

report;

**Parking and Traffic Assessment for
Mudgee Hospital**

For Health Infrastructure

22 June 2018

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Document Control

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1. Executive Summary

- Mudgee Hospital is a regional health service facility with 31 overnight beds, which provides emergency care, domiciliary care, rehabilitation and obstetric services. It is located at the north-western corner of Meares & Lewis Streets and has its own parking supply.
- **ptc.** has been engaged by Health Infrastructure (HI) to prepare a parking demand and traffic assessment report to accompany a State Significant Development Application for the construction of a new hospital within the existing hospital campus. This report has addressed the traffic & transport related matters of the Secretary’s Environmental Assessment Requirements (SEARs) and Roads and Maritime Services (RMS) comments as part of this development.
- Transport modes available to Hospital attendees (staff, outpatients and visitors) are primarily road, with limited bus services. Per our surveys, no Hospital attendees travel to the Hospital by public transport.
- All parking at the Hospital is currently unrestricted and free of charge.
- The Hospital currently has a total of 77 car parking spaces on campus (excluding emergency vehicles, ambulance and loading zones). During our surveys, the highest recorded peak occupancy was 47 spaces (60.4%). Of the 30 available spaces, the majority (67%) were ‘unrestricted’ spaces available for ‘general’ parking.
- At peak, we have calculated the car parks are 31% occupied by staff and 69% by patients / visitors (assuming all stays greater than 5 hours are staff). Based on our experience of other hospitals, we would opine that a 65% / 35% split would be more reasonable. The surveyed 31%/69% split at Mudgee Hospital is possibly because the majority (approximately 85%) of staff park off campus, which is indicated in our staff survey.
- Our parking occupancy survey of the Relevant Parking Zone (RPZ) indicates that current practical parking supply for use by Hospital staff, outpatients and visitors, within reasonable, practical distance (typically on Lewis Street, Church Street and Meares Street) comprises an approximate total of 212 spaces, summarised as follows:

Table 1 - Practical Alternative Parking Supply near the Hospital

Location	Unrestricted	Time Restricted	Total
Lewis Street, Church Street and Meares Street	193	19	212

- The observed peak occupancy on the above streets during our survey period was 49.8% at 10am. Our analysis in Section 8.10 indicates the majority (61%) of these spaces may be Hospital-related users.
- Based on the above, a summary of the estimated current parking demand and supply is as follows:

Table 2 - Summary of Estimated Current Parking Demand & Supply

Total Parking Supply/Demand Analysis	Current (2016/17)	Future (2026/27)
On Campus Supply		
Total On Campus Supply	77	127
Demand		
Staff	74	77
Public	42	43
LHD Controlled – Fleet Vehicles	2	2
Maintenance Vehicles	2	2
Total Demand	120	124
Total On Campus Surplus/(Shortfall)	(43)	3
Total Off Campus Supply near the Hospital	212	212
Estimated Total Off Campus Supply utilised by Hospital-related Users (69% of Total Supply)¹	146	146
Total Surplus / (Shortfall)	103	149

- The **current** estimated on campus shortfall of 43 spaces can be comfortably met by off campus parking supply near the Hospital (146 spaces) assuming 69% of bays are utilised for Hospital use.
- In the **future** scenario, the on-campus parking supply will meet the projected future demands (by an excess of 3 spaces). Hence, there will be **no reliance on off-campus parking**. As an additional benefit, this improves environmental amenity by reducing the number of vehicles parking on-street.
- This conclusion is subject to the following assumptions:

Demand

- No changes to the parking behaviour of staff, outpatients and visitors (i.e. same %'s continue to drive, park etc.).
- No changes to the % of outpatients and visitors who are dropped off and do not park.
- Note that should paid parking be introduced at the Hospital (or by Council in surrounding streets), it is likely that some or all of the above assumptions will change.

Supply

¹ 69% (73/106) of total off campus occupied bays were used by Hospital-related users per **ptc.** occupancy surveys.

- No changes by Council to on-street and off-street parking regimes that result in fewer bays being available to hospital-related users, for example:
 - Unrestricted parking spaces becoming restricted (e.g. 2P) and therefore not practically available for use by staff. Note, however, that assuming a time restriction of, say, 2P these spaces could be used by patients and visitors to the hospital.
 - Other parking restrictions (e.g. “No parking”) are introduced, thereby making spaces unavailable to hospital staff, patients and visitors.
- No significant increase in demand for parking from external sources (e.g. School and child care centre etc.).
- When asked about paid parking during our surveys, the following responses were received:

Table 3 - Staff, outpatients and visitors’ response to paid parking

Staff Weekly Fee	\$5	\$10	\$15
Number of Respondents	25	20	23
Yes	52.0%	30.0%	13.0%
No	48.0%	70.0%	87.0%
Number of Respondents	26	23	17
Yes	61.5%	47.8%	23.5%
No	38.5%	52.2%	76.5%

- Our analysis of these results showed more outpatients and visitors are prepared to pay for parking. This is as expected as outpatients and visitors generally value the convenience of parking close to the Hospital more than staff, who may be prepared to walk a distance to avoid having to pay for parking.
- **The contents of this report are governed by the statements set out in Section 8 and should therefore be read in conjunction with them.**

Traffic

A traffic assessment on the road network surrounding the hospital has been undertaken for existing scenario and we have found that both the Church Avenue/ Meares Street and Meares Street/ Lewis Street intersections are currently operating Level of Service (LOS) A & B with significant spare capacity to accommodate additional traffic in both the AM and PM Peak hours. There are high volumes of traffic in Church Street and as a consequence, the Church Street/ Meares Street intersection carries the highest volume of traffic in the locality. However, the existing giveway control operation on the minor approach (Meares Street) is currently operating at a satisfactory LOS with reasonable Average Movement Delay (AVD). As the redevelopment of the hospital will not result any increase in bed numbers or services within the hospital, the additional traffic generated by the proposal will be minor.

Due to the high volume of traffic along Church Street, no vehicular access is proposed via Church Street. New vehicular accesses are proposed via Mears and Lewis Streets, away from the intersections with no

major traffic safety issues (Chapter 8.5). The design of the car park is generally acceptable and it will comply with the requirements of AS 2890.1, 2 & 6 (Chapter 8.5). Swept path analysis show that heavy vehicles will be able to access the site without any difficulty.

Public transport usage to the hospital is negligible due to various reasons. Private vehicle trips are very popular as most of the staff and visitors travel to the hospital away from the areas where there is no public transport availability. This trend will continue in the future. A detailed assessment of the public transport usage is outlined in section 10.

The hospital should promote active transport usage to the staff and visitors. Day time staff members living within reasonable walking and cycling distance should be encouraged to avoid motorised trips. Specific recommendations are outlined in section 10.

In summary, as the parking supply is directly related to traffic generation, the hospital should focus on sustainable and other modes of transport for its day time staff so that the overall need for parking demand is reduced in the future. Similar to other hospitals, a Green Travel Plan (GTP) should be prepared for the Mudgee hospital.

2. Purpose of the Report

ptc. has been engaged by Health Infrastructure (HI) to prepare a parking demand and traffic assessment report to accompany a State Significant Development Application (SSDA) for the construction of a new hospital within the existing Mudgee Hospital campus.

This report has been prepared in accordance with the traffic and transport related comments stated in Secretary’s Environmental Assessment Requirements (SEARs) dated 6 April 2018 and RMS letter dated 5 April 2018 relating to the SSDA. The following table presents the SEARs relevant to Transport and Accessibility and confirms that each of these items has been addressed in this report.

SEARs	Comments and Reference
Item 5 – Transport and Accessibility	
Include a transport and accessibility impact assessment, which details, but not limited to the following:	
<ul style="list-style-type: none"> accurate details of the current daily and peak hour vehicle, public transport, pedestrian and cycle movement and existing traffic and transport facilities provided on the road network located adjacent to the proposed development; 	<p>The existing traffic activity associated with the Hospital is described in Section 9.2. The mode share is presented in Section 7.3, which was established through surveys of the staff, and found a very low usage of public transport, cycling or walking.</p>
<ul style="list-style-type: none"> an assessment of the operation of existing and future transport networks including the bus network and their ability to accommodate the forecast number of trips to and from the development; 	<p>The use of transport networks is described in Section 11.</p>
<ul style="list-style-type: none"> details of estimated total daily and peak hour trips generated by the proposal, including vehicle, public transport, pedestrian and bicycle trips; 	<p>The peak hour vehicle trips are presented in Section 9.2. The use of transport networks is described in Section 11.</p>
<ul style="list-style-type: none"> the adequacy of public transport, pedestrian and bicycle networks and infrastructure to meet the likely future demand of the proposed development; 	<p>The existing public transport, pedestrian and bike network are described in Section 6. Future transport demand is outlined in Section 11.</p>
<ul style="list-style-type: none"> the impact of the proposed development on existing and future public transport infrastructure within the vicinity of the site in consultation with Roads and Maritime Services and Transport for NSW and identify measures to integrate the development with the transport network; 	<p>The impact of the proposed development on existing and future road network is described in Section 11.</p>
<ul style="list-style-type: none"> details of any upgrading or road improvement works required to accommodate the proposed development; 	<p>The proposal results in no notable increase in traffic and therefore no upgrades are warranted as a result of this proposal as described in Section 9.3..</p>

SEARs	Comments and Reference
<ul style="list-style-type: none"> • details of travel demand management measures to encourage sustainable travel choices and details of programs for implementation; 	<p>Section 11 includes details on how mode share could be balanced across all available modes.</p>
<ul style="list-style-type: none"> • the impact of trips generated by the development on nearby intersections (particularly the Meares and Church Street intersection), with consideration of the cumulative impacts from other approved developments in the vicinity, and the need/associated funding for upgrading or road improvement works, if required (note: traffic modelling is to be undertaken with scope to be agreed by TfNSW and RMS in advance); 	<p>The intersection modelling described in Section 9.3 demonstrates that the intersections are operating well within capacity under the existing and post development scenarios. There are no known future developments which will increase traffic to the degree required to warrant intersection upgrades.</p>
<ul style="list-style-type: none"> • the proposed active transport access arrangements and connections to public transport services; 	<p>There are no proposed new connections to public transport as these are considered to satisfy the current needs of the hospital.</p>
<ul style="list-style-type: none"> • the proposed access arrangements, including car and bus pick-up/drop-off facilities, and measures to mitigate any associated traffic impacts and impacts on public transport, pedestrian and bicycle networks, including pedestrian crossings and refuges and speed control devices and zones; 	<p>The proposal will consolidate the existing access locations to a single driveway within the Meares Street frontage and Lewis Street frontage (Staff and emergency only) as described in Section 10.</p>
<ul style="list-style-type: none"> • measures to maintain road and personal safety in line with CPTED principles; 	<p>The proposal does not impact on the existing road operations. The parking and internal circulation have been designed in accordance with AS2890.1 as described in Section 10.2.</p>
<ul style="list-style-type: none"> • details of proposed bicycle parking facilities in secure, convenient, accessible areas close to main entries incorporating lighting and passive surveillance and end-of-trip facilities; 	<p>This report recommends the provision of a covered cycle facility in line with increasing cycling as a share of travel mode. See Section 11.4.</p>
<ul style="list-style-type: none"> • details of the proposed number of car parking spaces and compliance with appropriate parking codes and justification for the level of car parking provided on-site (including the provision of an updated parking study); 	<p>Refer to Sections 7 and 8, which detail the parking demand assessment and the proposed parking provision, which aims to reduce the current demand for on-street parking by staff.</p>
<ul style="list-style-type: none"> • details of emergency vehicle access arrangements; 	<p>Emergency vehicles will access from Lewis Street in isolation to the public car park access. Refer to Section 10.1.4.</p>

SEARs	Comments and Reference
<ul style="list-style-type: none"> an assessment of road and pedestrian safety adjacent to the proposed development and the details of required road safety measures; 	<p>The proposal does not impact on the existing road operations. The parking and internal circulation have been designed in accordance with AS2890.1 as described in Section10.2.</p>
<ul style="list-style-type: none"> service vehicle access, delivery and loading arrangements and estimated service vehicle movements including vehicle type and the likely arrival and departure times); 	<p>Service vehicles will access from Lewis Street in isolation to the public car park access. Refer to Section10.1.3.</p>
<ul style="list-style-type: none"> in relation to construction traffic: <ul style="list-style-type: none"> assessment of cumulative impacts associated with other construction activities; an assessment of road safety at key intersection and locations subject to heavy vehicle construction traffic movements and high pedestrian activity; details of construction program detailing the anticipated construction duration and highlighting significant and milestone stages and events during the construction process; details of anticipated peak hour and daily construction vehicle movements to and from the site; details of access arrangements of construction vehicles, construction workers to and from the site, emergency vehicles and service vehicle; details of temporary cycling and pedestrian access during construction; details of proposed construction vehicle access arrangements at all stages of construction; and traffic and transport impacts during construction, including cumulative impacts associated with other construction activities, and how these impacts will be mitigated for any associated traffic, pedestrian, cyclists, parking and public transport, including the preparation of a draft Construction Traffic Management Plan to demonstrate the proposed management of the impact (which must include vehicle routes, number of trucks, hours of operation, access arrangements and traffic control measures for all demolition/construction activities). 	<p>The preliminary Construction Traffic Management Plan (CTMP) is described in Section12. A more detailed CTMP is typically required as a condition of the consent and following the engagement of a contractor.</p>

RMS matters and associated responses are provided in table below.

RMS Comments	Responses and Reference
A traffic impact study prepared in accordance with the methodology set out in Section 2 of the RTA's Guide to Traffic Generating Developments and including:	
Construction	
<ul style="list-style-type: none"> Hours and days of construction of the project and how proposed operations will interact with all other road users (motorists and pedestrians) within and outside of the site 	<p>Hours of construction has been outlined in Section 12.3 and pedestrian movements during construction has been described in Section 12.9. It is envisaged that the construction site will be fenced off to prohibit any public access.</p>
<ul style="list-style-type: none"> Road transport volumes and types broken down into origin and destination, travel routes and peak hours during construction of the project. The traffic study should address internal traffic movements and parking facilities. 	<p>Construction traffic volume will be addressed in the detailed Construction Traffic Management Plan when the construction contraction is appointed.</p>
<ul style="list-style-type: none"> Movement of construction materials and machinery planned to minimise the risk and impact to other road users so far as is reasonably practicable. 	<p>Special type of construction material deliveries has been outlined in Sections 12.6 and 12.7.</p>
<ul style="list-style-type: none"> The impact of generated traffic and measures employed to ensure efficiency and safety on the public road network during construction. 	<p>Safety aspect of construction work has been outlined in Section 12.15.</p>
<ul style="list-style-type: none"> Any mitigating measures required to address expected construction traffic generation. 	<p>As stated above, any construction impact mitigation measures will be addressed in the detailed construction traffic management plan.</p>
<ul style="list-style-type: none"> Vehicular access arrangements during and post construction. 	<p>Construction vehicular access arrangement has been addressed in Section 12.2.</p>
Operation	
<ul style="list-style-type: none"> Traffic and transport volumes and types broken down into access routes and peak hours for the operation of the hospital. Volumes should include hospital input related traffic generation (e.g. services, maintenance, waste, etc) as well as patient, ambulance, staff, visitation traffic, etc. 	<p>Traffic Assessment has been undertaken in Section 9 of this report.</p>
<ul style="list-style-type: none"> Temporary and permanent staff numbers (including employees and contractors) and staff parking arrangements. Car parking areas need to accommodate peak parking demands (e.g. staff 	<p>Car parking demand assessment has been undertaken in Section 8 of this report.</p>

RMS Comments	Responses and Reference
changeover/shift changes). Demonstration of how traffic will be controlled/managed in the hospital site (e.g. turning movements that are allowed and/or disallowed).	
<ul style="list-style-type: none"> Ambulance manoeuvring and storage areas are to be clearly defined in the EIS. This is required to demonstrate where ambulances arrive and turning paths for manoeuvring these vehicles. 	Ambulance access is outlined in Section 10.1.4.
<ul style="list-style-type: none"> Allowance for emergency services (e.g. fire, police and hospital emergency vehicles including helicopter). 	Refer to Figure 18.
<ul style="list-style-type: none"> Assessment of pedestrian requirements, including disabled, and interaction with vehicles on-site. 	Pedestrian and vehicular path to the hospital will be separated. Disabled parking will be provided in accordance with the Building Code of Australia (BCA).
<ul style="list-style-type: none"> Vehicle types, e.g., light, heavy delivery, bus (public and hospital), and emergency vehicles included in the assessment of access location(s), car park and internal manoeuvring areas. 	Refer to Sections 9 and 10.
<ul style="list-style-type: none"> Impacts that projected related and cumulative impacts of hospital traffic generation will have on the surrounding road network and measures employed to ensure efficiency and safety on the adjacent road network. 	Mid-Western Regional Council website does not indicate any nearby major development, hence cumulative traffic impact assessment is not required.
<ul style="list-style-type: none"> Allowance for other transport modes e.g. bicycle and pedestrian. 	Refer to Sections 11.4 and 11.5.
<ul style="list-style-type: none"> Any mitigating measures required to address expected traffic generation. 	Refer to Section 9.3.
<ul style="list-style-type: none"> Access treatments are to be identified and be in accordance with Austroads Guide to Road Design including safe intersection sight distance. Internal parking and vehicular manoeuvring areas in accordance with Australian Standards 2890. 	All off-street car parking facilities will be designed in accordance with AS 2980.1, 2 & 6.
<ul style="list-style-type: none"> Vehicular access treatments to public roads lit in accordance with Australian Standards 1158. Particular attention should be placed on pedestrian-vehicle conflict areas and allowance made for local climatic conditions. 	Vehicular crossovers will be constructed in consultation with Mid-Western Regional Council.

