Better Transport Futures

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HMRI Development, Rankin Park Hospital Campus, New Lambton Heights, Newcastle, NSW

Transport and Accessibility Report

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1. EXECUTIVE SUMMARY

The Hunter Medical Research Institute plans to establish a leading Research Facility at the John Hunter Hospital, at Rankin Park. This location offers the Institute a site where they can combine a number of existing dispersed facilities into a single location. This will provide all the benefits of a single co-ordinated facility adjacent to a Health campus enabling interaction with other medical and research facilities. The proposed site is situated within the John Hunter Hospital Precinct. This is one of the busiest hospital precincts in NSW where efficient traffic circulation and parking is essential to the effective delivery of the health services provided. The precinct currently has approximately 2600 parking spaces and generates in the region of 15,500 vehicle trips per day. There is a widespread perception that the overall precinct does not currently provide adequate parking to support the facilities and services provided.

The development site is located to the north of the John Hunter Hospital Building with access off the existing circulation road, Kookaburra Circuit. The building is planned to accommodate offices, laboratories, and laboratory support zones, together with 250 parking bays. The current designs for the building indicate a Gross Floor Area of 15,962m^2. It is expected the building will accommodate 450 Fulltime Equivalent staff or 514 employees. Of these 381 are fulltime staff and 133 work part time. Of these staff, 149 fulltime and 35 part time staff already work within the Hunter Campus and will be relocated within the campus to the new facility. Consequently these workers already have existing travel and parking patterns which may not necessarily change when relocated.

The site is currently occupied by the former staff amenities building, bushland and the existing 150 bay Staff Car Park No 5. As part of the development two tiers of parking are proposed to be located alongside the new building. These will provide 250 bays for use by HMRI, this equates to a car park to staff ratio of approximately one bay per two staff. The majority of the bays will be for staff use though some may be allocated to visitors. The 150 existing general Hospital Staff parking bays will be replaced in a third tier of parking, and 16 existing permit parking bays located on Kookaburra Circuit will be relocated into the second tier of parking.

The design of the building has included a Sky Walk bridge which will provide excellent pedestrian access to the main Hospital and allow full integration with the medical facilities there. It will also encourage staff to use the public transport facilities located at the main entrance to the John Hunter Hospital. The overall Hospital Precinct is well serviced by public transport with 4 routes diverted into the precinct with stops located very close to the main hospital entrance. There are also bus stops located on Lookout Road and on Kookaburra Circuit near Rankin Park. Despite this, over recent years it has become increasingly difficult to park in the overall John Hunter Precinct and the Hunter New England Area Health (HNEAH) service have found it necessary to increase the parking facilities in the precinct.

In order to provide staff and visitors a viable alternative to parking on the campus, HNEAH have provided a free offsite Park and Ride service for some time based on parking at the Energy Australia Stadium in Broadmeadow. This service is operated by Inter Park in conjunction with HNEAH providing a shuttle bus service to the Hospital on a timetable suitable both for staff shift change times and for visitors during the day. This service is predominantly used by general Hospital staff with between 70 - 90 staff using it each day. HNEAHS recognises this service provides staff with a viable alternative to parking at the Hospital and has indicated its continuing support for the bus service. Staff from the Hospital campus are also known to park in the residential streets on the eastern side of Lookout Road and on Lookout Road itself. A recent introduction of stricter parking management on the residential roads to the east of Lookout Road was reflected in an increase in the patronage at the Park and Ride site.

There are no specific parking requirements in the current Newcastle City Council DCP 2005 Section 4.1, for parking for Research Facilities; consequently the parking provision has been based on a comparison with activities which would be expected to have a similar work environment and workforce. In this respect commercial offices are the nearest comparison; the NCC DCP 2005 requires 1Bay per 50m^2 GFA. Based on a GFA of 15,962m^2 this equates to 319 parking bays, or over 25% more than proposed. The DCP does, however, state "*A balanced approach to on-site car parking provision is required that addresses likely car parking demand as well as Council's objectives of encouraging increased trips by walking cycling and use of public transport in preference to the use of private motor vehicle.* In the spirit of this and the current policy of the Ministry of Transport, which seeks "*a minimalist approach to car parking provision based on the accessibility of the site to public transport"* a 20% reduction in the car parking provision is proposed with a parking provision of 250 bays adopted for construction. This approach will require the HMRI to adopt active measures and policies to encourage the use of other methods of transport.

The new development has been reviewed and it is anticipated it will generate up to approximately 385 additional vehicle trips in the morning peak hour and up to 300 additional vehicle trips in the evening peak hour on the adjacent road network. These levels of traffic generation will depend on the levels of alternative transport use that can be achieved on the campus.

This Transport and Accessibility Report has been prepared based on the general requirements of the RTA's Guide to Traffic to Traffic Generating Developments and the Director General's Requirements (ref: MP_08_0170) as shown in Table 1.1 below.

- **Table 1-1 Director General's Requirements, NCC and MoT. (ref: MP_08_0170)**

Transport and Accessibility DGR's	Reference
▪ Provide a Traffic and Transport Study that addresses the following:	▪ This document
• Surrounding Context and how the proposal fits within the overall hospital campus in terms of transport and traffic management;	▪ Sections 3.1 & 4.1
• Estimated vehicular traffic generation from the proposed development and the cumulative impact of this with any other known development proposals in the area;	▪ Section 5.1
• Existing public transport services in the site, together with the other transport services offered by the hospital;	▪ Section 3.6
• Measures to encourage mode shift to public transport and reduce reliance on on-site parking;	▪ Sections 3.6.2 & 4.2.7
• Existing pedestrian and cycle movements within the vicinity of the subject site and determine the adequacy of the proposal to meet the likely future demand for increased pedestrian and cycle access – this may include facilities for secure bicycle storage; and	▪ Sections 3.2.4 & 3.6.3
• Travel Demand Management (TDM) measures that will optimise the opportunity provided by the projects site's proximity to public transport	▪ Sections 3.2.4, 3.5 & 3.6.3
▪ Compliance with the RTA *Guide to Traffic Generating Developments*.	▪ All Sections
▪ Internal road and access arrangements including entry points, drop off points, traffic management and hierarchy.	▪ Sections 4.2 & 4.3
▪ Car parking provision for the development taking into consideration future developments proposed for the site	▪ Sections 3.5 & 4.4
▪ Service Delivery requirements.	▪ Sections 4.4.5
▪ Emergency Evacuation and Public Access.	▪ Sections 4.2
▪ Traffic management during construction including car parking requirements for construction workers	▪ Sections 4.3.7 & 5.4.3
City of Newcastle additional to DGR'S requirements	**Reference**
▪ Impacts on internal road system including a review of the capacity and intersection performance	▪ Section 5.4.2
▪ Compliance of any proposed car parking with the requirements of AS2890.1-2004 Part 1, and AS 2890.2-2002.	▪ Section 4.
▪ Car Parking assessment must also consider the current parking shortfall on the site and the impact this will have on the parking demand at the site	▪ Section 4.3.4
▪ Car Parking provision is to be in accordance with Element 4.1 of Council's DCP 2005	▪ Section 4
▪ Access to existing visitor parking is currently some distance away from the development,	▪ Section 4
Ministry of Transport	**Reference**
▪ Preparation of a Workplace Travel Plan	▪ Section 5
▪ Demonstration of minimalist approach to car parking provision based on the accessibility of the site to public transport	▪ Section 4
▪ Pedestrian and cycle movements , how likely future demand being met	▪ Section 4.3.6
Identification of Travel Demand Management measures and preparation of a Travel Access Guide.	▪ Section 5

As specified in these DGR's, there will be ongoing consultation with the Ministry of Transport, City of Newcastle, and RTA. It is understood the Ministry of Transport may require the integration of land use and transport issues at this site to be addressed under Section 3.4 of Section 117(2) of the Environmental Planning and Assessment Act 1979.

As part of the ongoing planning for the development a Travel Access Guide and a Workplace Travel Plan will be prepared to include incentives and measures such as:

- Full information to all staff re public transport options, guidance for its use, fares, timetables etc;
- Ensure the bus timetables are appropriate for all shift change times, and identify any routes/destinations not adequately catered for;
- Full information on the walking and cycling facilities on the approaches to, and around the Hospital.

Additionally, incentives to encourage public transport use and reduce the reliance on the private car for travel to the Campus should be identified at both the HMRI level and at Campus level, these could include:

- **Real time public transport information** Timetable information available at the bus stops and online, informing users when the next bus is actually arriving, staff can check if there is a bus due before they leave the office, visitors are informed at the bus stop when the next bus will actually arrive not just when it should arrive. This would require State Government support;
- **Bus Reliability.** As congestion on the approaches to the Hospital increases with general traffic growth, the opportunities to improve public transport reliability and journey times (compared to private car use) should be investigated;
- **Integrated Network Plans**. Liaison with the Ministry of Transport regarding the development of Integrated Network Plans (INP) for the Lower Hunter Region and how these can be used to improve the public transport services to the Campus;
- **Car Pooling.** Employees, campus wide, are informed of other staff who live in their suburbs and who could share cars. Could be supplemented with the designation of special parking bays for car pool vehicles or discounted parking rates;
- **Flexible working hours.** This would be particularly beneficial for staff at the HMRI where shift coverage is not so essential. This would increase the proportion of staff travelling to work outside peak times. As the adjacent road network becomes more congested, flexible working hours become a more attractive options to staff and management;
- **Extend the Park and Ride Route.** Discussions should be held with HNEAHS and InterPark regarding the extension of the existing park and ride scheme to include the HMRI building via Kookaburra Circuit. The proposed road improvements to Kookaburra Circuit have included provision for a drop off – pick up location for buses. It is not anticipated the public bus services will ever use Kookaburra Circuit, however, the smaller buses used for the shuttle

service would be viable. The footpath width has been extended adjacent to the bus stop to accommodate waiting passengers and a shelter. It will also be necessary for the service timetables to be reviewed to accommodate the HMRI shift hours and to increase capacity. These discussions should also be extended to include the introduction of a similar service from the area south or west of the campus to extend the catchment area for staff to use the shuttle/park and ride service. The extension to the service may also include other key locations such as the University and local train stations;

- The travel issues at the overall campus should be the responsibility of one person, such as a transport co-ordinator.

Parking on the campus is known to be extremely difficult to find at peak times and traffic conditions on the adjacent Lookout Road can be very congested during peak flows. Any additional development on the campus has the potential to exacerbate these issues. An increased awareness within the campus of the alternative options for transport will reduce the impact the HMRI development has on these aspects of the campus operation. All options to minimise that impact will be explored by the HMRI during the design development phase and they will work with HNEAHS and the State Authorities to provide modern integrated transport access arrangements for the campus.

2. Introduction

Background
Better Transport Futures has been commissioned by S2F Ltd to prepare a Transport and Accessibility Report for the proposed new Hunter Research Medical Institute building to the north of the existing John Hunter Hospital Building on the Rankin Health Campus off Lookout Road, New Lambton Heights. This work is required to support a Part 3A Application for the proposal to the NSW Department of Planning. Due to the potential impact of the development upon Lookout Road, which forms part of the regional road network, the Roads and Traffic Authority for NSW (RTA) and the NSW Ministry of Transport (MoT) will be required to review the proposal and provide advice to the Department of Planning.

Scope of Report
The scope of this report is to review the traffic, transport, access and parking implications of the proposed development. The report covers all aspects of transport and access to the Hospital providing advice on access for all forms of transport, internal car park layouts and issues relating to service vehicles and construction traffic.

Issues and Objectives of the study
The issues relative to the proposal are:

- Assess the overall transport opportunities and implications of the proposals for all forms of transport, including public transport, pedestrians and cyclists;
- Identify measures to encourage the use of transport other than the private car;
- Assess impact on the arterial and local road network due to the potential additional traffic flows;
- Assess the impact of the additional parking constructed as part of the development;
- Review the access arrangements for the development;
- Review the internal site layout and the car park access arrangements;
- Review the service arrangement for the development; and
- Assess any other transport impacts associated with the development.

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

Planning Requirements
As part of the development of this document, the following guides, publications and requirements were used:

- NSW Department of Planning Director General's Requirements, Dated 29th September 2008 (Ref MP 08_170);
- RTA Guide to Traffic Generating Developments, Version 2.2 Dated October 2002;
- Newcastle City Council Car Parking Technical Manual, and DCP 2005, Element 4.1 dated 21/4/09;
- Australian / New Zealand Standard – Parking Facilities Part 1 : off-street car parking (AS2890.1:2004);
- Australian/ New Zealand Standard – Parking Facilities Part 2: Off-street commercial vehicle facilities. (AS 2890.2-2002);
- Accident Data for the Lower Hunter, provided by the RTA (Newcastle office);

3. Existing Situation

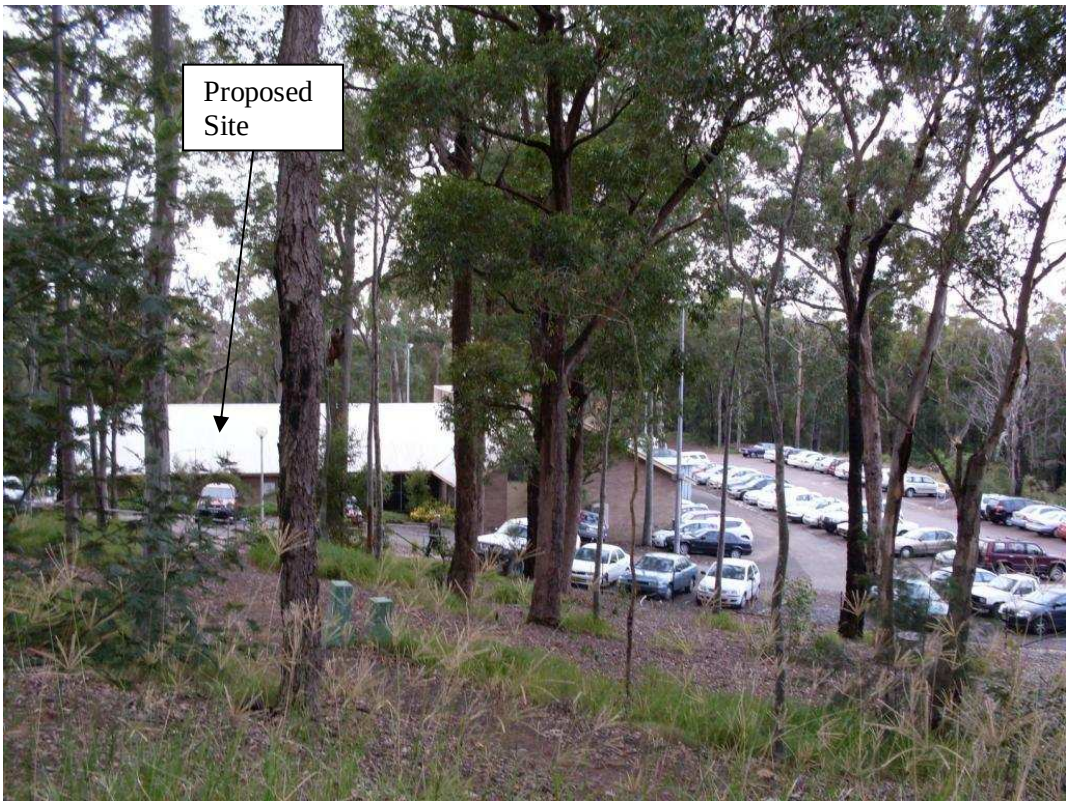
3.1 Site Description and Proposed Activity

3.1.1 Site Location and Access

The site chosen for development is located to the northwest of the John Hunter Hospital Building on the Rankin Park Site as shown in Appendix A.

