

Stockland  
**Castle Ridge Retirement Resort**  
Traffic Assessment

Rev E | 7 August 2020

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 248255

Arup  
Arup Pty Ltd ABN 18 000 966 165



**Arup**  
Level 10 201 Kent Street  
Sydney NSW 2000  
Australia  
[www.arup.com](http://www.arup.com)

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# 1 Introduction

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Stockland has commissioned Arup to undertake a transport assessment as part of the concept master plan and strategy for the Castle Ridge Retirement Resort. The assessment will support the planning submission to change the existing zoning of Castle Ridge Retirement Resort.

Castle Ridge Retirement Resort is an existing site located in the Northwest suburb of Castle Hill. The current accommodation at Castle Ridge consists of 113 independent living units (ILU's).

The project will ensure Castle Ridge Retirement Resort can provide the range of accommodation that future retirees are seeking.

## 1.1 Background

The Village was initially constructed in the early 1980's and now requires significant renewal. Since opening, the village has developed in a piecemeal fashion without the benefit of a site wide master plan.

The housing is outdated and does not have lift access to many of the apartments. Vehicular and pedestrian access is not legible and in many instances streets are too steep to walk.

The village's ageing dwellings and infrastructure requires a major redevelopment to ensure the long term viability of the village and attract the forthcoming baby boomer market whose expectations far exceed the current retiree market.

## 1.2 Scope

This traffic impact assessment supports the concept master plan application of Castle Ridge Retirement Resort (the site) and will outline the following:

- Existing transport conditions
- Forecast traffic generation
- Road network impacts
- Parking provisions
- Access arrangements
- Public transport availability

## 2 Existing conditions

### 2.1 Site location

The site sits within The Hills Shire Council local government area. It is located approximately 1km from the Castle Hill Town Centre and approximately 23km northwest of Sydney CBD. The site is located along Old Northern Road as indicated in Figure 1.

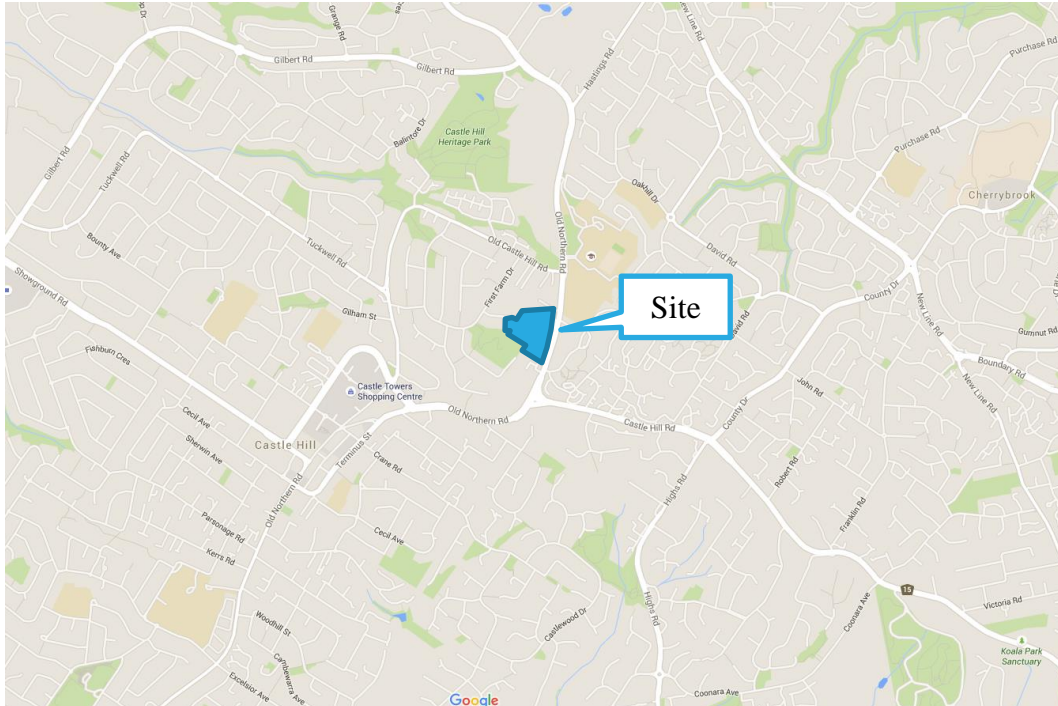


Figure 1: Site Location

### 2.2 Site accommodation

Castle Ridge Retirement Resort is an established retirement village consisting of a variety of accommodation types currently offering:

- 113 one, two and three bedroom independent living units
- A village Clubhouse including a library, hair salon, snooker, swimming pool/spa and café
- 145 car parking bays as shown in Figure 2.
- A village bus available for regular outings and for on-demand use by residents as shown in Figure 3.



Figure 2: Site layout showing parking locations



Figure 3: Village Bus



## 2.3 Road network and access

The site is directly accessed by both Palisander Place and Old Northern Road.

