



Camden Medical Campus

Traffic Impact and Parking Assessment

July 2016

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1 Introduction

Mott MacDonald has been engaged by Gregory Hills Corporate Park to undertake a Traffic Impact and Parking Assessment to support a State Significant Development Application (SSDA) for the proposed Camden Medical Campus. The proposed development is situated within the Gregory Hills Corporate Park (GHCP) in the suburb of Gledswood Hills and forms part of the ongoing development of a commercial and business park precinct that form part of the Turner Road release area.

1.1 Purpose of Report

This transport, traffic and parking impact assessment has been prepared to support a State Significant Development Application for a proposed medical precinct on Lot 846. This assessment acts as supplementary information to the findings obtained from previous traffic and parking assessment reports prepared to support the development of GHCP (refer Section 2).

This report will assess the traffic and transport impacts from the proposed development and has been prepared to form part of the supporting documentation for the proposed medical campus, which will be submitted to the Department of Planning and Environment for approval. A detailed description of the proposed development is provided in Section 3.

1.2 Background

1.2.1 Precinct Context

Gregory Hills Corporate Park (GHCP) is a large subdivision in the suburb of Gledswood Hills that is bounded by Camden Valley Way to the west, South Creek to the north, Gregory Hills Drive to the south and Hermitage Way to the east. The development as a whole is anticipated to yield a Gross Floor Area (GFA) of between 107,500 – 119,000m² (Refer to Appendix A) and consists of mixed use commercial, retail and health services developments.

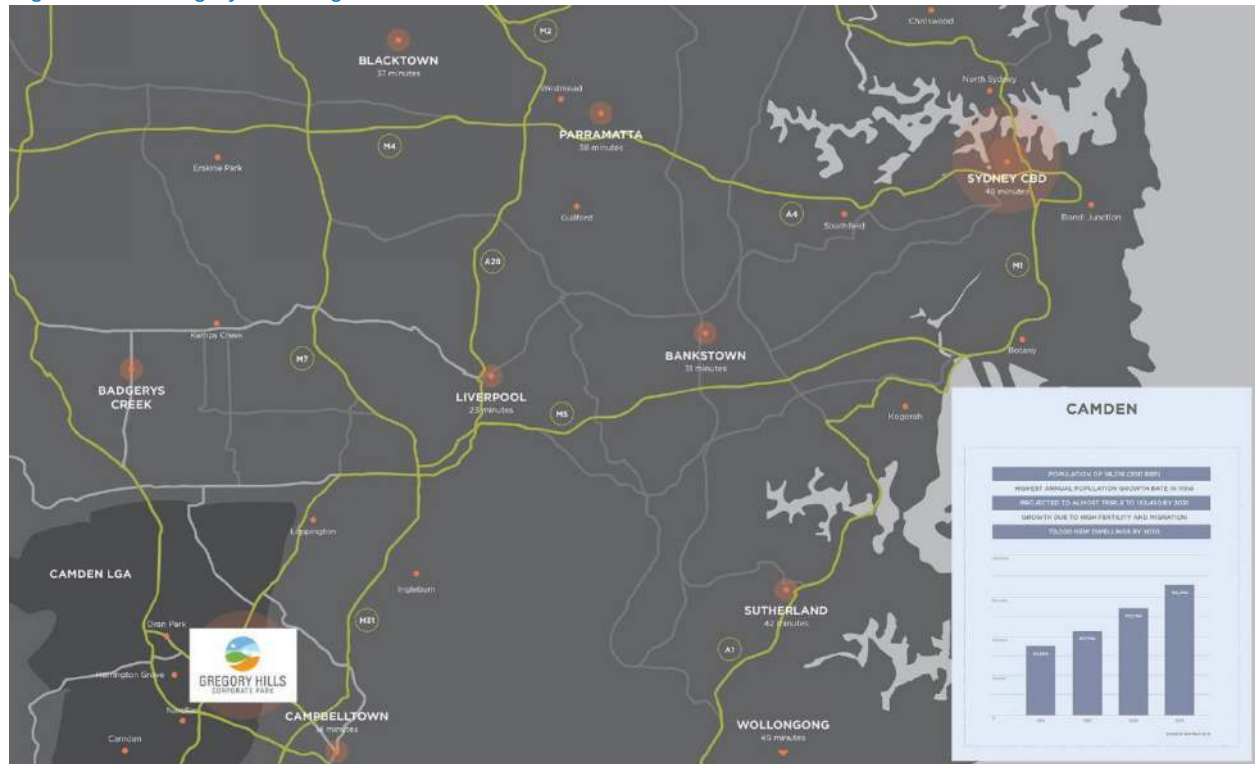
1.2.2 Status of Planning Approvals

The GHCP falls within the Turner Road Precinct, which was assessed in terms of traffic impact under full development as part of the Badgally Road Extension Report (Cardno, 2009). This report was therefore used as a comparison and benchmark for the road network modelling.

This rapidly expanding Corporate Park represents one of the first commercial developments in the South West Growth Centre (SWGEC) Turner Road Precinct and supports the rapid expanding residential subdivisions situated to the north east and south east of site and industrial type development to the south. The site is located close to the town centre of Campbelltown and is situated next to the arterial road network, providing a high level of access to regional centres to the north east.

The regional context for the site is presented in Figure 1.1.

Figure 1.1: Gregory Hills Regional Context

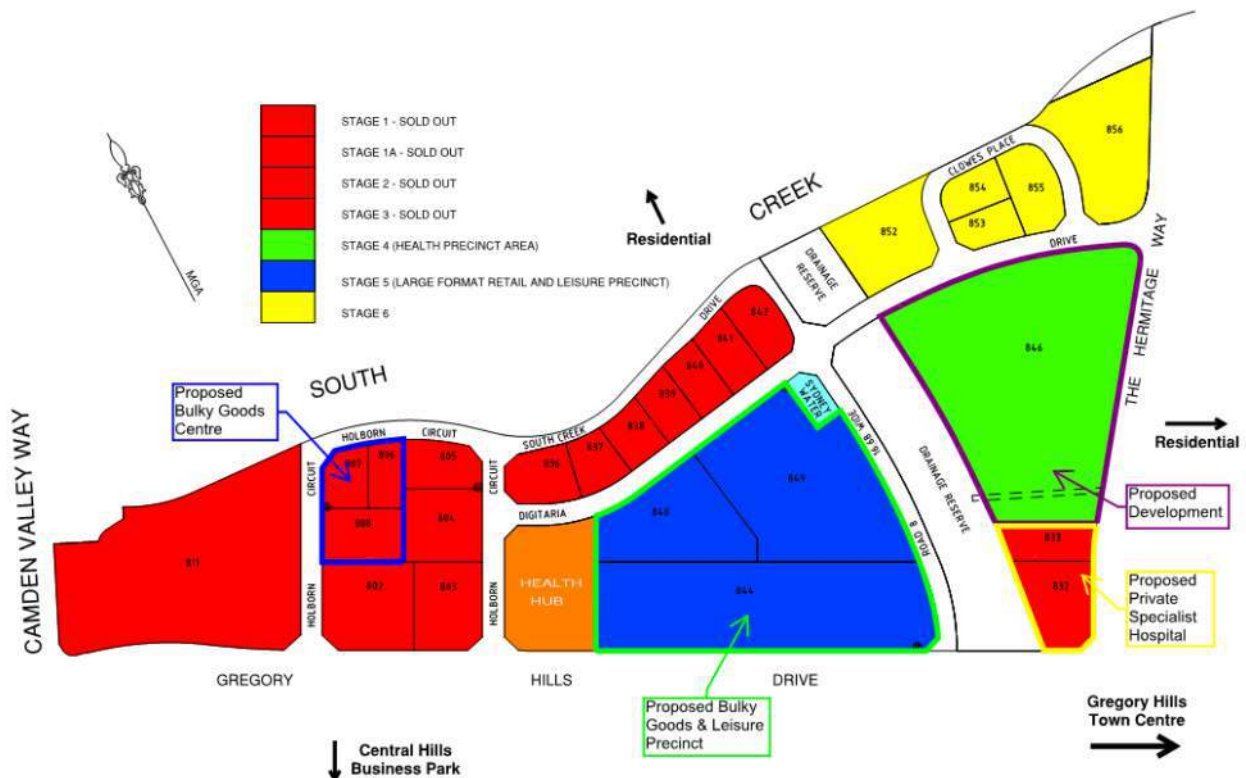


Source: Gregory Hills Corporate Park – Regional Context Plan (Health Projects International, 2016)

The original concept plans (dated 28/11/11) for the precinct were prepared by De Angelis & Taylor Associates and proposed an employment area divided into three separated stages. As presented in the earlier sections of this statement, the staging of the employment area was refined as part of subsequent planning and now consists of six stages, all of which align with the original concept layout.

The current proposed layout for the entire GHCP precinct is presented in Figure 1.2.

Figure 1.2: Gregory Hills Corporate Park Site Layout



Source: Gregory Hills Industrial Development Sales Plan (Burton & Field, 05/08/15)

1.3 Response to SEARs

A Secretary's Environmental Assessment Requirements (SEARs) has been provided by the Department of Planning and Environment indicating the planning requirements of the State Significant Development Application for the proposed planning concept. This included a consolidated response from Department of Planning and Environment and individual traffic and transport requirements specified by Transport for NSW (TfNSW) and Roads and Maritime Services (RMS). The SEARs and sections in this report where these items are addressed are summarised in Table 1.1.

Table 1.1: Review of Compliance with SEARs

SEAR	Compliance	Comments
Existing traffic and parking conditions, including daily and various peak period vehicle, public transport, pedestrian and bicycle movements and performance of the existing road network and intersections, including: - Camden Valley Way/Gregory Hills Drive/Oran Park Drive; - Camden Valley Way/Rodeo Drive; - Gregory Hills Drive/Central Hills Drive; and - Gregory Hills Drive/Donovan Boulevard.	Yes	Addressed in section 2. The assessment includes all intersections with available data for a full development 2026 scenario and is consistent with the previously approved precinct transport assessment. Initial discussions with RMS concluded that no data was available for the intersection of Camden Valley Way/ Rodeo Drive and the agreed method for addressing this concern was to allocate all traffic travelling via Camden Valley Way to the intersection of Camden Valley Way with Gregory Hills Drive. Note that the current existing performance of intersections is likely to change with the introduction of the Gregory Hills Drive extension and will result in changes in travel patterns in the region, and as a result it is proposed to undertake intersection analysis of the existing conditions after the Gregory Hills Drive extension is open to traffic (late 2016/early 2017).
Estimate daily and various peak vehicle, public transport, pedestrian and bicycle movements likely to be generated by the proposed development and at various stages of development.	Yes	Addressed in section 5. This report addresses the proposed changes in land use and traffic generation resulting from this development proposal. This approach is deemed to be conservative and includes all other known development applications within the GHCP that may result in a change to the previously approved precinct land use assumptions. Staging of the development was not considered and is proposed to be addressed as part of future detailed planning proposals.
The traffic impacts of the proposed development on general traffic, public transport, pedestrian and bicycle movements.	Yes	Addressed in section 5.
Any measures (including staging) required to mitigate impacts on intersections and the transport networks, having regard to local planning controls.	Yes	Addressed in section 6.
The access arrangements, including for vehicles, service vehicles, emergency vehicles, public transport, pedestrians and bicycles along the surrounding road network and within the site.	Yes	Addressed in section 3.
The pedestrian and cycle connections/circulation and required upgrades within the precinct and connections to the external networks and to public transport facilities to meet the likely future demand and maintain road safety.	Yes	Addressed in sections 3.3, 3.4 and 6.
The public transport infrastructure and services and required upgrades to meet the future demand.	Yes	Addressed in section 3.4 and 6.
The visitor and staff car parking spaces, pick-up/drop-off areas and bicycle parking spaces and compliance with the	Yes	Addressed in section 4, which demonstrates compliance of the concept with the parking

SEAR	Compliance	Comments
relevant parking codes.		codes (i.e. AS 2890.1 and 2890.6) and is subject to further detailed appraisal as of part of future applications that will support the staged development of the site.
Measures to promote travel choices that support sustainable travel, such as end-of-trip facilities, green travel plans and way finding strategies.	Yes	Addressed in section 3.4.
<i>Relevant policies and Guidelines:</i> • Guide to Traffic Generating Developments (RMS) • EIS Guidelines – Road and Related Facilities (DoPI) • NSW Planning Guidelines for Walking and Cycling • Cycling Aspects of Austroads Guides • Austroads Guide to Traffic Management Part 12: Traffic Impacts of Development	Yes	All stated guidelines and policies were reviewed and applied in the completion of this assessment.
Additional items from agency submissions (RMS)		
Details of the proposed accesses and the parking provisions associated with the proposed development including compliance with the requirements of the relevant Australian Standards (i.e. turn paths, sight distance requirements, aisle width, etc.).	Yes	Addressed in sections 3.3 and 4, which demonstrate compliance of the concept with the relevant Australian Standards and is subject to further detailed appraisal for the staged development of the site.
Proposed number of car parking spaces and compliance with the appropriate parking codes.	Yes	Addressed in section 4.
Details of service vehicle movements (including vehicle type and likely arrival and departure times).	Yes	Addressed in section 4.5.

Source: SEARs Letter to Applicant (NSW Planning & Environment, 10/12/2015)

1.4 Structure of Report

This report is structured as follows:

- **Section 1 – Introduction** (this section) – provides an understanding of the purpose of the study.
- **Section 2 – Existing Conditions** – provides an understanding of the current land use composition within and surrounding GHCP and its supporting transport network.
- **Section 3 – Proposed Development** – provides an understanding of the development proposal and its relationship with the GHCP.
- **Section 4 – Car Parking Requirements** – provides an understanding of the parking requirements associated with the proposed development and the parking provision.
- **Section 5 – Traffic Impact** – provides an understanding of the modelling assumptions, data sources, traffic flows and the scenario to be modelled as part of the appraisal, and then presents the modelling outcomes and improvements that may be required to support the development proposal.
- **Section 6 – Key Findings and Recommendations** – provides a summary of the assessment and any recommended mitigating measures.

2 Existing Conditions

The following section provides detail associated with existing conditions within and surrounding the study area, which is graphically displayed on the aerial shown in Figure 2.1.

Figure 2.1: Existing Conditions



Source: Google Earth (Google, 2016) and dated 05/05/2016

2.1.1 Land Uses

The existing land uses in the vicinity of the proposed development includes the following:

- The partially developed Central Hills Business Park and established areas situated within Turner Road Industrial Precinct to the south;
- The established residential areas of Harrington Grove and Harrington Park, and the partially constructed Oran Park and Catherine Field to the west.
- The Hermitage residential precinct in Gledswood Hills to the north, which is partially development and forms part of the staged development of the area.
- Gregory Hills residential areas to the east of GHCP, which are established to the west and under construction to the east.

Most surrounding land in close proximity to the site (except for GHCP and residential areas fronting The Hermitage Way) is developed or in the final stages of delivery, with other areas on the fringe of the Gregory Hills Precinct still in the early stages of construction.

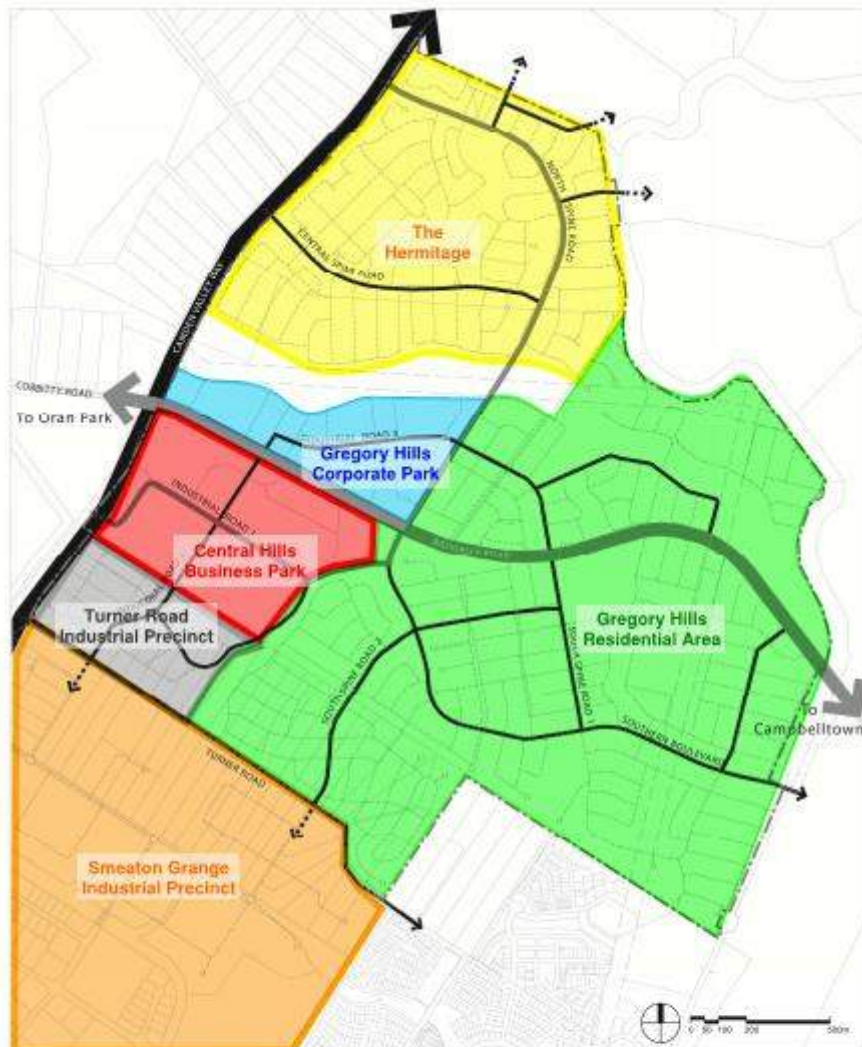
2.1.2 Road Network

The existing road network consists of the following:

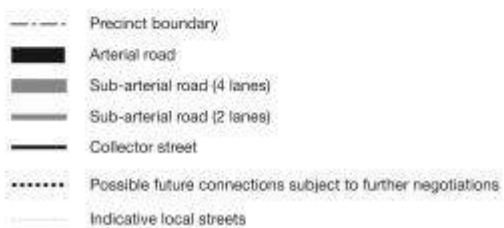
- **Camden Valley Way** – a major arterial road linking the Hume Highway, M7 and M5 interchange. This road consists of a recently design dual carriageway arrangement with two lanes in each direction (designed to accommodate a third lane), signalised intersections and a wide median. The typical speed limit is 80km/h and includes bus priority and shared paths.
- **Gregory Hills Drive** – a sub-arterial road connecting to Camden Valley Way to the west and running east towards Gregory Hills town centre and residential precincts. This road consists of two lanes in each direction, a 60km/h speed limit, signalised intersections and shared paths and is approved to be extended to Eagle Vale Drive. This extension will be delivered during 2016 and connect Gregory Hills directly with Campbelltown, MacArthur and the F5 and will improve bus, bike and private vehicle access to the precinct from the east.
- **The Hermitage Way** – a regional/ major collector road running north-south, which connects Gregory Hills Drive in the south and the eastern boundary of the GHCP site to The Hermitage precinct to the north. This road consists of a dual carriageway with one lane in each direction, which is controlled by signalised intersections with Gregory Hills Drive and Camden Valley Way. The road corridor will be delivered as part of the progressive construction of the surrounding area, which includes the construction of the western carriageway to the south by GHCP. The masterplan indicates that when fully completed The Hermitage Way will be connected to Camden Valley Way and other precinct areas to the north.
- **Holborn Circuit** – a local/ minor collector road consisting of a single carriageway with one traffic lane and one parking lane in each direction. This road connects to Gregory Hills Drive to the south with Digitaria Drive to the east and provides access to the proposed development.

The proposed road network that supports movement around the precinct is presented in Figure 2.2, and represents the approved transport network arrangement that will support the full development of the Gregory Hills precinct.

Figure 2.2: Proposed Road Network



Street Network



Source: Turner Road DCP (NSW DoP, 2007)

2.1.3 Intersections and Access

Existing intersections that provide access to the GHCP precinct and proposed development include:

- A signalised intersection at Gregory Hills Drive / Holborn Circuit / Central Hills Drive.
- A signalised intersection at Gregory Hills Drive / The Hermitage Way / Donovan Boulevard.
- A priority controlled intersection at Holborn Circuit/ Digitaria Drive.

2.1.4 Intersection Performance

The current existing performance of intersections is likely to change with the introduction of the Gregory Hills Drive extension and will result in changes in travel patterns in the region. In order to take this into account, it is recommended that this assessment is undertaken as part of the detailed development proposals for the staged development of the site.

2.1.5 Public Transport

The existing public transport network consists of three bus routes servicing the precinct (service routes 850, 857 and 896) with the majority operating with a 30 minute service frequency. These routes connect with surrounding key centres and provide adequate public transport access to the precinct.

Additional services, increases in service frequency and direct access to Campbelltown will be implemented in the future as part of the progressive development of the area and public transport network.

Refer to section 3.4 and Appendix F for further details on public transport service provision.

2.1.6 Pedestrian and Bicycle Network

The existing pedestrian and bicycle network is off road and is situated along all major routes (Camden Valley Way and Gregory Hills Drive) or green corridors (South Creek) and designed as part of a precinct wide shared path network that is connected via signalised crossings. The majority of the proposed pedestrian and bicycle network in the GHCP is yet to be constructed, but is planned to offer a high level of connectivity to the surrounding areas and promote active transport as an effective travel mode.

Refer to section 3.4 for further details on the future pedestrian and bicycle network, which will align with the approved network for the Turner Road release area.

2.1.7 Crash History

Crash analysis data obtained from the TfNSW Interactive Crash Statistics website indicated that there were two observed crashes close to the Gregory Hills Drive/Camden Valley Way intersection. These were involved a moderate and serious injury, with no fatalities. No other crashes were observed along Gregory Hills Drive in the vicinity of the proposed development. The crash statistics are presented in Figure 2.3.

Figure 2.3: Crash Statistics



Source: TfNSW Interactive Crash Statistics 2009 – 2013

3 Proposed Development

The following section details the development proposal concept for the proposed Camden Medical Campus, which forms part of a State Significant Development Application (SSDA) to the Department of Planning and Environment.

3.1 Subject Site

The Camden Medical Precinct is located in the eastern section of Gregory Hills Corporate Park. The site itself is bounded by Digitaria Drive to the north, The Hermitage Way to the east, a proposed private hospital with specialist healthcare facilities and Gregory Hills Drive to the south and South Creek to the west.

The site was previously zoned as a B5 employment zone under the Growth Centres SEPP 2006. Land uses in proximity to the site and situated to the west and southwest are zoned for similar purposes and are currently in various stages of development. Proposed and current uses for the employment zones include bulky goods/ commercial/ business park, medical, and leisure and entertainment uses. The site is also situated within close proximity to proposed residential precincts which are situated to the north (beyond South Creek), east and south. A new town centre for Gregory Hills is also planned to be situated within a short walking distance (approximately 1km to the south east) of the site.

3.2 Proposed Land Use and Facilities

The proposed concept development consists of a private hospital and ancillary uses, including the following key facilities:

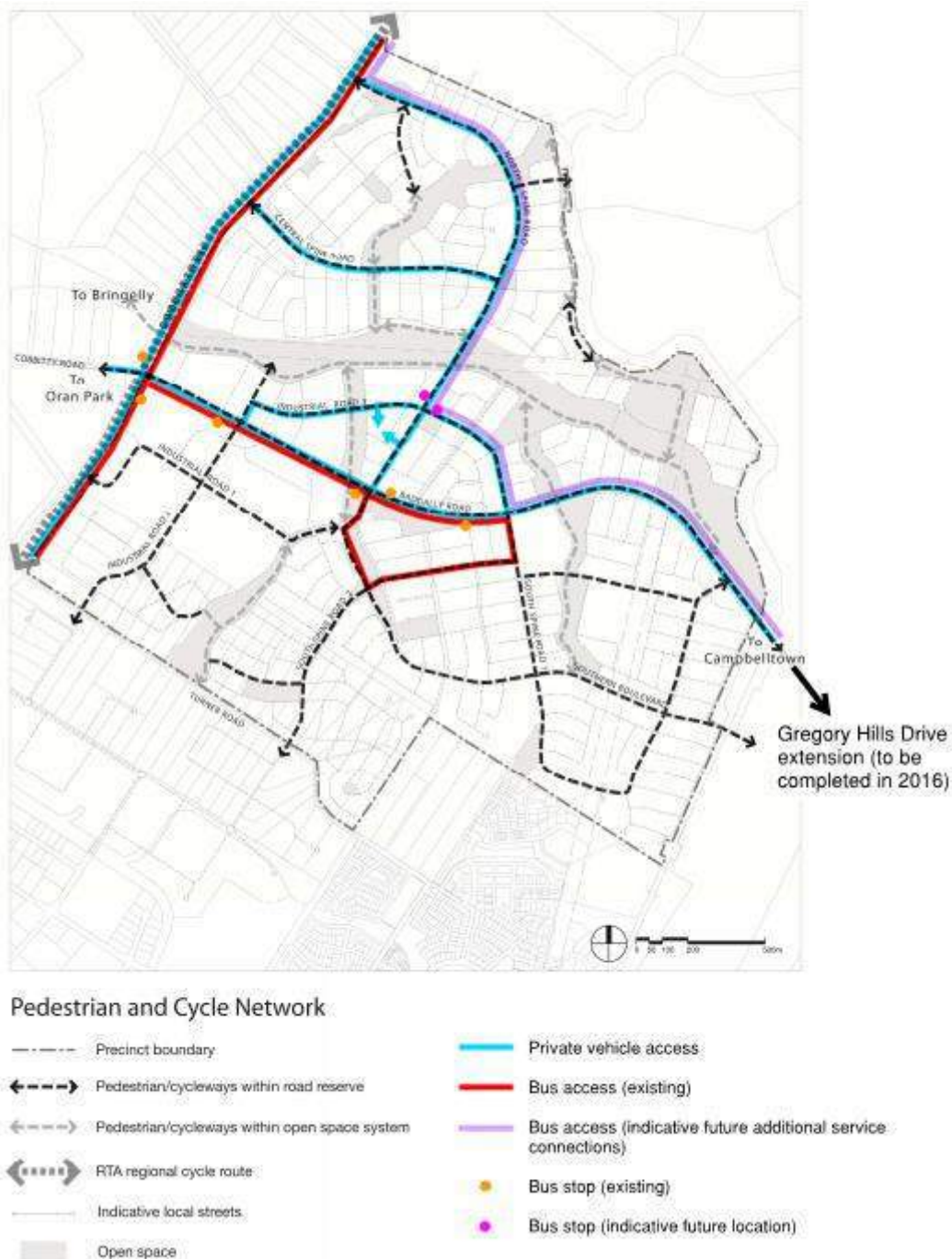
- Medical units generally accommodating low acuity and high turnover patients.
- Consulting rooms and specialist medical suites.
- Medical research and education facilities.
- Ancillary medical support uses including administration, housekeeping, engineering, retail, etc.
- A multi-level car park, two at-grade car parks and a basement car park to provide parking for the above facilities.

Refer to Appendix B for architectural plans which present land uses and facilities within the proposed development.

3.3 Proposed Access

The design concept and associated access arrangements have considered the opportunities for maximising a range of multi-modal travel to and from the site, which includes site access and its connectivity with public transport services, key walking and cycling route sand infrastructure and the proposed precinct road network. The modal access plan for the proposed development is presented in Figure 3.1, and outlines access to the site from the external network and its ability to promote different travel mode options.

Figure 3.1: Modal Access Plan



Source: Turner Road DCP (2007)

General access to the site is obtained via the main two-way access point on The Hermitage Way, which provides access to a proposed central spine road that feeds both car parks and drop off and pick up areas. To compliment this arrangement and to help balance traffic flows across the proposed precinct network it is also proposed to include a northern two-way access point into the site via Digitaria Drive. This access point will function as the main access point for patients and staff travelling from the north and a secondary access point for these users travelling from the east. This access point connects to the main spine road and offers direct access to staff parking area situated in the northern area of the site.

All car parks are serviced by the central spine road, which is designed to promote efficient circulation and minimise conflict and enables users travelling by private for vehicles to easily navigate the site and locate an available parking space.

In addition to the above access from the site is also provided via a one-way exit point on The Hermitage Way, which serves both car parks and drop-off areas. This connection provides efficient and safe site access to the northbound traffic lane on The Hermitage Way, and can then be used to travel to all surrounding destinations via the new The Hermitage Way/ Digitaria Drive roundabout.

