



Dubbo Health Service Redevelopment Stages 3&4

State Significant Development

Transport Assessment

Client // Health Infrastructure
Office // NSW
Reference // 16S1359000
Date // 22/02/17

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1. Introduction

1.1 Background

Health Infrastructure recently completed Stages 1&2 of the Dubbo Health Service (DHS) redevelopment, which included construction of new floor area covering approximately 9,575m². This included a new maternity ward, operating theatres, sterilising department and day surgery unit, together with refurbishment and demolition works.

A State Significant Development (SSD) Application for Dubbo Health Service Redevelopment Stage 3&4 will be lodged with the NSW Department of Planning and Environment (DP&E) to include a net increase of 5,200m², comprising the following:

- Stage 4 – Site preparation works
 - Demolition of George Hatch and Existing Nurses Administration
 - Demolition of Existing Surgical Ward ('S' Block)
 - New Construction – Temporary Corridor Bypass Link
 - New Construction – 1 x permanent corridor bypass link south.
- A new 3-storey clinical building comprising:
 - Ground Level
 - Medical Imaging
 - Emergency Department, including Short Stay Unit
 - A refurbished and expanded Main Entry.
 - Level 1
 - Renal Dialysis Unit
 - Ambulatory Care Services.
 - Level 2
 - 20 bed CCU/ Cardiovascular/ Stroke Unit
 - 12 bed ICU
 - Cardiovascular Suite.
 - Level 3 – Plant Area.
- Other associated works:
 - Expansion of on grade car parking facilities and improved access and wayfinding
 - Dedicated ambulance access off Myall Street
 - Amendments to the Cobbora Road roundabout to facilitate entry to the Hospital
 - Demolition of Playmates/ Doctors Accommodation
 - Demolition of external component of existing Ambulatory Care Unit
 - Landscaping including tree removal and other public domain works
 - Upgrades of related engineering services infrastructure supporting Stage 4
 - Refurbishment of the two ICU ensuites within the medical inpatient ward (G-ward).

TSA Management, on behalf of Health Infrastructure (HI) engaged GTA Consultants to provide traffic and transport input into the Stage 3&4 redevelopment as well as prepare the Transport Assessment as part of the SSD Application.

Funding for the upgrade in the order of \$150 million was announced by the NSW State Government in 2015, with planning works well underway to deliver improved health services to the people of Dubbo and Central West NSW.

1.2 Purpose of this Report

This report sets out an assessment of the anticipated transport conditions in the vicinity of DHS and provides strategic design advice to ensure an appropriate transport network. This includes consideration of the following:

- i a detailed review of the existing traffic and parking conditions within and surrounding the site
- ii provision of adequate parking supply to meet future demands
- iii traffic generation associated with future demands
- iv site accessibility
- v emergency services
- vi service vehicles and specific vehicle access requirements
- vii an identification of the transport related constraints and opportunities.

This study has also addressed the Secretary's Environmental Assessment Requirements (SEAR's) for the CASB (SSD 7720) issued on 15 July 2016. Section 5 of the SEAR's, sets out the transport and accessibility requirements, as detailed in Table 1.1.

Table 1.1: Secretary's Environmental Assessment Requirements (SEARs)

Project Phase	SEAR Description	Relevant Section
Transport and Accessibility	Include a transport and accessibility assessment which details, but is not limited to, the following:	
	The current daily and peak hour vehicle, public transport, pedestrian and bicycle movements and existing traffic and transport facilities provided on the road network located adjacent to the proposed development.	Section 2.3, 2.5, 2.10
	The existing and proposed pedestrian and bicycle routes and facilities within the vicinity of and surrounding the site and to public transport facilities as well as measures to maintain road and personal safety in line with CPTED principles.	Section 2.2, 2.11, 5.1, 5.2
	An estimate of the total daily and peak hour trips generated by the proposal, including vehicle, public transport, pedestrian and bicycle trips.	Section 6.2
	The impact of daily and peak (AM and PM) vehicle movements on nearby intersections, in particular on the Golden Highway and its intersections with Myall, Leonard and Caroline Streets and Mary McKillop Avenue, and consideration of the cumulative impacts from any other approved developments in the vicinity, and the need/associated funding for upgrading or road improvement works (if required), including traffic modelling and analysis.	Section 6.3, 6.4
	The assessment of the adequacy of existing public transport, pedestrian and cycle networks and infrastructure to meet the likely future demand of the proposed development.	Section 5
	Measures to promote travel choices that support sustainable travel, such as a location-specific sustainable travel plan, provision of end-of-trip facilities, green travel plans and wayfinding strategies.	Section 5.3.1
	Existing and proposed vehicular access arrangements, including pick-up/drop-off facilities, and measures to mitigate any associated traffic impacts and impacts on public transport, pedestrian and cycle networks.	Section 2.4, 3
	Proposed car and bicycle parking provisions for staff and visitors, including consideration of medium to long term access and parking issues and mitigation measures, availability of public transport and the requirements of the relevant parking codes and Australian Standards.	Section 4, 5.3
	Provision of end-of-trip facilities (i.e. showers, lockers, change rooms etc.) for the use of employees who choose to walk or cycle to/from work as well as undertake activities during work hours.	Section 5
	Ambulance, emergency vehicles (e.g. police and fire), service vehicle access, delivery and loading arrangements and estimated vehicle movements (including vehicle type and the likely arrival and departure times).	Section 3.6
	Traffic and transport impacts during construction, in particular on Myall Street, Mary McKillop Avenue and Cobbora Road, and how these impacts will be mitigated for any associated traffic, pedestrian, cyclists, parking and public transport and the cumulative impact of any nearby construction projects, including the preparation of a draft Construction Traffic Management Plan to demonstrate the proposed management of the impact.	Section 6.5
	Details of any works that may impact on the existing rail corridor, such as ground penetration works (e.g. excavation, piers/piles etc.) in consultation with the rail authority.	Section 2.9

1.3 References

In preparing this report, reference has been made to the following:

- an assessment of the site and its surrounds, including a detailed site inspection completed by GTA Consultants on 16 March 2016
- historical understanding of Armidale and its surrounds
- Dubbo Regional Council Local Environmental Plan (LEP) 2011
- Dubbo Regional Council Development Control Plan (DCP) 2013
- Australian Standard, Parking Facilities, Part 1: Off-Street Car Parking AS 2890.1:2004
- Australian Standard, Parking Facilities, Part 2: Off-Street Commercial Vehicle Facilities AS 2890.2:2002
- Australian Standard, Parking Facilities, Part 6: Off-Street Parking for People with Disabilities AS 2890.6:2009
- Roads and Maritime Services (Roads and Maritime) Guide to Traffic Generating Developments, 2002
- previous traffic engineering reports for Stages 1 and 2 redevelopment and Stages 3&4 Masterplan prepared by Cardno
- traffic surveys undertaken by GTA Consultants and RMS as referenced in the context of this report
- design plans prepared by HDR Rice Daubney, Drawing Number A10101, Revision 8, dated 18/11/16
- other documents and data as referenced in this report.

2. Existing Conditions

2.1 Site Location

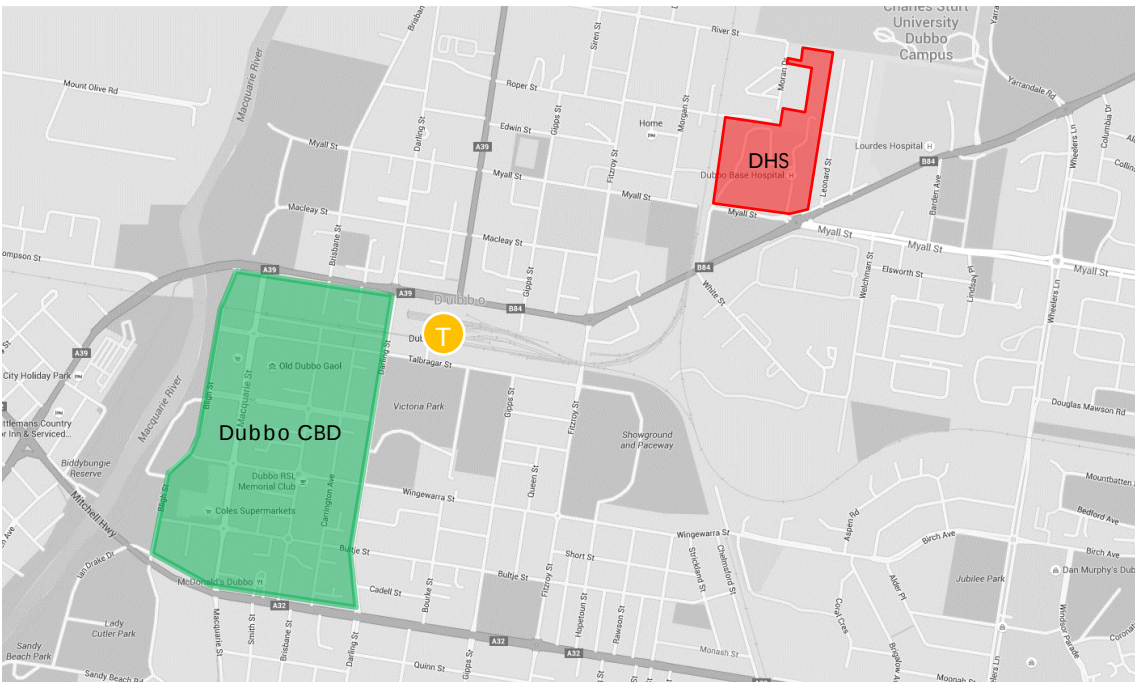
DHS is located within a health precinct site covering approximately 13.5ha, generally bounded by Myall Street and Cobbora Road to the south, the Coonamble Railway Line and Moran Drive to the west and River Street and Charles Sturt University to the north. Dubbo is located approximately 390km north-west of Sydney in Central West NSW.

The site is owned by the Western NSW Local Health District (WNSWLHD) and has a land use classification of *SP2 – Health Services Facility* under the Dubbo Regional Council LEP 2011. It comprises DHS along the southern (Myall Street) and eastern (McGuinn Drive) frontages, as well as Playmates Cottage Childcare Centre, Acacia Cottage, on-site accommodation for health student doctors, with educational facilities across the remainder of the site.

The site is located approximately 2km north-east of Dubbo CBD, and is primarily surrounded by low density residential dwellings, other medical services (such as Dubbo Private Hospital north of the site) and education facilities including Dubbo TAFE south of the site.

The location of the broader DHS site and its surrounding environs is shown in Figure 2.1, with the existing layout shown in Figure 2.2.

Figure 2.1: Subject Site Location and Context



Basemap source: Google Maps

Figure 2.2: DHS Precinct and Surrounds



Basemap source: Nearmap

2.2 Hospital Facilities

DHS is a 314-bed facility providing health-based services across several different buildings. The main entry, administration areas and ED is located in the south-east corner of the precinct, with the primary vehicle access via the Cobbora Road/ Myall Street roundabout.

Other services, including mental health, renal and oncology et al are located within the precinct with access via the internal roads, with allocated parking area provided close to select facilities, and where required.

It is understood that DHS currently employs 715 staff with a maximum daytime staff of approximately 80% of FTE staff. This equates to a maximum of 580 FTE staff on-site during the daytime shift.

2.3 Road Network

2.3.1 Adjoining and Surrounding Roads

Golden Highway (Cobbora Road)

The Golden Highway (Cobbora Road) is a State Highway and provides the key connection between the site and Dubbo CBD, as well as strategic connections to Newcastle and Hunter to the east. It is aligned in a northeast-southwest direction the vicinity of the site and generally provides one traffic lane in each direction. Separated carriageways provide two traffic lanes in each direction at the roundabout controlled intersection of Cobbora Road/ Myall Street and west of the Coonamble railway line.

Parking on the shoulder is generally prohibited on both sides of Cobbora Road, although angled parking associated with the TAFE to the south is located on the southern side with access via a service road.

Myall Street

Myall Street is a local road and provides local access to DHS west of Cobbora Road and to large residential areas to the east. It is aligned in an east-west direction and traverses the Coonamble railway line further west. Continuous vehicular access over the railway line is not provided, with pedestrian access only. Myall Street provides one traffic lane in each direction west of the Cobbora Road roundabout, with traffic and parking demand almost wholly related to the hospital. There is little reason for vehicles unrelated to the hospital to be in the area.

Parallel and angled kerbside parking is provided on both sides of the carriageway adjacent to the hospital.

McGuinn Drive/ Internal Roads

McGuinn Drive forms the main entrance to DHS and its associated car parking areas, as well as connecting to the internal roads circulating through the precinct. It is aligned in a north-south direction with one traffic lane in each direction.

Other Roads

Other roads within the vicinity of the site include:

- Mary Mackillop Drive runs north-south along the Coonamble Railway Line and connects the western end of Myall Street with Cobbora Road to the south. It facilitates left turns only at Cobbora Road.
- Muller Street runs east-west north of the site and typically facilitates access to the surrounding land uses and for a low level of informal access to/ from the west.
- Moran Drive runs in a north-south direction north of the site and also provides informal access to the hospital to/ from the north. It connects with River Street and in combination provide access to other health precinct facilities in the vicinity.

These local area roads are shown in Figure 2.3 to Figure 2.6.

Figure 2.3: Myall Street (looking west)



Figure 2.4: McGuinn Drive (looking south)



Figure 2.5: McGuinn Drive/ Myall Street (looking to Cobbora Road Roundabout)



Figure 2.6: Mary Mackillop Drive (looking south)



2.3.2 Surrounding Intersections

The following key intersections currently exist in the vicinity of the site:

- Cobbora Road/ Myall Street (roundabout)
- Myall Street/ McGuinn Drive (priority controlled)
- Myall Street/ Mary Mackillop Drive/ Internal Road (priority controlled)
- Cobbora Road/ Mary Mackillop Drive/ White Street (priority controlled, left-in/ left-out).

2.4 Hospital Access

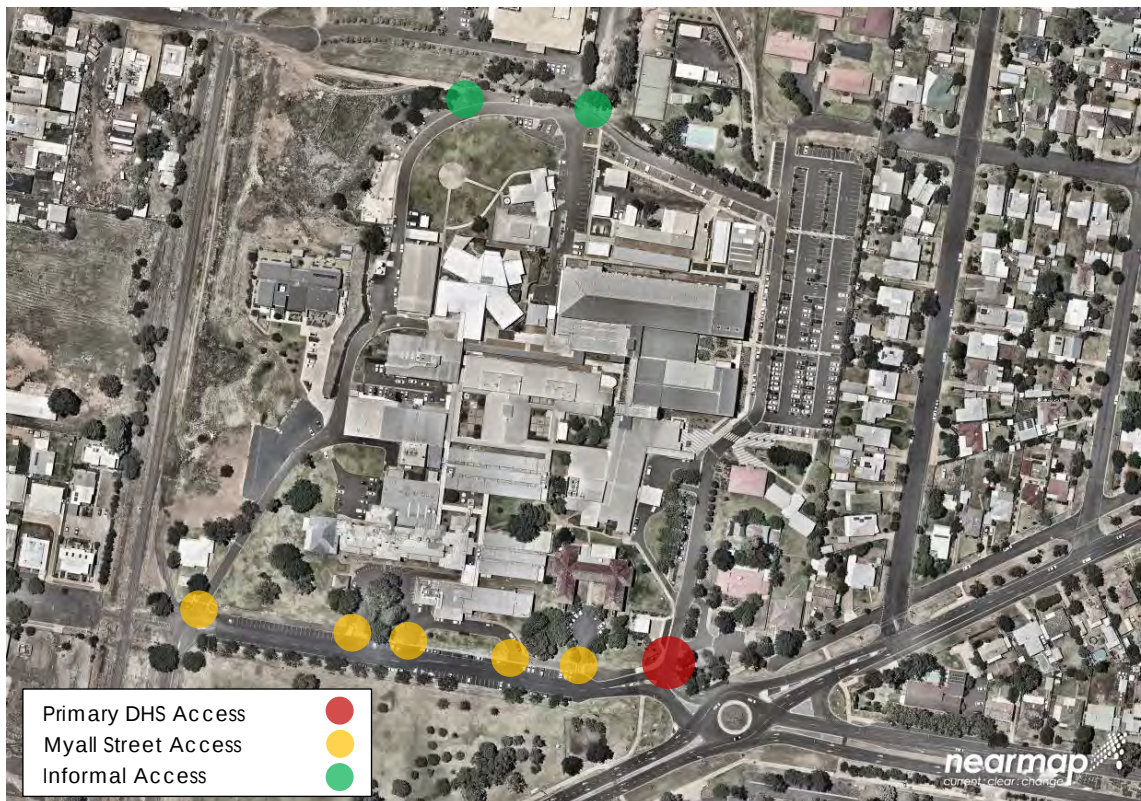
The site is currently provided vehicular access at several locations along Myall Street with the primary access close to the Cobbora Road roundabout and via McGuinn Drive. This provides convenient access to the arterial road network, with the key main entrance, ED and majority of visitor/ staff car parking areas making use of this access.

Other car parking areas are also accessed via dedicated driveways along Myall Street. The internal road loops through the precinct to the north and west to intersect with the western end of Myall Street, adjacent to the railway line.

As discussed, the internal road also facilitates two informal accesses along the northern edge of the precinct. These accesses are unsealed and not intended for regular vehicle use. On-site observations and discussions confirm that these accesses are currently primarily used by staff, site maintenance vehicles, delivery vehicles and taxis that tend to make use of them as shortcuts.

The vehicular access locations are shown in Figure 2.7 with the main access detailed in Figure 2.8. Other access locations are also shown in Figure 2.9 and Figure 2.10.

Figure 2.7: Existing Vehicular Access Locations



Basemap Source: Nearmap

Figure 2.8: Cobbora Road/ Myall Street Roundabout and McGuinn Drive



Image Source: Nearmap

Figure 2.9: Informal Access via Muller Street



Figure 2.10: Myall Street Access



2.5 Traffic Volumes

Traffic surveys were completed at the key access locations at the southern end and internal along the northern extents on Wednesday 16 March 2016 during the peak afternoon period. In addition, traffic surveys of the roundabout controlled intersection of Cobbora Road/ Myall Street were also completed in early December 2015.

An overview of the on-site traffic movements and site generation characteristics is below, with the existing traffic at the key roundabout shown in Figure 2.11.

Main DHS Access

- The main access generates up to 220 two-way vehicle movements during the peak hour ending 5:00pm.
- The peak exit time between approximately 3:30pm and 5:30pm results in more than 160 vehicles exiting in the peak hour.
- The arrival profile is more constant and peaked at 60 vehicles in the peak hour ending 3:45pm.
- Minor queuing occurred back from the adjacent roundabout during the peak exit period however this did not present any noticeable traffic related impacts.
- Myall Street carries up to 110 two-way vehicle movements in any peak hour at its eastern end.

Eastern DHS Access

- The eastern access generates up to 100 two-way vehicle movements during the peak hour ending 4:00pm with a 40:60 entry to exit split.
- The access is generally moderately used and experiences no traffic related constraints.
- Myall Street carries up to 100 two-way vehicle movements in any peak hour at its eastern end.
- The road linking with Cobbora Road further to the south carries low traffic volumes in the order of 50 two-way vehicle movements in any peak hour.