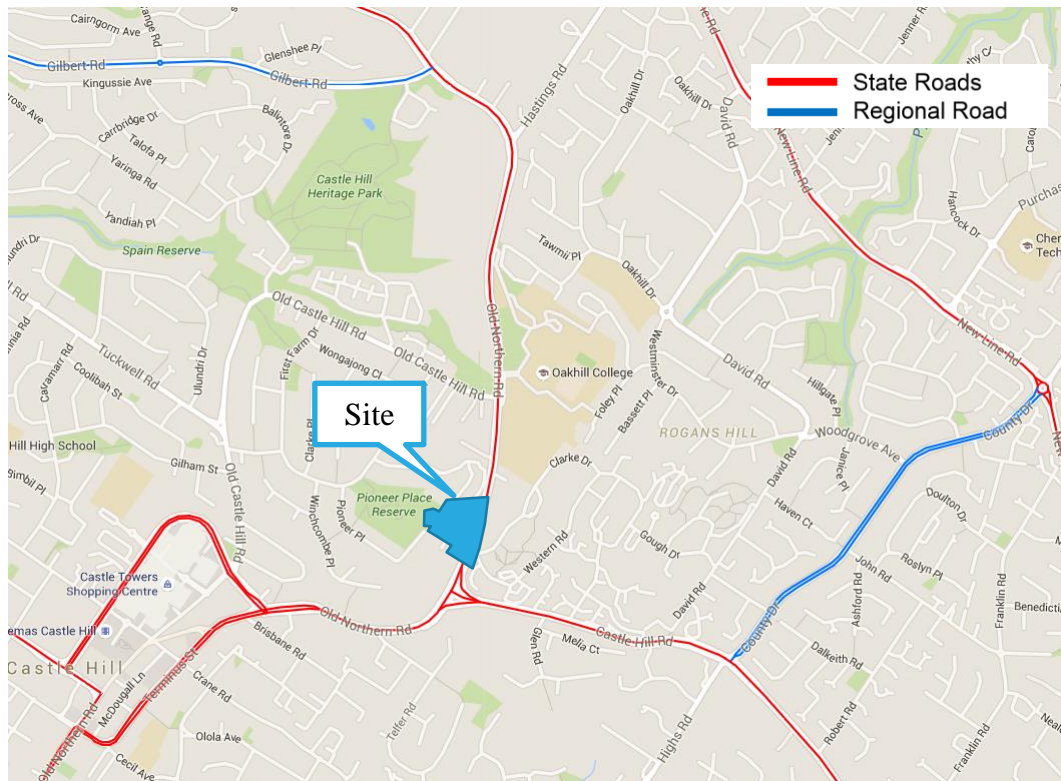


Figure 4: Classified roads around the site

Key roads surrounding the site include:

- **First Farm Drive**, which is a local road providing access to Palisander Place and the site. First Farm Drive provides a local loop to Old Castle Hill Road at a number of locations.
- **Old Castle Hill Road**, which is the main local collector access to surrounding state roads including Old Northern Road in the east and Pennant Street to the south. The road continues as a main street through the Castle Hill Town Centre.
- **Old Northern Road**, which is the main state road, fronting the site and providing direct left-in / left-out vehicular access to the site. Old Northern Road continues north to Wisemans Ferry via Dural and connects to Castle Hill Road in the south, becoming a major arterial to Baulkham Hills via Castle Hill.
- **Castle Hill Road** is a state arterial road, providing access to Pennant Hills Road to the east.

The internal road access is shown in Figure 5.



Figure 5: Existing internal road access

## 2.4 Walking

Pedestrian access to the site is generally poor and relatively undesirable due to the steep topography of the area and poor amenity due to traffic. There is a footpath along Old Northern Road leading to the site from the Town Centre as shown in Figure 6 and there is a pedestrian refuge crossing south of the access on Old Northern Road. There are no footpaths in First Farm Drive or Palisander Place.

The site is therefore mainly accessed by private vehicles or bus services.