RMS Comments	Responses and Reference
<ul style="list-style-type: none"> Demonstration that all vehicular access ways provide sufficient sight distance to pedestrians on footways and vehicles travelling on roads. This may require providing building and fence setback or splaying, and ensuring vegetation is controlled at conflict points. 	<p>Pedestrian and vehicular safety will be considered during construction of the vehicular access ways.</p>
<ul style="list-style-type: none"> All traffic movements to and from the site in a forward direction. 	<p>All traffic will access and egress the hospital in a forward direction.</p>
<ul style="list-style-type: none"> Adequate car parking contained within the site. 	<p>Adequate car parking will be provided within the Hospital campus (refer to Section 8).</p>
<ul style="list-style-type: none"> Pram ramps and other pedestrian facilities provided at all appropriate locations throughout the development. Accessible kerb is to be provided at all disabled bays. 	<p>Pram ramps will be constructed in consultation with Mid-Western Regional Council.</p>
<ul style="list-style-type: none"> Internal road network and parking areas clearly signposted to avoid confusion. 	<p>Appropriate wayfinding will be installed.</p>
<ul style="list-style-type: none"> Adequate internal circulation roadway widths are to be adequate for the largest vehicle anticipated to use the site. 	<p>Internal roadway will accommodate two-way circulation. Appropriate turn around facility will be provided.</p>
<ul style="list-style-type: none"> Canopy height or roof extensions need to be taken into consideration for service vehicles including any overhead garbage collection service. 	<p>Sufficient headroom will be provided for service vehicles.</p>
<ul style="list-style-type: none"> All traffic signage is to be in accordance with Australian Standards 1742 and Australian Standards 1743. 	<p>All traffic signage will be in accordance with AS 1742 & 1743.</p>
<ul style="list-style-type: none"> Pedestrian and bicycle access including connection to existing public pedestrian and bicycle infrastructure to service the site. 	<p>Refer to Sections 11.4 and 11.5.</p>

Mid-Western Regional Council

Council letter dated 3 April 2018 states that:

Council requests that details be provided specific to the Mears and Church Street intersection and the impact the additional traffic generation will have on its functionality. This intersection is located on a primary access road connecting residential areas and a nearby school with the Mudgee CBD. Currently, vehicles turning on to Church Street via Meares Street can experience significant delays, particularly in peak hours.

Response:

Church Street/ Meares Street intersection has been analysed by Sidra intersection model which shows that the intersection has significant spare capacity to accommodate additional traffic (Refer to Section 9.3).

The following documents were referenced during the preparation of this report.

- Guide to Traffic Generating Developments (Roads and Maritime Services)
- Cycling Aspects of Austroads Guides
- NSW Planning Guidelines for Walking and Cycling
- Austroads Guide to Traffic Management Part 12: Traffic Impacts of Development
- Standards Australia AS2890 suite of standards

The following correspondence has been undertaken between **ptc.** and the relevant agencies during the preparation of this report.

Date	Correspondence
8 August 2018	Site Inspection and Meeting with Council Traffic Engineer
18 April 2018	Meeting with Council
14 May 2018	Email from TfNSW advising of no requirement to consult
16 May 2018	Confirmation from RMS that meeting with them is not required.

3. Background

This section provides background to Mudgee Hospital (“the Hospital”).

3.1 Background²

Mudgee Hospital is a regional hospital located at Mudgee, NSW. It provides the following services:

- Domiciliary care
- Obstetric services
- Rehabilitation unit
- 24-hour emergency department

A summary of the current key statistics of the Hospital is as follows:

Table 4 - Hospital Key Statistics

Key Statistics	
Staff – Clinical, Administration & Support Services (FTE)	100
Overnight Beds	31
Outpatients Occasions of Services (2016/17)	21,991
Emergency Department Presentations (2014/15)	12,260

The campus is bordered by Church Street, Meares Street, and Lewis Street, Mudgee.

3.2 Campus Plan

The map below³ shows the Hospital campus and the various major parking areas.

² Sources: Mudgee Hospital, www.myhospitals.gov.au



Figure 1 - Campus Map

Parking allocations are signed including:

- Public Spaces
 - Unrestricted Spaces
 - Disabled Spaces
 - Drop off & pick up (10 Minute) Spaces
- Staff & Special Use Spaces
 - Maintenance Spaces
 - Doctor Spaces
 - Dentist Spaces
 - Delivery Vehicle Spaces

All parking at the Hospital is currently free of charge. Public spaces are not time restricted (except two 'Drop off & pick up 10 Minutes' spaces in Car Park A).

3.3 Current Parking Supply

A summary of the current parking supply at the Hospital is as follows. Loading docks and ambulance bays have been excluded, as these are not generally available to hospital staff and public.

A breakdown of the parking supply is as follows:

Table 5 - Breakdown of Parking Supply

Map Code	Car Parks	Capacity
A	Day public & night staff parking	17
B	Hospital fleet, maintenance & community transport vehicles	22
C	Day & night public parking	21
D	Day public & Night staff parking	17
Total		77

Average peak occupancy recorded during our surveys at the Hospital was 47 cars (60.4%) which occurred around 2pm – 3pm (see Section 7 of this report for details). Peak occupancy was very similar across both individual days of our surveys. Therefore, it appears that there are available spaces for hospital-related users on campus during peak hour.

3.4 Current Parking Issues

In discussions with the Hospital, and from our own observations, we understand that some of the current parking issues include:

- Insufficient day shift staff parking in the hospital (no spaces were designated for day shift staff parking in hospital car parks);
- Staff parked in surrounding streets or on nature strip via an informal vehicular crossover in Church Street (Photograph 1)



Photograph 1 - Parking on nature strip

- The existing parking spaces within the car parks are too narrow and do not comply with current Australian Standards. Therefore, some staff members do not park in the car park due to concerns about vehicular damage (e.g. scratches, dents etc).
- Many vehicles were observed to encroach into the neighbouring parking spaces, reducing the overall number of spaces, from a practical perspective.

4. Parking Demand Estimate Methodology Overview

ptc.'s general approach to estimating parking demand is outlined in the diagram below. This methodology is familiar to HI as it has been used to estimate parking demand at a number of hospital sites. We acknowledge that no two sites are identical; therefore, our general methodology is tailored to the requirements of each specific site.

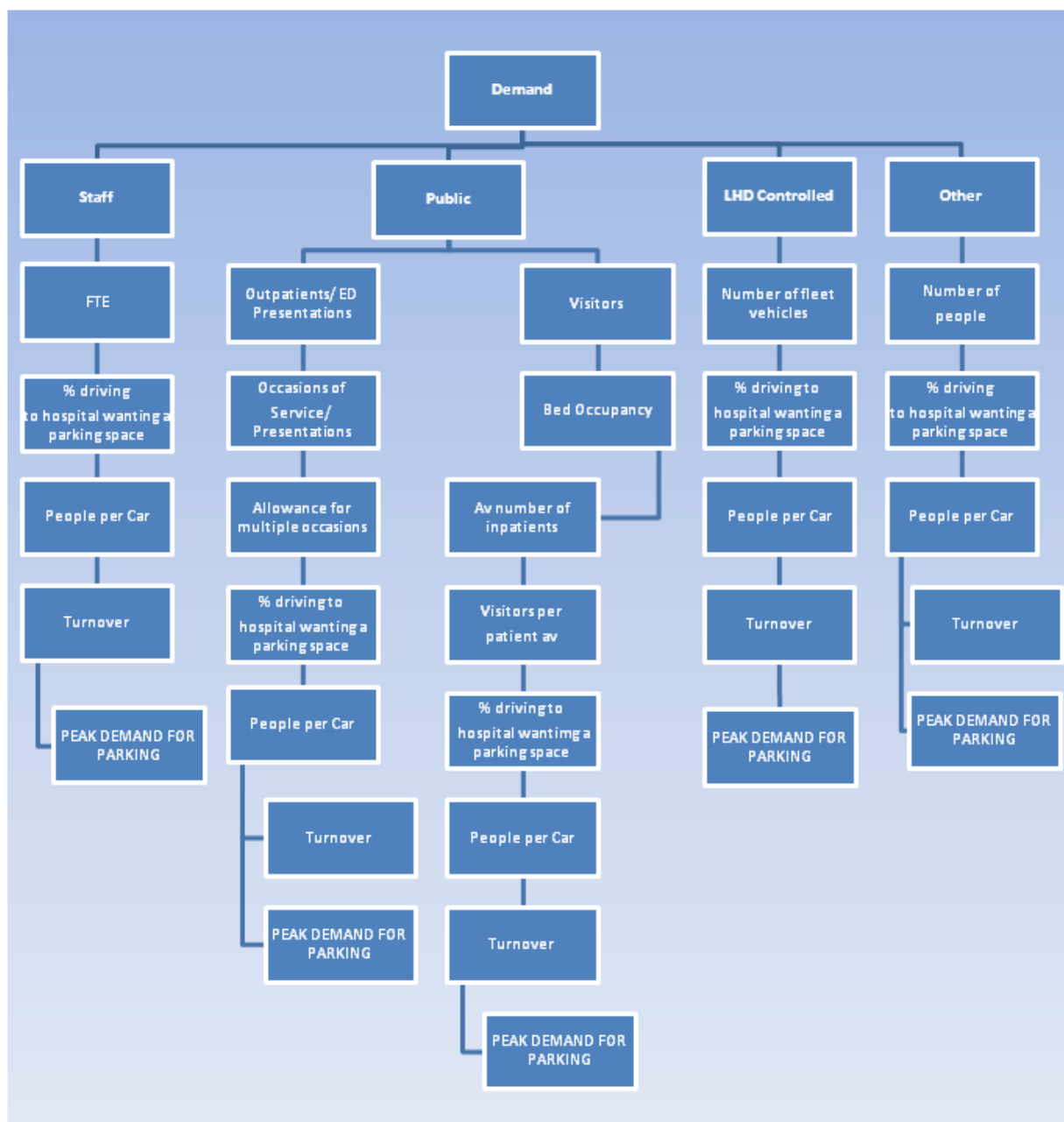


Figure 2 - Parking demand estimate methodology overview

In order to estimate the current and future parking demand at the Hospital, ptc. was provided with certain information by HI and the Hospital (via the Project Managers).

In addition, we carried out the following surveys:

-
- Staff – via online methodology
 - Outpatients and visitors – via face to face interviews, on 8th & 9th August 2017.
 - Car park occupancy and length of stay surveys of the entire hospital car parks, on 8th & 9th August 2017.
 - Parking supply and demand surveys within the Relevant Parking Zone (see Section 5 of this report).

We also undertook a site visit on Tuesday 8th August 2017 to audit the campus parking supply, review the site generally, and review the transport environment and Relevant Parking Zone.

Information reviewed in order to obtain an understanding of the parking demand generators at the Hospital included (list not exhaustive):

- Staff numbers (FTE)
- Overnight bed numbers and occupancy %
- Outpatient Occasions of Service
- Emergency Department Presentations
- Available nearby on-street parking
- Other off-street parking in the area (if any)
- External parking demand drivers (if any)
- Staff, outpatient and visitor survey responses
- Results of our on-campus car park surveys (occupancy and length of stay)

Where specific data was not available we applied our knowledge and experience of other comparable hospital sites in estimating key factors such as:

- % of Visitors attending site during peak hours
- % of ED Presentations occurring during peak hours
- % of afternoon shift staff arriving before day shift staff leave
- Car park turnover for staff and VMOs.

The raw demand data was converted into a detailed demand estimate, subdivided by the appropriate user and time categories, expected turnover per space, etc. The results have been incorporated into a spreadsheet representing the current situation.

5. Relevant Parking Zone

This section sets out details of the Relevant Parking Zone (RPZ) for the Hospital.

A site visit was carried out on Tuesday 8th August 2017 to assess the potential supply and demand for parking in the vicinity of the Hospital, and the likelihood of alternative parking supply for hospital staff, outpatients and visitors.

5.1 Relevant Parking Zone

We reviewed a scale plan of the Hospital in order to identify the Relevant Parking Zone ("RPZ"), as shown in the plan below.

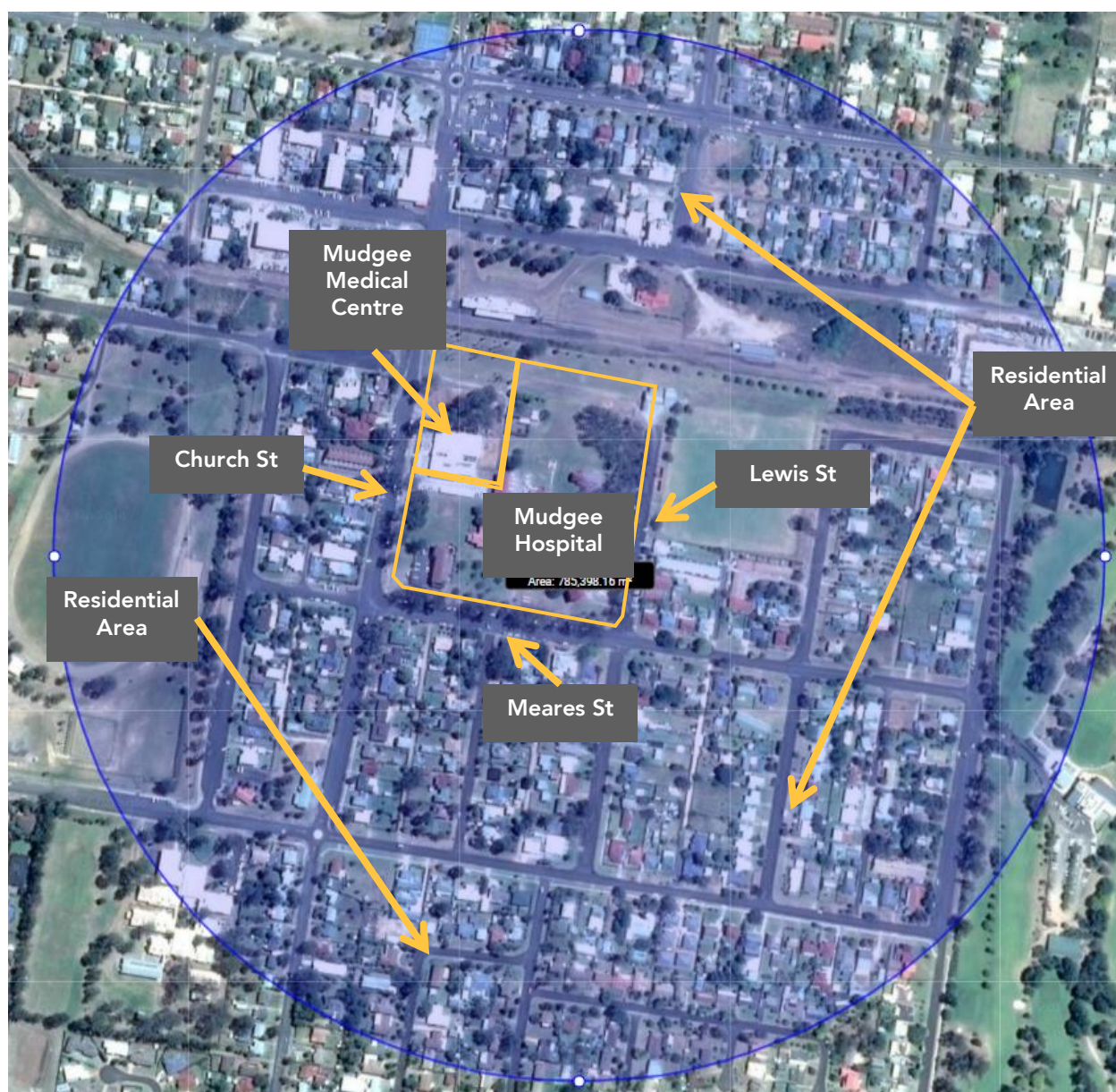


Figure 3 - Relevant Parking Zone

The RPZ was measured using a radius of 500 metres from the approximate centre of the Hospital campus (see circle on plan above), considered to be the maximum distance long stay parkers (e.g. dayshift and administration staff) would be prepared to walk to their ultimate destination. However, this distance is unlikely to be an attractive option for afternoon and night shift staff, who would likely seek to park significantly closer to the Hospital for safety and security reasons.

It is also likely that short stay parkers would want to park significantly closer than 500m, especially with hospital sites where a certain proportion of people with special requirements may need to park closer to their destination e.g. patients with walking difficulties. Special categories of patients would, ideally, require reserved parking immediately adjacent to their destination (e.g. oncology, radiology, dialysis etc).

