

Dubbo Base Hospital Redevelopment Review of Environmental Factors (REF)

TRAFFIC IMPACT ASSESSMENT



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1 INTRODUCTION

Cardno was commissioned by NSW Health Infrastructure to conduct a traffic study regarding the development of the new acute and sub specialities accommodation to Dubbo Base Hospital (DBH). These future programmed works are considered an essential investment to the district to enhance the services offered to the local community. The following report details the traffic impact of early works for Stage 1 and 2 of the redevelopment regarding the scope presented in the Dubbo Base Hospital Review of Environmental Factors (REF).

1.1 SCOPE OF WORKS

The objective of this report is to evaluate the impact of traffic generated by the project and its associated impact on the surrounding road network. In addition the study aims to determine the adequacy of parking provision, assess the availability of public transport and pedestrian facilities as well as external and internal access to the hospital redevelopment.

1.2 REFERENCE DOCUMENTS

The following documents have been reviewed as part of this study:

- > Australian Standard 2890.1:2004 Off Street Car Parking.
- > Australian Standard 2890.2:2002 Off Street Commercial Vehicle Facilities.
- > AUSTROADS Parts 5, 6, 13, 14.
- > NSW RTA Guide to Traffic Generating Developments (2002).
- > State Infrastructure Strategy 2006.
- > Dubbo Local Environmental Plan 2011.
- > Orana Regional Plan 2011 – 2021.
- > Dubbo City Council Strategic Plan 2011 – 2031.
- > A 2020 Vision for the City Of Dubbo.
- > Dubbo 2036 Community Strategic Plan.
- > Dubbo City Council Open Space Masterplan.
- > Footpaths and Cycleways Function Plan 2011/2012.
- > Design Guidelines for Hospitals and Day Procedure Centres: Traffic and Car Parking, Department of Health Services, Victoria.
- > DCC Development Control Plan G3.1 - Designing for Access and Mobility.
- > DCC Development Policy Code 1 - General Development Standards & Policies.
- > DCC Development Policy Code 3: Standards for Off-Street Parking of Motor Vehicles: Hospitals.
- > Guide to Traffic Generating Developments v2.2: Recommended Parking Rate for Private Hospitals, RTA.
- > Dubbo Base Hospital Preliminary Schematic Design/Concept Design Report.
- > Dubbo City Planning and Transportation Strategy 2036, November 2009, Stapleton Transportation and Planning.
- > Dubbo Base Hospital Master Plan – Traffic Advice, Hyder Consulting, November 2010.
- > DCC Urban Development Strategy Institutional Areas Development Strategy 199.7

1.3 Stakeholder Consultation

The following stakeholder consultation was undertaken to inform the development of the Traffic Impact Assessment.

1.3.1 Dubbo City Council (DCC)

Cardno attended a meeting held at Dubbo City Council (DCC) on 16 December 2011 with representatives from DCC's Planning, Engineering and Traffic teams to discuss the proposed redevelopment.

Cardno also separately met with DCC's Traffic Engineer to discuss Council's future plans for roads, parking and upgrades to pedestrian and cycle ways as well as the traffic and parking implications of the hospital development. Discussions at this meeting and follow up email communication were considered in the development of the Traffic Impact Assessment.

1.3.2 Roads and Maritime Services (RMS)

Cardno has liaised with RMS through the preparation of this application and Cardno has provided RMS with the preliminary transport assessment. RMS has advised that comments will be provided to inform the finalisation of the REF.

1.3.3 Transport for NSW (TfNSW)

Similarly to the approach take with RMS, Cardno has provided TfNSW with a preliminary copy of the transport assessment for review prior to lodgement of the REF.

2 EXISTING TRANSPORT SITUATION

2.1 SITE LOCATION & ACCESS

The existing DBH location is outlined in red on Figure 2.1 below. The DBH lies in the North East sector of Dubbo, east of the Newell Highway and north of the Golden Highway. The Coonamble railway line acts as the western boundary for the Hospital with limited railway crossings. It is bounded by the Dubbo Private Hospital and Charles Sturt University Dubbo Campus to the north, the Western Institute of TAFE – Dubbo College to the south and Lourdes Hospital to the east; all of which contribute to the Dubbo Institutional Precinct outlined in Dubbo City Council's *Urban Development Strategy – Institutional Areas Development Strategy (1997)*.

Figure 2.1 Site Location



2.2 SURROUNDING ROAD NETWORK

2.2.1 Classification Criteria

It is usual to classify roads according to a road hierarchy in order to determine their functional role within the road network. Changes to traffic flows on the roads can then be assessed within the context of the road hierarchy. Roads are classified according to the role they fulfil, as well as the volume and type of traffic they should appropriately carry. Typically, the following guidelines for the functional classification of roads apply:

- > **Arterial Road** - typically a main road carrying over 15,000 vehicles per day (vpd) and fulfilling a role as a major inter-regional link (over 1,500 vehicles per hour (vph)).
- > **Sub-arterial Road** - defined as secondary inter-regional links, typically carrying volumes between 5,000 and 20,000 vpd (500 to 2,000 vph).
- > **Collector Road** - provides a link between local roads and regional roads, typically carrying between 2,000 and 10,000 vpd (250 to 1,000 vph). At volumes greater than 5,000 vpd, residential amenity begins to decline noticeably.
- > **Local Road** - provides access to individual allotments, carrying low volumes, typically less than 2,000 vehicles per day (250 vph).

2.2.2 Road Sections

The following road sections within close vicinity of the site are considered likely to interact with access and function of the DBH re-development.

The Golden Highway

The Golden Highway (Cobbora Road) is a State Highway that runs from Dubbo towards Newcastle and enables road transport to the Hunter Region to bypass travelling over the Blue Mountains. A section of the Golden Highway between Leonard Street and Fitzroy Street, south of DBH operates as a Sub-Arterial Road with a speed limit of 60 km/hr, otherwise the highway operates as a rural arterial road. The road connects with Myall Street at a roundabout which also provides the main access to the hospital.

Myall Street

Myall Street runs east from Brisbane Street to Peachville Road providing access to residential zones throughout north eastern Dubbo as well as the Dubbo Health precinct. Currently there is no railway crossing for the Coonamble Railway line, thus providing a discontinuity near White Street and reducing the volume of traffic surrounding the hospital. In addition the discontinuity of the road makes Myall Street the main access road for Dubbo Base Hospital. Myall Street is a Sub-Arterial road east of the intersection with the Golden Highway (Cobbora Road) with a speed limit of 50km/hr.

White Street

White Street provides another connection to Myall Street near the Coonamble Railway line. This access to Myall Street is intended to be an alternative to the Golden Highway access distributing the traffic to and from the Hospital. White Street is a local street with a speed limit of 50km/hr and currently experiences low levels of traffic based on site investigations.

Muller Street and River Street

Muller Street and River Street are local roads which are the north-west boundaries of the site. They provide access for the residential and industrial areas on the eastern side of the railway line to the hospital facilities. Muller Street provides direct access to the Dubbo Nursing Home. River Street leads to Moran Drive which provides access to Dubbo Private Hospital and rear access to Dubbo Base Hospital (in the past this area has been gated). There are railway level crossings present on both roads and during redevelopment, consideration of safety implications of additional traffic using these links is essential.

2.2.3 Intersections

The following intersections are located within the vicinity of the site have the potential to interact with the development of Dubbo Base Hospital.

Golden Highway (Cobbora Road) /Myall Street

The Golden Highway (Cobbora Road)/Myall Street intersection is a four-way, two lane circulating roundabout with the configuration presented in **Figure 2.2**. Myall Street and The Golden Highway are not perpendicular to one another and meet at an acute angle. Pedestrian crossing facilities are provided on each approach approximately 30-50m from the control point on each approach.

Figure 2.2 Golden Highway (Cobbora Road)/Myall Street Intersection Layout



Golden Highway (Cobbora Road)/White Street/Hospital Access

The Golden Highway/White Street/Hospital Access intersection is a staggered priority intersection. There is a right turn bay into White Street from the western leg of the Golden Highway which extends back through railway crossing, as shown in Figure 2.3. Note that White Street is configured with left in/left out access only.

Figure 2.3 Golden Highway (Cobbora Road)/White Street/Hospital Access Intersection Layout



2.2.4 General vehicle access

Currently a majority of visitors to the hospital access the site via the Golden Highway/Myall Street roundabout entrance. Access is also possible on the northern boundaries using Muller Street and River Street linking the adjacent residential and industrial areas.

2.2.5 Emergency vehicle access

Emergency vehicles currently access the site via the Golden Highway / Myall Street roundabout entrance, the Emergency Department is well-located just 100 metres from this entrance. As the Emergency Department is located close to the main public entrance and car park, there is the potential for ambulances to experience delays caused by other site traffic at peak times. This was not, however, observed during site visits and is not reflected in the results of the operational assessment in **Section 2.3** below.

2.2.6 Service vehicle access

Service vehicles access the site via a loop road that connects to the western end of Myall Street at south of the site. The loop road allows service vehicles to avoid any potential conflicts with the Emergency Department, main public entrance and the major public car park.

2.3 EXISTING TRAFFIC CONDITIONS

An assessment of the existing traffic conditions along the major roads and intersections near the development site has been made using previous studies undertaken and site investigations. Traffic surveys were conducted to obtain the data required to assess the existing situation of the roads.

2.3.1 Traffic Surveys

Traffic surveys (Intersection Counts and Parking Surveys) conducted by SkyHigh Traffic consultants on the 15th of December 2011 in the AM peak [07:00-09:00] and PM peak [16:00-18:00] and 17th of December [11:00-13:00].

Data collected from the traffic surveys included the following:

- > Turning volumes and operation of the intersections below.
 - Golden Highway (Cobbora Road)/Myall Street.
 - Golden Highway (Cobbora Road)/White Street/Hospital Access.
 - Muller Street Access to Dubbo Base Hospital.
 - River Street Access to Dubbo Base Hospital.
- > Existing traffic generation of the site.
- > Understanding of the distribution of traffic within the study area.

2.3.2 Intersection Performance

The existing operation of the study intersections was assessed using the SIDRA 5.1 software package to determine the degree of saturation (DoS), average delay (AVD) in seconds and level of service (LoS) at each intersection; the generally accepted measures of the operational performance of an intersection.

The key indicator of intersection performance is LoS, where results are placed on a continuum from 'A' to 'F', as summarised in **Table 2.1**.

Table 2.1 Intersection Level of Service

LoS	Traffic Signal / Roundabout	Give Way / Stop Sign / T-Junction control
A	Good operation	Good operation
B	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	Satisfactory	Satisfactory, but accident study required
D	Operating near capacity	Near capacity & accident study required
E	At capacity, at signals incidents will cause excessive delays	At capacity, requires other control mode
F	Unsatisfactory and requires additional capacity, Roundabouts require other control mode	At capacity, requires other control mode

The AVD provides a measure of the operational performance of an intersection as indicated below, which relates AVD to LOS. The AVD's should be taken as a guide only as longer delays could be tolerated in some locations (i.e. inner city conditions) and on some roads (i.e. minor side street intersecting with a major arterial route).

For traffic signals, the average delay over all movements should be taken. For roundabouts and priority control intersections (sign control) the critical movement for LoS assessment should be the movement with the highest AVD.

Table 2.2 Intersection Average Delay (AVD)

LoS	AVD per Vehicles (seconds/vehicle)
A	Less than 14
B	15 to 28
C	29 to 42
D	43 to 56
E	57 to 70
F	>70

The DoS is another measure of the operational performance of individual intersections. For intersections controlled by traffic signals both queue length and delay increase rapidly as DoS approaches 1.0. It is common practice to ensure DoS is less than 0.9. DoS up to 0.8 generally represents satisfactory intersection operation; when DoS exceeds 0.9 the junction is considered to be approaching capacity, queues usually occur and mitigation may be required.

The existing intersection performance across the AM, Midday and PM Peak periods are presented in **Table 2.3** and **Table 2.4** for the Golden Highway/Myall Street Intersection and the Golden Highway/White Street intersection respectively. Full SIDRA movement summaries are shown in **Appendix A**.

Golden Highway (Cobbora Road)/Myall Street

The results of the SIDRA assessment of the Golden Highway (Cobbora Road)/Myall Street intersection present the following:

- > The intersection performs satisfactorily with LoS of A and delay values lower than 13 seconds across all peak periods assessed.
- > The maximum queue experienced across all peak periods occurs on Myall Street (East), during the AM Peak Period with a queue extending 19.2m (approximately 3-4 cars) from the intersection highlighting the concerns presented by Council regarding queuing along Myall Street. However this level of queuing is considered acceptable and the functioning of the intersection will not be impacted under the existing circumstances.

Table 2.3 SIDRA Results for the Intersection of Golden Highway/Myall Street

Golden Highway/Myall Street					
Time Period	DoS	AVD (s)	LoS	Queue Length (m)	Worst Movement
AM Peak	0.186	12.7	A	5.4	Myall Street (East) - Right
PM Peak	0.156	11.8	A	5.0	Myall Street (West) - Right
Saturday Midday Peak	0.023	12.0	A	0.6	Myall Street (East) - Right

Golden Highway (Cobbora Road)/White Street/Hospital Access

The results of the SIDRA assessment of the Golden Highway (Cobbora Road)/White Street intersection present the following, noting that these results do not affect the hospital approach:

- > The intersection performs satisfactorily with the LoS of D or better during all peak periods. However the LoS of D during the AM Peak period provides an indication that the intersection is approaching capacity and future development may cause failure of the intersection.
- > Currently a two-way volume in excess of 1400 vehicles per hour is experienced along the Golden Highway thus making it difficult for movements from the minor road onto the highway. This is evident with left turn and right turn movements out of White Street (South) being the worst movements across all three peak periods.
- > The maximum queue on the western leg of the Golden Highway is 16.5m (approximately 3 cars) occurring during the AM Peak. The distance between the railway crossing and the intersection is approximately 20m. It is noted that the turn bay extends west of the intersection for another 40m which allows sufficient storage for additional vehicles and as a result should not impact the performance of the intersection.

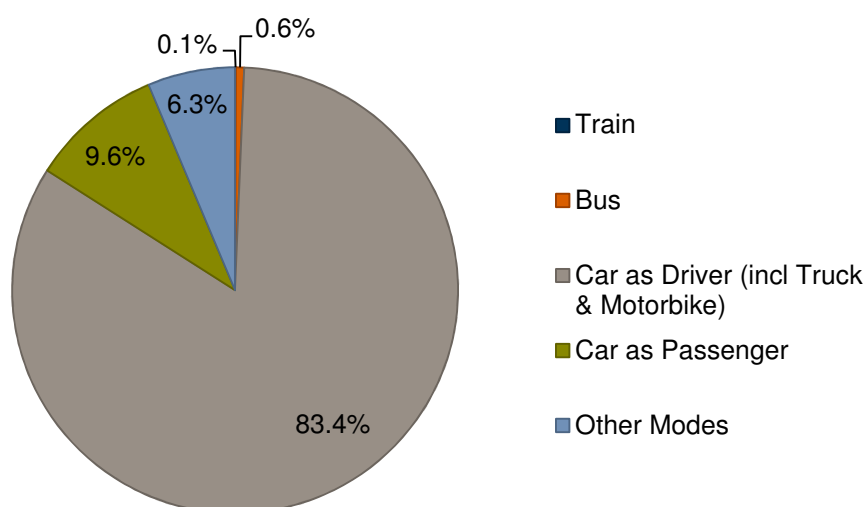
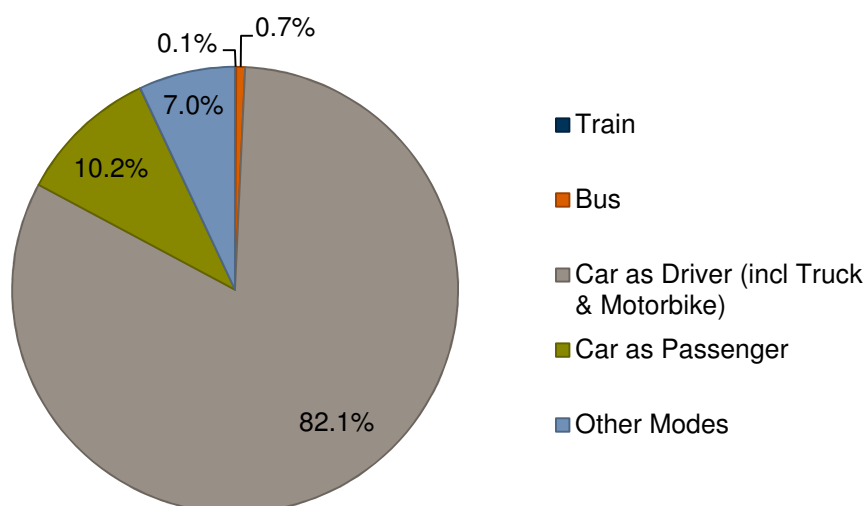
Table 2.4 SIDRA Results for the Intersection of Golden Highway/White Street/Hospital Access

Golden Highway/White Street/Hospital Access					
Time Period	DoS	AVD (s)	LoS	Queue Length (m)	Worst Movement
AM Peak	0.700	52.8	D	27.2	White Street (South) - Left
PM Peak	0.024	34.0	C	0.6	White Street (South) - Right
Saturday Midday Peak	0.056	26.0	B	1.5	White Street (South) - Right

2.3.3 Mode of Travel

The 2006 Census data for Journey to Work (JTW) data in the Dubbo area has been analysed to identify trends in the transport use. The JTW data shown in **Figure 2.4** indicates that 93% of workers travelling to Dubbo used either a car or truck, as either the driver or a passenger to arrive at their destination. The remaining 7% used either public transport or active transport to get to work. The statistics for workers travelling from Dubbo indicate a similar trend and is presented in **Figure 2.5**.

In summary, the JTW data has indicated that majority of people use private vehicles to travel to and from Dubbo and the use of public and active transport is limited. It is also important to note that the primary catchment area for DBH is Dubbo City. However DBH also services surrounding regional and remote areas which include 12 other Local Government Area (LGAs), Bogan, Bourke, Brewarrina, Cobar, Coonamble, Gilgandra, Mid-Western Regional, Narromine, Walgett, Warren, Warrumbungle and Wellington. In total DBH serves a catchment of 140,000 people and accordingly increases the likelihood of car travel from remote locations to the hospital for patients and visitors.

Figure 2.4 Journey to Work modeshare, travelling to Dubbo**Figure 2.5 Journey to Work modeshare, travelling from Dubbo**

2.4 EXISTING PARKING AND ACCESS ARRANGEMENTS

2.4.1 On-site parking locations and capacity

Hospital staff and visitors use a number of formal, informal and temporary car parks located in and adjacent to the existing hospital site. The key parking zones include:

- > Main car park: Located on the eastern side of the site. This car park includes disabled spaces and limited secure car spaces for staff.
- > Myall Street: Adjacent to the hospital site's southern end, unrestricted on-street parking provided by Dubbo City Council.
- > Short-stay car parks: There are a number of small short-stay car spaces located throughout the hospital site in proximity to different specialist services.
- > Temporary car parking: Occurring on the site's Loop Road, this informal and temporary car park is being used during the construction of the adjacent Sub-acute Mental Health facility.

All DBH car park zone locations are illustrated on **Figure 2.6** and the descriptions and parking capacity of each zone are provided in **Table 2.5**.

Figure 2.6 DBH parking zone locations

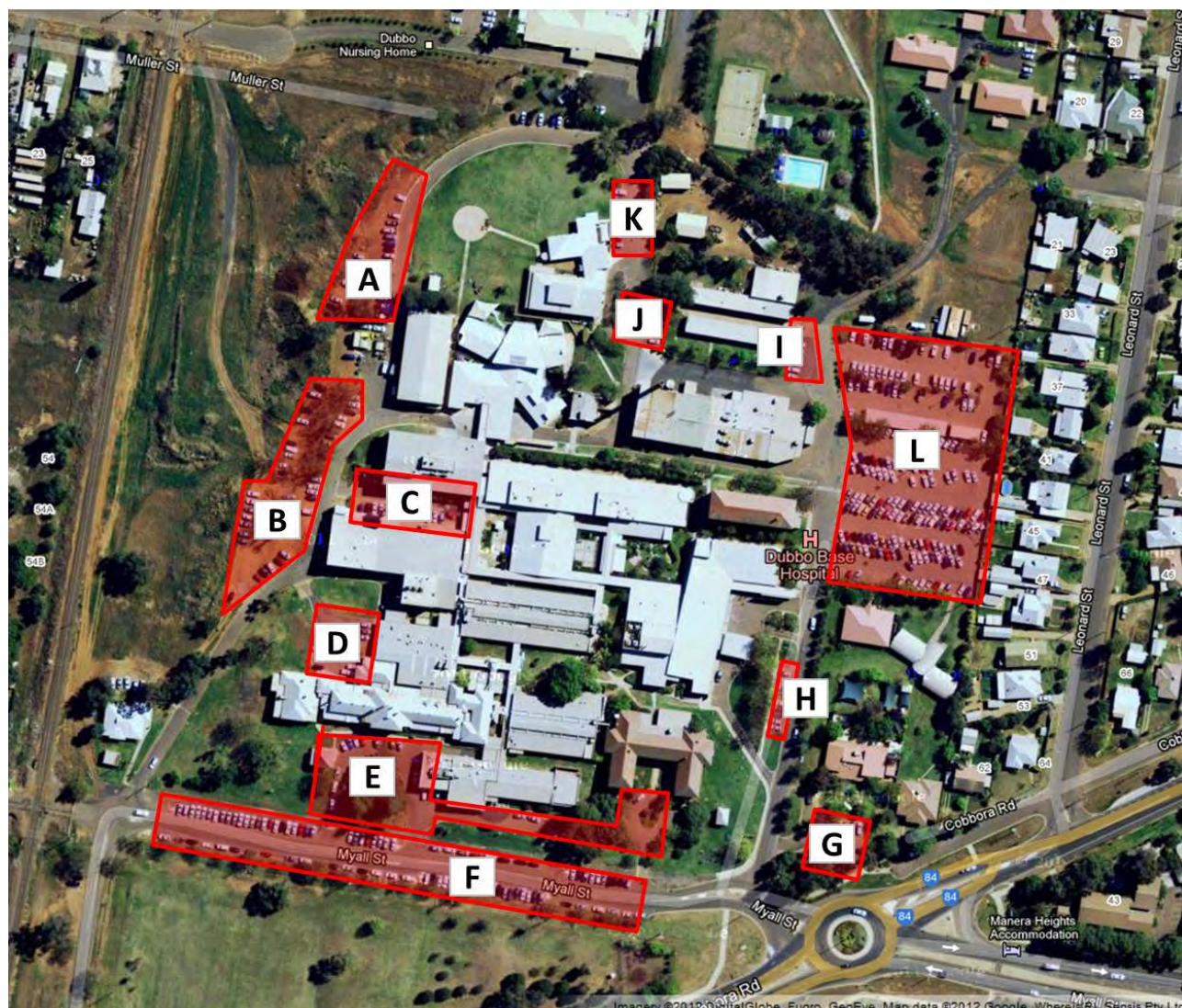


Table 2.5 DBH parking zones and capacity

ZONE	LOCATION	CLASSIFICATION	CAPACITY
A	Loop Road; north west corner	No restriction unmarked spaces - <i>informal off road parking</i>	n/a
B	Loop Road, west	No restriction unmarked spaces - <i>informal off road parking</i>	n/a
C	Maternity, Dialysis, CSSD Theatre Complex	5-6 doctors bays, 12 dialysis patients (includes 2 handicapped spaces)	17
D	Physio & Centre for Population Health	Physio & chronic patients only & no restriction + 1 security + 1 waste collection	11
E	Pathology & Cardiac Rehabilitation	2p or parking permit 0600 - 1800 7 days, 2 x spaced 10min, 2 x handicapped spaces	27
F	Myall Street, on street	No restriction marked spaces, external to site	100
G	Childcare	Playmates cottage only 1 x handicapped space	11
H	Front of House	6 x 1p or parking permit, 4 x handicapped spaces	10
I	Maintenance	Maintenance vehicles only	7

ZONE	LOCATION	CLASSIFICATION	CAPACITY
J	Maintenance/Oncology Drop Off	Maintenance vehicles only/Oncology Parking	12
K	Oncology	Includes 4 x handicapped spaces for use by oncology & diabetics patients	10
L	Main car park	5 x hospital transport, 7 x handicapped, 12 x undercover lockable, 6 x breast screen only, 0800-1700 M-F & 9 x GWAHS vehicles	235

Parking zones A and B are informal and temporary parking areas located off the Loop Road to the west of the hospital site. They are currently being used as overflow areas by staff.

2.4.2 Parking levels

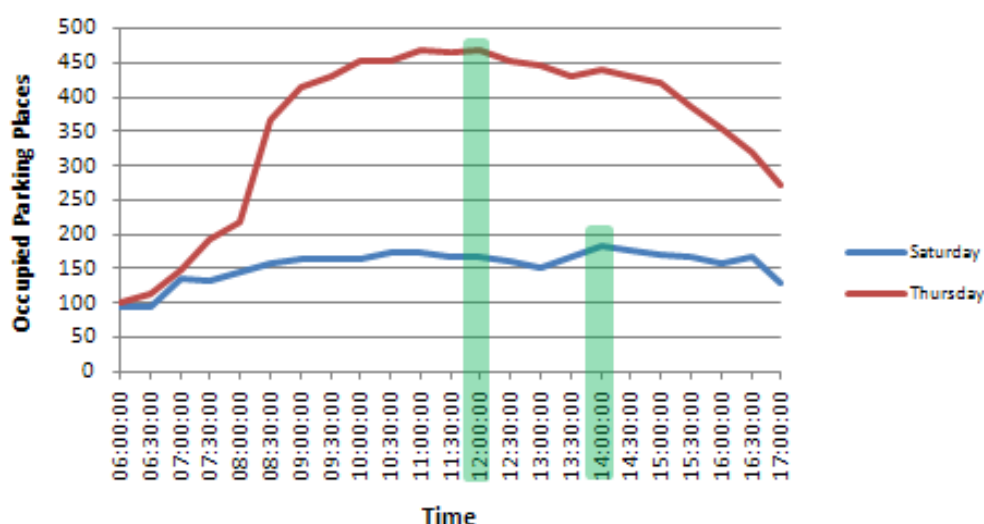
2.4.2.1 Parking surveys

Parking surveys were conducted by SkyHigh Traffic consultants on Thursday 15 and Saturday 17 December 2011 between 06:00 and 17:00 to understand the existing hospital's parking inventory and occupancy.

Analysis of the DBH parking survey results found that:

- > Parking levels at DBH reached maximum occupancy between 11:00am and 12:00pm on the Thursday surveyed and between 1:30pm and 2:30pm on the Saturday surveyed, see **Figure 2.7** for the parking levels across each surveyed day.
- > There is a considerable reduction in the level of occupancy during the weekend with over two and a half times the peak level of occupancy occurring during the weekday as compared to the weekend (468 places occupied on Thursday compared to 168 places occupied on Saturday).
- > During the Thursday surveyed a sharp incline in occupancy occurs, by approximately 150 additional parking spaces being occupied in 7:30am and 8:30am time period. This contrasts with the Saturday data where occupancy levels remain relatively stable throughout the day. The difference is expected given the likelihood of more employees attending the work at the hospital on the weekday increasing the demand for parking.

Figure 2.7 Parking usage by time of day



2.4.2.1 Staff feedback

Staff at DBH have raised the issue of the car park capacity, stating that they have experienced difficulty in finding car parking spaces on site.

2.4.2.2 Influencing factors

A number of factors have an influencing effect on the levels of parking by day and time period.

Staff levels

A much higher number of staff travel to Dubbo Base Hospital on weekdays versus weekends. 80% more general staff travel to the site on weekdays compared to Saturdays and Sundays and 38% more support services staff do the same. This significant difference drives the difference in parking levels between the surveyed days.

Visiting hours

General visiting hours are between 12:00-14:30 and 15:30-20:00, contributing to parking demand during these periods.