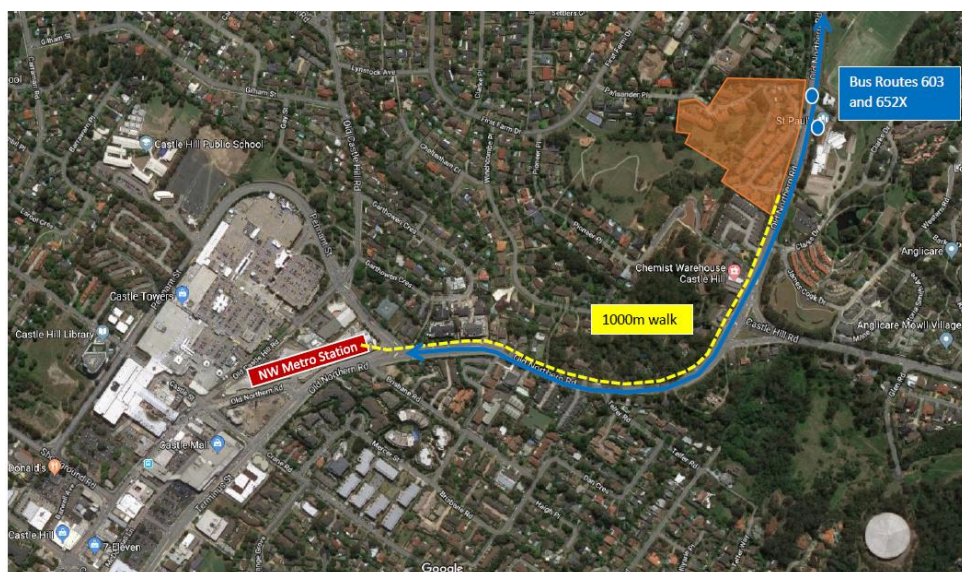


Figure 6: Footpath access to town centre



## 2.5 Public transport

Two bus stops located adjacent to the existing Old Northern Road access provide a number of bus services in the both directions as described in Table 1. A number of buses also operate from Old Castle Hill Road at the intersection of First Farm Drive.

Bus services are operated by Hills Bus and the network map is shown in Figure 7.

Table 1: Bus routes

Direction	Route	Destination
Northbound	603	Rouse Hill / Glenhaven
	652X	Knightsbridge
Southbound	603	Parramatta
	652X	Sydney

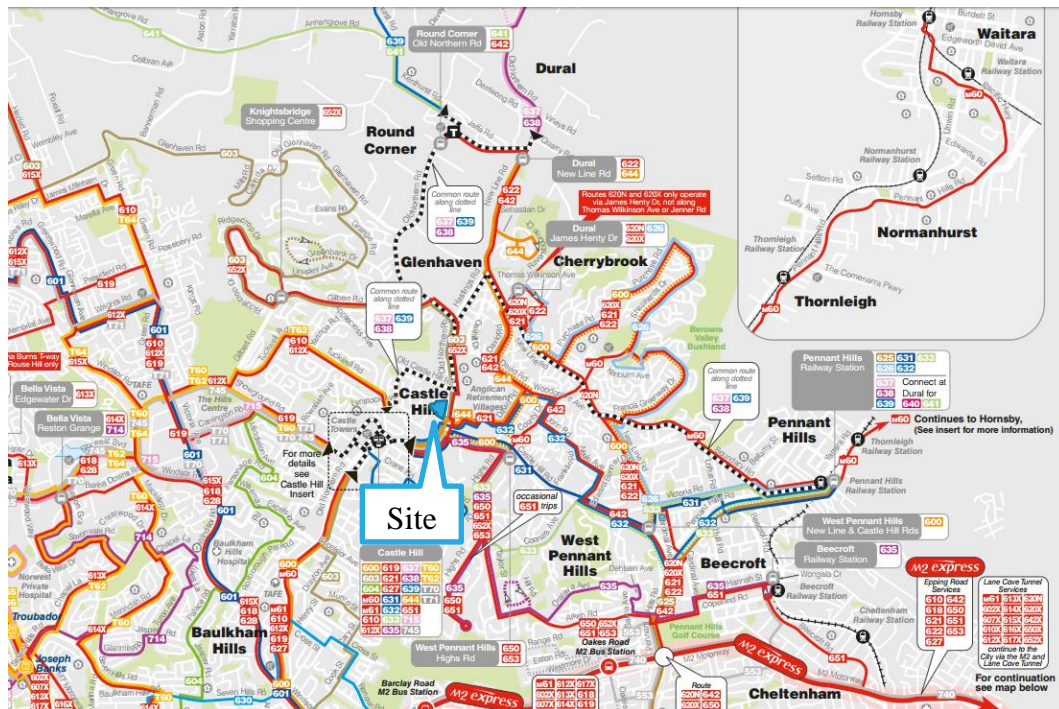


Figure 7: Bus routes (source: Hillsbus)



## 2.6 Traffic surveys

### Intersection counts

Intersection counts were carried out at the following intersections:

- First Farm Drive / Palisander Place
- Old Northern Road / Old Castle Hill Road

The surveys were undertaken during the following periods

- Thursday 11 February 2016, from 7am to 9am and 4pm to 6pm
- Saturday 13 February 2016, from 11am to 1pm

Road network peak hours were found to occur between 7:45am to 8:45am and 5:00pm to 6:00pm on weekdays, and between 11:45am to 12:45pm on weekends.

### Weekly counts

Seven day counts were carried out at both entrances, illustrated in Figure 8. The counts were undertaken at the two entry points to the Village to gain an understanding of the arrival and departure profiles of the existing occupants.

Counts indicate that peak arrivals and departures from the site occurred around 10am. This confirms that residents avoid the network peak hours on weekdays.