However, for the purpose of assessing the **practical supply** available to Hospital-related users, we largely discounted the residential areas surrounding the Hospital, because the Hospital-related users' demand for relatively long-time parking (especially for staff who generally require all-day parking) may increase the risk of complaints from local residents, resulting in parking controls being introduced by Council. This would mean that these spaces may not be a sustainable option for Hospital-related users into the future.

Therefore, **ptc.** only included the following streets in the RPZ.

- Lewis Street
- Meares Street
- Church Street

5.2 Off-Street Parking within the Relevant Parking Zone

During our site visit, the only off-street car park identified within the RPZ is the Mudgee Medical Centre (see Figure 3), located adjacent to the Hospital, which has its own car park with a capacity of 64 spaces.

Parking provided at the Medical Centre is designated for its attendees (e.g. staff, visitors) and therefore is not generally available to Hospital-related users (staff, outpatients and visitors).

Therefore, it has been discounted from the RPZ parking supply.

5.3 On-Street Parking near Mudgee Hospital

A summary of the observed supply and demand of on-street parking near Mudgee Hospital is shown in the table below.

Table 6 - Summary of On Street Parking Supply & Demand near Mudgee Hospital

Summary of Off-campus Parking by Streets					Occupied Bays			Occupancy %		
Street	From	To	Bay Type	Capacity	Average			Average		
					10:00	12:00	14:00	10:00	12:00	14:00
Lewis Street	End	Meares Street	Unrestricted	96	41	45	36	42.2%	46.9%	37.0%
Meares Street	Lewis Street	Church Street	Unrestricted	60	39	38	37	65.0%	62.5%	61.7%
Church Street	Meares Street	Nicholson Street	Unrestricted, 2P	56	26	21	18	46.4%	36.6%	31.3%
				212	106	103	90	49.8%	48.6%	42.5%

Comments are as follows:

- There is a total of 212 on-street parking spaces in close proximity to Mudgee Hospital.

- All spaces are unrestricted with the exception of 2P parking (approximately 19 spaces) on the east side of Church Street, thus providing free all-day parking for use by (for example) hospital staff.
- Average peak occupancy across our two days of surveys⁴ was 106 spaces (49.8% of capacity). This occurred at 10am however we observed a similar occupancy at 12pm.
- During our site visit, we also observed some staff (approximately 8 cars) parked on the grass verge on an informal vehicular crossover in Church Street.
- Approximately 10-15 vehicles were parked on the northern section of Grant Street at peak time. We believe that the majority of these may belong to Hospital staff (based on our observations).
- It is not possible to accurately identify if all observed vehicles belong to Hospital-related users, however we would say that the majority of residential dwellings in the area appear to have significant off-street parking, therefore it is likely that the majority of cars parked on-street belong to other parkers (e.g. hospital staff, visitors to the park, visitors to residents etc).

5.4 Summary and Conclusions

Our survey of on street spaces near the Hospital indicates that current alternative parking supply for use by Hospital staff, outpatients and visitors, within reasonable, practical distance comprises an approximate total of 212 spaces, summarised as follows:

Table 7 - Summary of Alternative Parking Supply near Mudjee Hospital

Location	Unrestricted	Time Restricted	Total
Lewis Street	96	N/A	96
Meares Street	60	N/A	60
Church Street	37	19	56
Total	193	19	212

⁴ 8th & 9th August 2017

6. Transport Environment at Mudgee Hospital

6.1 Transport mode options servicing the site

A summary of the transport environment and transport mode shares available at the Hospital are contained in this section of the report, as follows.

6.1.1 Road

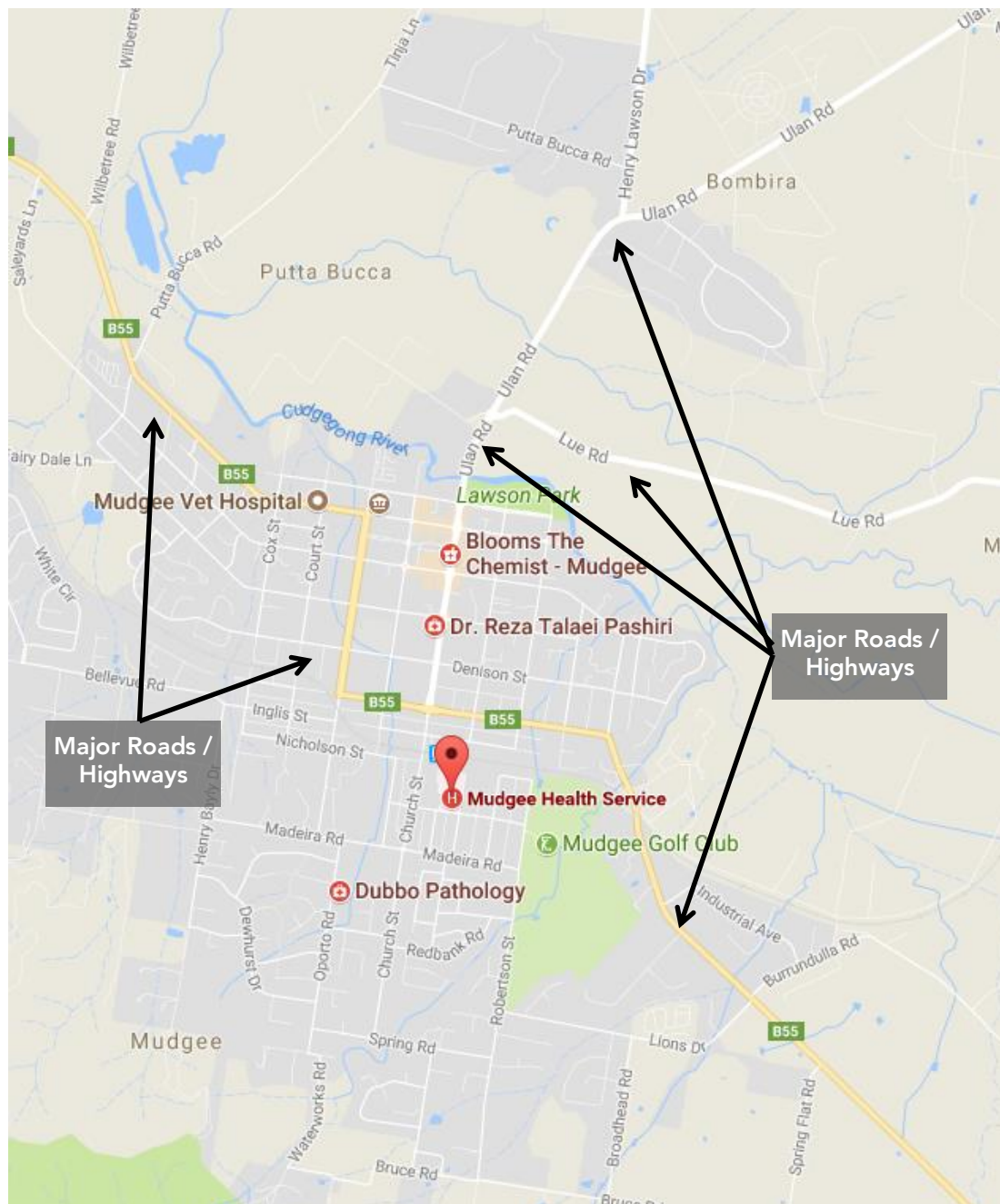


Figure 4 - Road network surrounding the site

Mudgee Hospital is located approximately 1.4km south of Mudgee CBD.

It has excellent road connections in all directions, making access by car (or motorcycle) relatively easy. It is serviced by the following major roads:

- North – Castlereagh Highway, Henry Lawson Drive and Ulan Road
- South – Castlereagh Highway
- East – Lue Road
- West – Castlereagh Highway+

6.1.2 Bus

Bus services to the Mudgee township are provided by Ogdens Coaches. Bus stops are located on Church Street and Meares Street, servicing the Hospital Campus as shown in Figure 5⁵ and Table 8:

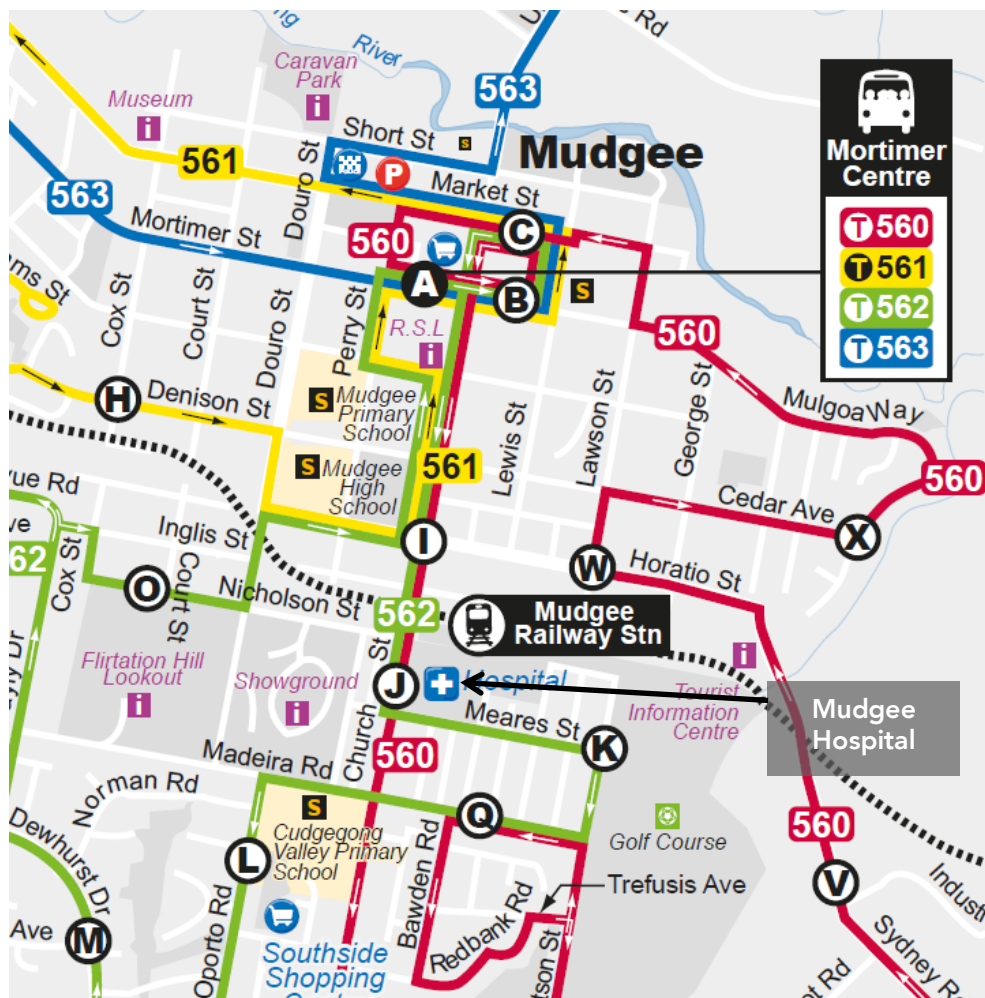


Figure 5 - The Mudgee Hospital Bus Service Map

⁵ source: <http://www.ogdenscoaches.com.au/>

Table 8 - Bus routes servicing the Hospital Campus

Route No.	Route Name	Weekday Services	Weekend Services
560	Mudgee to Mudgee East	Mortimer Centre 10:02 ... Mudgee Hospital 10:08 ... Mortimer Centre 10:30 Mortimer Centre 11:40 ... Mudgee Hospital 11:46 ... Mortimer Centre 12:08 Mortimer Centre 14:39 ... Mudgee Hospital 14:45 ... Mortimer Centre 15:07 Mortimer Centre 16:15 ... Mudgee Hospital 16:21 ... Mortimer Centre 16:43	No Services
562	Mudgee to Mudgee South	Mortimer Centre 09:36 ... Mudgee Hospital 09:41 ... Mortimer Centre 09:59 Mortimer Centre 12:10 ... Mudgee Hospital 12:15 ... Mortimer Centre 12:33 Mortimer Centre 14:13 ... Mudgee Hospital 14:18 ... Mortimer Centre 14:36 Mortimer Centre 16:44 ... Mudgee Hospital 16:49 ... Mortimer Centre 17:07	No Services

The Hospital is serviced by two bus routes only in morning (2-3 hours) and afternoon (2-3 hours) on weekdays. Both routes provide infrequent services during these hours (4 per day), therefore making this mode choice unlikely to be attractive to day shift and administration staff, who need to be at work prior to the first service time.

The infrequent bus services result in outpatients and visitors preferring to use private vehicles to access the Hospital as it is quicker and more convenient compared to public transport in this instance. Also, for public transport to be a viable option there needs to be a convenient bus (or train) stop close to their place of residence.

This appears to be confirmed by our surveys, which show no staff, outpatients or visitors utilising bus mode share to travel to the hospital.

6.1.3 Heavy Rail

Mudgee railway station is located approximately 850m from the Hospital main entrance. However, this station has been closed for approximately 20-30 years⁶, therefore heavy rail is not a mode share option available for Hospital-related users.

6.1.4 Cycling & Motorcycling

Our research indicates that the Hospital is not on any dedicated bicycle paths, however the good surrounding road network makes cycling and motorcycle relatively viable transport options.

However, despite the topography surrounding the site being relatively flat, cycling is only likely to be an attractive mode share for daytime staff, and even then, only for those that live within a relatively close distance.

Our surveys show that only 1.5% of staff cycle to work, although when asked if they would cycle if end of trip facilities were provided, 34.3% of staff surveyed said that they would be interested.

6.1.5 Walking

Walking is only likely to be an attractive option for people who live relatively close to the campus (see Relevant Parking Zone map in section 5 of this report for details of nearby residential areas).

⁶ Per ptc.'s site visit.

Walkers might include staff, outpatients and visitors; however, staff on early morning or late evening/night shifts would be unlikely to walk for safety reasons, unless (for example) renting a property in close proximity to the campus.

For these reasons, we expect that walking would only be an attractive mode share for people living locally. This appears to be supported by our surveys which show 4.4% of staff walking to work. 3.8% of visitors and 5% of outpatients walked to the Hospital.

6.2 Comments

Following our review of the current transport environment at the Hospital, we make the following general comments:

- Transport modes available to Hospital attendees (staff, outpatients and visitors) are primarily road. This is not unusual in regional centres where people may be travelling some distance into the centre, or where private vehicle provides the quickest and most convenient method of transport.
- Our surveys at other hospitals (and confirmed by our surveys at the Hospital) have indicated that when patrons have to change transport mode as part of their journey (e.g. bus to rail, bus to bus etc.) it becomes a less attractive proposition than if a single mode share can be adopted to their destination. This is particularly so for staff, who often live further away from the hospital than patients and visitors.
- In our experience, outpatients and visitors attending hospital are already under a certain level of stress; therefore, motor vehicle provides them with the easiest option in term of travelling to/from the hospital (i.e. they don't need to plan their journey to any great degree, as they would if using public transport). Also, if an outpatient is in a certain degree of discomfort, public transport does not provide an attractive option in terms of accessibility and comfort.
- Public transport is not a viable option for various reasons including lack of convenience, lack of flexibility (e.g. staff member who needs to drop off and pick up children), and a lack of services at the required times (e.g. evening and night shift staff may find that services are limited when they need to use them). Our surveys at the Hospital confirm that these are key reasons why people do not adopt public transport as their travel mode share.
- A further reason why people might not use public transport is that the journey time may take longer than by car, as public transport tends to not directly link point A to point B. This was also highlighted as a major issue in our surveys of staff at the Hospital.

Based on all of the above, we are of the view that car mode share is generally likely to be most attractive for staff, outpatients and visitors at the Hospital.

This opinion is supported by our surveys at the Hospital which indicate the following car mode share adopted by staff, visitors and outpatients. Table 9 provides comparison with survey results from other regional hospitals in NSW. The accessibility to public transport varies by site but all indicate the car is by far the most attractive transport mode for all user groups.

Table 9 - Summary of car mode share at Mudgee Hospital

	Car Mode Share		
	Staff	Visitors	Outpatients
Mudgee Hospital	91%	92%	95%
Hospital A (NSW)	96%	85%	93%
Hospital B (NSW)	93%	89%	87%

The above table shows that car mode share adopted by staff is slightly lower than **ptc.**'s benchmarked hospitals. However, car utilisation of visitors and outpatients at Mudgee Hospital is higher than our benchmarked hospitals.

7. Surveys undertaken at Mudgee Hospital

We undertook survey works at the Hospital to assist in building the demand model for parking at the campus.

The parking and intercept surveys were conducted over a period of two weekdays on Tuesday 8th and Wednesday 9th August 2017, between 9am-5pm each day. The staff survey was run over a period of 14 days from 7th August 2017 to 20th August 2017.

The date for the on-site surveys was chosen in consultation with the Hospital as the (normally) busiest days of the week.

The timing was chosen so that we captured the morning and afternoon peak periods which, in our experience, are respectively at around 11am (when outpatient activity is at its peak and wards are open for visitors) and 1pm - 2pm when the afternoon shift changeover occurs.