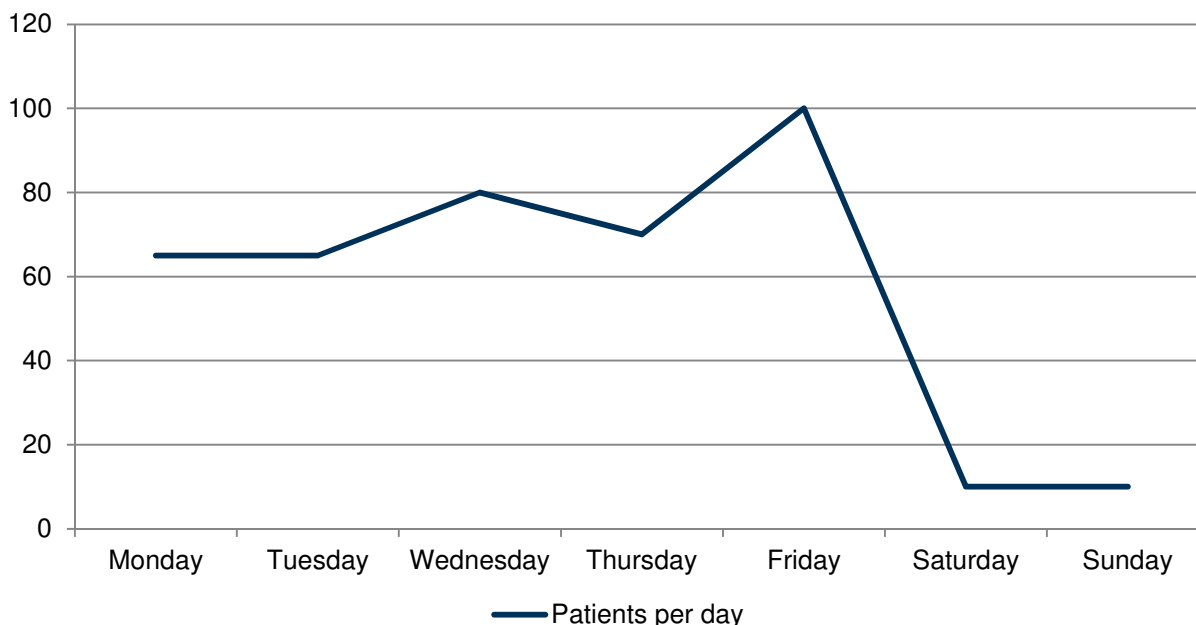
Shift changeover

Support Services and Nurses represent a large proportion of staff on site, around 40%, and both functions undergo shift changeover at around the same time each day. Support Services changeover at 14:30 and Nurses at 15:30. With commencing staff arriving for their shifts and finishing staff yet to leave, the changeover period will contribute to the parking levels at these times.

Ambulatory care

Many of the ambulatory care services provided at DBH are not offered every day, with potential to contribute to fluctuations in the parking levels by day of week. The number of ambulatory patients attending DBH throughout the week is provided in **Figure 2.8**.

Figure 2.8 Ambulatory care patient by day of week



2.4.3 Off-Site Parking

Dubbo City Council provides a number of free, off street public car parks, some with time restrictions. Car parks are located throughout the CBD and accommodate over 700 spaces.

Locations of Council's public car parks include:

- > Bligh Street (to the west of the Dubbo CBD). Approx 80 spaces.
- > Holls Avenue (within the Dubbo CBD). Approx 100 spaces.
- > Talbragar Street (to the north of the Dubbo CBD). Approx 60 spaces.
- > Church Street (within the Dubbo CBD). Approx 55 spaces.

Dubbo City Council is investigating the conversion of the Bligh Street carpark into a multi-level public carpark. The site has a pedestrian linkage already in place through to Macquarie Street in the CBD. The medium-term proposal to build a multi-level car park (ground level plus two more) on the site would occur when sufficient funds had been accumulated from a Section 94 Plan adopted for that purpose.

The Dubbo CBD is over 1.8km from Dubbo Base Hospital, well outside of the acceptable walking catchment of 400 metres.

2.5 PUBLIC TRANSPORT PROVISION

Dubbo Base Hospital has limited public transport options for staff and visitors. As Dubbo Base Hospital services a large regional catchment for health services, around 60% of patients are from outside of Dubbo, which increases their reliance on private vehicle. This is recognised in the Orana Regional Plan 2011-2021 which states,

"Public transport services are minimal or non-existent for residents of many of the small urban centres across the Orana region. This is particularly a problem for youth and aged sectors of the population who depend on public transport to access health and cultural services in larger regional centres that are not available in their town" Orana Regional Plan 2011 – 2021

2.5.1 Passenger Rail

Dubbo is serviced by the Countrylink Western train line, connecting Dubbo with eastern destinations and the Sydney CBD. Dubbo is the last railway station on the northern leg of the Western line, services to towns further north and west are continued by coach, see **Figure 2.9**, The Western Line rail service is illustrated in a wide yellow line, complemented by the Western Line coach services in thin yellow lines.

The Western Line is located to the south of Dubbo Base Hospital and does not intersect with the hospital site as shown in **Figure 2.9**. It is a single-track line with four at-grade crossings in Dubbo.

Only one train service connects Sydney to Dubbo daily; indicated in **Table 2.6**. The infrequency of services is a disincentive to travel by rail for hospital appointments and visitation. Infrastructure constraints, including the single track are impediments to any increase in service frequency. At-grade road crossings are also considered an impediment to increasing service frequency due to the additional delays caused to road traffic.

Table 2.6 Frequency of passenger rail services to Dubbo East Junction

Train Service	Frequency	Destinations
Sydney to Dubbo	Once daily	Dubbo East Junction railway station

The railway station is adjacent to the Dubbo CBD and accessed via Talbragar Street. Dubbo Base Hospital is located approximately 1400 metres from the train station via Talbragar Street and the Golden Highway. See **Figure 2.9** for the railway station location in relation to the hospital.

Dubbo East Junction Railway Station is the only train station in Dubbo and is the termination of passenger train services from Sydney on this section of the western line. A small car park is provided off Talbragar Street for Countrylink passengers.

Regional train travellers need to catch either a local bus or a taxi to access the Dubbo Base Hospital.

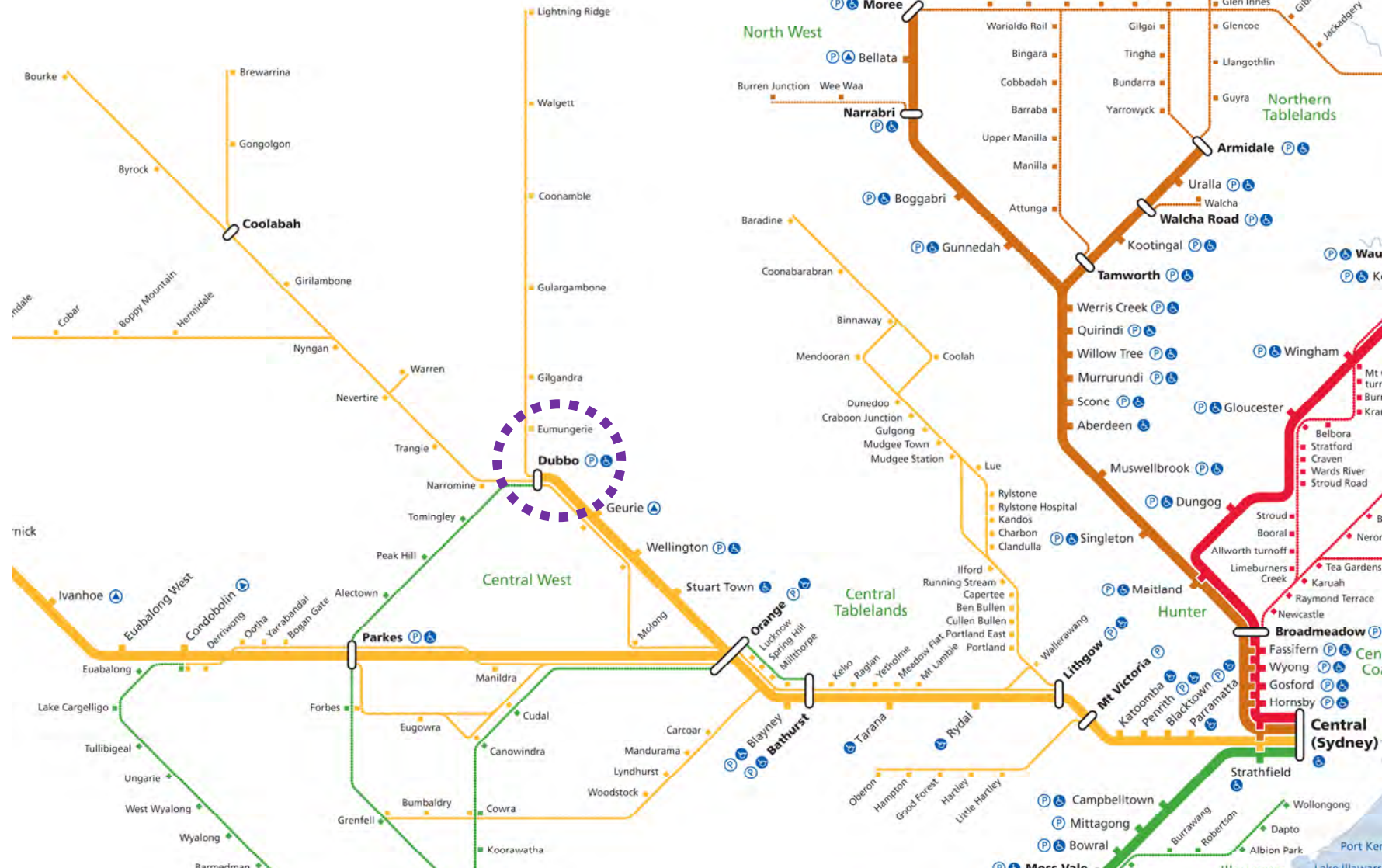
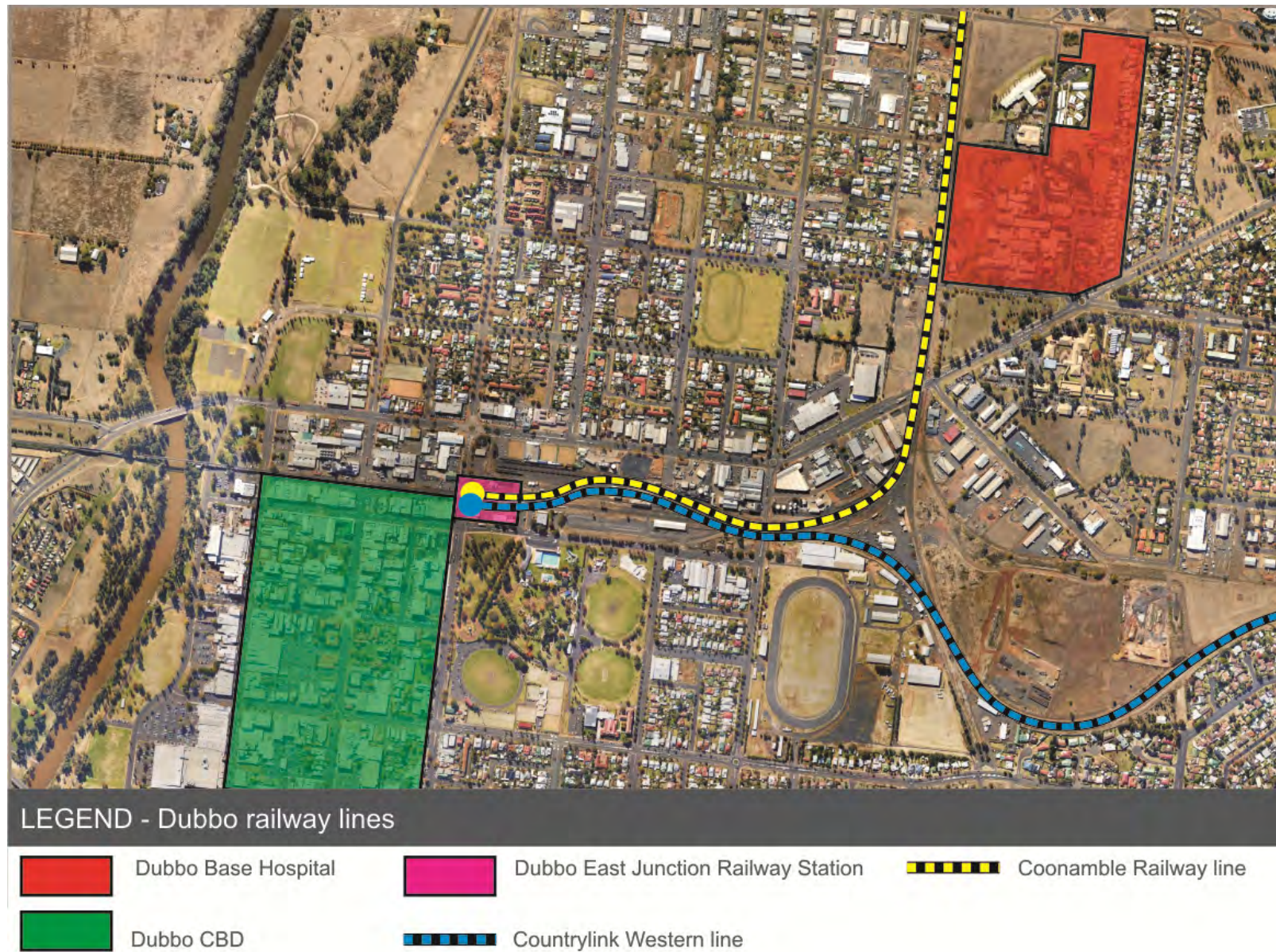


Figure 2.10 Dubbo railway lines



2.5.2 Coach services

Outlying regional centres connect to the Western Line train service at the Dubbo East Junction rail terminus via coach services originating from Bourke, Brewarrina, Lightning Ridge, Parkes and Broken Hill as shown in **Figure 2.9**.

Regional coach travellers need to catch either a local bus or a taxi to access the Dubbo Base Hospital.

Table 2.7 Frequency of coach services to Dubbo East Junction

Coach Service	Frequency	Destinations
Nyngan to Dubbo	Once daily (arrive 13:25)	Dubbo East Junction railway station
Broken Hill to Dubbo	Once daily	Dubbo East Junction railway station
Lighting Ridge to Dubbo	Once daily	Dubbo East Junction railway station
Brewarrina to Dubbo	Once daily on Mon/Wed/Fri/Sat	Dubbo East Junction railway station
Bourke to Dubbo	Once daily on Mon/Wed/Fri/Sat	Dubbo East Junction railway station

2.5.3 Freight

The hospital site's western boundary adjoins the Coonamble railway line which does not carry passenger traffic, shown on **Figure 2.10**. There are four level crossings of the Coonamble railway line leading to the Dubbo Base Hospital:

- > Golden Highway – level crossing controlled by boom gates and flashing lights.
- > Myall Street – pedestrian/cyclist only crossing.
- > Muller Street – level crossing, controlled by stop sign, only road access to adjacent aged care facility.
- > River Street – level crossing, controlled by boom gates and flashing lights.

The Coonamble Railway Line ends at the Dubbo East Junction railway station.

2.5.4 Bus

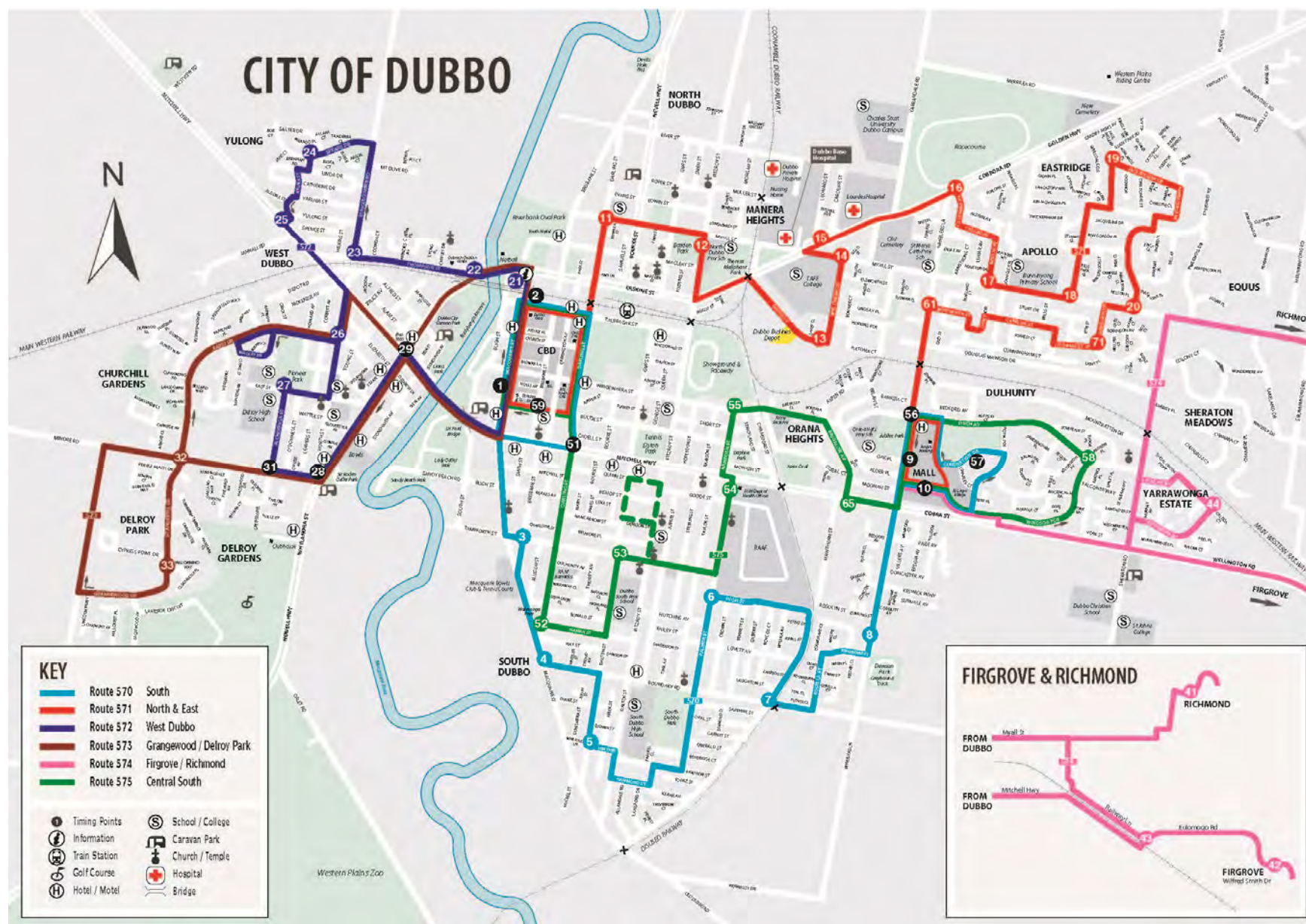
Dubbo's local bus network, Dubbo Buslines, is the only public transport option for travelling within Dubbo. Only Route 571 services the Dubbo Base Hospital with the service frequencies presented in **Table 2.8**.

Table 2.8 Bus routes and services to Dubbo Base Hospital

Route #	Bus stop within 400 metres	Frequency	Origin/destination
571	Golden Highway west bound (sheltered)	M-F: 7:56am 9:41am 9:56am 11:11am 11:41am 12:56am 2:11am 4:38am 5:45am Sat: 10:02am 11:51am 2:21am Sun: nil	Dubbo CBD/Orana Mall
571	Golden Highway east bound	M-F: 7:42am, 9:10am, 10:17am, 11:32am, 12:17am, 1:32pm, 2:47pm, 4:47, 5:22pm Sat: 8:47am, 10:37am, 11:57am Sun: nil	Orana Mall/Dubbo CBD

Bus services on route 571 are infrequent and are not direct from the Dubbo CBD or Orana Mall, The service originating from Orana Mall is particularly indirect and may be a disincentive for travel to the hospital by bus. All other bus routes servicing other areas of Dubbo originate or finish at either Dubbo CBD or Orana Mall as well, allowing interchange between the bus services. All Dubbo bus routes and bus stop locations are shown on **Figure 2.11**, Route 571 which services DBH is shown in red.

Figure 2.11 Dubbo bus routes and stop locations



The two bus stops servicing the hospital on either side of the Golden Highway west of the roundabout both provide seating and shelter for bus travellers. There is however poor provision of signage and information; there are no signs indicating that the shelter is a bus stop and there is no timetable or route information provided at either bus stop.

There are no pedestrian crossings or pathways linking the bus stops to the hospital, bus travellers need to cross two or three roads including the internal site road to reach the hospital's visitor entrance. The pedestrian crossings on the internal road are not convenient for bus travellers, located too far into the site.

2.5.5 Community Transport Facilities

A number of specialist transport services operate in Dubbo and between the hospital catchment towns and Dubbo to support people travelling to seek health assistance:

- > Dubbo Community Transport Scheme focuses on the needs of aged people with disabilities, their carers and the isolated people.
- > A Regional Care Service Car operates from the towns of Gilgandra, Narromine and Wellington into Dubbo, for specialist treatment, health and medical care and a car service is also available to Orange for medical appointments only.
- > A scheme run by the Indigenous Coordination Centre, the Police Citizens Youth Club, Dubbo Radio Cabs and Dubbo City Council provides subsidised taxi vouchers to Dubbo youth aged 12 to 17 years to help them access education, work, recreation and other destinations.
- > The Chronic Care for Aboriginal People Program provides health related transport to enhance existing services for Aboriginal people with or at risk of chronic disease.

Source: Dubbo Base Hospital Business Case and Implementation Plan

2.5.6 Taxi Services

Dubbo is serviced by Dubbo Radio Cabs Co-op. While there are no dedicated taxi facilities on-site, taxis can currently drop patients and visitors at the hospital's main entrance off Myall Street.

2.5.7 Future Public Transport Provision

A number of the recent strategic planning documents focused on Dubbo's future growth acknowledge public transport needs:

- > The Dubbo City Council's Strategic Plan 2011-2031 states that Council will continue to liaise with operators to ensure that a public transport system is available that facilitates the mobility of residents and visitors to the City. Special attention has been given in recent times to ensuring that public transport facilities meet Disability Discrimination Act guidelines.
- > The draft Dubbo 2036 Community Strategic Plan Strategy, Section 3.1.15 proposes that the public transport system should facilitate the mobility of residents and visitors to the City and meet the requirements of the Disability Discrimination Act.
- > A 2020 Vision for the City of Dubbo, Section 7.1 Inform the Community on Passenger Transport – The infrastructure exists in the form of train (XPT) from Sydney and Countrylink Bus that links regional towns to Dubbo as well as Air Travel (Performance Indicators: Information on available transport published on Dubbo City Council website on a regular basis).
- > Transport for NSW (TfNSW) is the state government agency responsible for all NSW bus operators and networks. At present, the TfNSW bus planning guidelines do not include rural/western NSW.

While the above strategic plans provide broad objectives of public transport improvements, there are no confirmed plans for upgrades and improvements to the existing train, coach or bus services for Dubbo.

2.6 CYCLE & PEDESTRIAN ACCESSIBILITY

Due to the nature and often distant origin of visitors to the hospital, vehicles remain the primary mode of transport for accessing the campus. Some pedestrian facilities are currently provided for those staff, patients and visitors who access the hospital on foot.

2.6.1 Existing pedestrian facilities

2.6.1.1 Internal

The hospital site has a disconnected arrangement of footpaths, ramps and walkways providing access within and between hospital buildings. Two pedestrian crossings provide access from the main car park to the main hospital building and the visitor entrance. Pedestrian facilities are particularly poor on the western side of the site with no footpath provided on either side of the loop road. A pedestrian crossing on the western side of the site crosses the loop road but connects only with a grass lawn.

2.6.1.2 External

Pedestrian footpaths provided on approach to Dubbo Base Hospital are provided in **Figure 2.13**.

The Golden Highway/Myall Street roundabout provides pedestrian refuge islands at each of the four approaches to the roundabout and the following footpath facilities connect to the hospital site via the roundabout:

- > Myall Street West: Footpath on northern side of the road. Poor visibility.
- > Myall Street East: Footpath on southern side of road. Good visibility by both vehicles and pedestrians. The pedestrian refuge island links with the Myall Street footpath that enters the hospital site.
- > Golden Highway West: Footpath on both sides of the road. There is poor visibility of pedestrians by vehicles heading eastward, vehicle/pedestrian vision is blocked by trees, see **Figure 2.12**.
- > Golden Highway East: Separate footpath commences around 250 metres to the east of the roundabout on the northern side only. While there is no footpath on approach to the roundabout, a side road, Cobbora Road, provides safer access for pedestrians and cyclists. Good visibility by both vehicles and pedestrians.

Figure 2.12 Golden Highway approach to roundabout

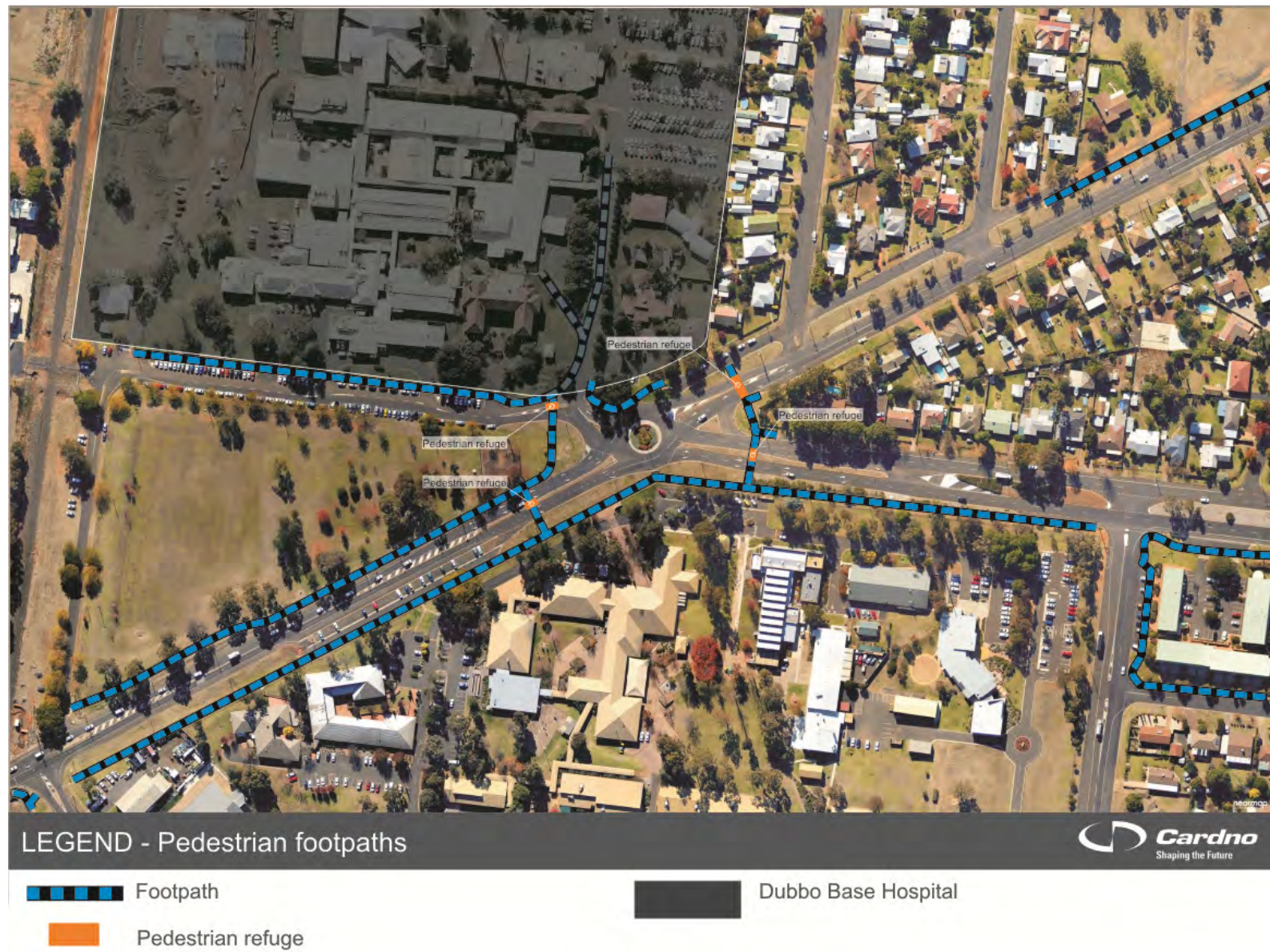


2.6.2 Planned/recommended upgrades and improvements

DCC's Footpaths and Cycleways Function Plan 2011/2012 refers to a 2006 Pedestrian Access Mobility Plan (PAMP) which identifies six Key Result Areas (KRA) to facilitate pedestrian movements. Although the PAMP is not accessible through the DCC website, the KRA actions are listed in the Footpaths and Cycleways Function Plan 2011/2012. KRA 6 addresses pedestrian safety near hospitals and recommends an all-weather footpath for:

- > Cobbora Road (north side) Yarrandale Road to Lourdes Hospital entrance.
- > Cobbora Road (north side) Lourdes Hospital to Base Hospital – partially completed.