The site is located to the east of the Cottages, west of No 5 Staff car park and is surrounded by native bush sloping away into the gully to the east and west. Access is via the Campus's main one way internal circulation road, Kookaburra Circuit. The existing land use adjacent to the site is all Health sector related.

Vehicle access to the HMRI building will be via the main Hospital access road system, with entry off Lookout Road via the signalised intersections at Kookaburra Circuit or Jacaranda Drive. All vehicles, including staff parking in the HMRI car park, visitors and service vehicles will then be required to drive past the main entrance to the Hospital on Kookaburra Circuit, around the loop and turn left into the driveway just past the current access to the former staff amenities building and Staff Car Park No 5. The driveway will ramp down to the building with access to the car park to the right, or left to the building drop off areas and service docks straight ahead. Appendix A shows the Site Layout Plan prepared by the Architects.



- **Photo 1 - View of site from Kookaburra Circuit**

Pedestrian access will be via a Sky Walk from Kookaburra Circuit. This will link directly into the building at Reception level (Level 4). Staff and visitors arriving at the campus by bus will be able

to get off the bus at the main Hospital door, walk through the Hospital and exit via a rear door to Kookaburra Circuit to the east of the access to No 4 Staff car park. This distance is approximately 380m. This is a route signposted for hospital staff from Staff Car Park No 4 to the Hospital. The walking distance from No 4 staff car park is approximately 260m, with Staff Car Park No 3 approximately 380m walk.

Cycle access will be available via the main road network, Kookaburra Circuit and Jacaranda Drive. There is also an established cycle track from the HMRI site, through the bushland to the north of the site towards Jesmond and North Lambton. This then links into a longer cycling route between Wallsend and Broadmeadow.

3.2 Existing Traffic Conditions

3.2.1 Road Hierarchy

Lookout Road
The major road through the locality is Lookout Road, it forms part of MR 23 and any new works along this road require concurrence from the Roads and Traffic Authority of NSW (RTA). Lookout Road operates as an arterial road linking the Newcastle Bypass with Newcastle Road.
Lookout Road is a 4 lane road, with a 60kph speed limit and on street parking where width permits. On street parking used by the hospital users occurs on the southern approaches to the intersection with Kookaburra Circuit.

Lookout Road is a major bus route, with 5 services, and stops located between the intersections with Kookaburra Circuit and Jacaranda Drive.

Kookaburra Circuit
Kookaburra Circuit forms the only circulatory road around the main John Hunter Hospital buildings. It operates as a two way road to the main John Hunter Hospital entrance then operates one way clockwise around the building. It operates with a single lane in each direction, and essentially a single lane through the one way part. . It is approximately 6m wide through the one way section with a 1m footpath along the northern kerb line. Parking is permitted along the left hand lane with all parking by Permit Only. There are 20kph speed limit signs on entering the Hospital off Lookout Drive with some repeater signs around Kookaburra Circuit.

■ **Photo 2. Kookaburra Circuit on approach to proposed driveway.**

Jacaranda Drive
Jacaranda Drive is a local internal circulation road, constructed in 2007 as part of the upgrade to the Hospital Layout. It has a variable width but is 8m wide for much of its length, no parking allowed and marked for cyclist use. It links the main hospital internal road network with the secondary access to Lookout Road, providing all hospital users with an alternate access into and out of the precinct. It is marked with 40kph speed limit signs.

3.2.2 Pedestrians

There are pedestrian footpaths along both sides of Lookout Road, which link into the pedestrian crossing phases at both the intersections of Lookout Road with Kookaburra Circuit and Jacaranda Drive. These provide pedestrian access into the Hospital. There are also numerous pedestrian footpaths and crossing locations around the Hospital site, developed to accommodate the significant number of pedestrian movements from the parking areas and for general mobility around the Hospital facilities. Many of the pedestrian facilities have been designed to cater for wheelchairs and disabled pedestrians. These, however, are mainly located in the busier public areas between the main hospital building and the main car parks. The demand for pedestrian facilities is not so prevalent around the section of Kookaburra Circuit adjacent to the proposed HMRI building. Photo 3 below clearly shows the existing footpath adjacent to the site.

Adjacent to the proposed HMRI site, Kookaburra Circuit has a substandard 1m footpath along the left hand side of the road. It is regularly used by staff parking in the Staff Car Parks No's 4 and 5 to access the pedestrian link into the Hospital and the zebra crossing located across the western end of Kookaburra Circuit.

■ **Photo 3. Existing zebra crossing adjacent to proposed site.**

3.2.3 Cycling Facilities

There are intermittent cycling facilities on the roads around the Hospital. Lookout Road has some on-road cycle lanes on the approaches to the signalised intersections, whilst in other locations there are no cycling facilities. There is a bike trail from the former staff amenities building area joining one of the longer distance trails that runs along the south side of Jesmond Park and through to Broadmeadow to the east and to Wallsend in the west. There are no specific cycling facilities within the hospital site; however Jacaranda Drive has been marked for on road cycle use and all other roads are generally low speed. Most of the other local roads in the broader Hospital area do not have any cycling facilities due to the low cycling demands and the low traffic flows.

Bicycle storage and showering facilities already exist throughout the Hospital

3.2.4 Road works

There are no road works currently occurring in the general vicinity of the subject site.

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

3.2.5 Traffic Management Works

It is understood that there are no planned traffic management works in the general locality of the hospital site.

3.3 Existing Traffic Flows

The key roads affected by the development will be Lookout Road, Jacaranda Drive and Kookaburra Circuit and the intersections between them. The proposed development is a research establishment with 450 full time equivalent staff, mainly laboratory and research staff. The majority of staff (381) will be full time; however, 133 will be part time. There will also be some visitors/Clinical subjects on research programmes. The peak traffic generation times are expected to be at the start and end of the working day. These are currently housed both on and off the Rankin Park campus and currently work 8.30am to 5.00pm.

Observations made during the course of this study confirmed significant queuing occurs on the approaches to the intersections on Lookout Road northbound in the morning and southbound in the evening peak times. There is also some minor intermittent queuing on the internal hospital roads and intersections at peak times.

This traffic review indicates the overall hospital campus generates in the order of 15,500 vehicles per day (vpd). The traffic counts show a peak activity into and out of the hospital before 7am, a smaller peak at 8am to 9am, a steady flow during the day, with peaks at 3pm and 5pm. This reflects the shift change times and the administration staff hours.

3.3.1 Daily Traffic Flows

Traffic flow data has been sourced from three sources:

- RTA Traffic Count Data. The RTA traffic count information indicates the AAWT on Lookout Road was approximately 39000vpd in 2008. This volume has remained at this level since 2004. The volumes on this section of road have only increased from 35,000vpd in 1995 to 39,000vpd in 2008, an increase of 13% over 13 years, an average of 1% per annum. A 1% growth per annum has, therefore, been adopted to extrapolate the future traffic conditions for the Year 2018 as required by the RTA;
- Traffic counts at the intersections of Lookout Road with Kookaburra Circuit, and Lookout Road and Jacaranda Drive undertaken in October 2008;
- 24 hour counts undertaken for the Hunter New England Area Health Service (HNEAHS) in July 2008 within the Hospital Campus have been made available to this study.

3.3.2 Daily Traffic Flow Distribution

The 24 hour counts undertaken in 2008 throughout the hospital area indicates the variation from day to day with the weekday flows on Jacaranda Drive, just west of the intersection with Lookout Road ranging from 1645 vehicles per day on a Wednesday to 1435 vehicles on Monday and 500 on a Sunday. The data indicates the traffic flows shown in Table 3.1 on the roads in the vicinity.

■ **Table 3-1 - Daily Traffic Flows inside the Hospital Area, July 2008**

ROAD	Daily traffic, vehicles per day		Peak hour vehicles per hour. AM/PM	Level of Service Peak hours. AM/PM
Kookaburra Circuit, west of Lookout Road	Into Hospital	7000vpd	194/272	A/B
	Out of Hosp	7000vpd	818/774	D/D
Jacaranda Drive west of Lookout Road	Into Hosp	855vpd	167/58	A/A
	Out of Hosp	803vpd	53/123	A/A
Kookaburra Circuit, west of Jacaranda Drive	Westwards	4770vpd	590/250	C/B
	Eastwards	2200vpd	170/185	A/B
Kookaburra Circuit, outside HAPS building	Northwards	3000vpd	285/265	B/B
Kookaburra Circuit, north of Jacaranda Drive	Northbound	4000vpd	150/550	A/B

Table 3.2 below is taken from the RTA Guide to Traffic Generating Developments and shows the capacity of urban roads, based on the Level of Service, with Level of Service A representing the best operation.

■ **Table 3-2– RTA Levels of Service**

Urban road peak hour flows per direction

Level of Service	One Lane (veh/hr)	Two Lanes (veh/hr)
A	200	900
B	380	1400
C	600	1800
D	900	2200
E	1400	2800

Source: RTA Guide to Traffic Generating Developments, version 2.2 dated October 2002.

3.3.3 Vehicle Speeds

No vehicle speed measurements have been taken as part of the study work. However, speed surveys undertaken by HNEAHS indicate speeding is not a problem at the locations surveyed.

3.3.4 Existing Traffic Flows Generated by the Proposed HMRI site

The site is currently occupied by the Hospital's social club, the former staff amenities building and by vacant land. The existing traffic movements generated by the site have not been counted as part of this study. There are currently approximately 150 staff parking spaces located on the site.

3.3.5 Heavy Vehicle Flows

The existing site use generates very low numbers of deliveries; however, the section of the Hospital that backs onto Kookaburra Circuit in this area is the Engineering section which has frequent deliveries and tradesman trucks in the vicinity. The majority of deliveries and servicing occurs in the large loading dock at the eastern end of Kookaburra Circuit. Here two way operations

on Kookaburra Circuit allow truck access directly off Jacaranda Drive into the Hospital servicing and loading dock.

3.3.6 Current Road Network Operation

As part of the assessment for the proposed development, the intersection analysis computer program Sidra has been used. The Sidra analysis has reviewed the current existing flows as well as the impact of background traffic growth along Lookout Road. It is a requirement of the RTA that the capacity analysis undertaken for these intersections takes into account the general overall growth of traffic in the area for the next 10 years. RTA advice recommends the use of 2% per annum growth per year. However, based on the traffic flows recorded over the last 13 years and the length of queues being experienced on Lookout Road, it is unlikely that 2% growth in the peak hours will be experienced. Consequently a 1% growth factor has been adopted in keeping with the growth recorded since 1995. This 1% growth has only been applied to the through movements on Lookout Road. Any growth in the traffic turning into or out of the Hospital will be generated by development on the Hospital site not by growth of general traffic in the area. The capacity assessments recorded in the Table below include allowance for the other known development in the area, the extension to the Private Hospital off Jacaranda Drive.

The results of the analysis for the existing and 2018 flows are provided in **Table 3-3** and Table 3-4 below.

- **Table 3-3 Existing and 2018 Traffic Flows without proposed development. Lookout Road/Jacaranda Drive**

Approach	Movement		Degree of Saturation AM/PM	Delays (Seconds) AM/PM	Level of Service AM/PM	Queues (Metres) AM/PM
Lookout Road Sth App	Through	2008	.87/.57	21/8	B/A	248/122
		2018	.9/.56	22/5	B/A	364/157
Lookout Road Nth App	Through	2008	.63/.87	10/18	A/B	123/302
		2018	.65/.86	8/9	A/A	156/415
	Right	2008	.44/.23	34/41	C/C	53/29
		2018	.57/.4	46/77	D/F	68/51
Jacaranda Dr, West App	Left	2008	.1/.45	32/42	C/C	12/54
		2018	.12/.8	43/84	D/F	16/95

Table 3-4 Existing and 2018 Traffic flows without proposed development. Lookout Road/Kookaburra Circuit.

Approach	Movement		Degree of Saturation AM/PM	Delays (Seconds) AM/PM	Level of Service AM/PM	Queue (metres) AM/PM
Lookout Road Sth App	Left	2008	.29/.10	9/8	A/A	40/11
		2018	.29/.11	9/8	A/A	42/13
	Through	2008	.95/.88	58/50	E/D	569/370
		2018	.96/.88	58/47	E/D	641/360
Ridgeway East App	Right	2008	.06/.08	68/64	E/E	8/11
		2018	.08/.08	68/66	E/E	11/11

Lookout Road Nth App	Through	2008	.4/.93	6/64	A/E	106/527
		2018	.5/.99	6/81	A/F	114/750
	Right	2008	1.00/.93	71/47	E/F	114/85
		2018	1.00/.85	77/88	F/F	124/83
Kookaburra Circuit West approach	Left turn	2008	.41/.96	30/26	C/B	27/49
		2018	.45/..98	34/26	C/B	29/69
	Right Turn	2008	.3/.92	70/91	F/F	59/90
		2018	.3/.99	70/117	F/F	55/218

The Sidra analysis confirms the on-site observations that there are significant queues occurring on the through movements on Lookout Road at peak times, these can be expected to deteriorate as general traffic volumes increase in the area.