Emergency access is provided via a separate one way vehicle access point on The Hermitage Way to the northern end of the site, and offers direct access to the emergency department for urgent care. This access point provides prioritises vehicle access for users with emergency needs and minimises conflict with other hospital users. The access arrangements are also designed to allow direct access to hospital parking facilities and other parking overflow areas via a planned internal road layout. Ambulances can also access the site via a proposed northern vehicle access point on Digitaria Drive, which is also separated to minimise conflict with other site and precinct users.

Service vehicle access is also provided via Digitaria Drive and clearly separated from both the ambulance and car park medical campus vehicle access points. The access serves a dedicated service yard, which is then separated into three separate functional areas with adequate service bays to service typical medical facility needs. Movement in the service yard is controlled through separate entry and exit points and this design helps to minimise both vehicle and pedestrian conflict and ensures that efficient and safe access to the site for service vehicles can be achieved.

Access to The Hermitage Way and Digitaria Drive from the external road network is provided via Gregory Hills Drive and Camden Valley Way. Gregory Hills Drive acts as a sub-arterial road and runs in a west-east direction serving Oran Park and other destinations along Camden Valley Way to the west and Gregory Hills Drive, the F5 and Campbelltown to the east. Camden Valley Way is a major arterial road and runs in a north-south direction providing access to Camden LGA, south west growth centre new release precincts, the South West Rail Link and the M7 Westlink Motorway and is accessed via new signalised intersections situated at Gregory Hills Drive or The Hermitage Way.

Access by walking and cycling will be provided via shared paths that exist on Gregory Hills Drive, and new planned off road routes on The Hermitage Way, Digitaria Drive and through South Creek parklands. These routes are planned to be high quality and offer good connectivity to the site and the wider network.

Pedestrian and cycling access within the concept is planned to minimise conflict with vehicle routes and is designed to provide convenient and direct access to the proposed medical campus facilities.

The concept includes both staff and public accessible and secure bicycle parking and end-of-trip facilities to encourage and promote active transport as a viable access option for short to medium distance trips. These proposed concept plan arrangements that support walking and cycling will be detailed as part of future staged planning proposals. These planning proposals are expected to include a future connection across South Creek to a proposed bulky goods and leisure precinct, which is currently dependent on confirming the precincts design and functional arrangements.

The proposed vehicular, walking and cycling access arrangements for the site are presented in Figure 3.2 and Figure 3.3.

3.4 Sustainable Access Plan (Proposed Development)

The design for the proposed development has considered access and sustainable travel outcomes, which is at the concept plan stage broken down into the following elements.

3.4.1 Mode Share

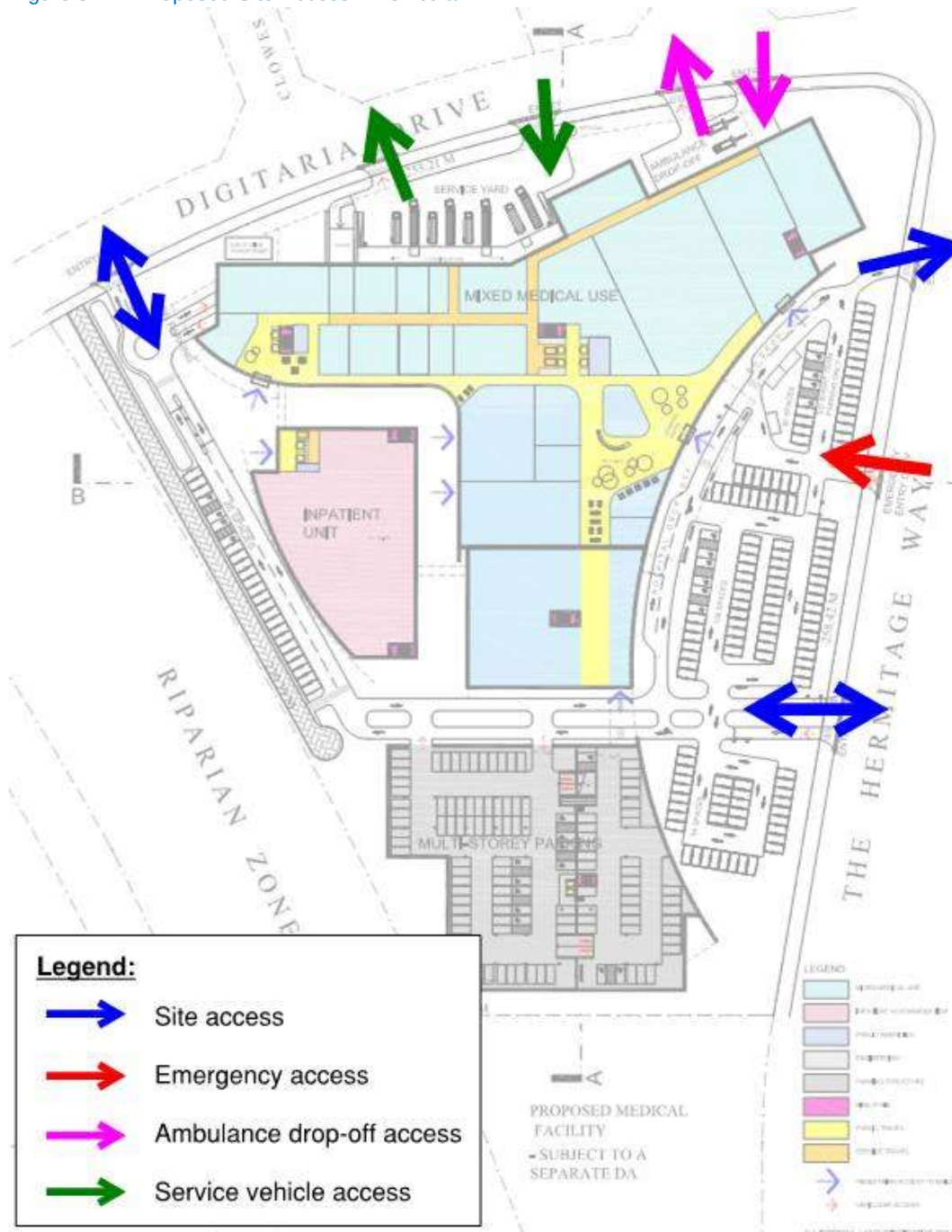
Mode share characteristics for the proposed development have been reviewed by studying mode share characteristics for other similar and more established activity areas in the south-west of Sydney. Campbelltown was used for comparison purposes due to the presence of a hospital and similar surrounding land uses. The Journey to Work data reviewed as part of the transport assessment indicates that for Campbelltown, the car is a popular mode of travel and similar to Camden is easily the highest person trip generator (refer to Appendix C for further detail regarding mode share). A key focus for managing traffic growth associated with this development will be to encourage people to travel to work by other (non-car) travel mode options. This will be facilitated by the proximity of land use, travel mode access options and their convenient, directness and reliability.

A key driver for medium and longer distance trips will be the penetration and access opportunities offered by services (do they connect key centres, residential lands and transport hubs), their frequency (are they deemed to be convenient and reliable), daily coverage (do they operate for the majority of the day seven days a week) and ease of access from the site. The details of bus routes that will service the site are detailed below, and should be complemented by a site based travel plan by the developer and a region-wide travel choices strategy implemented by Council and State Government Agencies to help reduce the current regional reliance on private vehicles for travel.

3.4.2 Cycling Provision and Opportunities

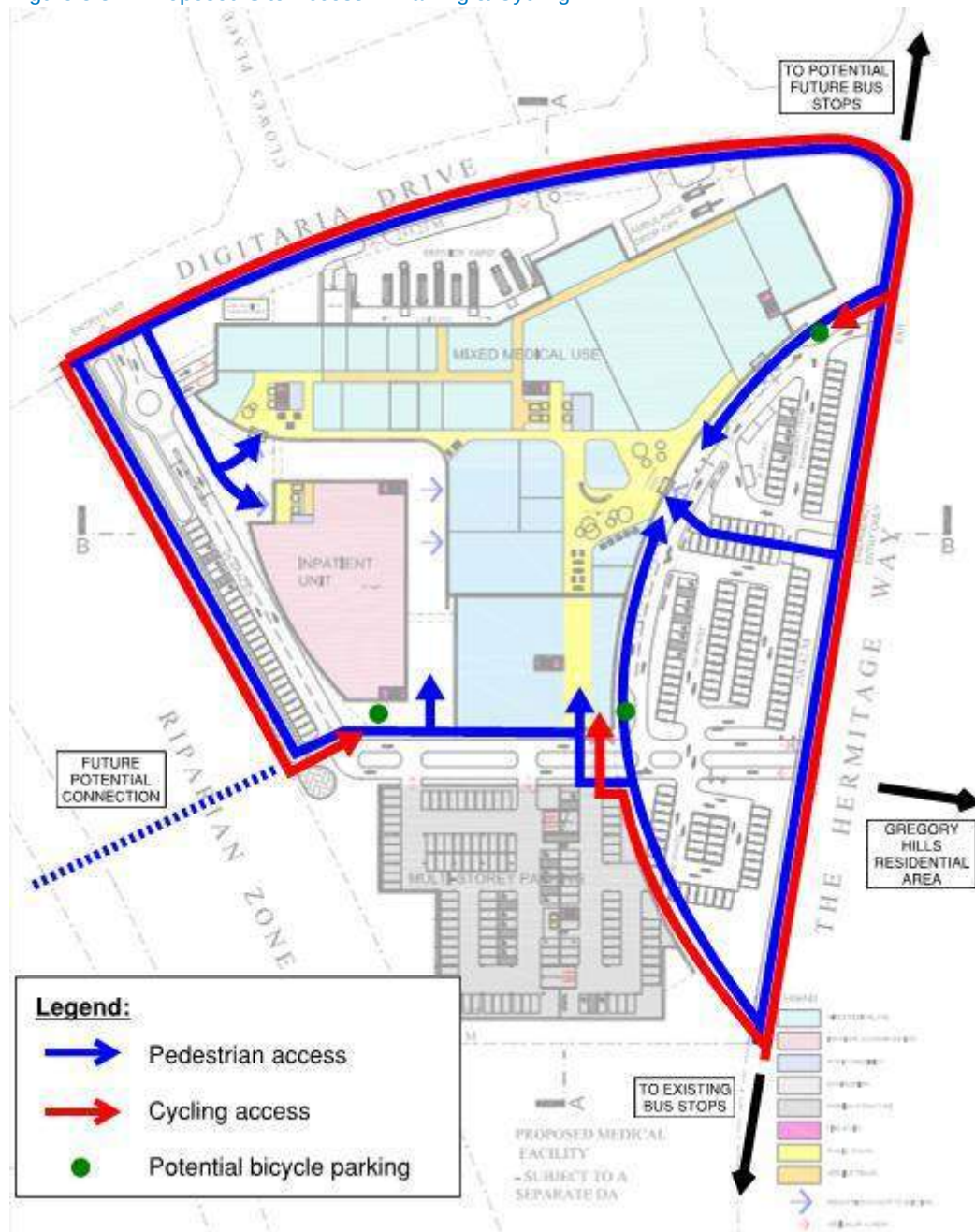
The proposed development supports the roll out of cycle path improvements identified within the DCP, which will help to promote access to the proposed Camden Medical Campus.

Figure 3.2: Proposed Site Access – Vehicular



Source: Ground level floor plan (Health Projects International, 08/06/2016)

Figure 3.3: Proposed Site Access – Walking & Cycling



Source: Ground level floor plan (Health Projects International, 08/06/2016)

The internal design of these facilities, which include cycle paths, road and traffic control treatments and parking facilities will be undertaken as part of detailed staged planning submissions. These submissions will consider the internal connectivity and its design, access arrangement and security concerns in the development of designs of high quality cycle facilities that align the design principles set in the Camden and Turner Road DCPs.

This focus on cycling provision will help to support higher usage of cycling for trips, positive changes to current region wide active transport mode share trends, and State Government mode share targets. Refer to Figure 3.4 for an understanding of the cycling provision within the Gregory Hills precinct.

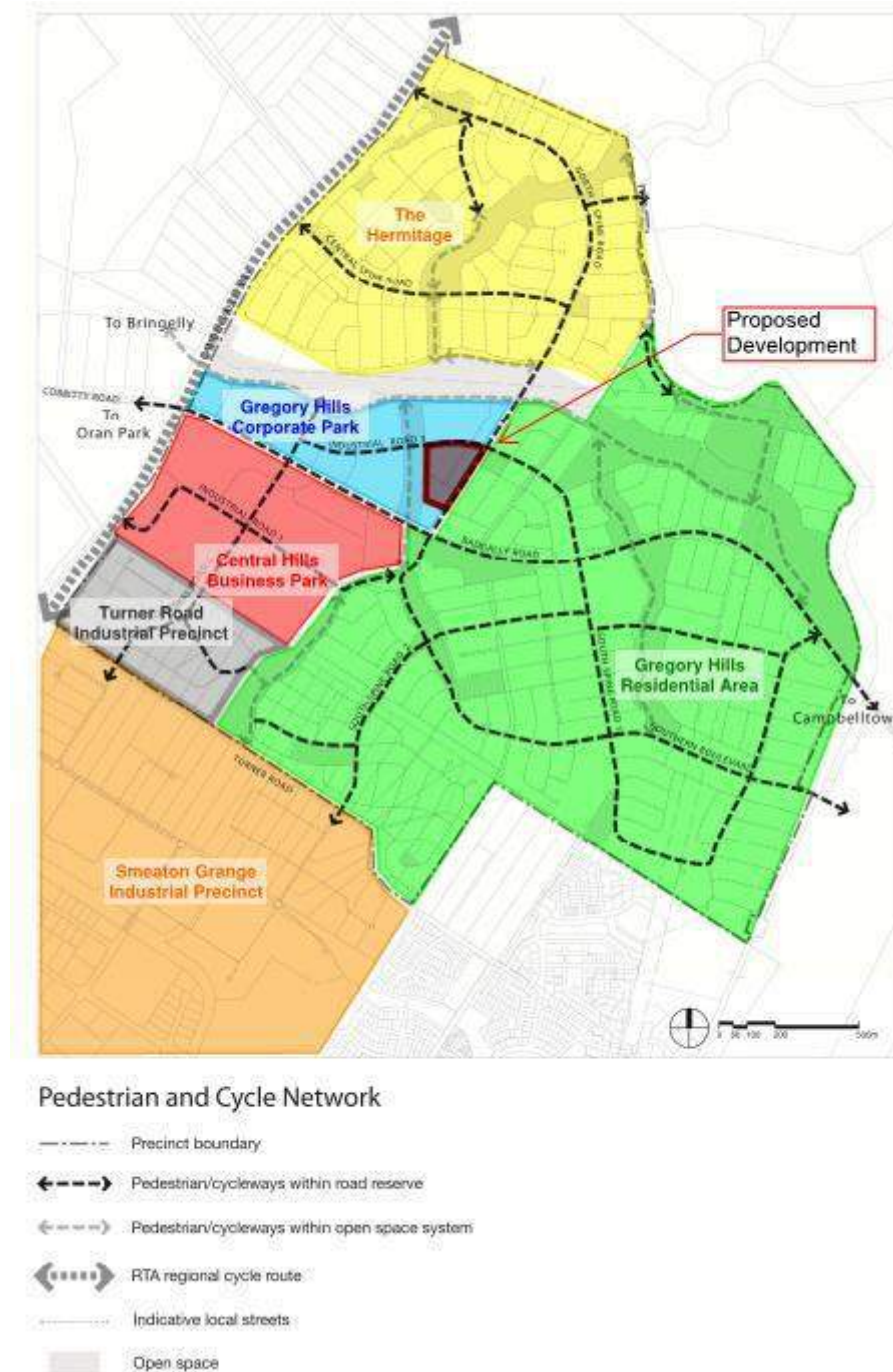
3.4.3 Walking Provision and Opportunities

The proposed development supports access by walking through the provision of an extensive footpath system. The provision of footpath and shared path infrastructure will help Gregory Hills become a convenient and desirable location for walk based trips, and is supported by the allocated of surrounding land use.

Walking is also a key component of access by public transport, which is planned to service stops in close proximity of the site. These buses nodes together with the planned Gregory Hills employment zone, local centre, schools and residential precincts are all within walking distance of the site, and support the targeted walking travel mode market of short to medium distance trips. The precinct also prioritises access by walking and cycling through more direct recreation paths through open space and wetlands and signalised intersections on Gregory Hill Drive and Camden Valley Way.

Access to and through the site is recognised to align with the streetscape concepts and routes identified in the Turner Road DCP, which are presented in Figure 3.4 and similar to cycling will help to support a positive change in the current region wide active transport mode share trend, and achieve State Government's mode share target.

Figure 3.4: Pedestrian and Bicycle Network



Source: Turner Road DCP (2007)

3.4.4 Public Transport Access

The site provides a highly desirable location for access via the current and proposed bus route service network. Current and future changes in infrastructure and services will promote access by public transport for both residents of Gregory Hills and surrounding planned and established areas, such as Campbelltown, Camden and MacArthur, and planned growth precincts at Oran Park, Catherine Fields and Leppington. The design considers the access needs of these user groups, the required facilities and initiatives that will help to support and promote awareness of the accessibility potential of the site.

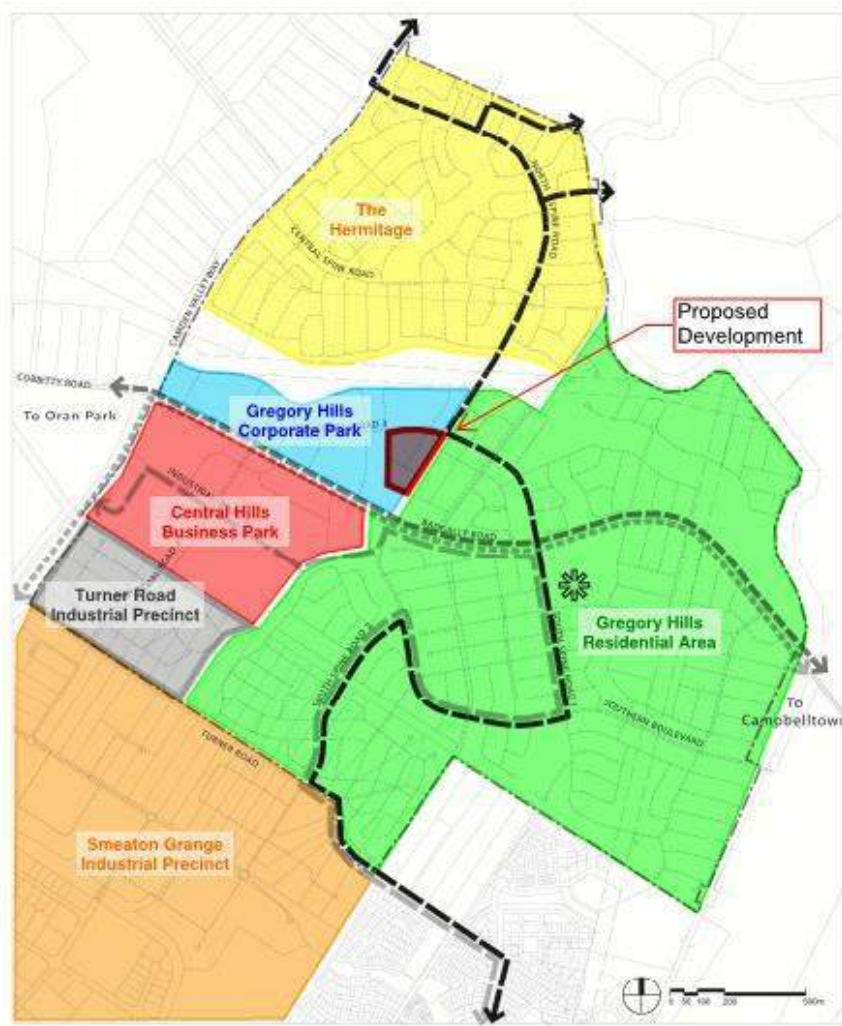
In this context the site is currently served by three separate bus route services, which consist of the following and are graphically presented in Appendix E:

1. Bus route 850 operates between Minto Station and Narellan, which offers a 30 minutes weekday peak period frequency and a hourly service frequency during weekday off-peak periods and weekends.
2. Bus route 857 operates between Liverpool and Narellan, which offers only a three bus service frequency during the weekday AM peak period, a two service frequency during the weekday PM peak period and three bus service frequency at weekends and public holidays.
3. Route 896 operates between Oran Park and Gregory Hills to Campbelltown, and offers a 30 minute bus service frequency during weekday peak periods and hourly service frequency during weekday off-peak periods and weekends.

The Turner Road Development Control Plan 2007 public transport network is shown in Figure 3.5 and indicates that access opportunities to the site by planned public transport services. The key to promoting public transport as a preferred mode of access is the introduction of bus services that are direct and connect with centres of activity and offer a desired service frequency level, which directly aligns with the development of the area and the delivery of the Gregory Hills Drive extension. Development of surrounding areas and local centres aligns with the need for additional services and remaining risk is access to the east, which should be resolved through the construction of the Gregory Hills Drive extension. The current planning and delivery program for this work indicates that this new road corridor will be open to traffic by late 2016/ early 2017 and is expected to align with the delivery of the majority of the network shown in Figure 3.5. Refer to Appendix J for further details.

The delivery of bus service, access and route improvements will help to support higher usage of public transport for medium to long distance trips, positive changes to current region wide active transport mode share trends, and State Government mode share targets.

Figure 3.5: Public Transport Network



Public Transport

- Precinct boundary
- Turner Road to Campbelltown (From Catherine Fields)
- Turner Road to Campbelltown (From Harrington Park)
- Turner Road to Campbelltown (From Narellan)
- Turner Road to Campbelltown (From Oran Park)
- Indicative local streets
- ✱ Neighbourhood Centre

Source: Turner Road DCP (2007)

3.4.5 Green Travel Plan

A green travel plan provides a travel demand management approach to the planning and operation of new developments, and through communication and planning aims to promote sustainable travel for residents and employees in this area of the Gregory Hills precinct. This plan will focus on improving the use of public transport (i.e. access by bus services) and active transport (i.e. walking and cycling) options, and in doing so, aims to minimise the need of road infrastructure and use of private vehicles for accessing the proposed development. The requirements of the green travel plan for the proposed development will be developed once acceptance of the planning concept is received and will form part of the detailed DA conditions for the project.

4 Car Parking Requirements

The car parking requirements identified in this report are based on the proposed land use identified in Section 3.3 and the peak staff, patient and visitor movements through the site. This section provides the approach and parking provision requirements estimated to support the proposed development.

4.1 Car Parking Requirements

Guidance for estimated parking requirements for private hospitals is stated within the following:

- Camden DCP, which states that parking requirements for hospitals will be assessed on merit taking into consideration the proposed uses and equivalent rates for similar uses as prescribed in the DCP.
- The RMS Guide to Traffic Generating Developments 2002 (RMS GTGD), which provides a peak parking accumulation approach using simple regression formulas to calculate parking requirements based on the number of beds and average staff per weekday day shift.

The above guides also indicate that consideration should be given to reducing the requirement if convenient and safe on-street parking is available.

4.1.1 Parking Provision - Approach

The parking requirements stated in the RMS GTGD is the typical accepted approach for calculating parking provision at hospitals and was adopted to estimate parking provision needs for the proposed development. The parking provision estimated using this formula was also compared through a sensitivity testing using estimated staff, patient and visitor peak activity/shift levels to understand its ability to accommodate expected maximum patronage levels under a full development scenario for the proposed development.

4.1.2 RMS Parking Rates

The RMS GTGD (2002) provides the following formula to estimate the parking demand for a private hospital based on a Peak Parking Accumulation (PPA) method, where B = the number of beds, and ASDS = average staff per weekday day shift:

- $PPA = -19.56 + 0.85 * B + 0.27 * ASDS$.

Application of the above formula to the proposed development provides the following results:

Table 4.1: Parking Requirements Based on RMS Rates

Beds	Average Staff levels per Weekday Day Shift	Parking Requirement
473	750	585

The above data was compared to expected hospital user type (staff, patients and visitors) demand levels to better understand parking provision, turnover and the traffic generation characteristics for this proposed development.

4.1.3 Sensitivity Testing – Review of On-Site Demand

A detailed sensitivity test was undertaken to determine the total number of parking spaces required to accommodate peak on-site demand. The sensitivity test was based on the hospital facilities, including number of beds, seats and rooms, and expected staffing, patient and visitor levels. This was deemed to provide a rigorous approach that could validate the RMS parking provision formula for private hospitals. This analysis adopted a number of key parking demand-generating factors that were provided by Health Projects International (HPI) and relate to the expected operation of hospital facilities and the associated staffing levels. This approach is considered to be more conservative than the formulas provided in the RMS GTGD.

Key assumptions adopted for the assessment of parking requirements included:

- Car mode share (assumed to be 90% for most aspects) is based on Journey to Work data for Campbelltown travel zones in proximity to the Campbelltown hospital.
- Vehicle occupancy is assumed to be 1.1 people per vehicle, based on BTS data for Camden – method of travel to work (2011).
- The hospital is assumed to be fully developed for the purposes of the parking requirements.
- The patients at any one time are limited by the number of beds and seats provided.
- Additional visitors relating to long-term patient stays comprise an additional 10% of patients
- Additional visitors relating to short-term patient stays comprise an additional 10% of patients
- For long-term stays, patients are accompanied by a visitor upon arrival, and the visitors represent the parking demand.
- Areas assumed not to generate parking include the store room and staff amenities.

The peak demand for parking was found to occur in the AM peak, and this was adopted for estimating the design capacity needs for this facility. The outcome of the sensitivity test resulted in a total parking requirement of 1,001 spaces.

The sensitivity test provides a parking requirement significantly greater than the requirement calculated using the RMS parking rates, and represents a conservative assessment for understanding the hospital operation needs (high mode share, areas 100% occupied, similar peaks and maximum staffing levels. The parking requirements calculated by the sensitivity test were therefore adopted for the purpose of this report to ensure that parking will be adequate for a worst-case scenario. It should be noted that the difference between the two calculations is $(1001 - 585 =) 416$ parking spaces, which represents approximately a 70% increase in parking provision from that required under the RMS rates.

Refer to Appendix F for further details relating to the parking assessment.

4.2 Car Parking Provision

On-site car parking is provided through the following facilities:

- A multi-level car park comprised of 7 levels with a total provision of 844 spaces;
- An at-grade car park adjacent to The Hermitage Way with a total provision of 135 spaces;

- An at-grade car park adjacent to Digitaria Drive with a total provision of 25 spaces; and
- A basement car park accessed via Digitaria Drive with a total provision of 76 spaces.

In total the proposed development provides 1,080 car parking spaces. As a result, this design is deemed to provide adequate parking provision to accommodate the estimated parking levels calculated by the sensitivity test.

Parking for the various user profiles are provided as follows:

- Visitor parking is provided in the multi-level car park and at-grade car parks accessed via The Hermitage Way and Digitaria Drive. A drop-off area is also provided adjacent to the main lobby, allowing vehicles to enter the site via The Hermitage Way and loop back after dropping off patients.
- Staff parking is provided in the basement car park with access to the hospital via lifts and stairs.
- An Emergency Department (ED) drop-off area is provided immediately outside the ED, with direct access off The Hermitage Way.
- Short-term parking for the ED is provided next to the ED drop-off area, allowing vehicles to park after dropping off patients in critical condition.

The provision of the above parking arrangements are outlined in Figure 4.1.

The car parks will be designed to comply with AS 2890.1 – Off-street car parking and AS 2890.6 – Off-street parking for people with disabilities and will be assessed as part of a future detailed development application. These assessments will include comprehensive reviews of parking layouts, vehicular and pedestrian circulation, parking aisle and access driveway design and other relevant design matters.