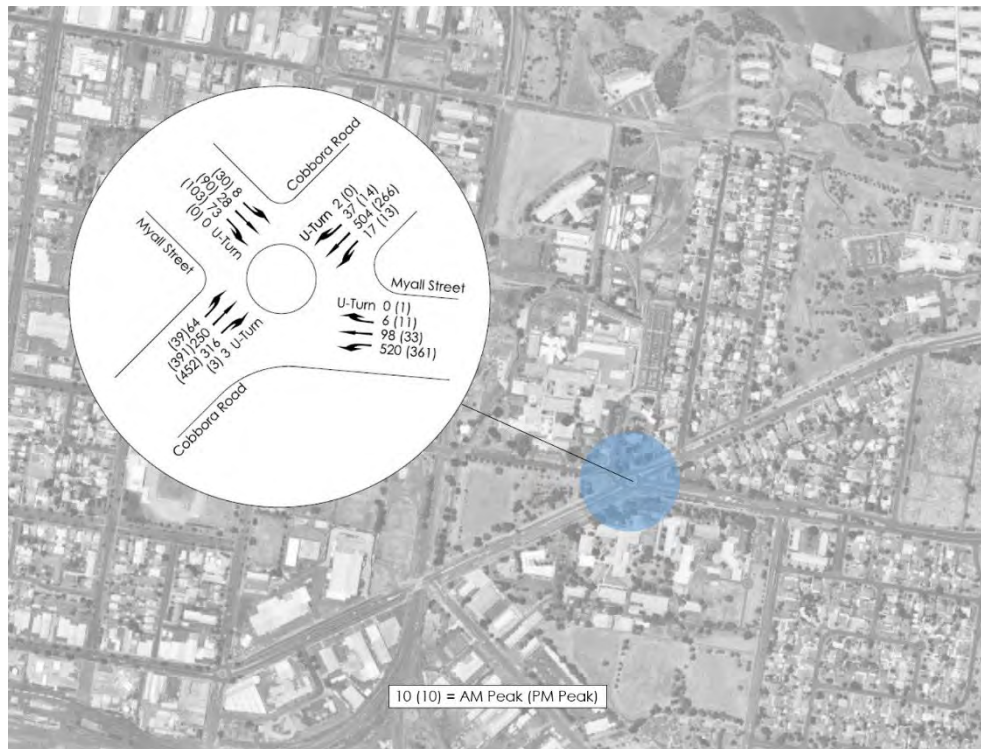
Northern Informal DHS Accesses

- The northern informal access generates minor activity, with approximately 25 two-way vehicle movements during the peak hour to 4:00pm.
- The access is informal and infrequently used.

In total, it is estimated that DHS currently generates up to 350 two-way vehicle trips during the weekday afternoon peak hour. The main access and public interface is via the roundabout

controlled intersection of Cobbora Road/ Myall Street. This intersection has been surveyed and the modelling results included in the following section.

Figure 2.11: Existing Weekday AM / PM Peak Hour Traffic Volumes



2.6 Intersection Operation

The operation of the key roundabout controlled intersection that carries the majority of DHS traffic has been assessed using SIDRA INTERSECTION¹, a computer based modelling package which calculates intersection performance.

The commonly used measure of intersection performance, as defined by Roads and Maritime, is vehicle delay. SIDRA INTERSECTION determines the average delay that vehicles encounter and provides a measure of the level of service.

Table 2.1 shows the criteria that SIDRA INTERSECTION adopts in assessing the level of service.

¹ Program used under license from Akcelik & Associates Pty Ltd.

Table 2.1: SIDRA INTERSECTION Level of Service Criteria

Level of Service (LOS)	Average Delay per vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Sign
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Near capacity	Near capacity, accident study required
E	57 to 70	At capacity, at signals incidents will cause excessive delays	At capacity, requires other control mode
F	Greater than 70	Extra capacity required	Extreme delay, major treatment required

Table 2.2 presents a summary of the existing operation of the intersection, with full results presented in Appendix B of this report.

Table 2.2: Existing Operating Conditions

Intersection	Peak	Leg	Road	Degree of Saturation (DOS) [1]	Average Delay (sec)	95th Percentile Queue (m)	Level of Service (LOS)
Cobbora Road/ Myall Street (roundabout)	AM	South-East	Myall Street	0.19	15	6	B
		East	Cobbora Road	0.39	13	17	A
		North	Myall Street	0.12	9	3	A
		West	Cobbora Road	0.23	12	10	A
	PM	South-East	Myall Street	0.07	13	2	A
		East	Cobbora Road	0.24	14	10	A
		North	Myall Street	0.21	9	6	A
		West	Cobbora Road	0.29	11	14	A

[1] A measure of how much demand an intersection is experiencing compared to the total capacity. Also known as the volume/capacity ratio where $v/c > 1.0$ represents oversaturated conditions.

Note: entries in bold indicate parameters relating to the worst performing turning movement, which for unsignalised intersections is taken to represent the operation of the overall intersection

On the basis of the above assessment, it is clear that the roundabout controlled intersection of Cobbora Road/ Myall Street currently operates well with minimal queues and delays on all approaches.

2.7 Car Parking

2.7.1 Supply

DHS has available a mix of on-site spaces as well as on-street parking within close proximity. A total of 480 parking spaces are provided on-site, with 393 of these spaces being formally marked and 87 being informal and/ or located in back-of-house areas. In addition, practical use of 134 on-street spaces are located along Myall Street and Mary Mackillop Drive, and known to wholly provide for Hospital overflow/ staff parking demand.

The breakdown of these spaces is as follows:

- 338 spaces for staff/ visitor use (some time-restricted)
- 22 disabled spaces
- 10 emergency short-stay spaces

- 23 spaces reserved for special uses (ambulances, police, patient transport, security and maintenance etc.)
- 92 on-street spaces on Myall Street
- 42 on-street spaces on Mary Mackillop Drive
- 87 spaces informally used as parking within the site (located on road verges, unsealed areas, back-of-house etc.).

These parking areas are shown in Figure 2.12 with the existing formal and informal car parking areas and usage rates shown in Figure 2.13 and Figure 2.14.

Figure 2.12: DHS Car Parking Areas



Basemap Source: Nearmap

Figure 2.13: Formal DHS Car Park



Figure 2.14: Overflow Informal DHS Parking



2.7.2 Parking Demand

On-Site and Adjacent Streets

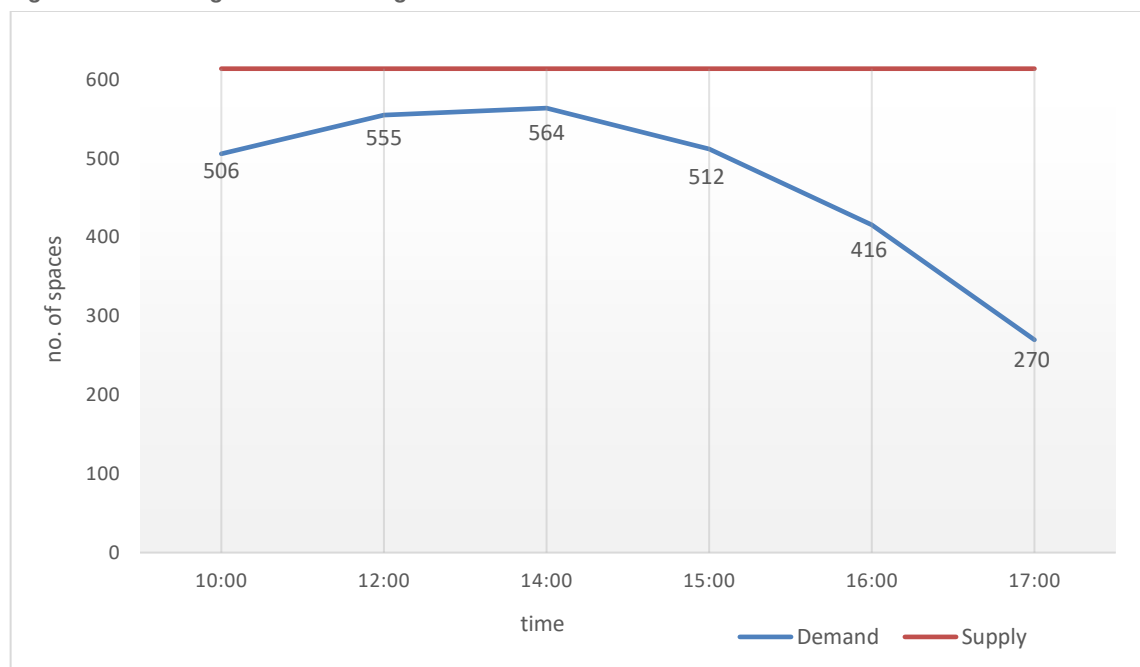
Parking demand surveys were completed throughout on Wednesday 16 March 2016 between 10:00am and 5:00pm to ensure all peak demand periods were adequately identified.

The results of these parking demand surveys are summarised in Table 2.3 and shown graphically in Figure 2.15.

Table 2.3: Existing On-Site and On-Street Car Parking Demand

Time	Parking Type						Total
	General	Disabled	Short-Stay	Special Use	On-Street	Informal	
10:00am	288	19	8	8	111	72	506
12:00pm	325	13	10	9	116	82	555
2:00pm	324	14	10	13	118	85	564
3:00pm	311	12	8	10	101	70	512
4:00pm	260	13	8	13	64	58	416
5:00pm	179	11	8	13	39	20	270
Peak Demand	96%	64%	100%	57%	88%	98%	92%
Supply	338	22	10	23	134	87	614

Figure 2.15: Existing Precinct Parking Demand



The parking demand surveys concluded that the hospital and adjacent streets generally experience high demand for car parking during the middle of the day. Similar high demand generally remains until 3:00pm where day shift staff begin to leave.

Peak parking demand across the surveyed areas occurred at 2:00pm with 92% capacity (50 spare spaces). It is also noted that the majority of the vacant spaces were observed to be those reserved for special uses, and as such not generally available for use by staff and/ or the general public.

While parking demand is generally high, there does not appear to be overflow effects on the surrounding residential areas, including those to the east. DHS generally stands alone and

therefore has little competing parking demands. While some of the immediate surrounding streets are at capacity, this does not impact other users nor the function/ safety of the area.

Broader Precinct

In addition to the formal car parking demand surveys, observations were made of the nearby car parking areas and streets in walking distance of the DHS site. These locations included:

- the Playmates child care centre car park
- Acacia Cottage
- Neami National mental health facility
- on-street on Cobbora Road and Leonard Street.

This includes the following observations:

- the Playmates centre car park generally has consistently high parking demand throughout the day (likely attributed to childcare staff)
- both Acacia Cottage and the mental health facility experienced moderate parking demand
- a small number of vehicles were observed to be parked kerbside on Cobbora Road (east of Myall Street) and Leonard Street, however demand was low and mostly unrelated to the hospital.

Summary of Parking Demand

Based on the above, and noting that parking demand is generally contained within DHS and throughout the immediate surrounds, a maximum of 570 DHS associated vehicles are parked during the busiest peak period. With an existing 28,583m², this equates to an existing demand of up to two spaces per 100m².

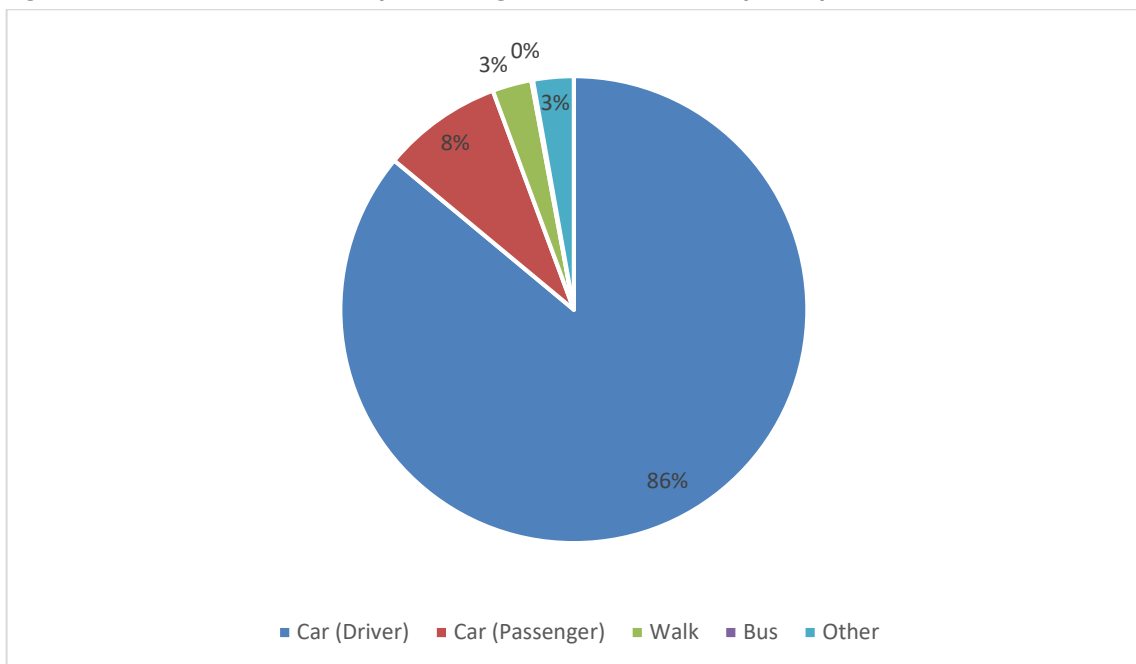
Existing car parking provision within the site was observed to be highly utilised and either at, or approaching capacity at most locations during the peak periods.

2.8 Travel Modes

2.8.1 ABS Census Data

In order to consider existing travel behaviour for people working in the area, consideration has been given to the Australian Bureau of Statistics (ABS) Journey to Work data from the 2011 Census. The smallest geographical area for the JTW data is available is a Travel Zone (TZ). The 2011 ABS JTW data for people working in TZ7486 (incorporating the DHS site) is shown in Figure 2.16.

Figure 2.16: 2011 JTW Data for People Working in North-East Dubbo (TZ7486)



The JTW data indicates that private vehicle is the predominant mode of transport for people working in this TZ, with nearly 95% of people either driving or travelling as a passenger. Other modes include walking, with a small number travelling by bus. It is of note that cycling was not given as a mode of travel by any respondents.

These results indicate that the hospital is highly dependent on travel by private car, and consequently parking, to facilitate access to the area. These findings and outcomes are typical of a site located on the periphery of a regional centre such as Dubbo.

2.8.2 Staff Journey to Work Survey

To further understand DHS staff travel behaviour, an online staff questionnaire was distributed to seek feedback on transport and parking related matters within and surrounding the hospital.

A total of 357 responses were received with the results collated and analysed by GTA, as shown in Table 2.4.

The staff survey showed that 96% of staff surveyed travel to DHS by car. Of these, 92% drove alone and 4% had at least one passenger and equates to an average car occupancy of 1.1 people.

Table 2.4: Staff Travel Mode Choice

Travel Mode	Number of Staff	% of Staff
Drive alone	327	92%
Drive with passenger(s)	15	4%
As a car passenger	3	<1%
Motorbike	4	1%
Bus	0	0%
Bicycle	1	<1%
Walk	3	<1%
Taxi	1	<1%
Other	3	<1%

Other key staff survey results include the following:

- 65% of respondents parked on DHS grounds
- travel distance and convenience accounted for 67% (40% travel distance, 27% convenience) of respondents as the main reason for their choice of transport
- 50% of respondents spend less than 10 minutes traveling to/ from work.

2.9 Stakeholder Consultation

Stakeholder consultation has been ongoing throughout all stages of the project to ensure understanding of the key traffic and transport and design matters, together with impacts on the Coonamble Railway Line west of the hospital.

The key stakeholders are Dubbo Regional Council, Roads and Maritime and Australian Rail Track Corporation (ARTC). The extent of consultation has included email correspondence and phone discussions regarding the transport related impacts, in particular:

- Masterplanning and the need for whole of site assessment
- hospital accesses, configuration and locations
- traffic generation, both existing and future
- parking provision and ensuring design is compliant with relevant guidelines
- emergency services provision and access arrangements
- Myall Street and Cobbora Road roundabout modifications, including the realignment of the hospital access
- Myall Street designation
- road network impacts and modelling
- intersection operation and improvements to the main roundabout configuration
- Council strategic planning and any such impacts on the railway line
- transport outcomes and areas to address as they relate to Stage 1&2.

Overall, the key stakeholders are generally accepting of the Stage 3&4 redevelopment, noting that transparency with the intended outcomes of all redevelopment stages is very much key to ensuring adequate outcomes over the longer term. Mention has been made with respect to traffic related impacts and the operation of the roundabout controlled intersection of Cobbora Road/ Myall Street which currently does, and will continue to serve as the primary approach and departure route for DHS traffic.

Myall Street purpose and designation has been raised by Council. Earlier strategic planning has pointed to a theoretical at-grade crossing of the Coonamble Railway Line west of the hospital. It has been regularly communicated that the function of Myall Street is not proposed to change form that of a local access road with DHS being the dominant user between Cobbora Road and

the railway line. The proposed minor realignment would not alter this function, and would likely improve traffic operations close to the Cobbora Road roundabout. Opening Myall Street to through traffic across the railway line thereby modifying its hierarchy is not a desirable outcome, especially considering the importance of maintaining the operation of the roundabout and prioritising emergency vehicle access.

Discussion with Timothy Wilson, Senior Project Development Manager, Roads and Maritime (Wagga Wagga) included authorisation for use of traffic data collected as part of the New Dubbo Bridge project. Roads and Maritime has no initial concerns from a major projects perspective as it relates to the minor impacts on the State road network. Direct discussion and email correspondence with Andrew McIntyre (Development Assessment Officer, Roads and Maritime, Parkes) has been unsuccessful to date.

Consultation has also been ongoing with Dennis Valentine, Traffic Engineer, Dubbo Regional Council. This has included email correspondence in May and June 2016 and discussions throughout October/ November 2016. Several traffic and transport aspects have been discussed, and while no major concerns have been raised, the following matters were discussed:

- road network implications and how the modifications impact broader traffic planning
- Myall Street being part of Council's strategic plan which flagged potential as a future east-west at-grade connection across the railway line
- dedication of Myall Street to DHS flagged by Council as a possible alternative
- indication made that RMS may widen all of Cobbora Road to four traffic lanes in the future (this would present no impact on the proposed modifications to the roundabout given Cobbora Road provides two traffic lanes in each direction through the roundabout itself).

ARTC phone discussions confirm no real implications on ARTC rail assets. A formal written response is pending however Michael Irons, Property Manager, ARTC Wagga Wagga stated that a state-wide directive is in place that prohibits approval of any new at-grade crossings of any railway line at any time. The DHS redevelopment poses no other obvious impacts on ARTC assets.