In accordance with the requirements of the City of Newcastle a capacity analysis of the internal intersections has been completed as part of this study. The Tables below show the operational characteristics of the two roundabouts on Jacaranda Drive with Kookaburra Circuit. Both tables show the good operation currently occurring at these intersections. Observations have confirmed the good levels of service occurring even during the peak entry and exit times. Some transient queuing occurs which generally clears very quickly.

- **Table 3-5 Roundabout at intersection of Kookaburra Circuit and Jacaranda Drive, by loading dock**

Approach	Movement		Degree of Saturation AM/PM	Delays (Seconds) AM/PM	Level of Service AM/PM	Queue (metres) AM/PM
Kookaburra Circuit west app	Left	2008	.2/.4	8/7	A/A	7/25
	Right	2008	.2/.4	12/12	A/A	7/25
Jacaranda Drive south app	Through	2008	.14/.06	6/6	A/A	8/3
	Left	2008	.15/.06	5/5	A/A	8/3
Jacaranda Dr north app	Through	2008	.16/.2	6/7	A/A	8/12
	Right	2008	.16/.2	12/13	A/A	8/12

- **Table 3-6 Roundabout at intersection of Kookaburra Circuit and Jacaranda Dr, by McDonald House.**

Approach	Movement		Degree of Saturation AM/PM	Delays (Seconds) AM/PM	Level of Service AM/PM	Queue (metres) AM/PM
Kookaburra Circuit east app	Left	2008	.42/.13	7/7	A/A	28/7
	Right	2008	.21/.13	11/11	A/A	11/1
Jacaranda Dr North app	Left	2008	.26/.5	7/7	A/A	14/33
	Right	2008	.26/.5	12/12	A/A	14/33
Kookaburra Circuit west app	Through	2008	.15/.15	7/6	A/A	7/7
	Right	2008	.15/.15	12/11	A/A	7/7

3.4 Traffic Safety and Accident History

- A review of the recorded crashes in the vicinity of Rankin Park has shown there have been no recorded accidents at the intersection of Jacaranda Drive and Lookout Road up until 10th June 2008.
- There have been 7 recorded accidents at the signalised intersection of Kookaburra Circuit and Lookout Road in the last 5 years. 4 were Treated injury accidents and 2 were Admitted Injury accidents.
- There are no records of any accidents occurring on the public roads within the Hospital in the last 5 years.

3.5 Existing Parking Supply and Demand

3.5.1 On-street Parking Provision

Currently, there is very little on street parking allowed within the overall Rankin Park/John Hunter Precinct. There are approximately 75 designated on road bays on Kookaburra Circuit, all controlled by Permits. There is, also, significant parking available in the residential streets on the eastern side of Lookout Road. Observations indicate in the order of 70 vehicles parking all day in these streets which do not belong to residents. This parking has been observed to occur all day and whilst some of the roads have time limited parking restrictions it is understood these are often flaunted. Newcastle City Council has recently extended the area covered by these limited time restrictions which has pushed the parking further from the Hospital. There is also on street parking where width permits on Lookout Road.

3.5.2 Off-Street Parking Provision

Parking is one of the biggest issues at the overall Hospital site, both for staff and visitors. The overall Hospital campus has in the order of 2600 parking bays. The proposed site for the HMRI building is currently adjacent to Staff Car Park No 5 with space for approximately 148 vehicles. Not all these bays are formally marked so the capacity varies with how the vehicles are informally positioned. The area comprises:

- 95 formed and marked car parking spaces;
- An additional 23 car parking spaces within the former tennis court;
- In the order of 30 additional parking spaces in the landscaped/garden beds and bushland areas;
- In total, approximately 148 spaces, dependant on the parking layout in the unmarked areas.

The demands for parking on the overall Hospital campus in recent years resulted in the introduction of a free offsite park and ride facility which enables staff and visitors to park at the Energy Australia Stadium in Broadmeadow and catch a special bus service to the Hospital. This service is becoming more popular with Hospital Staff with between 70 and 90 staff a day utilising the service. HNEAHS have pledged their continued support for this service.

3.5.3 Parking Demand and Utilisation

A parking utilization study has not been considered necessary as part of this project, however, parking is considered at a premium in the John Hunter Hospital area and is one of the biggest issues amongst staff and visitors. The staff parking areas adjacent to the proposed HMRI site are probably the least popular parking areas on the campus due to the distance from the hospital, however, these bays do fill to capacity at times and generally all hospital bays are well utilised. Staff parking is charged at a flat daily rate which has resulted in parking in the residential areas to the east of Lookout Road. In addition to this between 70 and 90 Hospital Staff utilise the parking facilities at Energy Australia Stadium.

3.6 Existing Public Transport

3.6.1 Rail Station Locations

There is currently no direct access to the site by rail, with no station within close proximity to the Hospital campus. Bus services do connect Broadmeadow, Cardiff and Waratah stations to the campus.

3.6.2 Bus Stops and Associated Facilities

The bus services in this area were upgraded in November 2008 to specifically improve the service and frequency of services to the Hospital Campus. This has improved the connectivity of the campus with the surrounding areas. Consequently the Ministry of Transport "*is therefore keen to ensure the development and the medical precinct within which it resides achieves a substantial mode share to public transport*" (from MoT letter dated 21st January 2009.)

There are 5 bus routes which enter John Hunter Campus, No's 100, 222, 272, 363 and 224. They provide services to /from the City, Charlestown, the University, Toronto, Mayfield, Wallsend, Warners Bay, Glendale and Kotara. Most of these services operate a 20 minute service during peak hours and a 30 minute service during off peak hours. The services enter the campus, stopping outside the main public hospital, turning at the entrance and returning to Lookout Road. This stop is identified in the 2008 Lower Hunter Transport Guide as a Connection Point where interchange between services can be achieved. There are also stops on Lookout Road adjacent to the Hospital and on Kookaburra Circuit adjacent to Rankin Park. There are good pedestrian links to all the bus stops. Signalised pedestrian crossings are installed at both the intersections of Lookout Road with Kookaburra Circuit and Jacaranda Drive.

The various Hospitals on the overall campus have cooperated to provide a free 40 minute bus service to and from the Energy Australia Stadium in Broadmeadow, where free parking has been designated for Hospital staff and visitors. Whilst the bus service is available for patients, visitors and staff, it is predominantly used by staff, with up to 70 – 90 staff utilising the service each day.

3.7 Other Proposed Developments

Discussions with HNEAH indicate the only known development on the Campus at present is the extension to the Private Hospital off Jacaranda Drive. The impact of this development has been included in this assessment.

4. Proposed Development

4.1 The Development

Plans for the development have been prepared by the Architects in Association: S2F and Denton Corker Marshall, a copy of the overall site layout is provided in Appendix A to this report.

4.1.1 Nature of Development

The proposal is for the Hunter Medical Research Institute to build a new Research facility comprising of offices, laboratories and laboratory support zones. This will be constructed on the site of the former staff amenities building area. The current plans indicate:

- a useable floor space of 9,435m^2, provided over 4 floors;
- a pod area where the public and clinical subjects will be accommodated separate from the laboratory zones;
- 250 car parking bays for HMRI use, provided on 2 levels, designed in accordance with AS 1289.1and AS2890/AS1428;
- 16 permit parking bays provided on the second tier to replace the parking removed from Kookaburra Circuit;
- Separate driveway access to Kookaburra Circuit, shared with access to 150 rebuilt HNEAHS general staff parking bays, Staff Car Park No 5;
- Dedicated pedestrian access via a Sky Walk from Kookaburra Circuit to the entrance to the building;
- Bus and car drop off area on Kookaburra Circuit adjacent to the Sky Walk;
- 36 Bicycle parking spaces on the ground floor adjacent to the west wing with change rooms and showers close by;
- 12 Motorcycle parking bays provided adjacent to the building;
- Drop off zones under the pod area together with Disabled bays and courier zones;
- Separated loading/servicing areas, designed in accordance with AS 1289.2.

Provision is being made in the design of the building for 450 full time equivalent employees in 2012. Of these 381 are fulltime and 133 part time employees, 514 employees in total. This will be one of the largest centres of employment on the campus.

4.1.2 Access and Circulation

Traffic access to the new development is proposed off Kookaburra Circuit using the current circulation patterns well established on the campus. This is a one way road so consequently all staff; visitors and servicing vehicles will arrive and depart via the same route. It is only at Jacaranda Drive that drivers have a choice of route to leave the campus. The existing access to the

former staff amenities building car park will be closed, the existing car park will be reconstructed in the new location and access provided via the new driveway located 80m to the east of the existing car park access. There will be no increase in the number of intersections off Kookaburra Circuit; there will, however, be an increase in the level of traffic using Kookaburra Circuit.

All traffic will have the option of entering and leaving the Hospital Campus off Lookout Road via either Kookaburra Circuit or Jacaranda Drive. Those entering via Kookaburra Circuit will simply drive straight ahead at the first roundabout, past the main hospital entrance and following the one way system, around the loop turning left into the HMRI driveway. They then have the option of using the drop off area or turning right into the car parks. Service vehicles will proceed straight ahead into their separate servicing area. Traffic arriving via Jacaranda Drive will have to proceed to the Kookaburra Circuit roundabout, turn right then follow the same route.

■ **Photo 4. View of proposed driveway location.**

All exiting vehicles will turn left out of the HMRI Drive, drive along Kookaburra Circuit, as shown on Photo 5, below, turning left or right at the Jacaranda roundabout depending on their choice of exit.

Kookaburra Circuit is a 20kph zone, frequent speed bumps along its length enforce this speed limit.

Pedestrian access will be via the existing internal hospital footpath system, crossing Kookaburra Circuit at the existing zebra crossing, and utilising the new footpath to the Sky Walk into the building. Footpaths from the parking decks will provide pedestrians access into the lower level of the building. Longer term it is hoped pedestrian access can be achieved through the Engineering section of the Hospital to allow pedestrians from the lower (general hospital staff) level of parking to provide a shorter more direct route to the Hospital.

A footpath is also provided from the lower staff parking area up to Kookaburra Circuit.

■ **Photo 5. Kookaburra Circuit from the proposed driveway looking east towaRoads Jacaranda Drive**

4.2 Access

4.2.1 Driveway Location

Vehicle access to the building will be via a single two way driveway off Kookaburra Circuit. The location of this driveway has been determined by the 9m level difference on the site between the roadway and the car park. The driveway has achieved this level change whilst using grades acceptable under AS standards. The location of the driveway also allows good visibility of vehicles approaching along Kookaburra Circuit from the right, approximately 90m of visibility is achievable. This is acceptable for a 20kph speed zone.

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■ **Photo 6 View south looking west along Kookaburra Circuit towards proposed access location.**

4.2.2 Road works

The construction will involve alterations to Kookaburra Circuit in the vicinity of the former staff amenities building driveway. This will be closed and a wider footpath provided to the existing zebra crossing to improve pedestrian conditions. Drop off bays will be designated in this location together with a bus bay.

4.2.3 Service Vehicle Access

All service vehicles will access the site by the same routes. There will be no requirement for service vehicles to pass through the drop off zone on the lower levels or to use the car park access roads. Based on the expected operation of the various laboratories within the complex a schedule of servicing requirements has been developed which indicates the following delivery schedule:

Size of vehicle	Daily	Weekly
6m truck	3	2
8m truck	5	2
10m truck	3	6
TOTAL	11	10

In additional to this will be the general courier deliveries both to the loading dock and to the general reception area. These will vary on a daily basis.

4.2.4 Queuing at entrance to site

Entry to the site will be via a left turn off Kookaburra Circuit, with vehicles then driving down the hill towards the building. The first turn off this drive into the car park access roads is approximately 70m from Kookaburra Circuit. The barrier gates controlling entry into the car parks are located a further 25m and 70m from the driveway.

4.2.5 Access to Public Transport

Access to existing public transport is very good from the overall Hospital site. Access to the regular service buses is within 380m walk and staff will be encouraged to utilise the free "Park and Ride" service run from Energy Australia Stadium. It is intended that support for this service will be maintained by both the HNEAHS and HMRI to provide a viable alternative for travel to the overall Hospital Campus.

As part of the ongoing development of alternative forms of transport, options to reroute this service around Kookaburra Circuit to stop at the Sky Walk will be investigated. This would significantly improve HMRI staff access to this service and would not inconvenience other users. The redesign of the footpath on Kookaburra Circuit to accommodate wheelchairs has included a facility for buses to stop at the Sky Walk. Whilst it is not expected that service buses will be rerouted along Kookaburra Circuit, the opportunity does exist to reroute the Shuttle buses around the hospital building along Kookaburra Circuit. The proposals widen the footpath to accommodate an area for passengers to wait and a bus shelter.

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4.2.6 Car Park and Loading Area Design.

All car parking, loading and vehicular manoeuvring areas will be designed in accordance with Australian Standards: AS/NZS2890.1-2004, AS/NZS 2890.2-2002.and AS/NZ2890.6.

The car park will be designed in accordance with the Category 1, Commuter parking in Table 1.1 of AS 2890.1-2004 that is: 5.5m by 2.4m bays, with 6.4m aisles. 6 accessible parking bays are provided.

4.2.7 Service Area Layout

The loading dock layout will allow all vehicles to enter and leave the service area in a forward direction. Allowance has been made to enable all trucks to reverse into the loading dock and drive straight out. There is also temporary parking areas provided to allow a truck to wait if the dock is occupied.

4.3 Parking

4.3.1 Proposed Supply

It is proposed 250 parking bays be provided for the use of the HMRI building. These bays will be predominantly staff parking bays, however, some visitor parking may be provided within this total. The alternative existing general hospital visitor parking is located at Car Park No 2, 480m away, or Car Park No 6, 420m away.

The project also includes the relocation and reconstruction of the existing 150 parking bays in Staff Car Park No 5. These will be for general hospital staff use as at present.