A range of surveys were carried out, as follows, to gain insight into parking behaviours and demand, including:

- Car park occupancy surveys, across the entire campus parking supply, at hourly intervals.
- Vehicle length of stay surveys, across the entire campus parking supply, at hourly intervals.
- Staff surveys. These were undertaken via an online survey (using SurveyGizmo). A total of 68 responses were obtained.
- Intercept (face to face) surveys of people entering the hospital. A total of 66 responses were obtained.

7.1 Occupancy Surveys

Occupancy surveys were conducted of all Hospital car parking, at hourly intervals.

Because the majority of on-campus parking is unrestricted (56 of 77 spaces, or 73%), it is not possible to accurately identify which vehicles belong to staff and patients/visitors. We have therefore assessed the following:

- Occupancy across the whole site.
- Occupancy by staff only. For the purposes of analysis, we have assumed that all vehicles staying longer than 5 hours in 'general' bays belong to staff⁷.
- Occupancy by patients/visitors only. For the purposes of analysis, we have assumed that all vehicles staying less than 5 hours belong to patients/visitors.
- The main objectives of the surveys were to:
 - Observe peak parking demand on weekdays.
 - Understand which parking areas are more highly utilised than others.
 - Utilise this data to cross-verify the estimated peak parking demand from our demand modelling, to ensure accuracy of the demand model.

⁷ It was observed that some cars parking in VMO bays and Permit Holders bays stayed for less than 5 hours, however these are assumed to be staff.

The occupancy survey results are shown in Appendix B.

7.1.1 Overview

The occupancy profile for the Hospital campus (outlined in yellow) over a "typical" weekday is illustrated in the heat maps below; Green, being occupancy of less than 50%, Amber occupancy between 50%-85% and Red occupancy greater than 85%.



Figure 6 - Parking profile "typical" weekday

Graphically, the car park occupancy profile is as shown below.

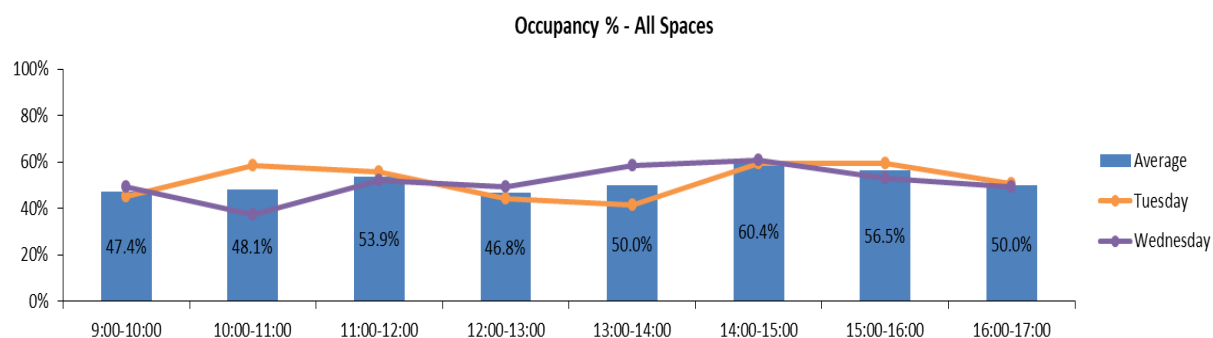


Figure 7 - Car Park Occupancy Profile Chart

Average peak occupancy across the two weekdays of surveys was 47 spaces (60.4% of capacity) at 2pm – 3pm, as summarised in the following table.

Table 10 - Car Park Occupancy Survey Results

Occupied Spaces	Capacity	9:00-10:00	10:00-11:00	11:00-12:00	12:00-13:00	13:00-14:00	14:00-15:00	15:00-16:00	16:00-17:00
Summary									
Tuesday	77	35	45	43	34	32	46	46	39
Wednesday	77	38	29	40	38	45	47	41	38
Average	77	37	37	42	36	39	47	44	39

A breakdown of the 30 available bays at peak on Wednesday 09th August 2017 is as follows:

Table 11 - Breakdown of available spaces at peak on Wednesday 09 August 2017

Space Type	Available
Unrestricted	20
Disabled	5
Drop off & Pick up (10 mins)	1
Maintenance	1
Doctor	2
Delivery vehicles only	1
Total	30

Comments:

- The majority of available spaces were in unrestricted parking areas for Visitors & Patients (67% of total available bays) and Mobility parkers (17% of total available bays).
- This appeared to be a common theme during our surveys and may suggest that these areas are underutilised.

7.1.2 Staff Parking

As noted earlier, it is not possible to accurately separate the parking supply in general visitor car parks (Car Park A, C and D) into staff and visitor parking, as parking is shared and uncontrolled. Therefore, for the purposes of our analysis we have assumed that all vehicles staying > 5 hours (as per our length of stay surveys) in general public car parks belong to staff. Based on this assumption, peak staff parking occurred between approximately 9am – 3pm as shown in the following table.

Table 12 - Staff Parking Occupancy Results

Occupied Spaces	9:00-10:00	10:00-11:00	11:00-12:00	12:00-13:00	13:00-14:00	14:00-15:00
Summary – All Staff						
Tuesday	12	13	14	13	15	15
Wednesday	11	11	11	11	13	13
Average	12	12	13	12	14	14

Average staff occupancy across the two days of surveys at peak time (2pm – 3pm) was 14 spaces.

Graphically, the staff peak occupancy profile is as shown below⁸:

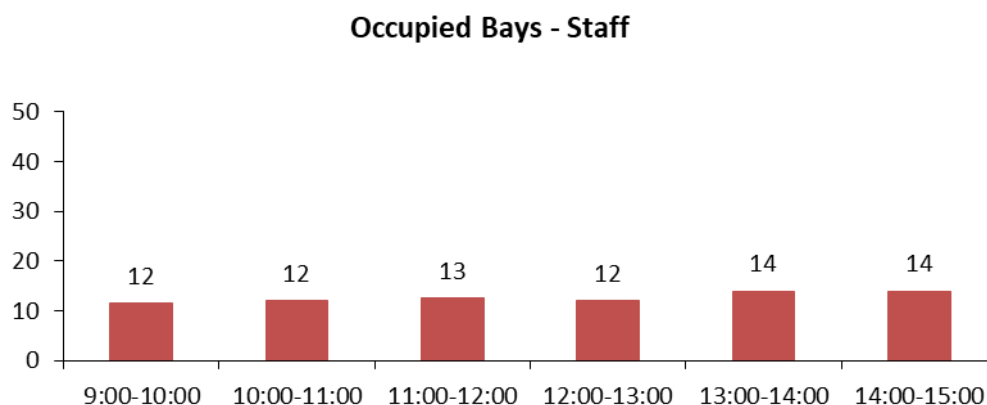


Figure 8 - Staff Parking Occupancy Chart

The parking profile is as we would expect for hospital staff parking, peaking during approximately 1.00pm – 2.00pm on each day. Based on our experience from other major hospitals, it is normal to see peak staff parking demand at this time of day, as afternoon shift staff start to arrive before all day shift staff have left.

7.1.3 Visitor/Patient Parking

As noted earlier, for modelling purposes we have assumed that vehicles staying less than or equal to 5 hours in general visitor car parks⁹ (as per our length of stay surveys) belong to visitors and patients.

Based on this assumption, peak visitor / patient parking occurred at 11am – 12pm, as shown in the following table. We have excluded data from 2pm in our analysis as it is potentially distorted by afternoon shift staff recorded as parking <5hours (as our surveys finished at 5pm).

⁸ Based on the average of two days of surveys.

⁹ General Public Car Parks – Car Park A, C, D

Table 13 - Visitor / Patient Parking Occupancy Results

Occupied Spaces	9:00-10:00	10:00-11:00	11:00-12:00	12:00-13:00	13:00-14:00
Summary – All Visitor & Patient					
Wednesday	23	32	29	21	17
Thursday	27	18	29	27	32
Average	25	25	29	24	25

Average visitor / patient occupancy across two days of surveys¹⁰ at peak time (11am-12pm) for all on campus parking was 29 spaces, or 69% of overall average peak occupancy (42 spaces).

Graphically, the visitor / patient peak occupancy profile is as shown below¹¹:

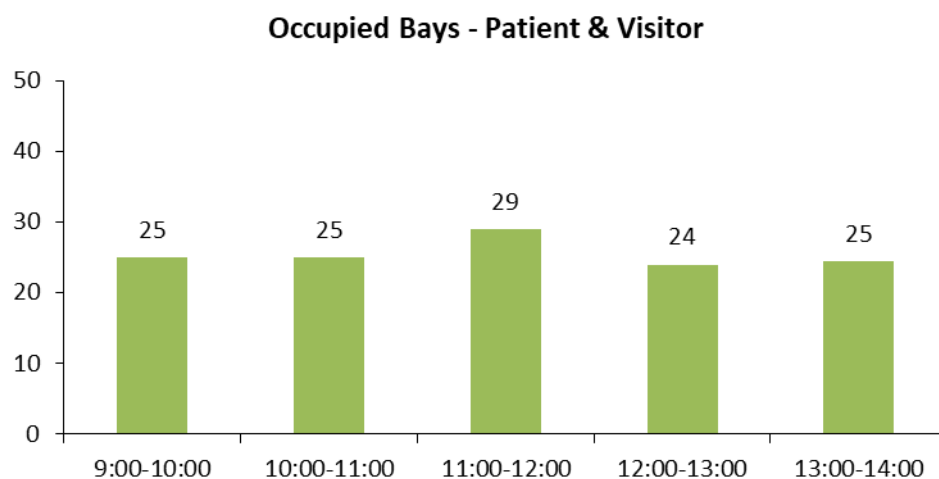


Figure 9 - Visitor / Patient Parking Occupancy Chart

The profile is in line with what we would expect to see at a hospital visitor car park, where peak occupancy usually occurs at approximately 11am-12pm, when patient and visitor activity is at peak. Occupancy then falls away from approximately 1pm onwards, as outpatient activity reduces.

7.1.4 Conclusions

Key conclusions from our occupancy surveys are as follows:

- Average peak occupancy across the two days of surveys of 47 spaces (60.4% of capacity) at 2pm-3pm.
- Of the 30 spaces available at Wednesday peak (capacity 77 spaces – occupancy 47 spaces), 20 spaces (or 67% of total available spaces) were available for ‘general’ parking for visitors and outpatients.
- At peak, the car parks appear to be 31% occupied by staff and 69% by patients / visitors.

¹⁰ Based on the average of our two days of surveys

¹¹ Based on the average of two days of surveys.

7.2 Visitor Car Park Length of Stay Surveys

We undertook vehicle length of stay surveys of all parking bays at the Hospital over a period of two weekdays¹⁸ to understand the average length of stay of outpatient and visitor vehicles and the average number of times the spaces turn over each day, for use in our parking demand modelling.

The results of our surveys are contained in Appendix B.

A summary of the average length of stay and parking space turnover results for outpatient and visitor vehicles is as follows¹²:

Table 14 - Visitor & Patient Length of Stay and Space Turnover

Visitor & Patient Parking	
Average Length of Stay	1.58 Hrs/Car
Parking Space Turnover	2.41 Cars/Space

The modal average length of stay is 0 – 2 hours, as demonstrated by the chart below:

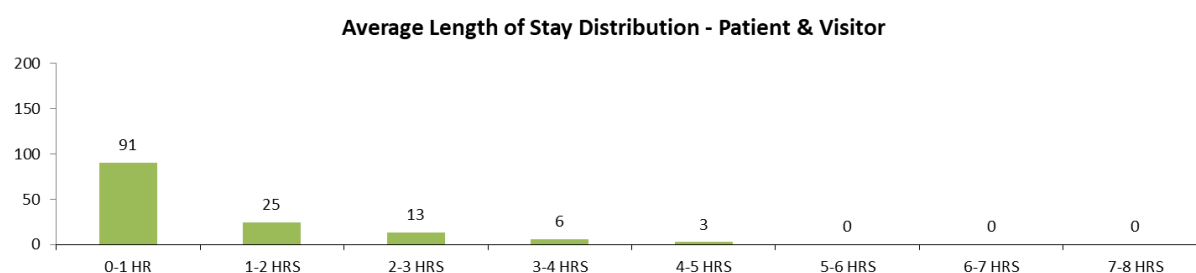


Figure 10 - Visitor & Patient Length of Stay Distribution

Based on our experience of other hospital sites, we would expect that most visitors / patients would stay for up to 2 hours, however the data shows that some are also staying considerably longer (up to 5 hours). As parking is currently free of charge and the majority unrestricted there is, of course, no incentive for visitors / patients to exit the car park as quickly as they can, or to be dropped off (and not park) if they expect to be at the Hospital for some time.

Outpatient length of stay will also be impacted by how quickly the Hospital is able to service those patients.

The surveyed parking space turnover (2.41 times) is within a range observed at similar hospitals, as shown in the following table:

Table 15 - Benchmarked NSW Hospitals Visitor/Patient Parking Space Turnover Data

Hospital	Space Turnover
Hospital A (NSW)	2.19
Hospital B (NSW)	2.59
Mudgee Hospital	2.41

¹² Based on the assumption that vehicles parking <= 5 hours belong to visitors & patients

7.3 Online Staff Surveys

We undertook surveys of staff at the Hospital, to understand:

- How they travel to work
- If they drive:
 - Where do they park
 - How many people are in the vehicle
 - Why they do not use public transport
 - Their attitude towards paid parking

This data was used to construct our estimates of parking demand.

The surveys were undertaken online via “Survey Gizmo”.

We obtained a total of 68 responses, which equates to approximately 72%¹³ of the estimated staff FTE.

Statistically, a response rate of this magnitude provides a robust basis for analysis.

A breakdown of staff respondents by shift is as follows:

Table 16 - Breakdown of Staff Survey Respondents

Staff Type / Shift	Number surveyed	% of total surveyed
Day Shift	33	48.5%
Afternoon Shift	3	4.4%
Night Shift	2	2.9%
Administration / Office Hours	22	32.4%
Other ¹⁴	8	11.8%

A summary report of staff responses to all questions can be found in Appendix C¹⁵.

A summary of the key mode share responses from all staff at the Hospital (irrespective of shift) is as follows:

¹³ Surveyed Staff / (Staff FTE) = 68/94=72%

¹⁴ On call, rotating roster, various different shifts per week etc.

¹⁵ Note that not all questions were answered by all respondents; therefore, the answers to some questions may not add up to the total number of responses.

1. How do you normally travel to work?

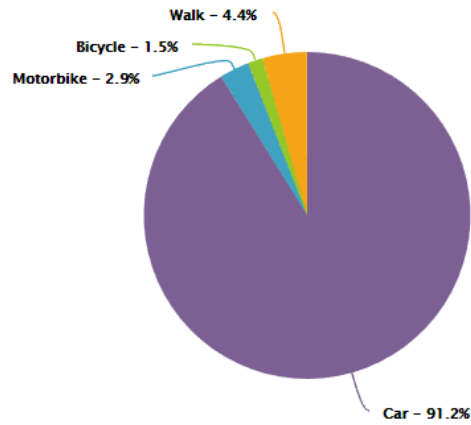


Figure 11 - Staff Mode Share Results

- Car mode share is the primary choice of staff at the Hospital (91.2%);
- No staff travel by public transport;
- 2.9% of staff travel by motorcycle; only 1.5% of staff cycle.
- 4.4% of staff walk

2. In the car you travel to work in, how many people are in the car (including the driver)?

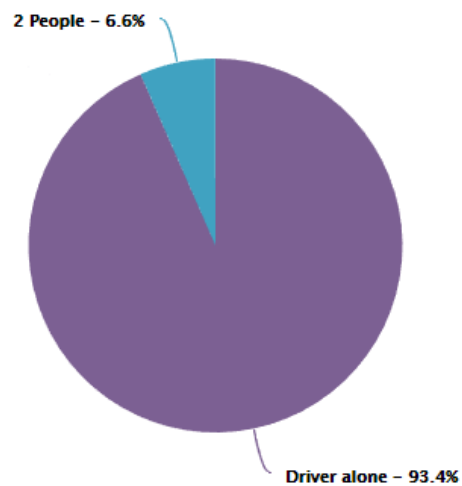


Figure 12 - Staff People per Car Results

- 93.4% of staff who drive to work, do so alone.
- 6.6% of vehicles have more than one person. These may be car sharing or family members travelling together.

3. Do all the people in the car work at Mudgee Hospital?

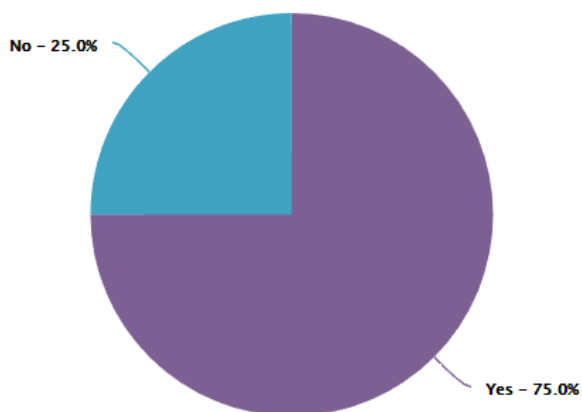


Figure 13 - Staff People per Car Work Location Results

- Where there is more than one person in a vehicle 75% work at the Hospital, suggesting a degree of car sharing.