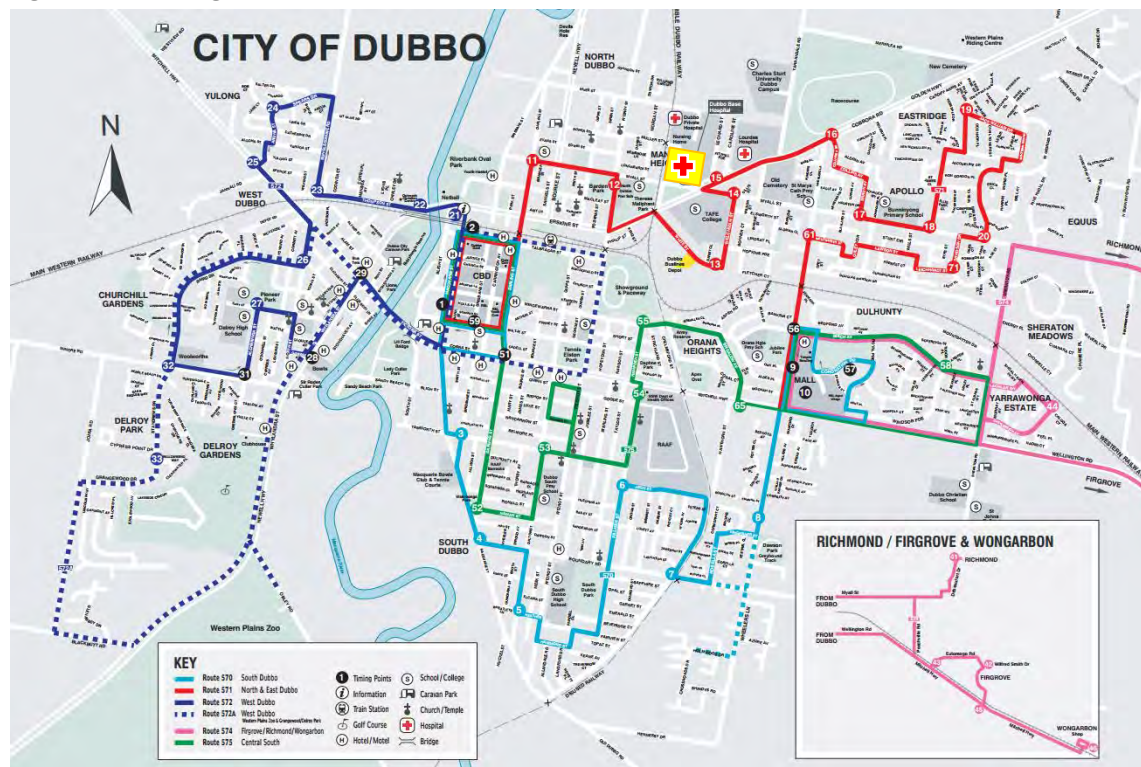
2.10 Public Transport

A review of the public transport available in the vicinity of the site is summarised in Table 2.5. The site is relatively poorly serviced by one local bus route, together with a stop on the intercity Dubbo-Narromine route.

Table 2.5: Public Transport Provision

Service	Route #	Route Description	Location of Stop	Distance to Nearest Stop	Frequency On/Off Peak
Bus	571	North and East (CBD-Orana Mall)	Cobbora Road, near Leonard Street	250m	30 minutes peak 90 minutes off peak
Bus	N2850	Dubbo-Narromine	Cobbora Road, near Myall Street	200m	One service each way per day

Figure 2.17: Existing Bus Routes



Map Source: Dubbo Buses

The site is also located approximately 1.6km east Dubbo Railway Station, located on the Western Line. NSW TrainLink operates a daily service from Sydney to Dubbo and back, stopping at regional centres including Orange, Bathurst, Lithgow and onto Sydney.

2.11 Pedestrian and Cycle Infrastructure

The site is well connected to the surrounding pedestrian footpath network. Footpaths are provided from the main pedestrian entrance to the existing ED, which connect to existing paths on Myall Street and Cobbora Road. Internal footpaths connecting the hospital to the main car parking area are also provided, with a marked pedestrian crossing on McGuinn Drive. Pedestrian connectivity and amenity in the western section is less well developed.

Formal cycle facilities are generally limited in the vicinity of the site, with connectivity facilitated by way of wide kerbside parking lanes on Cobbora Road. A shared path is also provided within Theresa Maliphant Park to the south of the site.

A covered bicycle parking area is provided within the hospital grounds, to the south of the existing oncology building. This area provides parking for up to 16 bicycles, and by way of fixed loops within the ground, as shown in Figure 2.18 to Figure 2.22. Site observations confirm that existing demand for bicycle parking is low and consistent with the findings of the travel mode survey information discussed in Section 2.8.2.

Figure 2.18: Formal Bicycle Parking



Figure 2.19: Formal Pedestrian Facilities



Figure 2.20: Marked Pedestrian Crossing



Figure 2.21: Myall Street



Figure 2.22: Forecourt Public Domain



The proposed Dubbo Health Service Stage 4 works incorporate the Stages 3&4 SSD works and follows on from Stage 1&2 which was opened in late 2015.

- Front-of-house
- Emergency Department
- Medical imaging
- Renal Dialysis Unit
- Ambulatory Care Unit
- ICU/Coronary Care/Cardiovascular Suite.

A visualisation of the main front entrance is also shown in Figure 3.2.

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Figure 3.2: Main Entrance Visualisation



Source: HDR | RD

3.2 Vehicle Access and Forecourt

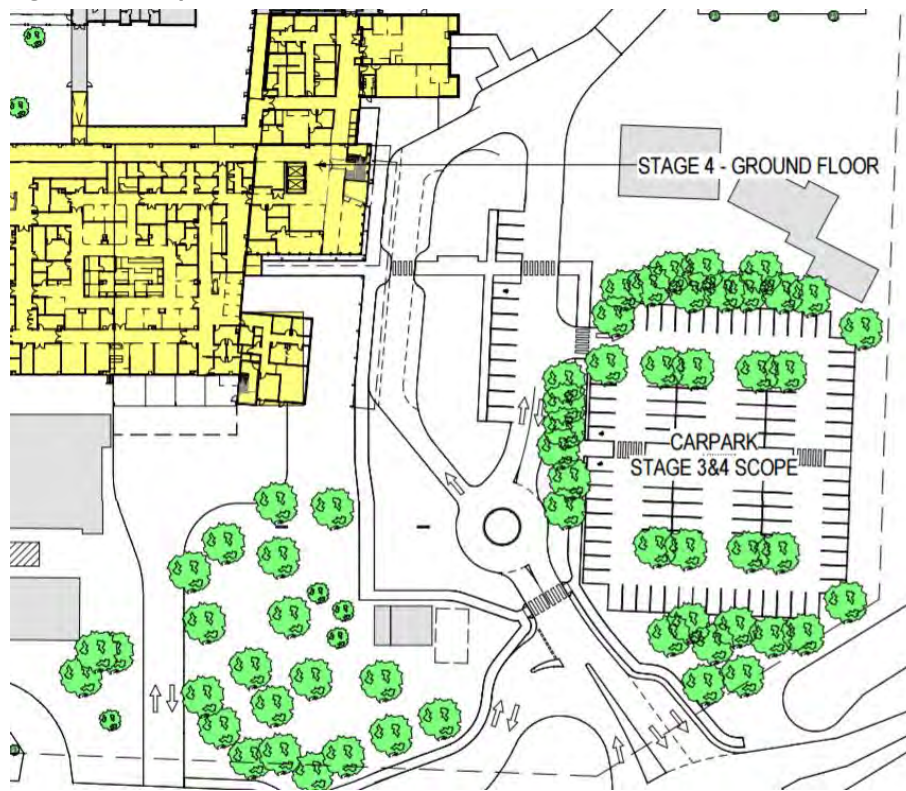
The forecourt design includes significant reconfiguration of the ED access arrangements, set-down/ pick-up area and Myall Street alignment via the Cobbora Road roundabout. In combination, the layout will significantly improve the user experience and the way the hospital interfaces with the surrounding road network. Safety for all users and the operation of the Cobbora Road/ Myall Street roundabout are paramount.

The proposed internal road layout, forecourt and car parking is illustrated in Figure 3.3.

The layout will better delineate McGuinn Drive as the primary entrance to the hospital and provide for a direct vehicle link to the ED as well as the main existing car park to the north.

The need for separate ED access necessitates the removal of the existing 11 DHS fleet vehicle parking and access driveway fronting the George Hatch building.

Figure 3.3: Proposed Forecourt and ED



Source: HDR Rice Daubney, Site Setout Plans, Location and Site Plan (A 10004 Revision 5, 18/11/16)

3.3 Car Parking

On-site car parking is proposed in an at-grade car park opposite and east of the main entrance. This comprises a 105 space car park to be located east of McGuinn Drive, in the current location of the Playmates childcare centre, plus 12 spaces perpendicular to McGuinn Drive (to replace the existing 10 spaces).

In all, a total provision of 107 car spaces for use by the visitors and staff is feasible. Short-stay and set-down/ pick-up spaces, together with dedicated parking, including fire appliance, on-call doctors, etc. have been considered and will be essential adjacent to the main entrance. Spaces for the dedicated use by DHS fleet vehicles will also be required within the DHS precinct to replace those lost as part of the Stage 3&4 redevelopment.

The configuration allows for efficient access to the new main entrance, with all vehicles able to access the forecourt area and circulate back to exit the hospital or to park in the car park. The internal road layout, including an internal fully mountable roundabout will allow for easy circulation and vehicles to complete the 'loop' back to the forecourt to pick-up patients etc.

Access to the ED will be clearly defined and well separated from the general public areas and appropriate for secure and dedicated emergency vehicle access. All ambulances are able to enter via Myall Street and reverse into the dedicated ambulance bays that have been designed for the standard Ambulance Service of NSW (ASNSW) bariatric vehicle and in strict accordance with ASNSW specifications. Additional capacity for other emergency services (Police etc.) is also accounted for.

3.4 Key Transport Provisions

The key transport features of the Stage 3&4 redevelopment include:

- dedicated ambulance parking/ drop-off area accommodating four ambulances, provided separately to the public set-down/ pick-up area, allowing ambulances to reverse directly up to the ED door
- provision for police vehicles in a dedicated area within the ED
- set-down/ pick-up for use by the general public as part of a reconfigured front entrance
- short-stay and specific user parking (visiting GP's, on-call Doctor, specialist services etc.) provided along McGuinn Drive close to the new front entrance
- internal roundabout along McGuinn Drive to provide formal and easy access for all vehicles, including infrequent access by coaches and fire appliance vehicles
- road layout allows for vehicles to easily recirculate when dropping-off or picking-up passengers
- Myall Street and McGuinn Drive realigned to formalise traffic movements while improving the 'user experience'
- Cobbora Road/ Myall Street roundabout redesigned to provide a more typical layout
- Myall Street realigned to improve safety and separate traffic, with a direct route to the main entrance and at-grade parking
- pedestrian footpaths to better connect DHS with surrounding facilities, including Cobbora Road bus stops
- formal zebra crossings located on pedestrian desire lines and to link parking areas with the front entrance
- bicycle parking facilities for visitors as part of the main entrance public domain areas.

The design strives to provide suitable access for all users while segregating different user types as much as practical. The separation of ambulances from the general public is a key requirement and one that provides a distinct advantage over existing layouts. The design of the ambulance ED is fully compliant with ASNSW design requirements, with independent access to each ambulance bay and minimum height clearance requirements provided under the awning.

It is recommended that appropriate wayfinding signage be implemented to ensure all users, particularly drivers of private vehicles and ambulances are directed to the correct access locations.

3.5 Cobbora Road/ Myall Street Roundabout

It is proposed to realign and reconfigure the north-west leg of the Cobbora Road/ Myall Street roundabout as part of the Stage 3&4 redevelopment. The existing alignment, as discussed in Section 2.4, presents some operational issues due to the close proximity of the Myall Street/ McGuinn Drive intersection to the Cobbora Road roundabout. While these are not considered a major safety concern, nor present unnecessary delay, the alignment is inefficient and not of a design that meets current standards.

The realignment also better facilitates the separation of ambulances from the general public, leading to improved emergency services provision, reducing conflicts and minimising wait times.

A concept layout of the reconfigured intersection is illustrated in Figure 3.4, which shows the Myall Street/ McGuinn Drive intersection relocated further north, creating greater separation from the Cobbora Road roundabout.

Figure 3.4: McGuinn Drive and Myall Street Layout



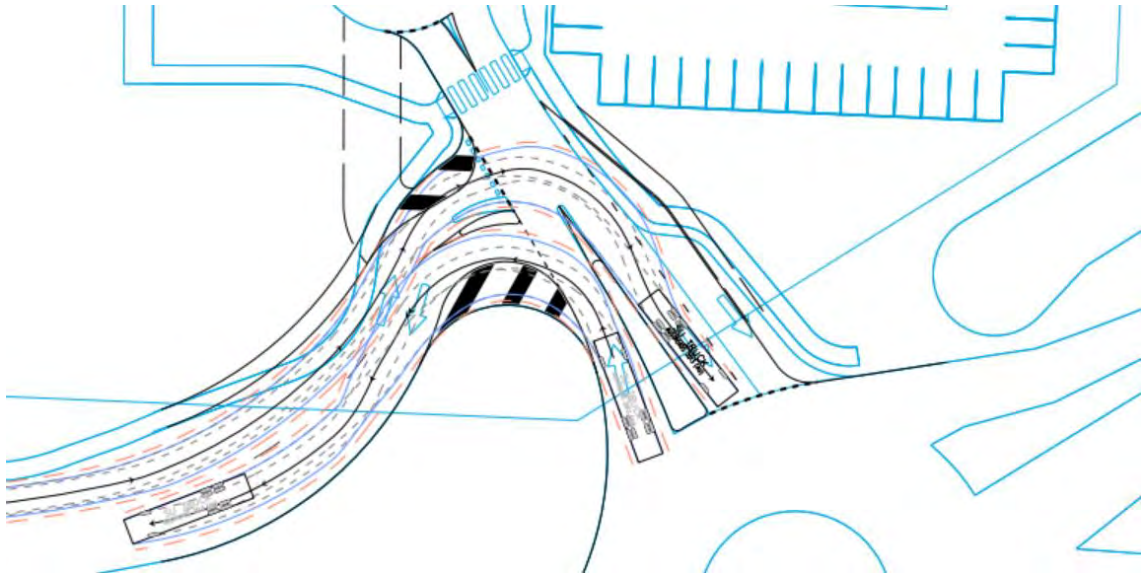
Source: HDR Rice Daubney, Site Setout Plans, Location and Site Plan (A 10004 Revision 5, 18/11/16)

The proposed reconfiguration has the following benefits with respect to day-to-day operations and safety within the main entrance:

- Further separation between the roundabout and the Myall Street intersection improves safety and performance, as vehicles turning right out of Myall Street will be less affected by any such queuing from the roundabout.
- The layout separates the ambulance ED and public set-down/ pick-up area. The main entrance and access to car parking areas are to be maintained for public use, while ambulances are provided with a separate dedicated access via Myall Street.
- The layout promotes one-way circulation within the main entrance 'loop', improving functionality and safety for all users.

The proposed layout is therefore expected to improve operations of the roundabout and the DHS main entrance. Provision of a single lane with a 30m left-turn slip lane for exiting vehicles on approach to the Cobbora Road roundabout can also be achieved, as illustrated in Figure 3.5.

Figure 3.5: Proposed Road Realignment and Layout



3.6 Service Vehicle Access

The Stage 3&4 redevelopment is not expected to require the relocation of any existing service bays within the hospital, with these primarily being located to the north and west of the Stage 3&4 redevelopment area.

The reconfigured Myall Street leg of the Cobbara Road roundabout has been designed to ensure provision for existing service vehicle requirements is maintained. Swept path assessments demonstrate that the proposed arrangement can adequately accommodate vehicles up to and including 12.5m Heavy Rigid Vehicles.

Access to on-site kiosk substation and other services will continue to be via the western loop road, wherever feasible.

4. Car Parking

4.1 Car Parking Requirements

The car parking requirements for public hospital precincts such as Dubbo are typically assessed through a combination of contributing factors that provide confidence in how particular precincts function and what their individual demand profiles look like.

This section outlines the various options for determining suitable car parking requirements for this site and is based on a combination of the following:

- increase in Gross Floor Area (GFA)
- staffing levels
- existing demand profiles
- staff travel mode choice
- Council's DCP
- RMS Guide to Traffic Generating Developments (2002).

4.1.1 Increase in Gross Floor Area

The total floor area incorporated within the Stage 3&4 redevelopment is 8,635m² GFA, with 5,560m² to be demolished. This equates to a net increase of 5,200m² GFA.

Conservatively assuming that 90% of the additional GFA will actually generate a demand for parking, and adopting the same rate as the existing parking demand of 570 spaces (2 spaces per 100m², refer Section 2.7.2), the future additional parking demand is expected to be 94 spaces.

Such an approach is generally considered appropriate and recognises that not all future additional floor area would generate demand for parking (e.g. larger space provisions for activities that currently occur in smaller spaces, additional ancillary areas such as entrance foyers etc.).

A detailed GFA based parking demand assessment has been completed and is detailed in Table 4.1. This conservative approach has assumed that all 5,200m² will generate parking demand. Application of this results in the need to provide 104 on-site car spaces for the intended uses.

Table 4.1: GFA Based Parking Demand Staging Assessment

	GFA at Commencement	New (GFA) SOA V13	Demolish (GFA)	Total (GFA)	Net Change (GFA)	Peak Parking Demand	Space/ 100m2 GFA
Existing							
Existing	28,583			28,583	0	570	2.0
Stage 3							
Surgical Inpatient Unit (34 additional beds and relocation of 24 beds)		1,260		29,843	1,260		0.0
Expansion of Oncology		865		30,708	2,125		0.0
Relocation of Offices, Medical Records, Admin & Education				30,708	2,125		0.0
Completion of Stage 3	28,583	2,125	0	30,708	2,125	612	2
Stage 4							
Demolish George Hatch & Nurses Admin			1,882	28,826	243		0.0
Demolish Surgical IPU (S Block) and Day Surgery			1,563	27,263	-1,320		0.0
New Medical Imaging		1,249		28,512	-71		0.0
Demolish existing Medical Imaging and ED etc.			1,543	26,969	-1,614		
Demolish existing Playmates and Doctors Accom.			571	26,398	-2,185		0.0
New Ambulatory Care		1,776		28,174	-409		0.0
New ED		1,493		29,667	1,084		0.0
Cardiac Catheterisation Laboratory		442		30,109	1,526		0.0
Cardiac/ Stroke Unit		948		31,057	2,474		0.0
Renal Dialysis		626		31,683	3,100		
New ICU/ HDU		1,086		32,769	4,186		0.0
New ED Short-Stay Unit		256		33,025	4,442		0.0
New Front of House		759		33,784	5,201		0.0
Completion of Stage 4	30,708	8,635	5,559	33,784	5,201	674	2
Stage 3 & 4 Net Change				5,201		104	2

4.1.2 Staffing Levels

Parking requirements can also be estimated based on the relationship between current and future staffing levels. Information relating to full-time equivalent (FTE) staffing levels (provided on 18/04/16) indicates a projected increase of 154 FTE staff over existing. Given the 2016/17 FTE staff (following Stage 1&2 completion) number 715 staff, this equates to an increase of 21% to 869 FTE staff.

Adopting both the Journey to Work travel mode data and online staff questionnaires, 89% of staff would be likely to drive to work. With the proportional maximum daytime staff roster (80% of FTE staff), the existing daytime staff car parking demand is approximately 500 spaces. Applying this to the redevelopment, the future staff parking demand could represent a theoretical maximum of 618 spaces; an increase of 118 spaces.