The road works proposed on Kookaburra Circuit to accommodate the drop off zones, bus bay and improved pedestrian facilities will result in the deletion of approximately 16 "Permit Only" parking bays. These will be relocated to the second tier of parking and will be controlled in the same way as currently by displaying a permit.

4.3.2 Authority Parking Requirements

NCC Parking Requirements

There are no specific parking requirements in the current Newcastle City Council DCP 2005 Section 4.1, for parking for Research Facilities; consequently the parking provision has been based on a comparison with activities which would be expected to have a similar work environment and workforce. In this respect commercial offices are the nearest comparison; the NCC DCP 2005 requires 1Bay per 50m^2 GFA. Based on a GFA of 15,962m^2 this equates to 319 parking bays, or approximately 25% more than proposed. The DCP does, however, state "*A balanced approach to on-site car parking provision is required that addresses likely car parking demand as well as Council's objectives of encouraging increased trips by walking cycling and use of public transport in preference to the use of private motor vehicles.*"In the spirit of this and the current policy of the Ministry of Transport, which seeks "*a minimalist approach to car parking provision based on the accessibility of the site to public transport*" a 20% reduction in the car parking provision is proposed with a parking provision of 250 bays adopted for construction. This approach will require the HMRI to adopt active measures and policies to encourage the use of other methods of transport.

This development has, therefore, taken recent government initiatives to encourage the use of public transport into account and has nominated a conservative parking provision of 250 bays, or 1 bay per two staff.

4.3.3 Parking Layout

The 250 new parking spaces will be accommodated in a simple tiered set of at grade car parks, 130 bays on the top level, 114 bays on the second level, and 150 bays on the lower level replacing the existing parking on the site. In addition 6 Disabled bays will be located adjacent to the Pod drop off area, and 16 "Permit" Only bays will be relocated from Kookaburra Circuit to the second tier of parking. All bays are designed in accordance with AS2890.1 and 2 and NCC DCP requirements in a simple deck layout. The decks have a central aisle and ramps allow circulation between the top and middle levels. Entry will be via the upper level with exit being from the middle level. The lower level will operate separately from the HMRI parking with its own entry and exit point located off the parking access road.

4.3.4 Parking Demand

It is expected there will be high demand for the 250 parking bays. The current research laboratories in Newcastle have recorded up to 78 % car use by the staff. This equates to 404 of the 514 staff arriving at the campus by car. This level of use will not be possible at this new building unless capacity exists in the adjacent staff car parks for over 150 cars. It is unlikely this level of parking spare capacity will be regularly available, particularly at 9am when peak staff parking demand is experienced. This will require a proportion of staff to find alternative parking or alternative modes of transport. The only alternative parking available within walking distance of the campus is in the residential streets to the east of Lookout Road. These streets are progressively being restricted to 2 hour parking to minimise the use by Hospital staff, and no longer provides a convenient alternative

for staff located at the western end of the campus as is the HMRI building. Walking distances of up to 1km may be required for HMRI staff parking in these streets.

For the purposes of this assessment it has been assumed some of the 250 HMRI bays may be allocated for short term/visitor parking use. The remaining bays will be for the sole use of the HMRI staff. At this stage it is not known if the bays will be allocated on a first come first served basis each day, or whether they will be allocated to a specific staff member.

It has also been assumed, for the purpose of this assessment, that each of the HMRI staff bays will be filled each day with a staff member working regular full time hours. The remaining 150 full time staff and 133 part time staff will be required to find alternative parking or an alternative mode of transport.

The planning for this development has included extensive positive measures to encourage the use of alternative methods of travel, particularly public transport and cycling. In particular the design of the building has included a Skywalk bridge to eliminate the grade difference and reduce the walking distances between the HMRI building and the main Hospital building. These will contribute to the use of public transport due to the pedestrian friendly route between the HMRI and the bus stops. In addition, allowance has been made for the Park and Ride shuttle bus to be rerouted to enable it to stop on Kookaburra Circuit adjacent to the Skywalk. Discussions regarding this will be initiated as soon as possible with HNEAHS and InterPark.

4.3.5 Service Vehicle Parking

The service vehicle loading dock has been designed specifically to accommodate the range of vehicles required to service the Research Institute as outlined in Section 4.2.3

4.3.6 Bicycle Parking

35 bicycle storage spaces will be provided initially. This equates to 7% of the total staff being supplied with a bike rack. This provision is based on a survey sample, undertaken in January 2009, of 72 of the existing HMRI staff who will be relocated to this proposed building. This indicated 5 out of 72 people (7%) cycled to work. The number of bike racks can be increased up to 100 racks (20%), as determined by demand, and as are required by the NCC DCP 2005. These will be provided adjacent to the west wing. Secure showers and lockers will also be provided for use by the staff.

4.3.7 Motorcycle parking

Provision has been made for 12 motorcycle parking bays to be provided adjacent to the building in accordance with NCC DCP 2005 at a rate of 1 bay per 20 car parking bay.

4.3.8 Construction Parking

A Construction Traffic Management Plan will be prepared and submitted to Council prior to any construction activity commencing on site. Construction is expected to take approximately 24 months over which period there will be up to 200 workers at the peak. The issue of where these workers will park has been considered as part of this assessment and, whilst the details of the construction method have not been finalised, the following options have been identified:

1. Stage 1 “Enabling Works” are planned to reconstruct the existing 150 bay car park. This will be undertaken by a small gang of workers who would be able to park on waste ground alongside the car park. These workers would then construct the 250 parking bays to base

coarse level so they can be used for contractor parking and construction materials. The workers temporary parking area will be allocated to accommodate all workers identified onsite;

2. Workers park at the Energy Australia Stadium or elsewhere as arranged by the construction company, and are bussed to the Hospital complex. This will require a temporary supplement to the capacity of the existing shuttle bus service;

3. Negotiations with the builder should include a clause in the contract specifying no contractor parking will be permitted other than in specified areas;

4. Construction staff must be discouraged from parking in the residential area to the east of Lookout Road

The solution to this issue is likely to be a combination of these Options.

4.3.9 Construction Traffic

The quantity of construction traffic will be determined by the construction time table, however, some controls could be put in place including (dependant on consultation with HNEAHS) the following:

- Construction traffic will be encouraged to avoid the peak on-street traffic periods;

- Construction traffic will be encouraged to use Jacaranda Drive where possible to reduce the use of the intersection of Kookaburra Circuit and Lookout Road and potential impacts on other essential services on the campus;

- Some specific deliveries etc may need to be undertaken on weekends to avoid blocking Kookaburra Circuit.

The location of the site will require all construction traffic to approach using Kookaburra Circuit past the front entrance to the Hospital. This is a low speed environment, with a number of speed bumps to control speed. Trucks will need to adhere to these speeds to avoid any loss of loads etc. There are a number of pedestrian crossings, where drivers will be required to take extra care. It will be necessary for all drivers to be inducted in safe practises around the hospital.

At peak times of construction between 200-300 additional vehicles could arrive and depart from the building site each day. This is a similar volume to that generated by the building when in operation. Whilst 200 of the vehicles will be employees arriving and departing in accordance with work hours, the remaining vehicles represent deliveries each day. These will be spread throughout the day and are not expected to exceed an average of 10 – 20 vehicles per hour. This level of use will not have a significant impact on the operation of Kookaburra Circuit. If a significant proportion of them are heavy vehicle deliveries, the drivers must be aware of the environment they are working in and speed limits strictly adhered to.

It is understood there is an opportunity to construct a track from the site alongside Jacaranda Drive and rejoin the road just before the Child Care Centre. This should be investigated further as this would remove the issue of all traffic and deliveries having to pass the front of the Hospital. It may

also remove some of the work timing constraints that may need to be put on the construction to minimise the impact on the Hospital.

4.4 Consultations

As part of this assessment, the proposals for the HMRI Building have been issued to a number of authorities to identify any issues they consider are relevant. The various responses are as follows:

1. **Ministry of Transport (Meeting held 4th Feb 09):** Context of Development discussed. The issues raised in their letter of 21st January 2009(ref TP09/00004) were reiterated:
   MoT key issue is parking. The proponent needs to demonstrate how the proposed development is contributing to the MoT DGR requirements to:

- Provide a minimalist approach to car parking provision based on the accessibility of the site to public transport, to encourage a shift to Public Transport, walking and cycling;
- How the proposal fits within the overall Hospitals precinct in terms of transport and traffic management;
- Detailing the existing pedestrian and cycle movements within the vicinity of the subject site and determining the adequacy of the proposal to meet the future demand for increased pedestrian and cycle access;
- Provision of facilities for the secure storage of bikes together with amenities for cyclists;
- Identification of Travel Demand Management (TDM) measures that will optimise the opportunity provided by the project site's proximity to public transport. This should include a requirement for the preparation of a Travel Access Guide (TAG) as detailed in the *Producing and Using Transport Access Guides* (RTA);
- Provision of car-share spaces which are subject to significantly discounted parking rates and preferential and highly visible locations;
- Promotion of flexible working practices;
- Provision of incentives to the uptake of public transport such as full/partial reimbursement for tickets; and
- Provision of personally tailored information and support to individuals seeking to travel to work by public or active transport.

The measures being included in the proposal relating to the above matters, and in particular in relation to parking reduction, were outlined. The key initiative of utilizing the shuttle service and parking at Energy Australia Stadium was considered a favorable response.

- **Director General Requirements: (in letter dated 29/1/09 ref mp_08_0250) the following requirements were specified:**

Provide a Traffic and Transport Study that addresses the following:

- Surrounding context and how the proposal fits within the overall hospital campus in terms of transport and traffic management; including cumulative effects of future developments in other parts of the site;

- Estimated vehicular traffic generation from the proposed development and the cumulative impact of this with any other known development proposals in the area;

- Any existing public transport services in the site, together with other transport services offered by the hospital;

- Measures to encourage mode shift to public transport and reduce reliance on on-site car parking;

- Existing pedestrian and cycle movements within the vicinity of the subject site and determine the adequacy of the proposal to meet the likely future demand for increased pedestrian and cycle access-this may include facilities for secure bicycle storage;

- Travel Demand Management (TDM) measures that will optimise the opportunity provided by the project site's proximity to public transport;

- Compliance with the RTA *Guide to Traffic Generating Developments;*

- Internal road and access arrangements including entry points, drop off points, traffic management and hierarchy;

- Service delivery requirements;

- Emergency evacuation and public access;

- Traffic Management during construction including car parking requirements for construction workers and;

- Car parking provisions for the development taking into consideration future developments proposed for the site.

This report has specifically addressed each of these items, Table 1.1 records where each of these items is addressed in this report.

Road Traffic Authority (Meeting held 5th Feb 09): Background information provided:

- Current shuttle bus from Energy Australia Stadium runs through the day and specifically at shift change times;
- Current site parking a problem during the day but not outside working hours;
- Issue of right turn into Russell Street was raised as there are two right turn back to back lanes and possible problems with overflow out of turning lane. The issue of improving the right turn bay was identified as an option if needed;

- RTA agrees the Hospital area is currently one of the best serviced area by public transport therefore is in a good location for expansion/new developments.

Newcastle City Council: Letter dated 23Road January 2009 from Damien Jaeger

The Traffic Assessment should be expanded to include:

- Impacts of the proposal on the access intersections with the arterial road network (Lookout Road) ;
- Impacts on the internal road system including a review of capacity and intersection performance;
- Impacts of Construction Traffic on both the external and internal road network;
- Compliance of the proposed car parking with the requirements of AS2890.1-2004 and AS2890.2-2002;
- The car parking assessment must also consider the current parking shortfall on the site and the impact this will have on parking demand at the site;
- Car Parking provision is to be in accordance with Element 4.1 of Council's 2005 DCP;
- Note that access to any visitor parking is currently some distance away.

5. Impact of Proposed Development

5.1 Traffic Generation

5.1.1 Vehicle generation.

The Research Institute is expected to work largely office hours 9.00am -5.00pm Monday to Friday. It is expected the building will accommodate 450 Fulltime Equivalent staff or 514 employees. Of these 381 are fulltime staff and 133 work part time. Of these staff 149 fulltime and 35 part time staff already work within the Hunter Campus and will be relocated to the new facility. These workers already travel to and from the campus. The traffic they currently generate and the parking demand they create has already been taken into account in the existing traffic statistics used. However, it is likely the floor space vacated by these staff will be reused by others; consequently no reduction in traffic generation has been made to account for this staff relocation within the Campus. If the floor space is not used to the same extent there may be some over estimation in the traffic generation assumed in this assessment.

The staff who will be accommodated in this new building all currently work at locations around the Newcastle area, such as at the David Madison Building in the Newcastle CBD, University of Newcastle, Mater Hospital, the Wallsend Health campus and in other buildings on the Rankin Campus. All 514 staff will be relocated and no allowance for the improvement in traffic conditions by removing them from their present locations has been made. Whilst the traffic generated by the staff has been identified as new to the road network in this location it can be expected a proportion will already be on the road network in this area travelling to the current laboratory locations and, as such, will be counted twice.

There will be a number of staff who work more flexible hours and will not always travel in the peak traffic hours. Information from surveys undertaken at the existing Research Unit at David Madison House in Newcastle indicates 80% of staff travel to work by car, while information from HNEAHS indicate it is generally understood 75% of Rankin Park staff travel by car.

A survey undertaken in January 2009 asked a sample of existing HMRI workers, who will be relocated to the proposed building, what their mode of transport to work was gave the following results:

Car:	78%
Bike:	7%
Walk:	7%
Public Transport:	7%
Motor cycle	1%

Based on this the HMRI development would require in the order of 400 parking bays.

At this stage it is not known what hours the part time staff will work, but for the purposes of this assessment it is assumed they will all work set hours at the same time, specifically 9.00am – 2.00pm and therefore do not travel in the evening peak hour. The following traffic generation assumptions are based on 514 staff:

- Based on the HMRI Existing Staff Travel Survey undertaken by DCM in January 2009:
  - 7%of total staff walk = 36 staff walk;
  - 7%of total staff cycle = 36 cycle;

- 10% of total staff use public transport = 51 public transport.(The surveyed 7% has been increased to 10% to allow for the Park and Ride service);
- Total by other forms of transport = 123 staff.