Figure 2.13 Pedestrian footpaths on approach to Dubbo Base Hospital



2.6.3 Existing Cycle Facilities

2.6.3.1 Cycle routes

The site is accessible by cyclist using a combination of shared off-street footpaths and on road facilities. Dubbo City Council's cycleways map is provided in **Figure 2.14** outlines the following cycleways to access Dubbo Base Hospital:

Travelling from the south

Unmarked road shoulder facility, shared with stationary vehicles, commencing at corner of Wheelers Lane and Boundary Street and continuing until the corner of Wheelers Lane and the Mitchell Highway where bicycle lane adjacent to kerbside parking commences the roundabout at the intersection of Wheelers Lane and Myall Street. The last leg of the cycle trip is an off-road shared footpath facility between Whelchman Street and the Golden Highway approaching the Golden Highway/Myall Street roundabout.

Travelling from the east

Off-road shared path commencing to the south of the Sheraton Road and Mitchell Highway intersection. The off-road facility ends just past the intersection and the cycle route continues as unmarked mixed traffic until Myall Road. The last leg of the cycle trip is an off-road shared footpath facility between Whelchman Street and the Golden Highway.

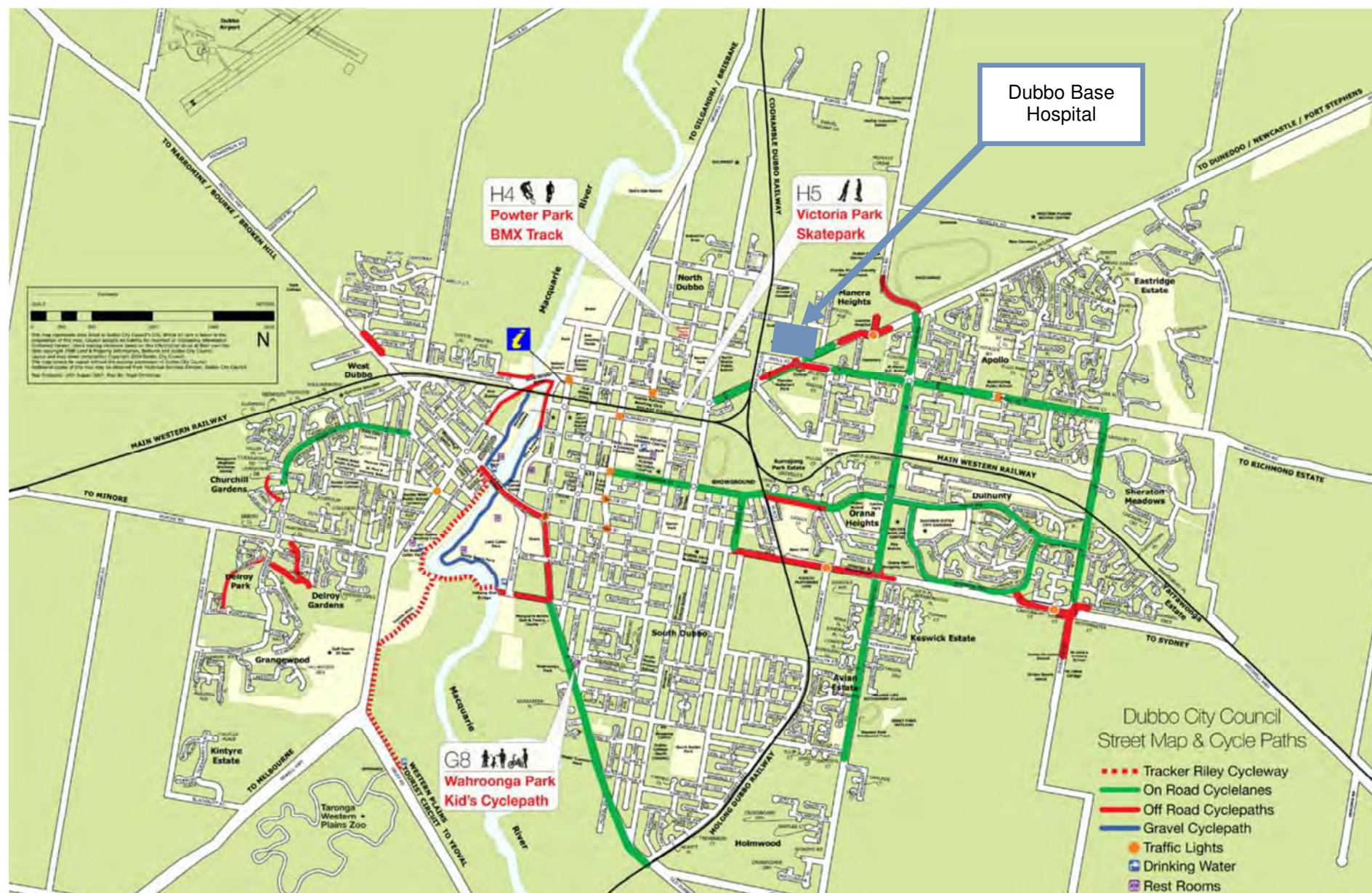
Travelling from the north

There are limited facilities for cyclists travelling from the north of the site. The cycling facilities only begin close to the site; the cycle route commences as an off-road shared path on Yarrandale Road in the approach to the Golden Highway and Yarrandale Road roundabout, undergoes a short length of unmarked on-road mixed traffic before the off-road share path recommences. The final component of the cycle route to reach the hospital is in the road shoulder of Golden Highway on approach to the roundabout.

Travelling from the west

There are no identified cycling facilities for cyclists travelling to the site from the Dubbo CBD. The on and off road footpaths nominated by Council to the west of the site are to the west and the south of the CBD and cyclists would need to navigate the Dubbo CBD and Newell Highway traffic to reach the hospital or take a long and undefined route through quieter streets.

Figure 2.14 Dubbo cycle ways, on and off road



2.6.3.2 On-site cycling facilities

A rack with storage for five bicycles is located close to the main public entrance to the hospital.

2.6.3.3 Off-site cycling storage

Bike storage lockers are available at two sites in Dubbo. A bank of four lockers is situated at Macquarie Regional Library while eight lockers have been constructed at the Church St carpark (behind Myer). Bikes can either be stored on a casual or long-term basis and the storage area is large enough to fit a bicycle and rider accessories.

3 PROPOSED REDEVELOPMENT

3.1 REDEVELOPMENT DETAILS

The REF details the following scope of works as part of the redevelopment of Dubbo Base Hospital which are shown also in Appendix C

- > Demolition of various structures including the existing Nurses Accommodation and Boiler House Buildings.
- > Construction of a new electrical substation building (including switchboard and generators) and relocation of existing padmount substations.
- > Upgrades and expansion of the existing car park.
- > Termination and relocation of existing hydraulic, water, sewer, stormwater, gas and electrical infrastructure services across the site.
- > Relocation of sheds to accommodate a new link road and construction access road in the northern part of the site.
- > Construction of a new building for ICT (Information and Communication Technology) infrastructure.
- > Minor reconfiguration of the Hospital's main entry and front house areas.
- > Provision of new landscaping.

These works are required to formalise existing informal / ad hoc parking arrangements, meet existing demand and cater for future programmed works (Stages 1 & 2) for the Hospital in the future. As such, an assessment of the adequacy of the parking provision has been made with respect to the future programmed works. Also, related to this, an increase in traffic will occur, and the impacts of this have also been considered. The following details regarding the future programmed works are noted:

- > The development will result in the construction of a new maternity unit, operating theatre suite, central sterilising department and day surgery unit.
- > Realignment of McGuinn Street to provide the main access to the hospital as well as linking the northern residential zones to Golden Highway (Cobbora Road).
- > An additional 19 beds will be provided.
- > An additional 46 staff will be hired.

4 TRAFFIC IMPACTS OF THE REDEVELOPMENT

Traffic throughout the network will increase with population growth and development. Accordingly to assess the impact of an individual development or redevelopment on the network a future base case or “No Development” scenario must be assessed for each horizon year. The “No Development” scenarios provided a comparison to determine whether the deterioration or improvement in the traffic conditions is as a result of the development or whether it is due to external factors affecting the network. The traffic impacts of the redevelopment of DBH were determined by assessing the following future traffic scenarios:

2013 No Development Scenario

The ‘2013 No Development’ scenario is used to determine a base for the performance of the network without the implementation of the redevelopment in the future. The existing traffic is grown by a percentage to form a level of background traffic to reflect future population and development growth external to the redevelopment of DBH.

2013 With Development Scenario

The ‘2013 With Development’ scenario determines the traffic situation at the completion of Stages 1 and 2 of the redevelopment. Additional traffic resulting from the redevelopment of DBH is included in this analysis. Details of the development indicate that an additional 19 beds will be provided at the completion of Stage 1 and 2 of the works.

2023 No Development Scenario

The ‘2023 No Development Scenario’ follows the same process of assessment as the ‘2013 No Development Scenario’ however considers a 2023 horizon year. Accordingly an additional 10 years of traffic growth external to the redevelopment have been assessed within this scenario.

2023 With Stage 1 and 2 Development Scenario

The ‘2023 With Stage 1 and 2 Development’ scenario determines the traffic situation at the completion of Stage 1 and 2 of the redevelopment of DBH with an additional 10 years of background traffic growth. This scenario was considered to determine the future impacts of the immediate construction of stages 1 and 2 of the redevelopment.

2023 With Full Development Scenario

The ‘2023 With Full Development’ scenario determines the traffic situation at the completion of the entire redevelopment of DBH. Additional traffic resulting from the redevelopment of DBH is included in this analysis. It was assumed that the development will result in increasing the number of beds from 216 to 266, according to the DBH Preliminary Schematic Concept Design Review V2, Section 2.2, resulting in an overall increase of 50 beds.

4.1 BACKGROUND TRAFFIC GROWTH

In order to assess the cumulative impacts of the future traffic scenario for the redevelopment of Dubbo Base Hospital, the determination of background traffic growth is essential. The level of traffic will increase as a result population and economic growth throughout Dubbo and the western region of New South Wales. An annual growth rate was estimated by conducting a literature review which detailed the following:

- > Dubbo City Planning and Transportation Strategy 2036 (Stapleton Transportation and Planning, November 2009) completed a TRACKS model of Dubbo presenting daily modelled traffic volumes for 2016, 2026, 2036 and 2046 for Myall Street and Cobbora Road. The average growth in traffic considering both roads is 0.85% per year across the 2 decades from 2006 to 2026.
- > Dubbo LGA, Economic & Demographic Profile (DCC, 2008) present an average annual growth rate of population between 2007 and 2031 as 0.8%.

Accordingly a growth rate of **0.85%** per year was used to grow the existing traffic present in the network to determine the level of background traffic.

4.2 TRAFFIC GENERATION

Traffic generation is generally dependent on land use and size of the redevelopment and estimated based on traffic survey of similar sites and comparison with published guidelines and generation rates for similar land uses.

The Institute of Transportation Engineers (ITE) Trip Generations Handbook, 8th Edition (2008), identifies a traffic generation rate of **1.5 trips per bed** for a General Hospital based on surveys conducted at specific sites.

The Roads and Traffic Authority Guide to Traffic Generating Development (2002) provides formulae to calculate the traffic generation for a Private Hospital based on the number of beds (B) and if available the average number of staff per weekday shift (ASDS). Following are the formulae presented:

When ASDS is known:

- > PVT (peak vehicle trips) $= -14.69 + 0.69B + 0.31ASDS$.
- > MVT (morning commuter peak vehicle trips) $= -10.21 + 0.47B + 0.06ASDS$.
- > EVT (evening commuter peak vehicle trips) $= -2.84 + 0.25B + 0.40ASDS$.

When ASDS is not known (approximation if data is unavailable):

- > PVT (peak vehicle trips) $= -22.07 + 1.04B$.
- > MVT (morning commuter peak vehicle trips) $= -12.41 + 0.57B$.
- > EVT (evening commuter peak vehicle trips) $= -11.96 + 0.69B$.

As stated earlier traffic surveys of similar sites and the site itself can provide information regarding trip generation rates. Currently, Dubbo Base Hospital has only 2 accesses to and from the site via Myall Street and White Street. Accordingly the traffic generated can be derived by considering the number of vehicles entering and exiting the site from the development. The intersection counts conducted for Dubbo Base Hospital included the intersection of Golden Highway (Cobbora Road)/Myall Street and Cobbora Road (Golden Highway)/White Street. Therefore the number of vehicles entering and exiting the site are equivalent to the volumes of traffic on the Myall Street (West) approach and the Hospital Access approach of the respective intersections. DBH provided information which showed that the total number of existing beds (inpatient and outpatient beds inclusive) is **216**.

Table 4.1 presents the total volumes entering and exiting the site based on the intersection counts as well as the traffic generation rates for each peak period as number of trips per bed. Site based trip generation rates for the AM and PM peak periods (1.699trips/bed and 1.495 trips/bed respectively) are consistent with the peak trip generation rate of 1.5 trips/bed detailed by the ITE Trip Generation Handbook. Accordingly the site specific generation rates derived from the traffic surveys were used for the estimation of future traffic generated.

Table 4.1 Existing Traffic Generation

Traffic Counts	Volumes Entering/Exiting using Golden Highway/Myall Street Intersection	Volumes Entering/Exiting using Golden Highway/White Street Intersection	Total Volumes	Traffic Generation Rate (Trips/Bed)
AM Peak				
Entering	215	84	299	1.699
Exiting	65	3	68	
Total Generated	280	87	367	
PM Peak				
Entering	91	44	135	1.495
Exiting	187	1	188	
Total Generated	278	45	323	
SAT Peak				
Entering	54	14	68	0.699
Exiting	82	1	83	
Total Generated	136	15	151	

Stage 1 and 2 development of the future programmed works involve the introduction of **19 beds** which result in the following additional traffic being generated by the hospital:

- > AM trip Generation = 32 trips.
- > PM trip Generation = 28 trips.
- > SAT trip Generation = 13 trips.

The total redevelopment will result in the introduction of **50 beds** which result in the following additional traffic being generated by the hospital:

- > AM trip Generation = 85 trips.
- > PM trip Generation = 75 trips.
- > SAT trip Generation = 35 trips.

4.3 TRIP DISTRIBUTION

Trip distribution analysis is the process by which trips originating or terminating in one zone or development are distributed to and from the adjacent road network. Traffic surveys provide turning movements of vehicles turning into and out of the hospital and the current distribution of traffic from the development. The traffic surveys conducted indicate the following existing access distributions into and out of the hospital (presented in **Table 4.2**):

- > Majority of traffic generated by the hospital utilises with Myall Street access with 76% of traffic using it during the AM Peak period, 86% during the PM Peak period and 90% during the Saturday Midday Peak Period.
- > The entering/exiting distribution for the Myall Street access to the hospital is as follows for each peak period:
 - AM Peak Period: Entering = 77%, Exiting = 23%.
 - PM Peak Period: Entering = 33%, Exiting = 67%.
 - Saturday Midday Peak Period: Entering = 40%, Exiting = 60%.
- > The entering/exiting distribution for the White Street access to the hospital is as follows for each peak period:
 - AM Peak Period: Entering = 97%, Exiting = 3%.
 - PM Peak Period: Entering = 98%, Exiting = 2%.
 - Saturday Midday Peak Period: Entering = 93%, Exiting = 7%.

Table 4.2 Existing Traffic Distribution

Traffic Counts	Cobbora Road (Golden Highway)/Myall St Intersection (Myall St (N) Approach)		Cobbora Road (Golden Highway)/White St Intersection (White St (N) Approach)		Total Accessing Hospital	
	Volumes	In/Out Distribution	Volumes	In/Out Distribution	Volumes	In/Out Distribution
AM Peak						
Entering	215	77%	84	97%	299	81%
Exiting	65	23%	3	3%	68	19%
Total Generated	280	100%	87	100%	367	100%
Split between Accesses	76%		24%			
PM Peak						
Entering	91	33%	44	98%	135	42%
Exiting	187	67%	1	2%	188	58%
Total Generated	278	100%	45	100%	323	100%
Split between Accesses	86%		14%			
SAT Peak						
Entering	54	40%	14	93%	68	45%
Exiting	82	60%	1	7%	83	55%
Total Generated	136	100%	15	100%	151	100%
Split between Accesses	90%		10%			

It is assumed that this distribution will be maintained into the future with Myall Street still being the predominant form of access to and from the hospital. Accordingly the above in/out splits were used to distribute future development traffic into the network. In addition existing percentage splits of turning movements derived from the traffic surveys were used to determine turning volumes at both the Myall Street/Golden Highway and White Street/Golden Highway intersections. **Figure 4.1** and **Figure 4.2** present future additional traffic volumes as a result of the redevelopment of the hospital at the completion of stages 1 and 2 and the completion of the entire redevelopment respectively.

Figure 4.1 Additional traffic volumes for Stage 1 and 2 Redevelopment (2013)



Figure 4.2 Additional traffic volumes for Total Redevelopment (2023)



FUTURE INTERSECTION PERFORMANCE

Several scenarios were considered during the traffic assessment of the redevelopment of DBH and accordingly the intersection performance for all these scenarios was determined. The following tables detail the SIDRA 5.1 intersection performance of the Golden Highway/Myall Street and Golden Highway/White Street/Hospital Access intersections considering for the following scenarios:

- > 2013 No Development Scenario (Table 4.3).
- > 2013 With Development Scenario (Table 4.4).
- > 2023 No Development Scenario (Table 4.5).
- > 2023 With Stage 1 and 2 Development Scenario (Table 4.6).
- > 2023 With Full Development Scenario (Table 4.7).

Table 4.3 2013 No Development Scenario Intersection Performance

2013 No Development					
Time Period	DoS	AVD (s)	LoS	Queue Length (m)	Worst Movement
Golden Highway/Myall Street					
AM Peak	0.189	12.7	A	4.5	Myall Street (East) - Right
PM Peak	0.083	11.9	A	1.8	Myall Street (West) - Right
Saturday Midday Peak	0.024	12.0	A	0.5	Myall Street (East) - Right
Golden Highway/White Street/Hospital Access					
AM Peak	0.758	60.4	E	24.9	White Street (South) - Left
PM Peak	0.026	35.5	C	0.5	White Street (South) - Right
Saturday Midday Peak	0.060	26.9	B	1.2	White Street (South) - Right

Table 4.4 2013 With Development Scenario Intersection Performance

2013 With Development					
Time Period	DoS	AVD (s)	LoS	Queue Length (m)	Worst Movement
Golden Highway/Myall Street					
AM Peak	0.197	12.6	A	4.7	Myall Street (East) - Right
PM Peak	0.174	11.9	A	4.5	Myall Street (West) - Right
Saturday Midday Peak	0.025	12.0	A	0.5	Myall Street (East) - Right
Golden Highway/White Street/Hospital Access					
AM Peak	0.761	62.5	E	25.5	White Street (South) - Left
PM Peak	0.026	35.6	C	0.5	White Street (South) - Right
Saturday Midday Peak	0.059	26.9	B	1.2	White Street (South) - Right

Table 4.5 2023 No Development Scenario Intersection Performance

2023 No Development					
Time Period	DoS	AVD (s)	LoS	Queue Length (m)	Worst Movement
Golden Highway/Myall Street					
AM Peak	0.210	12.9	A	5.1	Myall Street (East) - Right
PM Peak	0.183	12.0	A	6.6	Golden Highway (North) - Right
Saturday Midday Peak	0.026	12.1	A	0.5	Myall Street (East) - Right
Golden Highway/White Street/Hospital Access – 2023 No Development					
AM Peak	0.348	70.4	E	7.6	White Street (South) - Left
PM Peak	0.037	44.2	D	0.7	White Street (South) - Right
Saturday Midday Peak	0.080	32.0	C	1.6	White Street (South) - Right

Table 4.6 2023 With Stage 1 and 2 Development Scenario Intersection Performance

2023 With Stage 1 and 2 Development					
Time Period	DoS	AVD (s)	LoS	Queue Length (m)	Worst Movement
Golden Highway/Myall Street					
AM Peak	0.218	12.8	A	5.3	Myall Street (East) - Right
PM Peak	0.186	12.1	A	6.8	Golden Highway (North) - Right
Saturday Midday Peak	0.028	12.1	A	0.6	Myall Street (East) - Right
Golden Highway/White Street/Hospital Access					
Time Period	DoS	AVD (s)	LoS	Queue Length (m)	Worst Movement
AM Peak	0.349	70.6	E	7.6	White Street (South) - Right
PM Peak	0.034	44.2	D	0.7	White Street (South) - Right
Saturday Midday Peak	0.080	32.0	C	1.6	White Street (South) - Right

Table 4.7 2023 With Full Development Scenario Intersection Performance

2023 With Full Development					
Time Period	DoS	AVD (s)	LoS	Queue Length (m)	Worst Movement
Golden Highway/Myall Street					
AM Peak	0.232	12.7	A	5.8	Myall Street (East) - Right
PM Peak	0.190	12.2	A	7.1	Myall Street (West) - Right
Saturday Midday Peak	0.032	12.1	A	0.7	Myall Street (East) - Right
Golden Highway/White Street/Hospital Access					
Time Period	DoS	AVD (s)	LoS	Queue Length (m)	Worst Movement
AM Peak	0.350	70.9	F	7.6	White Street (South) - Right
PM Peak	0.034	44.4	D	0.7	White Street (South) - Right
Saturday Midday Peak	0.080	32.0	C	1.6	White Street (South) - Right

The Golden Highway/Myall Street intersection performs satisfactorily with LoS A throughout all scenarios. The Golden Highway/White Street/Hospital Access intersection performs satisfactorily during the PM and Saturday Midday Peak periods with LoS D or better. In the AM peak hour, the additional traffic through the intersection as a result of Stages 1 & 2 of the redevelopment has a negligible impact on the performance of the intersection. However it is noted that assuming full development of all future stages, the Level of Service of the intersection changes from LoS E to LoS F but the other measures of intersection performance are largely unaffected.

The analysis demonstrates that the deficient movements are the turning movements out of White Street that are opposed by 1850 vehicles per hour on the Golden Highway (in both directions). Of this, the full redevelopment of the hospital contributes an additional 17 vehicles above current volumes.

5 PARKING REQUIREMENTS

A key deliverable of the REF involves the upgrade and expansion of the existing car park. The following section of the report details the adequacy of the parking provisions in place as part of early works, for the future programmed works (Stages 1 and 2 of the redevelopment). The parking assessment determines the ability of the redevelopment to cater for an additional 19 beds and 46 staff members within the hospital which will be present at the completion of Stage 1 and 2 of the future redevelopment.

5.1 PARKING PROVISION

The early works proposed as part of the REF create a total of 289 spaces within the area bound by the application. Currently within this area there are a total of 241 spaces (235 in the main car park and 6 adjacent to the existing oncology building). This means the REF application proposed an increase on site of 48 spaces.

5.2 PARKING REQUIREMENTS

Hospitals need to provide a range of general and specialised car parking for staff, patients and visitors. In addition, the following categories of car park requirements need specific attention:

- > Parking spaces for persons with disability permits: Location and number. These spaces should be allocated close or adjacent to main patient building entrances and exits as well as near appropriate pedestrian infrastructure.
- > Short stay spaces (less than fifteen minutes): Acting as pick and drop off areas outside key building entrances.
- > Emergency vehicles and ambulances.
- > Visiting medical officers on call.
- > Nursing staff, particularly early & late shifts.
- > Patient access for scheduled appointments & treatments.
- > Public emergency access.
- > Public visitor access.

The parking requirement for the DBH redevelopment was determined by considering the following sources of information:

- > Other studies of Regional Hospital parking.
- > Policies and Guidelines providing parking rates.
- > Survey Data.

5.2.1 Regional Hospital Parking Case Studies

Parking studies of other regional hospitals within New South Wales provided an understanding of how parking requirements have been determined for other regional hospitals. A summary of the approach to parking provision at recent regional hospital developments is provided below:

Orange Health Campus

The project involved consolidation of the majority of health services provided across Orange to a single site and included the relocation of Orange Base Hospital and other health services from Orange CBD to Bloomfield Hospital, the continuation of the existing mental health provision at the site and the introduction of new mental health facilities including a secure mental health unit. The staff parking demand was calculated based on the forecast full-time equivalent (FTE) staff and multiplied by the percentage of staff that drove to the hospital. The public parking demand was calculated by deducting the staff parking from the surveyed peak hospital total parking demand.

- > Conclusion: The total forecast parking demand for Orange Health Campus was 931, the development provided parking capacity of 1,020, almost 10% above the forecast demand.

Wagga Wagga Base Hospital

The WWIRHS development project will provide new state-of-the-art health facilities on the Wagga Wagga Base Hospital site to meet changing clinical needs, expanded activities and the provision of educational facilities. The parking requirements were calculated by applying the existing parking demand profile and staff /non staff ratio to the predicted future hospital population for 2021.

- > Conclusion: The future parking demand was calculated to be 542 spaces. The hospital redevelopment project provided 496 spaces, meeting 91% of the predicted demand. A significant amount of on-street parking was occurring prior to the redevelopment (166 peak on-street spaces), this overflow demand will reduce to just 46 spaces with the additional provisions on site.

5.2.2 Parking guidelines

There is a range of parking provision guidelines or requirements that apply for healthcare developments, outlined in **Table 5.1**.

NSW Health Infrastructure has provided the following existing bed and staff numbers at DBH:

- > 216 beds (79 Outpatient beds and 137 Inpatient beds).
- > 541 staff (maximum staff onsite at any one time).

At the completion of Stage 1 and 2 of the redevelopment the following additional beds and staff will be present at DBH according the NSW Health Infrastructure:

- > 19 additional beds (16 Outpatient beds and 3 Inpatient Beds).
- > 46 staff.

It is noted that parking provision at Dubbo Base Hospital is catered for in a variety of on site, informal and off site (Myall Street) configurations. The guidelines allow identification of the increase in parking demand based on their forecast for the existing yield and the ultimate yield on site.

The required parking for the existing and post development scenarios were determined by substituting the values above into the guideline models presented in **Table 5.1** where possible. The high variability in the required parking numbers calculated indicated that a site specific assessment was undertaken to form an accurate figure for the future parking demands.

