*Mowbray Rd West*	*Willandra St*	*Mowbray Rd West*	
Peak Per	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	TOT
0700 - 0800	0	0	0	0	0
0715 - 0815	0	0	0	0	0
0730 - 0830	0	0	0	0	0
0745 - 0845	0	0	0	0	0
0800 - 0900	0	0	0	0	0

PEAK HR	0	0	0	0	0



TOTAL VOLUMES FOR COUNT PERIOD



APPENDIX 'H'

Mowbray Road Precinct Network Upgrade Proposals

FIGURE 1
MOWBRAY ROAD AND WILLANDRA STREET
LEFT/RIGHT-IN, LEFT-OUT OPTION

SMEC

FIGURE 2
MOWBRAY ROAD AND WILLANDRA STREET
LEFT/RIGHT-IN, LEFT-OUT OPTION

FIGURE 3
MOWBRAY ROAD AND GIRRAWEEN AVENUE
LEFT-IN, LEFT-OUT OPTION

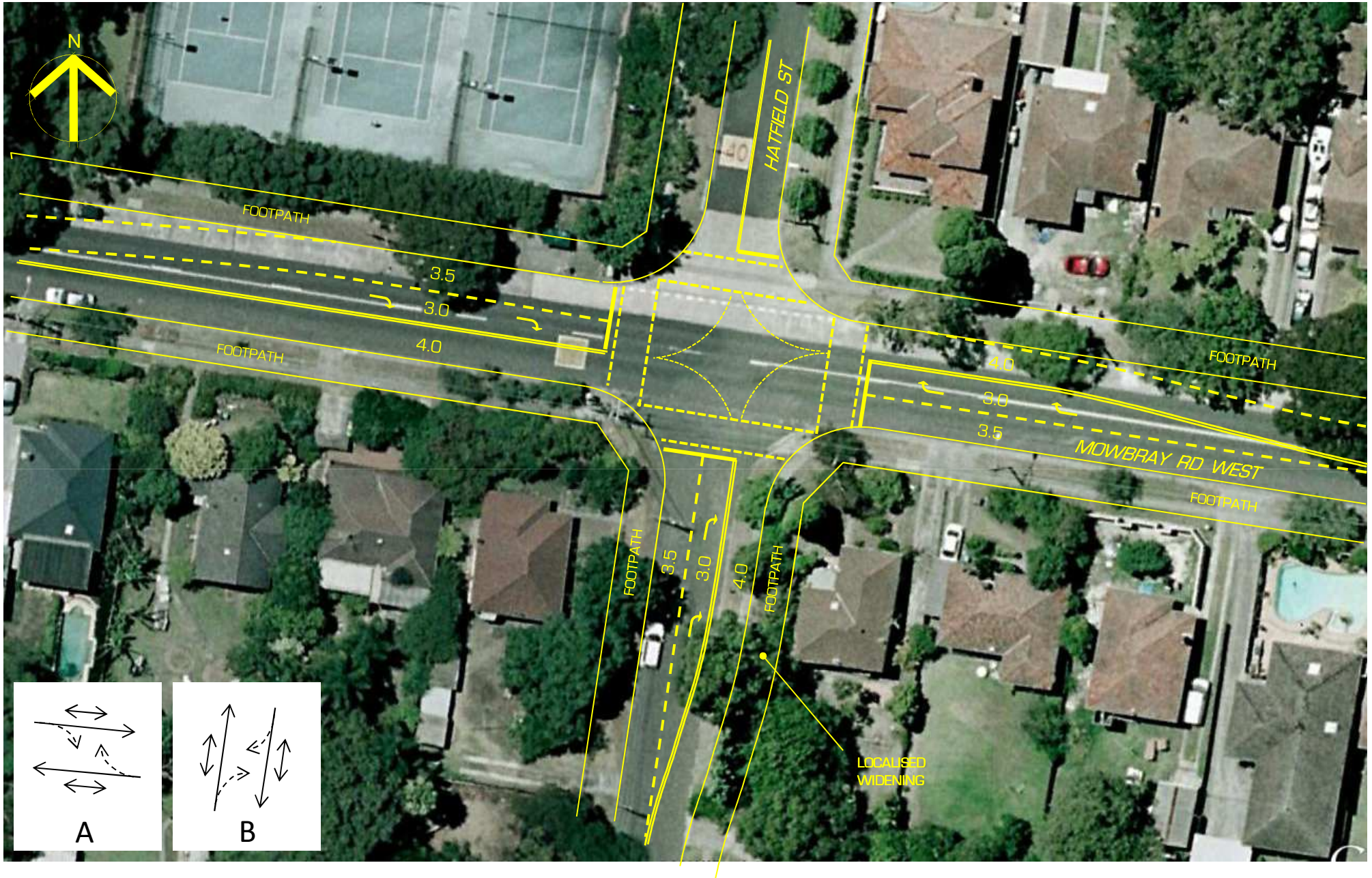


FIGURE 4
MOWBRAY ROAD, KULLAH PARADE AND HATFIELD STREET
SIGNAL UPGRADE OPTION

FIGURE 5
MOWBRAY ROAD AND MINDARIE STREET
LEFT-IN, LEFT-OUT OPTION

SMEC

FIGURE 6
MOWBRAY ROAD AND CENTENNIAL AVENUE
SIGNAL RECONSTRUCTION

APPENDIX 'I'

Strategic Cost Estimates

MOWBRAY ROAD PRECINCT STUDY

Mowbray/Centennial Intersection

Client:DP & I

CONSTRUCTION COST SUMMARY *November 2011*

0.35

ITEM	DESCRIPTION	UNIT	QTY	RATE	LABOUR	PLANT	MATS	S/CONT	AMOUNT	SELL AMOUNT	CONT	AMT + CONT	SUBTOTAL
1	**GENERAL**									**112,523**			**$172,814**
1.1	Property Surveys/Consultants	Item	1	2,160	0	0	0	1,600	1,600	2,160	35%	2,916	
1.2	Property Adjustments	Item	1	76,950	0	0	0	57,000	57,000	76,950	60%	123,120	
1.3	Bus Stop	each	1	33,413	0	0	0	24,750	24,750	33,413	40%	46,778	
2	**SERVICES**									**146,340**			**$226,827**
2.1	**Telecommunications**	Item	1	96,390	0	0	0	71,400	71,400	96,390	55%	149,405	
2.2	**Electrical**	item	1	49,950	0	0	0	37,000	37,000	49,950	55%	77,423	
3	**ENVIRONMENTAL**									**608**			**$851**
3.1	Silt Controls	Item	1	608	0	0	450	0	450	608	40%	851	
4	**TRAFFIC CONTROL**									**83,700**			**$129,735**
4.1	Temporary Control	Item	1	83,700	9,500	0	20,800	31,700	62,000	83,700	55%	129,735	
5	**DEMOLITION**									**12,346**			**$18,519**
5.1	Kerbs	m	100	46	350	2,025	1,000	0	3,375	4,556	50%	6,834	
5.3	Pavements	m2	100	73	0	0	0	5,400	5,400	7,290	50%	10,935	
5.2	Signage	No	2	250	140	110	120	0	370	500	50%	749	
5.3	Other												
6	**EARTHWORKS**									**26,947**			**$39,936**
6.1	Excavate to Disposal-boxout Pavements	m3	140	123	653	5,133	7,000	0	12,787	17,262	50%	25,893	
6.2	Select Layer	M3	50	194	744	3,241	3,189	0	7,174	9,685	45%	14,043	
7	**DRAINAGE**									**58,345**			**$84,600**
7.1	Longitudinal Drainage	m	120	222	2,200	6,835	10,711	0	19,746	26,657	45%	38,653	
7.2	Pits	No	1	3,553	83	113	797	1,640	2,632	3,553	45%	5,152	
7.3	Subsoil Drains	m	240	90	2,440	3,782	9,852	0	16,074	21,700	45%	31,466	
7.4	Pram Ramp	each	1	386	0	0	136	150	286	386	45%	560	
7.5	Kerbing	m	100	60	0	300	2,880	1,300	4,480	6,048	45%	8,769	
8	**PAVEMENTS**									**178,600**			**$266,119**
8.1	Heavy Duty Asphalt Pavement	m2	220	162	0	3,073	5,301	18,017	26,391	35,629	45%	51,661	
8.2	Profile and Overlay	m2	2500	57	0	0	0	105,905	105,905	142,972	50%	214,458	
8.3	Patching	m2	0		0	0	0	0	0	0	60%	0	
9	**BRIDGES & STRUCTURES**												
10	**ROAD FURNITURE**									**41,774**			**$62,392**
10.1	Traffic Lights-adjust Existing	No	1	26,055	0	0	0	19,300	19,300	26,055	55%	40,385	
10.2	Pavement Markings	Item	1	11,399	0	0	0	8,444	8,444	11,399	40%	15,959	
10.3	Signage	No	8	540	0	0	0	3,200	3,200	4,320	40%	6,048	
10.4	Concrete Paths-EXCLUDED	m2	0		0	0	0	0	0	0	35%	0	
	TOTAL DIRECT COST - MILLING				**$16,110**	**$24,611**	**$62,237**	**$386,806**	**$489,764**	**$661,182**	**52%**	**$1,001,791**	**$1,001,791**

	Adjust for No Milling												-207,994
8.2	Deduct Mill and Overlay				0	0	0	-105,905	-105,905	-142,972	50%	-214,458	
8.3	Deduct Patching				0	0	0	0	0	0		0	
10.2	Add remove line nmarking	m	855	4				3420	3420	4617	40%	6463.8	
	TOTAL DIRECT COST - NO MILLING				**$16,110**	**$24,611**	**$62,237**	**$284,321**	**$387,279**	**$522,827**	**52%**	**$793,797**	**$793,797**

MOWBRAY ROAD PRECINCT STUDY

Mowbray/Centennial Intersection

Client:DP & I

DETAILS ***Nov 2011***

ITEM	DESCRIPTION	UNIT	QTY	RATE	LABOUR	PLANT	MATERIALS	S/CONT	*AMOUNT*
1	**GENERAL**								
1.1	**Property Surveys/Consultants**								
	Houses	No	2	800				1,600	1,600
	TOTAL ITEM 1.1	**ITEM**	**1**	**1,600**	**0**	**0**	**0**	**1,600**	**1,600**
1.2	**Property Adjustments**								
	New Brick Walls	m	60	300				18,000	18,000
	Allowance for Landscape/Restore	item	1	15000				15,000	15,000
	Adjust Power/Water	No	3	8000				24,000	24,000
	TOTAL ITEM 1.2	**ITEM**	**1**	**57,000**	**0**	**0**	**0**	**57,000**	**57,000**
1.3	**Bus Stops**	**each**	**1**						
	Slab and preparation	m2	45	150				6,750	6,750
	Supply and install Shelters	No	1	15,000				15,000	15,000
	Seat furniture	No	1	3,000				3,000	3,000
	Total Item 1.3	**each**	**1**	**24,750**	**0**	**0**	**0**	**24,750**	**24,750**
2	**SERVICES -Excluded from this estimate**								
2.1	**Communications**	**Item**	**1**						
	Relocate Telstra line and pitts	m	150	450				67,500	67,500
	Pits	No	2	1200				2,400	2,400
	Services seach	m	150	10				1,500	1,500
	TOTAL ITEM 2.1	**ITEM**	**1**	**71,400**	**0**	**0**	**0**	**71,400**	**71,400**
2.2	**Power**	**Item**	**1**						
	Relocate Power Pole	**each**	**1**	32000				32,000	32,000
	Stay	**each**	**1**	5000				5,000	5,000
	TOTAL ITEM 2.2	**Item**	**1**	**37,000**	**0**	**0**	**0**	**37,000**	**37,000**
2.3	**Sewer**	**Item**	**1**						
	TOTAL ITEM 2.3	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
2.4	**Water**	**Item**	**1**						
	TOTAL ITEM 2.4	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
2.5	**Gas**	**Item**	**1**						
	TOTAL ITEM 2.5	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
2.6	**Domestic**	**Item**	**1**						
	Included in Property Adjustments								
	TOTAL ITEM 2.6	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
3	**ENVIRONMENTAL**								
3.2	**Silt Traps**								
	For protection of existing stormwater pits incl maintenance								
	Supply Silt Barrier in Kerb	no	6	75			450		450
	TOTAL ITEM 3.2	**Item**	**1**	**450**	**0**	**0**	**450**	**0**	**450**
4	**TRAFFIC CONTROL**								
4.1	**Temporary Diversions/Access**								
	Possible widening	m2	0	100				0	0
	Provison for pedestrians	m2	20	60				1,200	1,200
	Temp Fencing	m	0	30				0	0
	Temp Noise/Anti Gawk	m	0	25				0	0
4.2	**Traffic Switches**	**Item**	**1**						
	Swicthes - Nightly -See Traffic Controllers	No	0						
	traffic Control crew	Hr	0	350				0	0
	VMS	D	0	200		0			0
	Barracades/Signs	D	0	1200		0			0
	Labour	hr	0	55	0				0
4.3	**Signage and Traffic Control Devices**								
	Purchase NJK	m	0	280			0		0
	Resal NJK	m	0	-180			0		0