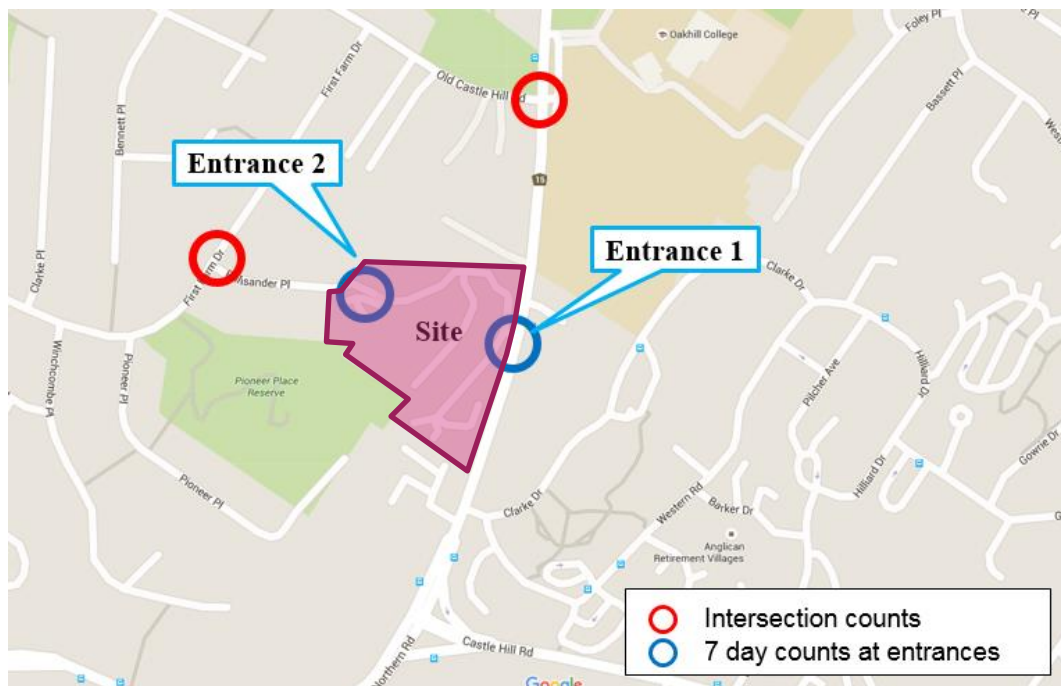


Figure 8: Traffic survey locations

## 2.6.1 Weekday profile

The average weekday arrival and departure profile to the site, from both entrances, is shown in Figure 9.

Peak entries and exits, to and from the site occurred outside of the road network peak. The following proportions of traffic related to the site, were found during the road network peak hours.

### AM weekday road peak, 7:45am to 8:45am

- 6 vehicles entering (5% of total daily vehicles entering)
- 10 vehicles exiting (6% of total daily vehicles exiting)

### PM weekday road peak, 5:00pm to 6:00pm

- 7 vehicles entering (5% of total daily vehicles entering)
- 9 vehicles exiting (6% of total daily vehicles exiting)