Table 5.1 Parking requirements by guideline

Policy / guideline	Organisation	Parking provision policy	Parking Requirements Existing Situation	Parking Requirements at completion of Stage 1 and 2 of Redevelopment	Net increase required
Design guidelines for hospitals and day procedure centres: traffic and car parking	The Department of Human Services, Victoria	Suburban and country conditions: $P_m = 0.9 S_m + 0.7 S_{sm} + 0.2 B_p + 0.3 B_m + 0.4 B_d + 1.5 D_{so}$ $P_a = 0.9 S_a + 0.7 S_{sa} + 0.3 B_p + 0.4 B_m + 0.25 B_d + 1.5 D_{so}$ Explanation of Codes: > P_m - required number of parking spaces during the morning peak > P_a - required number of parking spaces during the afternoon peak > S_m - number of staff during the morning peak (typically between 10.00 am and 11.00 am), including visiting doctors > S_a - number of staff during the afternoon peak (such as during the nursing shift changeover, both morning and afternoon nursing shifts counted), including visiting doctors and medical research staff > S_{sm} and S_{sa} - number of medical and nursing students present during the morning and afternoon peaks respectively; > C_{pt} - coefficient of public transport provision - 0.9 if a public transport node such as a bus/rail interchange is located within 250 m from the facility boundary, otherwise 1.0 > B_p - number of beds, all patients except maternity patients and children patients > B_m - number of maternity and children beds > B_d - number of beds or recliners for day patients > D_{so} - number of effective full time doctors and specialists treating Outpatients including Community and Allied Health, Physiotherapy and Imaging.	Pa = 541	Pa = 587	46
Policy code: standards for off-street parking of motor vehicles: hospitals	Dubbo City Council	One space per 10 beds plus; one space per each resident or staff doctor plus; one space for each employee on duty at any one time plus; ambulance parking.	563	611	48
Guide to traffic generating developments v2.2: recommended parking rate for private hospitals	RTA	Peak parking accumulation (PPA) = $-19.56 + 0.85 \times B + 0.27 \times ADAS$ Note: B: No. of beds, ADAS: Average staff per weekday day shift	243	259	16

5.2.3 Parking Demand Assessment based on Survey Data

Section 5.2.2 detailed the need to develop a site specific relationship to calculate the parking demanded for Dubbo Base Hospital. A relationship between the level of staff, number of beds and the parking occupancy was determined by conducting statistical analysis of data provided by Dubbo Base Hospital Parking Review as well as information provided for future programmed works and the Dubbo Base Hospital Funding Report.

An expression for peak parking demand was determined using the regression analysis. It is essential to determine the maximum possible utilisation of parking to cater for the greatest demand onsite. Thus only weekday parking occupancy, staff and bed numbers were utilised throughout the analysis. Parking occupancy provides an indication for parking demand and data was obtained from the parking survey conducted. An extended explanation of the development and validation of the analysis is presented in **Appendix D**.

The expression for parking demand derived from the regression analysis is as follows:

$$\text{DBH Peak Parking Demand} = 15.441 + 0.479(S) + 2.598(EO)$$

Where,

- > **S** = Maximum staff onsite, representing the maximum number of staff on site for a given day under normal operating conditions during the period of the parking survey.
- > **EO = Equivalent Outpatient Beds = Outpatient Beds + k_x (Inpatient Beds).**
- > **k_x** = Maximum percentage of inpatient beds having visitors at any one time during the period of the parking survey (10%).

Since we are considering the peak parking demand, all variables utilise the maximum figure which occurs throughout the day considering the worst case scenario for parking.

The model derived in the previous section was tested by substituting the existing maximum staff onsite, outpatient beds and inpatient beds. The model indicates that to accommodate the future parking demand at the completion of Stage 1 and 2 of the development an additional 61 spaces are required. **Table 5.2** presents a comparison of all considered models and the resultant net increase required.

Table 5.2 Comparison of Parking Demand/Required Estimates

Policy/Guideline Model	Organisation	Predicted Level of Existing Parking	Predicted Level of Parking at the Completion of Stage 1 and 2	Net Increase Required
Peak Parking Occupancy (according to parking survey conducted)		468		
Design guidelines for hospitals and day procedure centres: traffic and car parking	The Department of Human Services, Victoria	541	587	46
Development Policy: Standards for off-street parking of motor vehicles: hospitals	Dubbo City Council	563	611	48
Guide to traffic generating developments v2.2: recommended parking rate for private hospitals	RTA	243	259	16
DBH Peak Parking Demand Model	Cardno			61

5.2.4 Future Parking Recommendation

Table 5.3 presents the parking requirements when comparing the DCC LEP and the parking model developed by survey data provided.

Table 5.3 Parking Provision Assessment

Approach	Parking Spaces
Current Supply of Formal Parking with REF boundary	241
Parking supply provided at the completion of Stage 1 and 2 Redevelopment	289
Additional spaces required according to DCC LEP	48
Additional spaces required according to Survey Data Parking Demand Model	61
Net increase provided	48

The provision of 289 car parking spaces meets the requirements set out in the DCC LEP indicating that there is sufficient provision of parking spaces to cater for the completion of Stage 1 and 2 redevelopment of DBH. As well as satisfying Dubbo City Council requirements the quantum provided is close to accommodating the worst case demand model outlined above.

5.3 CAR PARK LAYOUT REVIEW

The proposed main car park is an extension of the existing carpark in the north-western corner of the hospital site. It has been designed for a vehicle capacity of 289 vehicles and provide capacity to accommodate the increased demand from future programmed works. All circulating roadways and parking aisles have been designed for two-way traffic flow. All parking aisles are configured in a north-south manner.

5.3.1 Car Park Space and Aisle Dimensions

Australian Standard AS2890.1 Part 1: Off-street car parking (AS2890.1), suggest user classification for the hospital car park of Class 1 (residential, domestic and employee parking) and Class 4 (people with disabilities). All car parking spaces have been designed primarily in a perpendicular configuration with some parallel parking along the main circulation roads.

AS2890.1 recommends normal car space dimensions of 5.4metres by 2.4metres, with an aisle width of 5.8 metres. The car park has been generally designed with dimensions of 5.4 metres by 2.4 metres with an aisle width of 6.2 metres, thus complying with Australian Standards.

5.3.2 Signage

Speed limit signage should be erected within the car park advising motorists that 10km/h speed limit applies. Pedestrian crossing signage and also warnings regarding the presence of emergency vehicles should also be provided.

5.4 DEMAND MANAGEMENT

It is noted that the existing parking supply is constrained, with a number of vehicles required to park in informal location around the site.

Strategies to manage car park demand could include:

- > Implementation of a car space booking system for a proportion of parking spaces during peak periods.
- > Given the site's parking constraints, a shuttle bus between the Dubbo CBD and the hospital may be required. Staff, patients and visitors could park in the Dubbo CBD or catch a bus service that terminates in the CBD and then board the hospital shuttle bus. The impact of this arrangement on DCC's existing car parks would need to be discussed with Council.
- > Provision of bicycle parking and end-of-trip facilities.
- > Improvement of the public transport facilities and scheduling.

6 CONCLUSIONS & RECOMMENDATIONS

6.1 CONCLUSIONS

- > The redevelopment's future programmed works will involve the addition of 19 beds and 46 staff which will generate a maximum of 32 vehicles during the AM peak period.
- > All intersections perform satisfactorily with acceptable levels of service when considering the impact of hospital traffic only.
- > The proximity of the Golden Highway (Cobbora Road)/White Street/ Hospital Access intersection to the railway level crossing raises safety concerns as the right turn bay from the Golden Highway to White Street extends through the crossing. This is an existing constraint and the introduction of hospital traffic does not increase the likelihood of this occurring.
- > The majority of staff, patients and visitors will travel to the hospital using private vehicles. A majority of patients live outside of the Dubbo urban area.
- > The provision of additional parking will satisfy the parking demand created by the additional beds and staff present at the completion of the future programmed works (Stage 1 and 2) redevelopment.
- > Car parks have been designed to Australian standards.
- > The main mode of transport utilised throughout Dubbo are private vehicles with over 92% of people using a car/truck to travel to work.
- > Public transport services are poor, both the inter-town services which run once daily and the local Dubbo bus network which is infrequent, indirect and requires interchange for travellers from Dubbo's southern and western suburbs.
- > A shuttle bus service could be provided to other destinations in Dubbo.

Dubbo Base Hospital
Redevelopment Review
of Environmental
Factors (REF) Traffic
Study

APPENDIX

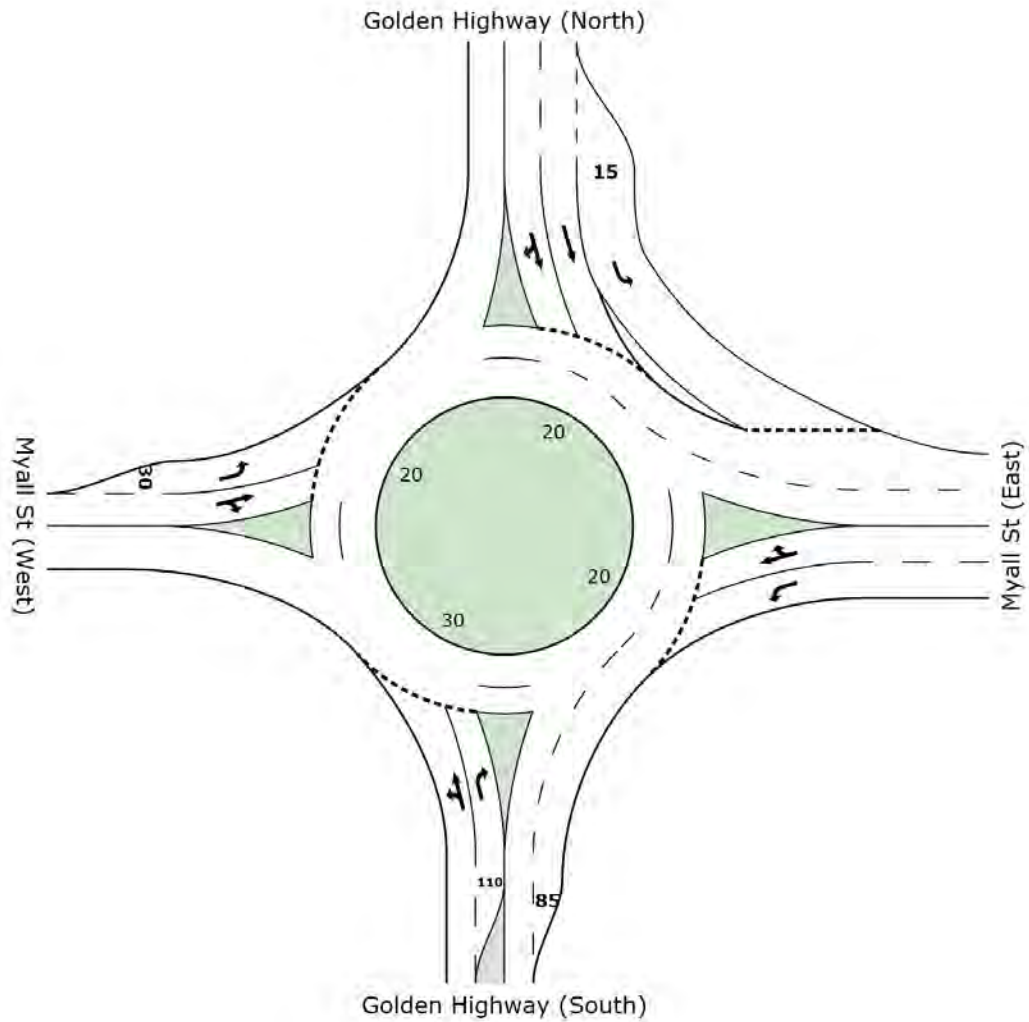
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SIDRA MOVEMENT
SUMMARIES



SIDRA SUMMARIES – EXISTING SITUATION

Golden Highway/Myall Street



MOVEMENT SUMMARY

Site: Myall St/Golden Hwy -
AM Peak

Existing AM Peak
Myall Street/Golden Highway
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Golden Highway (South)											
1	L	65	2.0	0.224	5.5	LOS A	1.4	10.3	0.33	0.52	49.7
2	T	199	10.0	0.224	5.8	LOS A	1.4	10.3	0.33	0.48	50.4
3	R	338	8.1	0.251	10.7	LOS A	1.6	12.1	0.32	0.64	44.8
Approach		602	8.1	0.251	8.5	LOS A	1.6	12.1	0.32	0.58	47.0
East: Myall St (East)											
4	L	513	6.0	0.452	7.3	LOS A	2.6	19.2	0.51	0.69	43.0
5	T	119	2.0	0.185	5.0	LOS A	0.8	5.4	0.45	0.54	43.9
6	R	13	15.2	0.186	12.7	LOS A	0.8	5.4	0.45	0.97	41.0
Approach		645	5.4	0.452	7.0	LOS A	2.6	19.2	0.50	0.66	43.1
North: Golden Highway (North)											
7	L	7	0.0	0.007	6.3	LOS A	0.0	0.1	0.30	0.51	48.8
8	T	511	4.0	0.254	6.4	LOS A	1.4	9.9	0.37	0.55	49.6
9	R	32	0.0	0.254	10.9	LOS A	1.4	9.9	0.38	0.84	45.8
Approach		550	3.7	0.254	6.6	LOS A	1.4	9.9	0.37	0.57	49.4
West: Myall St (West)											
10	L	10	0.0	0.015	7.7	LOS A	0.1	0.4	0.45	0.62	43.3
11	T	32	0.0	0.051	4.5	LOS A	0.2	1.6	0.41	0.47	43.5
12	R	24	0.0	0.051	11.3	LOS A	0.2	1.6	0.41	0.79	41.4
Approach		66	0.0	0.051	7.5	LOS A	0.2	1.6	0.42	0.61	42.6
All Vehicles		1863	5.6	0.452	7.4	LOS A	2.6	19.2	0.40	0.60	46.1

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).

Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (RTA NSW).

Approach LOS values are based on the worst delay for any vehicle movement.

Roundabout Capacity Model: SIDRA Standard.

MOVEMENT SUMMARY

Site: Myall St/Golden Hwy -
PM Peak

Existing PM Peak
Myall Street/Golden Highway
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Golden Highway (South)											
1	L	28	0.0	0.304	5.0	LOS A	2.0	14.6	0.21	0.48	50.5
2	T	443	3.0	0.306	5.2	LOS A	2.0	14.6	0.21	0.43	51.3
3	R	429	1.9	0.321	10.3	LOS A	2.1	14.7	0.22	0.63	45.2
Approach		900	2.4	0.321	7.6	LOS A	2.1	14.7	0.22	0.53	48.2
East: Myall St (East)											
4	L	368	2.0	0.302	6.5	LOS A	1.5	10.7	0.39	0.61	43.5
5	T	50	2.0	0.081	4.3	LOS A	0.3	2.2	0.37	0.46	44.3
6	R	11	9.1	0.081	11.8	LOS A	0.3	2.2	0.37	0.88	41.5
Approach		429	2.2	0.302	6.4	LOS A	1.5	10.7	0.38	0.60	43.5
North: Golden Highway (North)											
7	L	15	13.0	0.018	7.0	LOS A	0.1	0.4	0.38	0.54	48.3
8	T	300	3.0	0.160	7.0	LOS A	0.9	6.6	0.46	0.60	49.1
9	R	14	7.4	0.159	11.7	LOS A	0.9	6.6	0.46	0.84	45.5
Approach		329	3.6	0.160	7.2	LOS A	0.9	6.6	0.45	0.61	48.9
West: Myall St (West)											
10	L	26	0.0	0.042	8.4	LOS A	0.2	1.1	0.51	0.72	42.8
11	T	100	0.0	0.156	5.1	LOS A	0.7	5.0	0.49	0.53	43.0
12	R	62	0.0	0.156	11.8	LOS A	0.7	5.0	0.49	0.88	41.3
Approach		188	0.0	0.156	7.8	LOS A	0.7	5.0	0.49	0.67	42.3
All Vehicles		1846	2.3	0.321	7.3	LOS A	2.1	14.7	0.33	0.57	46.5

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).

Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (RTA NSW).

Approach LOS values are based on the worst delay for any vehicle movement.

Roundabout Capacity Model: SIDRA Standard.

MOVEMENT SUMMARY

Site: Myall St/Golden Hwy -
SATMD Peak

Existing Saturday Middy Peak
Myall Street/Golden Highway
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Golden Highway (South)											
1	L	29	0.0	0.227	4.9	LOS A	1.4	9.6	0.12	0.47	51.1
2	T	303	2.0	0.227	5.0	LOS A	1.4	9.6	0.12	0.42	52.1
3	R	360	1.0	0.236	10.0	LOS A	1.3	9.2	0.11	0.64	45.7
Approach		692	1.4	0.236	7.6	LOS A	1.4	9.6	0.11	0.53	48.5
East: Myall St (East)											
4	L	377	3.0	0.306	6.5	LOS A	1.5	10.6	0.37	0.61	43.6
5	T	15	0.0	0.023	4.1	LOS A	0.1	0.6	0.34	0.43	44.5
6	R	3	0.0	0.023	12.0	LOS A	0.1	0.6	0.34	0.91	40.6
Approach		395	2.9	0.306	6.5	LOS A	1.5	10.6	0.37	0.60	43.6
North: Golden Highway (North)											
7	L	10	0.0	0.010	6.3	LOS A	0.0	0.2	0.28	0.52	48.9
8	T	321	2.0	0.154	6.4	LOS A	0.7	5.3	0.34	0.55	49.9
9	R	11	0.0	0.155	11.1	LOS A	0.7	5.3	0.34	0.85	45.8
Approach		342	1.9	0.154	6.5	LOS A	0.7	5.3	0.34	0.56	49.7
West: Myall St (West)											
10	L	7	0.0	0.010	7.8	LOS A	0.0	0.3	0.45	0.62	43.2
11	T	31	0.0	0.068	4.6	LOS A	0.3	2.0	0.41	0.48	43.4
12	R	45	0.0	0.068	11.4	LOS A	0.3	2.0	0.41	0.79	41.3
Approach		83	0.0	0.068	8.6	LOS A	0.3	2.0	0.41	0.66	42.2
All Vehicles		1512	1.8	0.306	7.1	LOS A	1.5	10.6	0.25	0.56	47.0

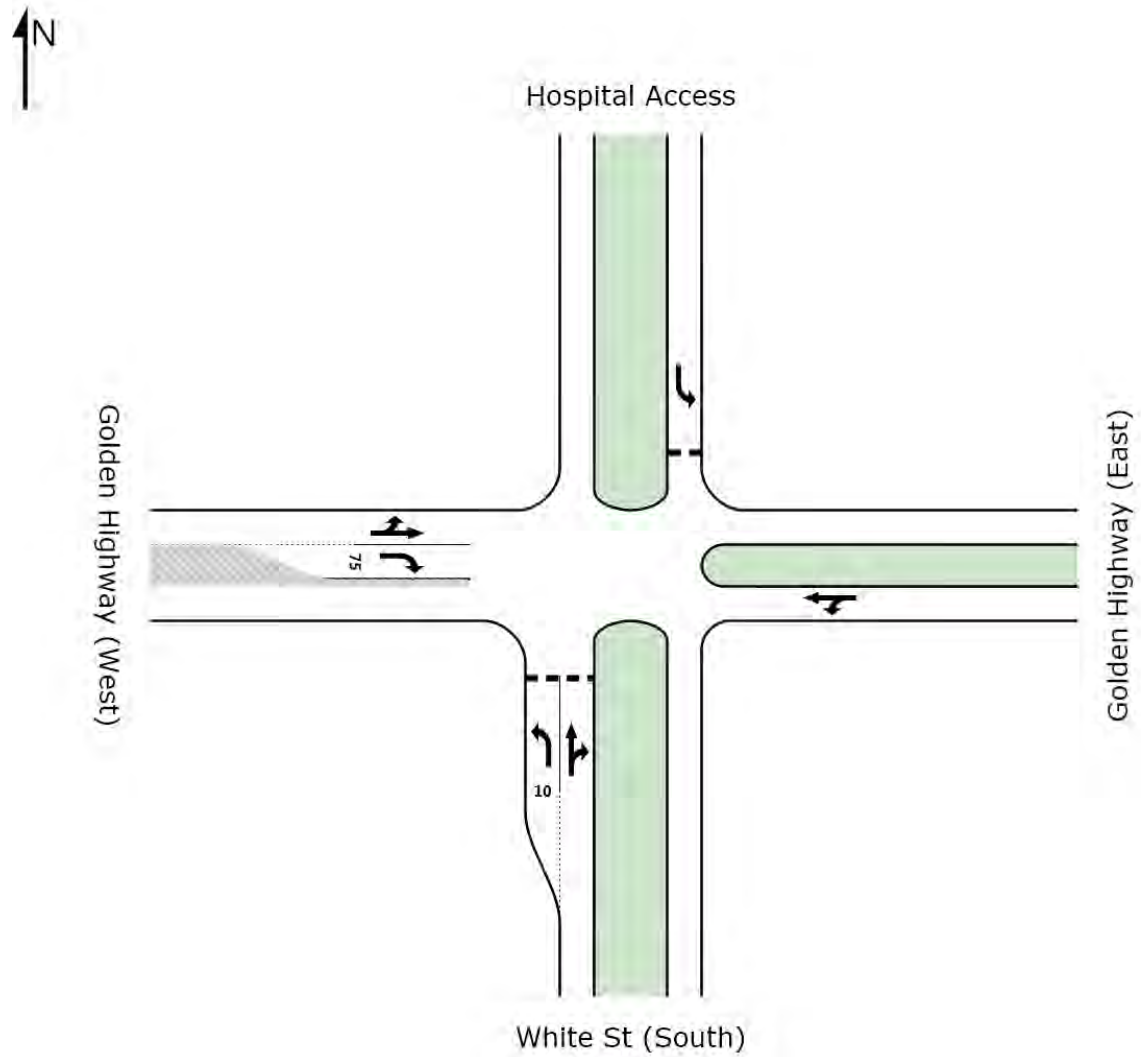
Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).

Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (RTA NSW).

Approach LOS values are based on the worst delay for any vehicle movement.

Roundabout Capacity Model: SIDRA Standard.

Golden Highway/White Street/Hospital Access



MOVEMENT SUMMARY

Site: White St/Golden Hwy -
AM Peak

Existing AM Peak
Golden Highway/White Street

Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%	v/c	sec	veh	m		per veh	km/h	
South: White St (South)											
1	L	98	13.0	0.700	52.8	LOS D	3.5	27.2	0.96	1.18	22.9
2	T	1	0.0	0.071	40.3	LOS C	0.3	1.8	0.93	0.96	25.1
3	R	6	0.0	0.073	42.4	LOS C	0.3	1.8	0.93	0.97	25.7
Approach		105	12.1	0.699	52.1	LOS D	3.5	27.2	0.96	1.16	23.1
East: Golden Highway (East)											
4	L	40	3.0	0.580	7.5	LOS A	0.0	0.0	0.00	1.16	48.6
5	T	1059	5.0	0.583	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		1099	4.9	0.583	0.3	LOS A	0.0	0.0	0.00	0.04	59.5
North: Hospital Access											
7	L	3	0.0	0.006	12.1	LOS A	0.0	0.2	0.59	0.72	39.9
Approach		3	0.0	0.006	12.1	LOS A	0.0	0.2	0.59	0.72	39.9
West: Golden Highway (West)											
10	L	84	0.0	0.370	7.4	LOS A	0.0	0.0	0.00	1.07	48.6
11	T	618	4.0	0.371	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	104	19.0	0.409	27.2	LOS B	2.0	16.5	0.90	1.03	33.5
Approach		806	5.5	0.410	4.3	LOS B	2.0	16.5	0.12	0.24	53.5
All Vehicles		2013	5.5	0.699	4.6	NA	3.5	27.2	0.10	0.18	52.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (RTA NSW).

Approach LOS values are based on the worst delay for any vehicle movement.

MOVEMENT SUMMARY

Site: White St/Golden Hwy -
PM Peak

Existing PM Peak
Golden Highway/White Street

Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: White St (South)											
1	L	101	2.0	0.301	15.6	LOS B	1.1	8.1	0.71	0.94	37.5
2	T	1	0.0	0.024	31.9	LOS C	0.1	0.6	0.90	0.95	28.0
3	R	2	0.0	0.024	34.0	LOS C	0.1	0.6	0.90	0.97	28.5
Approach		104	1.9	0.300	16.1	LOS C	1.1	8.1	0.72	0.94	37.2
East: Golden Highway (East)											
4	L	9	0.0	0.391	7.4	LOS A	0.0	0.0	0.00	1.18	48.6
5	T	746	3.0	0.395	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		755	3.0	0.395	0.1	LOS A	0.0	0.0	0.00	0.01	59.8
North: Hospital Access											
7	L	1	0.0	0.003	17.0	LOS B	0.0	0.1	0.76	0.78	36.6
Approach		1	0.0	0.003	17.0	LOS B	0.0	0.1	0.76	0.78	36.6
West: Golden Highway (West)											
10	L	44	0.0	0.484	7.4	LOS A	0.0	0.0	0.00	1.14	48.6
11	T	886	1.0	0.481	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	38	5.0	0.051	11.3	LOS A	0.2	1.8	0.61	0.80	44.6
Approach		968	1.1	0.481	0.8	LOS A	0.2	1.8	0.02	0.08	58.6
All Vehicles		1828	1.9	0.481	1.4	NA	1.1	8.1	0.05	0.10	57.2

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (RTA NSW).

Approach LOS values are based on the worst delay for any vehicle movement.

MOVEMENT SUMMARY

Site: White St/Golden Hwy -
SATMD Peak

Existing Saturday Midday Peak
Golden Highway/White Street
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: White St (South)											
1	L	63	3.0	0.193	14.8	LOS B	0.6	4.7	0.70	0.90	38.0
2	T	1	0.0	0.056	24.0	LOS B	0.2	1.5	0.86	0.93	31.3
3	R	9	0.0	0.056	26.0	LOS B	0.2	1.5	0.86	0.95	31.8
Approach		73	2.6	0.192	16.3	LOS B	0.6	4.7	0.72	0.90	37.0
East: Golden Highway (East)											
4	L	18	11.0	0.400	7.7	LOS A	0.0	0.0	0.00	1.19	48.6
5	T	756	1.0	0.401	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		774	1.2	0.401	0.2	LOS A	0.0	0.0	0.00	0.03	59.7
North: Hospital Access											
7	L	1	0.0	0.002	12.3	LOS A	0.0	0.1	0.60	0.68	39.7
Approach		1	0.0	0.002	12.3	LOS A	0.0	0.1	0.60	0.68	39.7
West: Golden Highway (West)											
10	L	14	0.0	0.359	7.4	LOS A	0.0	0.0	0.00	1.17	48.6
11	T	675	1.0	0.356	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	36	0.0	0.049	11.4	LOS A	0.2	1.7	0.61	0.80	44.5
Approach		725	0.9	0.356	0.7	LOS A	0.2	1.7	0.03	0.06	58.8
All Vehicles		1573	1.2	0.401	1.2	NA	0.6	4.7	0.05	0.08	57.6

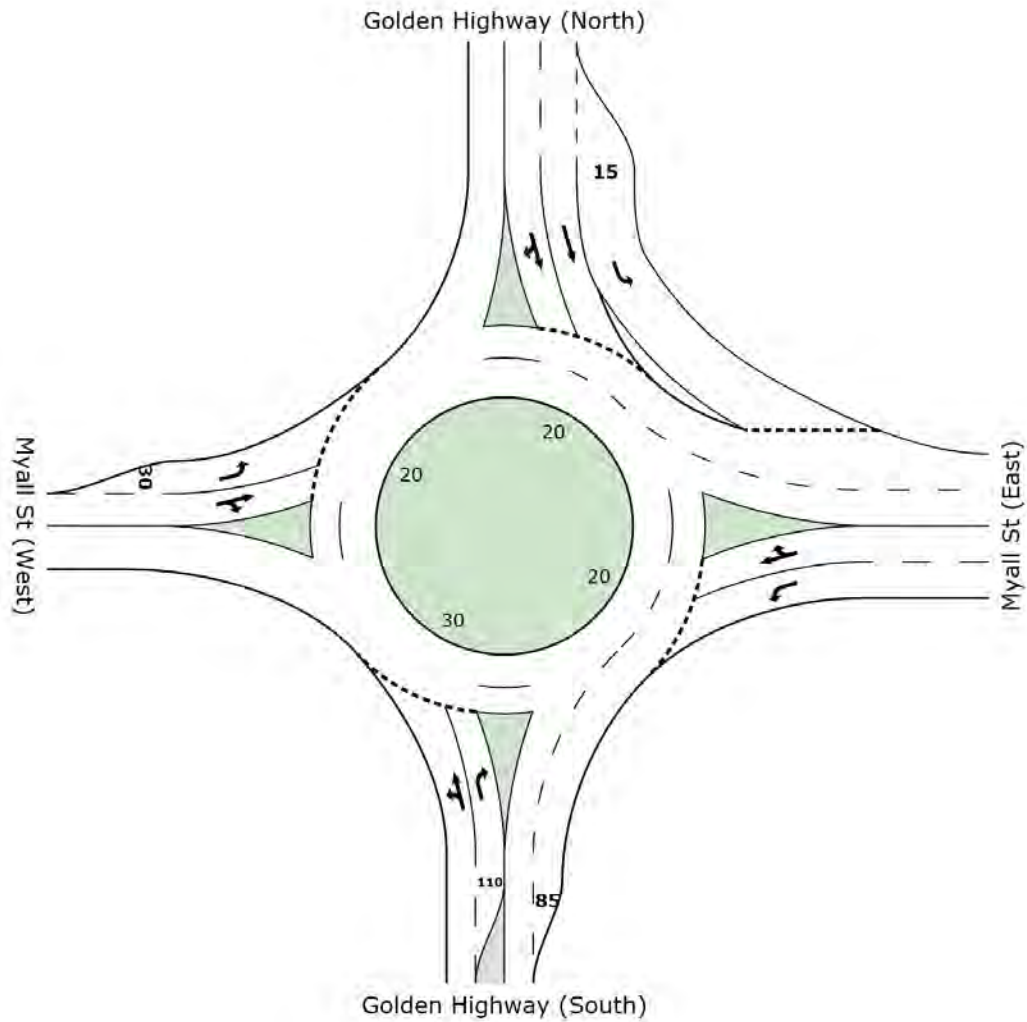
LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (RTA NSW).