	Hire VMS/speed 2No	wk	0	1200			0		0
	Hire Light Towers 3No	wk	3	2000			6,000		6,000
	Hire W/barriers 150m	wk	5	1000			5,000		5,000
	Hire Signs/Barracades/Lights	wk	6	1500			9,000		9,000
	Fuel	Item	1	800			800		800
4.4	**Traffic Controllers**								
	Allow Traffic Control Crews for Night demo and construct	N/ Shift	6	2800				16,800	16,800
	Traffic Controll crew for Mill and resheet and Linemark	N/ Shift	4	2800				11,200	11,200
	Traffic Control crew for Erect Permanet Signs	N/ Shift	0	2800				0	0
	Day shift crews for incident management	hr	10	250				2,500	2,500
4.5	**Barriers**	**ITEM**	**1**						
	Install Barrier	m	0	20				0	0
	Relocate NJK	m	0	15				0	0
	Remove NJK	m	0	15				0	0
	Erect and Maintain signs	hr	10	50	500				500
	Temp Fencing	m	0	25				0	0
	Anti Gawk Screens	m	0	15				0	0
4.6	**Traffic Controllers**								
	Allow:								
	Dayshift-1man x 2mths	hr	0	55	0				0
	Nightshift - 1man x 0.8 mths	hr	120	75	9,000				9,000
4.8	**Temp Linemarking**								
	Allow Temp Lines full length incl remove	m	0	5				0	0
	Misc-Cheverons/Symbols	Item	0	3000				0	0
	Total Item 4.8	**item**	**1**	**62,000**	**9,500**	**0**	**20,800**	**31,700**	**62,000**

5	**DEMOLITION**								
5.1	**Kerbing**	**m**	**100**						
	Under Traffic and at Night								
	Excavate and dispose to Tip	m	100						
	Allow Backhoe @ 20m/hr	hr	5.0	85.0		425			425
	Lab	hr	5.0	70.0	350				350
	Truck x 2	hr	10	100.0		1,000			1,000
	Load and cart to Tip in day	m3	20	30.0		600			600
	Fees	no	5.0	200.0			1,000		1,000
	TOTAL ITEM 5.1	**M**	**100**	**33.75**	**350**	**2,025**	**1,000**	**0**	**3,375**
5.3	**Demolish Pavements**	**m2**	**100**						
	Demolish Concrete paths and bitumen pavements at Night	m2	100	30				3,000	3,000
	Saw Cutting	m	120	20				2,400	2,400
	TOTAL ITEM 5.3	**M2**	**100**	**54**	**0**	**0**	**0**	**5,400**	**5,400**
5.7	**Signs**								
	Remove Signs	**No**	**2**						
	Allow 2men + S/Truck 4signs/hr								
	Lab	hr	2	70.0	140				140
	S/Plant	d	0	200		10			10
	S/Truck	hr	1	100		100			100
	Fees	No	0	300			120		120
	TOTAL ITEM 5.7	**NO**	**2**	**185**	**140**	**110**	**120**	**0**	**370**
6	**EARTHWORKS**								
6.1	**Boxout for pavement**	**m3**	**140**						
	Excavate for new pavement-slow production at Night								
	Exc @ 15m3/hr	hr	9	150		1,400			1,400
	Allow 20k haul - 90min haul=8m3/hr/truck								
	Allow 4 trucks	hr	37	100		3,733			3,733
	Lab	hr	9	70	653				653
	Tip Fees	m3	140	50			7,000		7,000
	TOTAL ITEM 6.1	**m3**	**140**	**91**	**653**	**5,133**	**7,000**	**0**	**12,787**
6.2	**200mm Select - SMZ**	**m2**	**250**						
	Supply	t	118	27			3,189		3,189
	Bobcat/Grader @10m3/hr	hr	8	100		750			750
	Roller	hr	8	110		825			825
	W/cart	hr	8	95		713			713
	Lab	hr	8	70	525				525
	Trim @ 60m2/hr								
	Grader/Bobcat	hr	3	100		313			313
	Roller	hr	3	110		344			344

	W/cart	hr	3	95		297			297
	Lab	hr	3	70	219				219
	Testing	No	0.00	135				0	0
	TOTAL ITEM 6.2	**m3**	**75**	**96**	**744**	**3,241**	**3,189**	**0**	**7,174**
7	**DRAINAGE**								
7.1	**375mm RCP Class 4 - RRJ**	**m**	**120**						
	Supply Pipe	m	122.40	53			6,487		6,487
	Supply Sand	t	192.00	22			4,224		4,224
	Allow crew 2.5 Pipes/hr	m/hr	6						
	Exc	hr	20.0	135		2,700			2,700
	Backhoe	hr	20.0	80		1,600			1,600
	Lab x 2	hr	40.0	55	2,200				2,200
	S/Plant	day	2.5	150		375			375
	Backfil 1.8m3/m	m3	216.00	10		2,160			2,160
	Extra over Rock/Foundation	m	0	10		0			0
	Total item 7.1	**m**	**120**	**165**	**2,200**	**6,835**	**10,711**	**0**	**19,746**
7.2	**Kerb Pits**	**Each**	**1**						
	Excavate and Backfill								
	Backhoe	hr	1.5	75		113			113
	Lab	hr	1.5	55	83				83
	Form and pour Pit	m	1.6	900				1,440	1,440
	Supply Conc	m3	1.3	190			247		247
	Supply Lid	No	1	550			550		550
	Install Lid	No	1	200				200	200
									0
	TOTAL ITEM 7.2	**EACH**	**1**	**2,632**	**83**	**113**	**797**	**1,640**	**2,632**
7.3	**Subsoil Drains**	**m**	**240**						
	Supply Pipe	m	264	6			1,584		1,584
	Supply NFC	m3	48	150			7,128		7,128
	Supply Geotext	m2	504	2			806		806
	Install @ 50m/day								
	Backhoe	hr	38	95		3,648			3,648
	Lab x 2	hr	32	70	2,240				2,240
	Clean Out @ 50m crs	no	5	110	158	106	264		528
	Connect to pits	no	2	70	42	28	70		140
	TOTAL ITEM 7.3	**M**	**240**	**67**	**2,440**	**3,782**	**9,852**	**0**	**16,074**
7.4	**Pram Ramp**	**each**	**1**						
	Allow 3m x 1.5m	m2	3.75						$0
	Supply Concrete	m3	0.42	170			71		71
	Supply mesh	m2	4.3125	15			65		65
	Form,Mesh and Pour	m2	4	40				150	150
	TOTAL ITEM 7.4	**each**	**1**	**286.1**	**0**	**0**	**136**	**150**	**$286**
7.5	**Kerbing**	**m**	**100**						
	Type SA	**m**	**100**						
	Prepare	m	100	3		300			$300
	Supply Concrete	m3	16.9	170			2,880		$2,880
	Kerbie	m	100	13				1,300	$1,300
	TOTAL ITEM 7.5	**M**	**100**	**45**	**0**	**300**	**2,880**	**1,300**	**4,480**
8	**PAVEMENTS**								
8.1	**Heavy Duty Asphalt Pavement**	**m2**	220						
	300mm HB Base	**m3**	**69**						
	Supply material	t	155.93	34			5,301		$5,301
	Place @ 10m3/hr								
	Bobcat	hr	6.9	95		658			$658
	Roller	hr	7	100		693			$693
	W/cart	hr	7	95		658			$658
	Trim @ 60m2/hr	m2	220						
	Bobcat	hr	4	95		348			$348
	Roller	hr	4	100		367			$367
	W/cart	hr	4	95		348			$348
	Test	No	2.00	115				230	$230
	AC14 (C320, 50mm thick)	**m^2**	**220**						
	S/Cont - N/S	t	80.85	220				17,787	$17,787
	Total Item 8.1	**m2**	**220**	**120**	**0**	**3,073**	**5,301**	**18,017**	**26,391**
8.2	**Profile existing at Night**	**m2**	**2,500**						

	Subcont incl disposal	m2	2500	10.0				25,000	25,000
	50mm O.G Asphalt	**m2**	**2500**						
	Subcontract-N/S	t	306	220.0				67,375	67,375
	Allowance for adjustment to levels	t	62	220.0				13,530	13,530
	TOTAL ITEM 8.2	**M2**	**2500**	**42**	**0**	**0**	**0**	**105,905**	**105,905**
8.3	**Patching**	**m2**	**0**						
	Allow to excavte 200mm and fill with AC								
	Saw Cut	m	0	15				0	0
	Excavate and dispose	m2	0	300				0	0
	AC	t	0	400				0	0
	TOTAL ITEM 8.3	**M**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
9	**BRIDGES & STRUCTURES**								
10	**MISCELLANEOUS**								
10.1	**Traffic Lights**	**no**	**1**						
	Allow to relocate one Post and new Detector Loops								
	Remove existing large post and lantern	each	1	2,000				2,000	2,000
	Traffic Signal Footings	each	2	650				1,300	1,300
	Replace Traffic light post	each	1	1200				1,200	1,200
	Detector loop (new through lane only)	each	6	800				4,800	4,800
	Decom and Adjustment to existing Controller	item	1	10000				10,000	10,000
	TOTAL ITEM 10.1	**NO**	**1**	**19,300**	**0**	**0**	**0**	**19,300**	**19,300**
10.2	**Pavement Markings**	**Item**	**1**						
	Lines	m	950						
	Supply and Install	m	950	3.00				2850	2850
	RPM's	No	79	8				594	594
	Arrows and Symbols	No	25	120				3000	3000
	Cheverons	m2	0	50				0	0
	Pedestrain crossing	No	1	2000				2000	2000
	Allowance for removing existing lines	m	0	4				0	0
	TOTAL ITEM 10.3	**ITEM**	**1**	**8,444**	**0**	**0**	**0**	**8,444**	**8,444**
10.3	**Signage and Gantries**	**No**	**8**						
	Signage-small	**No**	**8**						
	Small Signs-(1-2 Galv Post + S/Sign)	No	8	400				3,200	3,200
	Signage-medium	**No**	**0**						
	Small Signs-(3 Galv Post + M/Sign)	No	0	4000				0	0
	Signage-Large -relocate	**No**	**0**						
	Supply Sign	No	0	0			0		0
	Footings	m3	0	900	0	0	0		0
	erect on site								
	Est Cranes	No	0	2000		0			0
	Crane	hr	0	500		0			0
	Lab x 4	hr	0	60	0				0
	S/Plant	No	0	500		0			0
	Gantries	No	0						
	Extra over Fabricate and supply	t	0	9000				0	0
	Footing	m3	0	2000				0	0
	Erect								
	Est Cranes	No	0	2000		0			0
	Crane	hr	0	250		0			0
	Lab x 6	hr	0	60	0				0
	S/Plant	No	0	300		0			0
	TOTAL ITEM 10.3	**No**	**8**	**400**	**0**	**0**	**0**	**3,200**	**3,200**
10.4	**Concrete Paths**	**m2**	**0**						
	EXCLUDED								
	Client requested separate on lm basis								
	TOTAL ITEM 10.4	**M2**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**