4. When coming to the Hospital, where do you normally park?

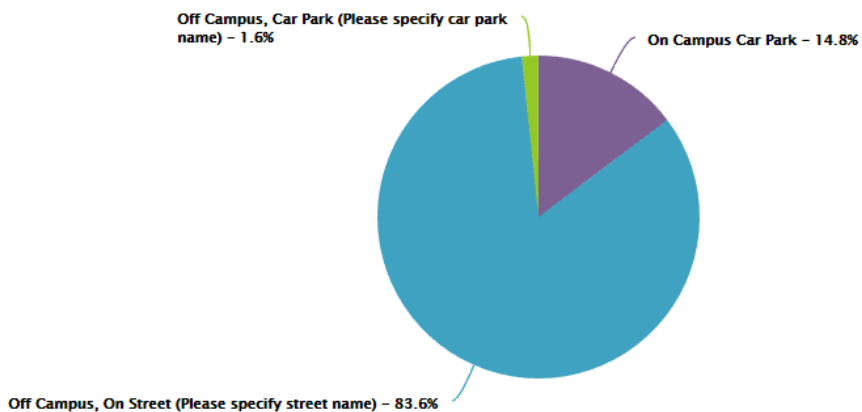


Figure 14 - Staff Parking Location Results

- Out of staff that drive only 14.8% park in the Hospital car parks.
- 85.2% park in off campus parking (83.6% on street; 1.6% off street)

Off-Campus On-Street Parking - Staff

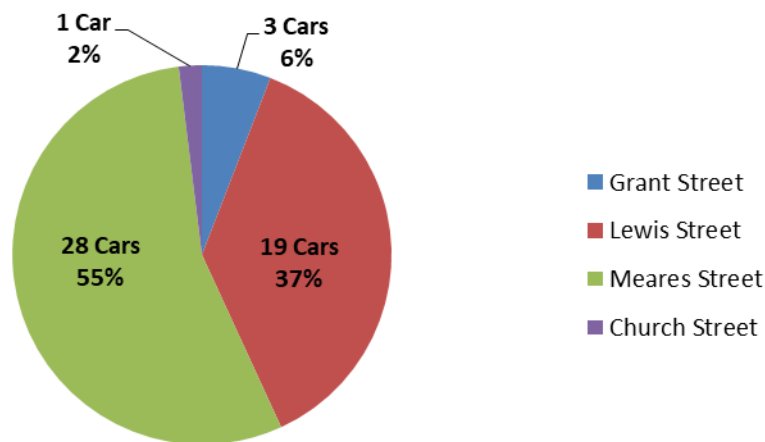


Figure 15 - Staff Off-campus On-street Parking Locations

- No staff are dropped off.

6. You have indicated you travel to work by car, for which reasons do you not use public transport? (Please tick all that apply)

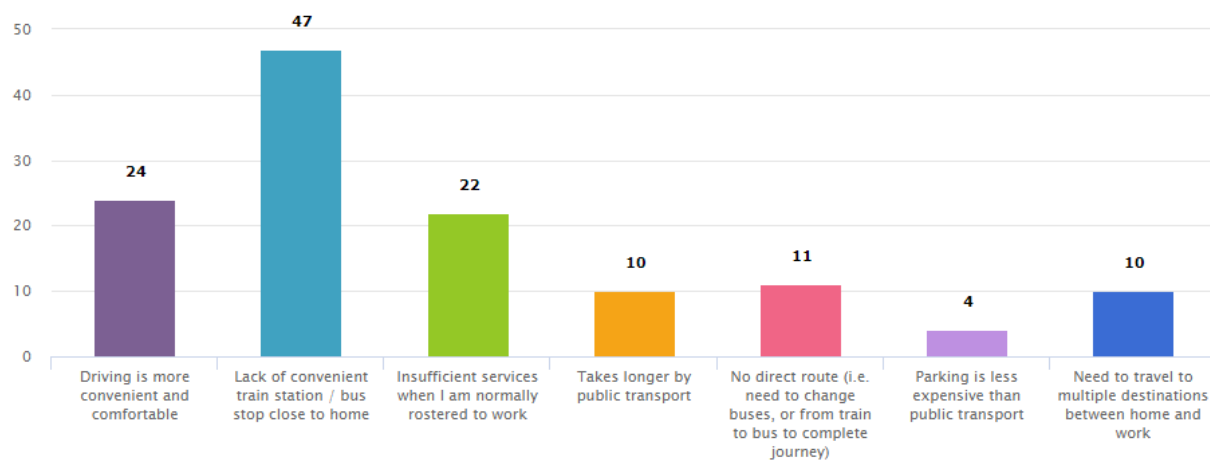


Figure 16 - Staff reasons for driving rather than using Public Transport (No. of Responses)

- The primary reason given for not using public transport is lack of convenient train station / bus stop close to home.
- The next highest responses are driving is more convenient and comfortable and insufficient services when staff are rostered on.
- Other main reasons are no direct route, travelling to multiple destinations between home and work and longer travelling hours by taking public transport.
- These responses are broadly similar to surveys we have conducted at other regional public hospitals, where public transport does not provide a viable option for the majority of staff, for the reasons shown above.

- When asked about paid parking during our surveys, the following responses were received:

Table 17 - Staff response to paid parking

Staff Weekly Fee	\$5	\$10	\$15
Number of Respondents	25	20	23
Yes	52.0%	30.0%	13.0%
No	48.0%	70.0%	87.0%

7.3.1 Conclusions

Key findings from our surveys are as follows:

- 91.2% of staff drive to work
- 93.4% drive alone
- Only 14.8% park in the hospital car parks
- No staff are dropped off, which means 91.2%¹⁶ (100% staff that drive to work) require a parking space somewhere (on or off campus).
- At the lowest price point (\$5 per week), more staff responded in the affirmative than the negative; whilst the majority of staff responded in the negative at the higher two price points.

7.4 Intercept Surveys

Intercept (face to face) surveys of outpatients, visitors to inpatients and others (e.g. contractors) were undertaken at the Hospital over two weekdays (08th and 09th August 2017).

The primary objectives of the surveys were to understand:

- How outpatients and visitors travel to the Hospital.
- If they drive:
 - Where do they park.
 - The number of people in each vehicle.
 - Their expected length of stay.
 - Their attitude towards paid parking.

This data was used to construct our parking demand estimates.

During the intercept surveys **ptc.** obtained a total of 66 responses from outpatients and visitors. This equates to approximately 65%¹⁷ of our estimated number of outpatients and visitors attending the Hospital each day.

¹⁶ Calculation: 91.2% drive, 100% of those require a park = 91.2% driving and require a parking space somewhere (on or off campus)

¹⁷ Surveyed Outpatients and Visitors / (Outpatients per day + Visitors per day) = 66 / (79+22) = 65%

We aim to have a sample size of at least 10% of outpatients and visitors, so the achieved 26% provides a reasonable sample.

The results of the intercept surveys are shown in Appendix D (outpatient results) and Appendix E (visitor to inpatient results).

The breakdown of people surveyed is as follows:

Table 18 - Breakdown of Intercept Survey Respondents

Category	Number surveyed	% of total surveyed
Outpatients	40	61%
Visitors	26	39%
Total	66	100%

7.4.1 Outpatients

Outpatient transport mode share results are summarised as follows:

Table 19 - Outpatients Transport Mode Share Results

Mode of Transport	%
Car	95.0%
Walk	5.0%

- The mode share results indicate that the primary mode of transport for outpatients is driving.
- The car mode share result of 95.0% is slightly higher than **ptc.**'s comparative studies (93% and 87% respectively¹⁸).
- No outpatients travelled by public transport to the Hospital.
- No outpatients travelled by taxi.
- Main reasons given for adopting car mode share rather than public transport is outlined in the graph below.

¹⁸ See Table 9

6. For what reasons did you drive and not use public transport? (Please tick all that apply)

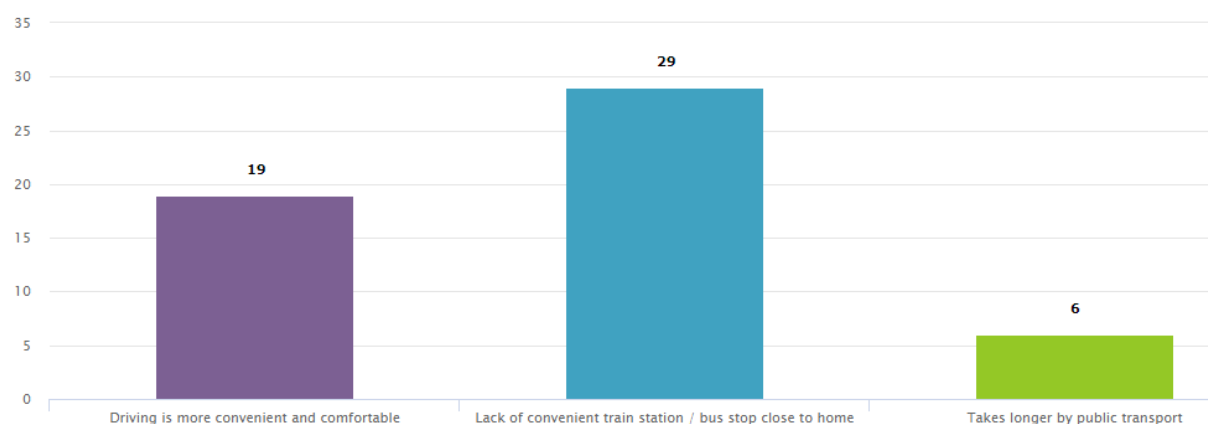


Figure 17 - Outpatients reasons for adopting car mode share over public transport (No. of Responses)

- The primary reason given for not using public transport is lack of convenient train station / bus stop close to home.
- The next highest response is that driving is more convenient and comfortable.
- Other main reason is that public transport takes longer time than driving.

The parking location of outpatients travelling by car is as follows:

Table 20 - Outpatient Parking Locations

Parking Location	%
Hospital Car Parks	81.6%
Off campus - On-Street	13.2%
Dropped off and did not park	5.3%

- Of outpatients that drive 81.6% park in the Hospital car parks and 13.2% park on street (4 of 5, or 80%, on Lewis Street).
- The % of outpatients dropped off (5.3%) is significantly lower than **ptc.**'s benchmarked hospitals (35% and 11.7% respectively).
- This may be due to a perceived lack of parking at **ptc.**'s benchmarked hospitals (peak occupancy over 90%), with the majority of bays occupied by staff before outpatients start to arrive.
- Therefore 90%¹⁹ require a parking space somewhere (on or off campus).

Number of people per car results are summarised as follows:

¹⁹ Calculation: 95.0% drive, 94.7% of those require a park (5.3% dropped off) = 95.0%*94.7% = 90% driving and require a parking space somewhere (on or off campus)

Table 21 - Outpatient Number of People per Car

No. of People per Car	%
Driver alone	65.8%
2	34.2%

- Where the number of people per car is greater than one, in our experience generally only one person is likely to be the outpatient.

Expected length of stay results are summarised as follows:

Table 22 - Outpatient Expected Length of Stay

Outpatients	Hours
Average expected length of stay	1.03

- Data from our car park length of stay surveys showed an average length of stay of 1.58 hours.
- It appears that outpatients generally under-estimated their expected length of stay, compared with our surveys of the car park.
- Note, however, that the car park includes outpatients and visitors to inpatients therefore an exact comparison is not possible; however, the data does provide a reasonable indication.
- When asked about paid parking during our surveys, the following responses were received:

Table 23 – Outpatients response to paid parking

Outpatients Hourly Fee	\$1	\$2	\$3
Number of Respondents	16	14	10
Yes	50%	50%	30%
No	50%	50%	70%

7.4.2 Visitors to Inpatients

Visitor mode share results are summarised as follows:

Table 24 - Visitor to Inpatient Transport Mode Share Results

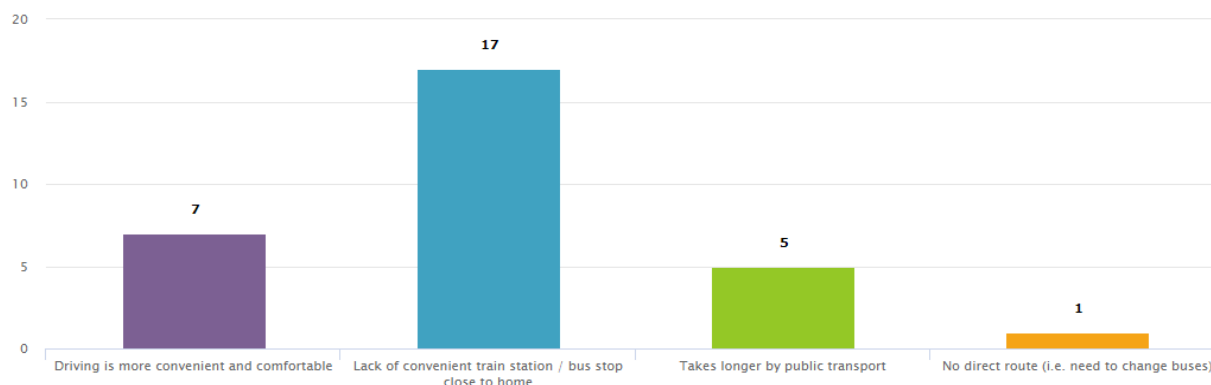
Mode of Transport	%
Car	92.3%
Taxi	3.8%
Walk	3.8%

- The mode share results indicate that the primary mode of transport for visitors is driving.
- The car mode share result of 92.3% is higher than ptc.’s benchmarked hospitals (85.1% and 89.3% respectively²⁰).

²⁰ See Table 9

- Similar to outpatients, no visitors travelled by public transport to the Hospital.
- Taxi usage (3.8%) is lower than ptc.'s benchmarked hospitals (6.0% and 4.0% respectively).
- Main reasons given for adopting car mode share rather than public transport is outlined in the graph below.

6. For what reasons did you drive and not use public transport? (Please tick all that apply)



- The primary reason given for not using public transport is lack of convenient train station / bus stop close to home.
- The next highest response is that driving is more convenient and comfortable.
- Other main reason is that public transport takes longer time than driving.

The parking location of visitors travelling by car is as follows:

Table 25 - Visitor to Inpatient Parking Locations

Parking Location	%
Hospital Car Parks	75.0%
Off campus - On-Street	25.0%

- Of visitors that drive 75% park in the Hospital car parks and 25% park on street (5 of 6, or 83%, on Lewis Street).
- No visitors are dropped off, which means 92.3%²¹ require a parking space somewhere (on or off campus).

Number of people per car results are summarised as follows:

Table 26 - Visitor to Inpatient Number of People per Car

No. of People per Car	%
1	83.3%
2	12.5%
3	4.2%

²¹ Calculation: 92.3% drive, 100% of those require a park = 92.3% driving and require a parking space somewhere (on or off campus)

- The average (1.21 people per car) appears to correlate with our surveys at other hospitals which suggest that 1 – 2 people per car is generally the norm.

Expected length of stay results are summarised as follows:

Table 27 - Visitor to Inpatient Expected Length of Stay

Visitors to Inpatients	Hours
Average expected length of stay	1.56

- As noted earlier, our surveys of the public car park showed an average length of stay of 1.58 hours.
- It appears that visitors slightly underestimated their expected length of stay; however, the car park includes outpatients and visitors; therefore, an exact comparison is not possible.
- When asked about paid parking during our surveys, the following responses were received:

Table 28 – Visitors response to paid parking

Visitors Hourly Fee	\$1	\$2	\$3
Number of Respondents	10	9	7
Yes	80%	44.4%	14.3%
No	20%	55.6%	85.7%

7.4.3 Conclusions

The key conclusions to be drawn from our intercept surveys of outpatients and visitors are as follows:

- The mode share results indicate that the primary mode of transport for outpatients and visitors is car (95.0% and 92.3% respectively).
- No visitors and outpatients use public transport.
- % of outpatients parking in the Hospital car parks (81.6%) is relatively higher than that of visitors (75%).
- Interestingly, a relatively significant % of outpatient (13.2%) and visitors (25%) chose to park off campus, when our surveys show that spaces were available in the Hospital car parks. This may be because as they approach the Hospital and see an available space on-street they take this, rather than risk driving onto the campus and then not being able to find a space in the Hospital car parks.
- % of outpatients being dropped off and not parking is 5.3%. No visitors are dropped off.

Table 29 - Outpatients and visitors' response to paid parking

Outpatients and Visitors Hourly Fee	\$1	\$2	\$3
Number of Respondents	26	23	17
Yes	61.5%	47.8%	23.5%
No	38.5%	52.2%	76.5%

- Our analysis of these results showed more outpatients and visitors are prepared to pay for parking. This is as expected as outpatients and visitors generally value the convenience of parking close to the Hospital more than staff, who may be prepared to walk a distance to avoid having to pay for parking.