Approach LOS values are based on the worst delay for any vehicle movement.

SIDRA SUMMARIES – 2013 NO DEVELOPMENT

Golden Highway/Myall Street



MOVEMENT SUMMARY

Site: Myall St/Golden Hwy -
AM Peak

2013 AM Peak ND
Myall Street/Golden Highway
Roundabout
Design Life Analysis (Practical Capacity): Results for 2 years

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%	v/c	sec	veh	m		per veh	km/h	
South: Golden Highway (South)											
1	L	66	2.0	0.229	5.6	LOS A	1.1	8.5	0.33	0.52	49.7
2	T	202	10.0	0.229	5.8	LOS A	1.1	8.5	0.33	0.48	50.4
3	R	344	8.1	0.256	10.7	LOS A	1.3	10.0	0.33	0.65	44.8
Approach		612	8.1	0.256	8.5	LOS A	1.3	10.0	0.33	0.58	47.0
East: Myall St (East)											
4	L	522	6.0	0.462	7.4	LOS A	2.2	16.2	0.52	0.70	42.9
5	T	121	2.0	0.189	5.0	LOS A	0.6	4.5	0.46	0.54	43.9
6	R	13	15.2	0.189	12.7	LOS A	0.6	4.5	0.46	0.98	41.0
Approach		656	5.4	0.462	7.1	LOS A	2.2	16.2	0.51	0.67	43.1
North: Golden Highway (North)											
7	L	7	0.0	0.007	6.3	LOS A	0.0	0.1	0.30	0.51	48.8
8	T	520	4.0	0.259	6.4	LOS A	1.1	8.2	0.38	0.55	49.6
9	R	33	0.0	0.259	10.9	LOS A	1.1	8.2	0.38	0.84	45.8
Approach		559	3.7	0.259	6.7	LOS A	1.1	8.2	0.38	0.57	49.3
West: Myall St (West)											
10	L	10	0.0	0.015	7.7	LOS A	0.0	0.3	0.46	0.62	43.3
11	T	33	0.0	0.052	4.5	LOS A	0.2	1.3	0.42	0.48	43.4
12	R	24	0.0	0.052	11.3	LOS A	0.2	1.3	0.42	0.80	41.4
Approach		67	0.0	0.052	7.5	LOS A	0.2	1.3	0.42	0.61	42.6
All Vehicles		1895	5.6	0.462	7.4	LOS A	2.2	16.2	0.41	0.61	46.0

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Myall St/Golden Hwy -
PM Peak

2013 PM Peak ND
Myall Street/Golden Highway
Roundabout
Design Life Analysis (Practical Capacity): Results for 2 years

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%	v/c	sec	veh	m		per veh	km/h	
South: Golden Highway (South)											
1	L	28	0.0	0.311	5.0	LOS A	1.7	12.1	0.22	0.48	50.5
2	T	451	3.0	0.311	5.2	LOS A	1.7	12.1	0.22	0.43	51.3
3	R	436	1.9	0.326	10.3	LOS A	1.7	12.1	0.23	0.63	45.2
Approach		915	2.4	0.326	7.6	LOS A	1.7	12.1	0.22	0.53	48.1
East: Myall St (East)											
4	L	374	2.0	0.308	6.5	LOS A	1.2	8.9	0.39	0.61	43.5
5	T	51	2.0	0.083	4.3	LOS A	0.3	1.8	0.37	0.46	44.3
6	R	11	9.1	0.083	11.9	LOS A	0.3	1.8	0.37	0.89	41.4
Approach		436	2.2	0.308	6.4	LOS A	1.2	8.9	0.39	0.60	43.5
North: Golden Highway (North)											
7	L	15	13.0	0.018	7.1	LOS A	0.0	0.4	0.38	0.54	48.3
8	T	305	3.0	0.164	7.0	LOS A	0.8	5.5	0.46	0.61	49.0
9	R	14	7.4	0.164	11.8	LOS A	0.8	5.5	0.47	0.84	45.4
Approach		335	3.6	0.164	7.2	LOS A	0.8	5.5	0.46	0.61	48.8
West: Myall St (West)											
10	L	26	0.0	0.043	8.5	LOS A	0.1	0.9	0.51	0.72	42.7
11	T	102	0.0	0.160	5.1	LOS A	0.6	4.1	0.50	0.54	43.0
12	R	63	0.0	0.160	11.8	LOS A	0.6	4.1	0.50	0.89	41.2
Approach		191	0.0	0.160	7.8	LOS A	0.6	4.1	0.50	0.68	42.3
All Vehicles		1877	2.3	0.326	7.3	LOS A	1.7	12.1	0.33	0.58	46.5

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

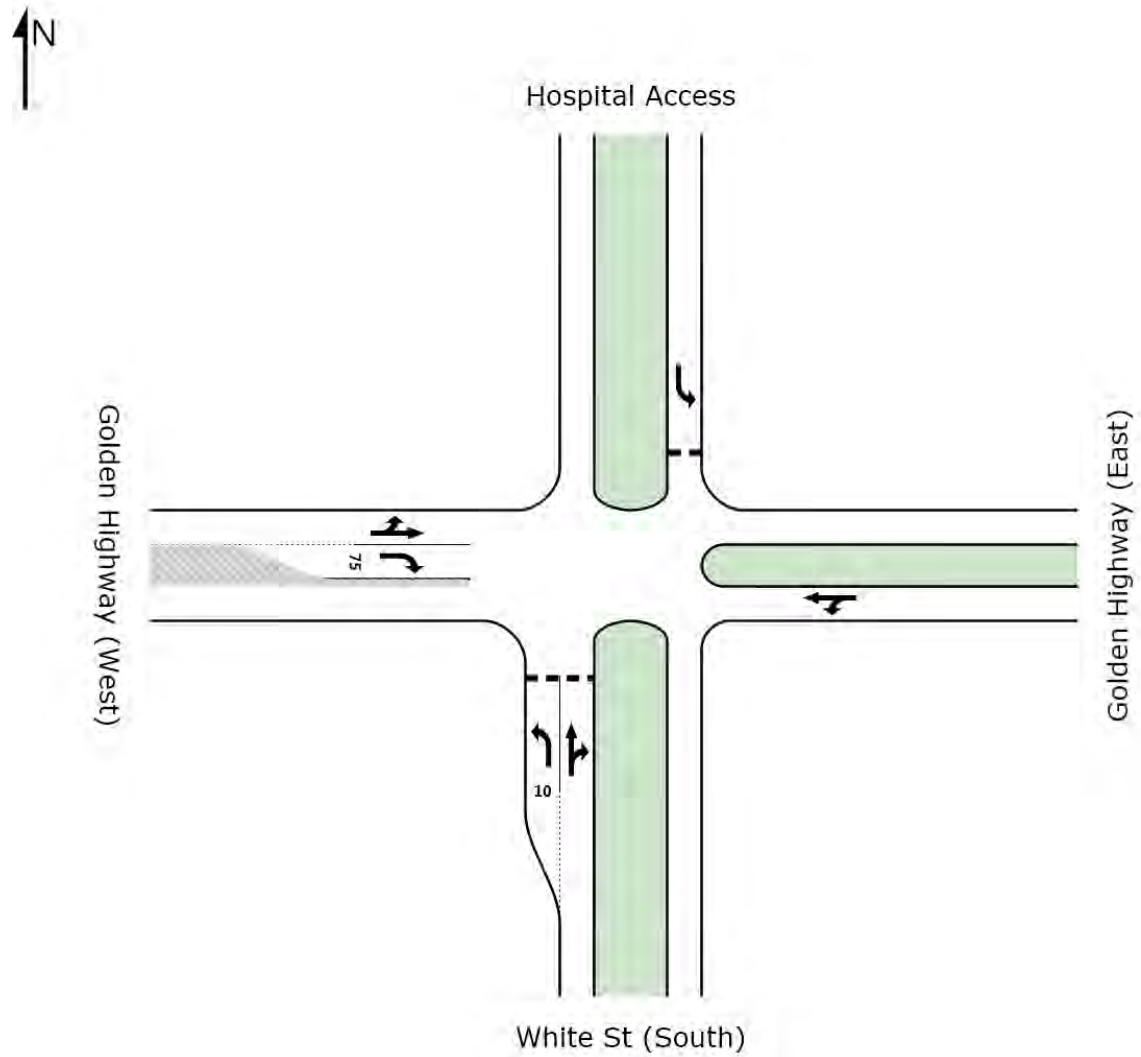
Site: Myall St/Golden Hwy -
SATMD Peak

2013 Saturday Middy Peak ND
Myall Street/Golden Highway
Roundabout
Design Life Analysis (Practical Capacity): Results for 2 years

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV Deg.	Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Golden Highway (South)											
1	L	29	0.0	0.231	4.9	LOS A	1.1	7.9	0.12	0.47	51.1
2	T	308	2.0	0.231	5.0	LOS A	1.1	7.9	0.12	0.42	52.0
3	R	366	1.0	0.240	10.0	LOS A	1.1	7.5	0.11	0.64	45.7
Approach		704	1.4	0.240	7.6	LOS A	1.1	7.9	0.11	0.53	48.5
East: Myall St (East)											
4	L	383	3.0	0.312	6.5	LOS A	1.2	8.8	0.38	0.61	43.6
5	T	15	0.0	0.024	4.1	LOS A	0.1	0.5	0.34	0.44	44.5
6	R	3	0.0	0.024	12.0	LOS A	0.1	0.5	0.34	0.91	40.6
Approach		402	2.9	0.312	6.5	LOS A	1.2	8.8	0.38	0.60	43.6
North: Golden Highway (North)											
7	L	10	0.0	0.010	6.3	LOS A	0.0	0.2	0.28	0.52	48.9
8	T	326	2.0	0.157	6.4	LOS A	0.6	4.3	0.35	0.55	49.8
9	R	11	0.0	0.157	11.1	LOS A	0.6	4.3	0.35	0.85	45.8
Approach		348	1.9	0.157	6.5	LOS A	0.6	4.3	0.34	0.56	49.6
West: Myall St (West)											
10	L	7	0.0	0.011	7.9	LOS A	0.0	0.2	0.45	0.62	43.2
11	T	32	0.0	0.069	4.7	LOS A	0.2	1.6	0.41	0.48	43.4
12	R	46	0.0	0.069	11.4	LOS A	0.2	1.6	0.41	0.79	41.3
Approach		84	0.0	0.069	8.6	LOS A	0.2	1.6	0.41	0.66	42.1
All Vehicles		1538	1.8	0.312	7.1	LOS A	1.2	8.8	0.25	0.57	47.0

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Golden Highway/White Street/Hospital Access



MOVEMENT SUMMARY

Site: White St/Golden Hwy -
AM Peak

2013 AM Peak ND
Golden Highway/White Street

Giveway / Yield (Two-Way)
Design Life Analysis (Practical Capacity): Results for 2 years

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: White St (South)											
1	L	100	13.0	0.758	60.4	LOS E	3.2	24.9	0.97	1.21	21.2
2	T	1	0.0	0.079	42.4	LOS C	0.2	1.5	0.93	0.96	24.5
3	R	6	0.0	0.079	44.5	LOS D	0.2	1.5	0.93	0.98	25.0
Approach		107	12.1	0.758	59.4	LOS E	3.2	24.9	0.97	1.20	21.4
East: Golden Highway (East)											
4	L	41	3.0	0.593	7.5	LOS A	0.0	0.0	0.00	1.16	48.6
5	T	1077	5.0	0.593	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		1118	4.9	0.593	0.3	NA	0.0	0.0	0.00	0.04	59.5
North: Hospital Access											
7	L	3	0.0	0.006	12.2	LOS A	0.0	0.1	0.60	0.73	39.8
Approach		3	0.0	0.006	12.2	LOS A	0.0	0.1	0.60	0.73	39.8
West: Golden Highway (West)											
10	L	85	0.0	0.377	7.4	LOS A	0.0	0.0	0.00	1.07	48.6
11	T	629	4.0	0.377	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	106	19.0	0.441	29.0	LOS C	1.8	14.4	0.91	1.04	32.5
Approach		820	5.5	0.441	4.5	NA	1.8	14.4	0.12	0.25	53.2
All Vehicles		2047	5.5	0.758	5.1	NA	3.2	24.9	0.10	0.19	52.2

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

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: White St/Golden Hwy -
PM Peak

2013 PM Peak ND
Golden Highway/White Street

Giveway / Yield (Two-Way)
Design Life Analysis (Practical Capacity): Results for 2 years

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: White St (South)											
1	L	103	2.0	0.310	16.0	LOS B	1.0	6.8	0.72	0.94	37.3
2	T	1	0.0	0.026	33.4	LOS C	0.1	0.5	0.90	0.95	27.5
3	R	2	0.0	0.026	35.5	LOS C	0.1	0.5	0.90	0.97	28.0
Approach		106	1.9	0.310	16.5	LOS B	1.0	6.8	0.73	0.94	36.9
East: Golden Highway (East)											
4	L	9	0.0	0.402	7.4	LOS A	0.0	0.0	0.00	1.18	48.6
5	T	759	3.0	0.402	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		768	3.0	0.402	0.1	NA	0.0	0.0	0.00	0.01	59.8
North: Hospital Access											
7	L	1	0.0	0.004	17.5	LOS B	0.0	0.1	0.76	0.79	36.3
Approach		1	0.0	0.004	17.5	LOS B	0.0	0.1	0.76	0.79	36.3
West: Golden Highway (West)											
10	L	45	0.0	0.489	7.4	LOS A	0.0	0.0	0.00	1.14	48.6
11	T	901	1.0	0.489	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	39	5.0	0.053	11.5	LOS A	0.2	1.5	0.61	0.81	44.5
Approach		985	1.1	0.489	0.8	NA	0.2	1.5	0.02	0.08	58.6
All Vehicles		1859	1.9	0.489	1.4	NA	1.0	6.8	0.05	0.10	57.2

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

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: White St/Golden Hwy -
SATMD Peak

2013 Saturday Middy Peak ND
Golden Highway/White Street
Giveaway / Yield (Two-Way)
Design Life Analysis (Practical Capacity): Results for 2 years

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%	v/c	sec	veh	m		per veh	km/h	
South: White St (South)											
1	L	64	3.0	0.199	15.2	LOS B	0.5	3.9	0.71	0.90	37.8
2	T	1	0.0	0.060	24.8	LOS B	0.2	1.2	0.87	0.93	30.9
3	R	9	0.0	0.060	26.9	LOS B	0.2	1.2	0.87	0.95	31.4
Approach		74	2.6	0.199	16.7	LOS B	0.5	3.9	0.73	0.91	36.8
East: Golden Highway (East)											
4	L	18	11.0	0.408	7.7	LOS A	0.0	0.0	0.00	1.19	48.6
5	T	769	1.0	0.408	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		787	1.2	0.408	0.2	NA	0.0	0.0	0.00	0.03	59.7
North: Hospital Access											
7	L	1	0.0	0.002	12.5	LOS A	0.0	0.0	0.61	0.68	39.6
Approach		1	0.0	0.002	12.5	LOS A	0.0	0.0	0.61	0.68	39.6
West: Golden Highway (West)											
10	L	14	0.0	0.362	7.4	LOS A	0.0	0.0	0.00	1.17	48.6
11	T	687	1.0	0.362	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	37	0.0	0.051	11.5	LOS A	0.2	1.4	0.62	0.81	44.4
Approach		737	0.9	0.362	0.7	NA	0.2	1.4	0.03	0.06	58.8
All Vehicles		1600	1.2	0.408	1.2	NA	0.5	3.9	0.05	0.09	57.6

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

Vehicle movement LOS values are based on average delay per movement

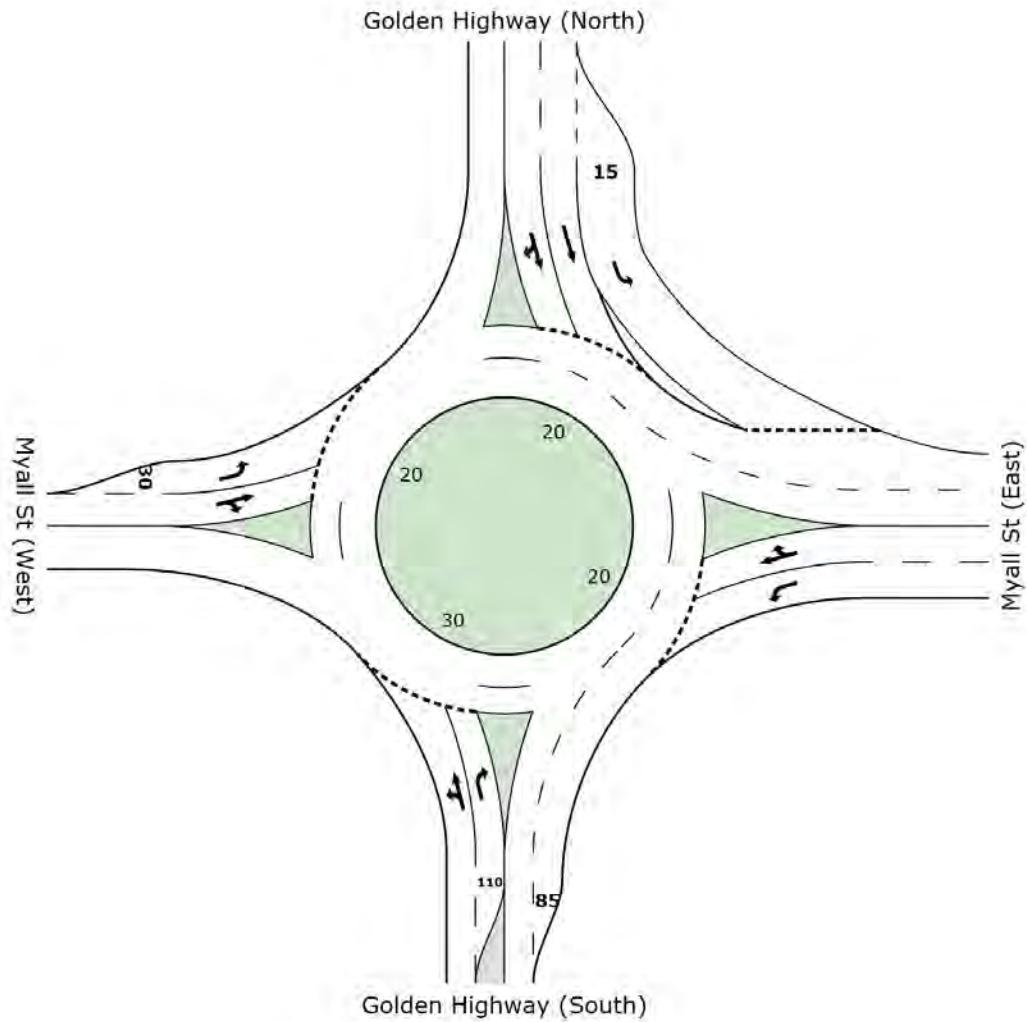
Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model used.

SIDRA SUMMARIES – 2013 WITH DEVELOPMENT

Golden Highway/Myall Street



MOVEMENT SUMMARY

Site: Myall St/Golden Hwy -
AM Peak

2013 AM Peak WD
Myall Street/Golden Highway
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Golden Highway (South)											
1	L	72	2.0	0.235	5.6	LOS A	1.2	8.7	0.35	0.52	49.6
2	T	202	10.0	0.235	5.8	LOS A	1.2	8.7	0.35	0.49	50.2
3	R	338	8.0	0.255	10.7	LOS A	1.3	9.9	0.34	0.65	44.7
Approach		612	8.0	0.255	8.5	LOS A	1.3	9.9	0.34	0.58	46.9
East: Myall St (East)											
4	L	522	6.0	0.462	7.4	LOS A	2.2	16.2	0.52	0.69	42.9
5	T	132	2.0	0.197	4.9	LOS A	0.7	4.7	0.46	0.53	43.9
6	R	13	15.2	0.197	12.6	LOS A	0.7	4.7	0.46	0.98	41.1
Approach		667	5.4	0.462	7.0	LOS A	2.2	16.2	0.51	0.67	43.1
North: Golden Highway (North)											
7	L	7	0.0	0.007	6.3	LOS A	0.0	0.1	0.30	0.51	48.8
8	T	520	4.0	0.261	6.4	LOS A	1.1	8.3	0.38	0.55	49.6
9	R	36	0.0	0.261	10.9	LOS A	1.1	8.3	0.38	0.84	45.8
Approach		563	3.7	0.261	6.7	LOS A	1.1	8.3	0.38	0.57	49.3
West: Myall St (West)											
10	L	11	0.0	0.017	7.7	LOS A	0.1	0.4	0.45	0.63	43.3
11	T	35	0.0	0.055	4.5	LOS A	0.2	1.4	0.42	0.47	43.4
12	R	26	0.0	0.055	11.3	LOS A	0.2	1.4	0.42	0.80	41.4
Approach		72	0.0	0.055	7.5	LOS A	0.2	1.4	0.42	0.61	42.6
All Vehicles		1914	5.5	0.462	7.4	LOS A	2.2	16.2	0.41	0.61	46.0

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

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Myall St/Golden Hwy -
PM Peak

2013 PM Peak WD
Myall Street/Golden Highway
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Golden Highway (South)											
1	L	30	0.0	0.314	5.1	LOS A	1.7	12.3	0.22	0.48	50.4
2	T	451	3.0	0.314	5.2	LOS A	1.7	12.3	0.22	0.44	51.2
3	R	436	1.9	0.327	10.4	LOS A	1.7	12.2	0.24	0.63	45.1
Approach		917	2.4	0.327	7.6	LOS A	1.7	12.3	0.23	0.53	48.1
East: Myall St (East)											
4	L	374	2.0	0.309	6.6	LOS A	1.3	8.9	0.40	0.61	43.5
5	T	55	2.0	0.088	4.4	LOS A	0.3	2.0	0.38	0.47	44.3
6	R	11	9.1	0.088	11.9	LOS A	0.3	2.0	0.38	0.89	41.4
Approach		440	2.2	0.309	6.4	LOS A	1.3	8.9	0.39	0.60	43.5
North: Golden Highway (North)											
7	L	15	13.0	0.018	7.1	LOS A	0.0	0.4	0.39	0.55	48.3
8	T	305	3.0	0.165	7.1	LOS A	0.8	5.7	0.47	0.61	48.9
9	R	15	7.5	0.165	11.8	LOS A	0.8	5.7	0.48	0.84	45.4
Approach		335	3.6	0.165	7.3	LOS A	0.8	5.7	0.47	0.62	48.7
West: Myall St (West)											
10	L	28	0.0	0.045	8.5	LOS A	0.1	1.0	0.51	0.72	42.7
11	T	111	0.0	0.174	5.1	LOS A	0.6	4.5	0.50	0.54	42.9
12	R	68	0.0	0.174	11.9	LOS A	0.6	4.5	0.50	0.89	41.2
Approach		207	0.0	0.174	7.8	LOS A	0.6	4.5	0.50	0.68	42.3
All Vehicles		1899	2.3	0.327	7.3	LOS A	1.7	12.3	0.34	0.58	46.4

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

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Myall St/Golden Hwy -
SATMD Peak

2013 Saturday Middy Peak WD
Myall Street/Golden Highway
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Golden Highway (South)											
1	L	32	0.0	0.233	4.9	LOS A	1.1	7.9	0.12	0.47	51.0
2	T	308	2.0	0.233	5.0	LOS A	1.1	7.9	0.12	0.42	52.0
3	R	366	1.0	0.240	10.0	LOS A	1.1	7.6	0.11	0.64	45.7
Approach		706	1.4	0.240	7.6	LOS A	1.1	7.9	0.12	0.53	48.5
East: Myall St (East)											
4	L	383	3.0	0.312	6.6	LOS A	1.2	8.8	0.38	0.61	43.5
5	T	16	0.0	0.025	4.2	LOS A	0.1	0.5	0.35	0.44	44.5
6	R	3	0.0	0.025	12.0	LOS A	0.1	0.5	0.35	0.91	40.6
Approach		402	2.9	0.312	6.5	LOS A	1.2	8.8	0.38	0.61	43.6
North: Golden Highway (North)											
7	L	10	0.0	0.010	6.3	LOS A	0.0	0.2	0.29	0.52	48.9
8	T	326	2.0	0.158	6.4	LOS A	0.6	4.4	0.35	0.55	49.8
9	R	12	0.0	0.158	11.1	LOS A	0.6	4.4	0.35	0.85	45.8
Approach		348	1.9	0.158	6.6	LOS A	0.6	4.4	0.35	0.56	49.6
West: Myall St (West)											
10	L	8	0.0	0.012	7.9	LOS A	0.0	0.3	0.45	0.63	43.2
11	T	35	0.0	0.076	4.7	LOS A	0.3	1.8	0.41	0.48	43.3
12	R	50	0.0	0.076	11.4	LOS A	0.3	1.8	0.41	0.80	41.3
Approach		93	0.0	0.076	8.6	LOS A	0.3	1.8	0.41	0.67	42.1
All Vehicles		1549	1.8	0.312	7.1	LOS A	1.2	8.8	0.26	0.57	46.9

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

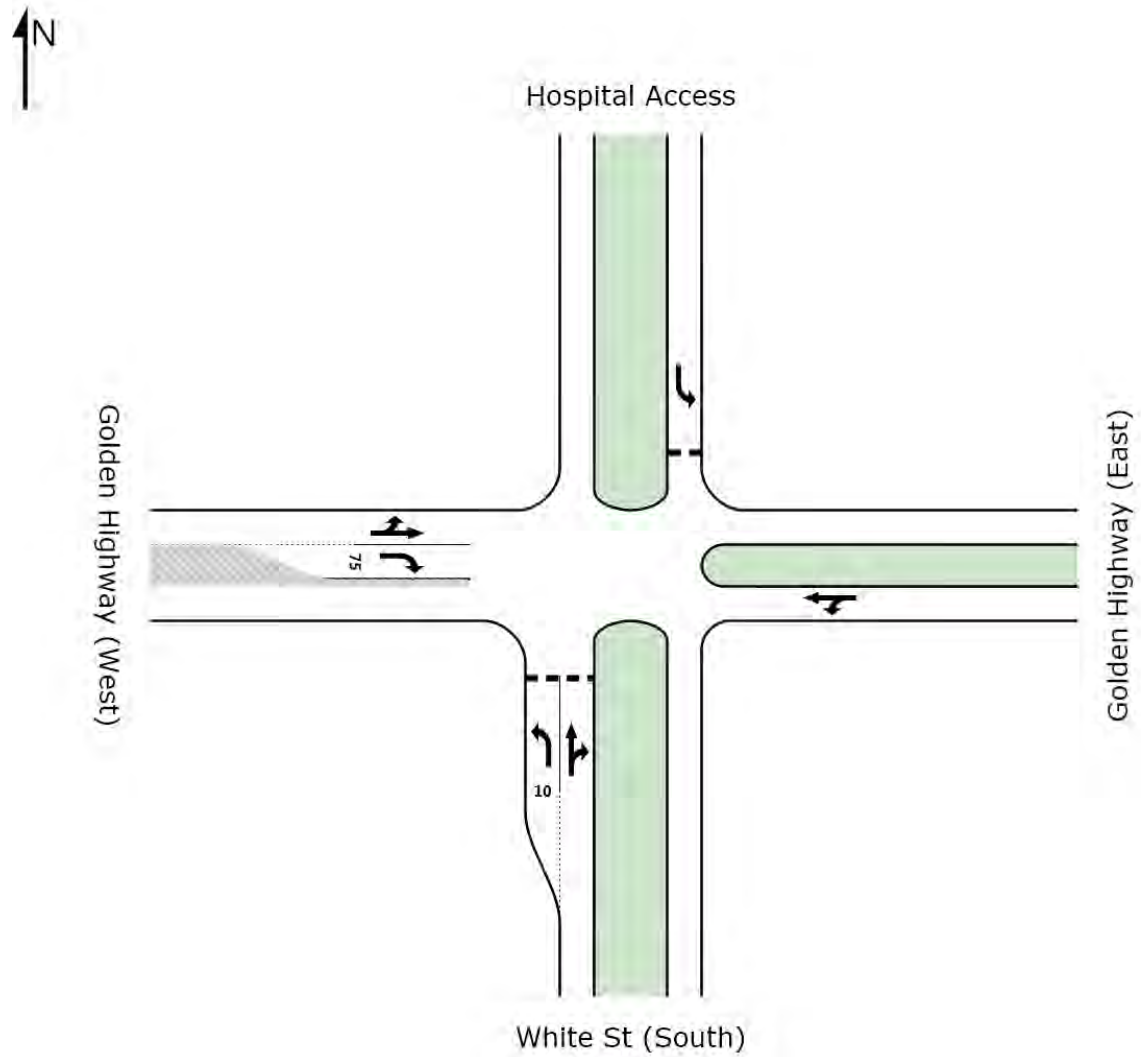
Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model used.