MOWBRAY ROAD PRECINCT STUDY

Mowbray/Girraween Ave

Client:DP & I

CONSTRUCTION COST SUMMARY ***November 2011***

0.35

ITEM	DESCRIPTION	UNIT	QTY	RATE	LABOUR	PLANT	MATS	S/CONT	AMOUNT	SELL AMOUNT	CONT	AMT + CONT	SUBTOTAL
1	**GENERAL**									**0**			**$0**
1.1	Property Surveys/Consultants	Item	0		0	0	0	0	0	0	35%	0	
1.2	Property Adjustments	Item	0		0	0	0	0	0	0	60%	0	
1.3	Bus Stop	each	0		0	0	0	0	0	0	40%	0	
2	**SERVICES - EXCLUDED**												
3	**ENVIRONMENTAL**									**608**			**$851**
3.1	Silt Controls	Item	1	608	0	0	450	0	450	608	40%	851	
4	**TRAFFIC CONTROL**									**18,360**			**$28,458**
4.1	Temporary Control	Item	1	18,360	3,500	0	4,500	5,600	13,600	18,360	55%	28,458	
5	**DEMOLITION**									**0**			**$0**
5.1	Kerbs	m	0		0	0	0	0	0	0	50%	0	
5.3	Pavements	m2	0		0	0	0	0	0	0	50%	0	
5.2	Signage	No	0		0	0	0	0	0	0	50%	0	
5.3	Other												
6	**EARTHWORKS**									**0**			**$0**
6.1	Excavate to Disposal-boxout Pavements	m3	0		0	0	0	0	0	0	50%	0	
6.2	Select Layer	M3	0		0	0	0	0	0	0	45%	0	
7	**DRAINAGE**									**0**			**$0**
7.1	Longitudinal Drainage	m	0		0	0	0	0	0	0	45%	0	
7.2	Pits	No	0		0	0	0	0	0	0	45%	0	
7.3	Subsoil Drains	m	0		0	0	0	0	0	0	45%	0	
7.4	Pram Ramp	each	0		0	0	0	0	0	0	45%	0	
7.5	Kerbing	m	0		0	0	0	0	0	0	45%	0	
8	**PAVEMENTS**									**87,381**			**$135,807**
8.1	Heavy Duty Asphalt Pavement	m2	0		0	0	0	0	0	0	45%	0	
8.2	Profile and Overlay	m2	1400	57	0	0	0	59,307	59,307	80,064	55%	124,099	
8.3	Patching	m2	20	366	0	0	0	5,420	5,420	7,317	60%	11,707	
9	**BRIDGES & STRUCTURES**												
10	**ROAD FURNITURE**									**4,610**			**$6,454**
10.1	Traffic Lights-adjust Existing	No	0		0	0	0	0	0	0	55%	0	
10.2	Pavement Markings	Item	1	2,450	0	0	0	1,815	1,815	2,450	40%	3,430	
10.3	Signage	No	4	540	0	0	0	1,600	1,600	2,160	40%	3,024	
10.4	Concrete Paths-EXCLUDED	m2	0		0	0	0	0	0	0	35%	0	
	TOTAL DIRECT COST				**$3,500**	**$0**	**$4,950**	**$73,742**	**$82,192**	**$110,959**	**55%**	**$171,570**	**$171,570**

	Adjust for No Milling												-133,992
8.2	Deduct Mill and Overlay				0	0	0	-59,307	-59,307	-80,064	55%	-124,099	
8.3	Deduct Patching				0	0	0	-5,420	-5,420	-7,317	60%	-11,707	
10.2	Add remove line nmarking	m	324	4				1296	1296	1296	40%	1814.4	
	TOTAL DIRECT COST - NO MILLING				**$3,500**	**$0**	**$4,950**	**$10,311**	**$18,761**	**$24,874**	**51%**	**$37,577**	**$37,577**

MOWBRAY ROAD PRECINCT STUDY

Mowbray/Girraween Ave Intersection

Client:DP & I

DETAILS ***Nov 2011***

ITEM	DESCRIPTION	UNIT	QTY	RATE	LABOUR	PLANT	MATERIALS	S/CONT	*AMOUNT*
1	**GENERAL**								
1.1	**Property Surveys/Consultants**								
	Houses	No	0	800				0	0
	TOTAL ITEM 1.1	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
1.2	**Property Adjustments**								
	New Brick Walls	m		300				0	0
	Allowance for Landscape/Restore	item		15000				0	0
	Adjust Power/Water	No		8000				0	0
	TOTAL ITEM 1.2	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
1.3	**Bus Stops**	**each**	**0**						
	Slab and preparation	m2	0	150				0	0
	Supply and install Shelters	No	0	15,000				0	0
	Seat furniture	No	0	3,000				0	0
	Total Item 1.3	**each**	**0**		**0**	**0**	**0**	**0**	**0**
2	**SERVICES -Excluded from this estimate**								
2.1	**Communications**	**Item**	**1**						
	No Service identified								
	TOTAL ITEM 2.1	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
2.2	**Power**	**Item**	**1**						
	No Service identified								
	TOTAL ITEM 2.2	**Item**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
3	**ENVIRONMENTAL**								
3.2	**Silt Traps**								
	For protection of existing stormwater pits incl maintenance								
	Supply Silt Barrier in Kerb	no	6	75			450		450
	TOTAL ITEM 3.2	**Item**	**1**	**450**	**0**	**0**	**450**	**0**	**450**
4	**TRAFFIC CONTROL**								
4.1	**Temporary Diversions/Access**								
	Possible widening	m2	0	100				0	0
	Provison for pedestrians	m2	0	60				0	0
	Temp Fencing	m	0	30				0	0
	Temp Noise/Anti Gawk	m	0	25				0	0
4.2	**Traffic Switches**	**Item**	**1**						
	Swicthes - Nightly -See Traffic Controllers	No	0						
	traffic Control crew	Hr	0	350				0	0
	VMS	D	0	200		0			0
	Barracades/Signs	D	0	1200		0			0
	Labour	hr	0	55	0				0
4.3	**Signage and Traffic Control Devices**								
	Purchase NJK	m	0	280			0		0
	Resal NJK	m	0	-180			0		0
	Hire VMS/speed 2No	wk	0	1200			0		0
	Hire Light Towers 3No	wk	1	2000			2,000		2,000
	Hire W/barriers 100m	wk	1	600			600		600
	Hire Signs/Barracades/Lights	wk	1	1600			1,600		1,600
	Fuel	Item	1	300			300		300
4.4	**Traffic Controllers**								
	Allow Traffic Control Crews for Night demo and construct	N/ Shift	0	2800				0	0
	Traffic Controll crew for Mill and resheet and Linemark	N/ Shift	2	2800				5,600	5,600
	Traffic Control crew for Erect Permanet Signs	N/ Shift	0	2800				0	0
	Day shift crews for incident management	hr	0	250				0	0
4.5	**Barriers**	**ITEM**	**1**						
	Install Barrier	m	0	20				0	0
	Relocate NJK	m	0	15				0	0
	Remove NJK	m	0	15				0	0
	Erect and Maintain signs	hr	10	50	500				500
	Temp Fencing	m	0	25				0	0
	Anti Gawk Screens	m	0	15				0	0

4.6	**Traffic Controllers**								
	Allow:								
	Dayshift-1man x 2mths	hr	0	55	0				0
	Nightshift - 1man x 0.8 mths	hr	40	75	3,000				3,000
4.8	**Temp Linemarking**								
	Allow Temp Lines full length incl remove	m	0	5				0	0
	Misc-Cheverons/Symbols	Item	0	3000				0	0
	Total Item 4.8	**item**	**1**	**13,600**	**3,500**	**0**	**4,500**	**5,600**	**13,600**
5	**DEMOLITION**								
5.1	**Kerbing**	**m**	**0**						
	TOTAL ITEM 5.1	**M**	**0**		**0**	**0**	**0**	**0**	**0**
5.3	**Demolish Pavements**	**m2**	**0**						
	TOTAL ITEM 5.3	**M2**	**0**		**0**	**0**	**0**	**0**	**0**
5.7	**Signs**								
	TOTAL ITEM 5.7	**NO**	**0**		**0**	**0**	**0**	**0**	**0**
6	**EARTHWORKS**								
6.1	**Boxout for pavement**	**m3**	**0**						
	Excavate for new pavement-slow production at Night								
	Exc @ 15m3/hr	hr	0	150		0			0
	Allow 20k haul - 90min haul=8m3/hr/truck								
	Allow 4 trucks	hr	0	100		0			0
	Lab	hr	0	70	0				0
	Tip Fees	m3	0	50			0		0
	TOTAL ITEM 6.1	**m3**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
6.2	**200mm Select - SMZ**	**m2**	**0**						
	Supply	t	0	27			0		0
	Bobcat/Grader @10m3/hr	hr	0	100		0			0
	Roller	hr	0	110		0			0
	W/cart	hr	0	95		0			0
	Lab	hr	0	70	0				0
	Trim @ 60m2/hr								
	Grader/Bobcat	hr	0	100		0			0
	Roller	hr	0	110		0			0
	W/cart	hr	0	95		0			0
	Lab	hr	0	70	0				0
	Testing	No	0.00	135				0	0
	TOTAL ITEM 6.2	**m3**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
7	**DRAINAGE**								
7.1	**375mm RCP Class 4 - RRJ**	**m**	**0**						
	Supply Pipe	m	0.00	53			0		0
	Supply Sand	t	0.00	22			0		0
	Allow crew 2.5 Pipes/hr	m/hr	6						
	Exc	hr	0.0	135		0			0
	Backhoe	hr	0.0	80		0			0
	Lab x 2	hr	0.0	55	0				0
	S/Plant	day	0.0	150		0			0
	Backfil 1.8m3/m	m3	0.00	10		0			0
	Extra over Rock/Foundation	m	0	10		0			0
	Total item 7.1	**m**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
7.2	**Kerb Pits**	**Each**	**0**						
	Excavate and Backfill								
	Backhoe	hr	0	75		0			0
	Lab	hr	0	55	0				0
	Form and pour Pit	m	0	900				0	0
	Supply Conc	m3	0	190			0		0
	Supply Lid	No	0	550			0		0
	Install Lid	No	0	200				0	0
									0
	TOTAL ITEM 7.2	**EACH**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
7.3	**Subsoil Drains**	**m**	**0**						
	Supply Pipe	m	0	6			0		0
	Supply NFC	m3	0	150			0		0
	Supply Geotext	m2	0	2			0		0
	Install @ 50m/day								
	Backhoe	hr	0	95		0			0
	Lab x 2	hr	0	70	0				0
	Clean Out @ 50m crs	no	0	110	0	0	0		0