8. Parking Demand

This section sets out the parking demand estimate at the Hospital based on the data provided to us, our review of the transport environment and the RPZ, and our surveys at the Hospital (see preceding sections of this Report).

8.1 Summary of Demand Estimates

We have prepared the current parking demand estimates, as follows:

Table 30 - Summary of Parking Demand Estimates

Demand Estimate	Overview of Content / Purpose	Appendix
Current (2016/17)	Current situation, based on data from the Hospital	Appendix G
Future (2026/27)	Future estimate, based on expected growth at the Hospital	Appendix G

8.2 General Assumptions

General assumptions used in the preparation of the **current** demand estimate (Appendix G) are as follows:

- Hospital data (number of beds, outpatient activity etc.) is as supplied by Mudgee Hospital.
- Where hard data has not been provided to us, or is not available, we have adopted assumptions based on our experience of other comparable hospitals and from observations during our site visit.
- The percentages adopted for driver mode share, parking on campus etc. are based on our staff and outpatient/visitor surveys at the Hospital.
- Parking space turnover data is based on our length of stay surveys at the Hospital.

The **future** demand estimate (Appendix G) adopts the same general assumptions except the forecast FTE growth at the Hospital. The Hospital estimates that FTE number will increase by 6 (from 100 to 106)²² since 2020/21.

We selected 2026/27 as the future year scenario because it represents a 10 year timeframe from current, which is a reasonable time frame for planning purposes.

Appendix F summarises the current and future demand drivers and assumptions, which we arrived at using a combination of the above.

Below is a summary of our analysis, assumptions and conclusions regarding current and future demand for parking at the Hospital. The data has been used to build our demand estimate (Appendix G).

8.3 How to interpret the Parking Demand estimates

We set out below the rationale for interpreting our demand estimates, adopting "Outpatients" (Appendix G) as a worked example.

²² Per TSA Management email on 06 June 2018

Reading from left to right across the spreadsheet:

- People x % requiring a car space²³ / people per car = total cars per day.
- Total cars per day (as above) / parking space turnover = peak parking bays required.
- Therefore, for Outpatients the calculation is as follows:

79 people per day x 90% requiring parking / 1 person per car = approx. 71 cars per day requiring parking / space turnover of 2.41 = approx. 30 parking spaces required at peak (rounded).

8.4 Weekday Staff Parking Demand

The Hospital provided the current FTE staff numbers for the Hospital (100)²⁴ and also provided a breakdown of staff between clinical staff (60%) and administration staff (40%) respectively.

The Hospital also provided a proportionate breakdown of the clinical staff % (60%) on each shift, being:

Table 31 - Breakdown of Staff per Shift

	% of staff on each shift
Day Shift	30%
Afternoon Shift	20%
Night Shift	10%

In order to calculate the future parking demand, we have adopted the forecast FTE staff number of 106 FTE during 2020/21.

To the day shift and administration staff numbers²⁵ we applied a percentage driving to work and requiring a car space²⁶ (91%), based on our staff surveys at the Hospital.

For afternoon shift and night shift staff we applied a driving to work percentage of 100%, and parking on campus 100%, based on our assumptions adopted at other hospital sites²⁷.

The number of staff per car adopted is 1.06 based on our surveys at the Hospital²⁸.

When estimating peak staff parking demand at a hospital campus, it is important to factor in the shift changeover which generally occurs in early afternoon when the day and afternoon shifts cross over, as some afternoon shift staff will require parking whilst day shift staff are still on campus.

The Hospital were unable to provide an estimate of the afternoon shift staff that arrive prior to day shift staff leaving, for handover purposes, so we assumed 44% (based on data provided for other similar hospitals).

²³ i.e. excludes those who arrive by car but are dropped off and do not park

²⁴ Updated per TSA Management email on 06 June 2018

²⁵ Day shift and administration only.

²⁶ i.e. excluding those who are dropped off and do not require parking

²⁷ PTC assume 100% of afternoon shift and night shift staff drive due to safety reasons.

²⁸ Day shift and administration only. Assume 1 person per car for afternoon shift and night shift.

Using the demand drivers and assumptions outlined above (and summarised in Appendix G) we estimate peak demand for staff parking to be as follows:

Table 32 - Staff Peak Parking Demand

Weekday staff peak demand for parking	Current (2016/17)	Future (2026/27)
Day Shift	26	27
Afternoon shift changeover allowance	9	9
Administration	34	36
Total spaces	74	77

8.5 Weekday VMO Parking Demand

Due to the absence of VMO data, ptc. applied the current number of VMO spaces (5) at Mudgee Hospital in our current demand estimate.

Forecast VMO numbers were assumed to remain unchanged²⁹.

On this basis (and summarised in Appendix G) we estimate peak demand for VMO parking to be as follows:

Table 33 - VMO Peak Parking Demand

Weekday VMO peak demand for parking	Current (2016/17)	Future (2026/27)
Spaces	5	5

8.6 Weekday Public Parking Demand

8.6.1 Weekday Outpatients Parking Demand

The Hospital supplied current annual outpatient activity (defined as “occasions of service”) of 21,991 per annum.

Forecast occasions of services were assumed to remain unchanged (21,991 per annum)³⁰.

To allow for multiple occasions of service to one patient (e.g. consultation and radiography) we divided the total occasions of service by a factor of 1.1 which, in the absence of hard data from the hospital, is our normal practice (based on our experience of other hospitals).

We divided the outcome by 252 weekdays³¹ to arrive at a volume per weekday. This assumes minimal outpatient activity at weekends.

We applied a percentage of outpatients driving to the Hospital and requiring a car space (95% * 94.7% = 90%), based on our surveys.

²⁹ Per Hospital information

³⁰ Per Hospital information

³¹ 260 weekdays minus 8 public holidays

We then applied a space turnover of 2.41 times to the resulting number of vehicles per day (based on our surveys at the Hospital), to arrive at the peak parking demand.

Applying the demand drivers set out above (and summarised in Appendix G) we estimate that the peak demand for parking from outpatients would be as follows:

Table 34 - Outpatient Peak Parking Demand

Outpatients peak demand for parking	Current (2016/17)	Future (2026/27)
Spaces	30	30

8.6.2 Weekday Visitor Parking Demand

The Hospital provided the current number of overnight beds (31) and a peak occupancy rate of 58%.

Forecast bed numbers were assumed to remain unchanged (31 beds)³².

To these numbers we applied an average of 1.25 visitors per inpatient to derive the total number of visitors, based on assumptions adopted at other NSW Hospitals and with a view to our visitor survey results.

We applied a percentage of weekday visitors driving to the Hospital and requiring a car space (92.3% * 100% = 92.3%) and people per car (1.21) based on our surveys at the Hospital.

We then applied a space turnover of 2.41 times per day (as for Outpatients), based on our surveys at the Hospital.

Peak daytime demand from visitors was estimated on the assumption that 60%³³ of visitors will require parking during the daytime peak hours.

Applying the demand drivers set out above (and summarised in Appendix G) we estimate that the peak demand for parking from visitors is as follows:

Table 35 - Visitor to Inpatient Peak Parking Demand

Visitor peak demand for parking	Current (2016/17)	Future (2026/27)
Spaces	4	4

8.6.3 Weekday Emergency Department Parking Demand

We were provided with annual ED Presentations data by the Hospital (12,260 in 2014/15 and 15,297 in 2026/27 respectively). ptc. applied an **Equivalent Annual Increase Rate** (1.8614%³⁴) to estimate the activity

³² Per Hospital information

³³ Per PTC benchmarked hospitals

³⁴ Equivalent Annual Increase Rate = $((1+(2026/27 \text{ number}/2014/15 \text{ number}-1)) ^ (1/12))-1 = ((1+(15297/12260-1)) ^ (1/12))-1 = 1.8614\%$

number in 2016/17. Therefore, our estimated 2016/2017 ED presentation number was 12,721³⁵ and the average daily presentation number was 12,721/365 days = 35.

Forecast daily ED presentation number was estimated based on Hospital’s data (15,297/365=42)

To the daily ED Presentations figure we applied a 90% car mode share requiring a car space, based on our surveys of outpatients. Those attending by ambulance would be expected to be followed relatively quickly thereafter by someone driving and requiring parking in the hospital car park.

We estimated the proportion (58%) of ED presentations that occur during peak parking hours³⁶ based on ptc.’s benchmarked hospitals.

We applied a space turnover of 2.41 times (as for outpatients and visitors) in order to estimate the peak weekday parking demand, as follows:

Table 36 - Emergency Department Peak Parking Demand

ED Presentations peak demand for parking	Current (2016/17)	Future (2026/27)
Spaces	8	9

8.7 LHD Controlled Fleet Vehicles

The current number of fleet vehicles was not supplied by the Hospital therefore we applied the current parking supply (2 spaces) of Fleet vehicles in the current demand estimate. On this basis (and as summarised in Appendix G) we estimate that the peak demand for parking from fleet vehicles is as follows:

Table 37 - LHD Controlled Fleet Vehicle Peak Parking Demand

LHD Controlled peak demand for parking	Current (2016/17)	Future (2026/27)
Spaces	2	2

8.8 Maintenance Vehicles

Similar to VMO and Fleet vehicle spaces, due to the absence of data, we applied the current parking supply of Maintenance vehicles (2 spaces) in the current demand estimate. On this basis (and as summarised in Appendix G) we estimate that the peak demand for parking from fleet vehicles is as follows:

Table 38 - Maintenance Vehicle Peak Parking Demand

Maintenance peak demand for parking	Current (2016/17)	Future (2026/27)
Spaces	2	2

³⁵ 2016/17 ED presentations = 2014/15 number * (1+Equivalent Annual Increase Rate) ^ (2) = 12260 * (1+1.8614%)^ (2) = 12721

³⁶ 8am – 6pm

8.9 Summary of Weekday Peak Parking Demand

A summary of estimated weekday peak parking demand is shown in the table below:

Table 39 - Summary of Weekday Peak Parking Demand

Summary of weekday peak demand for parking	Current (2016/17)	Future (2026/27)
Staff (inc VMO)	74	77
Public		
Outpatients	30	30
Visitors	4	4
ED Presentations	8	9
	42	43
LHD Controlled – Fleet Vehicles	2	2
Maintenance Vehicles	2	2
Total Parking Demand	120	124

8.10 Analysis of Parking Demand & Supply

Based on the above, a summary of the estimated current parking demand and supply is as follows:

Table 40 - Summary of Estimated Current & Future Parking Demand & Supply

Total Parking Supply/Demand Analysis	Current (2016/17)	Future (2026/27)
On Campus Supply		
Total On Campus Supply	77	127
Demand		
Staff	74	77
Public	42	43
LHD Controlled – Fleet Vehicles	2	2
Maintenance Vehicles	2	2
Total Demand	120	124

Total On Campus Surplus/(Shortfall)	(43)	3
Total Off Campus Supply near the Hospital	212	212
Estimated Total Off Campus Supply utilised by Hospital-related Users (69% of Total Supply)³⁷	146	146
Total Surplus / (Shortfall)	103	149

Conclusion:

- The **current** estimated on campus shortfall of 43 spaces can be met by off campus parking supply near the Hospital (146 spaces) assuming 69% spaces are utilised for Hospital use.

It also indicates that there is a future estimated on campus surplus of 3 spaces (in addition to additional off-campus capacity of 146 spaces assuming 69% of all off-campus spaces available for Hospital use). Hence, there will be **no reliance on off-campus parking**. As an additional benefit, this improves environmental amenity by reducing the number of vehicles parking on-street. This conclusion is subject to the following assumptions:

Demand

- No changes to the parking behaviour of staff, outpatients and visitors (i.e. same %'s continue to drive, park etc.).
- No changes to the % of outpatients and visitors who are dropped off and do not park.
- Note that should paid parking be introduced at the Hospital (or by Council in surrounding streets), it is likely that some or all of the above assumptions will change.

Supply

- No changes by Council to on-street and off-street parking regimes that result in fewer bays being available to hospital-related users, for example:
 - Unrestricted parking spaces becoming restricted (e.g. 2P) and therefore not practically available for use by staff. Note, however, that assuming a time restriction of, say, 2P these spaces could be used by patients and visitors to the hospital.
 - Other parking restrictions (e.g. "No parking") are introduced, thereby making spaces unavailable to hospital staff, patients and visitors.
- No significant increase in demand for parking from external sources (e.g. School and child care centre etc.).

³⁷ 69% (73/106) of total off campus occupied bays were used by Hospital-related users per PTC occupancy surveys.

8.11 Weekend Peak Parking Demand

Note that we have not quantified weekend parking demand as it will always be lower than the weekday peak, due to:

- Lower volumes of staff, particularly administration staff.
- Limited or no outpatient activity.

8.12 Verification check

We have tested the veracity of the current parking demand model in a number of ways:

- Comparing the estimated peak parking demand with the observed peak demand from our surveys.
- Reality check comparing the estimated number cars parking off campus at peak with the observed number of cars parking off campus at peak.

8.12.1 Estimated Peak Demand vs Observed Peak Demand

Appendix H adopts the current base estimate but applies to the number of cars each day the % that park on campus, per our surveys of staff, patients and visitors.

The outcome is the estimated peak on campus parking demand.

A summary of the analysis is as follows:

Table 41 – Verification Check

Verification check against observed peak occupancy	Spaces
Estimated peak <u>on-campus</u> parking demand (per Appendix H)	56
Observed peak occupancy – on campus (Wednesday 2pm-3pm)	47
Difference	-9

The difference between the estimated on-campus peak occupancy (per model) and the observed on-campus peak occupancy is approximately 16% and may be partially explained by the relatively low occupancy (approximately 44%³⁸) of VMO, Maintenance and Fleet vehicle spaces at peak.

8.12.2 Reality Check

As a high-level reality check, we undertook the following assessment.

Table 42 – Reality Check

High Level Reality Check	Spaces
Estimated Total Peak Parking Demand ³⁹ (A)	120
Observed peak on campus occupancy ⁴⁰ (B)	47
Balance assumed to be parking off campus (A – B = C)	73

³⁸ Per Occupancy survey and observation. 4 occupied spaces / 9 total spaces = 44%

³⁹ Per Table 39

⁴⁰ Per our surveys

Off campus occupied spaces near the Hospital (D)	106
% of off campus occupied spaces relating to hospital-related users (C / D)	69%

Comments:

- The above reality check shows that the current number of cars parking off campus is less than the off-campus supply. If the opposite were the case then the demand model would be incorrect.
- A utilisation figure in the region of 69% may be reasonable based on our surveys, which shows that the majority of staff and some outpatients and visitors parked off campus (85.2%, 13.2% and 25% respectively).

It is not possible to identify whether cars parking off campus belong to hospital-related users. Some may belong to other user groups such as:

- Residents
- Visitors to residents
- Visitors to the park
- Child care centre
- Mudgee Medical Centre visitors/staff

9. Traffic Assessment

9.1 Proposed Development

9.1.1 Hospital Redevelopment

The redevelopment of the hospital involves demolition of all existing buildings and construction of one consolidated hospital containing all required facilities. The new hospital will be located at the south – west of the site, near the corner of Church and Meares Streets (Figure 18).

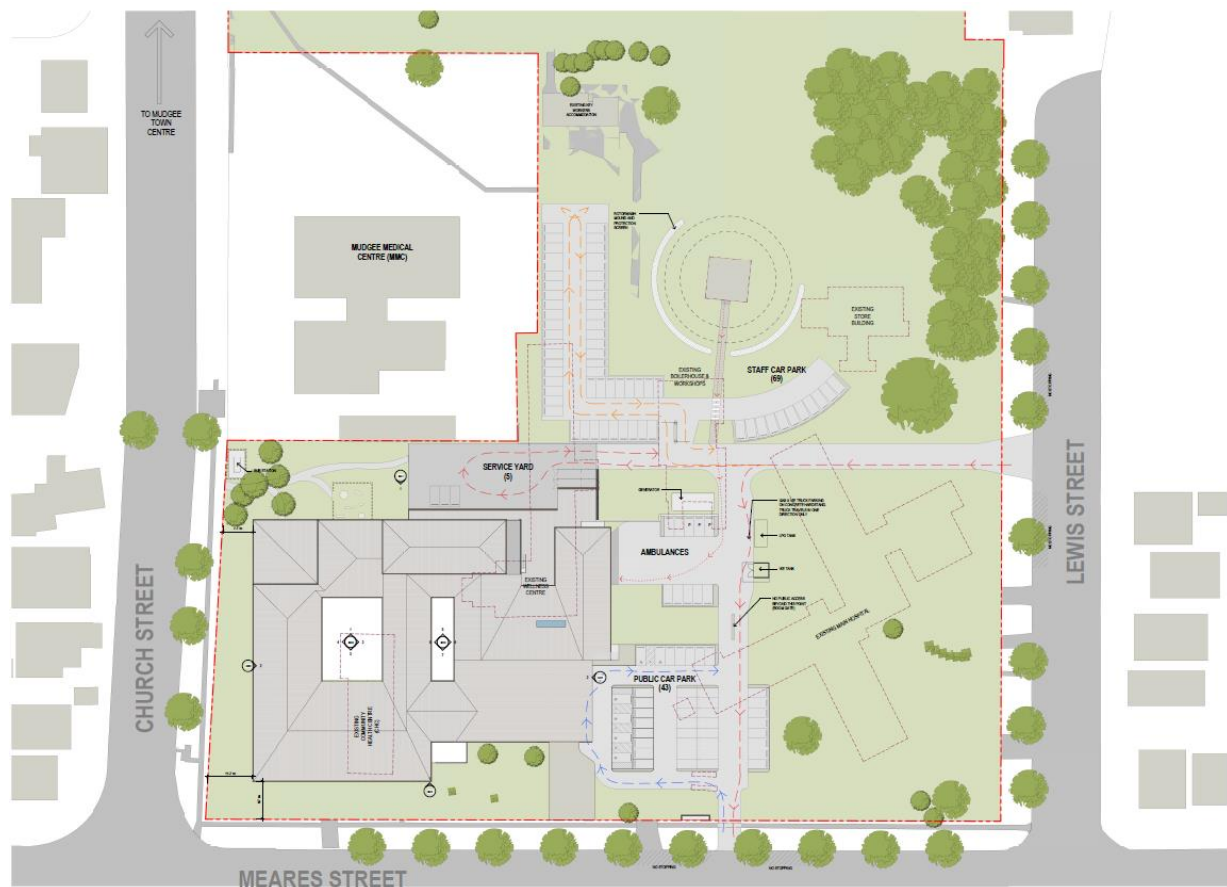


Figure 18 - Proposed Development

9.1.2 Car Park

The development proposes total 127 car parking spaces, as follows (Figure 18):

- Staff Parking – 69 spaces;
- Public Parking – 43 spaces;
- VMOs (minimum 5) and emergency vehicles (remaining 5) – 10 spaces; and
- Maintenance and service vehicle parking – 5 spaces.