Golden Highway/White Street/Hospital Access



MOVEMENT SUMMARY

Site: White St/Golden Hwy -
AM Peak

2013 AM Peak WD
Golden Highway/White Street

Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%	v/c	sec	veh	m		per veh	km/h	
South: White St (South)											
1	L	100	13.0	0.761	62.5	LOS E	3.3	25.5	0.97	1.23	20.8
2	T	1	0.0	0.078	42.6	LOS D	0.2	1.5	0.93	0.96	24.4
3	R	6	0.0	0.078	44.6	LOS D	0.2	1.5	0.93	0.98	25.0
Approach		107	12.1	0.761	61.3	LOS E	3.3	25.5	0.97	1.22	21.0
East: Golden Highway (East)											
4	L	41	3.0	0.593	7.5	LOS A	0.0	0.0	0.00	1.16	48.6
5	T	1077	5.0	0.593	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		1118	4.9	0.593	0.3	NA	0.0	0.0	0.00	0.04	59.5
North: Hospital Access											
7	L	3	0.0	0.006	12.3	LOS A	0.0	0.1	0.60	0.73	39.7
Approach		3	0.0	0.006	12.3	LOS A	0.0	0.1	0.60	0.73	39.7
West: Golden Highway (West)											
10	L	93	0.0	0.381	7.4	LOS A	0.0	0.0	0.00	1.06	48.6
11	T	629	4.0	0.381	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	106	19.0	0.443	29.0	LOS C	1.8	14.4	0.91	1.05	32.5
Approach		828	5.5	0.443	4.6	NA	1.8	14.4	0.12	0.25	53.1
All Vehicles		2056	5.5	0.761	5.2	NA	3.3	25.5	0.10	0.19	52.0

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

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: White St/Golden Hwy -
PM Peak

2013 PM Peak WD
Golden Highway/White Street

Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: White St (South)											
1	L	103	2.0	0.311	16.0	LOS B	1.0	6.8	0.72	0.94	37.2
2	T	1	0.0	0.026	33.5	LOS C	0.1	0.5	0.90	0.95	27.4
3	R	2	0.0	0.026	35.6	LOS C	0.1	0.5	0.90	0.97	28.0
Approach		106	1.9	0.311	16.5	LOS B	1.0	6.8	0.73	0.94	36.9
East: Golden Highway (East)											
4	L	9	0.0	0.402	7.4	LOS A	0.0	0.0	0.00	1.18	48.6
5	T	759	3.0	0.402	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		768	3.0	0.402	0.1	NA	0.0	0.0	0.00	0.01	59.8
North: Hospital Access											
7	L	1	0.0	0.004	17.5	LOS B	0.0	0.1	0.77	0.79	36.3
Approach		1	0.0	0.004	17.5	LOS B	0.0	0.1	0.77	0.79	36.3
West: Golden Highway (West)											
10	L	49	0.0	0.491	7.4	LOS A	0.0	0.0	0.00	1.13	48.6
11	T	901	1.0	0.491	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	39	5.0	0.053	11.5	LOS A	0.2	1.5	0.61	0.81	44.5
Approach		989	1.1	0.491	0.8	NA	0.2	1.5	0.02	0.09	58.6
All Vehicles		1864	1.9	0.491	1.4	NA	1.0	6.8	0.05	0.11	57.2

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

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: White St/Golden Hwy -
SATMD Peak

2013 Saturday Middy Peak WD
Golden Highway/White Street
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: White St (South)											
1	L	64	3.0	0.199	15.1	LOS B	0.5	3.9	0.71	0.90	37.8
2	T	1	0.0	0.059	24.9	LOS B	0.2	1.2	0.87	0.93	30.9
3	R	9	0.0	0.059	26.9	LOS B	0.2	1.2	0.87	0.95	31.4
Approach		74	2.6	0.199	16.7	LOS B	0.5	3.9	0.73	0.91	36.8
East: Golden Highway (East)											
4	L	18	11.0	0.407	7.7	LOS A	0.0	0.0	0.00	1.19	48.6
5	T	769	1.0	0.407	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		787	1.2	0.407	0.2	NA	0.0	0.0	0.00	0.03	59.7
North: Hospital Access											
7	L	1	0.0	0.002	12.5	LOS A	0.0	0.0	0.61	0.68	39.6
Approach		1	0.0	0.002	12.5	LOS A	0.0	0.0	0.61	0.68	39.6
West: Golden Highway (West)											
10	L	15	0.0	0.363	7.4	LOS A	0.0	0.0	0.00	1.17	48.6
11	T	687	1.0	0.363	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	37	0.0	0.052	11.5	LOS A	0.2	1.4	0.62	0.81	44.4
Approach		739	0.9	0.363	0.7	NA	0.2	1.4	0.03	0.06	58.7
All Vehicles		1601	1.2	0.407	1.2	NA	0.5	3.9	0.05	0.09	57.6

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

Vehicle movement LOS values are based on average delay per movement

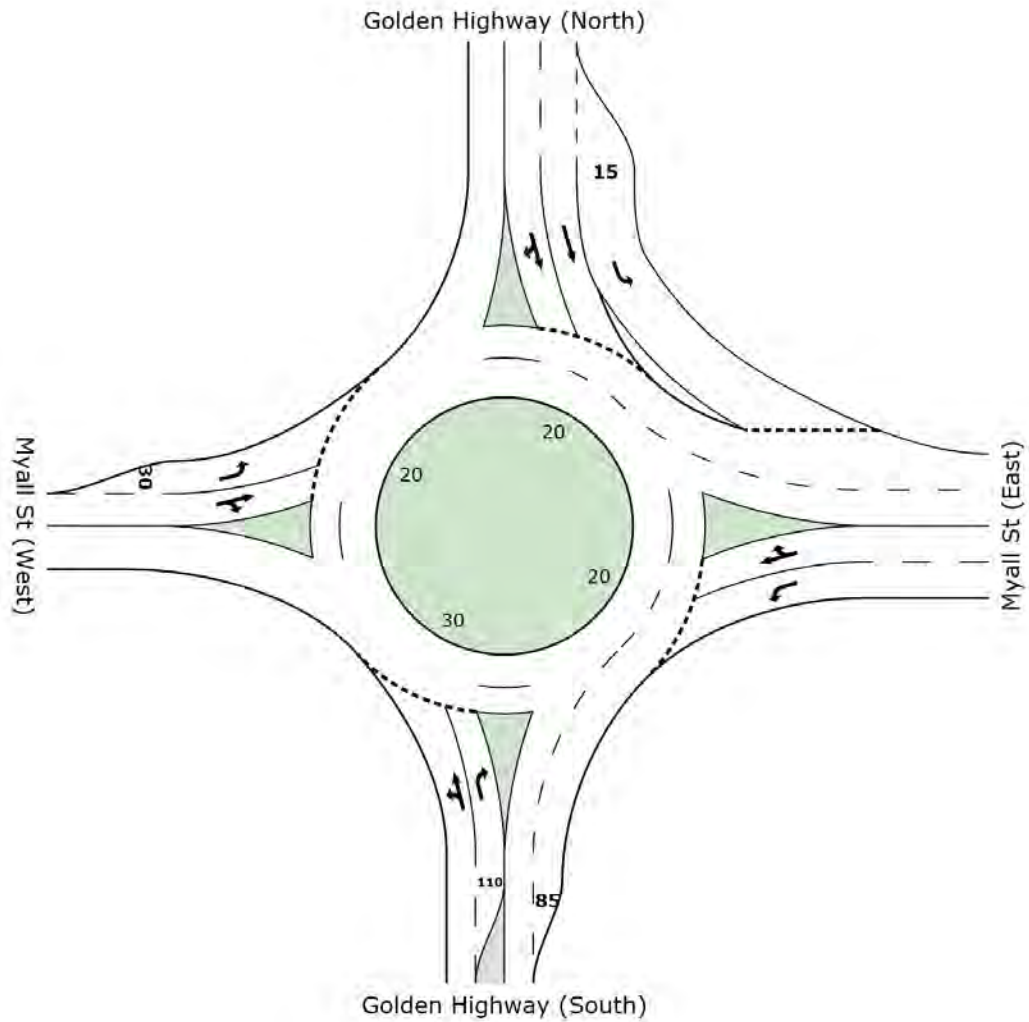
Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model used.

SIDRA SUMMARIES – 2023 NO DEVELOPMENT

Golden Highway/Myall Street



MOVEMENT SUMMARY

Site: Myall St/Golden Hwy -
AM Peak

2023 AM Peak ND
Myall Street/Golden Highway
Roundabout
Design Life Analysis (Practical Capacity): Results for 12 years

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%	v/c	sec	veh	m		per veh	km/h	
South: Golden Highway (South)											
1	L	72	2.0	0.251	5.6	LOS A	1.3	9.5	0.35	0.53	49.5
2	T	219	10.0	0.251	5.9	LOS A	1.3	9.5	0.35	0.49	50.2
3	R	373	8.1	0.280	10.8	LOS A	1.5	11.2	0.35	0.65	44.7
Approach		664	8.1	0.280	8.6	LOS A	1.5	11.2	0.35	0.59	46.8
East: Myall St (East)											
4	L	566	6.0	0.512	7.8	LOS A	2.7	20.0	0.57	0.75	42.7
5	T	131	2.0	0.210	5.2	LOS A	0.7	5.1	0.48	0.56	43.7
6	R	14	15.2	0.210	12.9	LOS A	0.7	5.1	0.48	0.98	40.9
Approach		711	5.4	0.512	7.4	LOS A	2.7	20.0	0.55	0.72	42.9
North: Golden Highway (North)											
7	L	8	0.0	0.008	6.3	LOS A	0.0	0.1	0.32	0.51	48.7
8	T	563	4.0	0.286	6.6	LOS A	1.3	9.7	0.41	0.57	49.3
9	R	35	0.0	0.286	11.0	LOS A	1.3	9.7	0.42	0.84	45.8
Approach		606	3.7	0.286	6.8	LOS A	1.3	9.7	0.41	0.58	49.1
West: Myall St (West)											
10	L	11	0.0	0.017	7.9	LOS A	0.1	0.4	0.47	0.64	43.2
11	T	35	0.0	0.057	4.6	LOS A	0.2	1.5	0.44	0.49	43.3
12	R	26	0.0	0.057	11.4	LOS A	0.2	1.5	0.44	0.80	41.4
Approach		73	0.0	0.057	7.6	LOS A	0.2	1.5	0.44	0.62	42.5
All Vehicles		2054	5.6	0.512	7.6	LOS A	2.7	20.0	0.44	0.63	45.8

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Myall St/Golden Hwy -
PM Peak

2023 PM Peak ND
Myall Street/Golden Highway
Roundabout
Design Life Analysis (Practical Capacity): Results for 12 years

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV Deg.	Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Golden Highway (South)											
1	L	31	0.0	0.339	5.1	LOS A	1.9	13.6	0.23	0.48	50.4
2	T	488	3.0	0.339	5.2	LOS A	1.9	13.6	0.23	0.44	51.2
3	R	473	1.9	0.354	10.4	LOS A	1.9	13.7	0.25	0.63	45.1
Approach		992	2.4	0.354	7.7	LOS A	1.9	13.7	0.24	0.53	48.0
East: Myall St (East)											
4	L	406	2.0	0.339	6.6	LOS A	1.4	10.2	0.42	0.62	43.4
5	T	55	2.0	0.091	4.4	LOS A	0.3	2.0	0.39	0.48	44.2
6	R	12	9.1	0.091	12.0	LOS A	0.3	2.0	0.39	0.89	41.4
Approach		473	2.2	0.339	6.5	LOS A	1.4	10.2	0.42	0.61	43.4
North: Golden Highway (North)											
7	L	17	13.0	0.020	7.2	LOS A	0.1	0.4	0.42	0.55	48.1
8	T	331	3.0	0.183	7.3	LOS A	0.9	6.6	0.51	0.63	48.7
9	R	15	7.4	0.183	12.0	LOS A	0.9	6.6	0.51	0.85	45.3
Approach		363	3.6	0.183	7.5	LOS A	0.9	6.6	0.50	0.63	48.5
West: Myall St (West)											
10	L	29	0.0	0.047	8.6	LOS A	0.1	1.0	0.53	0.74	42.6
11	T	110	0.0	0.177	5.3	LOS A	0.7	4.6	0.52	0.55	42.8
12	R	68	0.0	0.177	12.0	LOS A	0.7	4.6	0.52	0.90	41.2
Approach		207	0.0	0.177	7.9	LOS A	0.7	4.6	0.52	0.69	42.2
All Vehicles		2035	2.3	0.354	7.4	LOS A	1.9	13.7	0.36	0.58	46.3

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

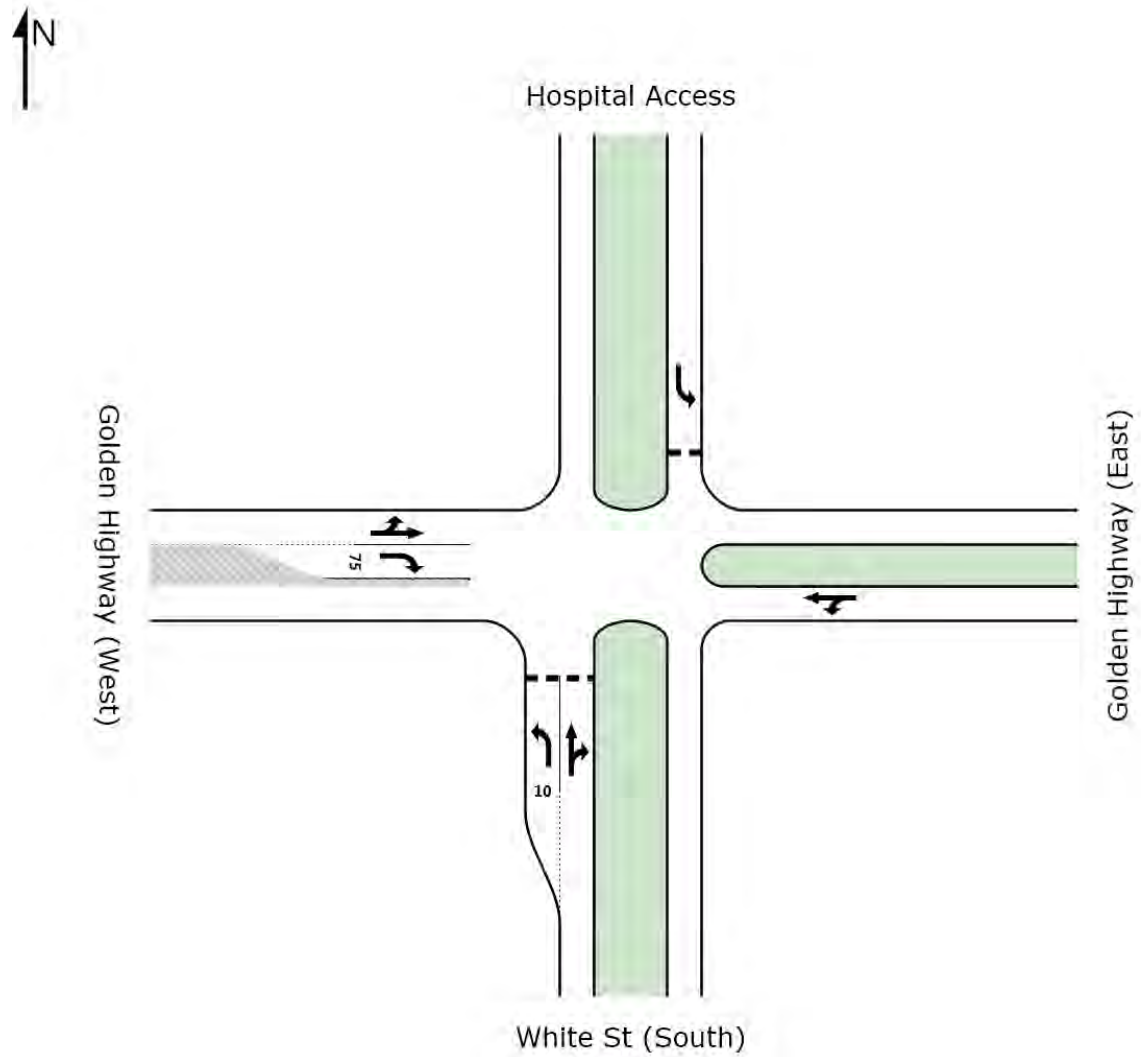
Site: Myall St/Golden Hwy -
SATMD Peak

2023 Saturday Middy Peak ND
Myall Street/Golden Highway
Roundabout
Design Life Analysis (Practical Capacity): Results for 12 years

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV Deg.	Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Golden Highway (South)											
1	L	32	0.0	0.251	4.9	LOS A	1.2	8.8	0.13	0.47	51.0
2	T	334	2.0	0.251	5.0	LOS A	1.2	8.8	0.13	0.42	52.0
3	R	397	1.0	0.260	10.0	LOS A	1.2	8.4	0.12	0.64	45.7
Approach		763	1.4	0.260	7.6	LOS A	1.2	8.8	0.12	0.53	48.4
East: Myall St (East)											
4	L	416	3.0	0.343	6.6	LOS A	1.4	10.0	0.41	0.62	43.4
5	T	17	0.0	0.026	4.2	LOS A	0.1	0.5	0.36	0.45	44.4
6	R	3	0.0	0.026	12.1	LOS A	0.1	0.5	0.36	0.91	40.6
Approach		435	2.9	0.343	6.6	LOS A	1.4	10.0	0.41	0.61	43.4
North: Golden Highway (North)											
7	L	11	0.0	0.011	6.4	LOS A	0.0	0.2	0.31	0.52	48.8
8	T	354	2.0	0.174	6.5	LOS A	0.7	5.0	0.38	0.57	49.6
9	R	12	0.0	0.174	11.2	LOS A	0.7	5.0	0.38	0.85	45.7
Approach		377	1.9	0.174	6.7	LOS A	0.7	5.0	0.37	0.57	49.5
West: Myall St (West)											
10	L	8	0.0	0.012	8.0	LOS A	0.0	0.2	0.46	0.64	43.1
11	T	34	0.0	0.076	4.8	LOS A	0.3	1.8	0.43	0.49	43.2
12	R	50	0.0	0.076	11.5	LOS A	0.3	1.8	0.43	0.80	41.2
Approach		91	0.0	0.076	8.7	LOS A	0.3	1.8	0.43	0.67	42.1
All Vehicles		1667	1.8	0.343	7.2	LOS A	1.4	10.0	0.27	0.57	46.9

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Golden Highway/White Street/Hospital Access



MOVEMENT SUMMARY

Site: White St/Golden Hwy -
AM Peak

2023 AM Peak ND
Golden Highway/White Street

Giveway / Yield (Two-Way)
Design Life Analysis (Practical Capacity): Results for 3 years

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: White St (South)											
1	L	101	13.0	0.790	59.4	LOS E	3.2	24.9	0.97	1.19	21.4
2	T	1	0.0	0.082	43.6	LOS D	0.2	1.6	0.93	0.96	24.2
3	R	6	0.0	0.082	45.6	LOS D	0.2	1.6	0.93	0.98	24.7
Approach		108	12.1	0.790	58.4	LOS E	3.2	24.9	0.97	1.17	21.6
East: Golden Highway (East)											
4	L	41	3.0	0.598	7.5	LOS A	0.0	0.0	0.00	1.16	48.6
5	T	1086	5.0	0.598	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		1127	4.9	0.598	0.3	NA	0.0	0.0	0.00	0.04	59.5
North: Hospital Access											
7	L	3	0.0	0.006	12.3	LOS A	0.0	0.1	0.60	0.73	39.7
Approach		3	0.0	0.006	12.3	LOS A	0.0	0.1	0.60	0.73	39.7
West: Golden Highway (West)											
10	L	86	0.0	0.380	7.4	LOS A	0.0	0.0	0.00	1.07	48.6
11	T	634	4.0	0.380	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	107	19.0	0.458	30.0	LOS C	1.8	14.9	0.91	1.05	32.0
Approach		827	5.5	0.458	4.7	NA	1.8	14.9	0.12	0.25	53.0
All Vehicles		2065	5.5	0.790	5.1	NA	3.2	24.9	0.10	0.18	52.1

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

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: White St/Golden Hwy -
PM Peak

2023 PM Peak ND
Golden Highway/White Street

Giveway / Yield (Two-Way)
Design Life Analysis (Practical Capacity): Results for 12 years

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: White St (South)											
1	L	111	2.0	0.368	18.3	LOS B	1.2	8.6	0.78	0.98	35.8
2	T	1	0.0	0.037	42.1	LOS C	0.1	0.7	0.93	0.96	24.6
3	R	2	0.0	0.037	44.2	LOS D	0.1	0.7	0.93	0.98	25.2
Approach		115	1.9	0.368	19.1	LOS B	1.2	8.6	0.78	0.98	35.4
East: Golden Highway (East)											
4	L	10	0.0	0.435	7.4	LOS A	0.0	0.0	0.00	1.18	48.6
5	T	822	3.0	0.435	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		832	3.0	0.435	0.1	NA	0.0	0.0	0.00	0.01	59.8
North: Hospital Access											
7	L	1	0.0	0.005	20.3	LOS B	0.0	0.1	0.81	0.84	34.7
Approach		1	0.0	0.005	20.3	LOS B	0.0	0.1	0.81	0.84	34.7
West: Golden Highway (West)											
10	L	49	0.0	0.530	7.4	LOS A	0.0	0.0	0.00	1.14	48.6
11	T	977	1.0	0.530	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	42	5.0	0.064	12.2	LOS A	0.2	1.7	0.65	0.85	43.8
Approach		1067	1.1	0.530	0.8	NA	0.2	1.7	0.03	0.09	58.6
All Vehicles		2015	1.9	0.530	1.6	NA	1.2	8.6	0.06	0.11	56.9

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

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: White St/Golden Hwy -
SATMD Peak

2023 Saturday Middy Peak ND
Golden Highway/White Street
Giveaway / Yield (Two-Way)
Design Life Analysis (Practical Capacity): Results for 12 years

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%	v/c	sec	veh	m		per veh	km/h	
South: White St (South)											
1	L	69	3.0	0.237	17.2	LOS B	0.7	5.0	0.76	0.93	36.5
2	T	1	0.0	0.080	29.9	LOS C	0.2	1.6	0.89	0.94	28.7
3	R	10	0.0	0.080	32.0	LOS C	0.2	1.6	0.89	0.96	29.3
Approach		80	2.6	0.237	19.2	LOS B	0.7	5.0	0.78	0.94	35.3
East: Golden Highway (East)											
4	L	20	11.0	0.442	7.7	LOS A	0.0	0.0	0.00	1.19	48.6
5	T	833	1.0	0.442	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		853	1.2	0.442	0.2	NA	0.0	0.0	0.00	0.03	59.7
North: Hospital Access											
7	L	1	0.0	0.003	13.4	LOS A	0.0	0.1	0.65	0.71	38.9
Approach		1	0.0	0.003	13.4	LOS A	0.0	0.1	0.65	0.71	38.9
West: Golden Highway (West)											
10	L	15	0.0	0.392	7.4	LOS A	0.0	0.0	0.00	1.17	48.6
11	T	744	1.0	0.392	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	40	0.0	0.062	12.3	LOS A	0.2	1.6	0.66	0.86	43.7
Approach		799	0.9	0.392	0.8	NA	0.2	1.6	0.03	0.07	58.7
All Vehicles		1734	1.2	0.442	1.3	NA	0.7	5.0	0.05	0.09	57.4

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

Vehicle movement LOS values are based on average delay per movement

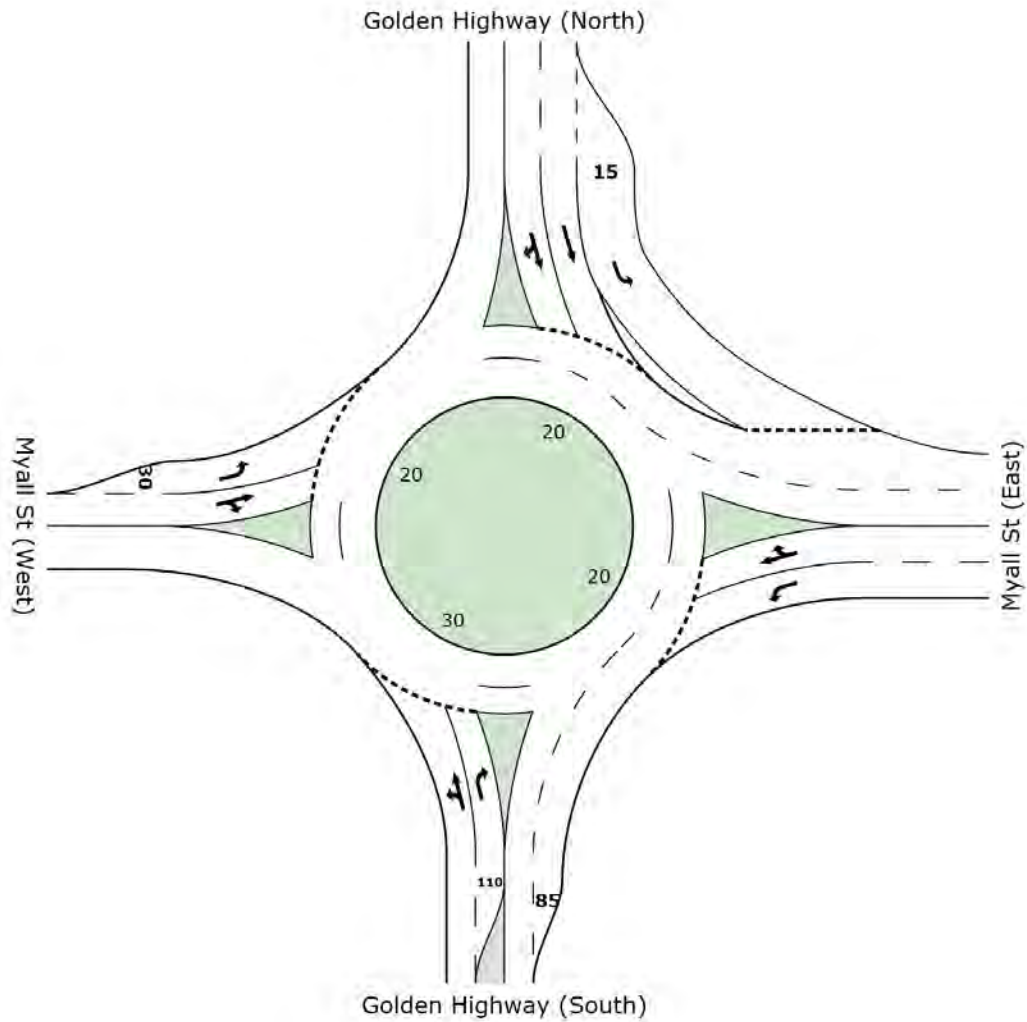
Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model used.