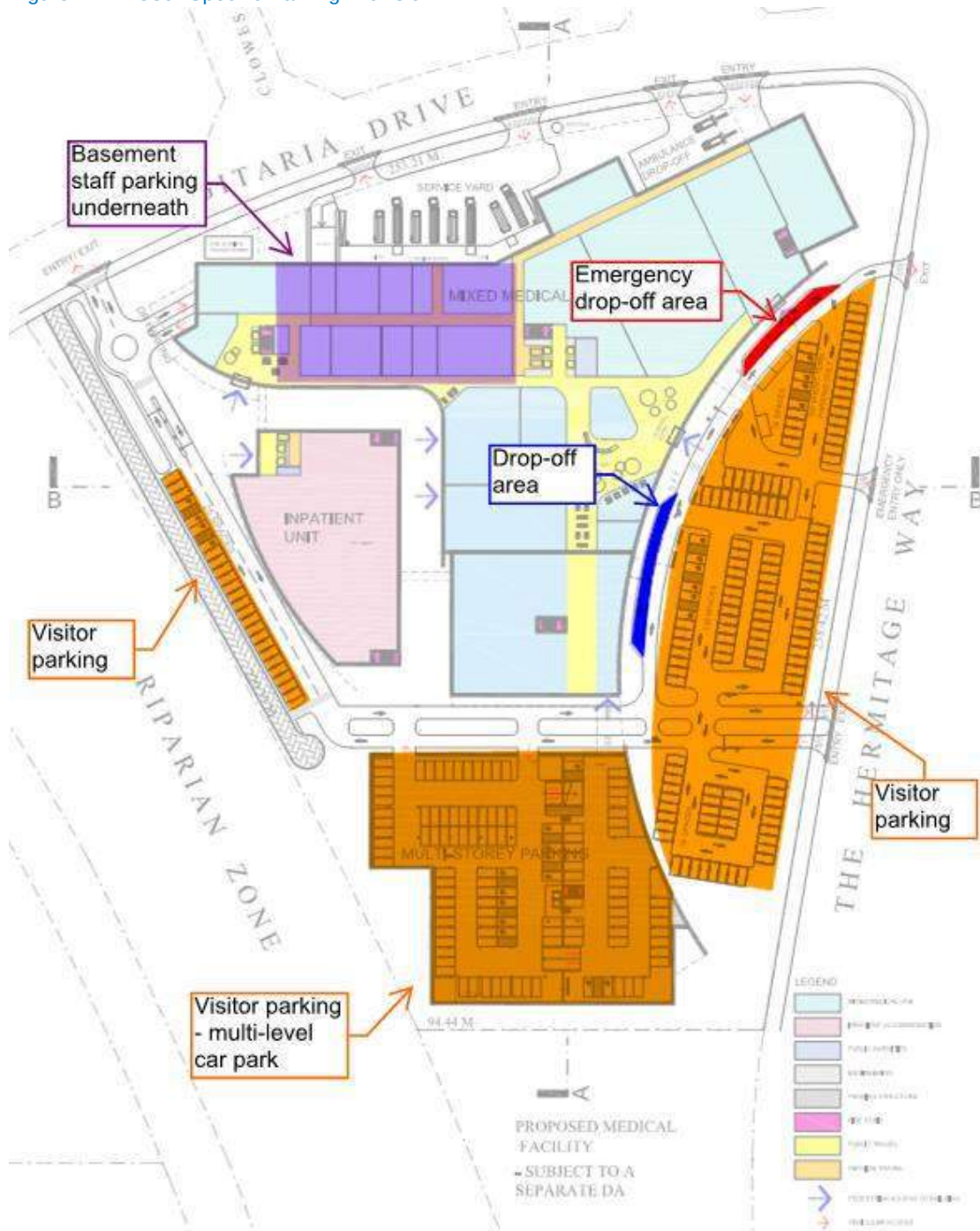
Access to all parking spaces except the spaces associated with emergency access are expected to be controlled by boom gates or a similar operating system, which is dependent on advancements in technology. A detailed review of queuing area requirements for the boom gates will be undertaken as part of a future detailed development application when the final design details are confirmed. In order to minimise this risk and ensure that adequate queuing can be provide in these locations, an initial high level spatial assessment was undertaken at the main vehicle access point on The Hermitage Way. The appraisal concluded that there is sufficient area is available to ensure that queuing can be managed.

The main vehicle access point was also initially tested at a conceptual level to understand if adequate provision was provided for vehicles turning into the site. Refer to turning path assessment outputs in Appendix I for further details, which demonstrate that the design allows for safe and efficient access. Comprehensive turning paths will be completed on a detailed car park design and used to support future proposals that support the staged development of the site.

4.3 On-Street Car Parking

On-street parking will be available on Digitaria Drive, and is restricted on The Hermitage Way and Gregory Hills Drive. Digitaria Drive contains a 12m wide carriageway, which allows for parking on both sides of the road. Based on parking provision it is recognised that the proposal can accommodate parking on-site and it is therefore concluded that on-street parking is not required to support the proposed development.

Figure 4.1: User-Specific Parking Provision



Source: Ground level floor plan (Health Projects International, 08/06/2016)

4.4 Bicycle Parking

Provision for bicycle parking will be included in the final development application and will help promote active and sustainable transport modes. This will specify the location and type of bicycle parking as well as end-of-trip facilities for users. Spatial provision has been accounted for in this concept DA to allow bicycle parking and associated facilities to be installed, which will be easily accessed via the proposed bicycle network as presented in Figure 3.4.

4.5 Service Vehicles

Loading bays for service vehicles are provided to the north of the site with access off Digitaria Drive (refer to Figure 3.2). These facilities are dedicated to service vehicles and separated from the car parks and key pedestrian movements to avoid conflict. A total of 9 bays are provided, which provides an ample amount compared to similar developments and ensures capacity is available.

Turning paths for the loading bays were assessed and are presented in Appendix I. The design service vehicles used were an 8.8m Medium Rigid Vehicle (MRV) and a 12.5m Single Unit Truck (SUT). The turning paths demonstrate that these vehicles are able to manoeuvre safely and efficiently into the loading bays.

Likely arrival and departure times for service vehicles are expected to be before the AM peak (i.e. prior to 7am), after the PM peak (i.e. after 6pm) or early afternoon to help minimise the impact on the surrounding road network. This will be managed by the operators of the proposed development to ensure efficient service vehicle movements and the mitigation of traffic impacts.

5 Traffic Impact

This section of the report provides an understanding of the model scenarios, performance measures and quantifies the impact from the inclusion of the proposed development on the surrounding road network.

5.1 Traffic Modelling Performance Measures

SIDRA Intersection 6.1 is a micro-analytical traffic modelling software tool that has been used to appraise the future conditions on the road network.

The 'Level of Service' (LoS) is the standard measure used to understand the operational performance of the network and intersections. This is defined as the qualitative assessment of the quantitative effect of factors such as speed, traffic volume, geometric features, delays and freedom of movement.

The level of service (LoS) concept is applied to intersections through measures of effectiveness, as summarised in Table 5.1.

Table 5.1: Measures of effectiveness for LoS definition for intersections

Intersection Control	Measure of Effectiveness
Priority controlled	Degree of Saturation
	Delay to critical movements (sec/vehicle)
	Queue length for critical movements
Traffic Signals	Average Delay (sec/vehicle)
	Delay to critical movements
	Degree of Saturation
	Cycle Length
	Queue length for critical movements
Roundabout	Average Delay (sec/vehicle)
	Delay to critical movements
	Degree of Saturation
	Queue length for critical movements

Source: RTA Guide to Traffic Generating Developments (2002)

The assessment of intersection operation is based on criteria outlined in Table 5.2, as defined by the NSW Roads and Maritime Services in the 'Guide to Traffic Generating Developments' (RMS 2002), and will be used to evaluate network conditions.

Table 5.2: Level of Service criteria for intersections (RTA NSW)

Level of Service	Average Delay per Vehicle (sec/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	< 14	Good operation	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 will cause excessive delays Roundabouts require other control modes	At capacity, requires other control mode
F	> 70	Over capacity, unstable operation	Over capacity, unstable operation

Source: RTA Guide to Traffic Generating Developments (2002)

Note:

1. The average delay assessed for signalised intersections is over all movements.
2. For roundabouts and priority control intersections (with Stop and Give Way signs or operating under the T-junction rule), the critical criterion for assessment is the movement with the highest average delay.
3. Average delay is expressed in seconds per vehicle.

5.2 Modelling Scenarios

The following scenarios have been modelled in SIDRA, with all scenarios assuming the construction of The Hermitage Way and the extension of Gregory Hills Drive towards Campbelltown to the east:

- **Approval** – the results presented in the Cardno Badgally Road Extension Report (2009), which includes full development of the Turner Road Precinct. These are presented for comparison purposes and are used as a benchmark.
- **Scenario 1 – 2026 Without Development (Turner Road Precinct Background Traffic Only – No GHCP Development)** – includes background traffic generated by the Turner Road Precinct only, without considering traffic generated by the Gregory Hills Corporate Park precinct. Refer to Section 5.5 for details on how background traffic was calculated.
- **Scenario 2 – 2026 Without Development (Full Development of Turner Road and GHCP Precincts Less Proposed Development)** – includes background traffic generated from the entire Turner Road Precinct, inclusive of the GHCP Precinct but without considering the traffic generated by the proposed development. Changes to proposed developments in the GHCP Precinct since the previous approval

are also considered. The included traffic generating developments within the GHCP Precinct are composed of the following (refer to Figure 1.2 for the location of each development):

- The proposed bulky goods centre.
 - The proposed bulky goods and leisure precinct.
 - The proposed health hub.
 - The proposed private hospital to the south (refer to section 5.5).
 - Planned business park areas in the remainder of the GHCP precinct, including:
 - Lot 801;
 - Lots 802 – 805;
 - Lots 824 – 830; and
 - Lots 835 – 840.
- **Scenario 3 – 2026 With Proposed Development Changes in the Gregory Hills Corporate Park – RMS Trip Generation** – includes all background traffic included in Scenario 2 plus traffic generated from the proposed development using RMS trip rates (refer to section 5.6.1 for further details).
- **Scenario 4 – 2026 With Proposed Development Changes in the Gregory Hills Corporate Park – Sensitivity Test** – includes all background traffic included in Scenario 2 plus traffic generated from the proposed development using data relating to expected operational characteristics of the proposed development (refer to section 5.6.2 for further details). This was undertaken to determine a worst-case scenario appraisal considering maximum utilisation and conservative estimates.

5.3 Agency Consultation

5.3.1 Consultation with RMS

Consultation was undertaken with RMS (on 15th April 2016) to discuss the traffic modelling approach and confirm the intersections to be modelled. Discussion indicated that data associated with the Camden Valley Way/Rodeo Road intersection does not currently exist and wasn't included in the previous assessment that supported the approval of the Gregory Hills Corporate Park precinct. On this basis, it was agreed that an assumption would be made to direct 100% of the traffic from the proposed hospital travelling to/from the south to the Gregory Hills Drive/Camden Valley Way intersection.

It is noted that this results in a conservative assessment of network conditions, since this increases traffic levels at the critical intersection and some traffic in reality would use Rodeo Road to access the precinct.

5.3.2 Consultation with TfNSW

Consultation was undertaken with Transport for New South Wales (TfNSW) to discuss the SEARs raised for the proposed development. TfNSW indicated that a concern was the completion date for the Gregory Hills Drive extension to Campbelltown. It was confirmed that the construction of this link would be completed by March 2017 as per the VPA entered into by Dart West, and TfNSW had no additional concerns.

5.4 Modelled Network

The following intersections for the AM and PM peak hours have been modelled in SIDRA, the first three being instructed by RMS and the last two being voluntarily provided:

- Camden Valley Way / Gregory Hills Drive / Oran Park Drive.
- Gregory Hills Drive / Holborn Circuit / Central Hills Drive.
- Gregory Hills Drive / The Hermitage Way / Donovan Boulevard.
- Gregory Hills Drive / South Spine Road.
- The Hermitage Way / Digitaria Drive / South Spine Road.
- The Hermitage Way access point.
- Digitaria Drive access point.

Each intersection has been modelled as an isolated intersection only in SIDRA. The modelled scenarios have been directly compared to the SIDRA results from the Mott MacDonald GHCP Stages 3 to 6 DA TIA for the Gregory Hills Drive / Holborn Circuit / Central Hills Drive and Gregory Hills Drive / The Hermitage Way / Donovan Boulevard intersections.

The SIDRA results for the Camden Valley Way / Gregory Hills Drive / Oran Park Drive and Gregory Hills Drive / South Spine Road intersections have been compared to the results from the Cardno Report (2009) for the initial approval.

No comparison is available for the Hermitage Way / Digitaria Drive / South Spine Road intersection, so these SIDRA results are assessed on the basis of achieving LOS C for a new intersection.

Access points for the hospital have been assessed to confirm efficient traffic flows to and from the hospital, achieving a minimum LOS C.

5.5 Background Traffic Volumes

5.5.1 2026 Background Traffic Volumes

The projected 2026 AM and PM peak traffic volumes in the 2009 Cardno Badgally Road Extension Report were used as the background traffic for the SIDRA analysis of the relevant intersections. This was considered to effectively represent the likely traffic on the surrounding road network after the complete development of the Turner Road Precinct. Adopting these volumes as the background traffic (excluding the anticipated traffic generation from the proposed development) incorporates the traffic from nearby developments.

Background traffic volumes from the Cardno Report were calculated by subtracting traffic volumes for developments within the GHCP. This approach is consistent with recent development applications submitted and approved by Camden Council. Due to limitations in the data available, assumptions were made for background volumes at the Gregory Hills Drive/South Spine Road intersection to make turning

ratios consistent with the approved 2026 modelling assumptions and outcomes. Refer to Appendix H for further details on background traffic volumes.

5.5.2 Proposed Private Hospital, Lots 832 – 833 (GHCP Stage 2)

The projected 2026 AM and PM traffic volumes for the proposed private hospital to the south (specialist children's hospital) have been extracted from the McLaren Traffic Engineering Supplementary Traffic Advice of Private Hospital At Hermitage Way, Gregory Hills (dated 6 April 2016). These volumes were provided for the intersections along The Hermitage Way. Volumes for other intersections were calculated using principles of flow conservation and distribution assumptions consistent with the Mott MacDonald GHCP Stages 3 to 6 DA TIA.

The private hospital is separated into two components – a hospital, and a medical centre composed of consulting rooms. It is noted that the McLaren report assumed a 50/50 split of vehicle trips in/out in both peaks for both components. This was considered slightly unrealistic in relation to typical movements during the AM and PM peak hours for the hospital component, and was therefore adjusted to the percentage splits presented in Table 5.3.

Table 5.3: Adjusted In/Out Proportions for the Private Hospital

Peak Period	In (%)	Out (%)
AM Peak Hour Trips	70	30
PM Peak Hour Trips	20	80

This is deemed to provide a more rigorous and conservative assessment for the traffic generation of the private hospital.

It is noted that the traffic generation for the private hospital in the McLaren report appeared conservative and may result in an overestimate of the number of trips generated by this development, which is acknowledged in subsequent correspondence with Council. The outcome of these discussions is understood to conclude that the PM peak traffic generation from this site is unlikely to coincide with the commuter peak period.

5.6 Trip Rates and Traffic Generation

The RMS Guide to Traffic Generating Developments 2002 (RMS GTGD) provides simple regression formulas to calculate traffic generation for private hospitals based on the number of beds and average staff per weekday day shift. A sensitivity test was also undertaken using a more detailed approach similar to the parking assessment, which was based on vehicle trips expected to be generated from staff, patient and visitor levels. This was assessed to determine the worst-case scenario for traffic impact and is deemed to provide a rigorous, conservative approach based on the key generators of traffic. The results were then compared to those resulting from the RMS GTGD formulas to further understand the results.

5.6.1 RMS Traffic Generation Rates

The RMS GTGD 2002 provides the following formulae to calculate the total traffic generation for a private hospital during the AM and PM peak hours, where B = the number of beds provided, and ASDS = average staff per weekday day shift:

- AM peak hour trips = $-10.21 + 0.47 * B + 0.06 * ASDS$.
- PM peak hour trips = $-2.84 + 0.25 * B + 0.40 * ASDS$.

The proportion of trips travelling in and out was assumed to be equal to the proportions obtained from the sensitivity test (refer to section 5.6.2), which were 75% in, 25% out in the AM peak and 20% in, 80% out in the PM peak. Application of the above formulas and assumptions to the proposed development provides the following results:

Table 5.4: Traffic Generation (Vehicles) Based on RMS Trip Rates

Beds	Avg. Staff per Weekday Day Shift	AM Trips In	AM Trips Out	PM Trips In	PM Trips Out
473	750	194	65	83	333

5.6.2 Sensitivity Test Traffic Generation Rates

This section provides the results of the traffic generation calculations based on a sensitivity test using expected operational characteristics of the proposed hospital. The key assumptions used in this analysis are consistent with the parking assessment (refer to section 4).

The outcomes of the traffic generation for the sensitivity test are presented in Table 5.5.

Table 5.5: Traffic Generation (Vehicles) Based on Sensitivity Test

	Trips In	Trips Out
AM Peak	558	174
PM Peak	85	374

Source: Data provided by Health Projects International (2016)

These figures are significantly greater than the numbers previously calculated using the RMS traffic generation formulae, and indicate that this assessment provides a conservative approach. The traffic generation calculated for the sensitivity test was considered to represent a worst-case scenario for the proposed development.

Refer to Appendix G for further details of the trip generation calculations. More detailed calculations can be provided upon request.

5.6.3 Traffic Generation for Other GHCP Developments

Traffic generation for the other proposed and planned developments in the GHCP precinct were calculated using relevant trip rates contained in the RMS GTGD (2002) and rates consistent with the Badgally Road Extension Report (Cardno, 2009). Specifically, traffic generation for each development was based on the following:

- **Bulky goods centre** – based on RMS trips rates for bulky goods land uses;
- **Bulky goods and leisure precinct** – based on RMS trip rates for bulky goods land uses and expected tenants for entertainment uses;
- **Health hub** – based on patient trips associated with consulting rooms and RMS trip rates for bulky goods, retail, commercial and healthcare land uses;
- **Private hospital** – based on data provided in the associated Traffic and Parking Impact Assessment and supplementary traffic advice (McLaren, 2016);
- **Planned business park lots** – based on trips rates for business parks presented in the RMS GTGD and consistent with the Badgally Road Extension Report (Cardno, 2009).

5.7 Daily Traffic Generation

Daily traffic generation for the proposed development was calculated based on expected daily patient and visitor turnover and staff shift changeover periods provided by Health Projects International. This approach adopted the traffic generation data used for the sensitivity test, and resulted in a total of 5,651 daily vehicle trips expected to be generated by the proposed development. Refer to Appendix G for further details relating to the daily traffic generation of the proposed development.

5.8 Multi-Modal Trip Generation

Trip generation for various modes was calculated based on BTS Journey To Work (2011) mode share data for similar areas in Campbelltown (refer to Appendix C for further details). This was undertaken to understand the impact of the proposed development on a range of modes and compare trips generated. A summary and comparison is presented in Table 5.6 based on data used for the sensitivity test of traffic generation.

Table 5.6: Multi-Modal Trip Generation

Mode Characteristics		Trip Generation		
Mode	Share	AM Peak	PM Peak	Daily
Car	90%	732	459	3944
Bus	7%	58	36	310
Cycling	1%	8	5	44
Walking	2%	16	10	89
Total	100%	814	511	4387
Sensitivity test – double walking and cycling mode share				
Car	80%	650	407	3501
Bus	14%	115	72	620
Cycling	2%	16	10	89
Walking	4%	33	21	177
Total	100%	814	511	4387

Source: Journey To Work Mode Share (BTS, 2011)

Note:

"Other mode" assumed to be cycling.

"Mode not stated" was distributed among other modes in proportion to their mode share.

"Train" mode share was assumed to use buses, which are expected to be available from Campbelltown train station.

Table 5.6 indicates that vehicles comprise the vast majority of trips, and the walking, cycling and bus trips generated are small. A sensitivity test was also undertaken with double the bus, walking and cycling mode shares, which indicated that the planned public transport, walking and cycling network will still easily have adequate capacity to offer a high level of service for active transport movements. The impact on bus, walking and cycling movements is therefore deemed to be negligible given the high quality pedestrian and cycling network proposed. There is also expected to be no significant impact on public transport, as current observations indicate spare capacity on bus services which are expected to increase in frequency and route provision in the future as part of strategic initiatives.

5.9 Traffic Distribution

The Mott MacDonald GHCP Stages 3 to 6 DA TIA adopted distribution percentages listed in the Cardno Report - 70% of traffic generated by the developments would utilise Badgally Road (Gregory Hills Drive) to the east, with 30% utilising Camden Valley Way.

However, a sensitivity check has been undertaken by Mott MacDonald based on a review of Bureau of Transport Statistics (BTS) Journey to Work (JTW) data.

Place of work data has been obtained from Travel Zone (TZ) 3215 and 3221 within Campbelltown which incorporates various Bulky Goods sites and the Campbelltown Hospital.

The base data obtained for TZ 3215 and 3221 is shown in Appendix C.

To derive a future traffic distribution profile for the GHCP, the base data has been applied to Camden and adjusted considering the following factors:

- A high percentage of trips accessing the GHCP would originate from Campbelltown.
- The data identifies that a high percentage (52%) of trips originate from Campbelltown. Of this 25% is assumed as trip containment within the GHCP (originating from adjacent residential areas) and the remaining 34% accesses the external road network via north, west or south.
- The overall distribution for vehicles originating from south of the GCHP has been reduced by 5% with north increased by 2% and west increased by 3%. This factors the location of future Greater Sydney growth areas.

The adjusted data is provided within Table 5.7 and Table 5.8 and has been adopted for this analysis.

Table 5.7: Adjusted Place of Work Distribution for Camden (Workers Commuting to the Selected Employment Area)

Origin	Total No. of Trips	Veh Driver Mode Share	Total No. of Veh Trips	Vehicle distribution factoring mode of travel	Direction of Travel Assumptions	Split
Camden	4976	90%	4479	34%	North	35%
					West	35%
					South	30%
Campbelltown	1605	75%	1204	16%	East	100%
Wollondilly	852	87%	742	10%	South	50%
					East	50%
Liverpool	321	87%	280	4%	North	50%
					East	50%
Bringelly - Green Valley	261	91%	238	3%	North	50%
					West	50%
Wollongong	248	94%	234	3%	East	100%
Southern Highlands	166	94%	157	2%	East	100%
Fairfield	165	88%	146	2%	East	100%
Bankstown	114	69%	79	1%	East	100%
Penrith	87	91%	80	1%	West	50%
					East	50%
Total	8795		7639	75%		

Table 5.8: Summary of Table 5.8 Above

Directional Split	Directional Split Percentage	Adjustment Factors	Adjusted Directional Split Percentage
North	15%	2%	17%
East	31%	0%	31%
South	15%	-5%	10%
West	14%	3%	17%

It is noted that workers are assumed to return via the same route as the originated from.

Distribution of trips within the precinct was determined based on the location of access points and attributes of each potential route, including expected delay, travel distance, convenience, etc. Refer to Appendix H for further details of the traffic distribution for the network, including detailed routes and assumptions.

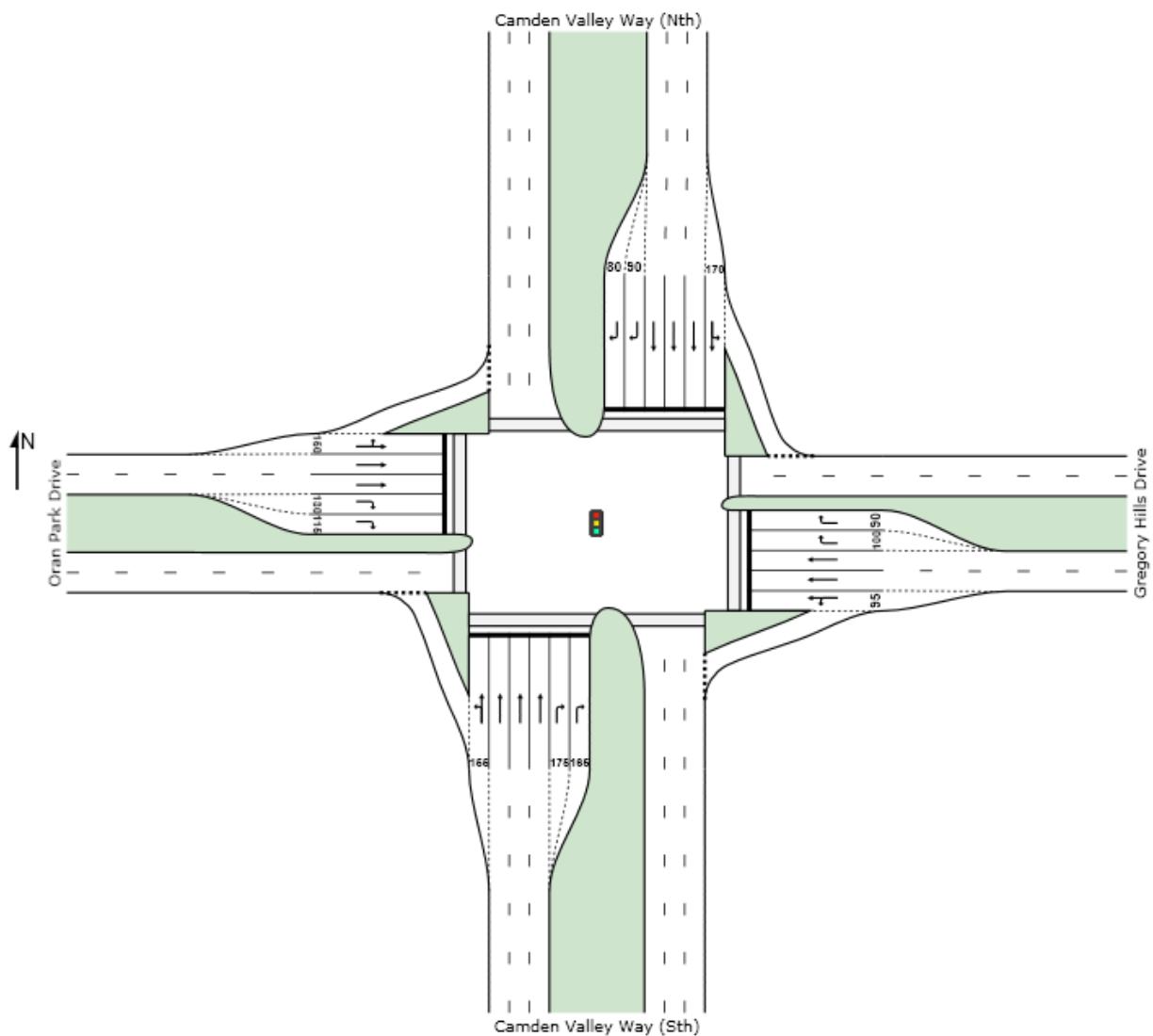
5.10 Intersection Operation

The key performance measures extracted from the models to understand operating conditions are level of service (LoS), degree of saturation (DoS), average delay in seconds and 95% back of queue distance.

5.10.1 Camden Valley Way / Gregory Hills Drive / Oran Park Drive

The existing arrangement of this intersection consists of two through lanes in each direction along Camden Valley Way. An additional through lane has been included in the SIDRA models to reflect a future concept expected to be completed by the time the proposed development is constructed, which is consistent with the modelling undertaken in the Cardno report for the precinct approval. The layout of the Camden Valley Way/Gregory Hills Drive/Oran Park Drive intersection is presented in Figure 5.1.

Figure 5.1: Camden Valley Way / Gregory Hills Drive / Oran Park Drive Intersection – SIDRA Layout



The results of the intersection modelling are presented in Table 5.9.