It should also be noted that as such precincts increase in size, the parking demand relationship also typically decreases. Initiatives such as well considered and monitored workplace travel plans can also positively reduce single occupant travel by car thereby changing the travel mode choice of many staff over time.

In adopting such a principle and assuming a minor reduction (from 89% to 85%) in staff driving to work, together with small improvements in carpooling as a realistic outcome of a workplace travel plan, the future staff parking demand would likely be 591 spaces; an increase of 91 spaces.

The parking demand surveys and on-site observations conclude that peak parking demands occur during the middle of the day (i.e. 10:00am to 3:00pm) on weekdays. It is expected that this would continue following the Stage 3&4 redevelopment, as the majority of staff are anticipated to be day shift staff (7:00am start and 3:00pm-5:00pm finish), and noting that an overlap of demand occurs between the day shift staff and night staff in the afternoon period around 3:00pm. As such, it is common to expect that staff shift changes would present a minor to moderate strain on parking supply.

4.1.3 Council DCP and RMS Guide

The car parking provision requirements for different development types are set out in Dubbo Regional Council's DCP 2013. A review of the car parking requirement rates and the floor area schedule results in a DCP 2013 parking requirement for the proposal as summarised in Table 4.2.

Table 4.2: DCP 2013 Car Parking Requirements

Description	Defined Use	Increase in Size	DCP Parking Rate	DCP Parking Requirement
Hospital	Hospitals and the like	50 new beds 154 FTE staff [1]	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	128 spaces plus 3 spaces for resident/ staff doctors [2]
Total				131 spaces

[1] Daily staff numbers have been calculated as 80% of FTE staff.

[2] Resident/ staff Doctor spaces are estimates, with ambulance area not included as part of this DCP parking assessment.

Based on the above, the Stage 3&4 redevelopment would be required to provide 131 car parking spaces as per DCP 2013.

It is noted that the DCP 2013 rates (and RMS Guide) are more accurately assessed against private hospitals where the relationship between the number of beds and parking demand is more straight forward and easily identifiable. Larger public hospital precincts that offer a far broader range of health-related services, including ancillary uses, accommodating visiting practitioners, administrative functions and larger 'back of house' floor areas typically require a more thorough assessment to determine car parking requirements.

As such, the existing demand profiles such as DHS staffing levels and increases in GFA have been utilised to determine the adequacy of parking supply, which as a result, supersedes the DCP 2013 parking requirement rate.

4.2 Adequacy of Parking Supply

Based on the above assessment, it is recommended that a minimum of 105 spaces be provided as part of the Stage 3&4 redevelopment. This is met with the provision of 107 spaces within the proposed at-grade car park and additional angled spaces along McGuinn Drive. The loss of 11 DHS fleet vehicle spaces would be able to be managed, with a likely minor increase to on-street parking demand south of the precinct.

4.3 Disabled Parking

The disabled car parking requirements for different development types are set out in the Building Code of Australia (BCA). For hospitals, the BCA rates require a provision of one space for every 100 non-outpatient car parking spaces, and one space for every 50 outpatient car parking spaces (up to 1,000 total spaces).

The overall provision of disabled parking within DHS generally exceeds this requirement. However, to ensure a high level of accessibility is maintained for persons with a disability, it is recommended that a minimum of two disabled car spaces be provided. These spaces should be designed and linemarked in accordance with AS/NZS 2890.6:2009.

4.4 Motorcycle Parking

DCP 2013 does not provide specific guidance on motorcycle parking provision requirements. It is however recommended that up to four motorcycle spaces be provided where possible within the proposed car parking areas to encourage motorcycle travel to the hospital (especially for staff). This would formalise motorcycle parking within DHS grounds, allowing motorcyclists to safely park without occupying a standard car space.

4.5 Car Parking Layout Review

The access arrangements and car park layout has been reviewed against the requirements of the Australian/ New Zealand Standard for Off Street Car Parking (AS/NZS2890.1:2004 and AS/NZS2890.6:2009). This assessment included a review of the following, and as described below:

- bay and aisle width
- adjacent structures
- turnaround facilities
- circulation roads
- pick-up/ set-down areas
- ambulance parking bays and grades
- parking for persons with a disability
- motorcycle parking.

The at-grade car park has been designed as a User Class 3 facility with all users (staff, patients/ visitors) appropriately accommodated. All circulation aisle widths are a minimum 5.8m wide with car space dimensions 2.5m wide and 5.4m long. Disabled spaces are a minimum 2.4m wide and 5.4m long. The main entrance set-down/ pick-up area has been designed to maximise capacity while maintaining a safe environment for all users. This includes localised narrowing at the pedestrian crossing and bollards to delineate the vehicle and pedestrian areas. Capacity for up to 10 vehicles, including dedicated on-call Doctor spaces is also possible, as are specific space allocation directly to the east, along McGuinn Drive.

The main entrance and internal circulation roads have been designed to ensure occasional access by coaches. The 10.1m fire appliance is also considered, with egress through the area possible once they have departed the hardstand area adjacent to the main entrance.

The internal fully mountable roundabout ensures all design vehicles are able to be accommodated while also allowing vehicles to recirculate as required. This includes visitors picking up a discharged patient. The roundabout design parameters have been assessed, with the small footprint ensuring efficient use by all vehicles.

5. Sustainable Transport Infrastructure

While it is recognised that the location of DHS somewhat limits the practicality of high usage of sustainable transport modes, there remains potential for improved utilisation of these modes, particularly cycling and walking, which will require the associated provision of high quality sustainable transport infrastructure. This assessment includes consideration of the following:

- bicycle parking facilities for DHS staff and visitors
- bicycle end-of-trip facilities for use by DHS staff at the start or end of shifts or during the middle any shift
- walking and cycling network, both internal and external to the hospital, and its links to existing external facilities
- local bus services linking the site with Dubbo CBD and other regional areas
- expansion of the local bus network and upgrade of facilities.

5.1 Walking and Cycling Network

Formal pedestrian and cycle connectivity to/ from DHS is via the Cobbora Road shared path that runs along the frontage of Theresa Maliphant Park, with this link connecting the existing ED and main entrance to the footpath network to the west of the railway line and onto Dubbo CBD. A sealed footpath is also provided on Myall Street along the DHS frontage however, it is considered to generally be in poor repair.

The Stage 3&4 redevelopment will concentrate pedestrian activity to the eastern section of the hospital and in the location of the current ED and along McGuinn Drive to/ from the existing and proposed at-grade car parking areas. As such, provisions for pedestrian and cycle connectivity are largely focused on this area, seamlessly integrating these with the redevelopment and car parking provided as part of existing facilities.

Convenient pedestrian connectivity is proposed by way of 2.5m wide shared paths linking the car park with the main entrance. This will ensure direct, safe and accessible connections are provided to all areas while also linking with external facilities along Cobbora Road and the nearby bus stops and shared path.

Other recommendations to improve pedestrian connectivity and safety could include the following:

- lighting and active/ passive surveillance along Myall Street and McGuinn Drive
- linemarking, signage and modified pavement treatments on all internal roads (namely McGuinn Drive) to inform users of pedestrian activity and pedestrian priority
- 10km/h speed limits along McGuinn Drive and throughout DHS
- signage and wayfinding to reinforce the hospital precinct environment.

5.2 Bicycle End-of-trip Facilities

The existing staff bicycle parking facility provided within the DHS precinct (adjacent to the oncology building) provides good amenity and an adequate quantum of bicycle parking within a dedicated area with weather protection. The facility exhibits low levels of usage, as illustrated in Figure 5.1.

Figure 5.1: Staff Bicycle Parking Facilities



DCP 2013 does not specify bicycle parking requirements for hospitals. It is however recommended that, in addition to maintaining the existing staff bicycle parking on-site, an additional provision be made for visitors (in the order of eight bicycle spaces) in close proximity to the main entrance. These spaces should be highly visible and well-located with respect to both internal and external connections, while not otherwise interfering with pedestrian, bicycle or vehicle movements.

The NSW Government *Planning Guidelines for Walking and Cycling* indicate a requirement of total bicycle parking provision to be 5%-10% of staff. Based on a daytime peak of 400 staff that would be able to potentially ride to work (based on the results of staff travel mode surveys and travel distances), 20 to 40 bicycle spaces would need to be provided in a secure area for use by staff. There are currently loops provided in a secure area covered by CCTV, with capacity for 32 bicycles (refer to Figure 5.1). Whilst not in a secure cage, the location and CCTV presence ensures an adequate level of security.

Based on this, together with existing demand for such facilities and the known staff travel mode choice, the existing bicycle storage facility is adequate and allows for future growth in demand should travel modes change over time.

The existing and proposed Hospital end of trip facilities include a total of six showers and associated lockers for the dedicated use by staff. Whilst this falls marginally below the required eight showers, they are considered an appropriate quantum having regard to the level of use by staff. They also allow for some expansion of use by both bicycle users and those exercising at lunchtime.

A Workplace Travel Plan (refer to Section 5.3.1) should be implemented to encourage a shift in travel mode choice away from single occupant cars, to more sustainable and active modes. In turn, the number of lockers should be reviewed at specific points to ensure that adequate provision is made to account for any such travel mode shift over time.

5.3 Public Transport

The site is accessible by town and intercity bus services operated by Dubbo Buslines. These services operate from the bus stops located on Cobbora Road adjacent to the Myall Street

roundabout. The town bus service operates at a varied frequency of up to 90 minutes during weekdays, providing some level of accessibility between the site, Dubbo CBD and the north-eastern suburbs. Services to Narromine, as well as services to other towns such as Orange and Bathurst are operated from Dubbo Railway Station and are also accessible, albeit with much more limited frequency.

The existing bus stops on Cobbora Road are located sufficiently close to the hospital to allow for convenient use by staff and visitors. The enhanced pedestrian links, together with refuges along Cobbora Road also provide sufficient amenity.

It is however recognised that the existing services are under-utilised, with this likely being a combination of low service frequency combined with slow, meandering routes not competing sufficiently with the convenience of private car travel. Improvements to the bus network including increasing the number of accessible routes could potentially increase the number of staff and visitors who travel to/ from the hospital by bus.

5.3.1 Workplace Travel Plan

A Workplace Travel Plan (or Green Travel plan) is a package of measures aimed at promoting and encouraging sustainable travel and reducing reliance on the private car. It is not designed to be 'anti-car', but will make apparent, encourage and support people's aspirations for carrying out their daily business in a more sustainable way. Green Travel Plans can provide both:

- measures which encourage reduced car use (disincentives or 'sticks')
- measures which encourage or support sustainable travel (also known as Active Transport), reduce the need to travel or make travelling more efficient (incentives or 'carrots').

A Green Travel Plan would promote the use of transport, other than by private car, for choice of travel to and from DHS which is more sustainable and environmentally friendly. Ultimately however, end users shall determine their most suitable means of transport.

The introduction of a Green Travel Plans would:

- advise the wider travel choices to staff
- help staff identify transport means which will result in them being healthier, fitter and more productive
- provide equal opportunities by supporting those staff who chose to access the site without a car
- aim to reduce traffic congestion and parking demand by providing easily identifiable transport means, improving relations with neighbours and enabling deliveries and essential journeys to move more freely.

6. Traffic Impact Assessment

6.1 Existing Site Traffic Generation

As detailed in Section 2.5, traffic surveys were completed in March 2016 to better understand the traffic conditions in and around DHS. These surveys have allowed an estimation of the existing site generation to be approximately 350 vehicle movements during the weekday PM peak periods.

6.2 Future Site Traffic Generation

In order to estimate the future site traffic generation upon completion of the Stage 3&4 redevelopment, consideration has been given to the following:

- design rates sourced from the RMS Guide to Traffic Generating Developments
- existing traffic generation of the site
- estimated increase in staff numbers
- proposed increase in Gross Floor Area
- proposed increase in parking space provision.

6.2.1 RMS Design Rates

In terms of hospitals, the RMS Guide to Traffic Generating Developments (2002) provides for trip generation rates for private hospitals only. Notwithstanding, an assessment has been completed using these rates for private hospitals when applied to the proposed redevelopment.

For private hospitals, the Guide recommends the following trip generation rates based on the number of beds and the average number of staff per weekday shift:

- Peak Vehicle Trips (PVT) = $-14.69 + 0.69B + 0.31ASDS$
- Morning Vehicle Trips (MVT) = $-10.21 + 0.47B + 0.06ASDS$
- Evening Vehicle Trips (EVT) = $-2.84 + 0.25B + 0.40ASDS$.

where 'B' represents the number of beds proposed and 'ASDS' is the average staff per day shift.

The trip generation rates were developed using survey data collected by RMS in 1994 from 19 private hospitals across the Sydney region. The hospitals surveyed had between 30 to 99 beds and an average day shift workforce of between 10 and 102 employees.

Of the 19 hospitals surveyed, the majority recorded their respective daily traffic peak (or PVT) between 3:00pm and 4:00pm. This time period generally coincided with a staff shift change at the surveyed hospitals and would coincide with the start of the on-road peak in the vicinity of the site. MVT and EVT represent the morning and evening commuter peak period traffic generation.

It should also be noted that of the 19 hospitals surveyed, an average of 87.4% of people travelling to each hospital did so by private car and the mode share attributed to car-based trips ranged from 67.3% to 98.2%. Average vehicle occupancy was 1.3 persons per vehicle.

Application of these rates to the proposed Stage 3&4 redevelopment comprising 50 additional beds and 123 daytime staff have been presented and compared as follows:

- 58 additional vehicle trips during the site peak (4:00pm-5:00pm)
- 21 additional vehicle trips during the AM commuter peak (8:00am-9:00am)
- 59 additional vehicle trips during the PM commuter peak (5:00pm-6:00pm).

6.2.2 Increase in Gross Floor Area

Traffic generation can be estimated based on the relationship between existing and future GFA. A net increase of 5,200m² GFA is proposed for the Stage 3&4 redevelopment. Based on the existing traffic generation volumes as detailed above, the additional site traffic generation is expected to be up to 65 vehicle movements in any peak hour.

6.2.3 Increase in Staff Numbers

Traffic generation can also be estimated based on the relationship between current and future staffing levels. Preliminary information provided to GTA Consultants relating to full-time equivalent staff numbers (as detailed in the Section 4 car parking assessment) indicates an increase of approximately 21% as a result of the Stage 3&4 redevelopment. Applied to the existing traffic generation, this would result in an additional 70-75 vehicles being generated by the site during the AM and PM peak periods.

6.2.4 Increase in Parking Provision

Provision of 107 spaces within the on-site car park and angled spaces represents an increase of 22% over the existing 480 formal and informal on-site parking spaces. This includes all formal and informal on-site parking and excludes the adjacent on-street parking supply. When all available (and utilised) parking is included (614 spaces), the increase equates to 17%. Applying this to the existing traffic generation, an additional 60 vehicle movements would be likely during any peak hour.

6.2.5 Traffic Generation Estimate Summary

The various estimate methodologies applied to the proposal have been summarised in Table 6.1.

Table 6.1: Summary of Traffic Generation Estimates

Methodology	AM Peak	PM Peak	PM Peak
	Anticipated Increase in Traffic		Anticipated Future Generation
RMS Private Hospital Rates	+27	+68	418
Increase in GFA	+65	+65	415
Increase in Staff Numbers	+75	+75	425
Increase in Parking Provision (107 spaces)	+60	+60	410

The data indicates that the proposal could be expected to generate between 65 and 75 additional vehicle movements in any peak hour. Based on DHS currently generating 350 vehicle movements in the PM peak hour, the redevelopment would likely result in a total of approximately 425 vehicle movements.

To account for infrequent peak events, short busier periods within the peak hour itself and to ensure a robust traffic assessment, a conservative approach has been adopted by assuming an additional traffic generation of 90 vehicle movements during the busiest weekday PM peak hour.

6.3 Distribution and Assignment

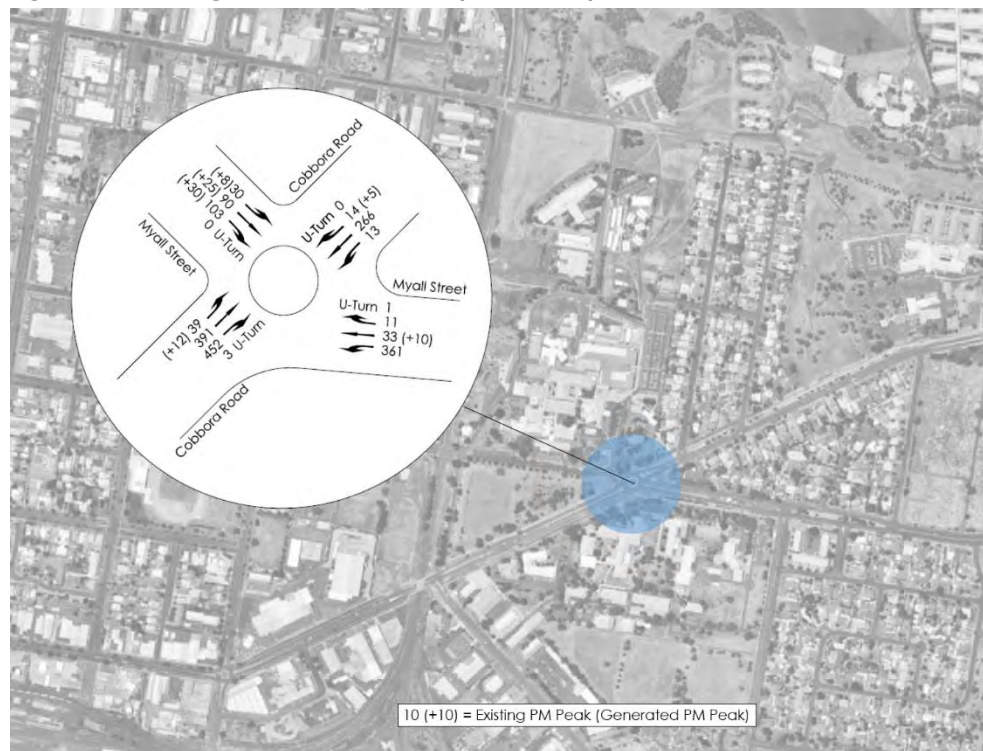
The directional distribution and assignment of traffic generated by the proposed development will be influenced by a number of factors, including the:

- i configuration of the arterial road network in the immediate vicinity of the site
- ii existing operation of intersections providing access between the local and arterial road network
- iii existing distribution of traffic and the key roundabout
- iv distribution of households in the vicinity of the site
- v likely distribution of employee's residences in relation to the site
- vi configuration of access points to the site.

Having consideration to the above and for the purposes of estimating vehicle movements, the existing directional distributions at the roundabout controlled intersection of Cobbora Road/ Myall Street have been adopted, while also assuming all future generated traffic would continue enter and exit DHS via this primary access.

Based on the above, Figure 6.1 has been prepared to show the estimated increase in turning movements in the vicinity of the hospital following full site development.

Figure 6.1: Existing PM Peak Hour Traffic plus Development Traffic



6.4 Traffic Impacts

Against existing traffic volumes in the vicinity of the site, the additional traffic generated by the Stage 3&4 redevelopment could not be expected to compromise the safety or function of the surrounding road network, including the Cobbora Road/ Myall Street roundabout.

The impacts on this primary access during the busy PM peak period is detailed in Table 6.2.