	Connect to pits	no	0	70	0	0	0		0
	TOTAL ITEM 7.3	**M**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
7.4	**Pram Ramp**	**each**	**0**						
	Allow 3m x 1.5m	m2	3.75						$0
	Supply Concrete	m3	0	170			0		0
	Supply mesh	m2	0	15			0		0
	Form,Mesh and Pour	m2	0	40				0	0
	TOTAL ITEM 7.4	**each**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**$0**
7.5	**Kerbing**	**m**	**0**						
	Type SA	**m**	**0**						
	Prepare	m	0	3		0			$0
	Supply Concrete	m3	0.0	170			0		$0
	Kerbie	m	0	13				0	$0
	TOTAL ITEM 7.5	**M**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
8	**PAVEMENTS**								
8.1	**Heavy Duty Asphalt Pavement**	**m2**	0						
	300mm HB Base	**m3**	**0**						
	Supply material	t	0.00	34			0		$0
	Place @ 10m3/hr								
	Bobcat	hr	0.0	95		0			$0
	Roller	hr	0	100		0			$0
	W/cart	hr	0	95		0			$0
	Trim @ 60m2/hr	m2	0						
	Bobcat	hr	0	95		0			$0
	Roller	hr	0	100		0			$0
	W/cart	hr	0	95		0			$0
	Test	No	0.00	115				0	$0
	AC14 (C320, 50mm thick)	**m^2**	**0**						
	S/Cont - N/S	t	0	220				0	$0
	Total Item 8.1	**m2**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
8.2	**Profile existing at Night**	**m2**	**1,400**						
	Subcont incl disposal	m2	1400	10.0				14,000	14,000
	50mm O.G Asphalt	**m2**	**1400**						
	Subcontract-N/S	t	172	220.0				37,730	37,730
	Allowance for adjustment to levels	t	34	220.0				7,577	7,577
	TOTAL ITEM 8.2	**M2**	**1400**	**42**	**0**	**0**	**0**	**59,307**	**59,307**
8.3	**Patching**	**m2**	**20**						
	Allow to excavte 200mm and fill with AC								
	Saw Cut	m	20	15				300	300
	Excavate and dispose	m2	4	300				1,200	1,200
	AC	t	9.8	400				3,920	3,920
	TOTAL ITEM 8.3	**m2**	**20**	**271**	**0**	**0**	**0**	**5,420**	**5,420**
9	**BRIDGES & STRUCTURES**								
10	**MISCELLANEOUS**								
10.1	**Traffic Lights**	**no**	**0**						
	Allow to relocate one Post and new Detector Loops								
	Remove existing large post and lantern	each		2,000				0	0
	Traffic Signal Footings	each		650				0	0
	Replace Traffic light post	each		1200				0	0
	Detector loop (new through lane only)	each		800				0	0
	Decom and Adjustment to existing Controller	item		10000				0	0
	TOTAL ITEM 10.1	**NO**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
10.2	**Pavement Markings**	**Item**	**1**						
	Lines	m	360						
	Supply and Install	m	360	3.00				1080	1080
	RPM's	No	30	8				225	225
	Arrows and Symbols	No	3	120				360	360
	Cheverons	m2	3	50				150	150
	Pedestrain crossing	No	0	2000				0	0
	Allowance for removing existing lines	m	0	4				0	0
	TOTAL ITEM 10.3	**ITEM**	**1**	**1,815**	**0**	**0**	**0**	**1,815**	**1,815**

10.3	**Signage and Gantries**	**No**	**4**						
	Signage-small	**No**	**4**						
	Small Signs-(1-2 Galv Post + S/Sign)	No	4	400				1,600	1,600
	Signage-medium	**No**	**0**						
	Small Signs-(3 Galv Post + M/Sign)	No	0	4000				0	0
	Signage-Large -relocate	**No**	**0**						
	Supply Sign	No	0	0			0		0
	Footings	m3	0	900	0	0	0		0
	erect on site								
	Est Cranes	No	0	2000		0			0
	Crane	hr	0	500		0			0
	Lab x 4	hr	0	60	0				0
	S/Plant	No	0	500		0			0
	Gantries	No	0						
	Extra over Fabricate and supply	t	0	9000				0	0
	Footing	m3	0	2000				0	0
	Erect								
	Est Cranes	No	0	2000		0			0
	Crane	hr	0	250		0			0
	Lab x 6	hr	0	60	0				0
	S/Plant	No	0	300		0			0
	TOTAL ITEM 10.3	**No**	**4**	**400**	**0**	**0**	**0**	**1,600**	**1,600**

10.4	**Concrete Paths**	**m2**	**0**						
	EXCLUDED								
	Client requested separate on lm basis								
	TOTAL ITEM 10.4	**M2**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**

MOWBRAY ROAD PRECINCT STUDY

Mowbray/Minarie Street Intersection

Client:DP & I

CONSTRUCTION COST SUMMARY ***November 2011***

0.35

ITEM	DESCRIPTION	UNIT	QTY	RATE	LABOUR	PLANT	MATS	S/CONT	AMOUNT	SELL AMOUNT	CONT	AMT + CONT	SUBTOTAL
1	**GENERAL**									**0**			**$0**
1.1	Property Surveys/Consultants	Item	0		0	0	0	0	0	0	35%	0	
1.2	Property Adjustments	Item	0		0	0	0	0	0	0	60%	0	
1.3	Bus Stop	each	0		0	0	0	0	0	0	40%	0	
2	**SERVICES**												
3	**ENVIRONMENTAL**									**608**			**$851**
3.1	Silt Controls	Item	1	608	0	0	450	0	450	608	40%	851	
4	**TRAFFIC CONTROL**									**18,225**			**$28,249**
4.1	Temporary Control	Item	1	18,225	3,500	0	4,400	5,600	13,500	18,225	55%	28,249	
5	**DEMOLITION**									**500**			**$749**
5.1	Kerbs	m	0		0	0	0	0	0	0	50%	0	
5.3	Pavements	m2	0		0	0	0	0	0	0	50%	0	
5.2	Signage	No	2	250	140	110	120	0	370	500	50%	749	
5.3	Other												
6	**EARTHWORKS**									**0**			**$0**
6.1	Excavate to Disposal-boxout Pavements	m3	0		0	0	0	0	0	0	50%	0	
6.2	Select Layer	M3	0		0	0	0	0	0	0	45%	0	
7	**DRAINAGE**									**0**			**$0**
7.1	Longitudinal Drainage	m	0		0	0	0	0	0	0	45%	0	
7.2	Pits	No	0		0	0	0	0	0	0	45%	0	
7.3	Subsoil Drains	m	0		0	0	0	0	0	0	45%	0	
7.4	Pram Ramp	each	0		0	0	0	0	0	0	45%	0	
7.5	Kerbing	m	0		0	0	0	0	0	0	45%	0	
8	**PAVEMENTS**									**91,040**			**$141,660**
8.1	Heavy Duty Asphalt Pavement	m2	0		0	0	0	0	0	0	45%	0	
8.2	Profile and Overlay	m2	1400	57	0	0	0	59,307	59,307	80,064	55%	124,099	
8.3	Patching	m2	30	366	0	0	0	8,130	8,130	10,976	60%	17,561	
9	**BRIDGES & STRUCTURES**												
10	**ROAD FURNITURE**									**6,953**			**$9,734**
10.1	Traffic Lights-adjust Existing	No	0		0	0	0	0	0	0	55%	0	
10.2	Pavement Markings	Item	1	4,793	0	0	0	3,550	3,550	4,793	40%	6,710	
10.3	Signage	No	4	540	0	0	0	1,600	1,600	2,160	40%	3,024	
10.4	Concrete Paths-EXCLUDED	m2	0		0	0	0	0	0	0	35%	0	
	TOTAL DIRECT COST				**$3,640**	**$110**	**$4,970**	**$78,187**	**$86,907**	**$117,324**	**54%**	**$181,242**	**$181,242**

	Adjust for No Milling												-139,644
8.2	Deduct Mill and Overlay				0	0	0	-59,307	-59,307	-80,064	55%	-124,099	
8.3	Deduct Patching				0	0	0	-8,130	-8,130	-10,976	60%	-17,561	
10.2	Add remove line nmarking	m	360	4				1440	1440	1440	40%	2016	
	TOTAL DIRECT COST - NO MILLING				**$3,640**	**$110**	**$4,970**	**$12,190**	**$20,910**	**$27,725**	**50%**	**$41,598**	**$41,598**

MOWBRAY ROAD PRECINCT STUDY

Mowbray/Minarie Street Intersection

Client:DP & I

DETAILS ***Nov 2011***

ITEM	DESCRIPTION	UNIT	QTY	RATE	LABOUR	PLANT	MATERIALS	S/CONT	AMOUNT
1	**GENERAL**								
1.1	**Property Surveys/Consultants**								
	Houses	No	0	800				0	0
	TOTAL ITEM 1.1	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
1.2	**Property Adjustments**								
	New Brick Walls	m		300				0	0
	Allowance for Landscape/Restore	item		15000				0	0
	Adjust Power/Water	No		8000				0	0
	TOTAL ITEM 1.2	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
1.3	**Bus Stops**	**each**	**0**						
	Slab and preparation	m2	0	150				0	0
	Supply and install Shelters	No	0	15,000				0	0
	Seat furniture	No	0	3,000				0	0
	Total Item 1.3	**each**	**0**		**0**	**0**	**0**	**0**	**0**
2	**SERVICES -Excluded from this estimate**								
2.1	**Communications**	**Item**	**1**						
	No Service identified								
	TOTAL ITEM 2.1	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
2.2	**Power**	**Item**	**1**						
	No Service identified								
	TOTAL ITEM 2.2	**Item**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
2.3	**Sewer**	**Item**	**1**						
	TOTAL ITEM 2.3	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
2.4	**Water**	**Item**	**1**						
	TOTAL ITEM 2.4	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
2.5	**Gas**	**Item**	**1**						
	TOTAL ITEM 2.5	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
2.6	**Domestic**	**Item**	**1**						
	Included in Property Adjustments								
	TOTAL ITEM 2.6	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
3	**ENVIRONMENTAL**								
3.2	**Silt Traps**								
	For protection of existing stormwater pits incl maintenance								
	Supply Silt Barrier in Kerb	no	6	75			450		450
	TOTAL ITEM 3.2	**Item**	**1**	**450**	**0**	**0**	**450**	**0**	**450**
4	**TRAFFIC CONTROL**								
4.1	**Temporary Diversions/Access**								
	Possible widening	m2	0	100				0	0
	Provison for pedestrians	m2	0	60				0	0
	Temp Fencing	m	0	30				0	0
	Temp Noise/Anti Gawk	m	0	25				0	0
4.2	**Traffic Switches**	**Item**	**1**						
	Swicthes - Nightly -See Traffic Controllers	No	0						
	traffic Control crew	Hr	0	350				0	0
	VMS	D	0	200		0			0
	Barracades/Signs	D	0	1200		0			0
	Labour	hr	0	55	0				0
4.3	**Signage and Traffic Control Devices**								
	Purchase NJK	m	0	280			0		0
	Resal NJK	m	0	-180			0		0
	Hire VMS/speed 2No	wk	0	1200			0		0
	Hire Light Towers 3No	wk	1	2000			2,000		2,000
	Hire W/barriers 100m	wk	1	600			600		600
	Hire Signs/Barracades/Lights	wk	1	1500			1,500		1,500
	Fuel	Item	1	300			300		300