Table 5.9: Camden Valley Way / Gregory Hills Drive / Oran Park Drive Intersection – SIDRA Results

AM Peak				PM Peak			
Degree of Saturation (DoS)	Level of Service (LoS)	Average Delay(s)	95% Back of Queue (m)	Degree of Saturation (DoS)	Level of Service (LoS)	Average Delay(s)	95% Back of Queue (m)
Approval – 2026 Cardno Modelling Report (Full development of Turner Road Precinct)							
0.805	C	30.2	177	0.996	D	44.4	241
Scenario 1 – 2026 Without Development (Turner Road Precinct Background Traffic Only – No GHCP Development)							
0.815	B	27.7	184	0.949	D	42.6	251
Scenario 2 – 2026 Without Development (Full Development of Turner Road and GHCP Precinct Less Proposed Development)							
0.858	C	30.4	198	1.061	D	50.6	285
Scenario 3 – 2026 With Proposed Development Changes in Gregory Hills Corporate Park – RMS Trip Generation							
0.858	C	30.7	198	1.085	D	51.0	285
Scenario 4 – 2026 With Proposed Development Changes in Gregory Hills Corporate Park – Sensitivity Test							
0.926	C	31.8	198	1.085	D	50.6	285

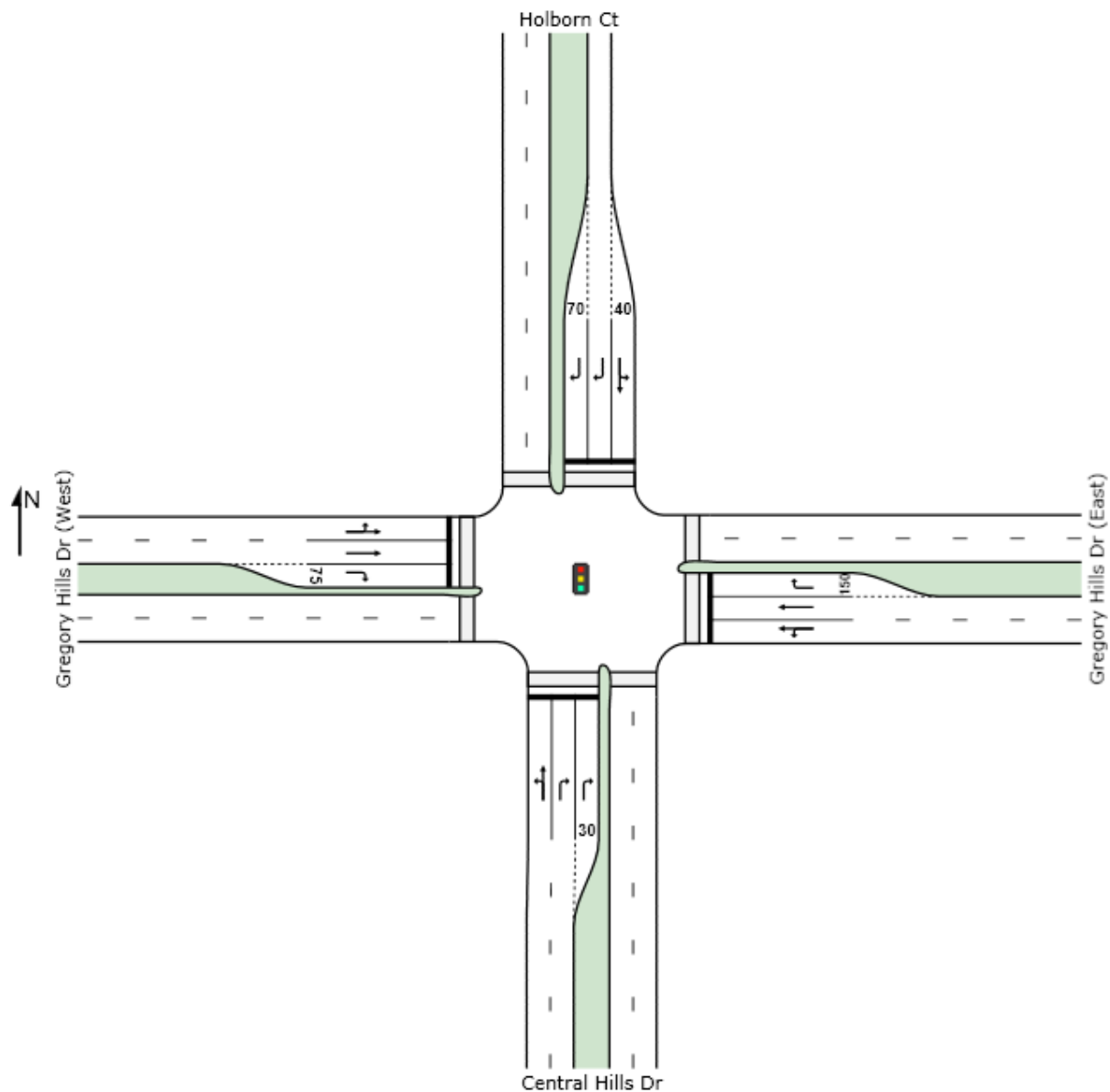
The assessment indicates the following:

- It is noted that the Cardno report did not allocate enough green time for pedestrian crossing movements across Camden Valley Way. The required minimum green time based on a pedestrian crossing speed of 1.2m/s (consistent with RMS modelling guidelines) is 32 seconds which is only accounted for in the modelling for Scenarios 1 – 4 in this report. The Cardno report allowed a minimum green time of 26 seconds, which allowed for greater flexibility and improved intersection performance.
- Scenario 2 indicates decreased performance to the precinct approval due to traffic generated by the GHCP precinct, particularly in the PM peak. However the intersection continues to operate at similar performance levels to that presented under the precinct approval.
- Scenario 3 indicates that under RMS trip generation rates, the proposed development contributes very little to the intersection performance, with only very minor differences observed in the PM peak.
- Scenario 4 indicates that under a sensitivity test the intersection operates performance decreases slightly but still operates at a similar level of performance to that presented under the precinct approval.
- No queuing issues were observed in the AM peak under Scenarios 3 and 4. Some queue spillbacks were observed in the PM peak at the left and right turn bays of Gregory Hills Drive, however similar issues were observed under Scenarios 1, 2 and the precinct approval and highlights that this condition isn't directly associated with traffic generated by the proposed development.
- Refer to Appendix D for further details of the performance of this intersection and a comparison between scenarios for the PM peak.

5.10.2 Gregory Hills Drive / Holborn Circuit / Central Hills Drive

The configuration of the Gregory Hills Drive/Holborn Circuit/Central Hills Drive intersection is based on the existing arrangement. The layout of the intersection is presented in Figure 5.2.

Figure 5.2: Gregory Hills Drive / Holborn Circuit / Central Hills Drive Intersection – SIDRA Layout



The results of the intersection modelling are presented in Table 5.10.

Table 5.10: Gregory Hills Drive / Holborn Circuit / Central Hills Drive Intersection – SIDRA Results

AM Peak				PM Peak			
Degree of Saturation (DoS)	Level of Service (LoS)	Average Delay(s)	95% Back of Queue (m)	Degree of Saturation (DoS)	Level of Service (LoS)	Average Delay(s)	95% Back of Queue (m)
Approval – 2026 Cardno Modelling Report (Full development of Turner Road Precinct)							
0.733	C	35.5	140	0.928	E	59.4	312
Scenario 1 – 2026 Without Development (Turner Road Precinct Background Traffic Only – No GHCP Development)							
0.546	B	17.4	73	0.788	B	25.9	151
Scenario 2 – 2026 Without Development (Full Development of Turner Road and GHCP Precinct Less Proposed Development)							
0.569	B	19.7	98	0.801	B	28.4	175
Scenario 3 – 2026 With Proposed Development Changes in Gregory Hills Corporate Park – RMS Trip Generation							
0.608	B	19.9	109	0.801	C	29.0	184
Scenario 4 – 2026 With Proposed Development Changes in Gregory Hills Corporate Park – Sensitivity Test							
0.714	B	20.3	144	0.801	C	29.1	184

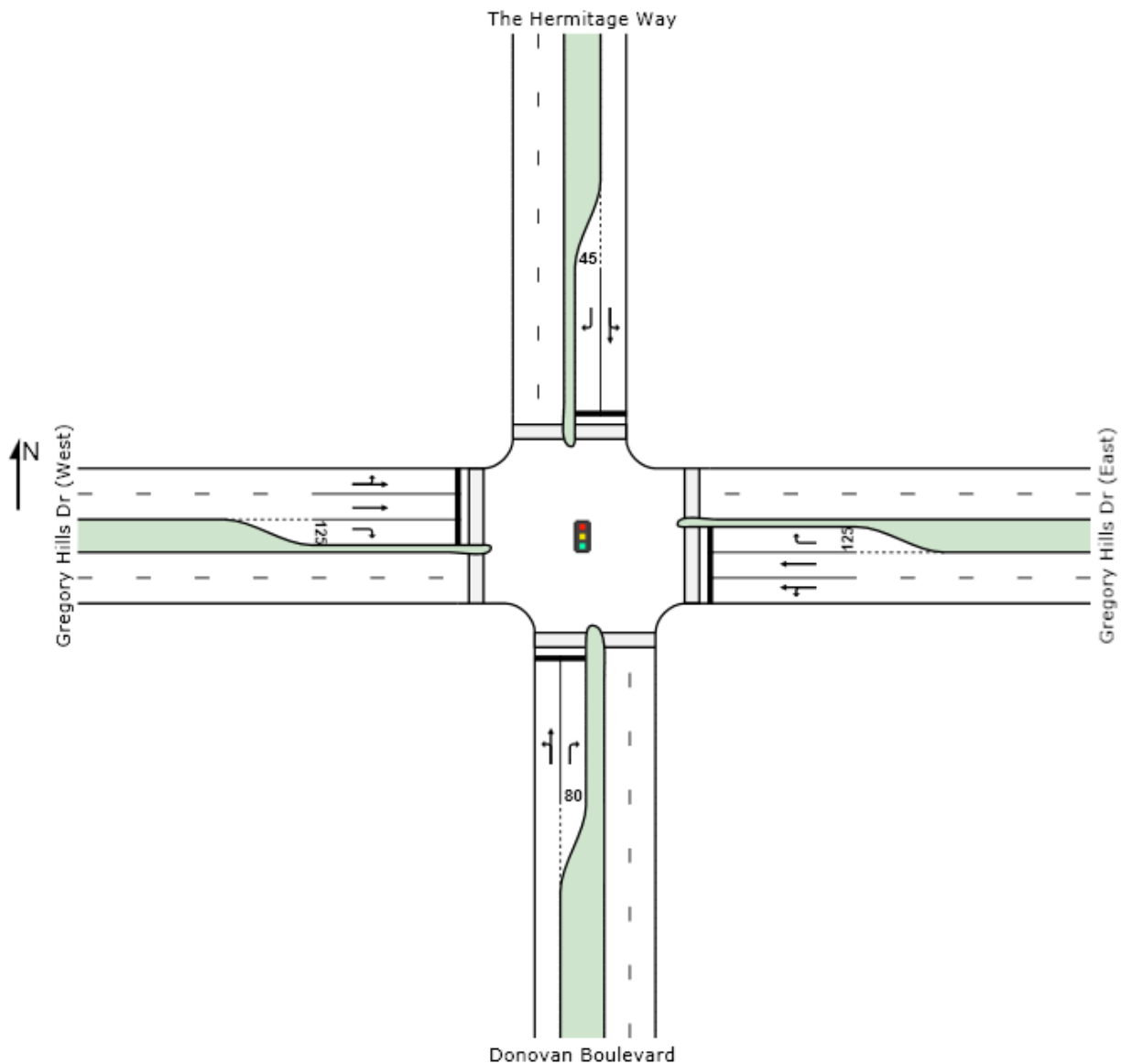
The assessment indicates the following:

- The intersection operates satisfactorily under all scenarios.
- No significant queuing associated with the proposed development was recorded.

5.10.3 Gregory Hills Drive / The Hermitage Way / Donovan Boulevard

The configuration of the Gregory Hills Drive/The Hermitage Way/Donovan Boulevard intersection is based on the existing arrangement. The layout of the intersection is presented in Figure 5.3.

Figure 5.3: Gregory Hills Drive / The Hermitage Way / Donovan Boulevard – SIDRA Layout



The results of the intersection modelling are presented in Table 5.11.

Table 5.11: Gregory Hills Drive / The Hermitage Way / Donovan Boulevard Intersection – SIDRA Results

AM Peak				PM Peak			
Degree of Saturation (DoS)	Level of Service (LoS)	Average Delay(s)	95% Back of Queue (m)	Degree of Saturation (DoS)	Level of Service (LoS)	Average Delay(s)	95% Back of Queue (m)
Approval – 2026 Cardno Modelling Report (Full development of Turner Road Precinct)							
0.684	C	30.5	174	0.683	B	21.2	167
Scenario 1 – 2026 Without Development (Turner Road Precinct Background Traffic Only – No GHCP Development)							
0.756	B	22.6	113	0.715	B	16.1	123
Scenario 2 – 2026 Without Development (Full Development of Turner Road and GHCP Precinct Less Proposed Development)							
0.838	B	25.2	138	0.866	B	20.8	135
Scenario 3 – 2026 With Proposed Development Changes in Gregory Hills Corporate Park – RMS Trip Generation							
0.901	B	27.5	154	0.925	B	23.5	135
Scenario 4 – 2026 With Proposed Development Changes in Gregory Hills Corporate Park – Sensitivity Test							
1.035	C	34.9	193	0.944	B	24.1	135

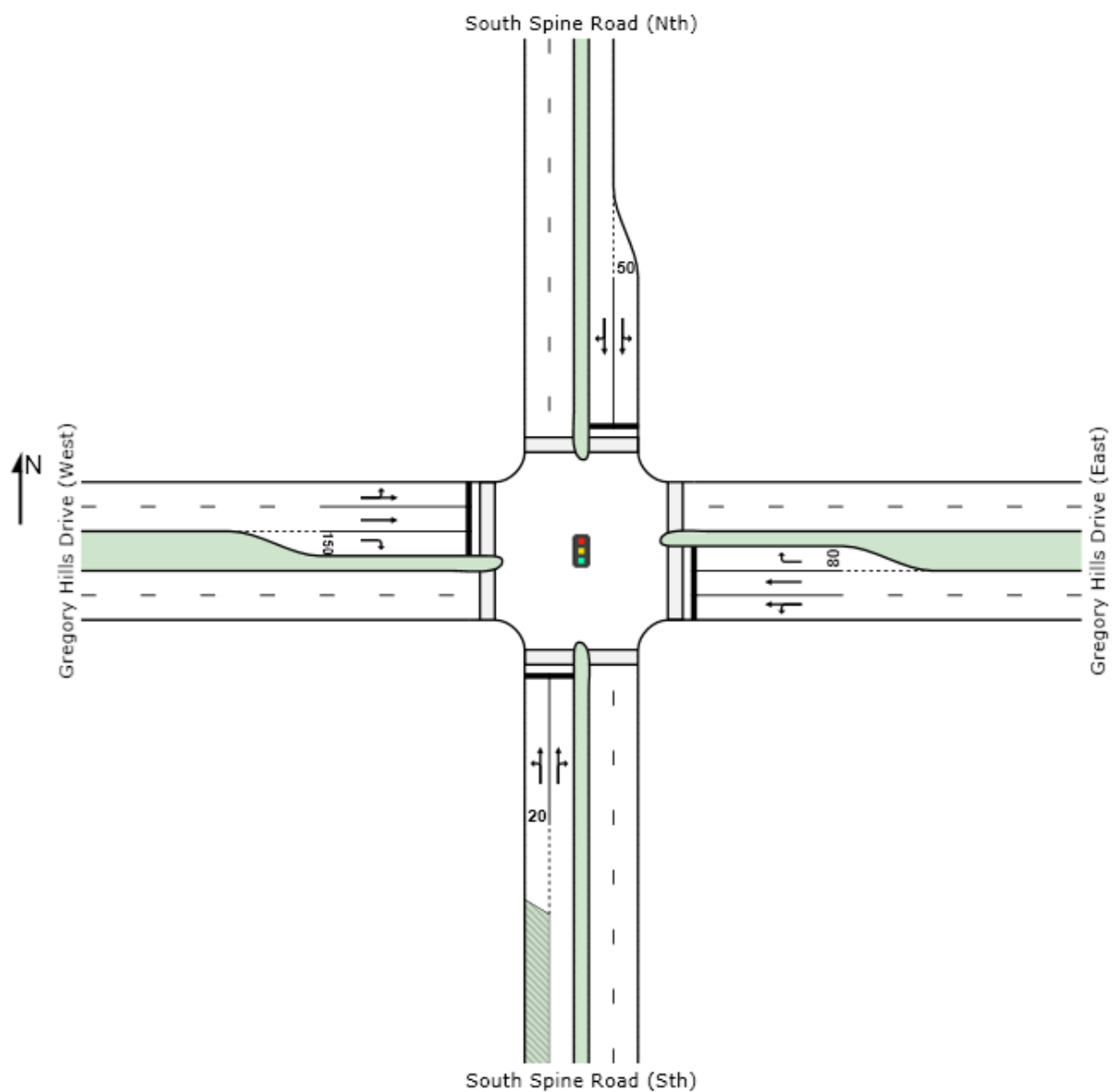
The assessment indicates the following:

- The intersection operates satisfactorily under all scenarios.
- No significant queuing associated with the proposed development was recorded.

5.10.4 Gregory Hills Drive / South Spine Road

The configuration of the Gregory Hills Drive/South Spine Road intersection is based on the existing arrangement with additional traffic signals as modelled in the Cardno report. The layout of the intersection is presented in Figure 5.4.

Figure 5.4: Gregory Hills Drive / South Spine Road – SIDRA Layout



The results of the intersection modelling are presented in Table 5.12.

Table 5.12: Gregory Hills Drive / South Spine Road Intersection – SIDRA Results

AM Peak				PM Peak			
Degree of Saturation (DoS)	Level of Service (LoS)	Average Delay(s)	95% Back of Queue (m)	Degree of Saturation (DoS)	Level of Service (LoS)	Average Delay(s)	95% Back of Queue (m)
Approval – 2026 Cardno Modelling Report (Full development of Turner Road Precinct)							
0.850	B	28.0	220	0.869	C	30.3	310
Scenario 1 – 2026 Without Development (Turner Road Precinct Background Traffic Only – No GHCP Development)							
0.852	C	31.3	297	0.699	B	19.0	204
Scenario 2 – 2026 Without Development (Full Development of Turner Road and GHCP Precinct Less Proposed Development)							
0.928	C	34.8	348	0.940	C	33.6	457
Scenario 3 – 2026 With Proposed Development Changes in Gregory Hills Corporate Park – RMS Trip Generation							
0.943	C	35.8	355	0.957	C	36.6	491
Scenario 4 – 2026 With Proposed Development Changes in Gregory Hills Corporate Park – Sensitivity Test							
0.976	C	37.9	365	0.958	C	36.9	492

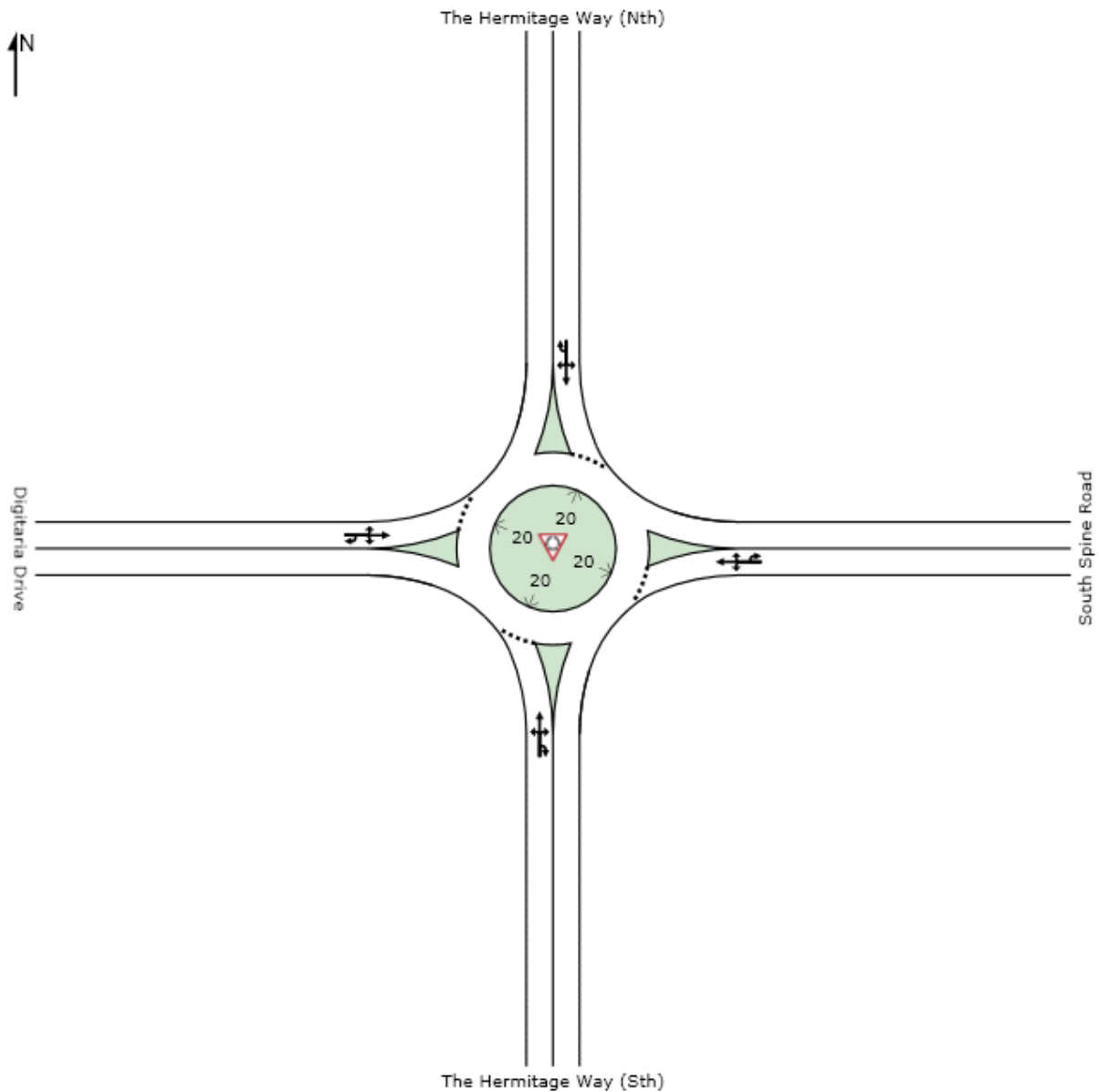
The assessment indicates the following:

- The intersection operates satisfactorily under all scenarios.
- It is noted that queuing in both the AM and PM peaks increases and this occurs with or without the inclusion of the proposed development, and does not impact on the operation of downstream intersections.

5.10.5 The Hermitage Way / Digitaria Drive / South Spine Road

The configuration of the The Hermitage Way/Digitaria Drive/South Spine Road intersection is based on the proposed indicative arrangement presented in the Mott MacDonald GHCP Stages 3 to 6 DA TIA (2015). The detailed design is expected to be completed in further work and will incorporate appropriate refinement of the intersection configuration. The layout of the intersection is presented in Figure 5.5.

Figure 5.5: The Hermitage Way / Digitaria Drive / South Spine Road – SIDRA Layout



The results of the intersection modelling are presented in Table 5.13.

Table 5.13: The Hermitage Way / Digitaria Drive / South Spine Road Intersection – SIDRA Results

AM Peak				PM Peak			
Degree of Saturation (DoS)	Level of Service (LoS)	Maximum Delay(s)	95% Back of Queue (m)	Degree of Saturation (DoS)	Level of Service (LoS)	Maximum Delay(s)	95% Back of Queue (m)
Scenario 1 – 2026 Without Development (Turner Road Precinct Background Traffic Only – No GHCP Development)							
0.328	A	8.3	16	0.295	A	7.9	11
Scenario 2 – 2026 Without Development (Full Development of Turner Road and GHCP Precinct Less Proposed Development)							
0.465	A	7.4	26	0.727	A	9.3	58
Scenario 3 – 2026 With Proposed Development Changes in Gregory Hills Corporate Park – RMS Trip Generation							
0.499	A	8.0	29	0.843	A	13.0	95
Scenario 4 – 2026 With Proposed Development Changes in Gregory Hills Corporate Park – Sensitivity Test							
0.558	A	9.0	34	0.854	A	13.6	100

The assessment indicates the following:

- The intersection operates satisfactorily under all scenarios.
- It is noted that queuing in both the AM and PM peaks increases and this occurs with or without the inclusion of the proposed development, and does not impact on the operation of downstream intersections.
- No comparison to the precinct approval is given as this intersection was not included in previous studies.

5.10.6 Access Points

Modelling of the access points on The Hermitage Way and Digitaria Drive was also undertaken to confirm that these intersections have enough capacity for traffic entering and exiting from the proposed development. Table 5.14 presents the operational performance of these intersections, which presents results from the sensitivity test only.

Table 5.14: Access Intersections – SIDRA Results

AM Peak				PM Peak			
Degree of Saturation (DoS)	Level of Service (LoS)	Maximum Delay(s)	95% Back of Queue (m)	Degree of Saturation (DoS)	Level of Service (LoS)	Maximum Delay(s)	95% Back of Queue (m)
Scenario 4 – Sensitivity Test – The Hermitage Way Access							
0.361	A	3.4	1	0.418	A	6.4	4
Scenario 4 – Sensitivity Test – Digitaria Drive Access							
0.209	A	6.2	5	0.368	A	6.5	12

Table 5.14 indicates that all access points operate satisfactorily and can easily accommodate traffic associated with the proposed development.

5.11 Construction Traffic Management

The management of construction and the staging of the proposed development will be developed once concept approval is obtained. To aid the development of an initial plan a broad level approach was developed for the construction period, which consists of the following management principles and planning responsibilities.

5.11.1 Construction Traffic Management Principles

The implications from constructing the Camden Medical Campus has been undertaken at a high level and is likely to consist of the construction traffic management principles:

- Access to the site is recommended via Gregory Hills Drive and The Hermitage Way (a proposed construction access for the Healthcare and Multi-Storey Car Park adjacent to the site at 832 Gregory Hills Drive).
- Construction deliveries are also recommended via Gregory Hills Drive and The Hermitage Way with access to Digitaria Drive restricted.
- Impact from construction workers parking on-street will be minimised through the site offering on-street parking and opportunities to cycle or travel by public transport, which will be encouraged during the construction period for the site.
- Construction will be contained within the site during the majority of the construction period and its impact on the surrounding road network and pedestrian footpaths will be minimised through appropriate traffic control measures.
- Continued pedestrian access via The Hermitage Way and Digitaria Drive shall be maintained when possible during the construction period.
- Planned works that impact on the surrounding road system will be controlled to minimise its impact on commuter peak periods.
- Appropriate traffic control, advanced warning and alternative routes will be presented in the construction traffic management plan and implemented to manage the impact on pedestrian and vehicular movement.

5.11.2 Construction Traffic Management Plan (Developer / Contractor)

A detailed construction traffic management plan will be produced as part of the detailed construction planning for the development and will be the responsibility of the preferred contractor. This plan will aim to manage the following:

- Construction worker vehicle parking.
- Construction plant and material deliveries and storage.
- Site entry, access routes, and kerbside occupation.
- Pedestrian access.
- The construction impact on Gregory Hills Drive, The Hermitage Way and Digitaria Drive during weekday commuter peak periods.

To help demonstrate how the above potential impacts are managed this plan will identify the following:

- Construction timeframe and construction staging.
- Number of workers and the critical construction periods.
- Construction parking requirements and information that will be supplied to workers to help them access the site by alternative travel modes.
- Number of deliveries (including type of vehicle) to on-site or offsite storage areas and construction traffic routes.
- Road or footpath occupation needs and traffic management plans.
- Traffic control requirements, signage and plans including kerbside parking changes.
- Management structure, approval process and communication protocols.

6 Key Findings and Recommendations

6.1 Key Findings

The traffic impact and parking arrangements for the proposed development of the Camden Medical Campus have been assessed as part of this report. The key findings from this assessment are as follows:

Existing Conditions:

- The site is currently serviced by bus routes 850, 857 and 896, which are observed to have spare capacity to accommodate future growth, although service frequency levels are relatively low.
- There is currently a high reliance on the car for travel within the Camden and Campbelltown LGAs which contributes towards peak hour network constraints.
- Significant upgrades to network corridor capacity have recently occurred along Camden Valley Way and Gregory Hills Drive and include the introduction of major signalised intersections that will serve the Gregory Hills precinct.
- The above corridor improvements include the introduction of a shared path network and high quality footpaths that support walking and cycling as a mode of travel.

Precinct Approval (Cardno 2009):

- A review of road network performance contained within the Cardno report highlights that the network is operating close to its capacity. The intersection identified to have poor performance in the PM peak was Gregory Hills Drive/Holborn Circuit/Central Hills Drive, which was assessed in detail as part of this study.

Without Development (Scenario 2):

- Scenario 2 is a conservative assessment for the full development of the site and includes additional traffic associated with other land use proposals within the GHCP. These developments generate higher traffic levels to those assessed under the original precinct approval.