- 250 HMRI parking bays: 20 short term visitors will arrive in the morning peak hour but leave outside the evening peak hour. It is assumed all the remaining 230 bays will be occupied by full time staff. Assume 20% of these staff parking in the HMRI bays will not travel in the peak hour. This equates to 204 vehicles generated in the morning peak hour and 184 in the evening peak hour;

- The remaining 284 staff will travel by alternative transport (123 staff) or will park elsewhere (161 staff), either on the site or off the site:

Table 5.1 Potential Traffic Generation

	AM PEAK	AM PEAK	PM PEAK	PM PEAK
	IN	OUT	IN	OUT
230 fulltime staff	184	10	15	184
20 visitors	20			
85 full time staff	85	10	15	85
75 part time staff	75			
Total	364 vehicles	20 vehicles	30 vehicles	269 vehicles
	384 vehicle trips in AM peak hour		299 vehicle trips in PM peak hour	

This results in a traffic generation of:

- 384 vehicle trips in the morning peak hour and

- 300 vehicle trips in the evening peak hour.

This traffic generation does not coincide with the majority of the traffic generated by the proposed Private Hospital Extensions. The bulk of the traffic generated by that development is at staff shift changes at 7am and 3pm, with a smaller number generated by administration staff at 8.00am to 9.00am.Conseqently there is little overlapping of generated traffic with the potential HMRI traffic.. The proposed Private Hospital plans also include the provision of parking for patients and visitors as well as some staff parking. This will result in improved parking facilities in that area of the campus which may also reduce the volume of circulating traffic looking for a parking space. This will improve overall traffic conditions on the campus.

5.1.2 Pedestrian and Cyclist Movements

It is expected the location of the HMRI building will generate a significant number of pedestrian movements between the new building and the existing John Hunter Hospital complex. These pedestrians will be walking between buildings both for work purposes and as part of their journey to work. For this reason part of the building works for the project includes the widening of the footpath on Kookaburra Circuit between the existing pedestrian crossing adjacent to Car Park No 4 and the location of the proposed Sky Walk. This will widen the existing footpath from 1m to 1.8m. This will significantly improve pedestrian conditions in this area.

The surveys undertaken at the existing HMRI buildings indicate approximately 7% of the surveyed staff cycle to work. If this percentage is achieved at the new building approximately 36 new cyclists will be using the Hospital road network and bike trail. A proportion of these can be expected to use the existing trail from the HMRI Building northwards to join the residential road network at Lambton or continue through to Jesmond Park and connect with the longer distance bike paths there. The remainder of the cyclists will use Kookaburra Circuit to reach Lookout Road and use the main road network. Kookaburra Circuit is a narrow one way road which is not ideal for cyclists. The HMRI staff however, only have to negotiate 400m of this slow speed link to join Jacaranda Drive.

5.2 Traffic Distribution and Assignments

5.2.1 Hourly Distribution of Trips

This trip distribution has allocated the majority of trips in the morning and evening peak periods. There will be trips generated during the day and particularly at 2pm when the part time staff are expected to leave work. The trip rate at 2pm will be lower than the evening peak period and will have a lower impact.

5.2.2 Origin / destinations assignment

The origin and destination of the generated traffic has been based on the general distribution of traffic arriving at and leaving the John Hunter Campus currently.

5.3 Impact on Road Safety

The additional traffic flows associated with the development of the HMRI site will have a minimal impact upon traffic safety. There will be an increase in the number of vehicles and service vehicles using Kookaburra Circuit. This will conflict with the pedestrians, all of whom have to cross Kookaburra Circuit to reach their destination. However, this is a slow speed environment with a posted speed limit of 20kph enforced by repeated speed bumps. There are a number of pedestrian crossings at key locations; these are easily visible, and signed.

It is considered the intersections will continue to operate in a safe and acceptable manner with the additional traffic associated with the proposed development.

5.4 Impact of Generated Traffic

5.4.1 Impact on daily Traffic Flows

The additional traffic flows will be concentrated on Kookaburra Circuit, this currently carries between 3000vpd on the section west of the site and 4000 vpd east of the site As shown in Section 2, this road currently operates at a level of Service B/C and this will continue with the additional traffic generated by this development.

5.4.2 Peak Hour Impacts on Intersections

As part of the assessment for the proposed development, the computer program Sidra has been used to assess the operation of the adjacent signalised intersections.

The results of the analysis for the existing and future 2018 base flows with the traffic generated by the proposed development added are provided in Tables 5.1 and 5.2 below.

The Sidra analysis confirms the on-site observations that there are delays currently occurring at this intersection which deteriorate with the growth of background traffic on Lookout Road. The operation of these two intersections is controlled by the through traffic flow on Lookout Road and Sidra runs the phases to minimise the delays and queues to traffic on the main road at the expense of the side road efficiency. Any additional traffic onto the side roads has a noticeable effect on the overall performance of the intersections, and particularly increases the queue lengths on these side roads

■ **Table 5-1 Existing and 2018 Traffic Flows with proposed development. Lookout Road/Jacaranda Drive**

Approach	Movement		Level of Service AM/PM	Delays (Seconds) AM/PM	Queues (Metres) AM/PM	Degree of Saturation AM/PM
Lookout Road Sth App	Through	2008	B/A	21/8	269/139	.87/.6
		2018	B/A	20/7	286/159	.87/.6
Lookout Road Nth App	Through	2008	A/B	9/18	131/340	.64/.88
		2018	A/A	9/13	151/400	.67/.88
	Right	2008	D/D	48/47	112/48	.87/.39
		2018	D/E	44/62	91/60	.75/.5
Jacaranda Dr, West App	Left	2008	C/E	35/63	28/116	.23/.9
		2018	C/F	37/206	11/233	.1/1.13

The increase in the delays and queuing on Jacaranda Drive is a result of the increased vehicles leaving the development. A reduction in this flow by the introduction of flexible working hours and a higher public transport use would reduce these delays and queues.

Table 5-2 Existing and 2018 Traffic flows with proposed development. Lookout Road/Kookaburra Circuit.

Approach	Movement		Degree of Saturation AM/PM	Delays (Seconds) AM/PM	Level of Service AM/PM	Queue (metres) AM/PM
Lookout Road Sth App	Left	2008	.3/.1	9/8	A/A	54/12
		2018	.4/.12	9/8	A/A	56/14
	Through	2008	.96/.89	65/55	E/D	596/348
		2018	.99/.95	81/70	F/E	738/440
Ridgeway East App	Right	2008	.06/.07	68/60	E/E	8/11
		2018	.06.07	68/63	E/E	8/11
Lookout Road Nth App	Through	2008	.4/.98	6/72	A/F	117/634
		2018	.45/1.05	6/118	A/F	126/856
	Right	2008	1.0/.88	71/89	F/F	114/92
		2018	1.0/.88	76/90	F/F	124/93

Kookaburra Circuit	Left turn	2008	.48/.93	30/24	C/B	31/66
		2018	.53/.96	37/27	C/B	35/68
	Right Turn	2008	.35/97	70/106	F/F	57/251
		2018	.35/1.04	71/144	F/F	57/292

In accordance with the requirements of the City of Newcastle, a capacity analysis of the internal intersections has been completed as part of this study. The Tables below show the operational characteristics of the two roundabouts on Jacaranda Drive with Kookaburra Circuit. Both tables show the good levels of service currently occurring at these intersections. Observations have confirmed the good levels of service occurring even during the peak entry and exit times. Both roundabouts have very low flows on the opposing movements, resulting in some transient queuing currently occurring but this generally clear very quickly.

The increase in flows as a result of the location of the HMRI car park will increase these queues for a short period at peak times, particularly during the evening peak period around 5pm. The increase in the volume of vehicles exiting Kookaburra Circuit from the Staff car parks will increase the length of the queue on the approach to the roundabout at Jacaranda Drive. This queue will extend under the building. It will impact on access out of the adjacent Hospital loading dock but is unlikely to cause any other safety or congestion issues.

Similarly the increase in the flows turning left from Jacaranda Drive into Kookaburra Circuit to exit the site at Lookout Road will increase the length of the queues extending along Jacaranda Drive to a point where they will occasionally block the roundabout with Kookaburra Circuit. This has been observed to occasionally occur now and was seen to clear quickly as the left turn towards Lookout Road resumed being the prime flow.

■ **Table 5.3 Roundabout at intersection of Kookaburra Circuit and Jacaranda Drive, adjacent to McDonald House**

Approach	Movement		Degree of Saturation AM/PM	Delays (Seconds) AM/PM	Level of Service AM/PM	Queue (metres) AM/PM
Kookaburra East app	Left	Existing	.42/13	7/7	A/A	28/7
	Left	HMRI	.58/.15	17/8	B/A	47/7
	Through	Existing	.42/.13	7/7	A/A	28/7
	Through	HMRI	.58/.15	7/8	A/A	47/8
	Right	Existing	.02/.05	11/2	A/A	2/11
	Right	HMRI	.25/.06	12/12	A/A	13/3
Jacaranda Drive north app	Left	Existing	.26/.51	7/8	A/A	14/33
	Left	HMRI	.32/.73	7/9	A/A	18/72
	Through	Existing	.26/.51	6/7	A/A	6/33
	Through	HMRI	.31/.72	6/9	A/A	18/72
	Right	Existing	.26/51/	12/12	A/A	14/33
	Right	HMRI	.32/.72	12/13	A/A	18/72
Kookaburra Circuit west app	Left	Existing	.15/16	7/6	A/A	7/8
	Left	HMRI	.16/17	8/7	A/A	8/8
	Through	Existing	.15/17	6/6	A/A	7/8

	Through	HMRI	.15/.17	7/6	A/A	8/8
	Right	Existing	.15/17	12/11	A/A	7/8
	Right	HMRI	.15/.17	12/11	A/A	8/8

Table 5.4 below shows the operation of the roundabout at the intersection of Jacaranda Drive and Kookaburra Circuit adjacent to Car Park No 6.

■ **Table 5.4 Internal Roundabout, Jacaranda Drive and Kookaburra Circuit, adjacent to Car Park No 6. Capacity analysis under existing conditions and with HMRI.**

Approach	Movement		Degree of Saturation AM/PM	Delays (Seconds) AM/PM	Level of Service AM/PM	Queue (metres) AM/PM
Kookaburra Circuit app	Left	Existing	.16/.41	8/7	A/A	7/25
	Left	HMRI	.2/.6	8/7/	A/A	9/47
	Right	Existing	.16/.41	12/12	A/A	7/25
	Right	HMRI	.2/.6	13/12	A/A	9/47
Jacaranda Dr west app	Left	Existing	.14/.06	6/6	A/A	8/3
	Left	HMRI	.17/.06	6/6	A/A	8/3
	Through	Existing	.15/.06	5/5	A/A	8/3
	Through	HMRI	.16/.06	5/5	A/A	8/3
Jacaranda Dr east app	Through	Existing	.16/.23	6/7	A/A	8/12
	Through	HMRI	.15/.33	7/10	A/A	7/20
	Right	Existing	.17/.23	12/13	A/A	8/12
	Right	HMRI	.14/.33	6/10	A/B	7/20

A capacity analysis of the driveway intersection with Kookaburra Circuit has also been undertaken. This indicates the vehicles leaving the HMRI driveway through the day will experience very little delay, however during the evening peak period delays of up to 16 seconds may be experienced and queues of up to 26m may develop. This queue will occur down the driveway to the HMRI car park and will not interrupt the flow of traffic on Kookaburra Circuit, nor will it block internal access to the various parts of the HMRI site.

5.4.3 Impact of Construction Traffic

The construction work will require deliveries and staff to the site. The Construction Management Plans will be developed to reduce the impact of the construction traffic on the adjacent road network, on pedestrian routes, cycle routes, public transport, emergency vehicles, safety and parking to the satisfaction of the consent authority. The construction plans will form part of the tender process and will be strictly adhered to. All works on site will be governed by the relevant EP&A rules and as stipulated within any development consent granted by the DoP.

5.4.4 Other Developments

This study has taken into account the proposed extension to the Newcastle Private Hospital. We are not aware of any other specific development proposals for the area, however, it can be expected there will be ongoing development of the Health Campus over coming years.

5.4.5 Assessment of Traffic Noise

An assessment of traffic noise has been carried out by Arup Acoustics based on traffic volumes prepared by this study.

5.5 Public Transport

5.5.1 Options for improving services

A review of bus services in the overall Newcastle area has recently been undertaken and new services have been introduced on a number of routes. The routes that service the Hospital area remain the same but the services have been upgraded. As the intensity of development on the Campus increases the demand for public transport to be upgraded further will increase. Additional services to improve options for travel will need to be investigated especially to increase the connection to rail services and to other interchange destinations. Similarly it will be necessary for the bus service timetable to reflect the demands of the overall campus staff in terms of the shift hours worked.

It is understood the Ministry of Transport plan to develop Integrated Network Plans (INP) for the Lower Hunter Region later this year, these will seek to build on the improvements already made and further enhance the level of public transport provision at the Hospital to improve its attractiveness as an option for travel. Both HMRI and HNEAHS must liaise with the Ministry during the Stakeholder consultation period. The HMRI building is planned for completion in mid 2012. This allows over 2 years for any public transport improvements to be identified, developed and implemented to be operating for the opening of the building. It will then be possible for the Work Place Travel Plans to be operational from the opening.

Improvements to ticketing and passenger information will require regional incentives, however, key locations and other interchanges would benefit from an improvement in both to improve service and to increase knowledge of the bus schedules.

5.5.2 Measures to encourage use of public transport, cycling and walking

It is essential an increase in the number of staff and visitors to the Health campus using alternative forms of transport is achieved. In order to progress towards this, a Travel Access Guide (TAG) and Work Place Travel Plans (WTTP) should be prepared for staff and visitors to the HMRI building as indicated by the Ministry of Transport. These should be prepared as one of a number developed for the campus as a whole and done in conjunction with each other.

These guides should include information on all options for transport to the campus, specifically public transport and cycling. These should be distributed to all employees, students and regular visitors.