4.4	**Traffic Controllers**								
	Allow Traffic Control Crews for Night demo and construct	N/ Shift	0	2800				0	0
	Traffic Controll crew for Mill and resheet and Linemark	N/ Shift	2	2800				5,600	5,600
	Traffic Control crew for Erect Permanet Signs	N/ Shift	0	2800				0	0
	Day shift crews for incident management	hr	0	250				0	0
4.5	**Barriers**	**ITEM**	**1**						
	Install Barrier	m	0	20				0	0
	Relocate NJK	m	0	15				0	0
	Remove NJK	m	0	15				0	0
	Erect and Maintain signs	hr	10	50	500				500
	Temp Fencing	m	0	25				0	0
	Anti Gawk Screens	m	0	15				0	0
4.6	**Traffic Controllers**								
	Allow:								
	Dayshift-1man x 2mths	hr	0	55	0				0
	Nightshift - 1man x 0.8 mths	hr	40	75	3,000				3,000
4.8	**Temp Linemarking**								
	Allow Temp Lines full length incl remove	m	0	5				0	0
	Misc-Cheverons/Symbols	Item	0	3000				0	0
	Total Item 4.8	**item**	**1**	**13,500**	**3,500**	**0**	**4,400**	**5,600**	**13,500**

5 DEMOLITION

5.1	**Kerbing**	**m**	**0**						
	Under Traffic and at Night								
	Excavate and dispose to Tip	m	0						
	Allow Backhoe @ 20m/hr	hr	0.0	85.0		0			0
	Lab	hr	0.0	70.0	0				0
	Truck x 2	hr	0	100.0		0			0
	Load and cart to Tip in day	m3	0	30.0		0			0
	Fees	no	0.0	200.0			0		0
	TOTAL ITEM 5.1	**M**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
5.3	**Demolish Pavements**	**m2**	**0**						
	Demolish Concrete paths and bitumen pavements at Night	m2	0	30				0	0
	Saw Cutting	m	0	20				0	0
	TOTAL ITEM 5.3	**M2**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
5.7	**Signs**								
	Remove Signs	**No**	**2**						
	Allow 2men + S/Truck 4signs/hr								
	Lab	hr	2	70.0	140				140
	S/Plant	d	0	200		10			10
	S/Truck	hr	1	100		100			100
	Fees	No	0	300			120		120
	TOTAL ITEM 5.7	**NO**	**2**	**185**	**140**	**110**	**120**	**0**	**370**

6 EARTHWORKS

6.1	**Boxout for pavement**	**m3**	**0**						
	Excavate for new pavement-slow production at Night								
	Exc @ 15m3/hr	hr	0	150		0			0
	Allow 20k haul - 90min haul=8m3/hr/truck								
	Allow 4 trucks	hr	0	100		0			0
	Lab	hr	0	70	0				0
	Tip Fees	m3	0	50			0		0
	TOTAL ITEM 6.1	**m3**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
6.2	**200mm Select - SMZ**	**m2**	**0**						
	Supply	t	0	27			0		0
	Bobcat/Grader @10m3/hr	hr	0	100		0			0
	Roller	hr	0	110		0			0
	W/cart	hr	0	95		0			0
	Lab	hr	0	70	0				0
	Trim @ 60m2/hr								
	Grader/Bobcat	hr	0	100		0			0
	Roller	hr	0	110		0			0
	W/cart	hr	0	95		0			0
	Lab	hr	0	70	0				0
	Testing	No	0.00	135				0	0
	TOTAL ITEM 6.2	**m3**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**

7	**DRAINAGE**								
7.1	**375mm RCP Class 4 - RRJ**	**m**	**0**						
	Supply Pipe	m	0.00	53			0		0
	Supply Sand	t	0.00	22			0		0
	Allow crew 2.5 Pipes/hr	m/hr	6						
	Exc	hr	0.0	135		0			0
	Backhoe	hr	0.0	80		0			0
	Lab x 2	hr	0.0	55	0				0
	S/Plant	day	0.0	150		0			0
	Backfil 1.8m3/m	m3	0.00	10		0			0
	Extra over Rock/Foundation	m	0	10		0			0
	Total item 7.1	**m**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
7.2	**Kerb Pits**	**Each**	**0**						
	Excavate and Backfill								
	Backhoe	hr	0	75		0			0
	Lab	hr	0	55	0				0
	Form and pour Pit	m	0	900				0	0
	Supply Conc	m3	0	190			0		0
	Supply Lid	No	0	550			0		0
	Install Lid	No	0	200				0	0
									0
	TOTAL ITEM 7.2	**EACH**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
7.3	**Subsoil Drains**	**m**	**0**						
	Supply Pipe	m	0	6			0		0
	Supply NFC	m3	0	150			0		0
	Supply Geotext	m2	0	2			0		0
	Install @ 50m/day								
	Backhoe	hr	0	95		0			0
	Lab x 2	hr	0	70	0				0
	Clean Out @ 50m crs	no	0	110	0	0	0		0
	Connect to pits	no	0	70	0	0	0		0
	TOTAL ITEM 7.3	**M**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
7.4	**Pram Ramp**	**each**	**0**						
	Allow 3m x 1.5m	m2	3.75						$0
	Supply Concrete	m3	0	170			0		0
	Supply mesh	m2	0	15			0		0
	Form,Mesh and Pour	m2	0	40				0	0
	TOTAL ITEM 7.4	**each**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**$0**
7.5	**Kerbing**	**m**	**0**						
	Type SA	**m**	**0**						
	Prepare	m	0	3		0			$0
	Supply Concrete	m3	0.0	170			0		$0
	Kerbie	m	0	13				0	$0
	TOTAL ITEM 7.5	**M**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
8	**PAVEMENTS**								
8.1	**Heavy Duty Asphalt Pavement**	**m2**	0						
	300mm HB Base	**m3**	**0**						
	Supply material	t	0.00	34			0		$0
	Place @ 10m3/hr								
	Bobcat	hr	0.0	95		0			$0
	Roller	hr	0	100		0			$0
	W/cart	hr	0	95		0			$0
	Trim @ 60m2/hr	m2	0						
	Bobcat	hr	0	95		0			$0
	Roller	hr	0	100		0			$0
	W/cart	hr	0	95		0			$0
	Test	No	0.00	115				0	$0
	AC14 (C320, 50mm thick)	**m^2**	**0**						
	S/Cont - N/S	t	0	220				0	$0
	Total Item 8.1	**m2**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
8.2	**Profile existing at Night**	**m2**	**1,400**						
	Subcont incl disposal	m2	1400	10.0				14,000	14,000
	50mm O.G Asphalt	**m2**	**1400**						
	Subcontract-N/S	t	172	220.0				37,730	37,730
	Allowance for adjustment to levels	t	34	220.0				7,577	7,577

	TOTAL ITEM 8.2	**M2**	**1400**	**42**	**0**	**0**	**0**	**59,307**	**59,307**
8.3	**Patching**	**m2**	**30**						
	Allow to excavte 200mm and fill with AC								
	Saw Cut	m	30	15				450	450
	Excavate and dispose	m2	6	300				1,800	1,800
	AC	t	14.7	400				5,880	5,880
	TOTAL ITEM 8.3	**M**	**30**	**271**	**0**	**0**	**0**	**8,130**	**8,130**
9	**BRIDGES & STRUCTURES**								
10	**MISCELLANEOUS**								
10.1	**Traffic Lights**	**no**	**0**						
	Allow to relocate one Post and new Detector Loops								
	Remove existing large post and lantern	each		2,000				0	0
	Traffic Signal Footings	each		650				0	0
	Replace Traffic light post	each		1200				0	0
	Detector loop (new through lane only)	each		800				0	0
	Decom and Adjustment to existing Controller	item		10000				0	0
	TOTAL ITEM 10.1	**NO**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
10.2	**Pavement Markings**	**Item**	**1**						
	Lines	m	400						
	Supply and Install	m	400	3.00				1200	1200
	RPM's	No	33	8				250	250
	Arrows and Symbols	No	5	120				600	600
	Cheverons	m2	30	50				1500	1500
	Pedestrain crossing	No	0	2000				0	0
	Allowance for removing existing lines	m	0	4				0	0
	TOTAL ITEM 10.3	**ITEM**	**1**	**3,550**	**0**	**0**	**0**	**3,550**	**3,550**
10.3	**Signage and Gantries**	**No**	**4**						
	Signage-small	**No**	**4**						
	Small Signs-(1-2 Galv Post + S/Sign)	No	4	400				1,600	1,600
	Signage-medium	**No**	**0**						
	Small Signs-(3 Galv Post + M/Sign)	No	0	4000				0	0
	Signage-Large -relocate	**No**	**0**						
	Supply Sign	No	0	0			0		0
	Footings	m3	0	900	0	0	0		0
	erect on site								
	Est Cranes	No	0	2000		0			0
	Crane	hr	0	500		0			0
	Lab x 4	hr	0	60	0				0
	S/Plant	No	0	500		0			0
	Gantries	No	0						
	Extra over Fabricate and supply	t	0	9000				0	0
	Footing	m3	0	2000				0	0
	Erect								
	Est Cranes	No	0	2000		0			0
	Crane	hr	0	250		0			0
	Lab x 6	hr	0	60	0				0
	S/Plant	No	0	300		0			0
	TOTAL ITEM 10.3	**No**	**4**	**400**	**0**	**0**	**0**	**1,600**	**1,600**
10.4	**Concrete Paths**	**m2**	**0**						
	EXCLUDED								
	Client requested separate on Im basis								
	TOTAL ITEM 10.4	**M2**	**0**		**0**	**0**	**0**	**0**	**0**

MOWBRAY ROAD PRECINCT STUDY

Mowbray/Hatfield Intersection

Client:DP & I

CONSTRUCTION COST SUMMARY ***November 2011***

0.35

ITEM	DESCRIPTION	UNIT	QTY	RATE	LABOUR	PLANT	MATS	S/CONT	AMOUNT	SELL AMOUNT	CONT	AMT + CONT	SUBTOTAL
1	**GENERAL**									**13,365**			**$20,844**
1.1	Property Surveys/Consultants	Item	1	2,160	0	0	0	1,600	1,600	2,160	35%	2,916	
1.2	Property Adjustments	Item	1	11,205	0	0	0	8,300	8,300	11,205	60%	17,928	
1.3	Bus Stop	each	0		0	0	0	0	0	0	40%	0	
2	**SERVICES**												**$2,160**
2.1	**Telecommunications**	Item	1	1,350	0	0	0	1,000	1,000	1,350	60%	2,160	
2.2	**Electrical**	item	1	0	0	0	0	0	0	0	60%	0	
3	**ENVIRONMENTAL**									**1,215**			**$1,701**
3.1	Silt Controls	Item	1	1,215	0	0	900	0	900	1,215	40%	1,701	
4	**TRAFFIC CONTROL**									**71,955**			**$111,530**
4.1	Temporary Control	Item	1	71,955	9,500	0	15,500	28,300	53,300	71,955	55%	111,530	
5	**DEMOLITION**									**11,666**			**$17,499**
5.1	Kerbs	m	55	46	193	1,114	550	0	1,856	2,506	50%	3,759	
5.3	Pavements	m2	175	49	0	0	0	6,350	6,350	8,573	50%	12,859	
5.2	Signage	No	3	196	140	115	180	0	435	587	50%	881	
5.3	Other												
6	**EARTHWORKS**									**15,665**			**$23,426**
6.1	Excavate to Disposal-boxout Pavements	m3	116	123	539	4,235	5,775	0	10,549	14,241	50%	21,362	
6.2	Select Layer	M3	37	39	109	476	469	0	1,055	1,424	45%	2,064	
7	**DRAINAGE**									**13,761**			**$19,953**
7.1	Longitudinal Drainage	m	0		0	0	0	0	0	0	45%	0	
7.2	Pits	No	0		0	0	0	0	0	0	45%	0	
7.3	Subsoil Drains	m	110	91	1,141	1,748	4,554	0	7,443	10,048	45%	14,570	
7.4	Pram Ramp	each	1	386	0	0	136	150	286	386	45%	560	
7.5	Kerbing	m	55	60	0	165	1,584	715	2,464	3,326	45%	4,823	
8	**PAVEMENTS**									**142,320**			**$218,304**
8.1	Heavy Duty Asphalt Pavement	m2	175	162	0	2,444	4,217	14,379	21,040	28,404	45%	41,186	
8.2	Profile and Overlay	m2	1800	57	0	0	0	76,252	76,252	102,940	55%	159,556	
8.3	Patching	m2	30	366	0	0	0	8,130	8,130	10,976	60%	17,561	
9	**BRIDGES & STRUCTURES**												
10	**ROAD FURNITURE**									**257,847**			**$397,435**
10.1	Traffic Lights-new	No	1	243,000	0	0	0	180,000	180,000	243,000	55%	376,650	
10.2	Pavement Markings	Item	1	8,367	0	0	0	6,198	6,198	8,367	40%	11,713	
10.3	Signage	No	12	540	0	0	0	4,800	4,800	6,480	40%	9,072	
10.4	Concrete Paths-EXCLUDED	m2	0		0	0	0	0	0	0	35%	0	
	TOTAL DIRECT COST				**$11,622**	**$10,298**	**$33,864**	**$336,173**	**$391,957**	**$528,467**	**54%**	**$812,852**	**$812,852**