Table 6.2: Post Development PM Operating Conditions

Intersection	Leg	Road	Degree of Saturation (DOS)	Average Delay (sec)	95th Percentile Queue (m)	Level of Service (LOS)
Cobbora Road/ Myall Street	South-East	Myall Street	0.09	14	3	A
	East	Cobbora Road	0.26	15	11	B
	North	Myall Street	0.28	9	9	A
	West	Cobbora Road	0.30	11	14	A

Based on the above assessment, it is clear that the Cobbora Road/ Myall Street roundabout would continue to function well and at a LOS A during the peak PM peak hour. This approach is also conservative by assuming all development traffic will access DHS via this roundabout, and by also adopting additional traffic volumes associated with future works.

6.5 Construction Traffic Impacts

A construction traffic management plan should be prepared prior to works commencing on-site.

This overview of construction traffic impacts associated with construction activity aims to ensure the safety of all workers and road users in the vicinity of the construction sites. The key principles are outlined below:

- to identify the need for adequate and compliant traffic management requirements both within the hospital and along the surrounding road network
- to maintain permanent access to/ from DHS for emergency services and minimise disruption associated with construction vehicles
- to ensure continuous, safe and efficient movement of traffic for DHS staff, general public and construction workers
- to restrict construction vehicle movements to designated routes to/ from the site and to prioritise these as required
- to establish a safe pedestrian environment at all times
- to maintain current levels of parking amenity within the DHS precinct
- to inform the Contractor and set the ground rules for managing construction traffic.

6.5.1 General Requirements

In accordance with RMS requirements, all vehicles transporting loose materials will be required to have the entire load covered and/ or secured to prevent any large items, excess dust or debris being deposited onto the roadway during travel to and from the site. All subcontractors and suppliers must be inducted by the Principal Contractor to ensure that the procedures are met for all vehicles entering and exiting the construction sites. The Principal Contractor will monitor the roads leading to and from the site and take all necessary steps to clean any debris deposited by construction vehicles.

Vehicles operating to, from and within the site shall do so in a manner which does not create unreasonable or unnecessary noise or vibration.

Public roads and access points will not be obstructed by any materials, vehicles, refuse skips or the like, under any circumstances.

Work Hours

The hours of operation will be as approved by the approval authority. No works will occur outside the nominated hours unless prior approval is granted.

Construction Worker Parking

Construction workers will be instructed not to park within DHS grounds or on-street within the typical parking catchment. This includes Myall Street. Designated parking will be provided immediately north of the hospital and to the rear of the School of Rural Health. Access to the parking will be via Moran Drive and River Street only.

A path will be provided to link the worker parking area with the work areas.

Construction Traffic Volumes

Traffic generated by the construction works will include construction worker light vehicles, as well as heavy vehicles for periodic delivery and removal of materials, including plant and equipment. Vehicle types and sizes would vary depending on the required use, but include medium and large rigid vehicles and articulated vehicles for import of bulk materials or minor spoil removal, as well as concrete trucks.

Formal prior approval will be required from the relevant authorities (RMS/ Council) for deliveries, with the timing of truck arrivals to ensure minimal disruption to general traffic along the route. The defined approach and departure routes will also need to be approved and observed.

Overall the construction works could not be expected to significantly impact intersection operation external to the site. This includes the roundabout controlled intersection of Cobbora Road/ Myall Street (which should be used only if essential) and the local intersections to the north and west.

Any works on weekends would not present significant traffic related impacts, with no known specific restrictions limiting access and/ or the work hours as specified.

All works within the site and associated vehicle movements will be restricted to the permitted working hours of the site. Detailed site access will be set out in the detailed construction traffic management plan following approvals.

6.5.2 Construction Vehicle Routes

Where construction vehicles have origins and destinations outside of Dubbo they are to remain on the State and Regional Road network where possible.

As such, likely construction vehicle routes have been developed with the aim to provide the shortest distances to/ from the State and Regional Road network, whilst minimising the impact of construction traffic on the local streets in the immediate vicinity. Alternative routes would not be used without specific prior approval from the relevant authorities. No trucks will be permitted to layover on approach to the construction sites without formal prior approval.

Access to this site is anticipated to be primarily via Cobbora Road (Golden Highway) to/ from the southern construction sites, and Bourke Street (Newell Highway) to make use of River Street and Moran Drive north of the hospital. This is primarily to ensure that impacts on DHS uses is kept to a minimum, including avoiding use of Myall Street directly to/ from the Cobbora Road roundabout, whenever feasible.

The truck routes are shown in Figure 6.2 and Figure 6.3. The Principal Contractor will provide a detailed CTMP prior to any works commencing on-site and be responsible for advising truck drivers of the designated truck routes to/ from the construction sites.

Figure 6.2: Truck Approach Routes



Basemap Source: Nearmap

Figure 6.3: Truck Departure Routes



Basemap Source: Nearmap

6.5.3 Traffic Control Plans

Traffic Guidance Schemes (TGS's), formerly Traffic Control Plans (TCPs) may need to be prepared to appropriately manage the use of the designated construction routes and site interfaces, and submitted to Council and/ or RMS if required by a Section 138 permit under the Roads Act. TGS's would also be required to obtain any appropriate Road Occupancy Licences and Road Opening Permits required by RMS and/ or Council.

As part of implementation of the TGS's, standard signage warning approaching vehicles of the construction activity and heavy vehicle movements should be installed. This should include static signage to be in-place in advance of the works. Other possible mitigation measures to minimise traffic impacts during construction generally include:

- Appropriate traffic management, including static signs, manual traffic control and provision of temporary barriers to control the designated work areas and minimise impact on DHS operations.
- Establishment of safe access points to work areas within DHS grounds, including safety measures like barriers and pedestrian warnings, and the provision of traffic management measures.
- Use of qualified construction workers to negotiate pedestrian and construction vehicle priority and access, if required.

The TGS's should also outline how potential construction vehicle manoeuvres (and the size of the largest vehicle) could be accommodated in and out of the construction sites.

6.5.4 Pedestrian Management

Pedestrian movements throughout are to be maintained as much as feasible during all construction stages. Where works require the closure of an existing pedestrian route, a suitable alternative is to be provided. As a minimum, Class A hoarding/ fencing would be provided between pedestrian paths and any work site.

6.5.5 Public Transport

Given the infrequent heavy vehicle movements associated with the construction works, the overall impact to existing public transport services is expected to be negligible. This includes the impact on the identified local area bus services.

6.5.6 Emergency Vehicles and Heavy Vehicles

During construction, the Principal Contractor will ensure that there is no disruption to emergency vehicles on public and internal roads.

Any potential minor impacts on emergency access associated with truck movements will be effectively managed throughout the works. Use of Myall Street and the roundabout at Cobbora Road will be minimised wherever possible to limit interaction with emergency services.

6.5.7 Existing and Future Developments

It is the Principal Contractor's responsibility to liaise with the relevant authorities should there be other potential future developments under construction at the same time. A coordinated approach to traffic management and wayfinding signage is logical in such instances.

7. Conclusion

Based on the analysis and discussions presented within this report, the following conclusions are made:

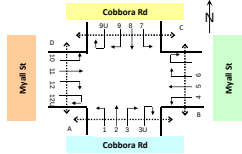
- i DHS provides much needed medical services to the surrounding local and regional areas.
- ii The site is accessible by limited public transport services and the majority of staff and visitors/ patients travel to the DHS by car.
- iii DHS provides a range of vehicle accesses along Myall Street in the south and the internal loop road via informal accesses along the northern boundary.
- iv Existing on-site parking demand remains relatively high, with vehicles also making use of Myall Street. A lack of surrounding land uses means that the hospital effectively does not compete for parking, with no impacts on residential streets to the east.
- v The Stage 3&4 SSD proposes to deliver much needed services for a net increase of 5,200m² of health-related floor area.
- vi The existing DHS main entrance is via McGuinn Drive in the southern section of the precinct. This intent will be largely maintained, albeit within a substantially redesigned front entrance area and internal road alignment to ensure improved efficiency, user safety and better providing for the function of the Cobbora Road/ Myall Street roundabout.
- vii The new building will also provide for ambulances in a designated area free from conflicts with the public, with direct access via Myall Street.
- viii Staff and visitor parking is proposed within an at-grade car park in the southern section of the hospital with the design allowing for convenient entry/ exit and circulation needs as required.
- ix A total of 107 car spaces is proposed as part of the Stage 3&4 SSD and accounts for the anticipated additional demand for 105 spaces. This will include provision of spaces for specific users, including on-call Doctors and other specialist users.
- x A minor increase to on-street parking demand south of the precinct is possible to account for the minor loss of 11 fleet vehicle spaces.
- xi The four ambulance bays have been designed for independent access by all ambulances, with the largest design vehicle being the bariatric ambulance, and complies with Ambulance Service of NSW requirements.
- xii The proposal is expected to have a negligible traffic impact on the surrounding road network, with the assessment based on generation of up to 90 additional vehicle movements during the busy PM peak hour.
- xiii The new main entrance and set-down/ pick-up area, plus additional DHS precinct car parks would benefit from targeted wayfinding signage designed to inform users of the available health facilities.
- xiv The majority of service vehicles are rigid trucks and vans less than 12.5m long.
- xv Together with maintaining existing bicycle parking facilities, loops with capacity for eight bicycles be provided in a highly visible location, ideally in close proximity to the new main entrance for use by visitors.
- xvi The redevelopment will be unlikely to result in significant changes to pedestrian routes, with the new at-grade car park provided with a high level of connectivity together with improved links with external facilities, including the Cobbora Road bus stops.
- xvii Improved wayfinding and end-of-trip facilities would support walking and cycling as viable alternative transport modes over time.

- xviii A construction traffic management plan will be approved and implemented prior to any works commencing on-site.
- xix Implementation of a Green Travel Plan could actively work towards reducing the heavy reliance by staff on the private car by educating and encouraging car-pooling schemes, active travel and public transport use.

Appendix A

Survey Results

Job No.	N2086
Client	GTA
Suburb	Dubbo
Location	19. Myall St / Cobbora Rd
Day/Date	Wed, 2nd Dec 2015
Weather	Fine
Description	Classified Intersection Count
	15 mins Data



Tracsis
Traffic Data Australia

Class 1	Class 2	Class 3	Class 4

Classifications	Cars	Rigid Trucks	Artic Trucks	Cyclists
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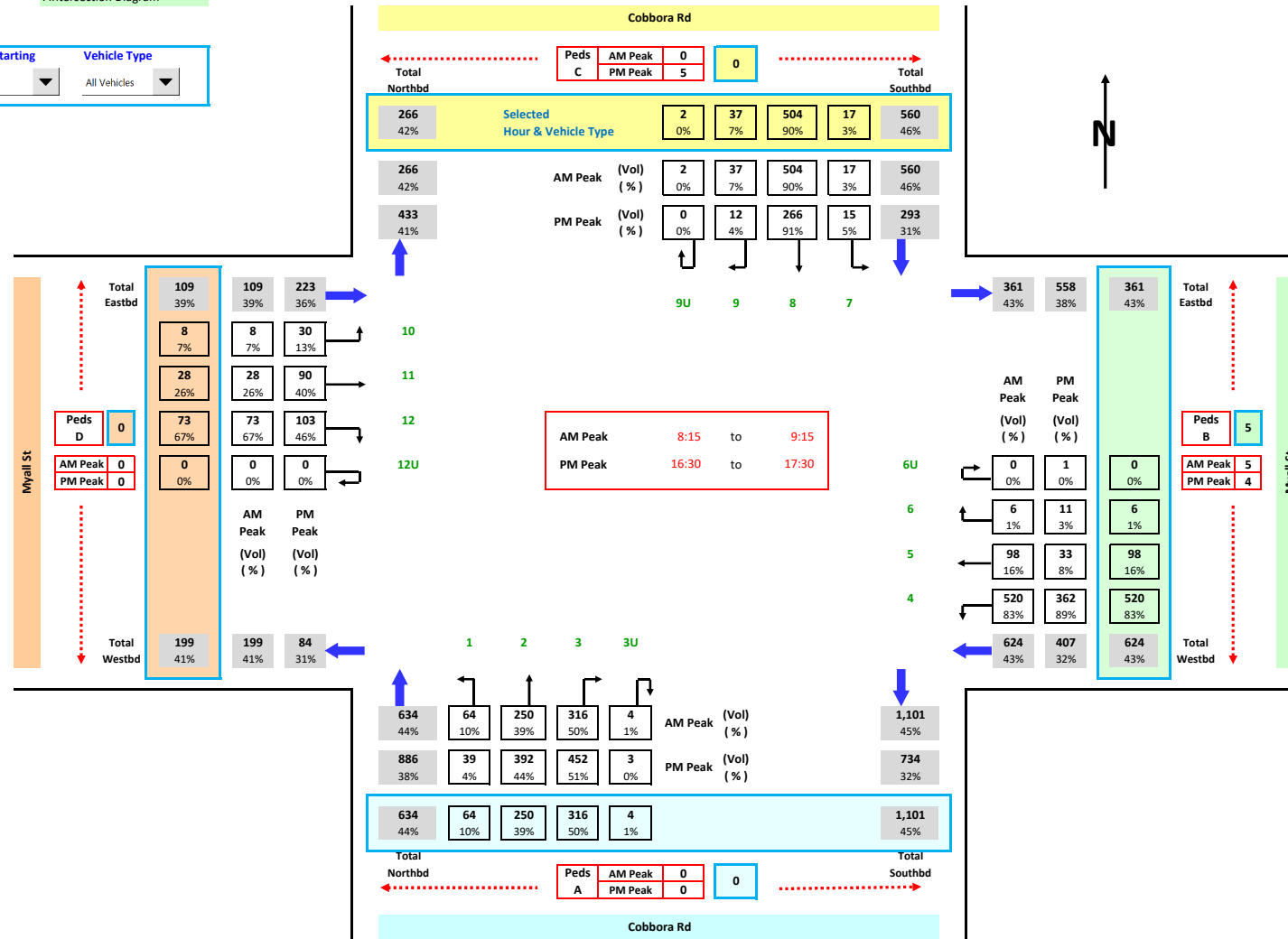
Approach													Cobblers Rd													Myall St															
Direction		Direction 1 (Left Turn)					Direction 2 (Through)					Direction 3 (Right Turn)					Direction 3U (U Turn)					Direction 4 (Left Turn)					Direction 5 (Through)					Direction 6 (Right Turn)					Direction 6U (U Turn)				
Time Period	Cars	Right-Turn Auto-Traffic	Auto-Traffic	Cyclists	Total	Cars	Right-Turn Auto-Traffic	Auto-Traffic	Cyclists	Total	Cars	Right-Turn Auto-Traffic	Auto-Traffic	Cyclists	Total	Cars	Right-Turn Auto-Traffic	Auto-Traffic	Cyclists	Total	Cars	Right-Turn Auto-Traffic	Auto-Traffic	Cyclists	Total	Cars	Right-Turn Auto-Traffic	Auto-Traffic	Cyclists	Total	Cars	Right-Turn Auto-Traffic	Auto-Traffic	Cyclists	Total						
9:45 - 10:15	5	0	0	0	5	17	17	0	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
10:15 - 10:30	12	0	0	0	12	11	41	3	0	44	24	1	0	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
10:30 - 10:45	10	0	0	0	10	17	0	0	1	18	26	4	0	1	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
10:45 - 11:00	15	0	0	0	15	17	1	2	0	40	47	5	0	0	52	1	0	0	0	0	1	117	2	0	0	119	12	0	0	0	32	1	1	0	0						
11:00 - 11:15	15	0	0	0	15	39	2	2	0	43	52	5	0	0	57	0	0	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0							
11:15 - 11:30	16	0	0	0	16	60	7	0	0	62	71	3	1	0	75	1	0	0	0	0	1	148	4	1	0	153	12	0	0	0	32	2	0	0	0						
11:30 - 11:45	13	0	0	0	13	73	3	0	0	76	80	2	0	0	82	1	0	0	0	0	1	127	8	1	0	136	25	0	0	25	1	0	0	0	0						
11:45 - 12:00	21	0	0	0	21	48	2	2	0	52	70	2	1	0	73	0	1	0	0	0	1	130	6	0	0	136	21	0	0	21	2	0	0	0	0						
12:00 - 12:15	14	0	0	0	14	55	4	1	0	60	83	3	0	0	86	1	0	0	0	0	1	92	3	0	0	95	20	0	0	20	1	0	0	0	0						
12:15 - 12:30	14	0	0	0	14	42	0	0	0	42	66	3	0	0	69	1	0	0	0	0	1	81	4	0	0	85	9	0	0	1	10	4	0	0	0						
12:30 - 12:45	8	0	0	0	8	62	2	1	0	65	58	5	0	0	63	2	0	0	0	0	2	79	5	0	0	84	12	0	0	0	0	0	0	0	0						
12:45 - 13:00	14	0	0	0	14	46	1	0	0	48	64	0	1	0	65	4	0	0	0	0	4	67	5	0	0	72	17	0	0	0	17	3	1	0	0						
PM Totals	156	0	0	0	156	547	21	10	0	578	666	13	3	1	703	11	0	0	0	12	1,123	56	4	0	1,189	246	0	0	0	247	18	2	0	0	20						
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17:15 - 17:30	12	0	0	0	12	113	1	0	1	115	116	1	0	0	117	2	1	0	0	0	1	84	2	0	0	87	7	0	0	0	7	3	1	0	0						
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Approach	Cobblers Rd																Myall St																Crossing Pedestrians					
Direction	Direction 7 (Left Turn)				Direction 8 (Through)				Direction 9 (Right Turn)				Direction 9J (U Turn)				Direction 10 (Left Turn)				Direction 11 (Through)				Direction 12 (Right Turn)				Direction 12U (U Turn)									
Time Period	Car	Rigid Truck	Artic Truck	Cyclist	Total	Car	Rigid Truck	Artic Truck	Cyclist	Total	Car	Rigid Truck	Artic Truck	Cyclist	Total	Car	Rigid Truck	Artic Truck	Cyclist	Total	Car	Rigid Truck	Artic Truck	Cyclist	Total	Car	Rigid Truck	Artic Truck	Cyclist	Total	A	B	C	D	E	Total		
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7:15 to 7:30	1	0	0	0	1	34	3	1	0	38	6	0	0	0	6	1	0	0	0	1	4	1	0	0	6	9	0	0	0	9	0	0	0	0	0	0		
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9:30 to 9:45	4	0	0	0	4	66	2	2	0	70	2	0	0	0	2	0	0	0	0	0	3	11	0	0	11	13	0	0	0	0	0	0	1	0	1	0		
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10:00 to 10:15	3	0	0	0	3	71	0	1	0	72	5	1	0	0	6	0	0	0	0	0	2	0	0	2	18	0	0	0	0	0	0	0	0	1	0	1	0	
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11:15 to 16:00	1	0	0	0	1	67	7	2	0	71	4	0	0	0	4	0	4	0	0	4	12	0	0	12	24	0	0	0	0	0	0	0	0	1	0	1	0	
16:00 to 16:15	1	0	0	0	1	72	1	2	0	75	3	0	0	0	3	0	2	0	0	2	15	1	0	16	18	0	0	0	0	0	0	1	0	0	1	0	1	
16:15 to 16:30	2	0	0	0	2	53	2	0	0	58	4	0	0	0	4	0	4	0	0	4	21	0	0	21	26	0	0	0	0	0	0	0	0	1	0	1	0	
16:30 to 16:45	4	0	0	0	4	74	0	0	0	74	4	0	0	0	4	0	0	0	0	0	6	24	0	0	24	30	0	0	0	0	0	0	1	1	0	2		
16:45 to 17:00	3	1	0	0	4	60	2	1	0	63	3	0	0	0	3	0	5	0	0	5	19	0	0	19	20	0	0	0	0	0	0	1	0	0	1	0		
17:00 to 17:15	4	0	0	0	4	64	0	0	0	64	2	0	0	0	2	0	10	0	0	10	20	0	0	20	26	0	0	0	0	0	0	1	3	0	4	0		
17:15 to 17:30	2	1	0	0	3	63	0	0	0	64	3	0	0	0	3	0	9	0	0	9	18	0	0	18	27	0	0	0	0	0	0	1	1	0	2	0		
PM Totals	29	5	0	0	34	822	15	19	0	856	42	1	0	0	43	0	65	0	0	65	227	3	0	230	326	0	0	0	0	0	0	8	10	0	18	0		