Additionally, incentives to encourage public transport use should be identified at both the HMRI level and at Campus level, these could include:

- **Real time public transport information** Timetable information available at the bus stops and online informing users when the next bus is actually arriving, staff can check if there is a bus due before they leave the office, visitors are informed at the bus stop when the next bus will actually arrive not just when it should arrive. This would require State Government support;
- **Car Pooling.** Employees, campus wide, are informed of other staff who live in their suburbs and who could share cars. Could be supplemented with the designation of special parking bays for car pool vehicles;
- **Flexible working hours.** This would be particularly beneficial for staff at the HMRI where shift coverage is not so essential. This would increase the proportion of staff travelling to work outside peak times;

- **Extend the Park and Ride Route.** Discussions should be held with HNEAHS and InterPark regarding extending the existing park and ride scheme to include the HMRI building. These discussions could also include the introduction of a similar service from the area south or west of the Campus.

5.6 Recommended Works

5.6.1 On Street works

It is not considered that any additional road improvements are required to accommodate the HMRI development proposed at the Rankin Park Campus, other than the footpath upgrade on Kookaburra Circuit identified as part of the project.

6. Conclusions

The following conclusions are drawn from the investigations into the proposed HMRI Development:

1. The HMRI project is a significant project, consolidating the various Health sectors onto the John Hunter Hospital/Rankin Park campus,

2. It is expected the building will ultimately accommodate 450 Fulltime Equivalent staff or 514 employees. Of these 381 are fulltime staff and 133 work part time. Of these staff, 149 fulltime and 35 part time staff already work within the Hunter Campus and will be relocated within the campus to the new facility. 250 parking spaces are planned to service the building.

3. It is estimated the building could generate up to 380 vehicle trips in the morning peak hour and 300 vehicle trips in the evening peak hours. This traffic has been superimposed onto the existing 2008 flows and the forecast Year 2018 flows. The impact of this additional traffic has been reviewed.

4. As part of the ongoing planning for this project a number of initiatives to reduce the private car traffic generated by the HMRI staff will be developed with the objective of increasing alternative modes of transport. This will contribute to reducing the levels of traffic generated by the development and consequently the impact on the adjacent road network.

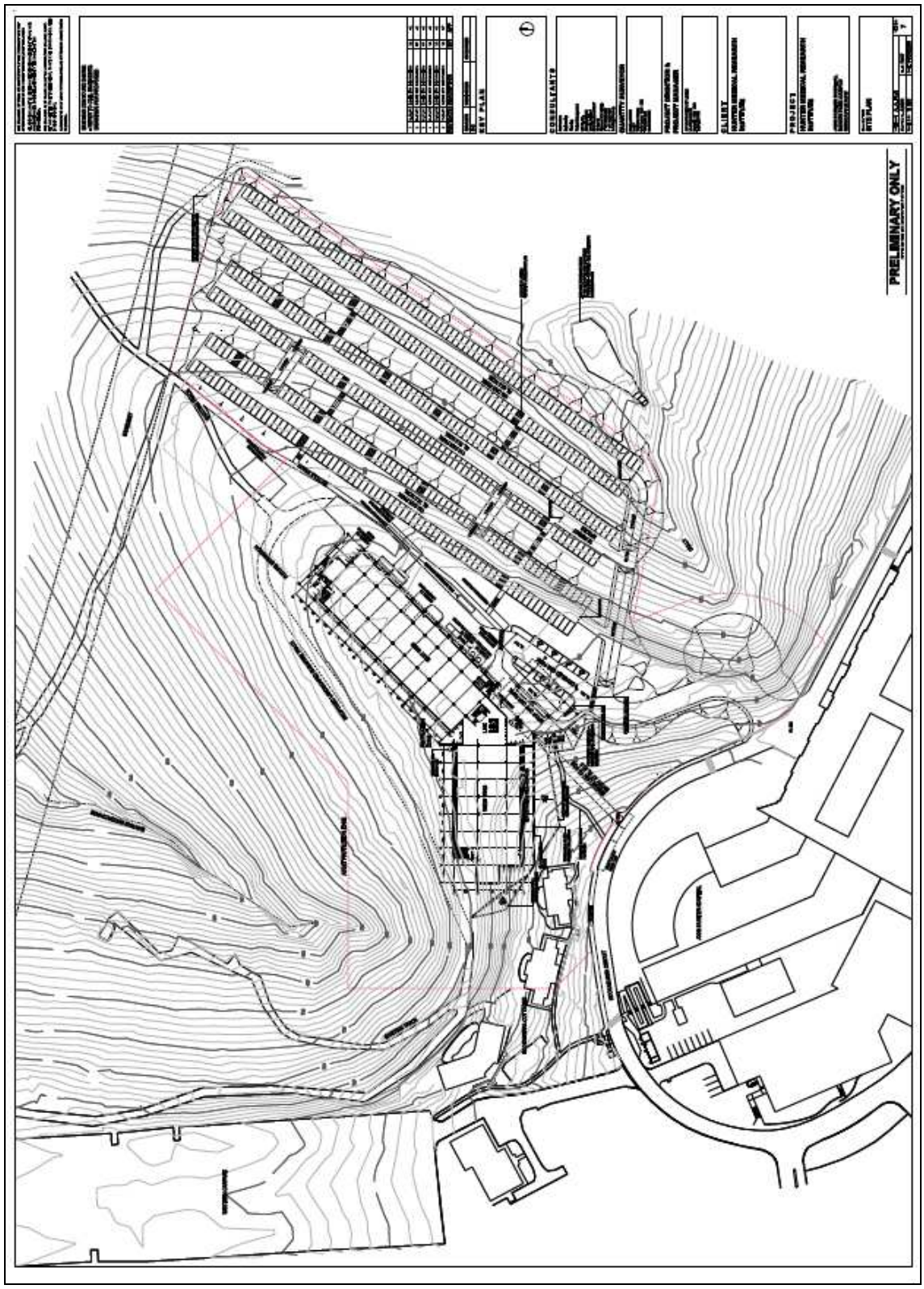
5. Primarily the two signalised intersections which provide access to the regional road network are operating with congested conditions and long queues on Lookout Road at the moment, and have been for a number of years. Any additional traffic results in an increase in the length of the delays and queues occurring. This assessment shows the additional traffic generated by the development within the Hospital campus does have an impact on the operation of these two intersections; however, the growth of the regional through traffic on Lookout Road also has a marked effect on the operation of the intersections.

6. Analysis of the adjacent intersections shows the existing flows result in significant queuing on Lookout Road during peak periods. This was confirmed by on site observations. The additional traffic generated by this development will result some increases in delays and queue lengths, however, the extent will depend on what level of reduction in the traffic generated can be achieved through the Travel Demand Management measures developed.

7. The number of parking bays provided on the site has been restricted to 1 bay per 2 staff. This, together with the lack of other available staff parking on the campus, will encourage staff to use other forms of transport to access the campus. A range of incentives have been identified in this report to encourage this to happen. These must be actively pursued both by HMRI management and by the HNEAHS.

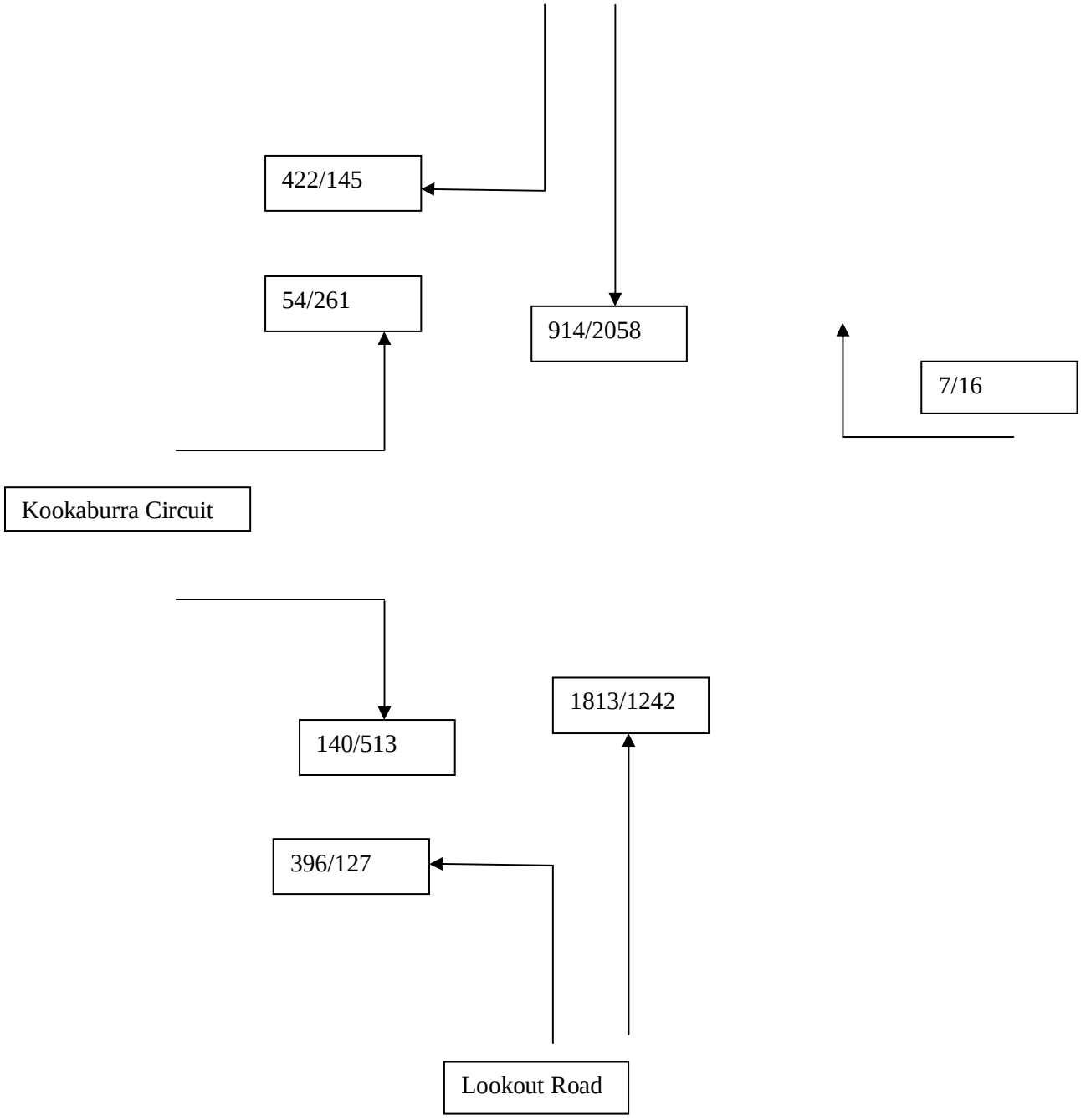
The overall conclusion from the investigations is that traffic and parking arrangements for the development proposal are satisfactory and that, with the recommendations made to improve alternative transport options being put in place, there are no traffic or parking impediments to the development proceeding.