**SIDRA SUMMARIES –
2023 WITH DEVELOPMENT
(Full Development)**

Golden Highway/Myall Street



MOVEMENT SUMMARY

Site: Myall St/Golden Hwy -
AM Peak

2023 AM Peak WD - Full
Myall Street/Golden Highway
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
South: Golden Highway (South)											
1	L	87	2.0	0.269	5.8	LOS A	1.4	10.4	0.39	0.55	49.3
2	T	219	10.0	0.269	6.0	LOS A	1.4	10.4	0.39	0.52	49.9
3	R	372	8.1	0.288	10.9	LOS A	1.6	11.7	0.38	0.66	44.5
Approach		678	7.9	0.288	8.7	LOS A	1.6	11.7	0.39	0.60	46.7
East: Myall St (East)											
4	L	566	6.0	0.515	7.8	LOS A	2.8	20.4	0.58	0.75	42.7
5	T	158	2.0	0.232	5.0	LOS A	0.8	5.8	0.49	0.55	43.7
6	R	14	15.4	0.232	12.7	LOS A	0.8	5.8	0.49	0.98	41.0
Approach		738	5.3	0.515	7.3	LOS A	2.8	20.4	0.56	0.71	42.9
North: Golden Highway (North)											
7	L	8	0.0	0.008	6.4	LOS A	0.0	0.1	0.33	0.51	48.6
8	T	563	4.0	0.292	6.6	LOS A	1.4	10.1	0.42	0.57	49.2
9	R	42	0.0	0.292	11.1	LOS A	1.4	10.1	0.43	0.84	45.7
Approach		613	3.7	0.292	6.9	LOS A	1.4	10.1	0.42	0.59	49.0
West: Myall St (West)											
10	L	13	0.0	0.020	7.9	LOS A	0.1	0.5	0.48	0.64	43.2
11	T	42	0.0	0.068	4.7	LOS A	0.3	1.8	0.44	0.49	43.3
12	R	31	0.0	0.068	11.4	LOS A	0.3	1.8	0.44	0.81	41.4
Approach		86	0.0	0.068	7.6	LOS A	0.3	1.8	0.45	0.63	42.5
All Vehicles		2115	5.5	0.515	7.7	LOS A	2.8	20.4	0.46	0.64	45.7

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

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Myall St/Golden Hwy -
PM Peak

2023 PM Peak WD - Full
Myall Street/Golden Highway
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Golden Highway (South)											
1	L	37	0.0	0.348	5.1	LOS A	2.0	14.2	0.26	0.49	50.2
2	T	488	3.0	0.348	5.3	LOS A	2.0	14.2	0.26	0.44	51.0
3	R	472	2.0	0.355	10.4	LOS A	2.0	14.0	0.27	0.63	45.0
Approach		997	2.4	0.355	7.7	LOS A	2.0	14.2	0.26	0.54	47.9
East: Myall St (East)											
4	L	406	2.0	0.342	6.7	LOS A	1.5	10.4	0.44	0.63	43.3
5	T	67	2.0	0.108	4.5	LOS A	0.3	2.5	0.40	0.49	44.1
6	R	12	9.2	0.108	12.0	LOS A	0.3	2.5	0.40	0.91	41.4
Approach		485	2.2	0.342	6.5	LOS A	1.5	10.4	0.43	0.61	43.4
North: Golden Highway (North)											
7	L	17	13.0	0.022	7.3	LOS A	0.1	0.4	0.43	0.56	48.0
8	T	331	3.0	0.190	7.5	LOS A	1.0	7.1	0.53	0.64	48.5
9	R	18	7.6	0.190	12.2	LOS A	1.0	7.1	0.54	0.85	45.1
Approach		366	3.7	0.190	7.8	LOS A	1.0	7.1	0.53	0.65	48.3
West: Myall St (West)											
10	L	35	0.0	0.058	8.6	LOS A	0.2	1.3	0.53	0.75	42.6
11	T	134	0.0	0.216	5.3	LOS A	0.8	5.8	0.54	0.56	42.7
12	R	82	0.0	0.216	12.0	LOS A	0.8	5.8	0.54	0.91	41.1
Approach		251	0.0	0.216	8.0	LOS A	0.8	5.8	0.54	0.70	42.1
All Vehicles		2099	2.3	0.355	7.5	LOS A	2.0	14.2	0.38	0.59	46.1

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

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Myall St/Golden Hwy -
SATMD Peak

2023 Saturday Middy Peak WD - Full
Myall Street/Golden Highway
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Golden Highway (South)											
1	L	39	0.0	0.257	4.9	LOS A	1.3	9.1	0.14	0.47	50.9
2	T	334	2.0	0.257	5.0	LOS A	1.3	9.1	0.14	0.42	51.9
3	R	396	1.0	0.261	10.1	LOS A	1.2	8.5	0.13	0.63	45.6
Approach		769	1.4	0.261	7.6	LOS A	1.3	9.1	0.14	0.53	48.4
East: Myall St (East)											
4	L	416	3.0	0.345	6.7	LOS A	1.4	10.1	0.41	0.62	43.4
5	T	21	0.0	0.032	4.3	LOS A	0.1	0.7	0.37	0.46	44.4
6	R	3	0.0	0.032	12.1	LOS A	0.1	0.7	0.37	0.93	40.6
Approach		440	2.8	0.345	6.6	LOS A	1.4	10.1	0.41	0.62	43.4
North: Golden Highway (North)											
7	L	11	0.0	0.011	6.4	LOS A	0.0	0.2	0.31	0.52	48.7
8	T	354	2.0	0.176	6.6	LOS A	0.7	5.2	0.39	0.57	49.5
9	R	14	0.0	0.176	11.2	LOS A	0.7	5.2	0.39	0.85	45.7
Approach		379	1.9	0.176	6.8	LOS A	0.7	5.2	0.39	0.58	49.3
West: Myall St (West)											
10	L	10	0.0	0.015	8.0	LOS A	0.0	0.3	0.46	0.65	43.1
11	T	41	0.0	0.092	4.8	LOS A	0.3	2.2	0.43	0.50	43.2
12	R	60	0.0	0.092	11.5	LOS A	0.3	2.2	0.43	0.81	41.2
Approach		111	0.0	0.092	8.7	LOS A	0.3	2.2	0.43	0.68	42.1
All Vehicles		1699	1.8	0.345	7.2	LOS A	1.4	10.1	0.28	0.57	46.8

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

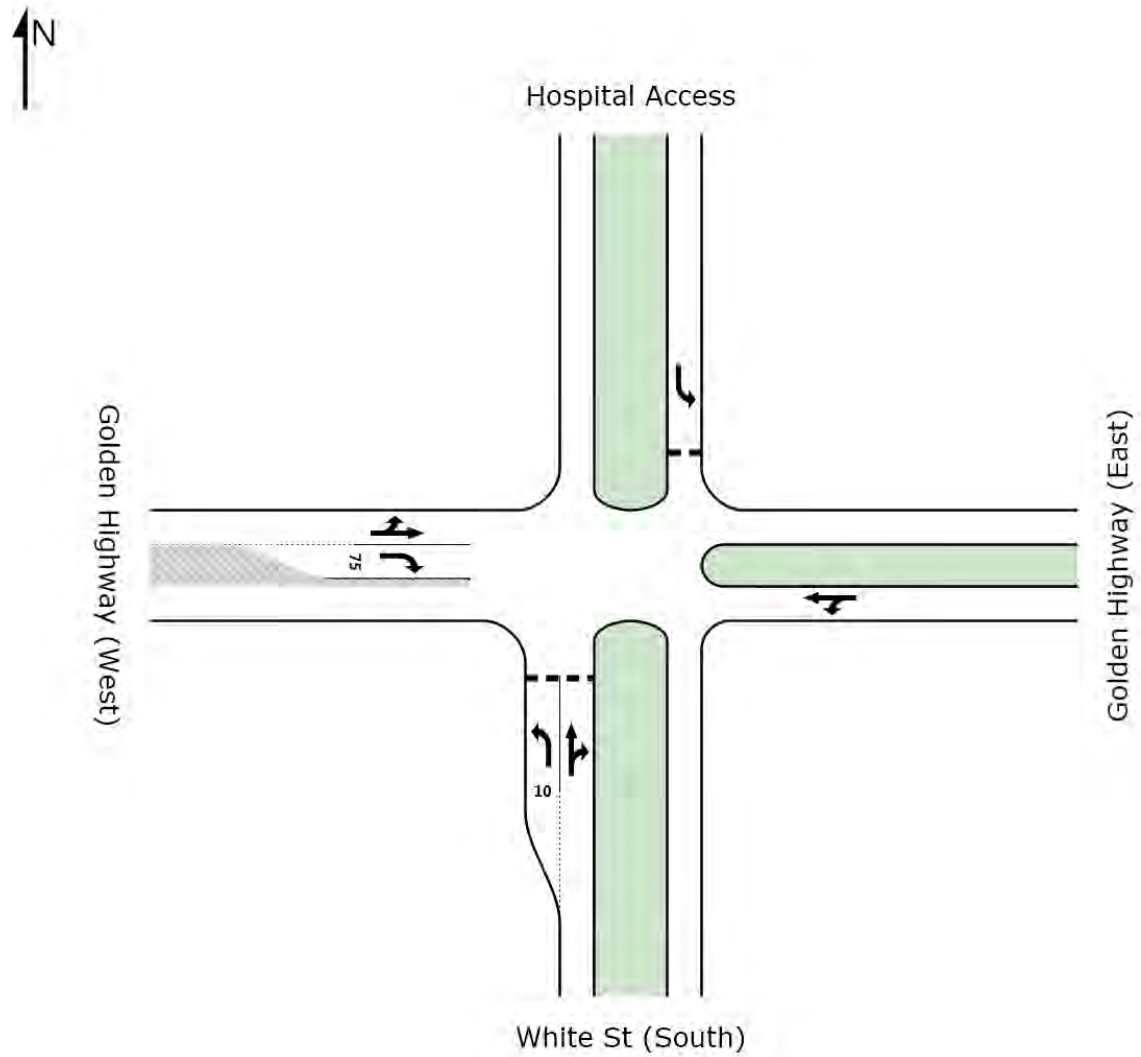
Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model used.

Golden Highway/White Street/Hospital Access



MOVEMENT SUMMARY

Site: White St/Golden Hwy -
AM Peak

2023 AM Peak WD - Full
Golden Highway/White Street

Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: White St (South)											
1	L	93	13.0	1.000 ³	55.5	LOS D	3.2	24.9	1.00	1.04	22.3
2	T	16	0.0	0.350	68.8	LOS E	1.0	7.6	0.96	1.01	18.6
3	R	7	0.0	0.350	70.9	LOS F	1.0	7.6	0.96	1.02	19.2
Approach		116	12.1	1.000	58.3	LOS E	3.2	24.9	0.99	1.04	21.5
East: Golden Highway (East)											
4	L	44	3.0	0.642	7.5	LOS A	0.0	0.0	0.00	1.16	48.6
5	T	1167	5.0	0.642	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		1211	4.9	0.642	0.3	NA	0.0	0.0	0.00	0.04	59.5
North: Hospital Access											
7	L	3	0.0	0.007	13.3	LOS A	0.0	0.2	0.64	0.76	39.0
Approach		3	0.0	0.007	13.3	LOS A	0.0	0.2	0.64	0.76	39.0
West: Golden Highway (West)											
10	L	113	0.0	0.419	7.4	LOS A	0.0	0.0	0.00	1.05	48.6
11	T	681	4.0	0.419	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	115	19.0	0.650	45.7	LOS D	2.8	22.6	0.96	1.13	25.8
Approach		909	5.4	0.650	6.7	NA	2.8	22.6	0.12	0.27	50.4
All Vehicles		2239	5.5	1.000	5.9	NA	3.2	24.9	0.10	0.19	51.1

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

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: White St/Golden Hwy -
PM Peak

2023 PM Peak WD - Full
Golden Highway/White Street

Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: White St (South)											
1	L	111	2.0	0.366	18.3	LOS B	1.2	8.6	0.78	0.98	35.8
2	T	1	0.0	0.034	42.3	LOS C	0.1	0.7	0.93	0.96	24.6
3	R	2	0.0	0.034	44.4	LOS D	0.1	0.7	0.93	0.98	25.1
Approach		114	1.9	0.366	19.0	LOS B	1.2	8.6	0.78	0.98	35.4
East: Golden Highway (East)											
4	L	10	0.0	0.435	7.4	LOS A	0.0	0.0	0.00	1.18	48.6
5	T	822	3.0	0.435	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		832	3.0	0.435	0.1	NA	0.0	0.0	0.00	0.01	59.8
North: Hospital Access											
7	L	1	0.0	0.004	20.5	LOS B	0.0	0.1	0.81	0.84	34.6
Approach		1	0.0	0.004	20.5	LOS B	0.0	0.1	0.81	0.84	34.6
West: Golden Highway (West)											
10	L	59	0.0	0.536	7.4	LOS A	0.0	0.0	0.00	1.13	48.6
11	T	977	1.0	0.536	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	42	5.0	0.064	12.2	LOS A	0.2	1.8	0.65	0.85	43.8
Approach		1078	1.1	0.536	0.9	NA	0.2	1.8	0.03	0.09	58.5
All Vehicles		2025	1.9	0.536	1.6	NA	1.2	8.6	0.06	0.11	56.9

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

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: White St/Golden Hwy -
SATMD Peak

2023 Saturday Middy Peak WD - Full
Golden Highway/White Street
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: White St (South)											
1	L	69	3.0	0.235	17.2	LOS B	0.7	4.9	0.76	0.93	36.5
2	T	1	0.0	0.080	29.9	LOS C	0.2	1.6	0.89	0.94	28.7
3	R	10	0.0	0.080	32.0	LOS C	0.2	1.6	0.89	0.96	29.3
Approach		80	2.6	0.235	19.2	LOS B	0.7	4.9	0.78	0.94	35.3
East: Golden Highway (East)											
4	L	20	11.0	0.442	7.7	LOS A	0.0	0.0	0.00	1.19	48.6
5	T	833	1.0	0.442	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		853	1.2	0.442	0.2	NA	0.0	0.0	0.00	0.03	59.7
North: Hospital Access											
7	L	1	0.0	0.002	13.4	LOS A	0.0	0.1	0.65	0.71	38.9
Approach		1	0.0	0.002	13.4	LOS A	0.0	0.1	0.65	0.71	38.9
West: Golden Highway (West)											
10	L	18	0.0	0.394	7.4	LOS A	0.0	0.0	0.00	1.16	48.6
11	T	744	1.0	0.394	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	40	0.0	0.063	12.3	LOS A	0.2	1.6	0.66	0.86	43.7
Approach		802	0.9	0.394	0.8	NA	0.2	1.6	0.03	0.07	58.7
All Vehicles		1736	1.2	0.442	1.3	NA	0.7	4.9	0.05	0.09	57.4

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

Vehicle movement LOS values are based on average delay per movement

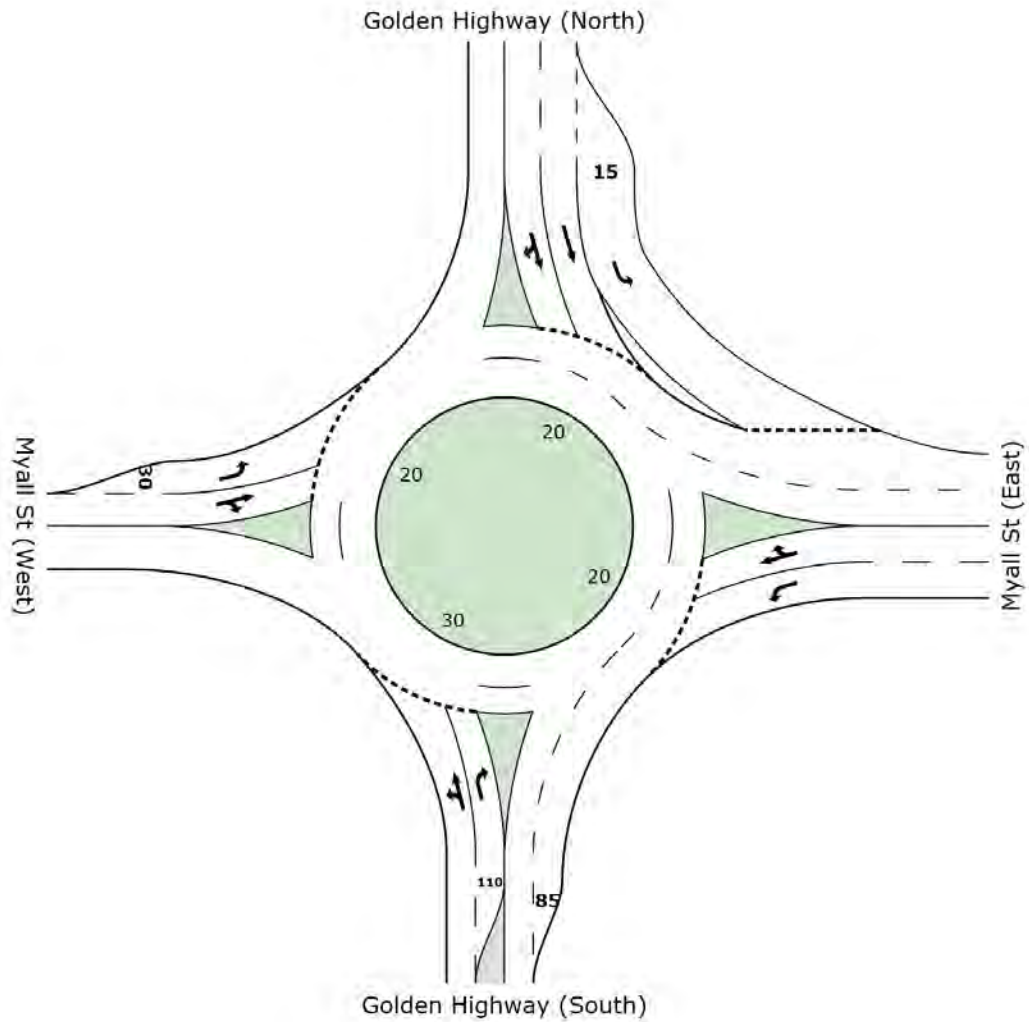
Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model used.

**SIDRA SUMMARIES –
2023 WITH DEVELOPMENT
(Only Stage 1 and 2 Development)**

Golden Highway/Myall Street



MOVEMENT SUMMARY

Site: Myall St/Golden Hwy -
AM Peak

2023 AM Peak WD S1+2
Myall Street/Golden Highway
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Golden Highway (South)											
1	L	78	2.0	0.257	5.7	LOS A	1.3	9.8	0.37	0.53	49.5
2	T	219	10.0	0.257	5.9	LOS A	1.3	9.8	0.37	0.50	50.1
3	R	366	8.0	0.279	10.8	LOS A	1.5	11.1	0.36	0.65	44.6
Approach		663	8.0	0.279	8.6	LOS A	1.5	11.1	0.36	0.59	46.8
East: Myall St (East)											
4	L	566	6.0	0.511	7.8	LOS A	2.7	19.9	0.57	0.74	42.7
5	T	142	2.0	0.218	5.1	LOS A	0.7	5.3	0.48	0.55	43.7
6	R	14	15.4	0.218	12.8	LOS A	0.7	5.3	0.48	0.98	41.0
Approach		722	5.4	0.511	7.3	LOS A	2.7	19.9	0.55	0.71	42.9
North: Golden Highway (North)											
7	L	8	0.0	0.008	6.4	LOS A	0.0	0.1	0.33	0.51	48.6
8	T	563	4.0	0.287	6.5	LOS A	1.3	9.7	0.41	0.56	49.3
9	R	38	0.0	0.287	11.0	LOS A	1.3	9.7	0.42	0.84	45.8
Approach		609	3.7	0.287	6.8	LOS A	1.3	9.7	0.41	0.58	49.1
West: Myall St (West)											
10	L	12	0.0	0.018	7.8	LOS A	0.1	0.4	0.47	0.64	43.2
11	T	37	0.0	0.060	4.6	LOS A	0.2	1.5	0.44	0.48	43.3
12	R	28	0.0	0.060	11.4	LOS A	0.2	1.5	0.44	0.80	41.4
Approach		77	0.0	0.060	7.6	LOS A	0.2	1.5	0.44	0.63	42.5
All Vehicles		2071	5.5	0.511	7.6	LOS A	2.7	19.9	0.44	0.63	45.8

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

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Myall St/Golden Hwy -
PM Peak

2023 PM Peak WD S1+2
Myall Street/Golden Highway
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Golden Highway (South)											
1	L	33	0.0	0.341	5.1	LOS A	1.9	13.8	0.24	0.48	50.3
2	T	488	3.0	0.341	5.2	LOS A	1.9	13.8	0.24	0.44	51.1
3	R	472	2.0	0.354	10.4	LOS A	1.9	13.8	0.25	0.63	45.1
Approach		993	2.4	0.354	7.7	LOS A	1.9	13.8	0.25	0.53	48.0
East: Myall St (East)											
4	L	406	2.0	0.340	6.7	LOS A	1.4	10.3	0.43	0.62	43.3
5	T	59	2.0	0.097	4.5	LOS A	0.3	2.2	0.39	0.48	44.2
6	R	12	9.2	0.097	12.0	LOS A	0.3	2.2	0.39	0.90	41.4
Approach		477	2.2	0.340	6.5	LOS A	1.4	10.3	0.42	0.61	43.4
North: Golden Highway (North)											
7	L	17	13.0	0.021	7.3	LOS A	0.1	0.4	0.42	0.56	48.1
8	T	331	3.0	0.186	7.4	LOS A	0.9	6.8	0.52	0.63	48.7
9	R	16	7.5	0.186	12.1	LOS A	0.9	6.8	0.52	0.85	45.2
Approach		364	3.7	0.186	7.6	LOS A	0.9	6.8	0.51	0.64	48.5
West: Myall St (West)											
10	L	31	0.0	0.051	8.6	LOS A	0.2	1.1	0.53	0.74	42.6
11	T	119	0.0	0.191	5.3	LOS A	0.7	5.0	0.53	0.56	42.8
12	R	73	0.0	0.191	12.0	LOS A	0.7	5.0	0.53	0.91	41.2
Approach		223	0.0	0.191	7.9	LOS A	0.7	5.0	0.53	0.70	42.2
All Vehicles		2057	2.3	0.354	7.4	LOS A	1.9	13.8	0.37	0.59	46.3

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

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Myall St/Golden Hwy -
SATMD Peak

2023 Saturday Middy Peak WD S1+2
Myall Street/Golden Highway
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Golden Highway (South)											
1	L	35	0.0	0.253	4.9	LOS A	1.2	8.9	0.13	0.47	51.0
2	T	334	2.0	0.253	5.0	LOS A	1.2	8.9	0.13	0.42	51.9
3	R	396	1.0	0.260	10.1	LOS A	1.2	8.4	0.12	0.64	45.6
Approach		765	1.4	0.260	7.6	LOS A	1.2	8.9	0.13	0.53	48.4
East: Myall St (East)											
4	L	416	3.0	0.344	6.7	LOS A	1.4	10.1	0.41	0.62	43.4
5	T	18	0.0	0.028	4.3	LOS A	0.1	0.6	0.36	0.45	44.4
6	R	3	0.0	0.028	12.1	LOS A	0.1	0.6	0.36	0.92	40.6
Approach		437	2.9	0.344	6.6	LOS A	1.4	10.1	0.41	0.62	43.4
North: Golden Highway (North)											
7	L	11	0.0	0.011	6.4	LOS A	0.0	0.2	0.31	0.52	48.8
8	T	354	2.0	0.175	6.6	LOS A	0.7	5.1	0.38	0.57	49.6
9	R	13	0.0	0.175	11.2	LOS A	0.7	5.1	0.38	0.85	45.7
Approach		378	1.9	0.175	6.7	LOS A	0.7	5.1	0.38	0.58	49.4
West: Myall St (West)											
10	L	9	0.0	0.014	8.0	LOS A	0.0	0.3	0.46	0.64	43.1
11	T	37	0.0	0.083	4.8	LOS A	0.3	1.9	0.43	0.49	43.2
12	R	54	0.0	0.083	11.5	LOS A	0.3	1.9	0.43	0.81	41.2
Approach		100	0.0	0.083	8.7	LOS A	0.3	1.9	0.43	0.68	42.1
All Vehicles		1680	1.8	0.344	7.2	LOS A	1.4	10.1	0.27	0.57	46.8

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

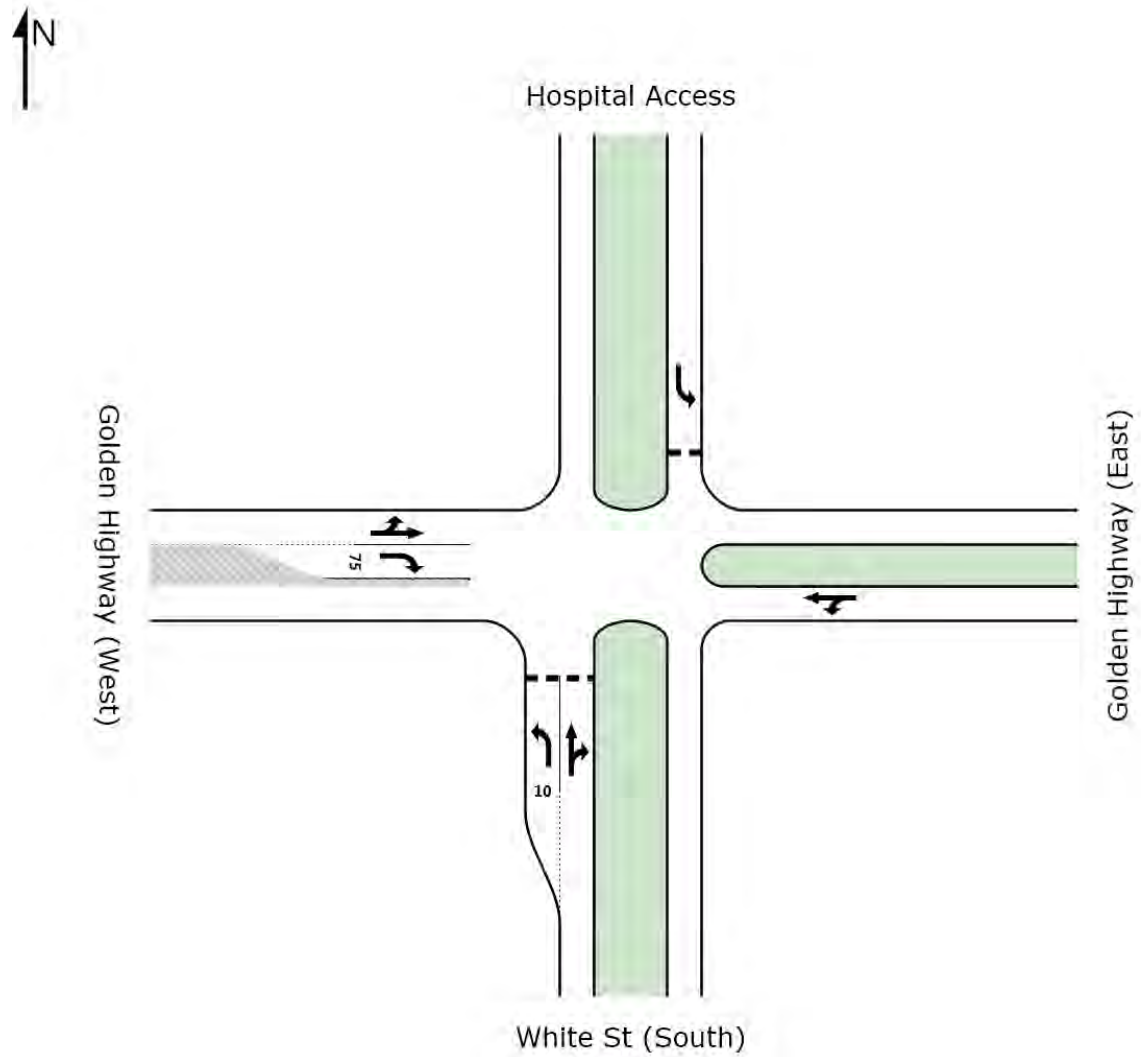
Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model used.