	Adjust for No Milling												-172,354
8.2	Deduct Mill and Overlay				0	0	0	-76,252	-76,252	-102,940	55%	-159,556	
8.3	Deduct Patching				0	0	0	-8,130	-8,130	-10,976	60%	-17,561	
10.2	Add remove line nmarking	m	630	4				2520	2520	3402	40%	4762.8	
	TOTAL DIRECT COST - NO MILLING				**$11,622**	**$10,298**	**$33,864**	**$254,311**	**$310,096**	**$417,954**	**53%**	**$640,497**	**$640,497**

MOWBRAY ROAD PRECINCT STUDY

Mowbray/Hatfield Intersection

Client:DP & I

DETAILS ***Nov 2011***

ITEM	DESCRIPTION	UNIT	QTY	RATE	LABOUR	PLANT	MATERIALS	S/CONT	*AMOUNT*
1	**GENERAL**								
1.1	**Property Surveys/Consultants**								
	Houses	No	2	800				1,600	1,600
	TOTAL ITEM 1.1	**ITEM**	**1**	**1,600**	**0**	**0**	**0**	**1,600**	**1,600**
1.2	**Property Adjustments**								
	New Fence	m	40	120				4,800	4,800
	Allowance for Landscape/Restore	item	1	2000				2,000	2,000
	Remove Trees	Item	1	1500				1,500	1,500
	Adjust Power/Water	No	0	8000				0	0
	TOTAL ITEM 1.2	**ITEM**	**1**	**8,300**	**0**	**0**	**0**	**8,300**	**8,300**
1.3	**Bus Stops**	**each**	**0**						
	Slab and preparation	m2	0	150				0	0
	Supply and install Shelters	No	0	15,000				0	0
	Seat furniture	No	0	3,000				0	0
	Total Item 1.3	**each**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
2	**SERVICES -Excluded from this estimate**								
2.1	**Communications**	**Item**	**1**						
	Service search Only	m	200	5				1,000	1,000
	TOTAL ITEM 2.1	**ITEM**	**1**	**1,000**	**0**	**0**	**0**	**1,000**	**1,000**
2.2	**Power**	**Item**	**1**						
	TOTAL ITEM 2.2	**Item**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
2.3	**Sewer**	**Item**	**1**						
	TOTAL ITEM 2.3	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
2.4	**Water**	**Item**	**1**						
	TOTAL ITEM 2.4	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
2.5	**Gas**	**Item**	**1**						
	TOTAL ITEM 2.5	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
2.6	**Domestic**	**Item**	**1**						
	Included in Property Adjustments								
	TOTAL ITEM 2.6	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
3	**ENVIRONMENTAL**								
3.2	**Silt Traps**								
	For protection of existing stormwater pits incl maintenance								
	Supply Silt Barrier in Kerb	no	12	75			900		900
	TOTAL ITEM 3.2	**Item**	**1**	**900**	**0**	**0**	**900**	**0**	**900**
4	**TRAFFIC CONTROL**								
4.1	**Temporary Diversions/Access**								
	Possible widening	m2	0	100				0	0
	Provison for pedestrians	m2	10	60				600	600
	Temp Fencing	m	0	30				0	0
	Temp Noise/Anti Gawk	m	0	25				0	0
4.2	**Traffic Switches**	**Item**	**1**						
	Swicthes - Nightly -See Traffic Controllers	No	0						
	traffic Control crew	Hr	0	350				0	0
	VMS	D	0	200		0			0
	Barracades/Signs	D	0	1200		0			0
	Labour	hr	0	55	0				0
4.3	**Signage and Traffic Control Devices**								
	Purchase NJK	m	0	280			0		0
	Resal NJK	m	0	-180			0		0
	Hire VMS/speed 2No	wk	0	1200			0		0
	Hire Light Towers 3No	wk	3	2000			6,000		6,000
	Hire W/barriers 150m	wk	4	800			3,200		3,200

	Hire Signs/Barracades/Lights	wk	4	1500			6,000		6,000
	Fuel	Item	1	300			300		300
4.4	**Traffic Controllers**								
	Allow Traffic Control Crews for Night demo and construct	N/ Shift	5	2800				14,000	14,000
	Traffic Controll crew for Mill and resheet and Linemark	N/ Shift	4	2800				11,200	11,200
	Traffic Control crew for Erect Permanet Signs	N/ Shift	0	2800				0	0
	Day shift crews for incident management	hr	10	250				2,500	2,500
4.5	**Barriers**	**ITEM**	**1**						
	Install Barrier	m	0	20				0	0
	Relocate NJK	m	0	15				0	0
	Remove NJK	m	0	15				0	0
	Erect and Maintain signs	hr	10	50	500				500
	Temp Fencing	m	0	25				0	0
	Anti Gawk Screens	m	0	15				0	0
4.6	**Traffic Controllers**								
	Allow:								
	Dayshift-1man x 2mths	hr	0	55	0				0
	Nightshift - 1man x 0.8 mths	hr	120	75	9,000				9,000
4.8	**Temp Linemarking**								
	Allow Temp Lines full length incl remove	m	0	5				0	0
	Misc-Cheverons/Symbols	Item	0	3000				0	0
	Total Item 4.8	**item**	**1**	**53,300**	**9,500**	**0**	**15,500**	**28,300**	**53,300**

5	**DEMOLITION**								
5.1	**Kerbing**	**m**	**55**						
	Under Traffic and at Night								
	Excavate and dispose to Tip	m	55						
	Allow Backhoe @ 20m/hr	hr	2.8	85.0		234			234
	Lab	hr	2.8	70.0	193				193
	Truck x 2	hr	6	100.0		550			550
	Load and cart to Tip in day	m3	11	30.0		330			330
	Fees	no	2.8	200.0			550		550
	TOTAL ITEM 5.1	**M**	**55**	**33.75**	**193**	**1,114**	**550**	**0**	**1,856**
5.3	**Demolish Pavements**	**m2**	**175**						
	Demolish Concrete paths and bitumen pavements at Night	m2	175	30				5,250	5,250
	Saw Cutting	m	55	20				1,100	1,100
	TOTAL ITEM 5.3	**M2**	**175**	**36**	**0**	**0**	**0**	**6,350**	**6,350**
5.7	**Signs**								
	Remove Signs	**No**	**3**						
	Allow 2men + S/Truck 4signs/hr								
	Lab	hr	2	70.0	140				140
	S/Plant	d	0	200		15			15
	S/Truck	hr	1	100		100			100
	Fees	No	1	300			180		180
	TOTAL ITEM 5.7	**NO**	**3**	**145**	**140**	**115**	**180**	**0**	**435**
6	**EARTHWORKS**								
6.1	**Boxout for pavement**	**m3**	**116**						
	Excavate for new pavement-slow production at Night								
	Exc @ 15m3/hr	hr	8	150		1,155			1,155
	Allow 20k haul - 90min haul=8m3/hr/truck								
	Allow 4 trucks	hr	31	100		3,080			3,080
	Lab	hr	8	70	539				539
	Tip Fees	m3	116	50			5,775		5,775
	TOTAL ITEM 6.1	**m3**	**116**	**91**	**539**	**4,235**	**5,775**	**0**	**10,549**
6.2	**200mm Select - SMZ**	**m2**	**37**						
	Supply	t	17	27			469		469
	Bobcat/Grader @10m3/hr	hr	1	100		110			110
	Roller	hr	1	110		121			121
	W/cart	hr	1	95		105			105
	Lab	hr	1	70	77				77
	Trim @ 60m2/hr								
	Grader/Bobcat	hr	0	100		46			46
	Roller	hr	0	110		51			51
	W/cart	hr	0	95		44			44
	Lab	hr	0	70	32				32
	Testing	No	0.00	135				0	0

	TOTAL ITEM 6.2	**m3**	**11**	**96**	**109**	**476**	**469**	**0**	**1,055**
7	**DRAINAGE**								
7.1	**375mm RCP Class 4 - RRJ**	**m**	**0**						
	Supply Pipe	m	0.00	53			0		0
	Supply Sand	t	0.00	22			0		0
	Allow crew 2.5 Pipes/hr	m/hr	6						
	Exc	hr	0.0	135		0			0
	Backhoe	hr	0.0	80		0			0
	Lab x 2	hr	0.0	55	0				0
	S/Plant	day	0.0	150		0			0
	Backfil 1.8m3/m	m3	0.00	10		0			0
	Extra over Rock/Foundation	m	0	10		0			0
	Total item 7.1	**m**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
7.2	**Kerb Pits**	**Each**	**0**						
	Excavate and Backfill								
	Backhoe	hr	0	75		0			0
	Lab	hr	0	55	0				0
	Form and pour Pit	m	0	900				0	0
	Supply Conc	m3	0	190			0		0
	Supply Lid	No	0	550			0		0
	Install Lid	No	0	200				0	0
									0
	TOTAL ITEM 7.2	**EACH**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
7.3	**Subsoil Drains**	**m**	**110**						
	Supply Pipe	m	121	6			726		726
	Supply NFC	m3	22	150			3,267		3,267
	Supply Geotext	m2	231	2			370		370
	Install @ 50m/day								
	Backhoe	hr	18	95		1,672			1,672
	Lab x 2	hr	15	70	1,027				1,027
	Clean Out @ 50m crs	no	2	110	73	48	121		242
	Connect to pits	no	2	70	42	28	70		140
	TOTAL ITEM 7.3	**M**	**110**	**68**	**1,141**	**1,748**	**4,554**	**0**	**7,443**
7.4	**Pram Ramp**	**each**	**1**						
	Allow 3m x 1.5m	m2	3.75						$0
	Supply Concrete	m3	0.42	170			71		71
	Supply mesh	m2	4.3125	15			65		65
	Form,Mesh and Pour	m2	4	40				150	150
	TOTAL ITEM 7.4	**each**	**1**	**286.1**	**0**	**0**	**136**	**150**	**$286**
7.5	**Kerbing**	**m**	**55**						
	Type SA	**m**	**55**						
	Prepare	m	55	3		165			$165
	Supply Concrete	m3	9.3	170			1,584		$1,584
	Kerbie	m	55	13				715	$715
	TOTAL ITEM 7.5	**M**	**55**	**45**	**0**	**165**	**1,584**	**715**	**2,464**
8	**PAVEMENTS**								
8.1	**Heavy Duty Asphalt Pavement**	**m2**	175						
	300mm HB Base	**m3**	**55**						
	Supply material	t	124.03	34			4,217		$4,217
	Place @ 10m3/hr								
	Bobcat	hr	5.5	95		524			$524
	Roller	hr	6	100		551			$551
	W/cart	hr	6	95		524			$524
	Trim @ 60m2/hr	m2	175						
	Bobcat	hr	3	95		277			$277
	Roller	hr	3	100		292			$292
	W/cart	hr	3	95		277			$277
	Test	No	2.00	115				230	$230
	AC14 (C320, 50mm thick)	**m^2**	**175**						
	S/Cont - N/S	t	64.3125	220				14,149	$14,149
	Total Item 8.1	**m2**	**175**	**120**	**0**	**2,444**	**4,217**	**14,379**	**21,040**
8.2	**Profile existing at Night**	**m2**	**1,800**						
	Subcont incl disposal	m2	1800	10.0				18,000	18,000
	50mm O.G Asphalt	**m2**	**1800**						