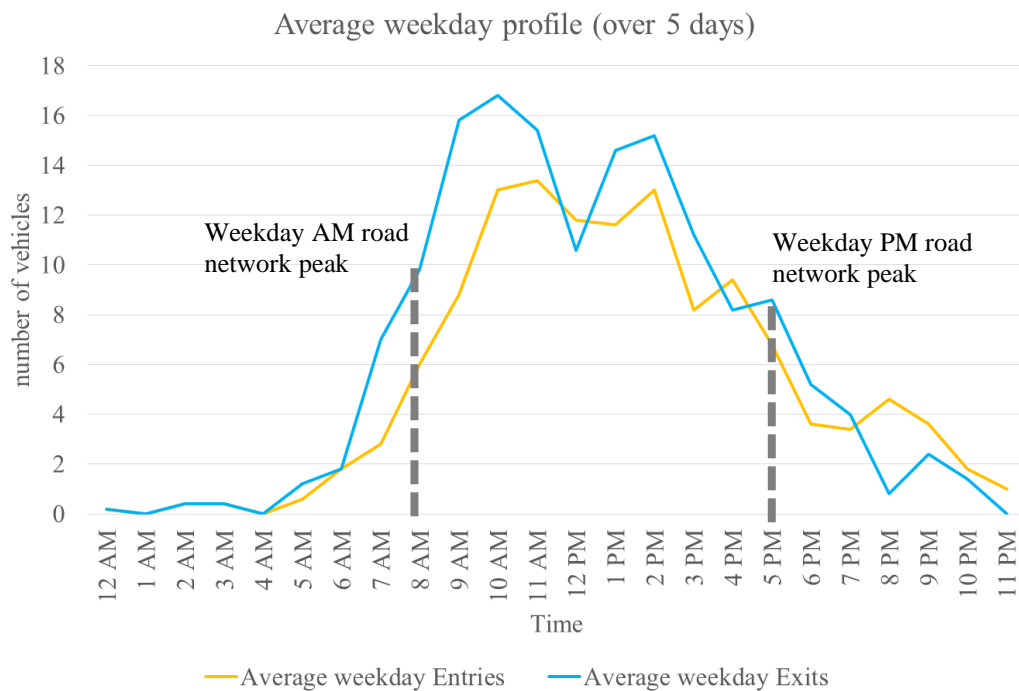


Figure 9: Average daily traffic entering the site

## 2.6.2 Weekend profile

The average weekend arrival and departure profile to the site, from both entrances, is shown in Figure 9.

The following proportions of traffic related to the site, were found during the weekend road network peak hours

### Weekend road peak 11:45am to 12:45pm

- 12 vehicles entering (8% of total daily vehicles entering)
- 11 vehicles exiting (12% of total daily vehicles exiting)

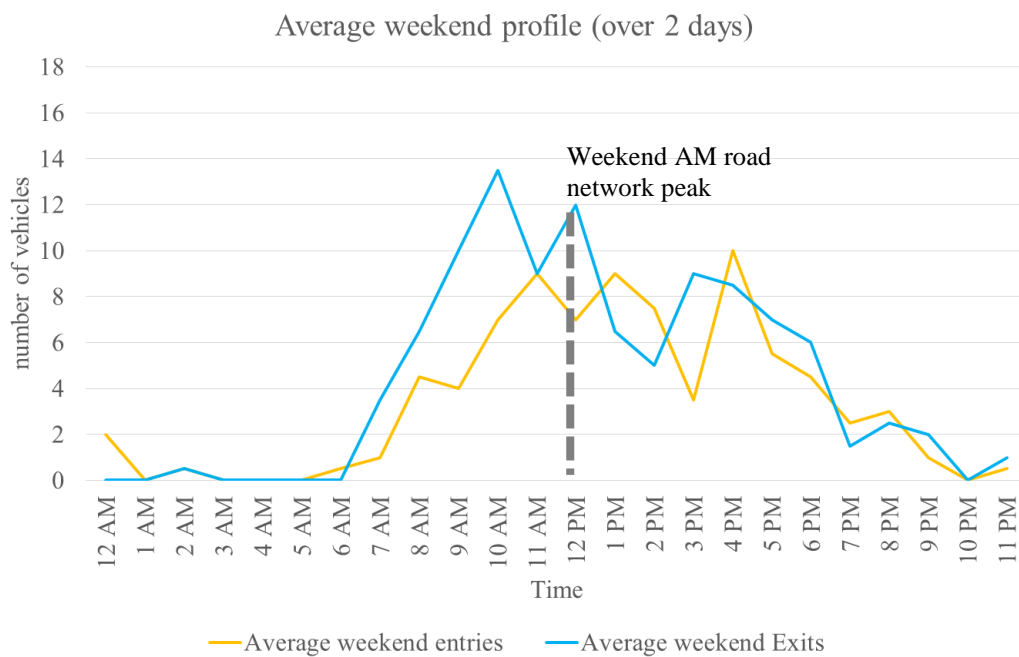


Figure 10: Average daily traffic entering the site



### 3 Planning proposal

This Traffic and Transport Assessment accompanies the master plan produced by Architectus, which involves the staged renewal of the Castle Ridge Retirement Resort in Castle Hill. The Master Plan seeks to amend the land use height and FSR controls for the site. Key objectives include:

- The master plan proposes to introduce ‘seniors housing’ as an additional permitted use in the existing E4 zone.
- Amend the maximum building height from 9 metres to a maximum of 24 metres.
- Introduce a proposed FSR of 1:1 across the site.

#### 3.1 Indicative master plan

An indicative master plan has been prepared by Architectus to support a Planning Proposal to amend the land use, height and floor space ratio controls for the site. The proposed master plan provides solutions to the site’s existing issues, whilst maintaining the Village’s landscaped character and minimising impacts on surrounding neighbours.

The indicative master plan will comprise of 247 new independent living units. A new purpose built community centre will also form part of the initial development stage. A model is shown in Figure 11.



Figure 11: Master plan

Source: Architectus Urban Design Report

## 4 Transport and parking assessment

### 4.1 Internal site roadways

The master plan proposes to improve accessibility for both pedestrians and vehicles on the site. The indicative layout of the internal road network is shown in Figure 12. It provides an efficient network with connections to the various future building arrangements and associated basement car parks.



Figure 12: Indicative road internal road network

Source: Architectus Urban Design Report

Proposed upgrades corresponding to Figure 12 include:

1. Upgraded with improved access and increased functionality.
2. Community hub + facilities at grade adjacent to new improved main entry.
3. New green linkages to improve visual connections back to lower level park land.
4. Park edge walkway and promenade.
5. Village green and community event space located adjacent to community facilities.
6. Existing trees to be retained within the park itself and other large trees in select areas.
7. Visual linkage of Pioneer Place Reserve to existing parkland as a 'borrowed landscape.'