Proposed Development:

- Parking requirements associated with the proposed development have been estimated using a peak parking accumulation (PPA) method based on expected staff, patient and visitor demand.
- A worst-case total parking requirement of 1,001 spaces was calculated, which was found to be accommodated by the total of 1,080 parking spaces in the proposed development car parks.
- Traffic generation for the proposed development using RMS trip generation rates (Scenario 3) was calculated to be 258 trips in the AM peak hour (194 in, 65 out) and 416 trips in the PM peak hour (83 in, 333 out).
- Traffic generation for the proposed development under the sensitivity test (Scenario 4) was calculated to be 732 trips in the AM peak hour (558 in, 174 out) and 459 trips in the PM peak hour (85 in, 374 out). These volumes exceeded volumes calculated using basic formulas provided in the RMS GTGD and are deemed to provide a conservative assessment.
- The traffic generation calculated in Scenario 4 was 184% higher in the AM peak and 10% higher in the PM peak than the traffic generation using the RMS GTGD (Scenario 3) and is deemed to be a conservative assessment.

- The assumptions made regarding the traffic generation of the proposed private hospital to the south on lots 832 – 833 are conservative and are likely to be greater than the traffic generation in reality (refer to section 5.5.2 for further details).

Traffic Modelling:

- SIDRA modelling of Camden Valley Way/Rodeo Drive was not undertaken based on consultation with RMS relating to the lack of data available for this intersection. An assumption was made that 100% of traffic from the proposed developments travelling to/from the south would take the Gregory Hills Drive/Camden Valley Way intersection, resulting in a conservative assessment of this intersection and avoiding the need to model the Camden Valley Way/Rodeo Drive intersection.
- The SIDRA modelling results indicated that the intersection operational performance was satisfactory.
- Operational performance of the modelled intersections was compared to the Cardno Badgally Road Extension Report (2009) and was deemed to operate at a similar or better performance level to the outcomes presented in the traffic study that supported the precinct approval.
- It is noted that the previous deficiency at the intersection of Gregory Hills Drive/Holborn Circuit/Central Hills Drive has been resolved as part of the detailed appraisal undertaken as part of this study.
- The road network operates within its practical capacity and no further road upgrades are required.

6.2 Recommendations

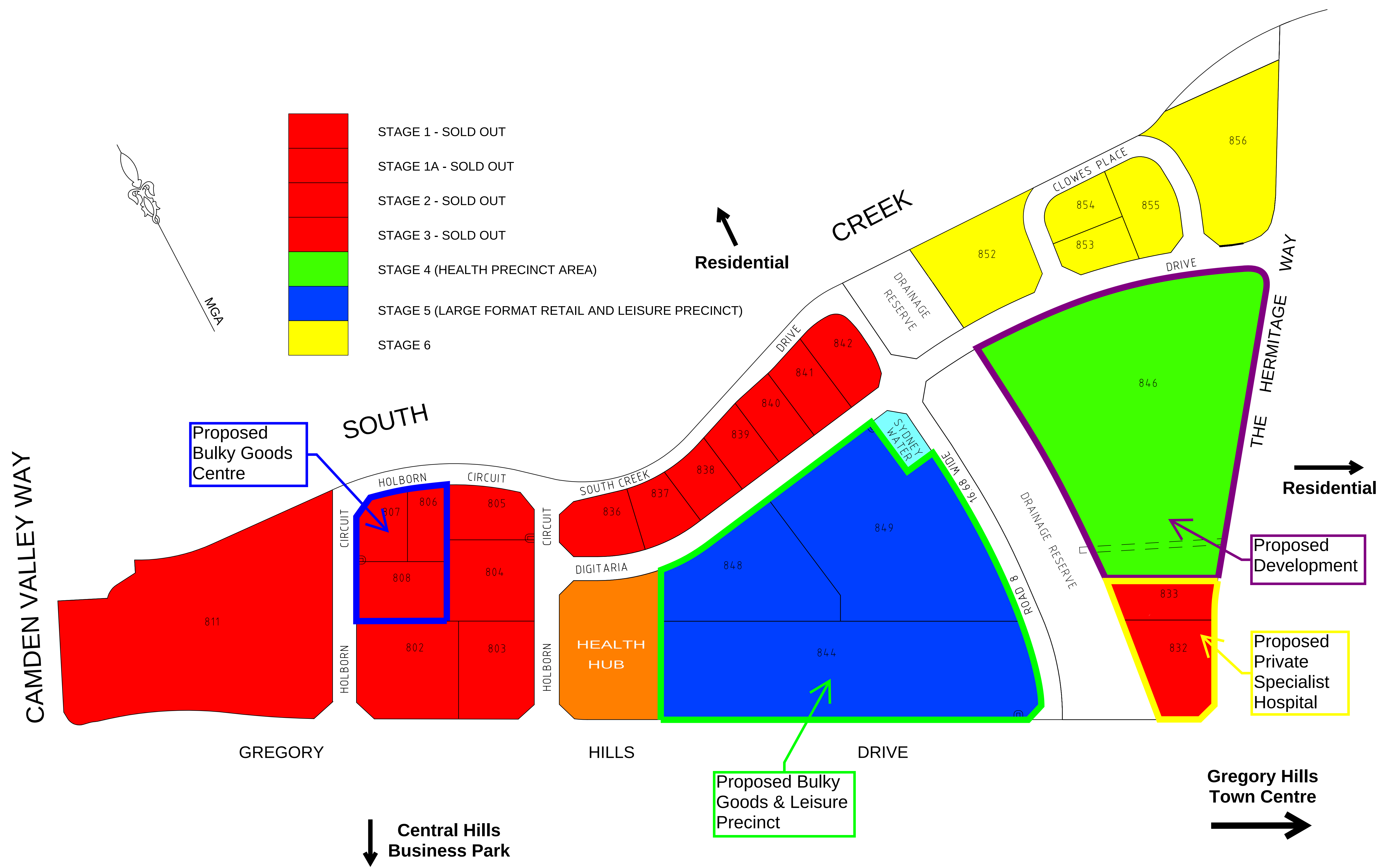
The following key recommendations have been identified as part of this study:

- The extension of the future Gregory Hills to Campbelltown link should be constructed as early as possible to ensure that regional travel demand needs are met and access to the precinct by bus, walking and cycling can be achieved. It is understood that the extension of Gregory Hills Drive will be undertaken by other developers in the precinct as per their VPA arrangement with RMS and the Department of Planning by the year 2026.
- A green travel plan should be produced to support future detailed proposals for the staged development of the site.
- Turning path assessments should be produced to demonstrate the safe and efficient operation of internal roads and car parking areas. This should be completed as part of the staged development of the site.
- Existing conditions should only be assessed once the Gregory Hills Drive extension to Campbelltown is constructed.
- Car park compliance assessments with the AS 2890 series should be undertaken to support the detailed planning proposals for the site.
- Bicycle parking and end-of-trip facilities should be provided to support the detailed planning proposals for the site and encourage active transport.
- A region-wide travel choices strategy should be implemented by Council and State Government Agencies to help reduce the current regional reliance on private vehicles for travel.

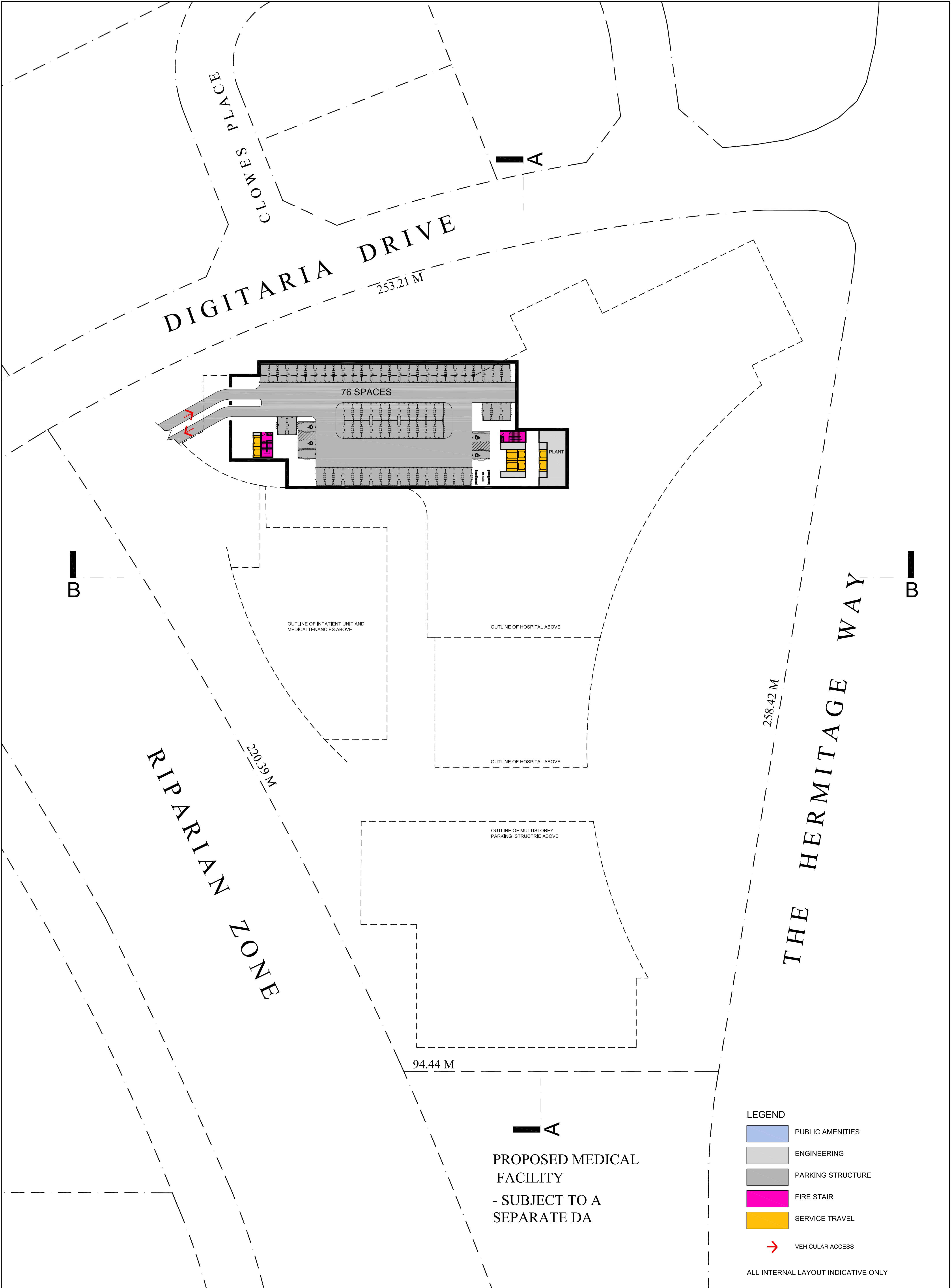
Appendices

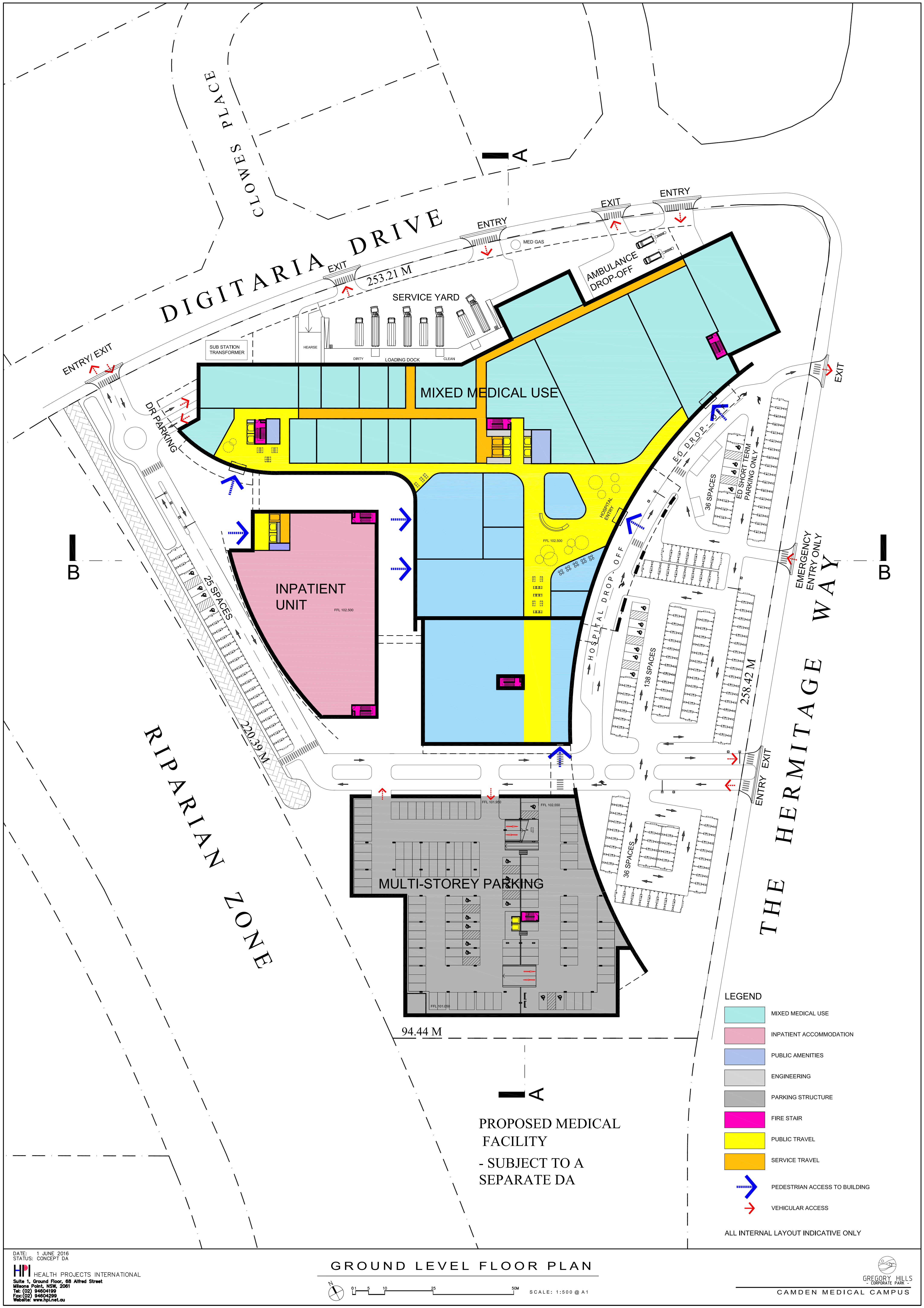
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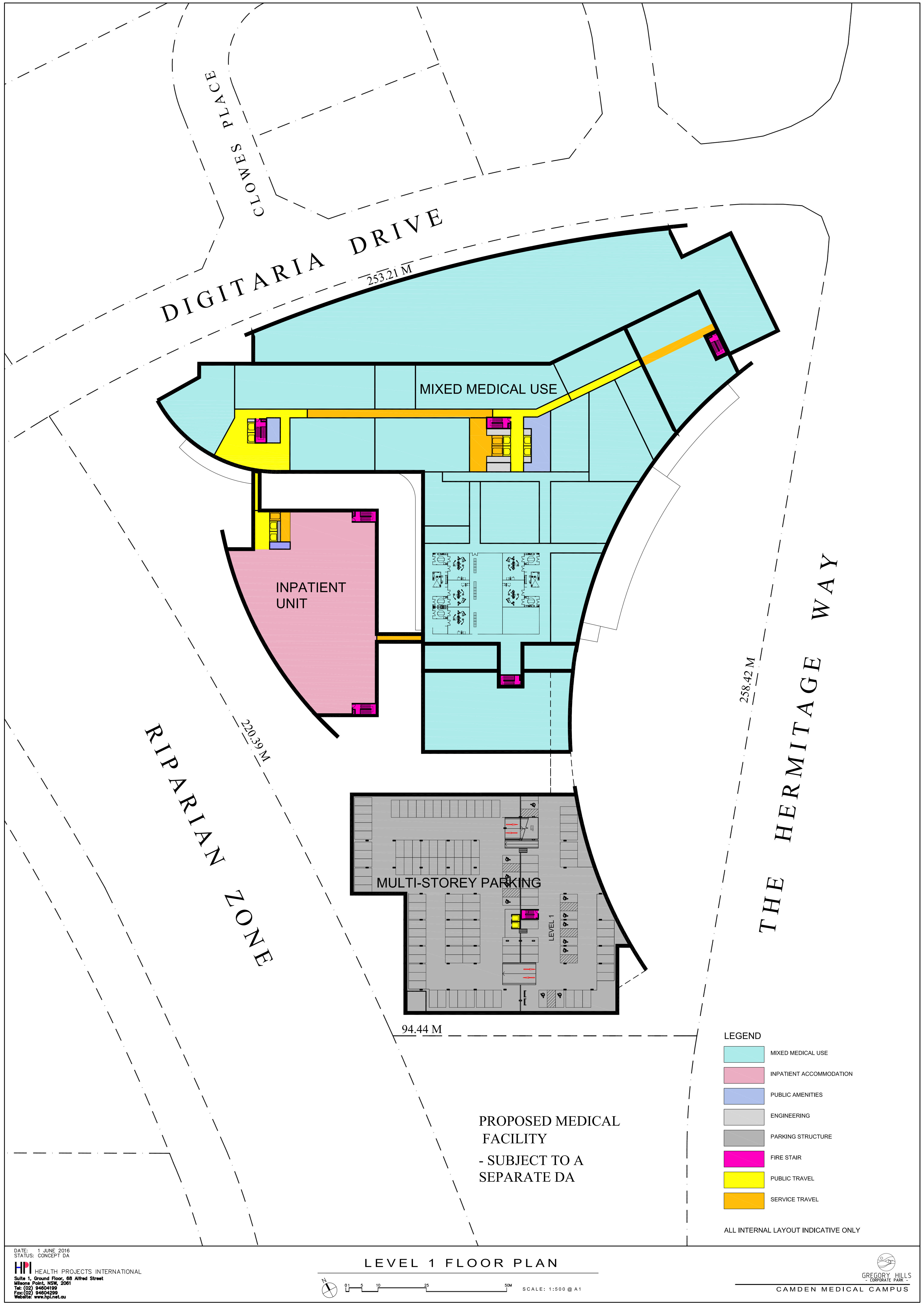
Appendix A. Gregory Hills Corporate Park