	Subcontract-N/S	t	221	220.0				48,510	48,510
	Allowance for adjustment to levels	t	44	220.0				9,742	9,742
	TOTAL ITEM 8.2	**M2**	**1800**	**42**	**0**	**0**	**0**	**76,252**	**76,252**

8.3	**Patching**	**m2**	**30**						
	Allow to excavte 200mm and fill with AC								
	Saw Cut	m	30	15				450	450
	Excavate and dispose	m2	6	300				1,800	1,800
	AC	t	14.7	400				5,880	5,880
	TOTAL ITEM 8.3	**M**	**30**	**271**	**0**	**0**	**0**	**8,130**	**8,130**

9 BRIDGES & STRUCTURES

10 MISCELLANEOUS

10.1	**Traffic Lights**	**no**	**1**						
	New 4 way Set of traffic lights								
	Supply,install and commision	each	1	180,000				180,000	180,000
	TOTAL ITEM 10.1	**NO**	**1**	**180,000**	**0**	**0**	**0**	**180,000**	**180,000**

10.2	**Pavement Markings**	**Item**	**1**						
	Lines	m	700						
	Supply and Install	m	700	3.00				2100	2100
	RPM's	No	58	8				438	438
	Arrows and Symbols	No	12	120				1440	1440
	Cheverons	m2	0	50				0	0
	Speed Sign	No	1	220				220	220
	Pedestrain crossing	No	1	2000				2000	2000
	Allowance for removing existing lines	m	0	4				0	0
	TOTAL ITEM 10.3	**ITEM**	**1**	**6,198**	**0**	**0**	**0**	**6,198**	**6,198**

10.3	**Signage and Gantries**	**No**	**12**						
	Signage-small	**No**	**12**						
	Small Signs-(1-2 Galv Post + S/Sign)	No	12	400				4,800	4,800
	Signage-medium	**No**	**0**						
	Small Signs-(3 Galv Post + M/Sign)	No	0	4000				0	0
	Signage-Large -relocate	**No**	**0**						
	Supply Sign	No	0	0			0		0
	Footings	m3	0	900	0	0	0		0
	erect on site								
	Est Cranes	No	0	2000		0			0
	Crane	hr	0	500		0			0
	Lab x 4	hr	0	60	0				0
	S/Plant	No	0	500		0			0
	Gantries	No	0						
	Extra over Fabricate and supply	t	0	9000				0	0
	Footing	m3	0	2000				0	0
	Erect								
	Est Cranes	No	0	2000		0			0
	Crane	hr	0	250		0			0
	Lab x 6	hr	0	60	0				0
	S/Plant	No	0	300		0			0
	TOTAL ITEM 10.3	**No**	**12**	**400**	**0**	**0**	**0**	**4,800**	**4,800**

10.4	**Concrete Paths**	**m2**	**0**						
	EXCLUDED								
	Client requested separate on lm basis								
	TOTAL ITEM 10.4	**M2**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**

MOWBRAY ROAD PRECINCT STUDY

Mowbray/Willandra Street Intersection

Client:DP & I

CONSTRUCTION COST SUMMARY ***November 2011***

0.35

ITEM	DESCRIPTION	UNIT	QTY	RATE	LABOUR	PLANT	MATS	S/CONT	AMOUNT	SELL AMOUNT	CONT	AMT + CONT	SUBTOTAL
1	**GENERAL**									**33,413**			**$46,778**
1.1	Property Surveys/Consultants	Item	0		0	0	0	0	0	0	35%	0	
1.2	Property Adjustments	Item	0		0	0	0	0	0	0	60%	0	
1.3	Bus Stop	each	1	33,413	0	0	0	24,750	24,750	33,413	40%	46,778	
2	**SERVICES**												
3	**ENVIRONMENTAL**									**810**			**$1,134**
3.1	Silt Controls	Item	1	810	0	0	600	0	600	810	40%	1,134	
4	**TRAFFIC CONTROL**									**18,225**			**$28,249**
4.1	Temporary Control	Item	1	18,225	3,500	0	4,400	5,600	13,500	18,225	55%	28,249	
5	**DEMOLITION**									**500**			**$749**
5.1	Kerbs	m	0		0	0	0	0	0	0	50%	0	
5.3	Pavements	m2	0		0	0	0	0	0	0	50%	0	
5.2	Signage	No	2	250	140	110	120	0	370	500	50%	749	
5.3	Other												
6	**EARTHWORKS**									**0**			**$0**
6.1	Excavate to Disposal-boxout Pavements	m3	0		0	0	0	0	0	0	50%	0	
6.2	Select Layer	M3	0		0	0	0	0	0	0	45%	0	
7	**DRAINAGE**									**0**			**$0**
7.1	Longitudinal Drainage	m	0		0	0	0	0	0	0	45%	0	
7.2	Pits	No	0		0	0	0	0	0	0	45%	0	
7.3	Subsoil Drains	m	0		0	0	0	0	0	0	45%	0	
7.4	Pram Ramp	each	0		0	0	0	0	0	0	45%	0	
7.5	Kerbing	m	0		0	0	0	0	0	0	45%	0	
8	**PAVEMENTS**									**110,257**			**$171,264**
8.1	Heavy Duty Asphalt Pavement	m2	0		0	0	0	0	0	0	45%	0	
8.2	Profile and Overlay	m2	1800	57	0	0	0	76,252	76,252	102,940	55%	159,556	
8.3	Patching	m2	20	366	0	0	0	5,420	5,420	7,317	60%	11,707	
9	**BRIDGES & STRUCTURES**												
10	**ROAD FURNITURE**									**21,399**			**$29,959**
10.1	Traffic Lights-adjust Existing	No	0		0	0	0	0	0	0	55%	0	
10.2	Pavement Markings	Item	1	18,699	0	0	0	13,851	13,851	18,699	40%	26,179	
10.3	Signage	No	5	540	0	0	0	2,000	2,000	2,700	40%	3,780	
10.4	Concrete Paths-EXCLUDED	m2	0		0	0	0	0	0	0	35%	0	
	TOTAL DIRECT COST				**$3,640**	**$110**	**$5,120**	**$127,873**	**$136,743**	**$184,603**	**51%**	**$278,132**	**$278,132**

	Adjust for No Milling												-168,996
8.2	Deduct Mill and Overlay				0	0	0	-76,252	-76,252	-102,940	55%	-159,556	
8.3	Deduct Patching				0	0	0	-5,420	-5,420	-7,317	60%	-11,707	
10.2	Add remove line nmarking	m	405	4				1620	1620	1620	40%	2268	
	TOTAL DIRECT COST - NO MILLING				**$3,640**	**$110**	**$5,120**	**$47,821**	**$56,691**	**$75,966**	**44%**	**$109,136**	**$109,136**

MOWBRAY ROAD PRECINCT STUDY

Mowbray/Willandra Street Intersection

Client:DP & I

DETAILS ***Nov 2011***

ITEM	DESCRIPTION	UNIT	QTY	RATE	LABOUR	PLANT	MATERIALS	S/CONT	*AMOUNT*
1	**GENERAL**								
1.1	**Property Surveys/Consultants**								
	Houses	No	0	800				0	0
	TOTAL ITEM 1.1	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
1.2	**Property Adjustments**								
	New Brick Walls	m		300				0	0
	Allowance for Landscape/Restore	item		15000				0	0
	Adjust Power/Water	No		8000				0	0
	TOTAL ITEM 1.2	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
1.3	**Bus Stops**	**each**	**1**						
	Slab and preparation	m2	45	150				6,750	6,750
	Supply and install Shelters	No	1	15,000				15,000	15,000
	Seat furniture	No	1	3,000				3,000	3,000
	Total Item 1.3	**each**	**1**	**24,750**	**0**	**0**	**0**	**24,750**	**24,750**
2	**SERVICES -Excluded from this estimate**								
2.1	**Communications**	**Item**	**1**						
	No Service identified								
	TOTAL ITEM 2.1	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
2.2	**Power**	**Item**	**1**						
	No Service identified								
	TOTAL ITEM 2.2	**Item**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
2.3	**Sewer**	**Item**	**1**						
	TOTAL ITEM 2.3	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
2.4	**Water**	**Item**	**1**						
	TOTAL ITEM 2.4	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
2.5	**Gas**	**Item**	**1**						
	TOTAL ITEM 2.5	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
2.6	**Domestic**	**Item**	**1**						
	Included in Property Adjustments								
	TOTAL ITEM 2.6	**ITEM**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
3	**ENVIRONMENTAL**								
3.2	**Silt Traps**								
	For protection of existing stormwater pits incl maintenance								
	Supply Silt Barrier in Kerb	no	8	75			600		600
	TOTAL ITEM 3.2	**Item**	**1**	**600**	**0**	**0**	**600**	**0**	**600**
4	**TRAFFIC CONTROL**								
4.1	**Temporary Diversions/Access**								
	Possible widening	m2	0	100				0	0
	Provison for pedestrians	m2	0	60				0	0
	Temp Fencing	m	0	30				0	0
	Temp Noise/Anti Gawk	m	0	25				0	0
4.2	**Traffic Switches**	**Item**	**1**						
	Swicthes - Nightly -See Traffic Controllers	No	0						
	traffic Control crew	Hr	0	350				0	0
	VMS	D	0	200		0			0
	Barracades/Signs	D	0	1200		0			0
	Labour	hr	0	55	0				0
4.3	**Signage and Traffic Control Devices**								
	Purchase NJK	m	0	280			0		0
	Resal NJK	m	0	-180			0		0
	Hire VMS/speed 2No	wk	0	1200			0		0
	Hire Light Towers 3No	wk	1	2000			2,000		2,000
	Hire W/barriers 100m	wk	1	600			600		600
	Hire Signs/Barracades/Lights	wk	1	1500			1,500		1,500
	Fuel	Item	1	300			300		300

4.4	**Traffic Controllers**								
	Allow Traffic Control Crews for Night demo and construct	N/ Shift	0	2800				0	0
	Traffic Controll crew for Mill and resheet and Linemark	N/ Shift	2	2800				5,600	5,600
	Traffic Control crew for Erect Permanet Signs	N/ Shift	0	2800				0	0
	Day shift crews for incident management	hr	0	250				0	0
4.5	**Barriers**	**ITEM**	**1**						
	Install Barrier	m	0	20				0	0
	Relocate NJK	m	0	15				0	0
	Remove NJK	m	0	15				0	0
	Erect and Maintain signs	hr	10	50	500				500
	Temp Fencing	m	0	25				0	0
	Anti Gawk Screens	m	0	15				0	0
4.6	**Traffic Controllers**								
	Allow:								
	Dayshift-1man x 2mths	hr	0	55	0				0
	Nightshift - 1man x 0.8 mths	hr	40	75	3,000				3,000
4.8	**Temp Linemarking**								
	Allow Temp Lines full length incl remove	m	0	5				0	0
	Misc-Cheverons/Symbols	Item	0	3000				0	0
	Total Item 4.8	**item**	**1**	**13,500**	**3,500**	**0**	**4,400**	**5,600**	**13,500**