## 4.2 External road access

### 4.2.1 Old Northern Road access driveway

The existing driveway access on Old Northern Road is proposed to be retained as the main site entry and exit point. Give the increase in activity on the site, a left turn deceleration lane would provide an improved access arrangement and reduce the impact on northbound traffic. A concept design is shown in Figure 13. The road verge in the vicinity of the site is 8.5m wide providing the opportunity for an additional lane.

Old Northern Road has a speed limit of 60km/h which requires a deceleration lane length of some 60m. It is recommended that the central pedestrian refuge be relocated to the end of the deceleration lane so that pedestrians are only crossing two lanes in each direction. This will require partial realignment of the road and result in a lengthened right turn bay into St Paul's Anglican Church. The power poles on the western verge appear to be set back sufficiently for this road widening to occur.



Figure 13: Potential left turn deceleration lane at existing site access

Warrants for turn treatments on the major road and unsignalised intersections are provided in the Austroads Guide to Road Design Part 4: Intersections and Crossings – General. The future trip generation for the site anticipates the following left turn traffic at the main entrance:

Peak Hour	Left turn entry	Old Northern Road northbound
AM Peak	10 veh/hr	740 veh/hr
PM Peak	13 veh/hr	1090 veh/hr
Saturday Peak	30 veh/hr	810 veh/hr



These traffic flows have been plotted on Figure A10 (b) from the guide to indicate that the warrants for a turn treatment are satisfied. An auxiliary (AUL) turn treatment on the major road may be a normal indented turn lane or be shielded by a parking lane, depending on the situation. See Figure A7 reproduced below from the guide.

The road verge in the vicinity of the site is 8.5m wide providing the opportunity for this additional lane as shown in Figure 14. The remaining verge width would contain a relocated footpath and similar landscaping quantity to the existing conditions. Further landscaping and roadways are proposed within the site boundary providing set back to the built form.



Figure 14: Existing road verge on Old Northern Road

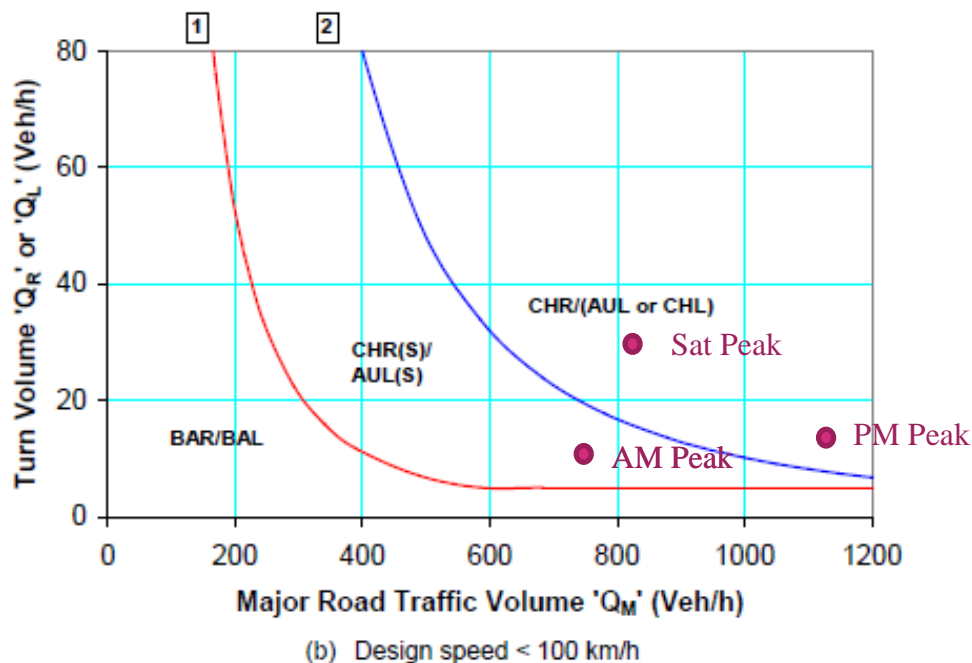


Figure 15: reproduced Figure A10 (b): Warrants for turn treatments on the major road and unsignalised intersections (From Austroads Guide to Road Design Part 4: Intersections and Crossings - General)