Appendix A Site Plan

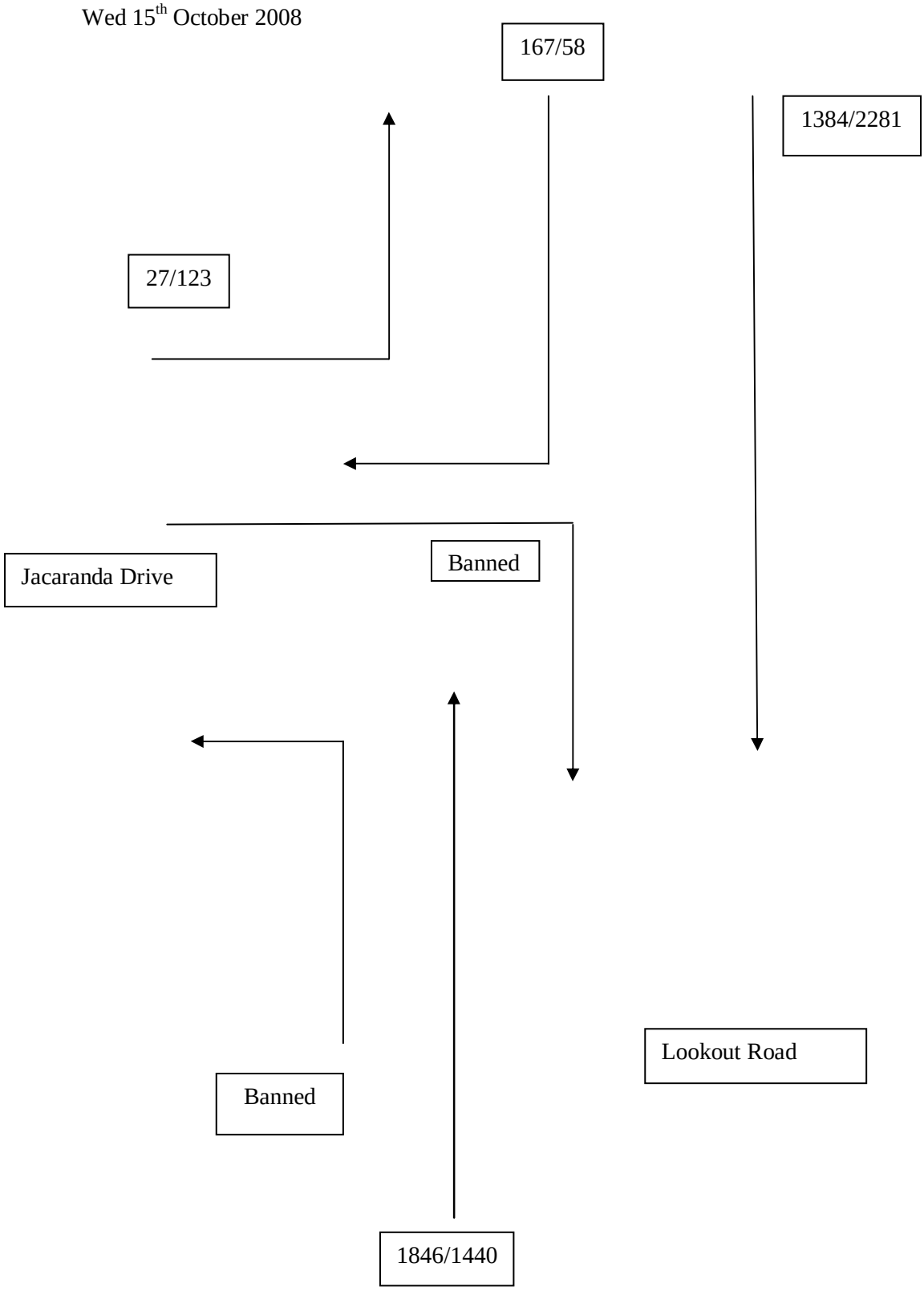


Appendix B Traffic Survey Results

AM/PM peak
18th October 2008
8am-9am

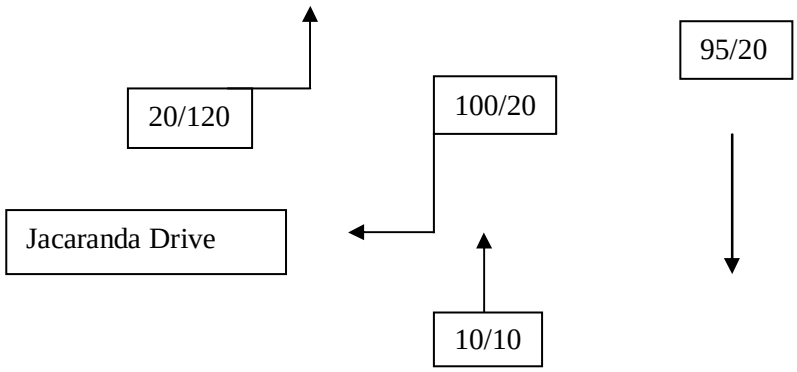


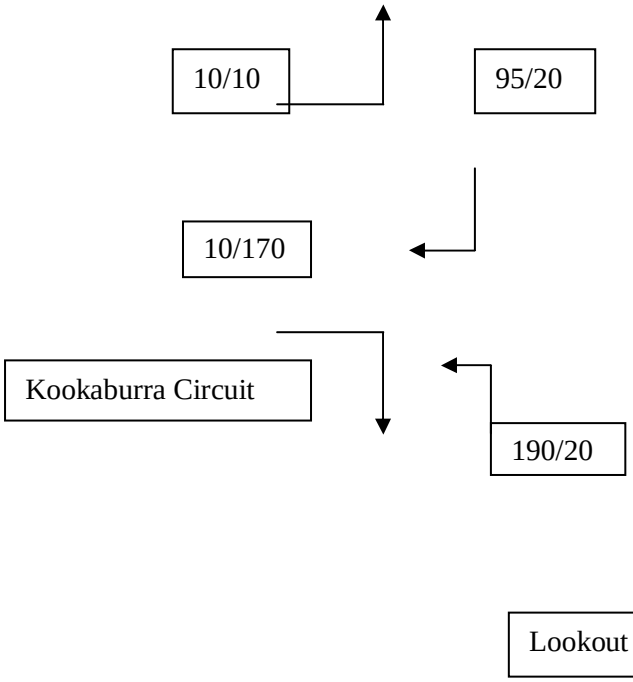
AM/PM Peak
Wed 15th October 2008



Appendix C Generated Traffic Flows

AM/PM (Vehicles per peak hour)





Lookout Road

Appendix D Sidra Results

SIDRA INTERSECTION

Movement Summary

P0530 Lookout Rd/Jacaranda Drive AM 2008

Private Hospital Expansion

Signalised - Fixed time **Cycle Time = 70 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Lookout Rd southern approach										
2	T	1980	3.8	0.867	20.7	LOS B	248	0.90	0.96	38.3
Approach		**1980**	**3.8**	**0.867**	**20.7**	**LOS B**	**248**	**0.90**	**0.96**	**38.3**
Lookout Rd Northern Approach										
8	T	1457	4.4	0.640	9.8	LOS A	125	0.70	0.63	47.3
9	R	229	7.0	0.569	35.1	LOS C	66	0.94	0.82	30.6
Approach		**1687**	**4.7**	**0.640**	**13.3**	**LOS A**	**125**	**0.73**	**0.66**	**44.0**
Jacaranda Drive Western Approach										
10	L	73	4.2	0.175	32.3	LOS C	21	0.84	0.76	31.8
Approach		**72**	**4.2**	**0.175**	**32.3**	**LOS C**	**21**	**0.84**	**0.76**	**31.8**
All Vehicles		**3739**	**4.3**	**0.867**	**17.5**	**LOS B**	**248**	**0.83**	**0.82**	**40.5**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	11	29.3	LOS C	0	0.91	0.91
P7	8	6.4	LOS A	0	0.43	0.43
All Peds	**19**	**19.6**	**LOS B**	**0**	**0.71**	**0.71**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

Movement Summary

P0530 Lookout Rd/Jacaranda Drive AM 2018

Private Hospital Expansion

Signalised - Fixed time **Cycle Time = 90 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Lookout Rd southern approach										
2	T	2360	3.2	0.897	22.4	LOS B	364	0.89	0.95	37.1
Approach		**2360**	**3.2**	**0.897**	**22.4**	**LOS B**	**364**	**0.89**	**0.95**	**37.1**
Lookout Rd Northern Approach										
8	T	1709	3.7	0.652	8.4	LOS A	156	0.61	0.56	48.7
9	R	177	9.0	0.571	46.2	LOS D	68	0.96	0.81	26.5
Approach		**1886**	**4.2**	**0.652**	**12.0**	**LOS A**	**156**	**0.65**	**0.59**	**45.2**
Jacaranda Drive Western Approach										
10	L	38	7.9	0.122	42.6	LOS D	16	0.87	0.74	27.7
Approach		**38**	**7.9**	**0.122**	**42.6**	**LOS D**	**16**	**0.87**	**0.74**	**27.7**
All Vehicles		**4284**	**3.7**	**0.897**	**18.0**	**LOS B**	**364**	**0.78**	**0.79**	**40.1**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	11	39.2	LOS D	0	0.93	0.93
P7	8	5.0	LOS A	0	0.33	0.33
All Peds	**19**	**24.8**	**LOS B**	**0**	**0.68**	**0.68**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

Movement Summary

P0530 Lookout Rd/Jacaranda Drive PM 2008

Private Hospital Expansion

Signalised - Fixed time **Cycle Time = 85 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Lookout Rd southern approach										
2	T	1497	1.5	0.578	8.0	LOS A	124	0.58	0.53	49.2
Approach		**1497**	**1.5**	**0.578**	**8.0**	**LOS A**	**124**	**0.58**	**0.53**	**49.2**
Lookout Rd Northern Approach										
8	T	2271	1.4	0.876	19.3	LOS B	309	0.87	0.91	39.2
9	R	102	5.9	0.304	41.3	LOS C	38	0.90	0.78	28.2
Approach		**2373**	**1.6**	**0.876**	**20.3**	**LOS B**	**309**	**0.87**	**0.90**	**38.5**
Jacaranda Drive Western Approach										
10	L	176	2.3	0.512	42.7	LOS D	60	0.95	0.81	27.6
Approach		**176**	**2.3**	**0.512**	**42.7**	**LOS D**	**60**	**0.95**	**0.81**	**27.6**
All Vehicles		**4046**	**1.6**	**0.876**	**16.7**	**LOS B**	**309**	**0.77**	**0.76**	**41.1**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	11	36.7	LOS D	0	0.93	0.93
P7	8	5.3	LOS A	0	0.35	0.35
All Peds	**19**	**23.5**	**LOS B**	**0**	**0.69**	**0.69**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

Movement Summary

P0530 Lookout Rd/Jacaranda Drive PM 2018

Private Hospital Expansion

Signalised - Fixed time **Cycle Time = 150 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Lookout Rd southern approach										
2	T	1769	1.2	0.562	5.0	LOS A	157	0.38	0.35	52.7
Approach		**1769**	**1.2**	**0.562**	**5.0**	**LOS A**	**157**	**0.38**	**0.35**	**52.7**
Lookout Rd Northern Approach										
8	T	2705	1.2	0.860	9.1	LOS A	415	0.68	0.65	48.0
9	R	76	8.0	0.400	77.5	LOS F	51	0.98	0.77	19.2
Approach		**2781**	**1.4**	**0.860**	**10.9**	**LOS A**	**415**	**0.69**	**0.66**	**46.1**
Jacaranda Drive Western Approach										
10	L	155	2.6	0.797	84.7	LOS F	95	1.00	0.90	18.0
Approach		**155**	**2.6**	**0.797**	**84.7**	**LOS F**	**95**	**1.00**	**0.90**	**18.0**
All Vehicles		**4705**	**1.4**	**0.860**	**11.2**	**LOS A**	**415**	**0.58**	**0.55**	**45.9**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	11	69.1	LOS F	0	0.96	0.96
P7	8	3.0	LOS A	0	0.20	0.20
All Peds	**19**	**41.3**	**LOS C**	**0**	**0.64**	**0.64**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

Movement Summary

P0530 Lookout Rd/Jacaranda Drive PM 2008+DEV

Private Hospital Expansion

Signalised - Fixed time **Cycle Time = 85 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Lookout Rd southern approach										
2	T	1517	1.5	0.585	8.1	LOS A	127	0.59	0.53	49.1
Approach		**1517**	**1.5**	**0.586**	**8.1**	**LOS A**	**127**	**0.59**	**0.53**	**49.1**
Lookout Rd Northern Approach										
8	T	2292	1.4	0.884	20.7	LOS B	322	0.88	0.93	38.2
9	R	118	5.1	0.350	41.6	LOS C	43	0.91	0.79	28.0
Approach		**2410**	**1.6**	**0.884**	**21.7**	**LOS B**	**322**	**0.88**	**0.93**	**37.6**
Jacaranda Drive Western Approach										
10	L	215	1.9	0.623	43.7	LOS D	72	0.97	0.83	27.2
Approach		**215**	**1.9**	**0.623**	**43.7**	**LOS D**	**72**	**0.97**	**0.83**	**27.2**
All Vehicles		**4142**	**1.5**	**0.884**	**17.9**	**LOS B**	**322**	**0.78**	**0.78**	**40.2**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	11	36.7	LOS D	0	0.93	0.93
P7	8	5.3	LOS A	0	0.35	0.35
All Peds	**19**	**23.5**	**LOS B**	**0**	**0.69**	**0.69**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

Movement Summary

P0530 Lookout Rd/Jacaranda Drive AM 2018+DEV

Private Hospital Expansion

Signalised - Fixed time **Cycle Time = 95 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Lookout Rd southern approach										
2	T	2402	3.2	0.891	20.3	LOS B	367	0.87	0.91	38.5
Approach		**2402**	**3.2**	**0.891**	**20.3**	**LOS B**	**367**	**0.87**	**0.91**	**38.5**
Lookout Rd Northern Approach										
8	T	1752	3.7	0.652	8.1	LOS A	161	0.59	0.55	49.1
9	R	226	7.0	0.762	53.1	LOS D	92	1.00	0.91	24.4
Approach		**1978**	**4.0**	**0.762**	**13.3**	**LOS A**	**161**	**0.64**	**0.59**	**44.0**
Jacaranda Drive Western Approach										
10	L	66	4.5	0.218	45.9	LOS D	28	0.90	0.76	26.5
Approach		**66**	**4.5**	**0.218**	**45.9**	**LOS D**	**28**	**0.90**	**0.76**	**26.5**
All Vehicles		**4446**	**3.6**	**0.891**	**17.5**	**LOS B**	**367**	**0.77**	**0.76**	**40.5**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	11	41.7	LOS E	0	0.94	0.94
P7	8	4.7	LOS A	0	0.32	0.32
All Peds	**19**	**26.1**	**LOS B**	**0**	**0.68**	**0.68**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

Movement Summary

P0530 Lookout Rd/Jacaranda Drive PM 2018 +DEV

Private Hospital Expansion

Signalised - Fixed time **Cycle Time = 140 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Lookout Rd southern approach										
2	T	1812	1.2	0.585	5.5	LOS A	163	0.41	0.38	52.1
Approach		**1811**	**1.2**	**0.585**	**5.5**	**LOS A**	**163**	**0.41**	**0.38**	**52.1**
Lookout Rd Northern Approach										
8	T	2747	1.2	0.887	10.1	LOS A	438	0.76	0.72	46.9
9	R	112	5.4	0.543	73.2	LOS F	66	0.99	0.79	19.9
Approach		**2859**	**1.3**	**0.887**	**12.6**	**LOS A**	**438**	**0.77**	**0.73**	**44.6**
Jacaranda Drive Western Approach										
10	L	215	1.9	1.026	135.5	LOS F	156	1.00	1.24	12.7
Approach		**215**	**1.9**	**1.026**	**135.5**	**LOS F**	**156**	**1.00**	**1.24**	**12.7**
All Vehicles		**4885**	**1.3**	**1.026**	**15.4**	**LOS B**	**438**	**0.64**	**0.62**	**42.2**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	11	64.1	LOS F	0	0.96	0.96
P7	8	3.2	LOS A	0	0.21	0.21
All Peds	**19**	**38.5**	**LOS C**	**0**	**0.64**	**0.64**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

Movement Summary

P0591 Lookout Rd/Kookaburra Cres AM 2008

HMRI

Signalised - Fixed time **Cycle Time = 150 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Lookout Rd southern approach										
1	L	435	3.7	0.291	8.8	LOS A	40	0.19	0.65	48.4
2	T	1908	3.5	0.950	58.3	LOS E	569	1.00	1.10	23.1
Approach		**2343**	**3.5**	**0.950**	**49.1**	**LOS D**	**569**	**0.85**	**1.02**	**25.6**
Ridgeway Eastern Approach										
6	R	12	0.0	0.056	67.6	LOS E	8	0.89	0.70	21.0
Approach		**12**	**0.0**	**0.056**	**67.6**	**LOS E**	**8**	**0.89**	**0.70**	**21.0**
Lookout Rd Northern Approach										
8	T	958	4.2	0.388	5.8	LOS A	105	0.35	0.32	51.8
9	R	466	2.7	1.000#	70.0	LOS E	114	0.97	0.82	20.6
Approach		**1424**	**3.9**	**1.000**	**19.0**	**LOS B**	**114**	**0.48**	**0.42**	**39.4**
Kookaburra Cres Western Approach										
10	L	67	4.5	0.413	29.8	LOS C	27	0.61	0.70	33.2
12	R	168	8.9	0.330	70.8	LOS F	55	0.94	0.78	20.5
Approach		**236**	**7.6**	**0.412**	**59.2**	**LOS E**	**55**	**0.85**	**0.76**	**23.0**
All Vehicles		**4015**	**3.9**	**1.000**	**39.1**	**LOS C**	**569**	**0.72**	**0.79**	**29.0**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	16	63.5	LOS F	0	0.92	0.92
P5	13	69.1	LOS F	0	0.96	0.96
P7	3	17.8	LOS B	0	0.49	0.49
All Peds	**32**	**61.5**	**LOS E**	**0**	**0.90**	**0.90**