Job No. : N2086
Client : GTA
Suburb : Dubbo
Location : 19. Myall St / Cobbora Rd

Day/Date : Wed, 2nd Dec 2015
Weather : Fine
Description : Classified Intersection Count
Intersection Diagram

Hour Starting 8:15
Vehicle Type All Vehicles

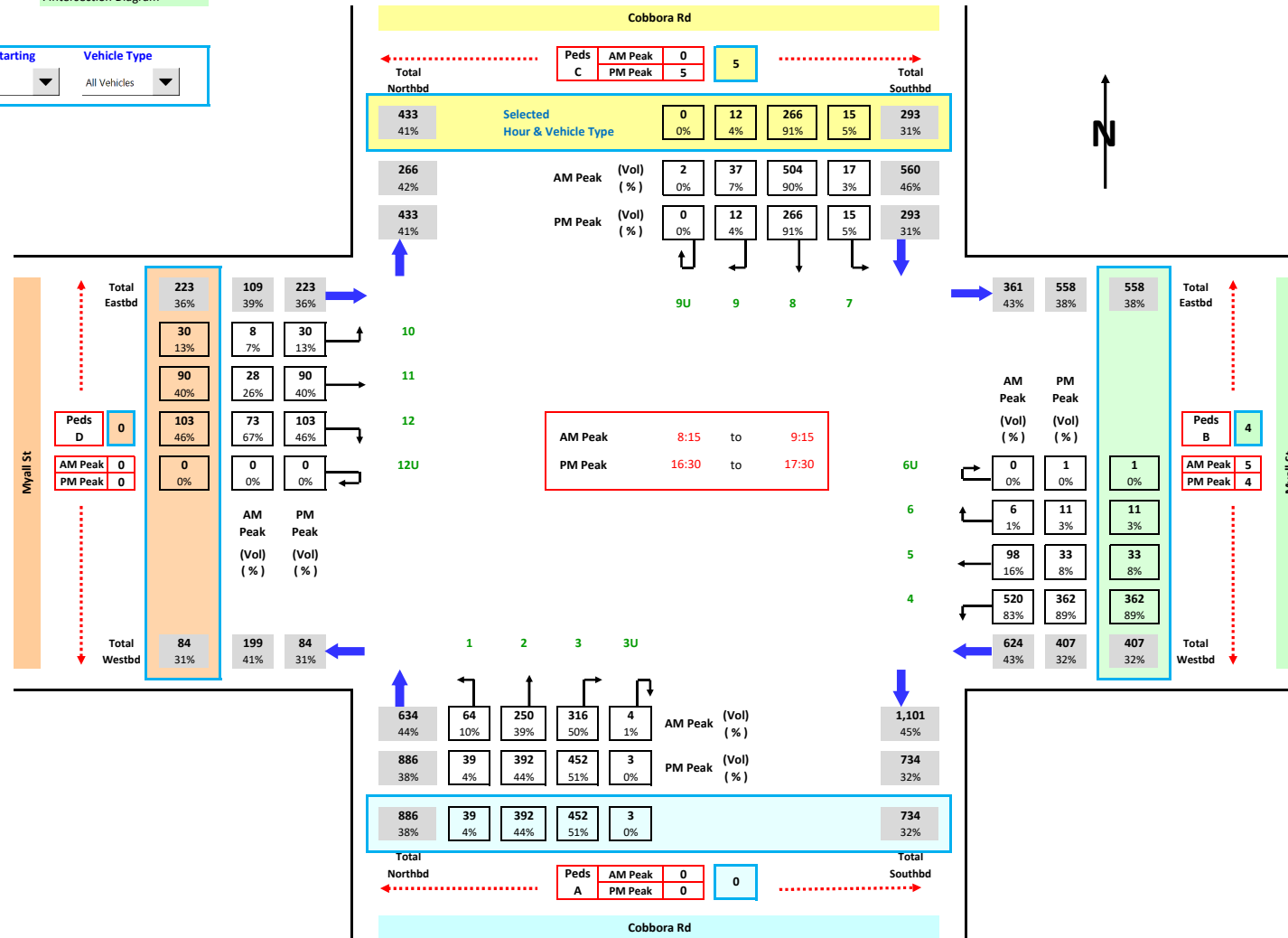


Job No. : N2086
Client : GTA
Suburb : Dubbo
Location : 19. Myall St / Cobbora Rd

Day/Date : Wed, 2nd Dec 2015
Weather : Fine
Description : Classified Intersection Count
Intersection Diagram

Tracsis
Traffic Data Australia

Hour Starting 16:30
Vehicle Type All Vehicles



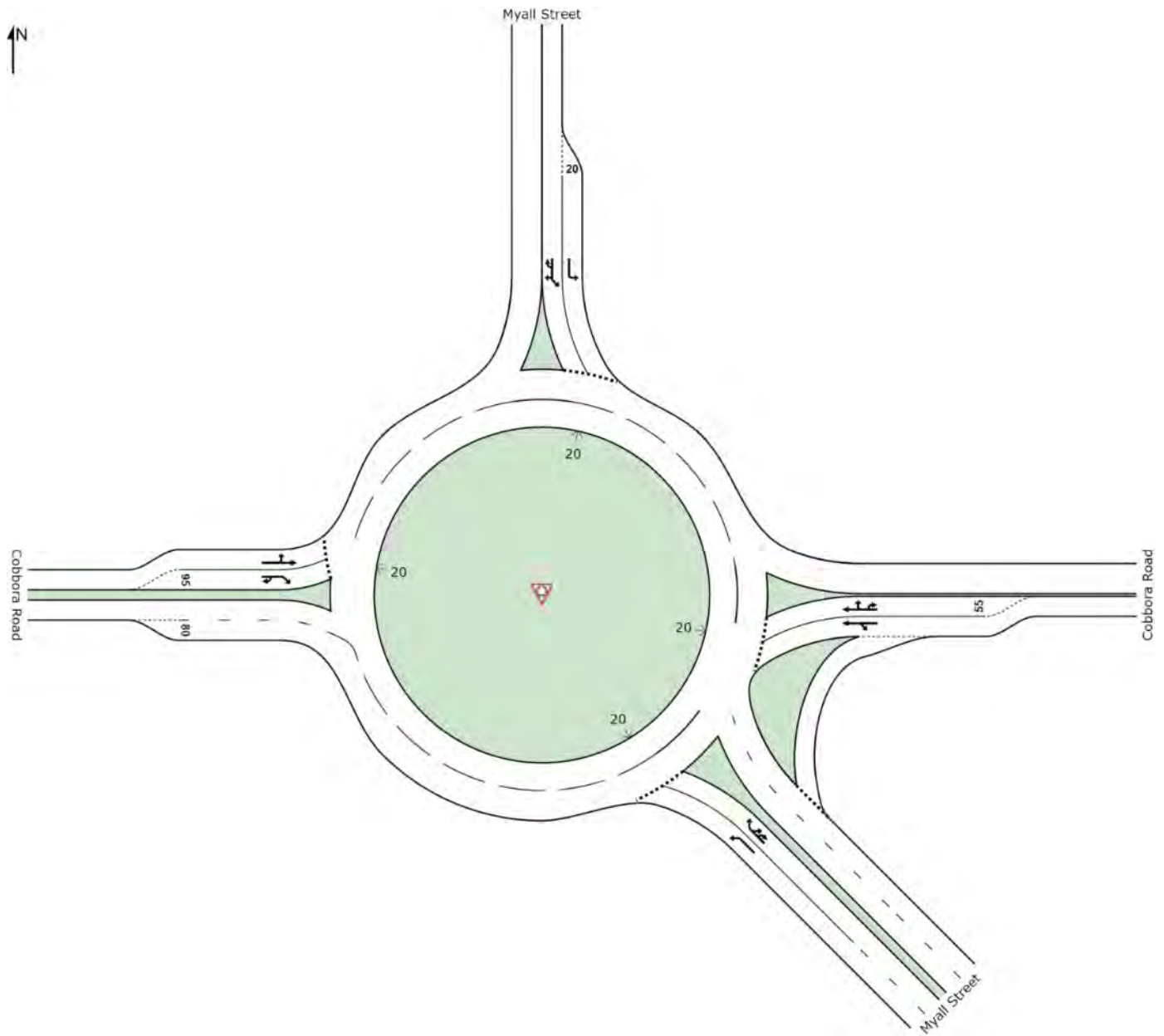
Appendix B

SIDRA INTERSECTION Results

SITE LAYOUT

 **Site: Cobbora Rd/ Myall St - Ex AM**

16S1359000 Dubbo Hospital Redevelopment
Cobbora Road and Myall Street
Existing AM Peak
Roundabout



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Organisation: GTA CONSULTANTS | Created: Friday, 11 November 2016 2:09:43 PM

Project: P:\16S1300-1399\16S1359000 Dubbo Hospital Redevelopment Project\Modelling\161111sid-16S1359000 (survey volumes).sip6

MOVEMENT SUMMARY

 **Site: Cobbora Rd/ Myall St - Ex AM**

16S1359000 Dubbo Hospital Redevelopment
Cobbora Road and Myall Street
Existing AM Peak 8:15am - 9:15am
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total 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
SouthEast: Myall Street											
21a	L1	547	4.4	0.580	7.8	LOS A	4.3	30.9	0.74	0.89	53.5
23a	R1	103	0.0	0.193	11.6	LOS A	0.8	5.7	0.61	0.85	43.6
23b	R3	6	0.0	0.193	13.7	LOS A	0.8	5.7	0.61	0.85	51.7
23u	U	1	0.0	0.193	14.8	LOS B	0.8	5.7	0.61	0.85	52.1
Approach		658	3.7	0.580	8.4	LOS A	4.3	30.9	0.72	0.88	51.6
East: Cobbora Road											
4b	L3	18	11.8	0.220	6.1	LOS A	1.1	7.7	0.54	0.65	52.3
5	T1	531	3.8	0.394	6.6	LOS A	2.3	16.8	0.58	0.65	54.0
6	R2	39	0.0	0.394	11.0	LOS A	2.3	16.8	0.59	0.65	46.0
6u	U	2	0.0	0.394	13.2	LOS A	2.3	16.8	0.59	0.65	54.9
Approach		589	3.8	0.394	6.9	LOS A	2.3	16.8	0.58	0.65	53.3
North: Myall Street											
7	L2	8	0.0	0.014	4.8	LOS A	0.0	0.3	0.52	0.54	44.5
7a	L1	29	0.0	0.105	2.6	LOS A	0.4	3.0	0.49	0.62	44.4
9	R2	77	1.4	0.105	7.0	LOS A	0.4	3.0	0.49	0.62	44.7
9u	U	1	0.0	0.105	8.5	LOS A	0.4	3.0	0.49	0.62	45.4
Approach		116	0.9	0.105	5.8	LOS A	0.4	3.0	0.49	0.61	44.6
West: Cobbora Road											
10	L2	67	0.0	0.257	4.9	LOS A	1.6	11.7	0.38	0.48	45.2
11	T1	263	5.6	0.257	5.0	LOS A	1.6	11.7	0.38	0.48	55.1
12a	R1	333	3.8	0.227	8.4	LOS A	1.4	10.3	0.35	0.60	52.3
12u	U	4	25.0	0.227	11.9	LOS A	1.4	10.3	0.35	0.60	53.0
Approach		667	4.3	0.257	6.7	LOS A	1.6	11.7	0.36	0.54	52.5
All Vehicles		2031	3.7	0.580	7.3	LOS A	4.3	30.9	0.55	0.69	51.9

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 is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Organisation: GTA CONSULTANTS | Processed: Friday, 11 November 2016 2:36:39 PM

Project: P:\16S1300-1399\16S1359000 Dubbo Hospital Redevelopment Project\Modelling\161111sid-16S1359000 (survey volumes).sip6

MOVEMENT SUMMARY

 **Site: Cobbora Rd/ Myall St - Ex PM**

16S1359000 Dubbo Hospital Redevelopment
Cobbora Road and Myall Street
Existing PM Peak 4:30pm - 5:30pm
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total 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
SouthEast: Myall Street											
21a	L1	380	3.0	0.349	5.3	LOS A	1.8	13.2	0.53	0.58	54.5
23a	R1	35	0.0	0.074	10.1	LOS A	0.3	2.2	0.49	0.72	44.1
23b	R3	12	27.3	0.074	13.3	LOS A	0.3	2.2	0.49	0.72	51.4
23u	U	1	0.0	0.074	13.3	LOS A	0.3	2.2	0.49	0.72	52.9
Approach		427	3.4	0.349	6.0	LOS A	1.8	13.2	0.52	0.60	53.3
East: Cobbora Road											
4b	L3	14	0.0	0.133	6.4	LOS A	0.6	4.4	0.61	0.70	52.2
5	T1	280	1.9	0.238	7.8	LOS A	1.3	9.5	0.63	0.71	53.7
6	R2	15	14.3	0.238	12.6	LOS A	1.3	9.5	0.65	0.71	45.8
6u	U	1	0.0	0.238	14.3	LOS A	1.3	9.5	0.65	0.71	54.7
Approach		309	2.4	0.238	8.0	LOS A	1.3	9.5	0.63	0.71	53.2
North: Myall Street											
7	L2	32	0.0	0.057	5.8	LOS A	0.2	1.4	0.57	0.67	44.0
7a	L1	95	0.0	0.214	3.3	LOS A	0.9	6.3	0.57	0.68	44.5
9	R2	108	0.0	0.214	7.7	LOS A	0.9	6.3	0.57	0.68	44.8
9u	U	1	0.0	0.214	9.2	LOS A	0.9	6.3	0.57	0.68	45.5
Approach		236	0.0	0.214	5.7	LOS A	0.9	6.3	0.57	0.67	44.6
West: Cobbora Road											
10	L2	41	0.0	0.316	4.5	LOS A	2.1	15.0	0.25	0.42	45.6
11	T1	412	1.8	0.316	4.5	LOS A	2.1	15.0	0.25	0.42	55.8
12a	R1	476	2.2	0.290	8.0	LOS A	1.9	13.7	0.23	0.58	52.8
12u	U	3	0.0	0.290	11.2	LOS A	1.9	13.7	0.23	0.58	54.4
Approach		932	1.9	0.316	6.3	LOS A	2.1	15.0	0.24	0.50	53.7
All Vehicles		1904	2.1	0.349	6.4	LOS A	2.1	15.0	0.41	0.58	52.2

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 is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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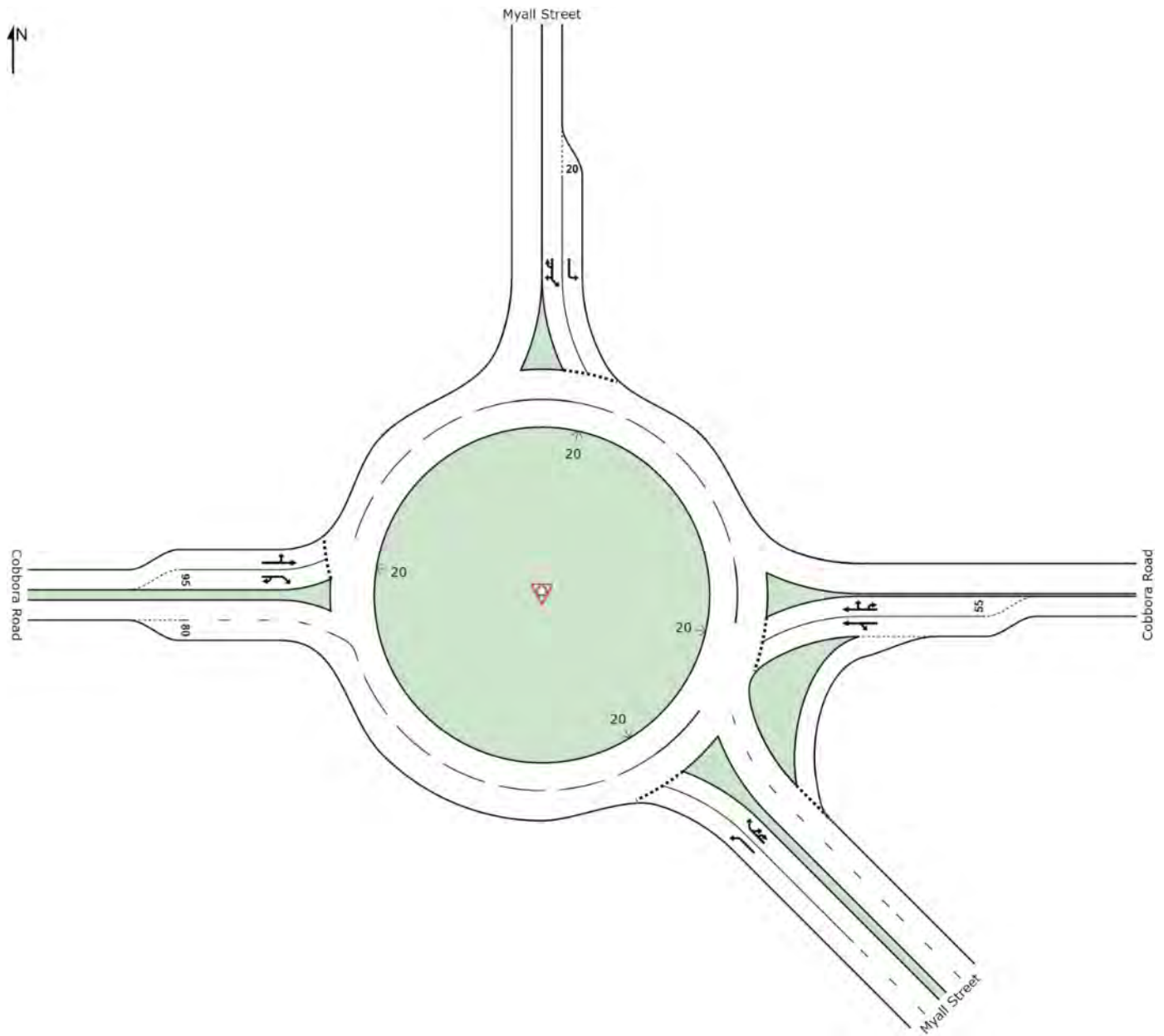
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Project: P:\16S1300-1399\16S1359000 Dubbo Hospital Redevelopment Project\Modelling\161111sid-16S1359000 (survey volumes).sip6