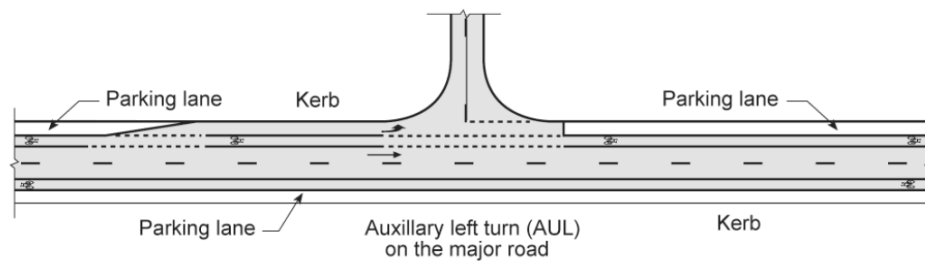


Figure 16: reproduced *Figure A7 Urban auxiliary lane (AU) turn treatments* (From *Austrroads Guide to Road Design Part 4: Intersections and Crossings - General*)

## 4.2.2 Old Northern Road access driveway exit to the south

Drivers exiting the site who wish to travel southbound are able to cross the two traffic lanes when there is a gap in the traffic to join the right turn bay into St Paul's Church access roadway. It is acknowledged that some drivers may choose to execute a U-turn at this point rather than travel into the roadway before turning around. It is suggested that a No U-turn sign be installed at this location as shown in Figure 17 to remove the U-turn and potentially 3 point turn movements being executed.



Figure 17: No U-turn signage location



Drivers may also choose to utilize the drop-off zone at Oakhill College adjacent to Old Castle Hill Road intersection with Old Northern Road. A right turn bay allows cars to turn into this facility.

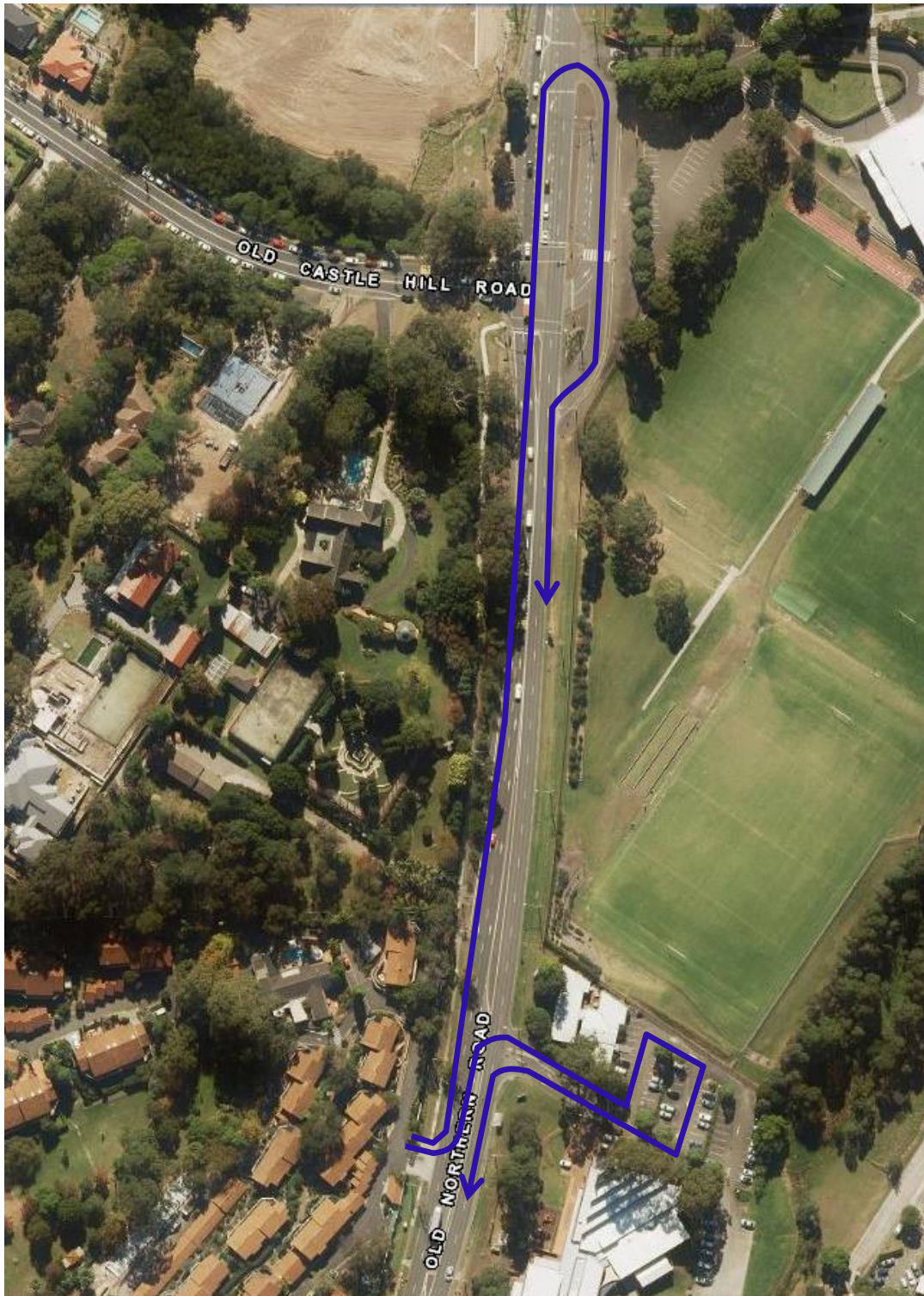


Figure 18: Possible right turn locations



Drivers are able to proceed on southbound journeys by using the main road system to circulate to the desired route as shown below.