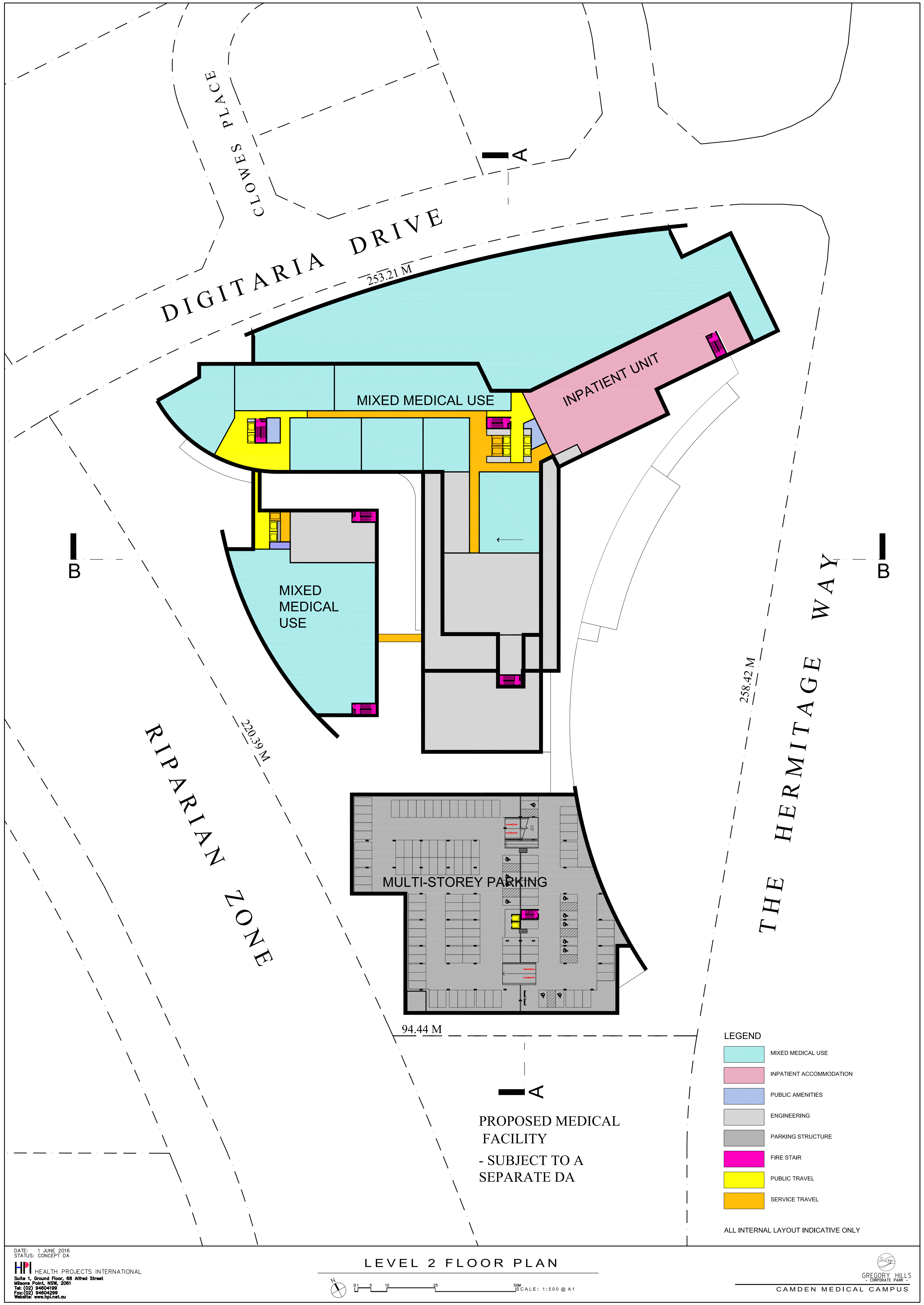


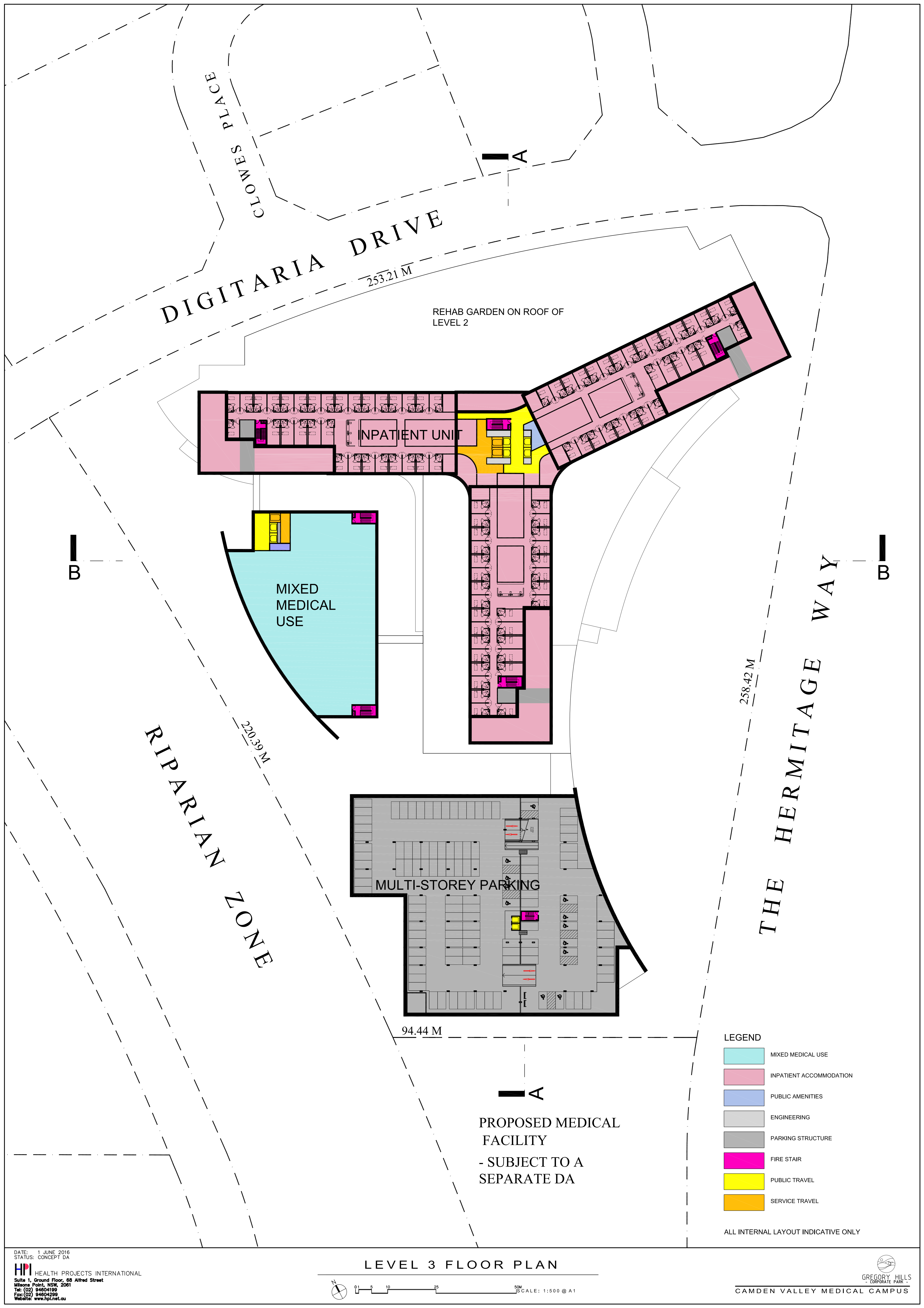
Appendix B. Proposed Development

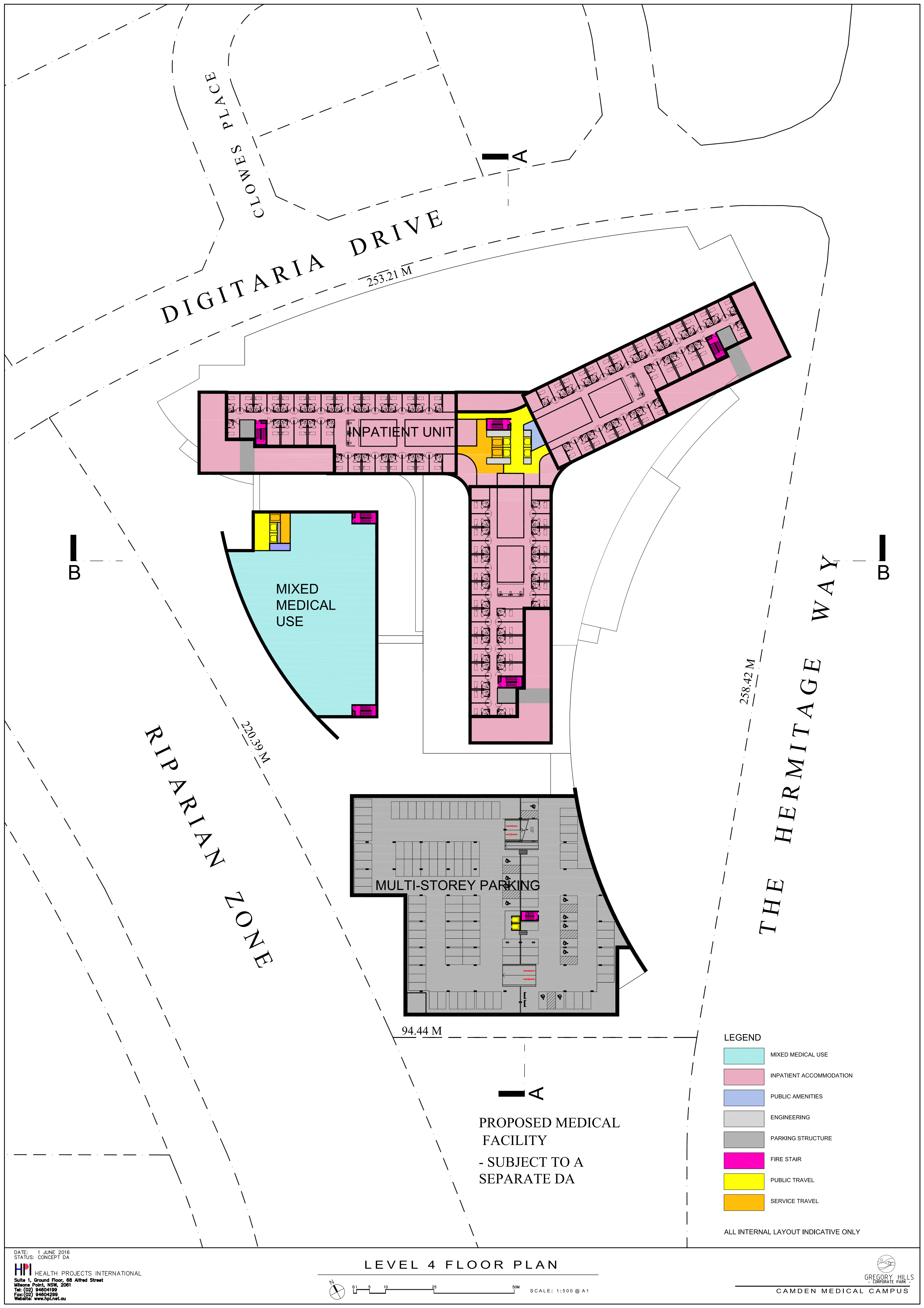


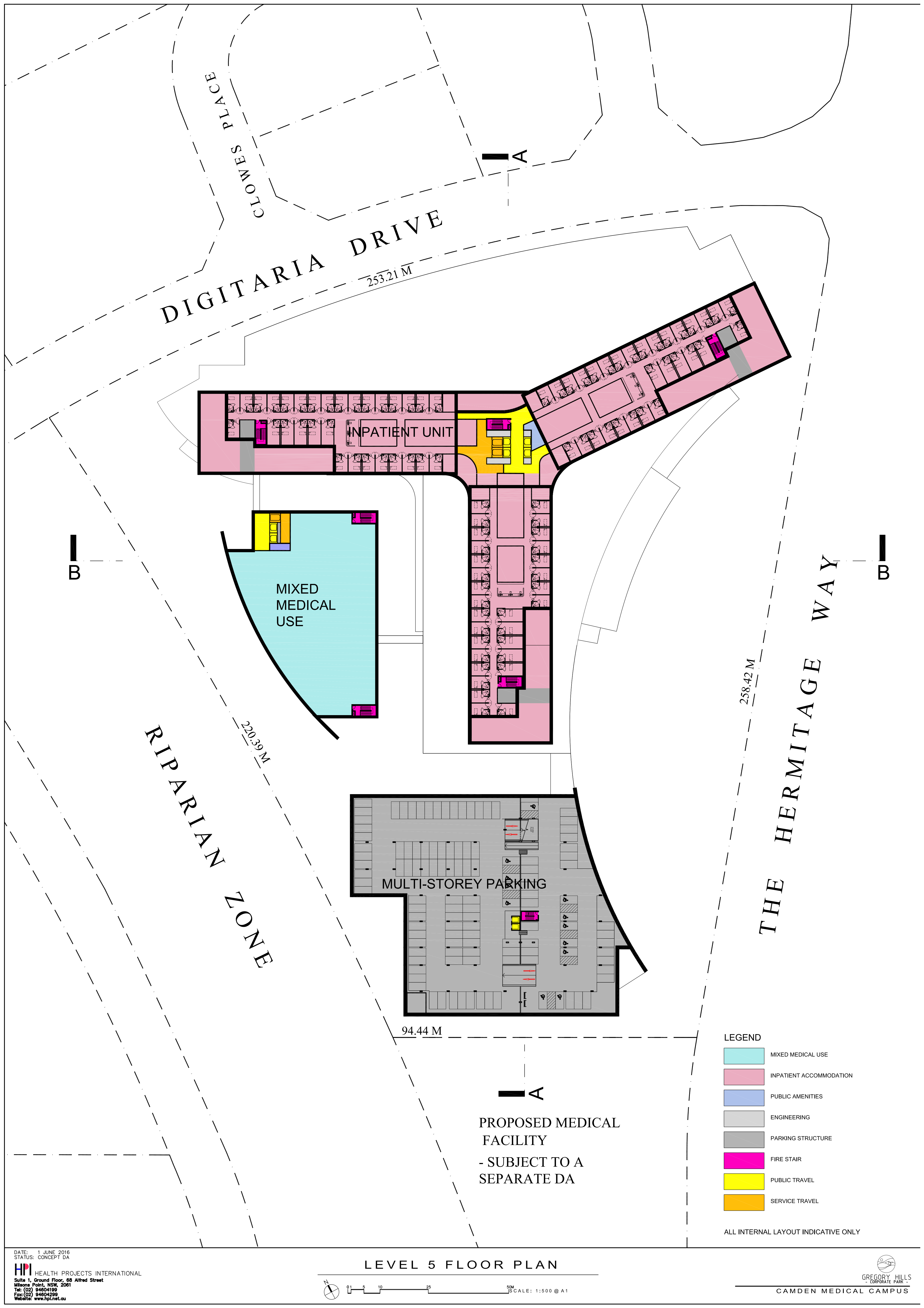


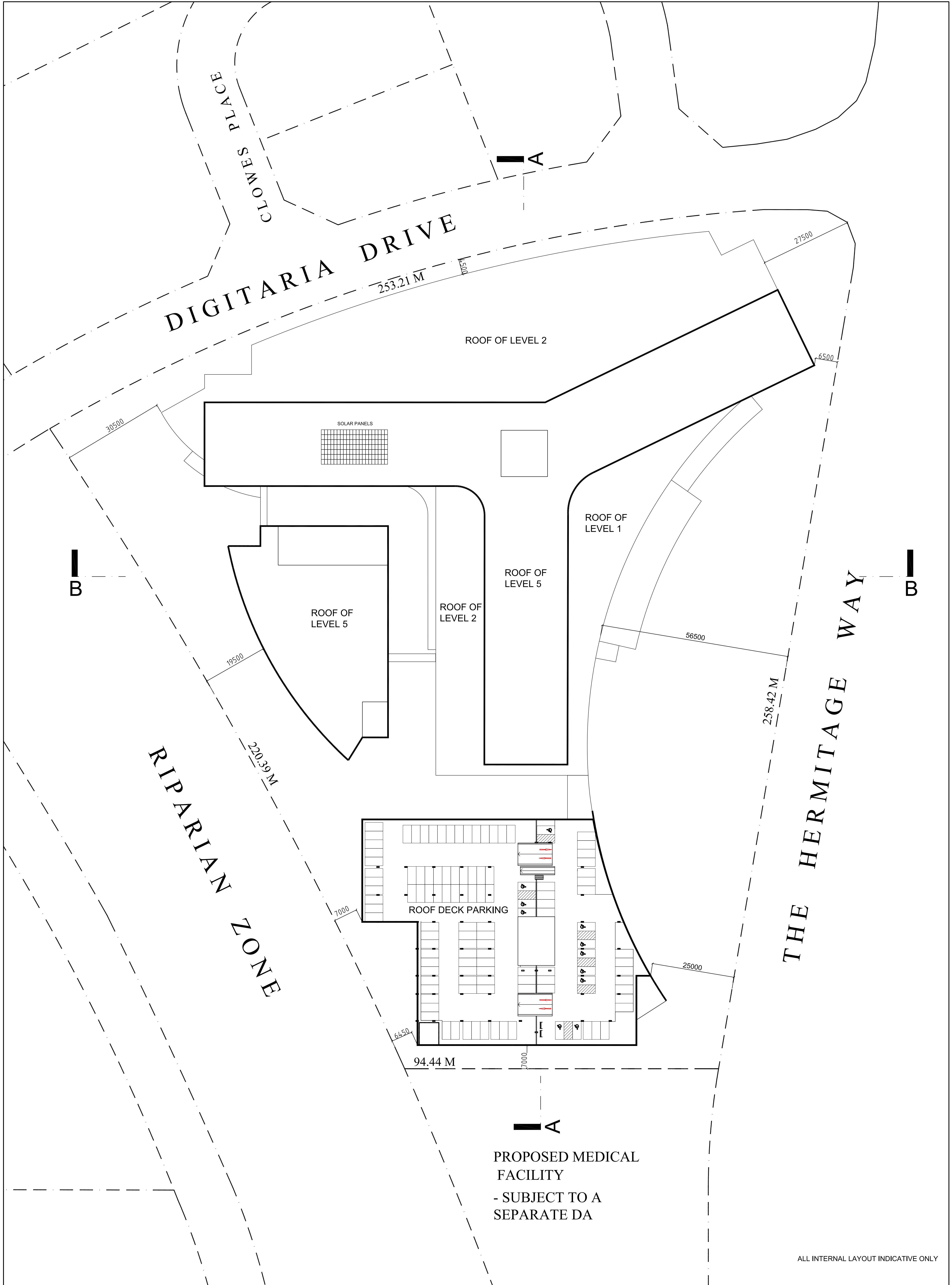


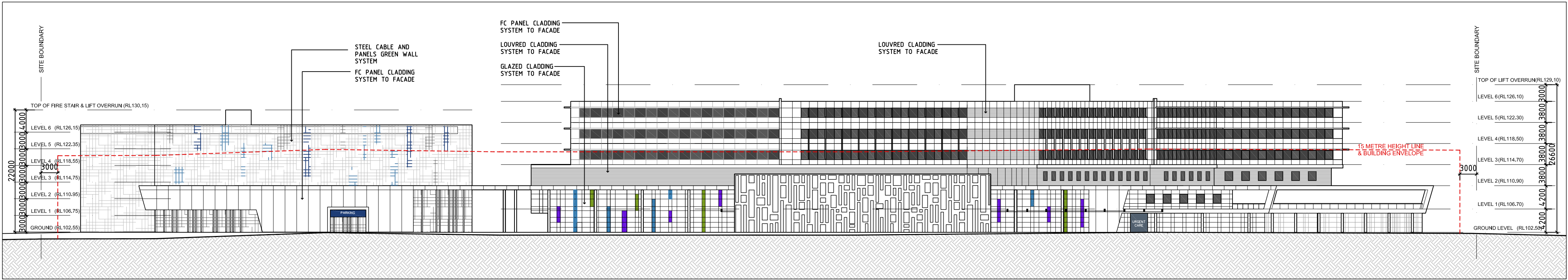




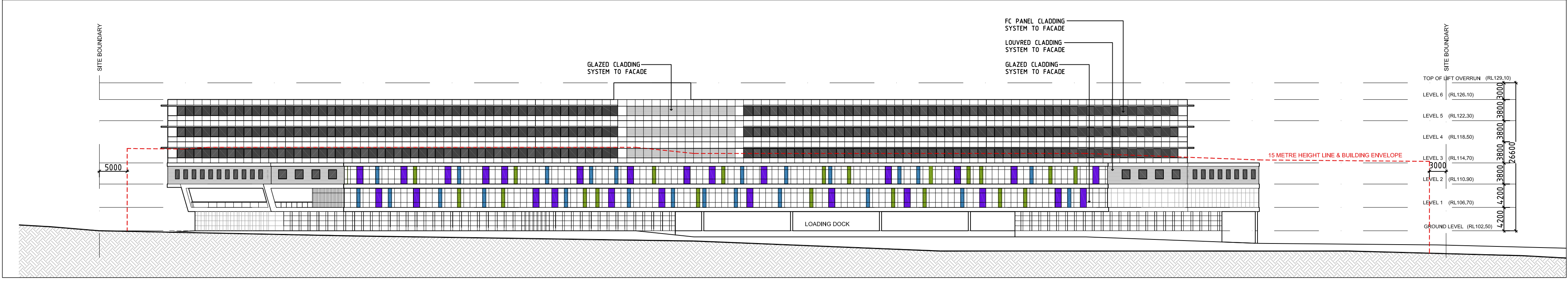




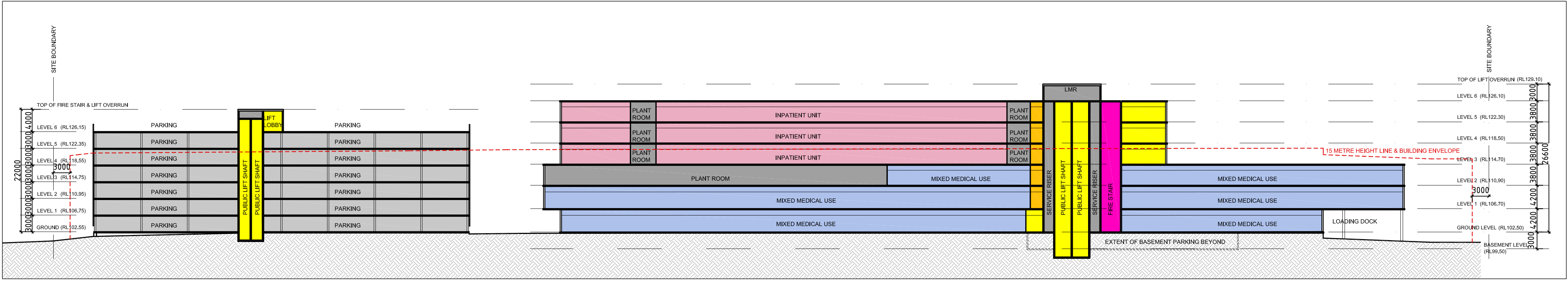




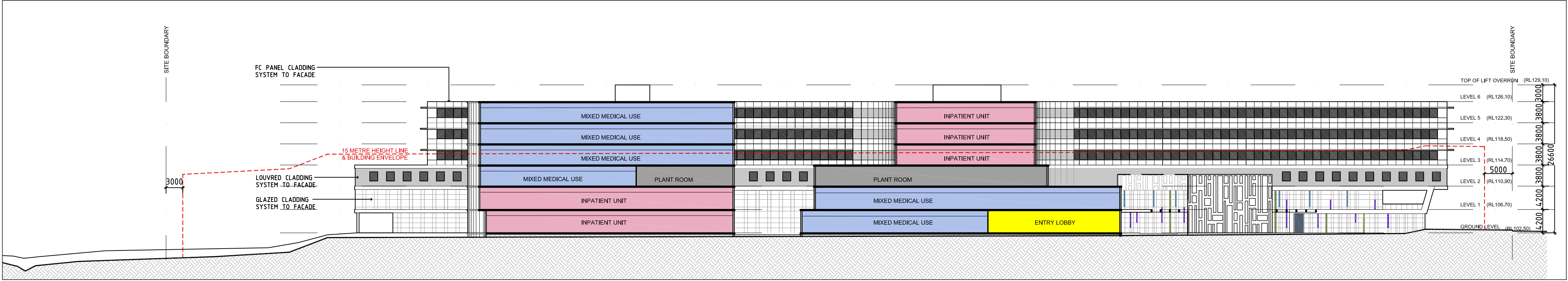
EAST ELEVATION (AS SEEN FROM THE HERMITAGE WAY)



NORTH ELEVATION (AS SEEN FROM DIGITARIA DRIVE)



SECTION A-A



SECTION B-B

NOTES
MULTI-STOREY PARKING STRUCTURE HAS A SPLIT LEVEL DESIGN. ON GROUND LEVEL THE UPPER DECK IS AT RL102.55, WHILE THE LOWER DECK IS AT RL 101.05. TO ILLUSTRATE THE MAXIMUM HEIGHT IMPACT THE UPPER DECK RL IS NOTED IN THE ELEVATIONS AND SECTIONS

- LEGEND
- MIXED MEDICAL USE
 - INPATIENT ACCOMMODATION
 - PUBLIC AMENITIES
 - ENGINEERING
 - PARKING STRUCTURE
 - FIRE STAIR
 - PUBLIC TRAVEL
 - SERVICE TRAVEL

ALL MATERIALS, FINISHES AND COLOURS INDICATIVE ONLY

Appendix C. Base JTW Data

Table C.1: Place of Work (Workers Commuting to the Selected Employment Area) Data for TZ 3215 & 3221

Origin	Total No. of Trips	Veh Driver Mode Share	Total No. of Veh Trips	Vehicle distribution factoring mode of travel	Direction of Travel Assumptions	Split
Campbelltown	4976	75%	3732	52%	North	50%
					East	
					South	50%
Camden	1605	90%	1445	20%	West	100%
Wollondilly	852	87%	742	10%	South	100%
Liverpool	321	87%	280	4%	North	100%
Bringelly - Green Valley	261	91%	238	3%	West	100%
Wollongong	248	94%	234	3%	East	100%
Southern Highlands	166	94%	157	2%	South	100%
Fairfield	165	88%	146	2%	North	100%
Bankstown	114	69%	79	1%	North	100%
Penrith	87	91%	80	1%	North	100%
Total	8795		7133	100%		

Table C.2: Summary of Table C.1

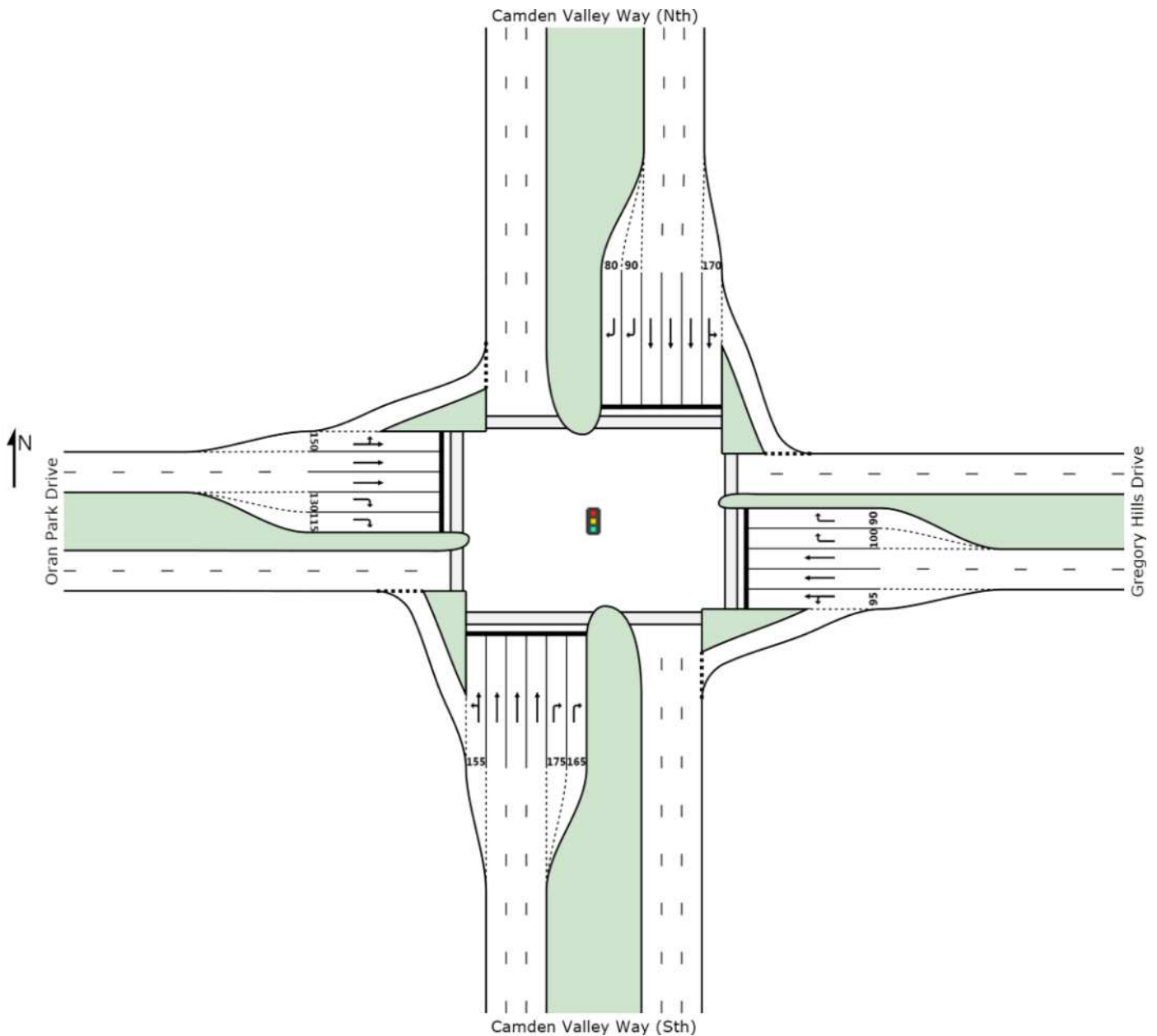
Direction on Road Network	Directional Percentage Split
North	34%
East	3%
South	39%
West	24%

Appendix D. SIDRA Result Summaries

SITE LAYOUT

Site: AM End - Gregory Hills Dr/Camden Valley Way

Final Scenario - Full Development of site and Turner Road Precinct
Signals - Fixed Time Coordinated



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MOVEMENT SUMMARY

Site: AM End - Gregory Hills Dr/Camden Valley Way

Final Scenario - Full Development of site and Turner Road Precinct

Signals - Fixed Time Coordinated Cycle Time = 115 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m	per veh	km/h	
South: Camden Valley Way (Sth)											
1	L2	60	0.0	0.044	8.6	LOS A	0.5	3.2	0.20	0.65	61.3
2	T1	917	0.0	0.401	15.4	LOS B	8.0	56.0	0.50	0.43	62.1
3	R2	269	0.0	0.926	79.4	LOS F	8.9	62.3	1.00	0.95	24.2
Approach		1246	0.0	0.926	28.9	LOS C	8.9	62.3	0.59	0.55	49.7
East: Gregory Hills Drive											
4	L2	453	0.0	0.481	17.3	LOS B	13.4	93.8	0.63	0.78	49.1
5	T1	210	0.0	0.188	32.9	LOS C	3.9	27.3	0.70	0.56	44.0
6	R2	333	0.0	0.858	70.2	LOS E	10.3	72.3	1.00	0.93	33.2
Approach		995	0.0	0.858	38.3	LOS C	13.4	93.8	0.77	0.78	40.3
North: Camden Valley Way (Nth)											
7	L2	890	0.0	0.680	14.1	LOS A	21.7	151.7	0.61	0.82	59.4
8	T1	1716	0.0	0.803	33.4	LOS C	28.3	198.0	0.89	0.81	49.2
9	R2	189	0.0	0.836	73.5	LOS F	5.9	41.3	1.00	0.87	36.2
Approach		2795	0.0	0.836	29.9	LOS C	28.3	198.0	0.81	0.82	50.5
West: Oran Park Drive											
10	L2	169	0.0	0.133	9.7	LOS A	2.2	15.2	0.31	0.66	63.6
11	T1	294	0.0	0.321	39.4	LOS C	6.9	48.0	0.87	0.71	41.0
12	R2	101	0.0	0.521	68.2	LOS E	3.0	20.8	1.00	0.75	31.4
Approach		564	0.0	0.521	35.6	LOS C	6.9	48.0	0.73	0.70	44.6
All Vehicles		5601	0.0	0.926	31.8	LOS C	28.3	198.0	0.74	0.74	47.8

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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

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

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	51.8	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	41.8	LOS E	0.1	0.1	0.85	0.85
P3	North Full Crossing	53	51.8	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	40.2	LOS E	0.1	0.1	0.84	0.84
All Pedestrians		211	46.4	LOS E			0.90	0.90

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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 \SIDRA\160610 End scenario baseline.sip6

PHASING SUMMARY

 **Site: AM End - Gregory Hills Dr/Camden Valley Way**

Final Scenario - Full Development of site and Turner Road Precinct

Signals - Fixed Time Coordinated Cycle Time = 115 seconds (User-Given Phase Times)

Phase times specified by the user

Sequence: Leading right turn - RS

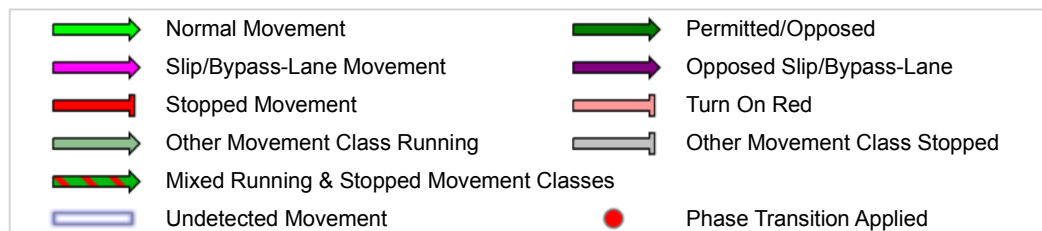
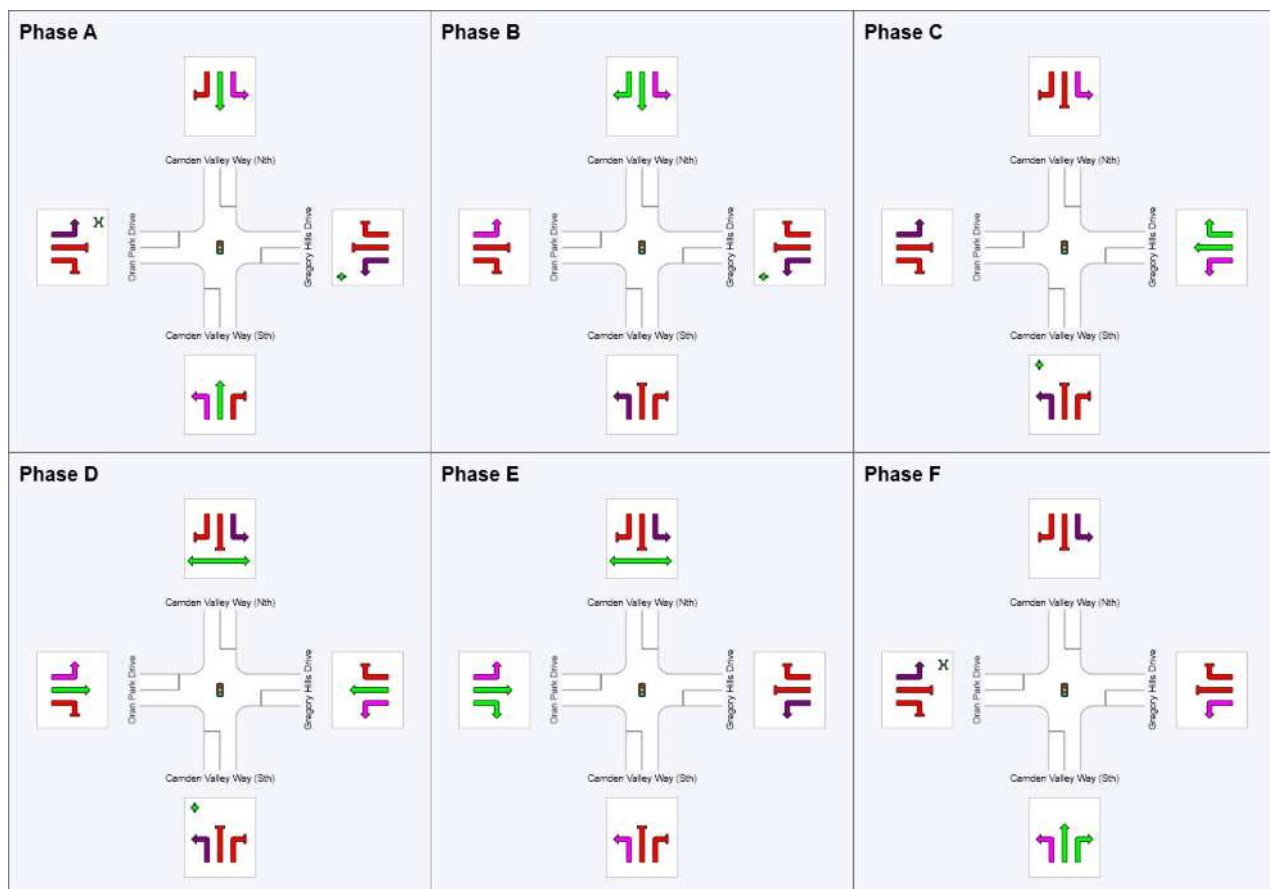
Movement Class: All Movement Classes

Input Sequence: A, B, C, D, E, F

Output Sequence: A, B, C, D, E, F

Phase Timing Results

Phase	A	B	C	D	E	F
Reference Phase	Yes	No	No	No	No	No
Phase Change Time (sec)	0	36	49	67	88	100
Green Time (sec)	30	7	12	15	6	9
Yellow Time (sec)	4	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2	2
Phase Time (sec)	36	13	18	21	12	15
Phase Split	31 %	11 %	16 %	18 %	10 %	13 %