Golden Highway/White Street/Hospital Access



MOVEMENT SUMMARY

Site: White St/Golden Hwy -
AM Peak

2023 AM Peak WD S1+2 WD S1+2
Golden Highway/White Street

Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: White St (South)											
1	L	93	13.0	1.000 ³	55.5	LOS D	3.2	24.9	1.00	1.04	22.3
2	T	16	0.0	0.349	68.5	LOS E	1.0	7.6	0.96	1.01	18.7
3	R	7	0.0	0.349	70.6	LOS F	1.0	7.6	0.96	1.02	19.2
Approach		116	12.1	1.000	58.3	LOS E	3.2	24.9	0.99	1.04	21.5
East: Golden Highway (East)											
4	L	44	3.0	0.642	7.5	LOS A	0.0	0.0	0.00	1.16	48.6
5	T	1167	5.0	0.642	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		1211	4.9	0.642	0.3	NA	0.0	0.0	0.00	0.04	59.5
North: Hospital Access											
7	L	3	0.0	0.007	13.2	LOS A	0.0	0.2	0.64	0.75	39.1
Approach		3	0.0	0.007	13.2	LOS A	0.0	0.2	0.64	0.75	39.1
West: Golden Highway (West)											
10	L	101	0.0	0.413	7.4	LOS A	0.0	0.0	0.00	1.06	48.6
11	T	681	4.0	0.413	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	115	19.0	0.650	45.7	LOS D	2.8	22.6	0.96	1.13	25.8
Approach		897	5.5	0.650	6.7	NA	2.8	22.6	0.12	0.26	50.5
All Vehicles		2227	5.5	1.000	5.9	NA	3.2	24.9	0.10	0.18	51.1

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

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: White St/Golden Hwy -
PM Peak

2023 PM Peak WD S1+2
Golden Highway/White Street

Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: White St (South)											
1	L	111	2.0	0.366	18.3	LOS B	1.2	8.6	0.78	0.98	35.8
2	T	1	0.0	0.034	42.2	LOS C	0.1	0.7	0.93	0.96	24.6
3	R	2	0.0	0.034	44.2	LOS D	0.1	0.7	0.93	0.98	25.2
Approach		114	1.9	0.366	19.0	LOS B	1.2	8.6	0.78	0.98	35.4
East: Golden Highway (East)											
4	L	10	0.0	0.435	7.4	LOS A	0.0	0.0	0.00	1.18	48.6
5	T	822	3.0	0.435	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		832	3.0	0.435	0.1	NA	0.0	0.0	0.00	0.01	59.8
North: Hospital Access											
7	L	1	0.0	0.004	20.3	LOS B	0.0	0.1	0.81	0.84	34.6
Approach		1	0.0	0.004	20.3	LOS B	0.0	0.1	0.81	0.84	34.6
West: Golden Highway (West)											
10	L	53	0.0	0.533	7.4	LOS A	0.0	0.0	0.00	1.13	48.6
11	T	977	1.0	0.533	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	42	5.0	0.064	12.2	LOS A	0.2	1.8	0.65	0.85	43.8
Approach		1072	1.1	0.533	0.8	NA	0.2	1.8	0.03	0.09	58.5
All Vehicles		2019	1.9	0.533	1.6	NA	1.2	8.6	0.06	0.11	56.9

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

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: White St/Golden Hwy -
SATMD Peak

2023 Saturday Middy Peak WD S1+2
Golden Highway/White Street
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: White St (South)											
1	L	69	3.0	0.235	17.2	LOS B	0.7	4.9	0.76	0.93	36.5
2	T	1	0.0	0.080	29.9	LOS C	0.2	1.6	0.89	0.94	28.7
3	R	10	0.0	0.080	32.0	LOS C	0.2	1.6	0.89	0.96	29.3
Approach		80	2.6	0.235	19.2	LOS B	0.7	4.9	0.78	0.94	35.3
East: Golden Highway (East)											
4	L	20	11.0	0.442	7.7	LOS A	0.0	0.0	0.00	1.19	48.6
5	T	833	1.0	0.442	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		853	1.2	0.442	0.2	NA	0.0	0.0	0.00	0.03	59.7
North: Hospital Access											
7	L	1	0.0	0.002	13.4	LOS A	0.0	0.1	0.65	0.71	38.9
Approach		1	0.0	0.002	13.4	LOS A	0.0	0.1	0.65	0.71	38.9
West: Golden Highway (West)											
10	L	16	0.0	0.393	7.4	LOS A	0.0	0.0	0.00	1.17	48.6
11	T	744	1.0	0.393	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	40	0.0	0.063	12.3	LOS A	0.2	1.6	0.66	0.86	43.7
Approach		800	0.9	0.393	0.8	NA	0.2	1.6	0.03	0.07	58.7
All Vehicles		1734	1.2	0.442	1.3	NA	0.7	4.9	0.05	0.09	57.4

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

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model used.

Dubbo Base Hospital
Redevelopment Review
of Environmental
Factors (REF) Traffic
Study

APPENDIX

B

PARKING
OCCUPANCY BY
ZONE



Parking occupancy by zone, Thursday 15 December 2011

Time Period / Zone	A*	B*	C	D	E	F	G	H	I	J	K	L	Total
06:00:00	0%	11%	0%	16%	20%	21%	0%	40%	40%	0%	30%	26%	20%
06:30:00	0%	13%	0%	21%	16%	29%	0%	40%	40%	0%	40%	26%	22%
07:00:00	0%	24%	0%	16%	24%	36%	0%	40%	40%	0%	0%	38%	29%
07:30:00	23%	26%	18%	16%	20%	51%	0%	30%	40%	86%	0%	44%	37%
08:00:00	29%	26%	18%	21%	20%	61%	27%	60%	60%	86%	0%	47%	42%
08:30:00	77%	35%	53%	32%	64%	92%	64%	100%	40%	43%	30%	79%	72%
09:00:00	94%	65%	53%	53%	88%	97%	82%	90%	0%	43%	80%	84%	81%
09:30:00	94%	72%	65%	68%	88%	98%	82%	90%	40%	43%	90%	85%	84%
10:00:00	94%	74%	59%	84%	88%	96%	91%	90%	40%	43%	100%	93%	88%
10:30:00	94%	76%	59%	84%	84%	96%	91%	90%	60%	29%	100%	94%	88%
11:00:00	100%	100%	65%	84%	92%	95%	82%	90%	20%	14%	90%	96%	91%
11:30:00	100%	100%	65%	84%	92%	95%	82%	90%	20%	14%	90%	96%	91%
12:00:00	90%	100%	65%	74%	92%	97%	82%	90%	60%	0%	90%	97%	92%
12:30:00	90%	100%	65%	74%	92%	97%	64%	80%	40%	29%	90%	91%	88%
13:00:00	90%	100%	65%	79%	92%	97%	73%	80%	20%	43%	90%	88%	87%
13:30:00	90%	74%	65%	74%	84%	92%	73%	100%	20%	43%	90%	88%	84%
14:00:00	100%	76%	82%	89%	92%	95%	82%	90%	20%	14%	100%	87%	86%
14:30:00	94%	74%	82%	100%	80%	88%	55%	70%	20%	14%	100%	90%	84%
15:00:00	94%	72%	82%	95%	76%	82%	82%	40%	20%	43%	70%	90%	82%
15:30:00	90%	67%	88%	47%	84%	69%	91%	100%	40%	43%	70%	80%	76%
16:00:00	94%	57%	76%	63%	76%	61%	100%	90%	40%	43%	60%	73%	69%
16:30:00	74%	50%	65%	47%	56%	48%	100%	70%	20%	43%	50%	72%	62%
17:00:00	68%	46%	71%	47%	56%	33%	82%	70%	20%	29%	40%	62%	53%

*Occupancy based on maximum observed informal spaces on 15 Thursday December 2011

Parking occupancy by zone, Saturday 17 December 2011

Time Period / Zone	A*	B*	C	D	E	F	G	H	I	J	K	L	Total
06:00:00	6%	4%	29%	53%	44%	5%	0%	70%	20%	29%	0%	22%	18%
06:30:00	10%	4%	29%	47%	52%	5%	0%	70%	20%	29%	0%	21%	19%
07:00:00	16%	13%	71%	53%	60%	9%	0%	80%	20%	57%	10%	28%	26%
07:30:00	16%	13%	76%	53%	48%	14%	0%	60%	20%	43%	10%	27%	26%
08:00:00	19%	15%	88%	53%	56%	16%	0%	90%	20%	43%	10%	28%	28%
08:30:00	19%	26%	82%	53%	76%	22%	0%	70%	20%	43%	10%	28%	31%
09:00:00	19%	30%	82%	58%	48%	26%	0%	70%	20%	43%	10%	30%	32%
09:30:00	19%	26%	82%	58%	52%	24%	0%	60%	20%	43%	10%	32%	32%
10:00:00	19%	24%	82%	63%	44%	25%	0%	60%	20%	43%	10%	33%	32%
10:30:00	19%	33%	82%	63%	44%	26%	9%	80%	20%	43%	10%	34%	34%
11:00:00	16%	28%	82%	58%	56%	26%	0%	60%	20%	43%	10%	35%	34%
11:30:00	16%	33%	82%	58%	44%	24%	0%	60%	20%	43%	10%	34%	33%
12:00:00	19%	26%	82%	58%	52%	25%	0%	60%	20%	57%	10%	33%	33%
12:30:00	19%	20%	76%	63%	56%	21%	0%	50%	20%	43%	10%	34%	32%
13:00:00	19%	20%	82%	63%	56%	17%	0%	40%	20%	43%	10%	31%	29%
13:30:00	23%	22%	71%	63%	56%	18%	0%	60%	40%	57%	10%	36%	33%
14:00:00	23%	22%	71%	63%	60%	17%	0%	80%	40%	71%	10%	42%	36%
14:30:00	19%	20%	59%	63%	56%	18%	0%	60%	40%	71%	10%	41%	34%
15:00:00	19%	22%	76%	32%	32%	17%	0%	80%	20%	57%	0%	43%	33%
15:30:00	10%	24%	65%	21%	36%	15%	0%	80%	20%	43%	0%	45%	32%
16:00:00	10%	20%	35%	21%	36%	15%	0%	80%	20%	43%	0%	44%	31%
16:30:00	10%	26%	24%	26%	32%	14%	0%	90%	20%	43%	0%	48%	33%
17:00:00	10%	22%	24%	26%	36%	14%	0%	80%	20%	43%	0%	32%	25%

*Occupancy based on maximum observed informal spaces on 15 Thursday December 2011

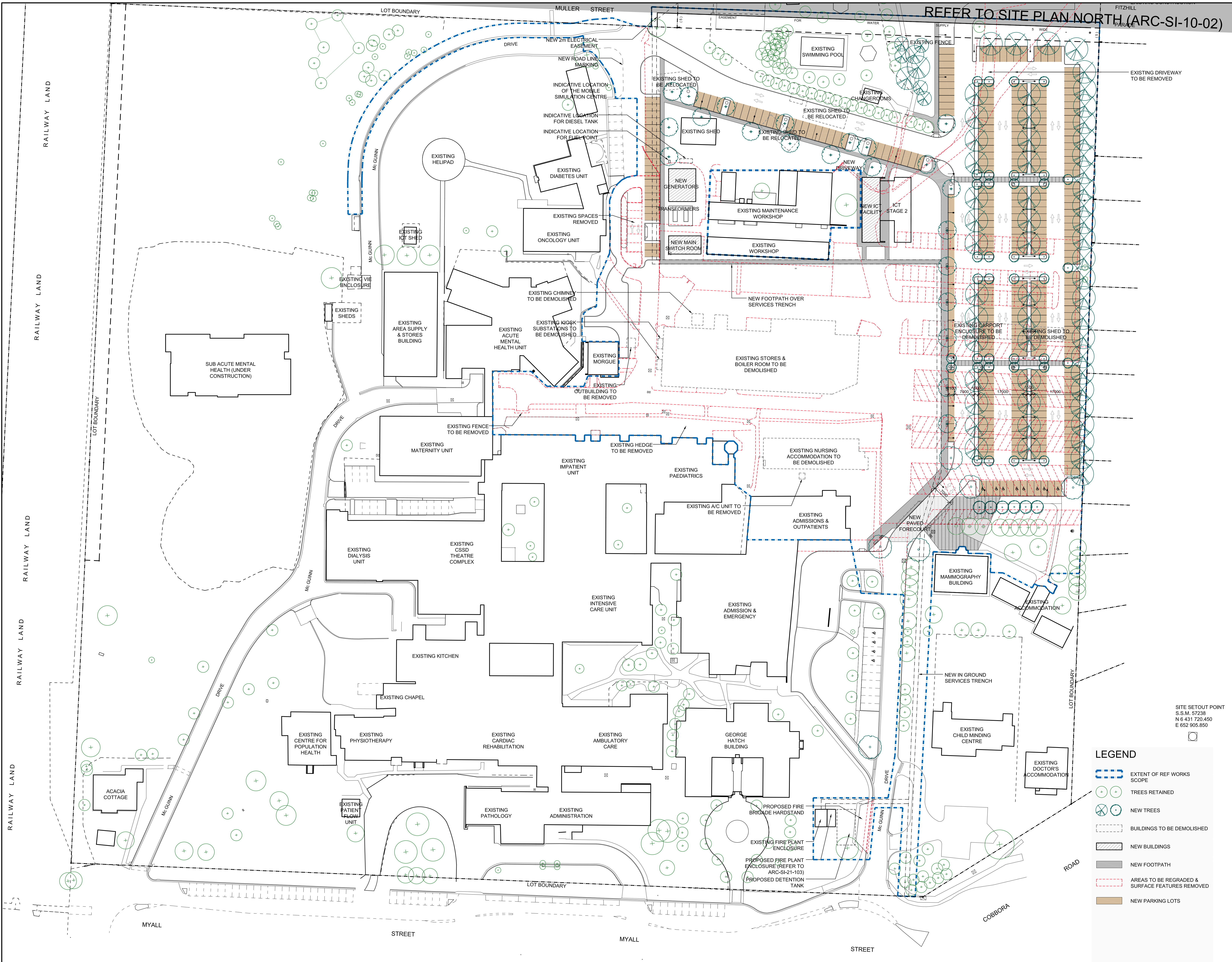
Dubbo Base Hospital
Redevelopment Review
of Environmental
Factors (REF) Traffic
Study

APPENDIX

C

STAGES 1 & 2
REDEVELOPMENT
PLAN





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Rev	Description	By	Date
01	ISSUE FOR REVIEW	XL	20-06-12
02	ISSUE FOR APPROVAL	XL	22-06-12
03	ISSUE FOR REVIEW	XL	02-07-12
04	ISSUE FOR APPROVAL	XL	04-07-12

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NSW **Health**
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Project No.
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Project
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REDEVELOPMENT STAGE 1 & 2
MYALL STREET, DUBBO NSW

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Dubbo Base Hospital
Redevelopment Review
of Environmental
Factors (REF) Traffic
Study

APPENDIX

D

PARKING
ANALYSIS:
DEVELOPMENT
AND VALIDATION



Dubbo Base Hospital Parking Demand Model

The following discusses the development of a parking demand model based on the Parking survey conducted on the 15th of Decemeber 2011 and current staff and bed numbers provided by NSW Health Infrastructure for Dubbo Base Hospital.

Parking Demand Model Development

In statistics, linear regression is an approach to modelling the relationship between a dependant variable and one or more explanatory variables. A linear regression analysis (Ordinary Least Squares Multiple Regression) was conducted in this situation where parking demand (dependent variable) was regressed against the independent variables of staff numbers and bed numbers.

An expression for peak parking demand was determined using the regression analysis. It is essential to determine the maximum possible utilisation of parking to cater for the greatest demand onsite. Thus only weekday parking occupancy, staff and bed numbers were utilised throughout the analysis. Parking occupancy provides an indication for parking demand and data was obtained from the parking survey conducted.

The following assumptions were made whilst developing the relationship.

- > It was assumed that beds and chairs resulted in equal parking demand for parking as patients would arrive at the hospital to utilise one or the other.
- > Staff numbers were obtained using the data provided by NSW Health specific to DBH
 - It was assumed that all staff are present throughout entire shift indicated
 - Though total staff indicated in data is equal to 660, a maximum staff level at any onetime occurs during 14:00-14:30 period with 541 staff on site.
- > Bed numbers are based on patient services numbers provided by NSW Health specific to DBH, Masterplan and Funding Report
 - It was assumed that all beds occupied throughout the hours indicated on the data thus providing the distribution of bed numbers relative to time. A uniform distribution was applied with maximum occupancy to develop the worst case scenario
 - Outpatient Beds and Inpatient Beds were separated to account for the different behaviour of patients/visitors and its impact on parking
 - > Outpatients are patients who do not stay overnight at the hospital. It was assumed that each outpatient requires a bed and arrived in 1 vehicle accounting for a demand of 1 parking space. The distribution is dependent on the number of beds present for each section of the hospital. For an example, if we consider Ambulatory Care and Clinics a total of 16 beds are present however 110 patients are treated per day. The duration of treatment times for patients vary and accordingly the utilisation of beds cannot be determined. Thus the worst case scenario of all beds being occupied will result in 16 parking spaces being occupied throughout the period of operation for the Ambulatory Care and Clinics department.
 - > Inpatients are patients that stay overnight at the hospital. The parking demand is derived from the number of people visiting patients. Visiting hours at DBH are from 9am to 8pm. There are approximately 137 inpatient beds which were assumed to be all occupied for a worst case parking scenario. It was also assumed that on average each inpatient will have 1 group of visitors which occupy 1 car parking space during the time of visitation. The distribution of visitors was formed to have two peak periods. One during the lunch time period (between 12pm and 2pm, 41% of visitors arriving during this time period) and the other straight after work (between 5pm and 7pm, 52% of visitors arriving during this time period). The remaining 7% is distributed evenly amongst the remaining hours of visitation.
- > Due to the differences in the types of beds present an **“equivalent outpatient bed number”** was calculated.
 - It was deemed that an equivalent outpatient bed is equal to the number of outpatient beds plus the number of visitors arriving to visit inpatients which is a percentage of the inpatient beds utilised at any point in time.

The data presented in **Table 1** was used to conduct the regression analysis. **Figure 1** shows the regression output from Microsoft Excel containing the statistical outputs of the analysis.

Table 1 Data utilised for Regression Analysis

Time	Staff	Equivalent Outpatient Beds	Parking Occupied
5:30 AM	58	17	101
6:00 AM	152	17	112
6:30 AM	152	17	148
7:00 AM	324	54	191
7:30 AM	346	54	217
8:00 AM	432	72	366
8:30 AM	446	72	415
9:00 AM	452	80	429
9:30 AM	454	80	451
10:00 AM	456	80	452
10:30 AM	456	80	467
11:00 AM	455	80	466
11:30 AM	455	80	468
12:00 PM	453	93	451
12:30 PM	453	93	447
1:00 PM	509	93	429
1:30 PM	509	93	441
2:00 PM	541	78	431
2:30 PM	447	78	421
3:00 PM	447	78	386
3:30 PM	332	78	355
4:00 PM	324	67	318
4:30 PM	285	67	273

OLS Multiple Regression Output - Regression of Parking on Beds and Staff						
SUMMARY OUTPUT						
Regression Statistics						
Multiple R	0.941174567					
R Square	0.885809566					
Adjusted R Square	0.874390523					
Standard Error	43.23107713					
Observations	23					
ANOVA						
	df	SS	MS	F	Significance F	
Regression	2	289956.4359	144978.218	77.5730102	3.76962E-10	
Residual	20	37378.5206	1868.92603			
Total	22	327334.9565				
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	15.44117067	29.06959333	0.531179453	0.601144463	-45.19693826	76.0792796
Staff	0.478710597	0.249278474	1.920384816	0.06918371	-0.041275187	0.998696382
Eq Outpatient Beds (Base)	2.598518715	1.253798447	2.072517094	0.051357427	-0.016859009	5.213896439

Figure 1 - Regression Output

The expression for parking demand derived from the regression analysis is as follows;

$$\text{DBH Peak Parking Demand} = 15.441 + 0.479(S) + 2.598(EO)$$

Where,

- > **S** = Maximum staff onsite, representing the maximum number of staff on site for a given day under normal operating conditions during the period of the parking survey
- > **EO = Equivalent Outpatient Beds = Outpatient Beds + k_x (Inpatient Beds)**
- > **k_x** = Maximum percentage of inpatient beds having visitors at any one time during the period of the parking survey (10%)

Since we are considering the peak parking demand, all variables utilise the maximum figure which occurs throughout the day considering the worst case scenario for parking.

Parking Demand Model Validation

The model derived in the previous section was tested by substituting the existing maximum staff onsite, outpatient beds and inpatient beds. The peak parking demand was calculated to be 516 which is a considerably closer value to the peak parking occupancy of 468 spaces observed during the parking survey. Table 2 presents a comparison of all considered models and the predicted level of existing parking.

Table 2 Comparison of Parking Demand/Required Estimates

Policy/Guideline Model	Organisation	Predicted Level of Existing Parking
Design guidelines for hospitals and day procedure centres: traffic and car parking	The Department of Human Services, Victoria	541
Policy code: standards for off-street parking of motor vehicles: hospitals	Dubbo City Council	563
Guide to traffic generating developments v2.2: recommended parking rate for private hospitals	RTA	243
DBH Peak Parking Demand Model	Cardno	516
Peak Parking Occupancy (according to parking survey conducted)		468

In addition to comparisons with other models the following statistical evidence is present;

R-square Value

The R-square value provides an indication of the validity of a regression model. The R-square value represents the proportion of the variation in the dependant variable (Peak Parking Demand) which can be explained by the independent variable (staff and equivalent outpatient beds). The R-Square of this particular model is 0.8858, which indicates a 94% correlation amongst the variables considered. Thus the model can be considered an acceptable relationship amongst the variables.

T-Statistic

This is a ratio of the coefficient to the standard error for that parameter. The larger the t-stat is, the more significant the parameter becomes. This statistic is compared to a t-distribution table, which allows for an evaluation of the level of significance. In general, the 5% or 10% significance levels are utilised.

P-Value

This is based upon the t-stat and the t-distribution table. The p-value represents the probability that null hypothesis (usually that the variable is not significant, i.e. $\beta = 0$) is able to explain the result. As per the t-statistic, a significance level of 5-10% is often utilised. The following notes are made about the resulting p-values:

- > Intercept ($|p| > 0 = 0.601$), this is not significant at the 5% or 10% significance levels. Such a result is expected since the implication is that at 0 beds and staff, there will be 0 parking demand. However, the regression CANNOT be run with a fixed intercept, since the regression is being undertaken of a sample, and not the population (or at least a very large sample). As such, any attempt to fix the intercept will increase the standard error and potentially alter the statistical conclusions. The lack of significance of the intercept is generally not considered to be an issue
- > Equivalent Outpatient Beds ($|p| > 0 = 0.069$), this is not significant at the 5% level, but is significant at the 10% level.
- > Staff ($|p| > 0 = 0.051$), this is not significant at the 5%, but is significant at the 10% levels

F-Statistic

In terms of determining whether any parameter may need to be dropped based upon the p-value, the F-statistic is considered. The F-statistic is a measure of the overall significance of the model (i.e. it measures the significance of the parameters working together to estimate the model). Similarly with the T-stat, the F-stat is compared to an F-distribution table at the 5% and/or 10% significance levels

The F-stat is 77.573 with a corresponding p-value of less than 0.001. As such, the overall model is significant at the 5% and 10% significance levels. Based upon this, all the parameters should be kept to ensure the performance of the regression model.

Normal Probability Plot (PP-Plot)

This graph is utilised to confirm a crucial assumption of OLS; that the variance of the residuals is constant and that the sample has a normal distribution. In the PP-plot, the graph should approximately resemble a straight line, and this holds true for the regression undertaken as shown in

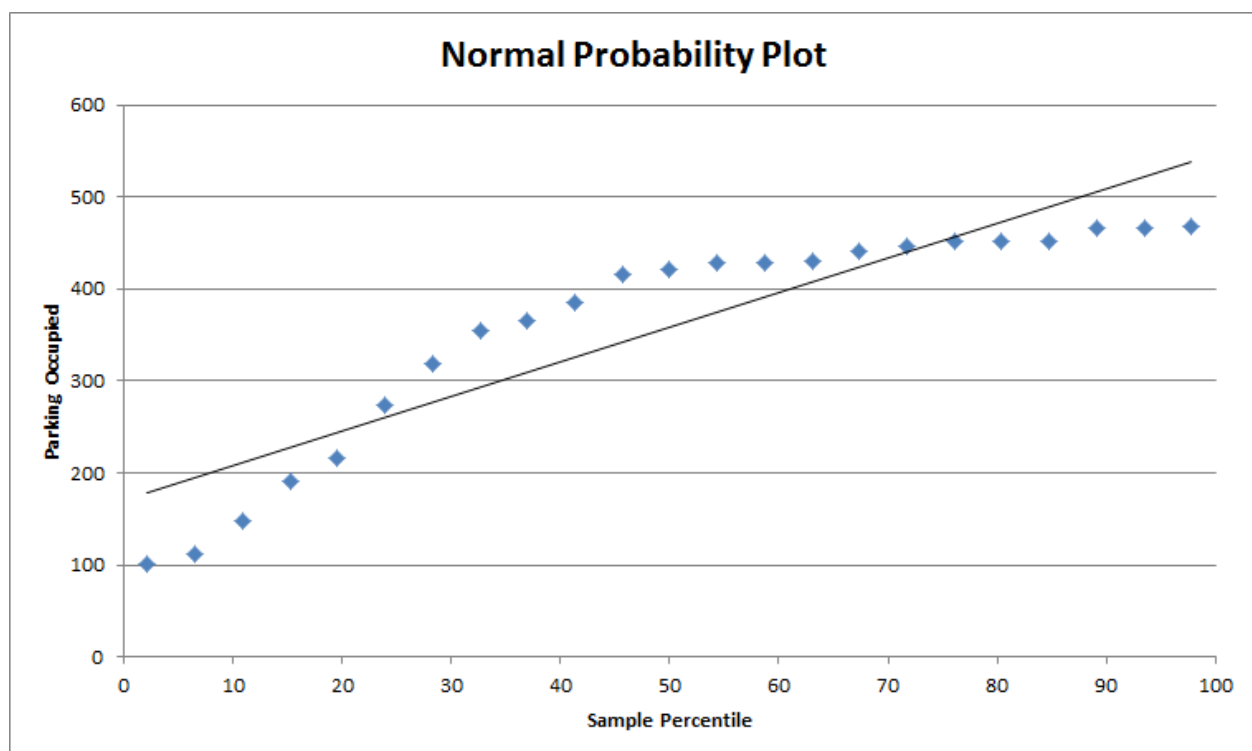


Figure 2 Normal Probability Plot for Regression Analysis

Overall the Parking Demand model is statistically significant and suggests a correlation between the peak parking demand, number of staff and the number of beds.