In addition to above, 3 ambulance bays are proposed externally and will be located within an undercroft area. Two loading dock will be provided which is considered to be sufficient for this hospital. As shown in

Figure 18, the public and staff parking to the new hospital will be separated which is a desirable outcome in terms of traffic and pedestrian safety.

9.1.3 Vehicular Access

Two vehicular accesses are proposed via Lewis & Meares Streets. While Lewis Street access will be predominantly used as an entry for service vehicles and staff members, the Meares Street access will predominantly serve as entry and exit for patients and visitors. The proposed traffic circulation within the internal car park is shown in Figure 18.

Ambulances and service vehicles will enter the site via Lewis Street and exit via Meares Street.

9.2 Existing Traffic Review

It is difficult to quantify the existing trip generation by the hospital staff and visitors as many of them currently park on-street due to existing shortage of parking in the hospital campus. Therefore, analysis of the nearby intersections is a good representation of existing traffic generated by the hospital.

Traffic count have been undertaken in nearby intersections and access points on Tuesday, 8 August 2017 (non-school holiday period) between the periods 7-10am & 3-6pm. The following intersections have been counted (Figure 19 & Figure 20):

- Church Street/ Meares Street;
- Meares Street/ Lewis Street; and
- Hospital accesses along Meares & Lewis Streets.

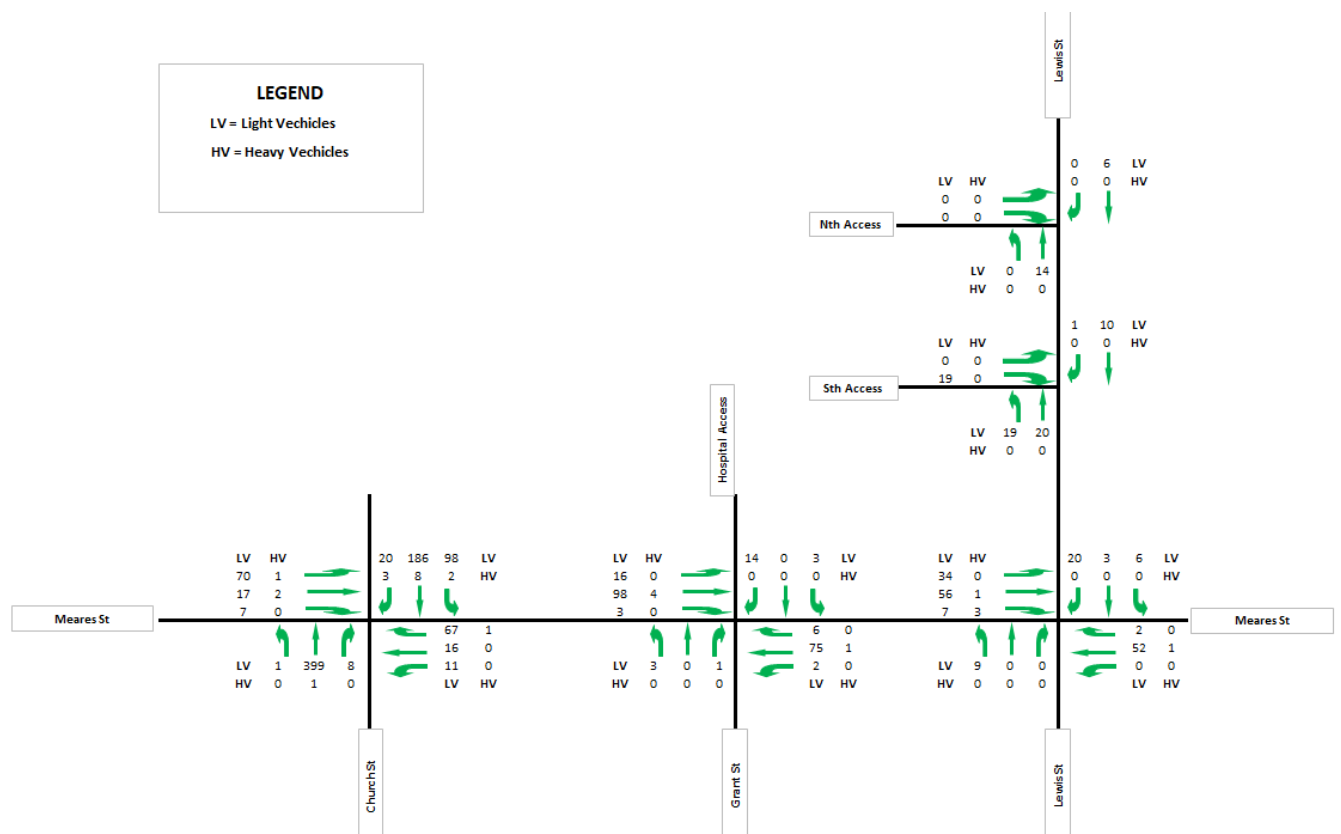


Figure 19: AM Peak Intersection Count Data (8.30-9.30am)

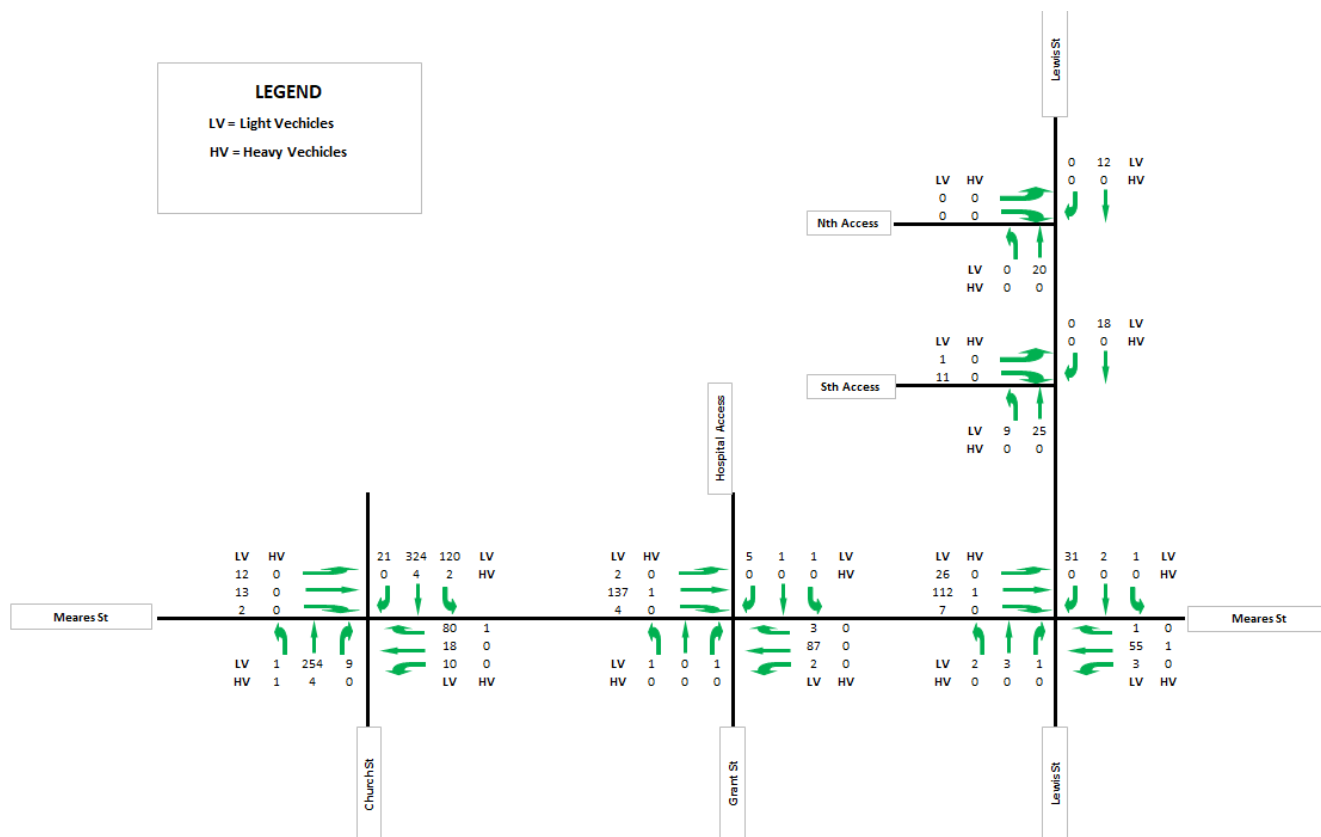


Figure 20: PM Peak Intersection Count Data (4-5pm)

The data in the above figures show that traffic is fairly consistent during the AM and PM peak hours. The Church Street/ Meares Street intersection was the busiest intersection due to high volume of traffic along Church Street. This intersection carried 918 and 876 vehicles respectively during the AM & PM peak hours. In Church Street, the dominant movement was southbound in the AM peak and opposite direction in the PM peak.

At Meares Street/ Lewis Street intersection, there were 194 vehicles during the AM peak and 246 vehicles during the PM peak. Eastbound traffic along Meares Street is almost double during the PM peak, compared to the AM peak, which is possibly the workforce returning to their residents from the Mudgee Town Centre.

During the AM and PM peak hours, total 39 and 12 vehicles used the existing hospital access in Meares Street.

There are two existing vehicular accesses in Lewis Street. The southern vehicular access (combined entry and exit) which is allocated for the hospital visitors carried 39 and 21 vehicles during the AM and PM peak hours respectively.

The northern vehicular access in Lewis Street (separated entry and exit) is allocated for ambulance vehicles only. No ambulance movement was noted during the AM and PM peak hours.

9.3 Intersection Performance

Using the collected survey data, the subject two intersections have been modelled with the SIDRA intersection modelling software. The SIDRA software package is designed to assess the amount of delay to

vehicles using an intersection, and provides a level of service, as well as other performance indicators, that describe an intersection’s performance based on its arrangement. These performance indicators are as follows:

- Degree of Saturation – The total usage of the intersection expressed as a factor of 1, with 1 representing 100% use/saturation. (e.g. 0.8 = 80% saturation)
- Average Delay – The average delay encountered by all vehicles passing through the intersection. It is often important to review the average delay of each approach as a side road could have a long delay time, while the large free flowing major road traffic will provide an overall low average delay.
- 95% Queue lengths (Q95) - is defined to be the queue length in metres that has a 5-percent probability of being exceeded during the analysis time period. It transforms the average delay into measurable distance units.
- Level of Service (LoS) – This is a categorisation of average delay, intended for simple reference using six different bands as presented in Table 43. In NSW, a LoS D or better is considered acceptable in the urban areas.

Table 43 – Level of Service Definitions

Level of Service	Average Delay (secs/vehicle)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	<14	Good operation	
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity. At signals, incidents would cause excessive delays. Roundabouts require other control mode	At capacity, requires other control mode
F	>70	Extra capacity required	Extreme delay, major treatment required

An analysis of the existing intersection operation has been performed in SIDRA, using the existing road geometry and traffic volumes. The results are summarised in Table 44.

Table 44 – SIDRA Outputs associated with Existing Situation

Period	Intersection	Deg Sat (V/C)	Ave Delay (S)	LoS	HMD (Sec)	Approach
AM Peak	Church St/ Meares St	0.276	3.7	A & B	20.5	RT* from Meares St (E) to Church St (N)
	Meares St/ Lewis St	0.037	2.6	A	6.7	T** and RT from Lewis St (N)
PM Peak	Church St/ Meares St	0.288	3.5	A & B	18.5	RT from Meares St (E) to Church St (N)
	Meares St/ Lewis St	0.067	2.0	A	7.3	RT from Lewis St (N) to Meares St (W)

*- Right Turn movement

**- Through movement

Sidra modelling results in Table 44 show that currently the Church Street/ Meares Street intersection is operating at LOS A & B with significant spare capacity. The average vehicular delay is below 4 (four) seconds in both the AM and PM peak traffic hours. The highest movement delay from Meares Street (S) to Church Street (N) is also reasonable. The maximum queue at this intersection will not affect any nearby intersection.

The Meares Street / Lewis Street intersection is also operating at LOS A on all approaches in both the AM and PM peak hours. This intersection also has significant spare capacity to accommodate additional traffic. The maximum right turn delay from Lewis Street (N) to Meares Street (W) is also considered acceptable.

Overall, the existing road network at the vicinity of the hospital is observed to be free flowing.

9.4 Forecast Traffic Generation

As the redevelopment of the hospital will not result any further increase of the bed number, the additional traffic generation by the hospital will not be significant. The only notable change is car parking provision which will be increased from existing 77 spaces to 112 spaces (69 staff and 43 public spaces – refer to section 9.1.2) which is an increase of 35 spaces. However, this is an existing deficiency of the on-campus parking supply. The vehicular trips are already generated by the existing staff members and visitors who park on-street.

The redevelopment of the hospital may result in a slight annual increase in FTE staff in the future. As a sensitivity assessment should there be an increase of 5-10 FTE staff, the net increase of 5 to 10 trips during the AM and PM peaks will not be noticeable within the existing road network.

The forecast trips generated by the service vehicles will also remain at current level as there is no change in overall bed number at the hospital. As such, with the redevelopment of the hospital, the surrounding road network will continue to operate at a satisfactory Level of Service (LOS).

10. Car Park Design Compliance Review

During the detailed design stage, all car parking spaces will be designed in accordance with AS2890.1 (Off-street car parking), AS2890.2 (Commercial Vehicles), and AS2890.6 (Off-street parking for people with disabilities).

10.1.1 Vehicular Access

The proposed two vehicular accesses in Lewis & Meares Street are away from the adjoining intersections, hence there is no traffic safety issues. The vehicular accesses will be wide enough to facilitate two-way traffic.

General vehicular access will be provided via Mears Street. The staff parking will be provided on the northern end of the hospital and will be accessible via Lewis Street. Staff parking will be boom gate controlled to prohibit any public access.

Overall, the balance of traffic between the proposed two vehicular access is generally uniform and considered to be acceptable. There is no net increase of vehicular access to the hospital.

10.1.2 Car Park Layout and Circulation

All car spaces will be designed in accordance with AS 2890.1. The space dimensions and aisle widths will comply with the requirements to accommodate two-way flow without any conflict point. Vehicles will enter and exit the driveways in a forward direction, hence there is no traffic safety issues.

Pedestrian and vehicular accesses will be separated, therefore there will be no pedestrian and vehicular conflict.

10.1.3 Service Vehicle Access

Service vehicle access, generally 8.8m Medium Rigid Vehicle (MRV), will be designed in accordance with the AS 2890.2. Service vehicular access (entry & exit) will be restricted to Lewis Street to minimise any adverse impacts to the nearby residential properties.

Oxygen trucks, equivalent to a 12.5m Heavy Rigid Vehicle (HRV), will access the site via Lewis Street and egress the site via Mears Street to ensure all movements to and from the hospital are in a forward direction.

10.1.4 Ambulance Access

Three (3) ambulance parking bays will be provided at the northern end of emergency department. Ambulance entry & egress will be provided via Lewis Street, away from the adjoining residential properties. During construction for the Final Works, a temporary ambulance access will be provided via Meares Street.