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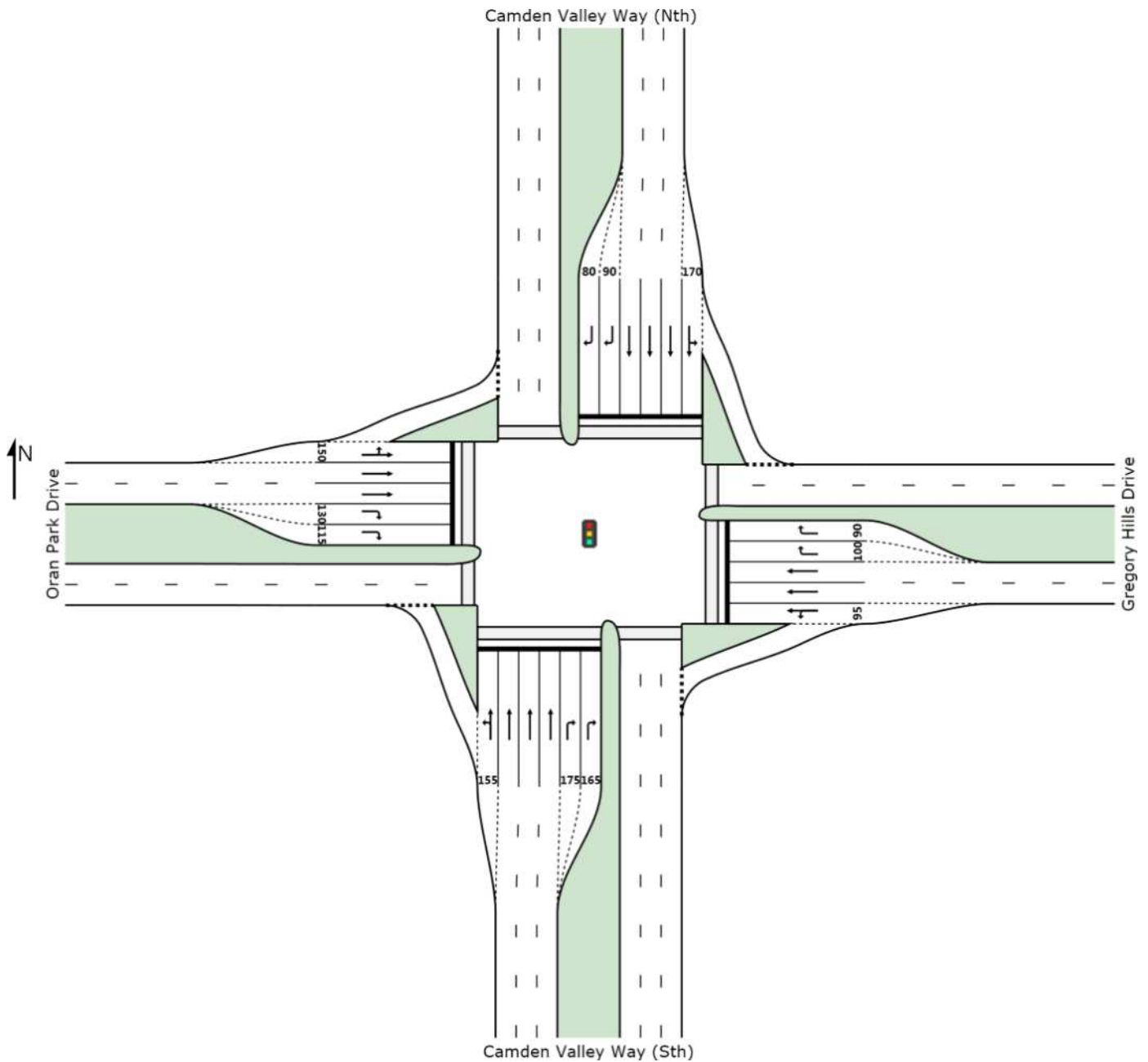
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 \SIDRA\160610 End scenario baseline.sip6

SITE LAYOUT

Site: PM End - Gregory Hills Dr/Camden Valley Way

Final Scenario - Full Development of site and Turner Road Precinct
Signals - Fixed Time Coordinated



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MOVEMENT SUMMARY

Site: PM End - Gregory Hills Dr/Camden Valley Way

Final Scenario - Full Development of site and Turner Road Precinct

Signals - Fixed Time Coordinated Cycle Time = 130 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m		per veh	km/h
South: Camden Valley Way (Sth)											
1	L2	101	0.0	0.076	8.7	LOS A	0.9	6.2	0.20	0.65	61.2
2	T1	1415	0.0	0.684	24.3	LOS B	20.4	143.0	0.74	0.65	55.0
3	R2	394	0.0	1.061	121.3	LOS F	17.5	122.3	1.00	1.06	18.0
Approach		1910	0.0	1.061	43.5	LOS D	20.4	143.0	0.76	0.73	42.1
East: Gregory Hills Drive											
4	L2	534	0.0	0.515	19.6	LOS B	18.3	128.0	0.64	0.78	47.3
5	T1	225	0.0	0.171	32.0	LOS C	4.9	34.6	0.74	0.60	44.4
6	R2	751	0.0	0.982	90.4	LOS F	30.0	209.9	1.00	1.03	28.7
Approach		1510	0.0	0.982	56.7	LOS E	30.0	209.9	0.83	0.88	34.3
North: Camden Valley Way (Nth)											
7	L2	434	0.0	0.334	12.1	LOS A	8.7	60.6	0.39	0.72	61.1
8	T1	1642	0.0	0.953	65.2	LOS E	40.8	285.4	1.00	1.03	36.0
9	R2	166	0.0	0.968	96.1	LOS F	6.4	44.9	1.00	0.92	31.3
Approach		2242	0.0	0.968	57.2	LOS E	40.8	285.4	0.88	0.96	38.5
West: Oran Park Drive											
10	L2	378	0.0	0.396	21.7	LOS B	12.6	88.1	0.62	0.77	55.5
11	T1	292	0.0	0.374	48.7	LOS D	8.1	56.4	0.91	0.74	37.4
12	R2	66	0.0	0.231	69.6	LOS E	2.0	14.3	0.97	0.73	31.1
Approach		736	0.0	0.396	36.7	LOS C	12.6	88.1	0.77	0.75	45.3
All Vehicles		6397	0.0	1.061	50.6	LOS D	40.8	285.4	0.82	0.85	39.2

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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

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

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	South Full Crossing	53	51.0	LOS E	0.2	0.2	0.89	0.89	
P2	East Full Crossing	53	52.8	LOS E	0.2	0.2	0.90	0.90	
P3	North Full Crossing	53	59.3	LOS E	0.2	0.2	0.96	0.96	
P4	West Full Crossing	53	46.6	LOS E	0.2	0.2	0.85	0.85	
All Pedestrians		211	52.4	LOS E			0.90	0.90	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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 \SIDRA\160610 End scenario baseline.sip6

PHASING SUMMARY

 **Site: PM End - Gregory Hills Dr/Camden Valley Way**

Final Scenario - Full Development of site and Turner Road Precinct

Signals - Fixed Time Coordinated Cycle Time = 130 seconds (User-Given Phase Times)

Phase times specified by the user

Sequence: Leading Right Turn

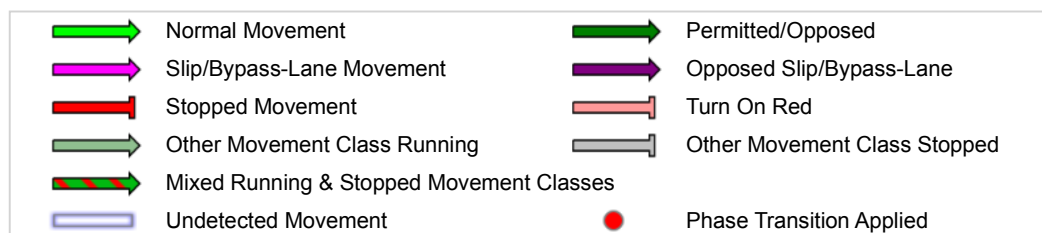
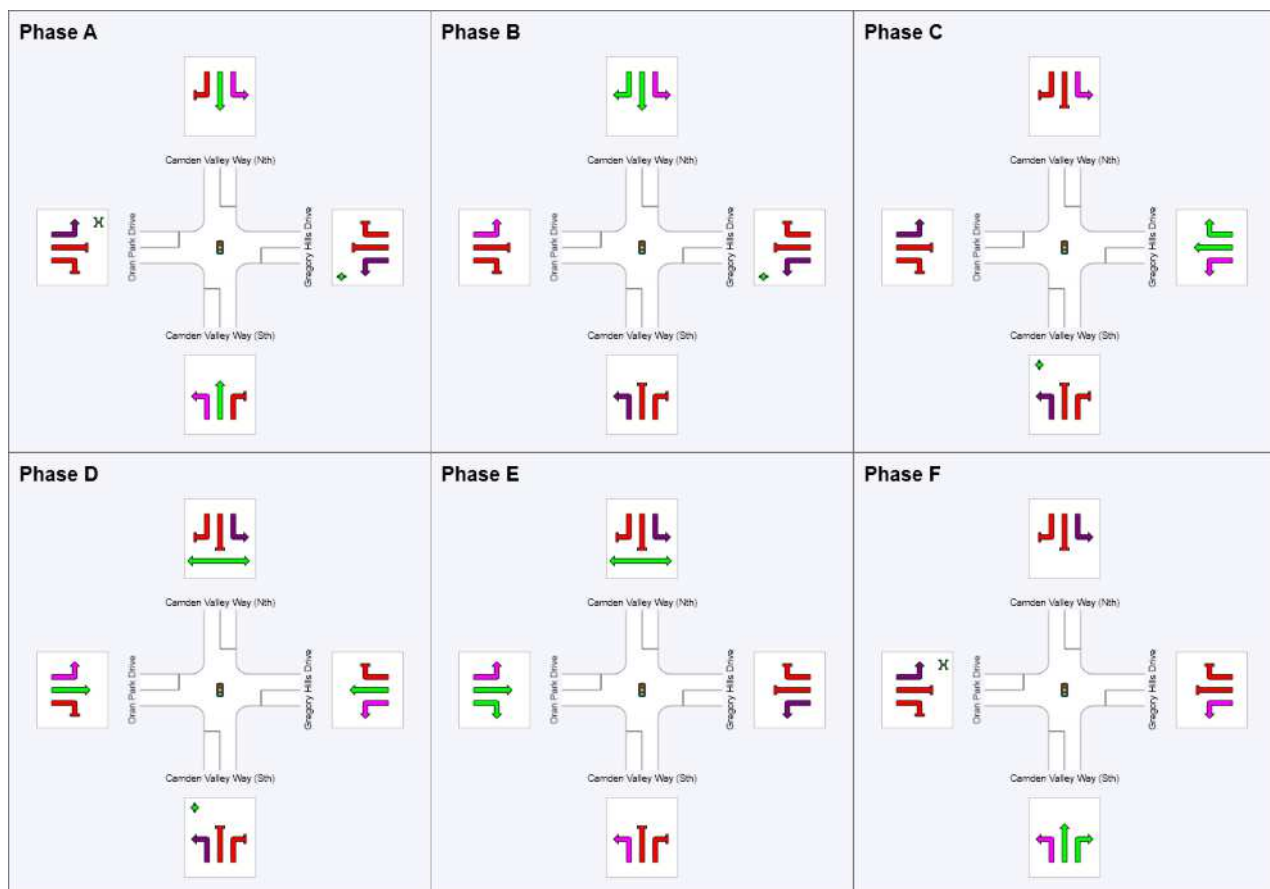
Movement Class: All Movement Classes

Input Sequence: A, B, C, D, E, F

Output Sequence: A, B, C, D, E, F

Phase Timing Results

Phase	A	B	C	D	E	F
Reference Phase	Yes	No	No	No	No	No
Phase Change Time (sec)	0	33	45	79	95	111
Green Time (sec)	27	6	28	10	10	13
Yellow Time (sec)	4	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2	2
Phase Time (sec)	33	12	34	16	16	19
Phase Split	25 %	9 %	26 %	12 %	12 %	15 %



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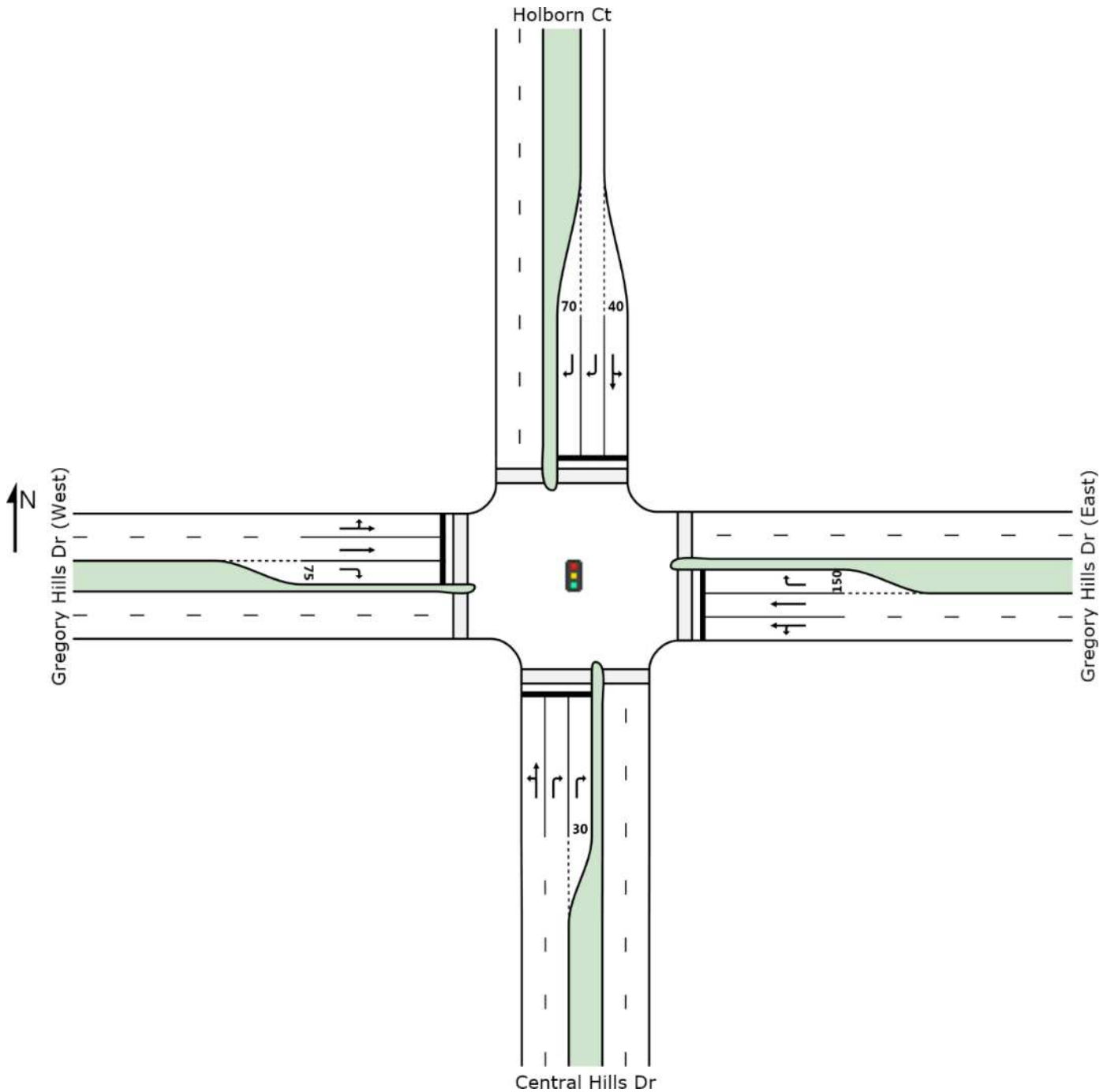
SITE LAYOUT

Site: AM End - Gregory Hills Dr/Central Hills Dr

Final Scenario - Full Development of site and Turner Road Precinct

AM Peak

Signals - Fixed Time Coordinated



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MOVEMENT SUMMARY



Site: AM End - Gregory Hills Dr/Central Hills Dr

Final Scenario - Full Development of site and Turner Road Precinct

AM Peak

Signals - Fixed Time Coordinated Cycle Time = 100 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Central Hills Dr											
1	L2	95	0.0	0.348	46.9	LOS D	4.3	30.0	0.93	0.77	24.4
2	T1	1	0.0	0.348	41.4	LOS C	4.3	30.0	0.93	0.77	13.9
3	R2	224	0.0	0.548	53.1	LOS D	5.4	37.9	0.99	0.79	20.6
Approach		320	0.0	0.548	51.2	LOS D	5.4	37.9	0.97	0.78	21.7
East: Gregory Hills Dr (East)											
4	L2	334	0.0	0.478	15.0	LOS B	9.3	65.0	0.41	0.60	42.1
5	T1	670	0.0	0.478	10.6	LOS A	10.6	74.0	0.46	0.47	53.3
6	R2	70	0.0	0.431	22.4	LOS B	1.7	11.7	0.69	0.74	32.7
Approach		1074	0.0	0.478	12.8	LOS A	10.6	74.0	0.46	0.53	49.0
North: Holborn Ct											
7	L2	24	0.0	0.093	44.8	LOS D	1.1	7.4	0.88	0.71	22.2
8	T1	1	0.0	0.093	39.3	LOS C	1.1	7.4	0.88	0.71	14.5
9	R2	216	0.0	0.529	52.9	LOS D	5.2	36.5	0.99	0.78	22.2
Approach		241	0.0	0.529	52.1	LOS D	5.2	36.5	0.98	0.78	22.2
West: Gregory Hills Dr (West)											
10	L2	139	0.0	0.714	19.2	LOS B	20.6	144.0	0.62	0.61	30.4
11	T1	1265	0.0	0.714	12.9	LOS A	20.6	144.0	0.60	0.57	51.5
12	R2	128	0.0	0.485	21.3	LOS B	3.0	21.0	0.61	0.76	37.4
Approach		1532	0.0	0.714	14.2	LOS A	20.6	144.0	0.60	0.59	48.2
All Vehicles		3167	0.0	0.714	20.3	LOS B	20.6	144.0	0.62	0.60	41.6

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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

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

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	18.0	LOS B	0.1	0.1	0.60	0.60
P2	East Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P3	North Full Crossing	53	18.6	LOS B	0.1	0.1	0.61	0.61
P4	West Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		211	31.3	LOS D			0.77	0.77

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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PHASING SUMMARY

 **Site: AM End - Gregory Hills Dr/Central Hills Dr**

Final Scenario - Full Development of site and Turner Road Precinct

AM Peak

Signals - Fixed Time Coordinated Cycle Time = 100 seconds (User-Given Phase Times)

Phase times specified by the user

Sequence: Split Phasing

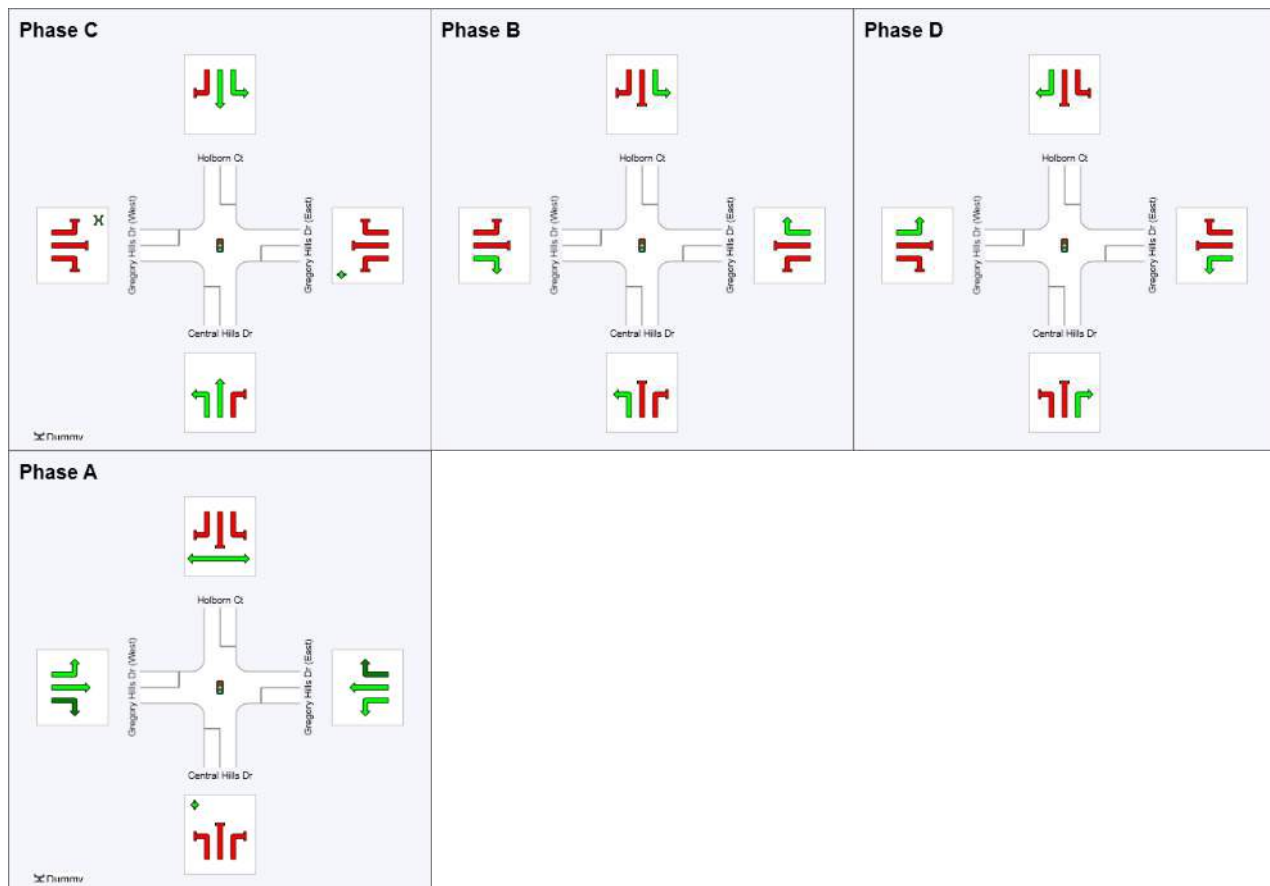
Movement Class: All Movement Classes

Input Sequence: C, B, D, A

Output Sequence: C, B, D, A

Phase Timing Results

Phase	C	B	D	A
Reference Phase	No	No	No	Yes
Phase Change Time (sec)	59	76	83	0
Green Time (sec)	11	1	11	53
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	17	7	17	59
Phase Split	17 %	7 %	17 %	59 %



	Normal Movement		Permitted/Opposed
	Slip/Bypass-Lane Movement		Opposed Slip/Bypass-Lane
	Stopped Movement		Turn On Red
	Other Movement Class Running		Other Movement Class Stopped
	Mixed Running & Stopped Movement Classes		Phase Transition Applied
	Undetected Movement		

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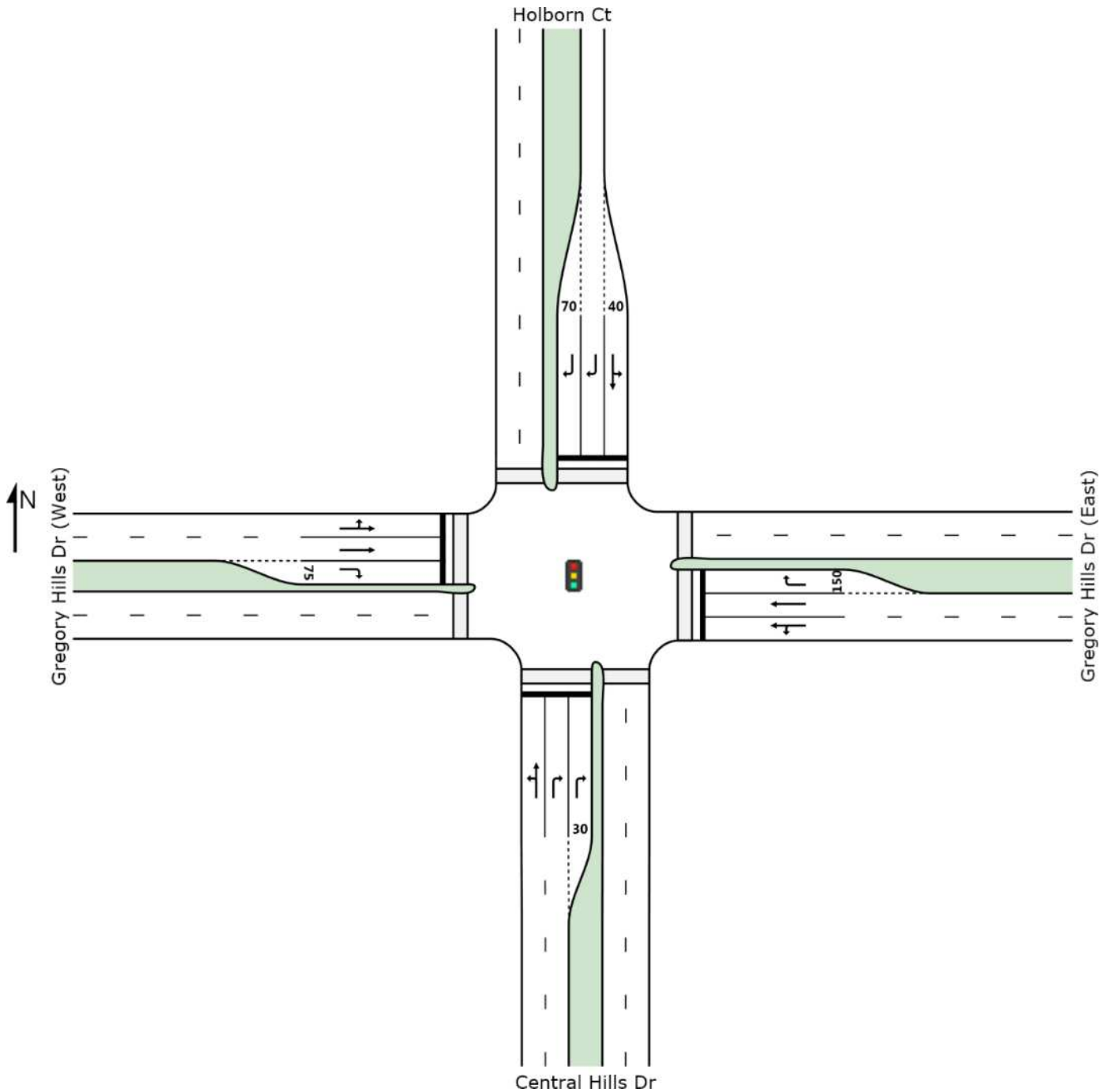
SITE LAYOUT

Site: PM End - Gregory Hills Dr/Central Hills Dr

Final Scenario - Full Development of site and Turner Road Precinct

AM Peak

Signals - Fixed Time Coordinated



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MOVEMENT SUMMARY



Site: PM End - Gregory Hills Dr/Central Hills Dr

Final Scenario - Full Development of site and Turner Road Precinct

AM Peak

Signals - Fixed Time Coordinated Cycle Time = 110 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Central Hills Dr											
1	L2	177	0.0	0.663	54.8	LOS D	9.4	65.7	0.99	0.83	22.1
2	T1	1	0.0	0.663	49.3	LOS D	9.4	65.7	0.99	0.83	12.3
3	R2	417	0.0	0.801	56.1	LOS D	11.3	79.2	0.97	0.90	19.8
Approach		595	0.0	0.801	55.7	LOS D	11.3	79.2	0.98	0.88	20.5
East: Gregory Hills Dr (East)											
4	L2	156	0.0	0.686	24.3	LOS B	21.5	150.5	0.68	0.66	36.1
5	T1	1133	0.0	0.686	18.4	LOS B	21.9	153.6	0.68	0.64	46.5
6	R2	95	0.0	0.623	33.7	LOS C	3.6	25.0	0.88	0.81	26.5
Approach		1384	0.0	0.686	20.1	LOS B	21.9	153.6	0.70	0.65	44.0
North: Holborn Ct											
7	L2	37	0.0	0.176	51.9	LOS D	2.0	14.3	0.92	0.73	20.3
8	T1	5	0.0	0.176	46.3	LOS D	2.0	14.3	0.92	0.73	13.0
9	R2	405	0.0	0.600	51.0	LOS D	10.2	71.4	0.97	0.82	22.7
Approach		447	0.0	0.600	51.0	LOS D	10.2	71.4	0.97	0.81	22.4
West: Gregory Hills Dr (West)											
10	L2	113	0.0	0.763	25.4	LOS B	26.3	184.3	0.75	0.70	27.7
11	T1	1254	0.0	0.763	18.9	LOS B	26.3	184.3	0.72	0.66	46.2
12	R2	107	0.0	0.625	31.0	LOS C	3.8	26.5	0.84	0.80	31.4
Approach		1474	0.0	0.763	20.3	LOS B	26.3	184.3	0.73	0.68	43.4
All Vehicles		3900	0.0	0.801	29.1	LOS C	26.3	184.3	0.78	0.71	36.0