5 DEMOLITION

5.1	**Kerbing**	**m**	**0**						
	Under Traffic and at Night								
	Excavate and dispose to Tip	m	0						
	Allow Backhoe @ 20m/hr	hr	0.0	85.0		0			0
	Lab	hr	0.0	70.0	0				0
	Truck x 2	hr	0	100.0		0			0
	Load and cart to Tip in day	m3	0	30.0		0			0
	Fees	no	0.0	200.0			0		0
	TOTAL ITEM 5.1	**M**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
5.3	**Demolish Pavements**	**m2**	**0**						
	Demolish Concrete paths and bitumen pavements at Night	m2	0	30				0	0
	Saw Cutting	m	0	20				0	0
	TOTAL ITEM 5.3	**M2**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
5.7	**Signs**								
	Remove Signs	**No**	**2**						
	Allow 2men + S/Truck 4signs/hr								
	Lab	hr	2	70.0	140				140
	S/Plant	d	0	200		10			10
	S/Truck	hr	1	100		100			100
	Fees	No	0	300			120		120
	TOTAL ITEM 5.7	**NO**	**2**	**185**	**140**	**110**	**120**	**0**	**370**

6 EARTHWORKS

6.1	**Boxout for pavement**	**m3**	**0**						
	Excavate for new pavement-slow production at Night								
	Exc @ 15m3/hr	hr	0	150		0			0
	Allow 20k haul - 90min haul=8m3/hr/truck								
	Allow 4 trucks	hr	0	100		0			0
	Lab	hr	0	70	0				0
	Tip Fees	m3	0	50			0		0
	TOTAL ITEM 6.1	**m3**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
6.2	**200mm Select - SMZ**	**m2**	**0**						
	Supply	t	0	27			0		0
	Bobcat/Grader @10m3/hr	hr	0	100		0			0
	Roller	hr	0	110		0			0
	W/cart	hr	0	95		0			0
	Lab	hr	0	70	0				0
	Trim @ 60m2/hr								
	Grader/Bobcat	hr	0	100		0			0
	Roller	hr	0	110		0			0
	W/cart	hr	0	95		0			0
	Lab	hr	0	70	0				0
	Testing	No	0.00	135				0	0
	TOTAL ITEM 6.2	**m3**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**

7	**DRAINAGE**								
7.1	**375mm RCP Class 4 - RRJ**	**m**	**0**						
	Supply Pipe	m	0.00	53			0		0
	Supply Sand	t	0.00	22			0		0
	Allow crew 2.5 Pipes/hr	m/hr	6						
	Exc	hr	0.0	135		0			0
	Backhoe	hr	0.0	80		0			0
	Lab x 2	hr	0.0	55	0				0
	S/Plant	day	0.0	150		0			0
	Backfil 1.8m3/m	m3	0.00	10		0			0
	Extra over Rock/Foundation	m	0	10		0			0
	Total item 7.1	**m**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
7.2	**Kerb Pits**	**Each**	**0**						
	Excavate and Backfill								
	Backhoe	hr	0	75		0			0
	Lab	hr	0	55	0				0
	Form and pour Pit	m	0	900				0	0
	Supply Conc	m3	0	190			0		0
	Supply Lid	No	0	550			0		0
	Install Lid	No	0	200				0	0
									0
	TOTAL ITEM 7.2	**EACH**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
7.3	**Subsoil Drains**	**m**	**0**						
	Supply Pipe	m	0	6			0		0
	Supply NFC	m3	0	150			0		0
	Supply Geotext	m2	0	2			0		0
	Install @ 50m/day								
	Backhoe	hr	0	95		0			0
	Lab x 2	hr	0	70	0				0
	Clean Out @ 50m crs	no	0	110	0	0	0		0
	Connect to pits	no	0	70	0	0	0		0
	TOTAL ITEM 7.3	**M**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
7.4	**Pram Ramp**	**each**	**0**						
	Allow 3m x 1.5m	m2	3.75						$0
	Supply Concrete	m3	0	170			0		0
	Supply mesh	m2	0	15			0		0
	Form,Mesh and Pour	m2	0	40				0	0
	TOTAL ITEM 7.4	**each**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**$0**
7.5	**Kerbing**	**m**	**0**						
	Type SA	**m**	**0**						
	Prepare	m	0	3		0			$0
	Supply Concrete	m3	0.0	170			0		$0
	Kerbie	m	0	13				0	$0
	TOTAL ITEM 7.5	**M**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
8	**PAVEMENTS**								
8.1	**Heavy Duty Asphalt Pavement**	**m2**	0						
	300mm HB Base	**m3**	**0**						
	Supply material	t	0.00	34			0		$0
	Place @ 10m3/hr								
	Bobcat	hr	0.0	95		0			$0
	Roller	hr	0	100		0			$0
	W/cart	hr	0	95		0			$0
	Trim @ 60m2/hr	m2	0						
	Bobcat	hr	0	95		0			$0
	Roller	hr	0	100		0			$0
	W/cart	hr	0	95		0			$0
	Test	No	0.00	115				0	$0
	AC14 (C320, 50mm thick)	**m^2**	**0**						
	S/Cont - N/S	t	0	220				0	$0
	Total Item 8.1	**m2**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
8.2	**Profile existing at Night**	**m2**	**1,800**						
	Subcont incl disposal	m2	1800	10.0				18,000	18,000
	50mm O.G Asphalt	**m2**	**1800**						
	Subcontract-N/S	t	221	220.0				48,510	48,510
	Allowance for adjustment to levels	t	44	220.0				9,742	9,742

	TOTAL ITEM 8.2	**M2**	**1800**	**42**	**0**	**0**	**0**	**76,252**	**76,252**
8.3	**Patching**	**m2**	**20**						
	Allow to excavte 200mm and fill with AC								
	Saw Cut	m	20	15				300	300
	Excavate and dispose	m2	4	300				1,200	1,200
	AC	t	9.8	400				3,920	3,920
	TOTAL ITEM 8.3	**M**	**20**	**271**	**0**	**0**	**0**	**5,420**	**5,420**

9 BRIDGES & STRUCTURES

10 MISCELLANEOUS

10.1	**Traffic Lights**	**no**	**0**						
	Allow to relocate one Post and new Detector Loops								
	Remove existing large post and lantern	each		2,000				0	0
	Traffic Signal Footings	each		650				0	0
	Replace Traffic light post	each		1200				0	0
	Detector loop (new through lane only)	each		800				0	0
	Decom and Adjustment to existing Controller	item		10000				0	0
	TOTAL ITEM 10.1	**NO**	**0**	**#DIV/0!**	**0**	**0**	**0**	**0**	**0**
10.2	**Pavement Markings**	**Item**	**1**						
	Lines	m	450						
	Supply and Install	m	450	3.00				1350	1350
	RPM's	No	38	8				281	281
	Arrows and Symbols	No	6	120				720	720
	Cheverons	m2	190	50				9500	9500
	Pedestrain crossing	No	1	2000				2000	2000
	Allowance for removing existing lines	m	0	4				0	0
	TOTAL ITEM 10.3	**ITEM**	**1**	**13,851**	**0**	**0**	**0**	**13,851**	**13,851**
10.3	**Signage and Gantries**	**No**	**5**						
	Signage-small	**No**	**5**						
	Small Signs-(1-2 Galv Post + S/Sign)	No	5	400				2,000	2,000
	Signage-medium	**No**	**0**						
	Small Signs-(3 Galv Post + M/Sign)	No	0	4000				0	0
	Signage-Large -relocate	**No**	**0**						
	Supply Sign	No	0	0			0		0
	Footings	m3	0	900	0	0	0		0
	erect on site								
	Est Cranes	No	0	2000		0			0
	Crane	hr	0	500		0			0
	Lab x 4	hr	0	60	0				0
	S/Plant	No	0	500		0			0
	Gantries	No	0						
	Extra over Fabricate and supply	t	0	9000				0	0
	Footing	m3	0	2000				0	0
	Erect								
	Est Cranes	No	0	2000		0			0
	Crane	hr	0	250		0			0
	Lab x 6	hr	0	60	0				0
	S/Plant	No	0	300		0			0
	TOTAL ITEM 10.3	**No**	**5**	**400**	**0**	**0**	**0**	**2,000**	**2,000**
10.4	**Concrete Paths**	**m2**	**0**						
	EXCLUDED								
	Client requested separate on Im basis								
	TOTAL ITEM 10.4	**M2**	**0**		**0**	**0**	**0**	**0**	**0**

MOWBRAY ROAD PRECINCT STUDY

Itersection:Wilandra, Hatfield, Mindarie, Girraween

CLIENT:DP & I

Location/Item	Description
Scope of work	Upgrade Mowbray road by providing: Dedicated LH Turn Only at Willandra St Dedicated RH Turn Lanes at Hatfield and Mowbray Rd with Traffic Lights Dedicated RH Turn on Mowbray and LH Turn at Mindarie St Dedicated LH Turn Only at Girraween Ave
Length of Project	
Information/Drawings	4No Overlays -No Drawing Numbers
Services	No allowance for services except Mowbray/Centennial
Traffic Control	Allow TC for milling and Linemarking
Drainage	No allowance
Kerbing	New Sa Kerb to widening at Mowbray/Hatfield
Earthworks	Boxout for pavement wideing Mowbray/Hatfield
Bridges	No bridgework required.
Retaining walls	No retaining walls required.
Pavement	Allow new flexible pavment to widening Mowbray/Hatfield. Allow 200mm Select + 300mm HB Base + 150mm AC Allow Mill and Resheet to Flexible Pavement due to linemarking and Surface condition. No allowance to mill concrete pavements Allow isolated Patching
Concrete Pavements	Pathways - Requested to provide lm rate only. Excl from estimate
Noise Attenuation	No allowance for noise attentuation.
Lighting	No allowance for light adjustments.
Miscellaneous	Allowed for new signs.
Property Acquisition	No property resumption required to Hatfield

MOWBRAY ROAD PRECINCT STUDY

Itersection: Mowbray/Centennial

CLIENT:DP & I

Location/Item	Description
Scope of work	Upgrade Mowbray road by providing: Dedicated LH and RH turn at Centennial and 2 x RH Turn at Mowbray
Length of Project	
Information/Drawings	1No Overlays -No Drawing Numbers
Services	Possible adjustment to Widen Mowbray Road at Centennial No allowance for services except Mowbray/Centennial
Traffic Control	Allow TC for milling and Linemarking
Drainage	Allow new pipeline at Widening at Mowbray/Centennial
Kerbing	New Sa Kerb to widening a Mowbray/Centennial
Earthworks	Boxout for pavement wideing Mowbray/Centennial
Bridges	No bridgework required.
Retaining walls	No retaining walls required.
Pavement	Allow new flexible pavment to widening Mowbray/Centennial. Allow 200mm Select + 300mm HB Base + 150mm AC Allow Mill and Resheet to Flexible Pavement due to linemarking and Surface condition. No allowance to mill concrete pavements Allow isolated Patching
Concrete Pavements	Pathways - Requested to provide lm rate only
Noise Attenuation	No allowance for noise attentuation.
Lighting	No allowance for light adjustments.
Miscellaneous	Allowed for new signs.
Property Acquisition	No property resumption required to 506 and 508 Mowbray Road

Mowbray road Precint Study

Address	Lot Number	Plan Number	Approximate Area	Type
No details allowance only		Area	Rate	Amount
3 Properties on Mowbray rd at Centennial		0	500	$0
1 property - side Hatfield		120	500	$60,000
Total Property Acquisition				$60,000

Address	Lot Number	Plan Number	Approximate Area	Type
No details allowance only		Area	Rate	Amount
3 Properties on Mowbray rd at Centennial		275	500	$137,500
1 property - side Hatfield		0	500	$0
Total Property Acquisition				$137,500