10.2 Safety Assessment

A traffic safety assessment has been undertaken at the proposed site accesses in Church & Meares Streets, as follows:

- As there will be no vehicular access via Church Street, there is no safety or sight distance issues;

- Currently vehicles were observed to park close to the intersections and driveways, potentially limiting sight distances. Therefore, sufficient 'No Stopping' zones could be provided on both sides of the new vehicular access on Meares Street and Lewis Street;
- There is no major traffic safety concern at the hospital precinct. The conflict between the existing vehicles turning right from the Mudgee Medical Centre car park (64 spaces) and southbound vehicles in Church Street coming down from the crest is a concern. However, this issue is not relevant to hospital redevelopment;
- There was a rear end type of crash when a northbound vehicle on Church Street was reversing into the angle parking space and hit by a vehicle from the rear. TfNSW Centre for Road Safety Crash Statistics show that there were only three crashes over the last five years (2012-16) which is considered to be low (Figure 21);

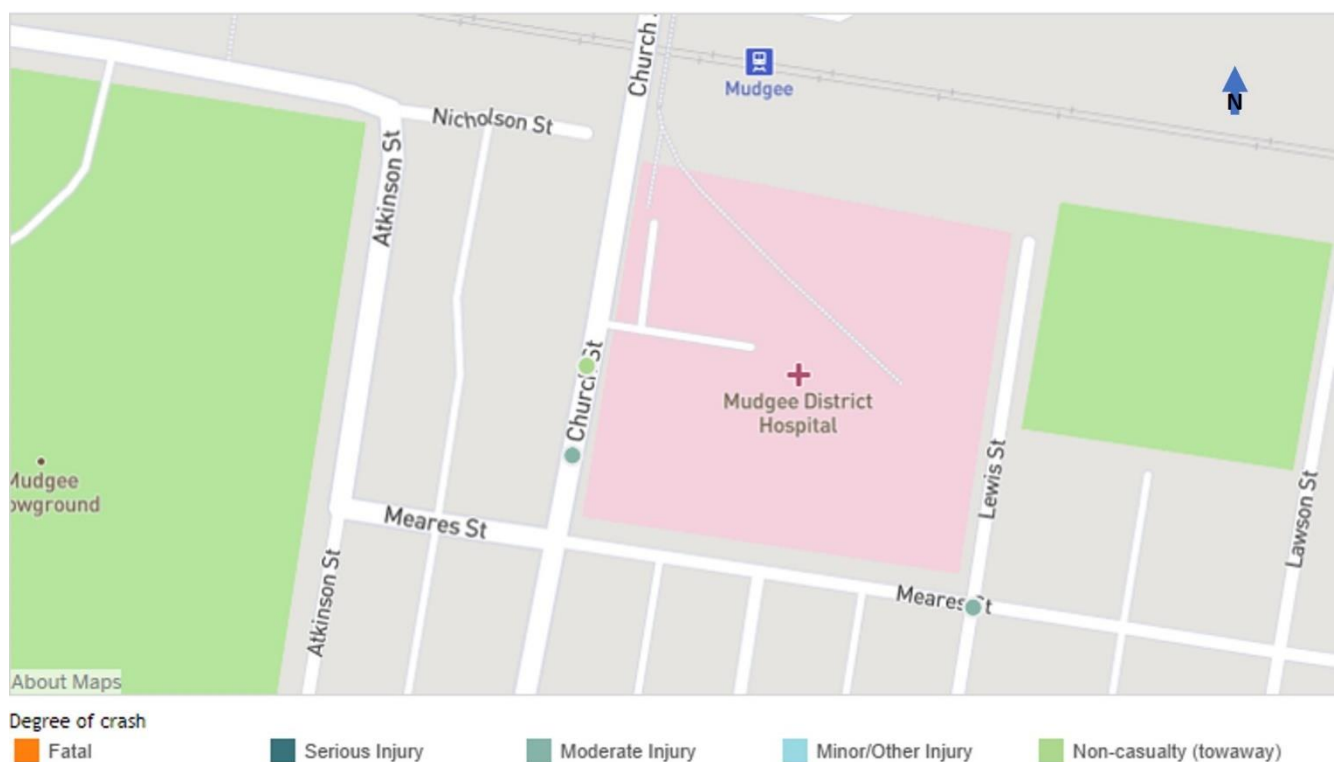


Figure 21: Centre for Road Safety Crash Diagram

- During the site visit, southbound traffic speed in Church Street (coming from the crest) was observed to be moderate. No excessive speeding was noted; and
- Council’s Traffic Engineer has indicated that there are no issues with the hospital redevelopment and is generally supportive to the proposed vehicular accesses in Lewis and Meares Streets. The Engineer has advised that the isolated site is located away from the town centre and has sufficient land to expand the existing car parks.

11. Usage of Public Transport

11.1 Bus Service

Hospital staff or visitors currently do not use bus services. Staff members have advised that they drive to/ from 20 to 40km radius of the hospital where there is no bus service connection.

The bus usage in the future is not expected to increase. Private vehicles will continue to be the dominant mode of transport.

11.2 Taxis

Patients and visitors were observed to be dropped off and picked up by Mudgee taxis. Taxi services will continue to serve the hospital as an alternate mode of public transport.

11.3 Community Transport

Mid-Western Regional Council provides community transport to people who require specialised needs such as disadvantaged groups in the community, including isolated families, the frail aged, younger people with disabilities, and their carers. Existing usage of community transport to the hospital is unknown.

11.4 Cycling

Currently 1.5% staff cycle to the hospital, however, 34.3% staff has advised that they would be interested to cycle if end of trip facilities are provided. Currently only one (1) non-standard bike rack is provided at carpark D. No bike was observed to be parked at this rack. However, a bike was found to be parked near car park A. The existing end of trip facilities include 3 showers in the Main Hospital and 2 showers in Wellness Centre (for Staff).

To improve the future bike usage by the hospital day time staff and visitors, it is recommended that an undercover (weather protected) bike rack should be provided near the hospital entrance. The proposed end of trip facilities includes:

- 4 Public bike racks (Ground Level Main Entry)
- 5 Staff bike racks (Lower Ground Service Yard)
- 2 Staff WC/Change Rooms (Adjacent to Staff Room)
- 1 Staff Shower (Adjacent to Staff Room)

Staff members living within 2.5m radius (considered as a short trip) should be encouraged to ride. Discussions could also be held with the Council for a safe and direct cycling path to the hospital from the nearby residential precincts.

11.5 Walking

Currently 3-5% staff, visitors and outpatients walk to the hospital. Walking is a viable transport option for distances under one (1) kilometre (approximately 20-25min) and is often quicker for short trips door to door. Walking is also the most space efficient mode of transport for short trips and presents the highest benefits. Co-benefits where walking replaces a motorised trip include improved health for the individual, reduced congestion on the road network and reduced noise and emission pollution.

Our site observations show that the existing footpath networks and crossing points between the adjoining residential precincts and the hospital are generally adequate, although there is no pedestrian crossing facility in Church Street. Currently parking is restricted to two (2) hours on the eastern side and unrestricted on the western side (60° angled parking rear to kerb) of Church Street. Therefore, staff and visitors to the Mudgee Medical Centre park on the opposite side (western side) and cross the street.

Discussion with the Council's Traffic Engineer it has been noted that a report was prepared to the Traffic Committee for a crossing facility in Church Street, however, the proposal was declined due to lack of funding. A crossing facility may increase pedestrian safety in Church Street, however, this is not relevant to the hospital redevelopment project.

In the staff survey, staff members living within the walking catchment of the hospital could not be determined due to large geometry of the postcode 2850 (Mudgee). As such, it is recommended that further staff survey should be undertaken to target staff living within 800m-1km catchment (approximately 10-20min walk). Walk trip should be promoted to these staff members.

Pedestrian access to the hospital will be separated from the vehicular access.

'Walk to Work Day' should be celebrated to the hospital on annual basis (<http://www.walk.com.au/wtw/homepage.asp>).

11.6 Implementation of Green Travel Plan

A Green Travel Plan (GTP) sets out policies and practices to develop objectives and measures to encourage more walking, cycling, public transport and car share to an organisation. In principle, a well-connected, direct and prioritised infrastructure for walking and cycling should essentially reduce the demand for onsite parking.

A GTP should be prepared for Mudgee hospital similar to:

- Royal North Shore Hospital

(http://www.nslhd.health.nsw.gov.au/HealthInformation/HealthPromotion/Documents/Projects/Healthy_Weight/GoActive2Work/RNSH_WTP.pdf)

- Lismore Hospital

(<http://nswlhd.health.nsw.gov.au/wp-content/uploads/LBHTravelPlan.pdf>)

A Transport Advisory Committee should be formed who will observe, set out and monitor the transport goals of the hospital on short, medium and long-term basis.

11.7 Disability Parking Spaces

Currently eight (8) disability parking spaces are provided in the campus which equates to 10% of total spaces. Our site observations indicate that some of the disability spaces were underutilised due to its isolated location. For example, in car park D three (3) disability parking spaces are provided where no one parked during the entire survey.

This proposed redevelopment of the hospital will provide four (4) disability parking spaces at the front entrance which is considered to be sufficient.

12. Preliminary Construction Traffic Management

12.1 Objectives

The traffic management plan associated with the construction activity aims to ensure the safety of all workers and road users within the vicinity of the construction site. The following are the primary objectives:

- To minimise the impact of the construction vehicle traffic on the overall operation of the road network;
- To ensure continuous, safe and efficient movement of traffic for both the general public and construction workers;
- Installation of appropriate advance warning signs to inform users of the changed traffic conditions;
- To provide a description of the construction vehicles and the volume of these construction vehicles accessing the site;
- To provide information regarding the changed access arrangement and also a description of the proposed external routes for vehicles including the construction vehicles accessing the site; and
- Establishment of a safe pedestrian environment in the vicinity of the site.

12.2 The Proposed Works

The project involves the demolition of buildings within the campus (some building will be removed as part of an early works project, subject to a separate approval) and the construction of a new building which will consolidate services into the single new building.

The project will include the construction of a new public car park fronting Meares Street while a separate staff car park will be located adjacent to the existing helipad, which is to remain in place.

The existing primary driveway on Meares Street will be retained to provide access to the public parking, while a separate driveway and associated internal roadway on Lewis Street will provide access for staff parking, emergency and service vehicles.

The total construction activities will be around 62 weeks which comprises approximately 4 weeks for excavation, 15 weeks for demolition and 43 weeks for construction.

12.3 Hours of Work

Hours of work will be defined by the Development Conditions of Consent.

Notwithstanding, the following hours are proposed, which align with typical council regulations:

- Mondays to Fridays - 7:00am to 6:00pm;
- Saturdays 8am-1pm

It is proposed that the nominated builder be able to undertake safety inspections and works preparation from 6:30am on weekdays.

12.4 General Requirements

In accordance with Road and Maritime Services (RMS) requirements, all vehicles transporting loose materials will have the entire load covered and / or secured to prevent any large items, dust or dirt particles

depositing onto the roadway during travel to and from the site. All subcontractors must be inducted by the lead contractor to ensure that the procedures are met for all vehicles entering and exiting the construction site. The lead contractors will monitor the roads leading to and from the site and take all necessary steps to rectify any road deposits caused by site vehicles.

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

No tracked vehicles will be permitted or required on any paved roads. Public roads and access points will not be obstructed by any materials, vehicles, refuse skips or the like, under any circumstances. No construction vehicles are permitted to double park, or park on the public road.

12.5 Construction Vehicle

The maximum number of deliveries will occur during the concrete pour. It is estimated that maximum 32 deliveries will occur per day which equates to four vehicles per hour during the eight-hour day. The likely vehicular route is Church Street and Meares Street. The estimated four vehicles during the peak hours are unlikely to have any significant impact on the existing road network.

There is no known approved development at the vicinity of the hospital, hence any cumulative construction traffic assessment is not required.

The construction project will involve a range of vehicle types, with the largest expected to be 12.5m Heavy Rigid Vehicles (HRV) while Truck and Dog trailers will likely be used for the excavation stages. Construction vehicular access will be provided via Meares Street. The relatively low volume of construction traffic will not compromise the safety and accessibility of Church Street/ Meares Street intersection.

12.6 Special Deliveries

Oversize and over-mass vehicles are not allowed to travel on Local Roads (unless approval for a one-off occasion is obtained from Council). Requests to use these vehicles must be submitted to Council 28 days prior to the vehicle's scheduled travel date. For more information please contact the National Heavy Vehicle Regulator (NHVR) on 1300 696 487 or www.nhvr.gov.au.

Should the contractor require a partial road closure on a Council or RMS road, or carry out work within 100m of traffic signals, an application will be made to the relevant authority to obtain their approval.

12.7 Traffic Control

Traffic Control Plans (TCPs) will need to be provided in accordance with RMS Traffic Control at Work Sites and these will be provided for approval by Council prior to construction commencement onsite.

12.8 Parking during Construction Period

The development will occur in several stages, including the temporary decantation of the services from the existing Wellness Centre and Community Health Centre into the existing Main Hospital Building. Following the demolition stage, the site area will be prepared for the construction of the proposed hospital building. When the new hospital building becomes operational, the remaining buildings will be demolished.

During the construction period, construction workers will be required to park using available on-street parking on roads other than those in close proximity of the Hospital.

While some parking will remain on site, staff and visitors may use the available on-street parking.

According to our parking surveys, there are over 50% vacant spaces in Church, Meares and Lewis Streets in the vicinity of the hospital. As most of the residential properties have more than one (1) off-street parking capacity, the parking impact at the nearby residential street during the construction period is considered to be minimal.

12.9 Pedestrian, Cyclist and Public Transport Management

All public footpath and pedestrian facility will remain available by the public at all times, with protective hoardings employed as required to ensure pedestrian safety and amenity.

If specific construction activities are required that require closure of the footpath or public road, an application will be made to Council for its approval.

There is no dedicated cycling facility at the vicinity of the hospital. The construction traffic is unlikely to have any adverse impact to the existing cyclists and public transport users.

12.10 Work Site Security

The principal contractor will be responsible for access to and security of the site during demolition and construction of the project.

The site will be secured by perimeter fencing (complying with WorkCover NSW codes of practice) and hoardings with designated vehicle and pedestrian entry gates. Vehicle entry points will be manned while in operation to ensure protection of the public when vehicles are entering or leaving the site. All gates will be appropriately secured after hours.

Daily inspections of all hoardings, fences & gates will be undertaken with graffiti and bill posters removed and/or painted over within 48 hours and damage repaired as quickly as reasonably possible.

The principal contractor will review and confirm its preferred fencing and overhead protection strategy as part of its construction management plan to be prepared and approved by the principal certifying authority prior to commencement of works.

The principal contractor is responsible to report any serious external security concerns with the local police.

12.11 Access to Adjoining Properties

Access to all adjoining properties will be maintained throughout the works. The adjacent land owners will be notified of works via letter box distribution and road signage to advised of anticipated truck movements in operation with access to adjoining properties being maintained at all times.

12.12 Method of Communicating Traffic Changes

Traffic control plans in accordance with Australian Standards (AS 1742.3 – Traffic Control Devices for Works on Roads) and RMS Traffic Control at Worksites manual will advise motorist of upcoming changes in the road network.

During construction the contractor shall each morning, prior to work commencing, ensure all signage is erected in accordance with the TCP and clearly visible. Each evening, upon completion of work, the contractor is to ensure signage is either covered or removed as required. Sign size is to be size "A". At the end of each work day, the traffic controller is to remove all signs. Signs are not to be covered.

Any variation to the layout of the TCP on site is to be recorded and certified by authorised RMS accredited personnel. The associated TCP road signage will inform drivers of works activities in the area including truck movements in operation.

Prior to commencement of works on site, the contractor is to inform neighbouring properties of proposed works and provide site contact information by means of a letter box distribution.

12.13 Contact Details of the Site Manager

The contact details of the site manager shall be confirmed once a nominated contractor is engaged.

12.14 Emergency Vehicle Access

The proposed works are not anticipated to involve the closure of any local road. Unobstructed access for any emergency vehicles requiring access to the project site shall be provided.

12.15 Occupational Health and Safety

Any workers required to undertake works or traffic control within the public domain shall be suitably trained and will be covered by adequate and appropriate insurances. All traffic control personnel will be required to hold RMS accreditation in accordance with Section 8 of Traffic Control at Worksites.

All staff and subcontractors engaged on site will be required to undergo a site induction. The induction will include permitted access routes to and from the construction site for all vehicles, as well as standard environmental, OH&S, driver protocols and emergency procedures. Additionally, the lead contractor will advise workers of public transport and car-pooling opportunities.

13. Limits of this Report

All surveys, forecasts and recommendations have been made in good faith and on the basis of the information available to **ptc.** at the time of writing this report, as provided by the Hospital/HI via the Project Managers.

Where general data has been applied based on other hospitals, there is the need to recognize the fact that each hospital is to some extent unique, particularly regarding driving habits, sensitivity to parking prices, alternative means of transport, available free parking on street, demographics of the area etc.

The demand estimates should be considered as indicative only because they do not take into account variations due to:

- The potential effect of economic up or downturns,
- Inflation trends,
- The introduction or increase of any taxes on property in general or specific to parking,
- Any other factors that may adversely or positively affect parking demand.

Any reference to future market conditions should be regarded as estimates only. The process of making forward projections of such elements involves assumptions about a considerable number of variables and contingencies which are acutely sensitive to changing conditions.