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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

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

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	22.3	LOS C	0.1	0.1	0.64	0.64
P2	East Full Crossing	53	49.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	23.0	LOS C	0.1	0.1	0.65	0.65
P4	West Full Crossing	53	49.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	36.0	LOS D			0.79	0.79

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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PHASING SUMMARY

 **Site: PM End - Gregory Hills Dr/Central Hills Dr**

Final Scenario - Full Development of site and Turner Road Precinct

AM Peak

Signals - Fixed Time Coordinated Cycle Time = 110 seconds (User-Given Phase Times)

Phase times specified by the user

Sequence: Split Phasing

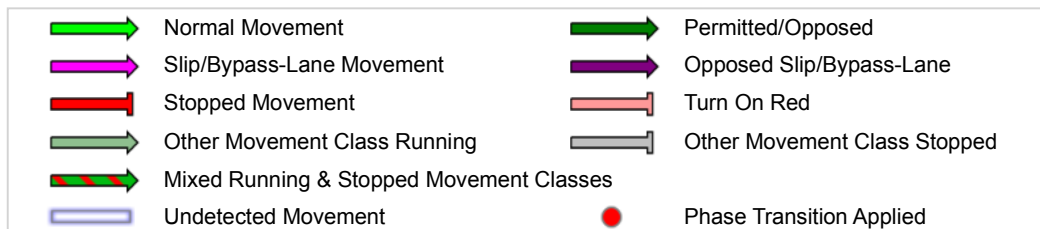
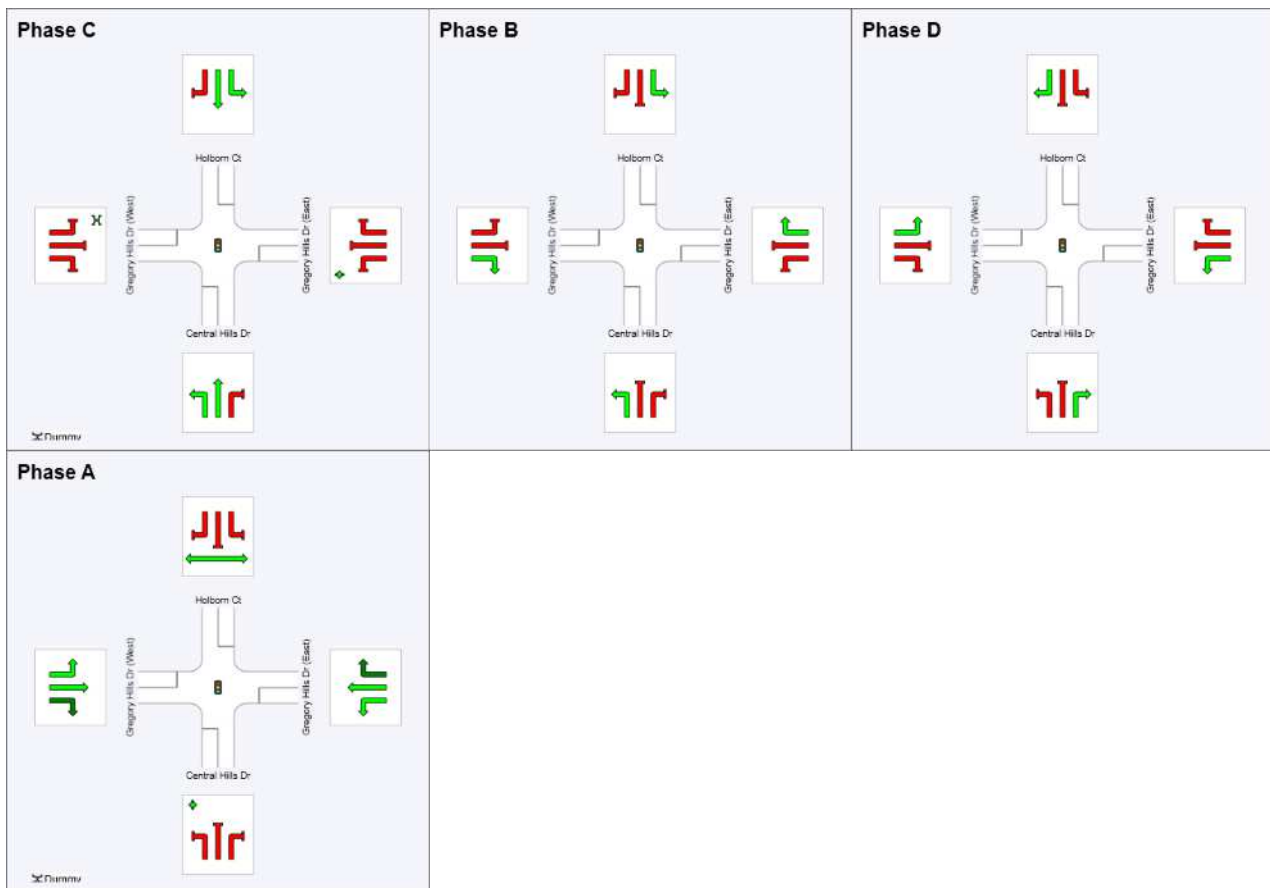
Movement Class: All Movement Classes

Input Sequence: C, B, D, A

Output Sequence: C, B, D, A

Phase Timing Results

Phase	C	B	D	A
Reference Phase	No	No	No	Yes
Phase Change Time (sec)	59	76	84	0
Green Time (sec)	11	2	20	53
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	17	8	26	59
Phase Split	15 %	7 %	24 %	54 %



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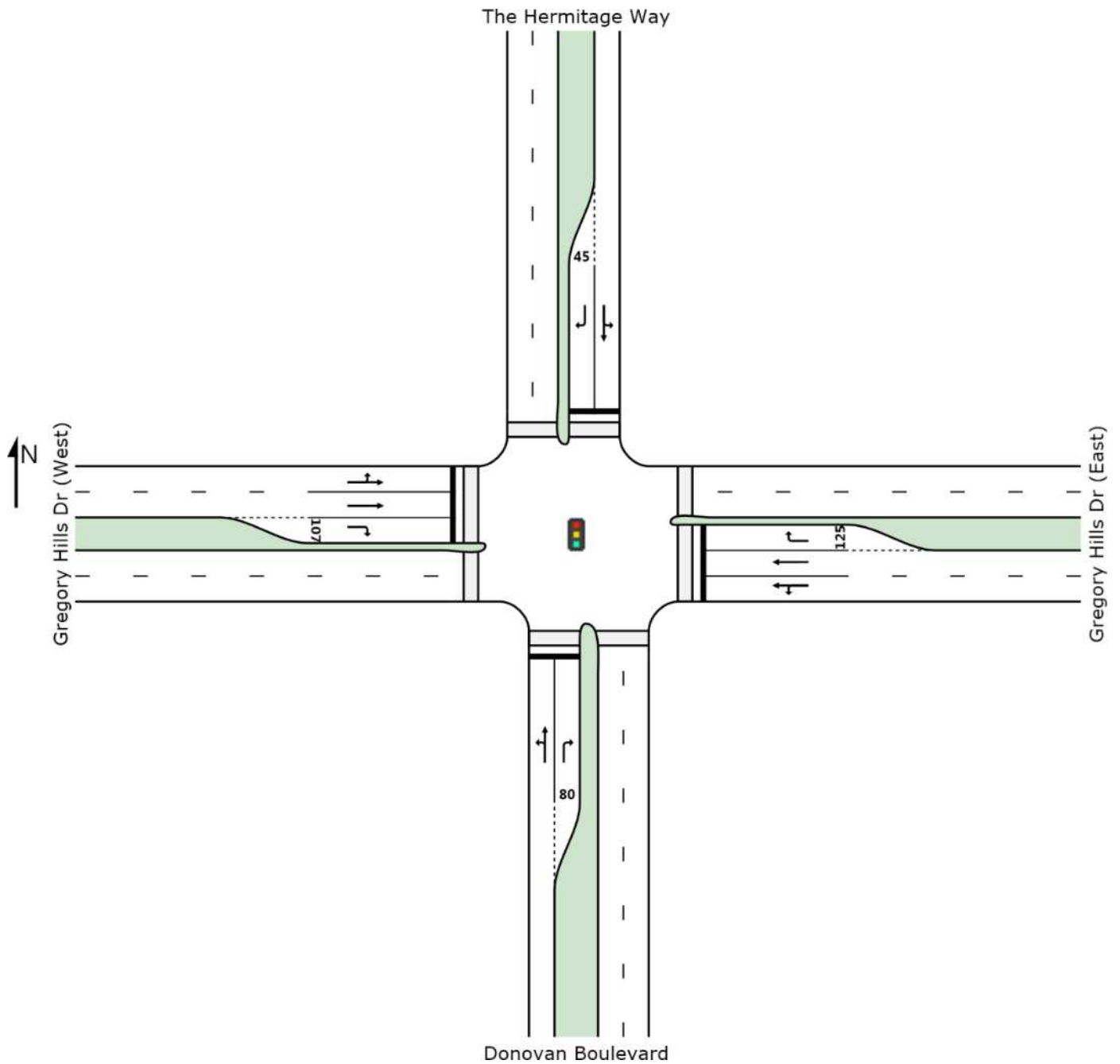
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 \SIDRA\160610 End scenario baseline.sip6

SITE LAYOUT

 **Site: AM End - Gregory Hills Dr/The Hermitage Way/Donovan Blvd**

Final Scenario - Full Development of site and Turner Road Precinct

Signals - Fixed Time Coordinated



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MOVEMENT SUMMARY



Site: AM End - Gregory Hills Dr/The Hermitage Way/Donovan Blvd

Final Scenario - Full Development of site and Turner Road Precinct

Signals - Fixed Time Coordinated Cycle Time = 70 seconds (User-Given Phase Times)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Donovan Boulevard											
1	L2	111	0.0	0.546	28.9	LOS C	8.6	60.0	0.90	0.78	41.9
2	T1	178	0.0	0.546	23.4	LOS B	8.6	60.0	0.90	0.78	38.5
3	R2	208	0.0	0.966	61.9	LOS E	10.2	71.2	1.00	1.14	28.6
Approach		497	0.0	0.966	40.7	LOS C	10.2	71.2	0.94	0.93	33.9
East: Gregory Hills Dr (East)											
4	L2	37	0.0	0.564	24.0	LOS B	9.9	69.3	0.75	0.66	46.7
5	T1	784	0.0	0.564	17.6	LOS B	10.0	70.1	0.75	0.65	52.6
6	R2	330	0.0	1.001	44.1	LOS D	14.3	99.9	1.00	1.02	34.1
Approach		1151	0.0	1.001	25.4	LOS B	14.3	99.9	0.82	0.76	46.0
North: The Hermitage Way											
7	L2	380	0.0	0.840	33.2	LOS C	15.7	110.1	0.89	0.94	38.4
8	T1	74	0.0	0.840	27.7	LOS B	15.7	110.1	0.89	0.94	35.1
9	R2	236	0.0	1.035	79.7	LOS F	13.2	92.2	1.00	1.24	24.8
Approach		690	0.0	1.035	48.5	LOS D	15.7	110.1	0.93	1.04	32.0
West: Gregory Hills Dr (West)											
10	L2	183	0.0	0.926	40.3	LOS C	26.7	186.6	1.00	1.07	37.4
11	T1	1148	0.0	0.926	33.8	LOS C	27.5	192.5	1.00	1.07	42.7
12	R2	63	0.0	0.147	20.1	LOS B	1.2	8.3	0.62	0.72	45.6
Approach		1394	0.0	0.926	34.0	LOS C	27.5	192.5	0.98	1.05	42.2
All Vehicles		3732	0.0	1.035	34.9	LOS C	27.5	192.5	0.92	0.94	39.9

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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

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

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	25.8	LOS C	0.1	0.1	0.86	0.86
P2	East Full Crossing	53	29.3	LOS C	0.1	0.1	0.92	0.92
P3	North Full Crossing	53	22.4	LOS C	0.1	0.1	0.80	0.80
P4	West Full Crossing	53	29.3	LOS C	0.1	0.1	0.92	0.92
All Pedestrians		211	26.7	LOS C			0.87	0.87

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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PHASING SUMMARY



Site: AM End - Gregory Hills Dr/The Hermitage Way/Donovan Blvd

Final Scenario - Full Development of site and Turner Road Precinct

Signals - Fixed Time Coordinated Cycle Time = 70 seconds (User-Given Phase Times)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Phase times specified by the user

Sequence: Split Phasing

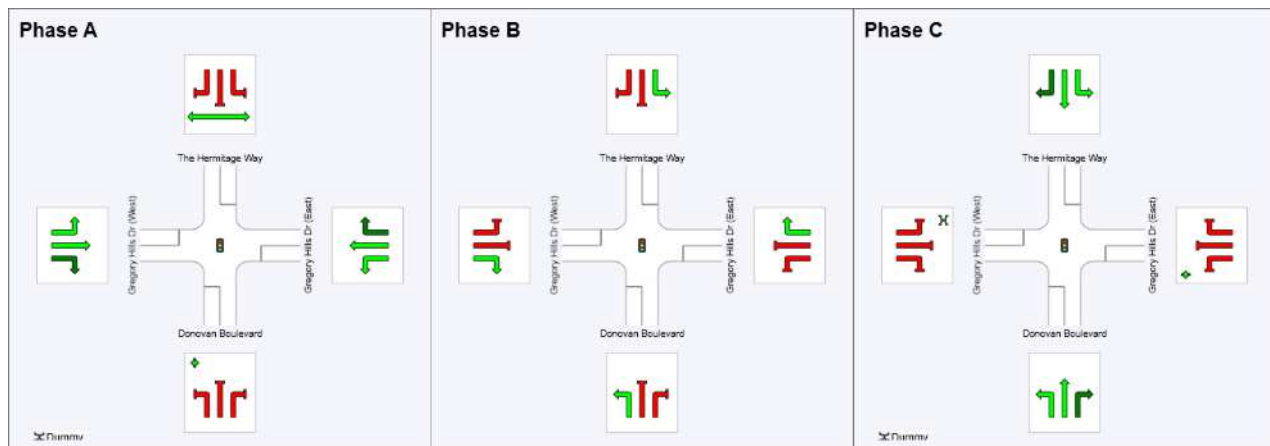
Movement Class: All Movement Classes

Input Sequence: A, B, C1, C

Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Reference Phase	Yes	No	No
Phase Change Time (sec)	0	32	46
Green Time (sec)	26	8	18
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	32	14	24
Phase Split	46 %	20 %	34 %



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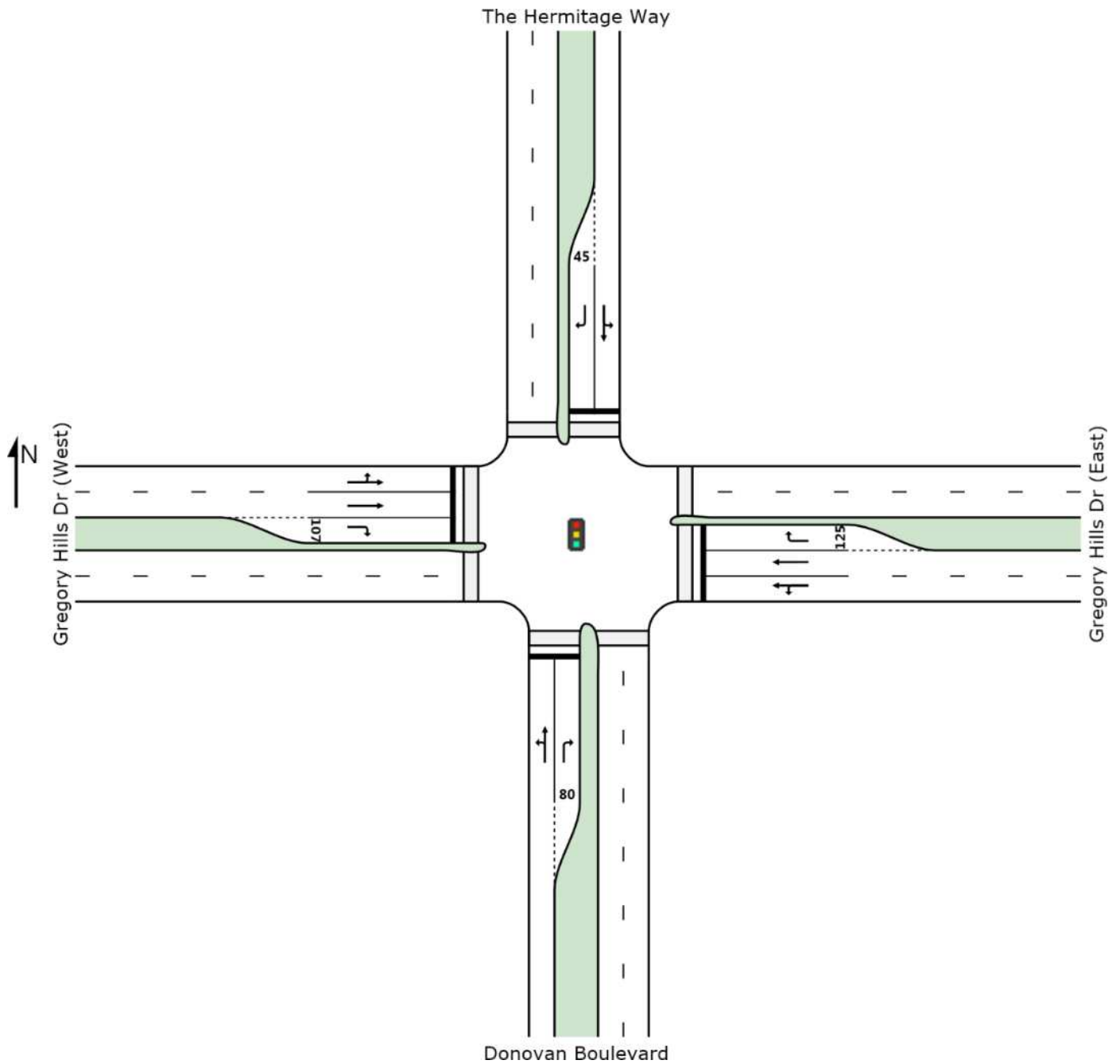
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SITE LAYOUT

 **Site: PM End - Gregory Hills Dr/The Hermitage Way/Donovan Blvd**

Final Scenario - Full Development of site and Turner Road Precinct

Signals - Fixed Time Coordinated



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MOVEMENT SUMMARY



Site: PM End - Gregory Hills Dr/The Hermitage Way/Donovan Blvd

Final Scenario - Full Development of site and Turner Road Precinct

Signals - Fixed Time Coordinated Cycle Time = 80 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Donovan Boulevard											
1	L2	48	0.0	0.754	44.6	LOS D	8.7	60.8	1.00	0.90	35.2
2	T1	164	0.0	0.754	39.0	LOS C	8.7	60.8	1.00	0.90	31.9
3	R2	48	0.0	0.485	50.2	LOS D	2.0	14.1	1.00	0.72	31.8
Approach		260	0.0	0.754	42.1	LOS C	8.7	60.8	1.00	0.87	32.5
East: Gregory Hills Dr (East)											
4	L2	142	0.0	0.749	19.8	LOS B	19.0	133.2	0.72	0.69	49.2
5	T1	1320	0.0	0.749	13.4	LOS A	19.3	135.4	0.72	0.67	55.6
6	R2	379	0.0	0.925	51.8	LOS D	17.1	119.6	1.00	1.13	31.5
Approach		1841	0.0	0.925	21.8	LOS B	19.3	135.4	0.78	0.76	48.4
North: The Hermitage Way											
7	L2	230	0.0	0.944	58.4	LOS E	16.7	117.1	1.00	1.11	29.8
8	T1	102	0.0	0.944	52.9	LOS D	16.7	117.1	1.00	1.11	26.7
9	R2	47	0.0	0.454	49.2	LOS D	2.0	13.7	1.00	0.73	32.2
Approach		379	0.0	0.944	55.8	LOS D	16.7	117.1	1.00	1.06	29.3
West: Gregory Hills Dr (West)											
10	L2	265	0.0	0.716	19.2	LOS B	16.9	118.4	0.69	0.69	48.8
11	T1	1118	0.0	0.716	12.9	LOS A	17.6	122.9	0.69	0.65	55.8
12	R2	251	0.0	0.630	29.3	LOS C	7.6	53.5	0.85	0.90	40.5
Approach		1634	0.0	0.716	16.4	LOS B	17.6	122.9	0.71	0.69	52.0
All Vehicles		4114	0.0	0.944	24.1	LOS B	19.3	135.4	0.79	0.77	46.1

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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

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

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	South Full Crossing	53	19.6	LOS B	0.1	0.1	0.70	0.70	
P2	East Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93	
P3	North Full Crossing	53	16.9	LOS B	0.1	0.1	0.65	0.65	
P4	West Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93	
All Pedestrians		211	26.3	LOS C			0.80	0.80	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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PHASING SUMMARY



Site: PM End - Gregory Hills Dr/The Hermitage Way/Donovan Blvd

Final Scenario - Full Development of site and Turner Road Precinct

Signals - Fixed Time Coordinated Cycle Time = 80 seconds (User-Given Phase Times)

Phase times specified by the user

Sequence: Split Phasing

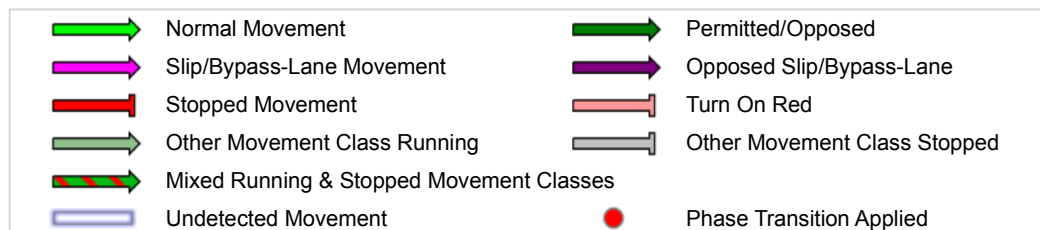
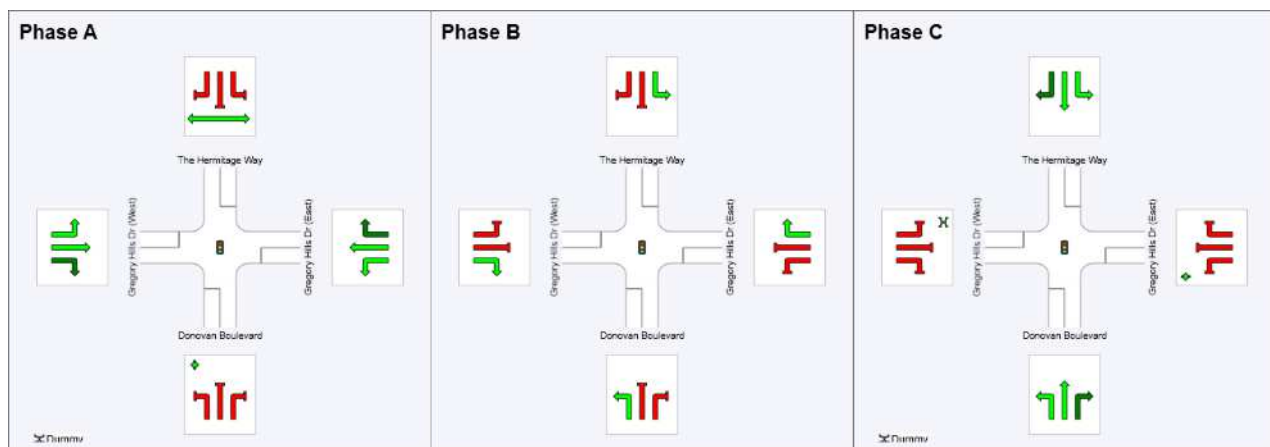
Movement Class: All Movement Classes

Input Sequence: A, B, C

Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Reference Phase	Yes	No	No
Phase Change Time (sec)	0	46	63
Green Time (sec)	40	11	11
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	46	17	17
Phase Split	58 %	21 %	21 %



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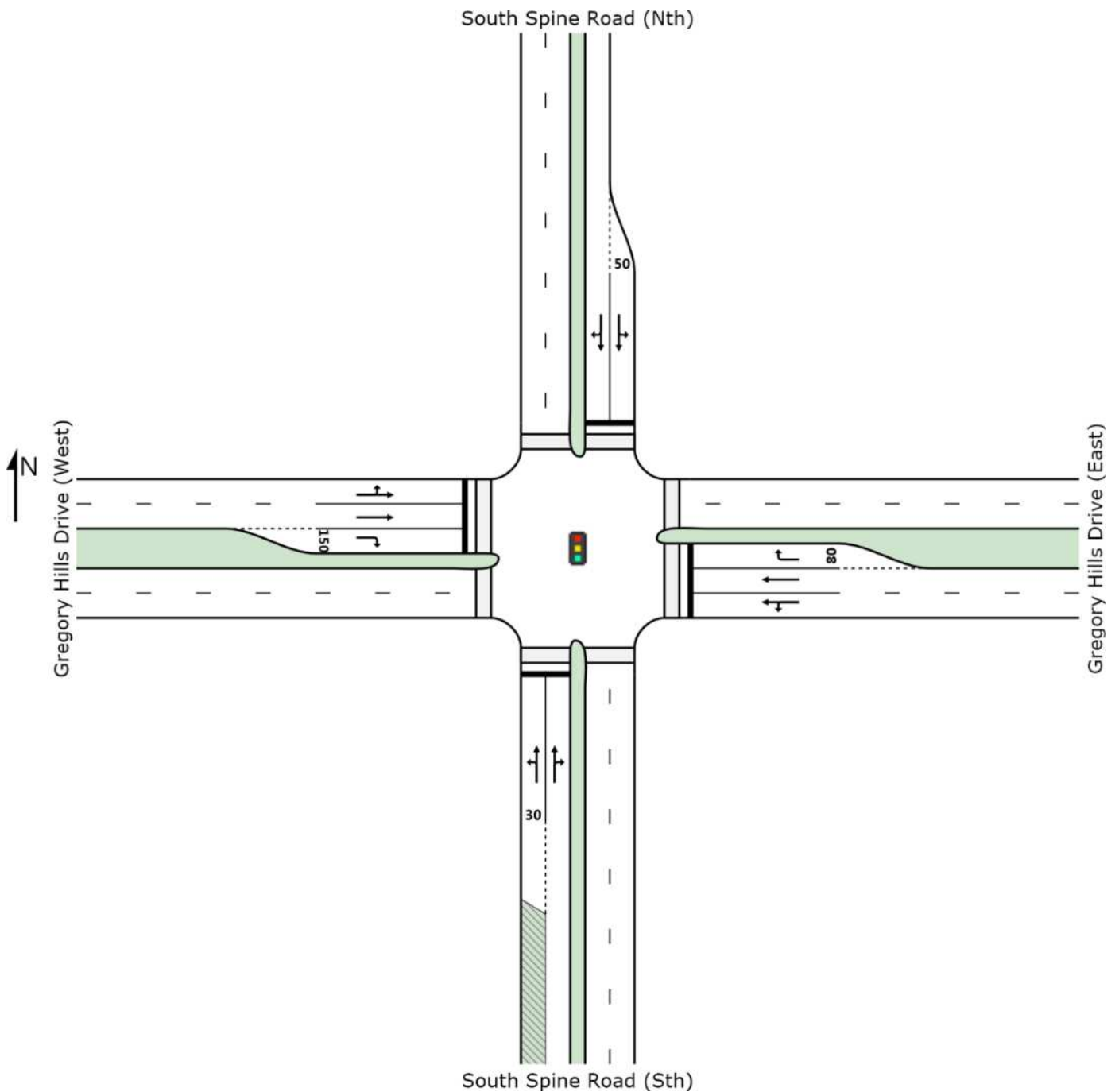
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SITE LAYOUT

Site: AM End - Gregory Hills Dr/South Spine Rd

Final Scenario - Full Development of site and Turner Road Precinct
Signals - Fixed Time Isolated



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