SITE LAYOUT

Site: Cobbora Rd/ Myall St - PD PM

16S1359000 Dubbo Hospital Redevelopment
Cobbora Road and Myall Street
Post-Development PM Peak 4:30pm - 5:30pm
Roundabout



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Organisation: GTA CONSULTANTS | Created: Friday, 11 November 2016 4:37:27 PM

Project: P:\16S1300-1399\16S1359000 Dubbo Hospital Redevelopment Project\Modelling\161111sid-16S1359000 (survey volumes).sip6

MOVEMENT SUMMARY

 **Site: Cobbora Rd/ Myall St - PD PM**

16S1359000 Dubbo Hospital Redevelopment
Cobbora Road and Myall Street
Post-Development PM Peak 4:30pm - 5:30pm
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total 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
SouthEast: Myall Street											
21a	L1	380	3.0	0.356	5.5	LOS A	1.9	13.6	0.55	0.60	54.4
23a	R1	45	2.3	0.094	10.5	LOS A	0.4	2.8	0.51	0.75	44.0
23b	R3	12	27.3	0.094	13.6	LOS A	0.4	2.8	0.51	0.75	51.2
23u	U	1	0.0	0.094	13.6	LOS A	0.4	2.8	0.51	0.75	52.7
Approach		438	3.6	0.356	6.2	LOS A	1.9	13.6	0.55	0.62	53.0
East: Cobbora Road											
4b	L3	14	0.0	0.143	6.4	LOS A	0.7	4.9	0.64	0.73	51.8
5	T1	280	1.9	0.256	8.3	LOS A	1.5	10.7	0.68	0.74	53.4
6	R2	20	10.5	0.256	13.0	LOS A	1.5	10.7	0.69	0.75	45.6
6u	U	1	0.0	0.256	14.8	LOS B	1.5	10.7	0.69	0.75	54.4
Approach		315	2.3	0.256	8.6	LOS A	1.5	10.7	0.68	0.74	52.7
North: Myall Street											
7	L2	40	0.0	0.072	5.9	LOS A	0.3	1.8	0.58	0.69	44.0
7a	L1	121	0.9	0.280	3.5	LOS A	1.2	8.7	0.60	0.70	44.4
9	R2	140	1.5	0.280	7.9	LOS A	1.2	8.7	0.60	0.70	44.6
9u	U	1	0.0	0.280	9.3	LOS A	1.2	8.7	0.60	0.70	45.4
Approach		302	1.0	0.280	5.9	LOS A	1.2	8.7	0.60	0.70	44.5
West: Cobbora Road											
10	L2	54	2.0	0.331	4.6	LOS A	2.2	15.9	0.29	0.43	45.4
11	T1	412	1.8	0.331	4.6	LOS A	2.2	15.9	0.29	0.43	55.6
12a	R1	476	2.2	0.296	8.1	LOS A	2.0	14.0	0.26	0.58	52.7
12u	U	3	0.0	0.296	11.3	LOS A	2.0	14.0	0.26	0.58	54.2
Approach		944	2.0	0.331	6.4	LOS A	2.2	15.9	0.28	0.51	53.4
All Vehicles		1999	2.3	0.356	6.6	LOS A	2.2	15.9	0.45	0.60	51.6

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 is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

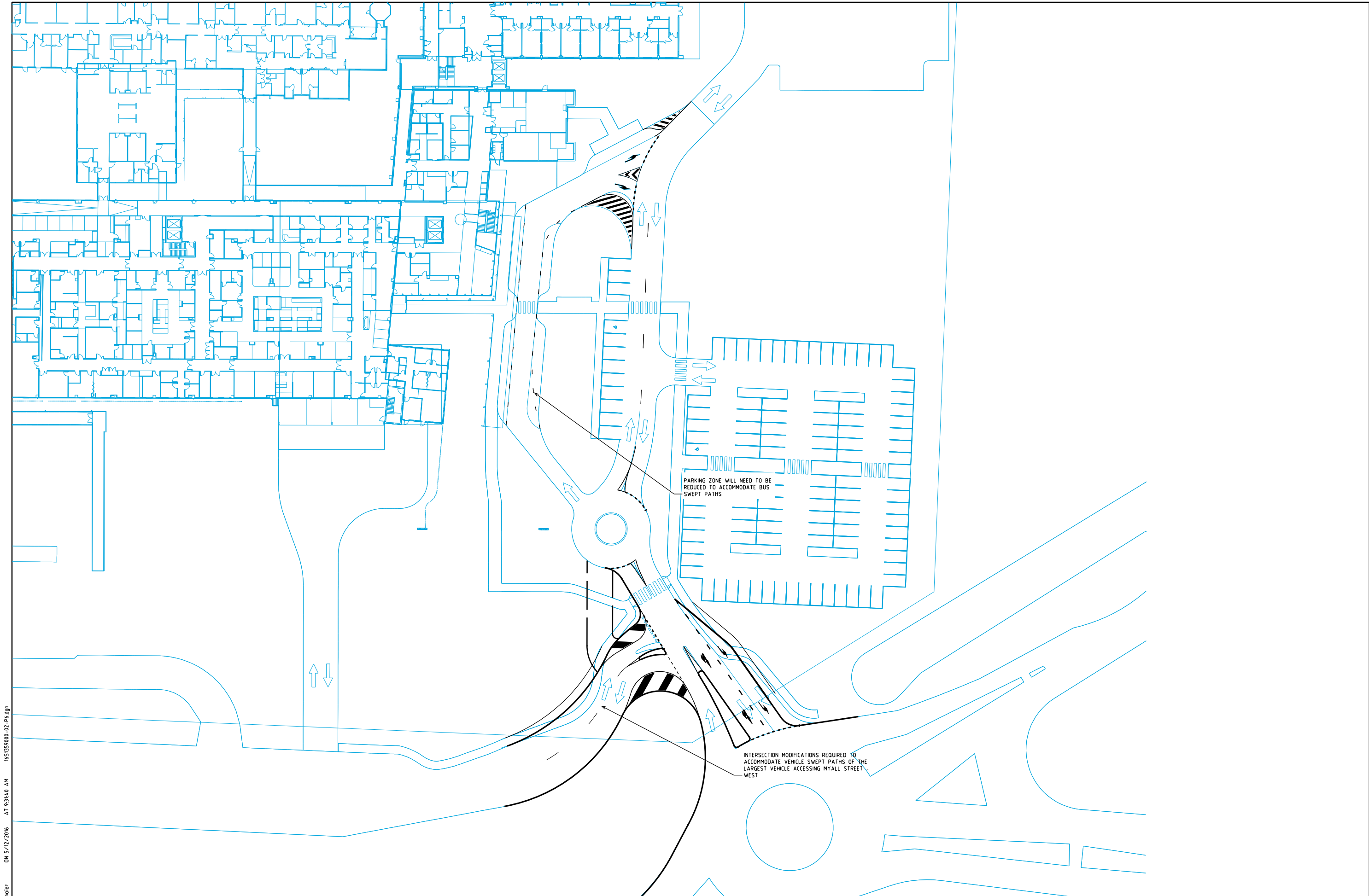
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Organisation: GTA CONSULTANTS | Processed: Friday, 11 November 2016 4:35:59 PM

Project: P:\16S1300-1399\16S1359000 Dubbo Hospital Redevelopment Project\Modelling\161111sid-16S1359000 (survey volumes).sip6

Appendix C

Vehicle Swept Paths



16S1359000-02-P6.dgn
ON 5/12/2016 AT 9:34:0 AM
PLOTTED BY : Helko Obermaier

Melbourne 03 9851 9600
Sydney 02 8448 1800
Brisbane 07 3113 5000
Canberra 02 6243 9400
Adelaide 08 8334 3600
Gold Coast 07 5510 4814
Townsville 07 4722 2765
Perth 08 6316 4634



PRELIMINARY PLAN
FOR DISCUSSION PURPOSES ONLY
SUBJECT TO CHANGE WITHOUT
NOTIFICATION

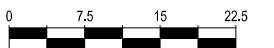
DUBBO HOSPITAL REDEVELOPMENT
GROUND FLOOR - LAYOUT REVIEW
& PROPOSED DESIGN MODIFICATIONS

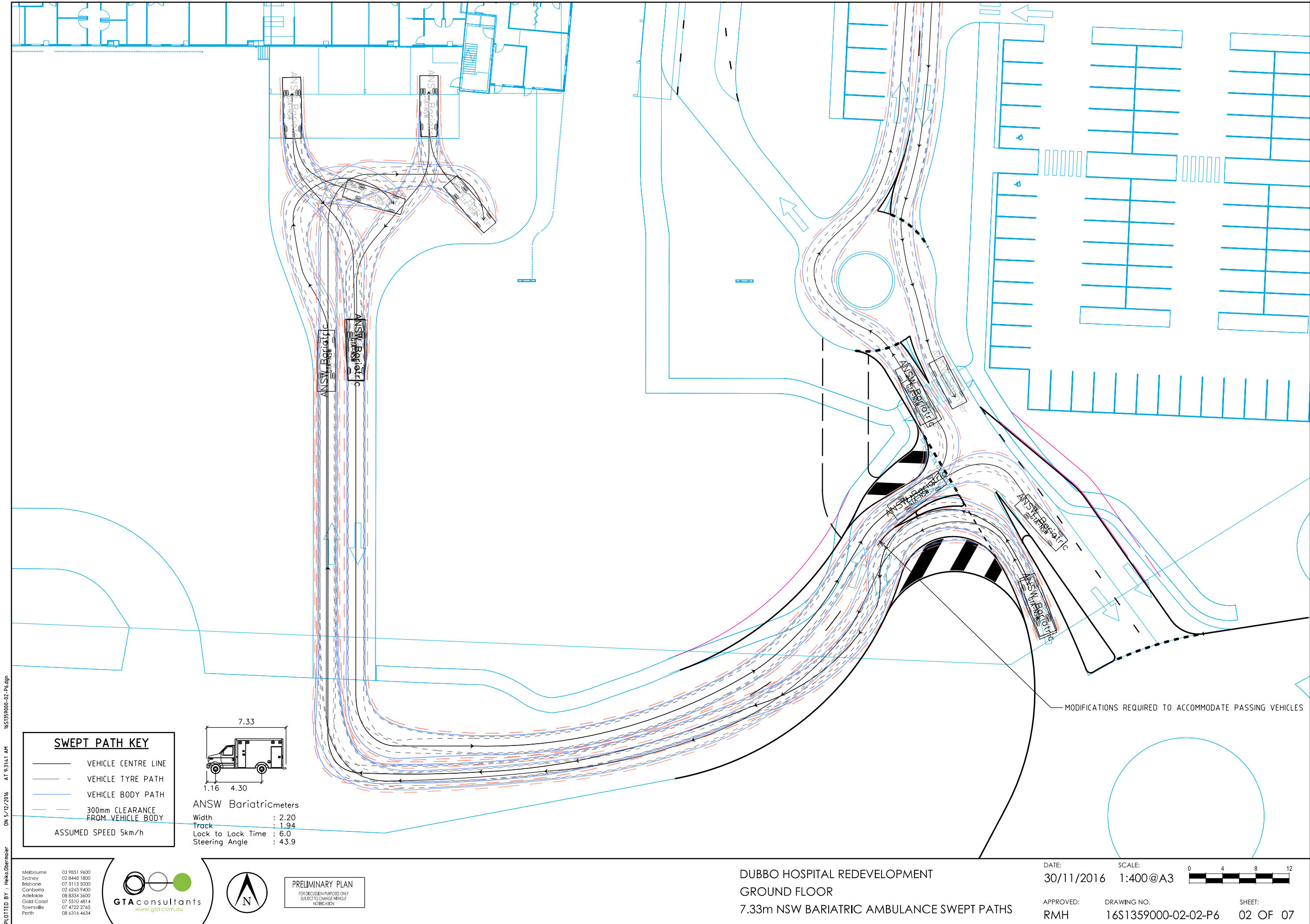
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APPROVED: RMH

DRAWING NO. 16S1359000-02-01-P6

SHEET: 01 OF 07

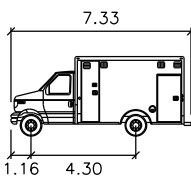




SWEPT PATH KEY

- VEHICLE CENTRE LINE
- - VEHICLE TYRE PATH
- VEHICLE BODY PATH
- 300mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 5km/h



ANSW Bariatric meters

Width : 7.33
Track : 4.30
Lock to Lock Time : 6.0
Steering Angle : 43.9

Melbourne 03 9851 9600
Sydney 02 8448 1800
Brisbane 07 3113 5000
Canberra 02 6243 9400
Adelaide 08 8334 3600
Gold Coast 07 5510 4814
Townsville 07 4722 2765
Perth 08 6316 4634



PRELIMINARY PLAN
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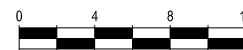
DUBBO HOSPITAL REDEVELOPMENT
GROUND FLOOR
7.33m NSW BARIATRIC AMBULANCE SWEPT PATHS

DATE: 30/11/2016
SCALE: 1:400@A3

APPROVED: RMH

DRAWING NO. 16S1359000-02-02-P6

SHEET: 02 OF 07



16S1359000-02-P6.dgn
ON 5/12/2016 AT 9:34:1 AM
PLOTTED BY : Helko Obermaier

Melbourne 03 9851 9600
Sydney 02 8448 1800
Brisbane 07 3113 5000
Canberra 02 6243 9400
Adelaide 08 8334 3600
Gold Coast 07 5510 4814
Townsville 07 4722 2765
Perth 08 6316 4634



PRELIMINARY PLAN
FOR DISCUSSION PURPOSES ONLY
SUBJECT TO CHANGE WITHOUT
NOTIFICATION

DUBBO HOSPITAL REDEVELOPMENT
GROUND FLOOR
6.16m NSW AMBULANCE SWEPT PATHS

DATE: 30/11/2016
SCALE: 1:400@A3

APPROVED: RMH

DRAWING NO. 16S1359000-02-03-P6

SHEET: 03 OF 07



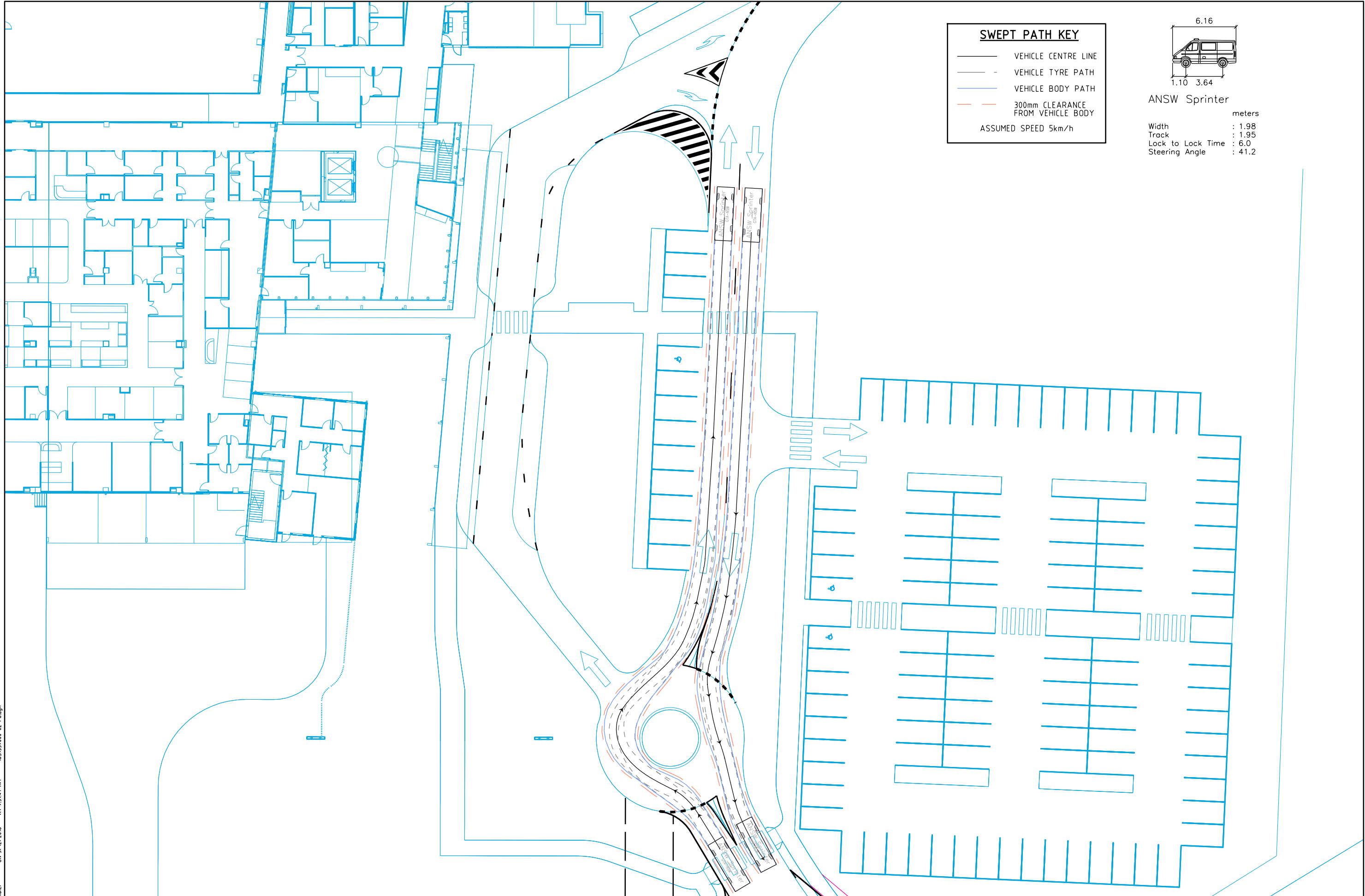
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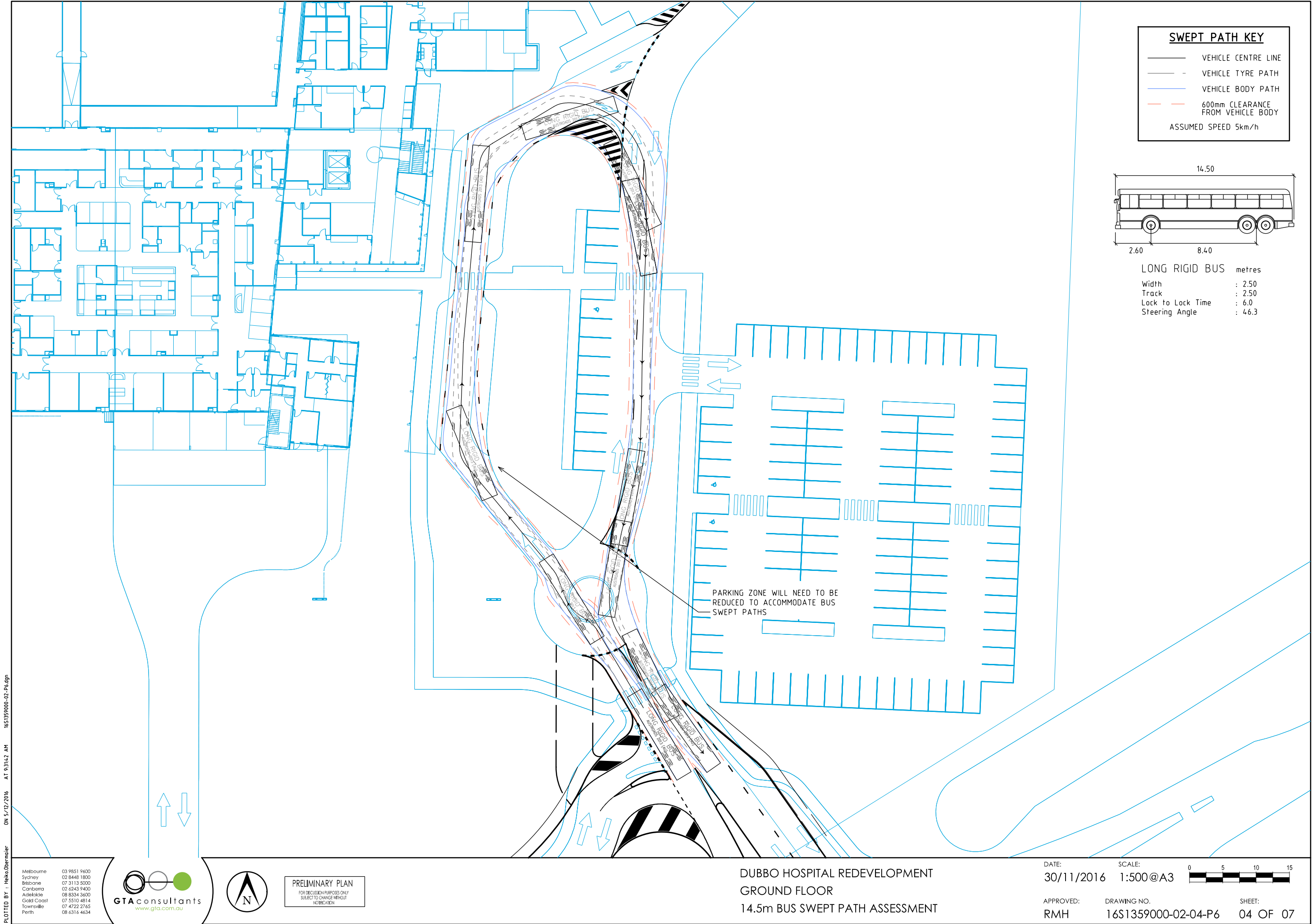
- VEHICLE CENTRE LINE
- - VEHICLE TYRE PATH
- VEHICLE BODY PATH
- 300mm CLEARANCE FROM VEHICLE BODY
- ASSUMED SPEED 5km/h