Movement Summary

P0591 Lookout Rd/Kookaburra Cres PM 2008

HMRI

Signalised - Fixed time **Cycle Time = 150 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Lookout Rd southern approach										
1	L	169	6.5	0.107	8.3	LOS A	11	0.12	0.63	49.1
2	T	1464	1.0	0.886	49.8	LOS D	370	1.00	0.99	25.3
Approach		**1635**	**1.5**	**0.886**	**45.5**	**LOS D**	**370**	**0.91**	**0.95**	**26.7**
Ridgeway Eastern Approach										
6	R	17	0.0	0.077	64.4	LOS E	11	0.87	0.72	21.7
Approach		**17**	**0.0**	**0.077**	**64.4**	**LOS E**	**11**	**0.87**	**0.72**	**21.7**
Lookout Rd Northern Approach										
8	T	1967	1.1	0.929	47.4	LOS D	527	1.00	1.04	26.0
9	R	174	4.0	0.898	92.0	LOS F	85	1.00	0.92	17.1
Approach		**2140**	**1.4**	**0.929**	**51.0**	**LOS D**	**527**	**1.00**	**1.03**	**25.0**
Kookaburra Cres Western Approach										
10	L	207	3.4	0.966	26.1	LOS B	69	0.58	0.78	35.2
12	R	633	1.3	0.920	90.6	LOS F	190	1.00	1.07	17.2
Approach		**839**	**1.8**	**0.966**	**74.7**	**LOS F**	**190**	**0.90**	**0.99**	**19.7**
All Vehicles		**4631**	**1.5**	**0.966**	**53.4**	**LOS D**	**527**	**0.95**	**0.99**	**24.3**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	17	63.5	LOS F	0	0.92	0.92
P3	1	16.3	LOS B	0	0.47	0.47
P5	23	69.1	LOS F	0	0.96	0.96
P7	4	25.8	LOS C	0	0.59	0.59
All Peds	**45**	**62.0**	**LOS E**	**0**	**0.90**	**0.90**

Movement Summary

P0591 Lookout Rd/Kookaburra Cres PM 2008 with HMRI

HMRI

Signalised - Fixed time **Cycle Time = 150 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Lookout Rd southern approach										
1	L	169	6.5	0.108	8.4	LOS A	12	0.13	0.63	49.0
2	T	1333	1.1	0.890	55.2	LOS D	348	1.00	1.00	23.8
Approach		**1503**	**1.7**	**0.890**	**49.9**	**LOS D**	**348**	**0.90**	**0.96**	**25.3**
Ridgeway Eastern Approach										
6	R	17	0.0	0.068	60.6	LOS E	11	0.84	0.72	22.6
Approach		**17**	**0.0**	**0.068**	**60.6**	**LOS E**	**11**	**0.84**	**0.72**	**22.6**
Lookout Rd Northern Approach										
8	T	1967	1.1	0.977	72.3	LOS F	634	1.00	1.18	20.1
9	R	195	3.6	0.880	89.0	LOS F	92	0.99	0.92	17.5
Approach		**2161**	**1.3**	**0.977**	**73.8**	**LOS F**	**634**	**1.00**	**1.16**	**19.8**
Kookaburra Cres Western Approach										
10	L	218	3.2	0.930	24.0	LOS B	66	0.56	0.76	36.4
12	R	761	1.4	0.972	106.1	LOS F	251	1.00	1.18	15.4
Approach		**980**	**1.8**	**0.972**	**87.8**	**LOS F**	**251**	**0.90**	**1.09**	**17.6**
All Vehicles		**4661**	**1.5**	**0.977**	**69.0**	**LOS E**	**634**	**0.95**	**1.08**	**20.7**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	17	63.5	LOS F	0	0.92	0.92
P3	1	18.3	LOS B	0	0.49	0.49
P5	23	69.1	LOS F	0	0.96	0.96
P7	4	29.5	LOS C	0	0.63	0.63
All Peds	**45**	**62.3**	**LOS E**	**0**	**0.90**	**0.90**

Movement Summary

P0591 Lookout Rd/Kookaburra Cres AM 2008 with HMRI

HMRI

Signalised - Fixed time **Cycle Time = 150 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Lookout Rd southern approach										
1	L	561	2.9	0.373	8.9	LOS A	54	0.22	0.66	48.3
2	T	1908	3.5	0.962	64.8	LOS E	596	1.00	1.14	21.6
Approach		**2469**	**3.3**	**0.962**	**52.1**	**LOS D**	**596**	**0.82**	**1.03**	**24.7**
Ridgeway Eastern Approach										
6	R	12	0.0	0.056	67.6	LOS E	8	0.89	0.70	21.0
Approach		**12**	**0.0**	**0.056**	**67.6**	**LOS E**	**8**	**0.89**	**0.70**	**21.0**
Lookout Rd Northern Approach										
8	T	958	3.8	0.423	6.0	LOS A	117	0.37	0.33	51.5
9	R	561	2.8	1.000#	70.8	LOS F	114	0.97	0.83	20.4
Approach		**1519**	**3.6**	**1.000**	**18.4**	**LOS B**	**117**	**0.48**	**0.43**	**39.9**
Kookaburra Cres Western Approach										
10	L	78	3.8	0.481	30.5	LOS C	31	0.62	0.71	32.9
12	R	179	8.4	0.348	71.0	LOS F	57	0.94	0.78	20.4
Approach		**257**	**7.0**	**0.481**	**58.7**	**LOS E**	**57**	**0.84**	**0.76**	**23.1**
All Vehicles		**4257**	**3.6**	**1.000**	**40.5**	**LOS C**	**596**	**0.70**	**0.80**	**28.4**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	16	63.5	LOS F	0	0.92	0.92
P5	13	69.1	LOS F	0	0.96	0.96
P7	3	18.3	LOS B	0	0.49	0.49
All Peds	**32**	**61.5**	**LOS E**	**0**	**0.90**	**0.90**

Movement Summary

P0591 Lookout Rd/Kookaburra Cres AM 2018

HMRI

Signalised - Fixed time **Cycle Time = 150 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Lookout Rd southern approach										
1	L	435	3.7	0.286	8.9	LOS A	42	0.20	0.66	48.3
2	T	2100	3.5	0.961	58.2	LOS E	641	1.00	1.12	23.1
Approach		**2535**	**3.6**	**0.961**	**49.8**	**LOS D**	**641**	**0.86**	**1.04**	**25.4**
Ridgeway Eastern Approach										
6	R	12	0.0	0.056	67.6	LOS E	8	0.89	0.70	21.0
Approach		**12**	**0.0**	**0.056**	**67.6**	**LOS E**	**8**	**0.89**	**0.70**	**21.0**
Lookout Rd Northern Approach										
8	T	1053	4.3	0.417	5.9	LOS A	114	0.36	0.33	51.6
9	R	466	2.6	1.000#	77.0	LOS F	124	0.99	0.82	19.3
Approach		**1519**	**3.9**	**1.000**	**20.3**	**LOS B**	**124**	**0.49**	**0.43**	**38.5**
Kookaburra Cres Western Approach										
10	L	67	4.5	0.450	34.2	LOS C	29	0.66	0.71	31.1
12	R	168	8.9	0.330	70.8	LOS F	55	0.94	0.78	20.5
Approach		**236**	**7.6**	**0.450**	**60.4**	**LOS E**	**55**	**0.86**	**0.76**	**22.7**
All Vehicles		**4302**	**3.9**	**1.000**	**40.0**	**LOS C**	**641**	**0.73**	**0.81**	**28.6**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	16	63.5	LOS F	0	0.92	0.92
P5	13	69.1	LOS F	0	0.96	0.96
P7	3	14.5	LOS B	0	0.44	0.44
All Peds	**32**	**61.2**	**LOS E**	**0**	**0.89**	**0.89**

Movement Summary

P0591 Lookout Rd/Kookaburra Cres PM 2018

HMRI

Signalised - Fixed time **Cycle Time = 150 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Lookout Rd southern approach										
1	L	169	6.5	0.107	8.3	LOS A	11	0.12	0.63	49.1
2	T	1466	1.1	0.874	47.0	LOS D	360	0.99	0.96	26.2
Approach		**1637**	**1.6**	**0.874**	**43.0**	**LOS D**	**360**	**0.90**	**0.93**	**27.5**
Ridgeway Eastern Approach										
6	R	17	0.0	0.082	66.3	LOS E	11	0.88	0.71	21.3
Approach		**17**	**0.0**	**0.082**	**66.3**	**LOS E**	**11**	**0.88**	**0.71**	**21.3**
Lookout Rd Northern Approach										
8	T	2164	1.2	0.998	81.6	LOS F	750	1.00	1.25	18.5
9	R	174	4.0	0.850	87.7	LOS F	83	0.99	0.89	17.6
Approach		**2337**	**1.4**	**0.998**	**82.0**	**LOS F**	**750**	**1.00**	**1.22**	**18.4**
Kookaburra Cres Western Approach										
10	L	207	3.4	0.981	26.1	LOS B	69	0.58	0.78	35.2
12	R	633	1.3	0.991	117.7	LOS F	218	1.00	1.20	14.2
Approach		**839**	**1.8**	**0.991**	**95.1**	**LOS F**	**218**	**0.90**	**1.10**	**16.7**
All Vehicles		**4830**	**1.5**	**0.998**	**71.0**	**LOS F**	**750**	**0.95**	**1.10**	**20.4**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	17	63.5	LOS F	0	0.92	0.92
P3	1	15.4	LOS B	0	0.45	0.45
P5	23	69.1	LOS F	0	0.96	0.96
P7	4	25.2	LOS C	0	0.58	0.58
All Peds	**45**	**61.9**	**LOS E**	**0**	**0.90**	**0.90**

Movement Summary

P0591 Lookout Rd/Kookaburra Cres PM 2018 with HMRI

HMRI

Signalised - Fixed time **Cycle Time = 150 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Lookout Rd southern approach										
1	L	191	5.8	0.121	8.4	LOS A	14	0.13	0.63	48.9
2	T	1466	1.1	0.947	70.2	LOS E	440	1.00	1.12	20.5
Approach		**1658**	**1.6**	**0.947**	**63.1**	**LOS E**	**440**	**0.90**	**1.07**	**22.0**
Ridgeway Eastern Approach										
6	R	17	0.0	0.075	63.4	LOS E	11	0.86	0.72	21.9
Approach		**17**	**0.0**	**0.075**	**63.4**	**LOS E**	**11**	**0.86**	**0.72**	**21.9**
Lookout Rd Northern Approach										
8	T	2161	1.0	1.046	117.7	LOS F	856	1.00	1.45	14.2
9	R	195	3.6	0.888	89.8	LOS F	93	0.99	0.92	17.4
Approach		**2355**	**1.2**	**1.046**	**115.4**	**LOS F**	**856**	**1.00**	**1.41**	**14.4**
Kookaburra Cres Western Approach										
10	L	218	3.2	0.958	27.1	LOS B	68	0.58	0.78	34.7
12	R	761	1.4	1.036	144.0	LOS F	292	1.00	1.34	12.1
Approach		**980**	**1.8**	**1.036**	**118.0**	**LOS F**	**292**	**0.91**	**1.21**	**14.2**
All Vehicles		**5010**	**1.5**	**1.046**	**98.4**	**LOS F**	**856**	**0.95**	**1.25**	**16.2**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	17	63.5	LOS F	0	0.92	0.92
P3	1	17.3	LOS B	0	0.48	0.48
P5	23	69.1	LOS F	0	0.96	0.96
P7	4	28.2	LOS C	0	0.61	0.61
All Peds	**45**	**62.2**	**LOS E**	**0**	**0.90**	**0.90**

Movement Summary

P0591 Lookout Rd/Kookaburra Cres AM 2018 with HMRI

HMRI

Signalised - Fixed time **Cycle Time = 150 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Lookout Rd southern approach										
1	L	561	2.9	0.370	9.1	LOS A	56	0.22	0.66	48.1
2	T	2100	3.5	0.995	80.8	LOS F	738	1.00	1.24	18.6
Approach		**2661**	**3.4**	**0.995**	**65.7**	**LOS E**	**738**	**0.84**	**1.12**	**21.4**
Ridgeway Eastern Approach										
6	R	12	0.0	0.056	67.6	LOS E	8	0.89	0.70	21.0
Approach		**12**	**0.0**	**0.056**	**67.6**	**LOS E**	**8**	**0.89**	**0.70**	**21.0**
Lookout Rd Northern Approach										
8	T	1053	4.0	0.449	6.2	LOS A	126	0.38	0.35	51.3
9	R	561	2.6	1.000#	75.7	LOS F	124	0.98	0.83	19.5
Approach		**1614**	**3.7**	**1.000**	**19.5**	**LOS B**	**126**	**0.49**	**0.44**	**39.1**
Kookaburra Cres Western Approach										
10	L	78	3.8	0.533	36.6	LOS C	35	0.69	0.72	30.1
12	R	179	8.4	0.348	71.0	LOS F	57	0.94	0.78	20.4
Approach		**257**	**7.0**	**0.533**	**60.6**	**LOS E**	**57**	**0.87**	**0.76**	**22.7**
All Vehicles		**4544**	**3.7**	**1.000**	**49.0**	**LOS D**	**738**	**0.72**	**0.86**	**25.6**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	16	63.5	LOS F	0	0.92	0.92
P5	13	69.1	LOS F	0	0.96	0.96
P7	3	15.9	LOS B	0	0.46	0.46
All Peds	**32**	**61.3**	**LOS E**	**0**	**0.89**	**0.89**