6.16
1.10 3.64
ANSW Sprinter

meters

Width : 1.98
Track : 1.95
Lock to Lock Time : 6.0
Steering Angle : 41.2

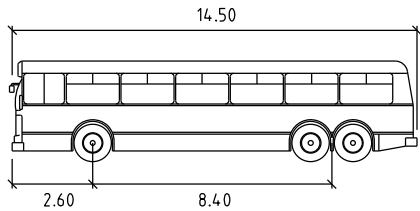




SWEPT PATH KEY

- VEHICLE CENTRE LINE
- - VEHICLE TYRE PATH
- VEHICLE BODY PATH
- - 600mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 5km/h



LONG RIGID BUS	metres
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 46.3

PARKING ZONE WILL NEED TO BE REDUCED TO ACCOMMODATE BUS SWEPT PATHS

16S1359000-02-P6.dgn
ON 5/12/2016 AT 9:34:2 AM
PLOT BY : Helko Obermaier

Melbourne 03 9851 9600
Sydney 02 8448 1800
Brisbane 07 3113 5000
Canberra 02 6243 9400
Adelaide 08 8334 3600
Gold Coast 07 5510 4814
Townsville 07 4722 2765
Perth 08 6316 4634



PRELIMINARY PLAN
FOR DISCUSSION PURPOSES ONLY
SUBJECT TO CHANGE WITHOUT
NOTIFICATION

DUBBO HOSPITAL REDEVELOPMENT
GROUND FLOOR
14.5m BUS SWEPT PATH ASSESSMENT

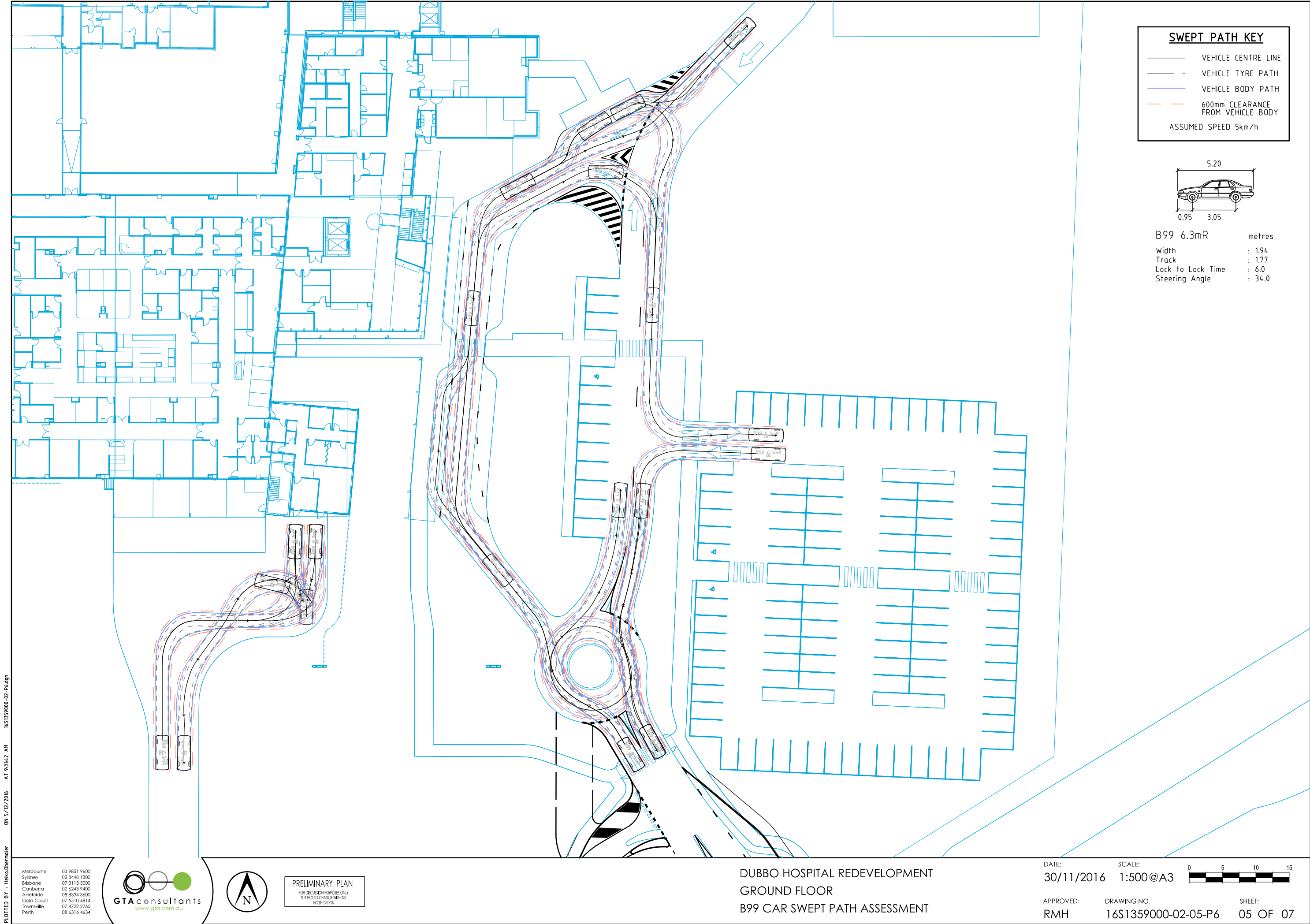
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APPROVED: RMH

DRAWING NO. 16S1359000-02-04-P6

SHEET: 04 OF 07

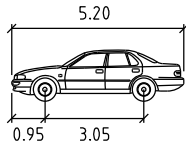




SWEPT PATH KEY

- VEHICLE CENTRE LINE
- - VEHICLE TYRE PATH
- VEHICLE BODY PATH
- - 600mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 5km/h



B99 6.3mR	metres
Width	: 1.94
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.0

16S1359000-02-P6.dgn
ON 5/12/2016 AT 9:34:2 AM
PLOT BY : Helko Obermaier

Melbourne 03 9851 9600
Sydney 02 8448 1800
Brisbane 07 3113 5000
Canberra 02 6243 9400
Adelaide 08 8334 3600
Gold Coast 07 5510 4814
Townsville 07 4722 2765
Perth 08 6316 4634



PRELIMINARY PLAN
FOR DISCUSSION PURPOSES ONLY
SUBJECT TO CHANGE WITHOUT
NOTIFICATION

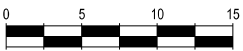
DUBBO HOSPITAL REDEVELOPMENT
GROUND FLOOR
B99 CAR SWEPT PATH ASSESSMENT

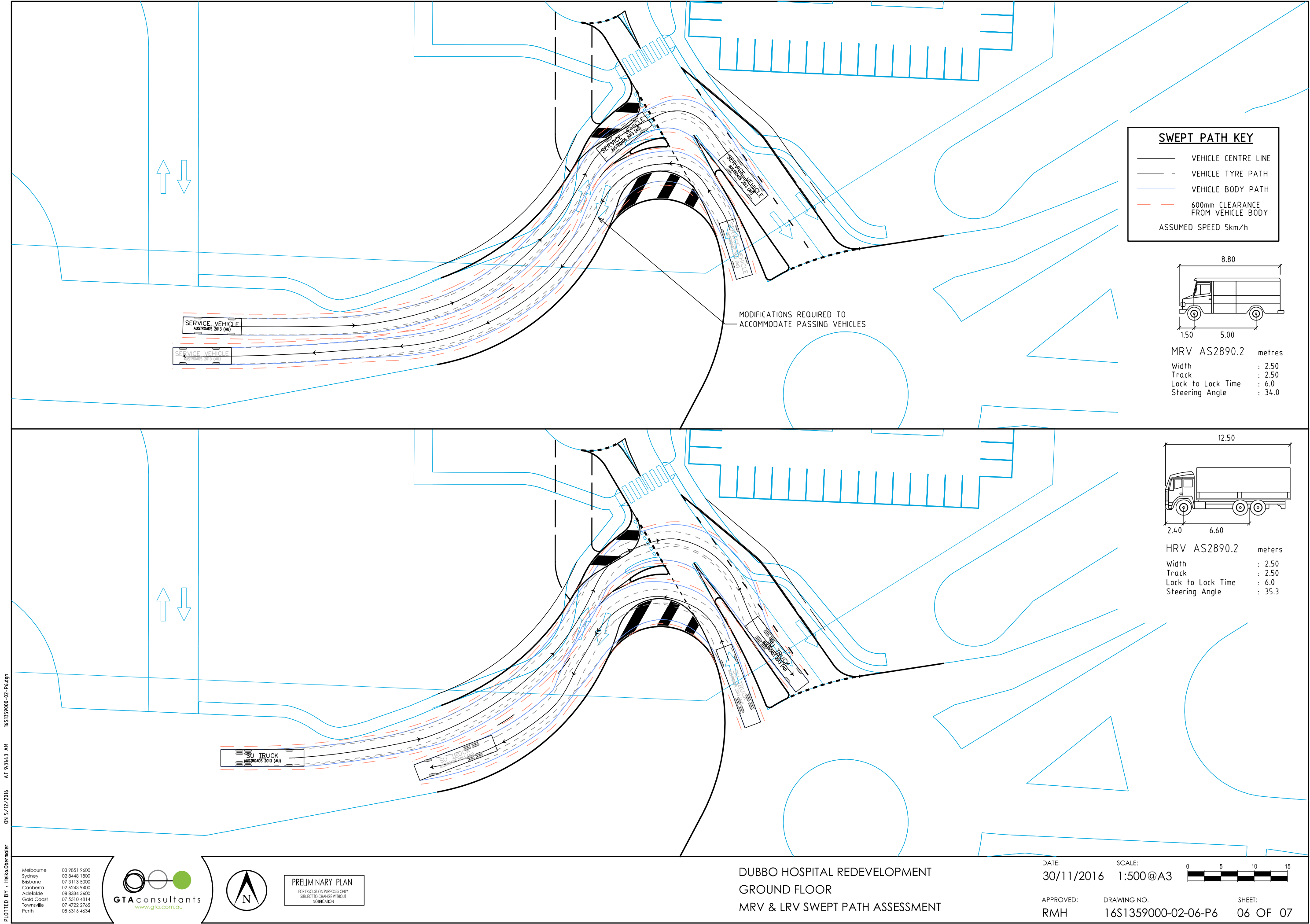
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APPROVED: RMH

DRAWING NO. 16S1359000-02-05-P6

SHEET: 05 OF 07

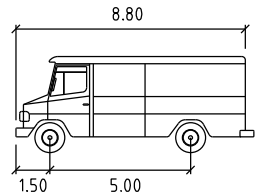




SWEPT PATH KEY

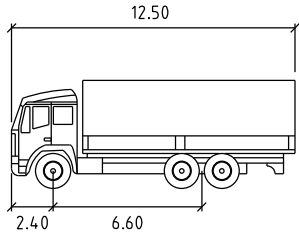
- VEHICLE CENTRE LINE
- - VEHICLE TYRE PATH
- VEHICLE BODY PATH
- - 600mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 5km/h



MRV AS2890.2 metres

Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 34.0



HRV AS2890.2 metres

Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 35.3

16S1359000-02-P6.dgn
ON 5/12/2016 AT 9:34:3 AM
PLOTTED BY : Helko Obermaier

Melbourne 03 9851 9600
Sydney 02 8448 1800
Brisbane 07 3113 5000
Canberra 02 6243 9400
Adelaide 08 8334 3600
Gold Coast 07 5510 4814
Townsville 07 4722 2765
Perth 08 6316 4634



PRELIMINARY PLAN
FOR DISCUSSION PURPOSES ONLY
SUBJECT TO CHANGE WITHOUT
NOTIFICATION

DUBBO HOSPITAL REDEVELOPMENT
GROUND FLOOR
MRV & LRV SWEPT PATH ASSESSMENT

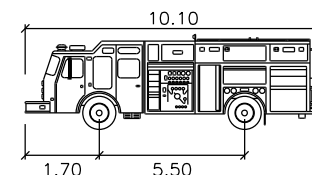
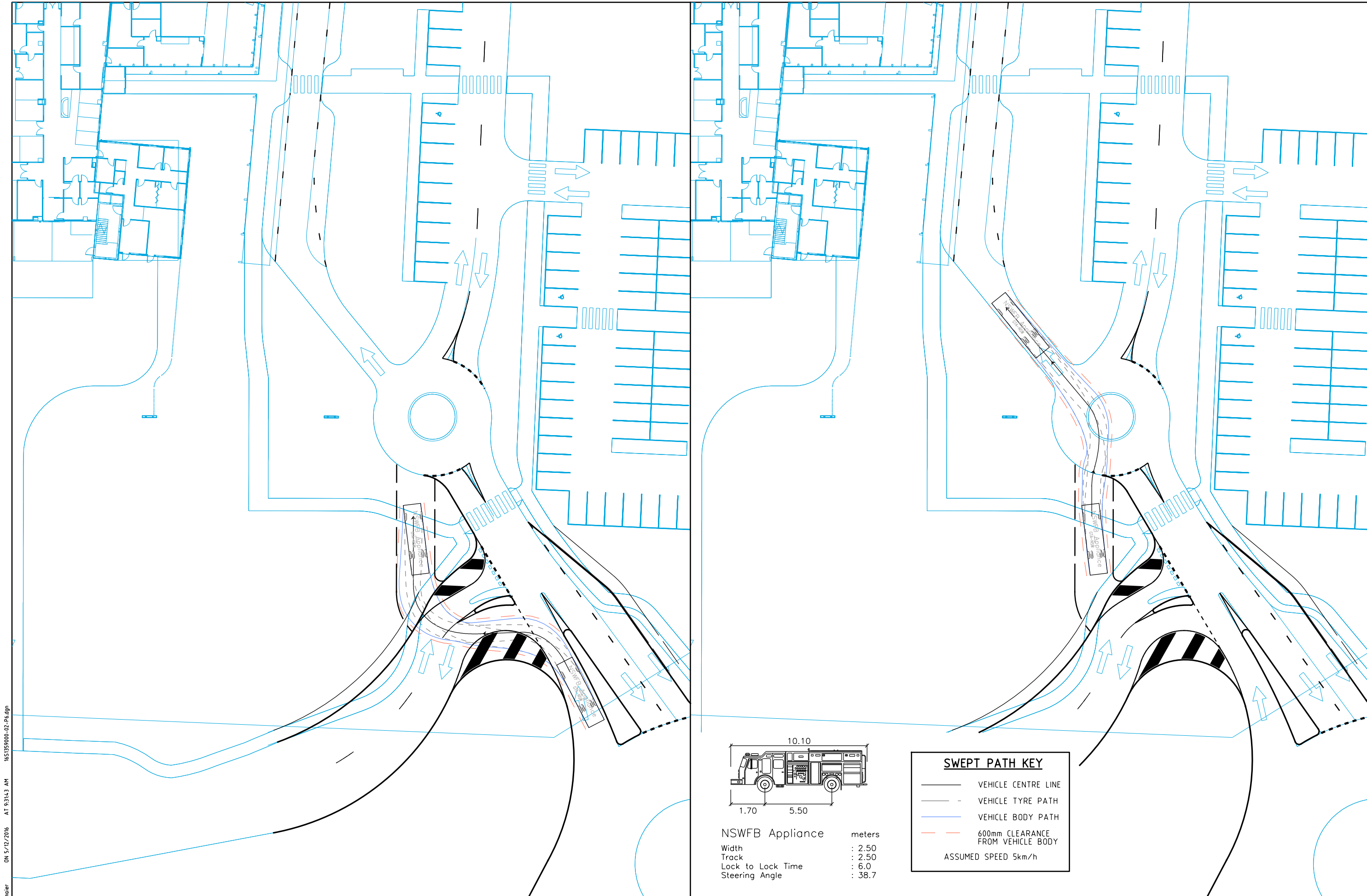
DATE: 30/11/2016
SCALE: 1:500@A3

APPROVED: RMH

DRAWING NO. 16S1359000-02-06-P6

SHEET: 06 OF 07





NSWFB Appliance	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 38.7

SWEPT PATH KEY	
	VEHICLE CENTRE LINE
	VEHICLE TYRE PATH
	VEHICLE BODY PATH
	600mm CLEARANCE FROM VEHICLE BODY
ASSUMED SPEED 5km/h	

DUBBO HOSPITAL REDEVELOPMENT
GROUND FLOOR
MRV & LRV SWEPT PATH ASSESSMENT

DATE: 30/11/2016 SCALE: 1:500@A3
APPROVED: RMH DRAWING NO. 16S1359000-02-07-P6 SHEET: 07 OF 07

16S1359000-02-P6.dgn ON 5/12/2016 AT 9:34:3 AM

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