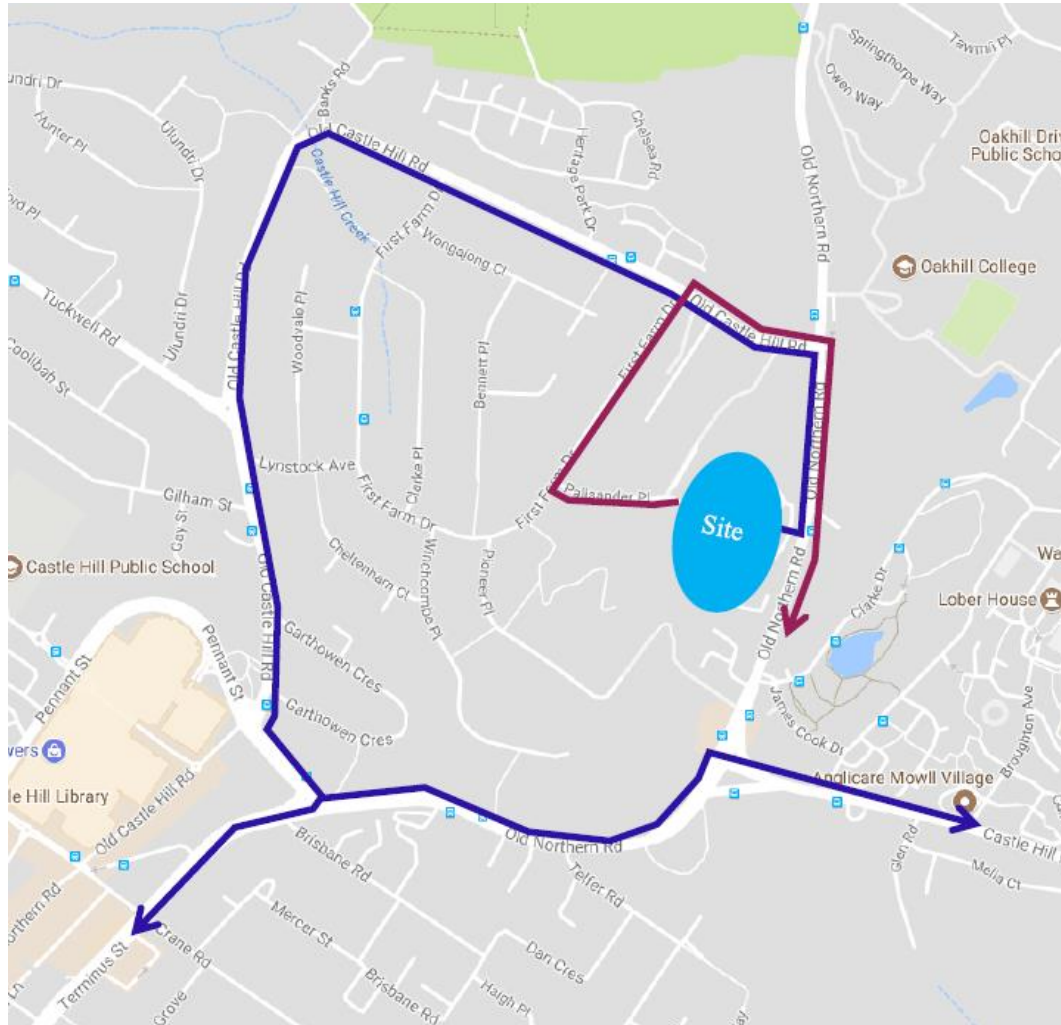


Figure 19: Alternative exit routes

### 4.2.3 Intersection upgrades

We understand that The Hills Shire Council is currently developing designs for a traffic signal upgrade at the intersection of Old Northern Road and Old Castle Hill Road and improvements to the intersection of Old Castle Hill Road and First Farm Drive. This upgrade will provide capacity and safety improvements to all road users.

#### 4.2.4 Relocation of the pedestrian refuge

It is proposed to relocate the pedestrian refuge some 40m south of its existing position as shown in Figure 20. The refuge is likely to be used primarily for access to the bus stops on each side of Old Northern Road and for access to the church. There is no continuous footpath along the eastern side of Old Northern Road limiting access to other locations. The existing and future pedestrian routes are shown below. Given that there will be a number of pedestrian access points to the site similar to those currently existing, the relocation of the crossing will have minimal impact on the overall accessibility for pedestrians.

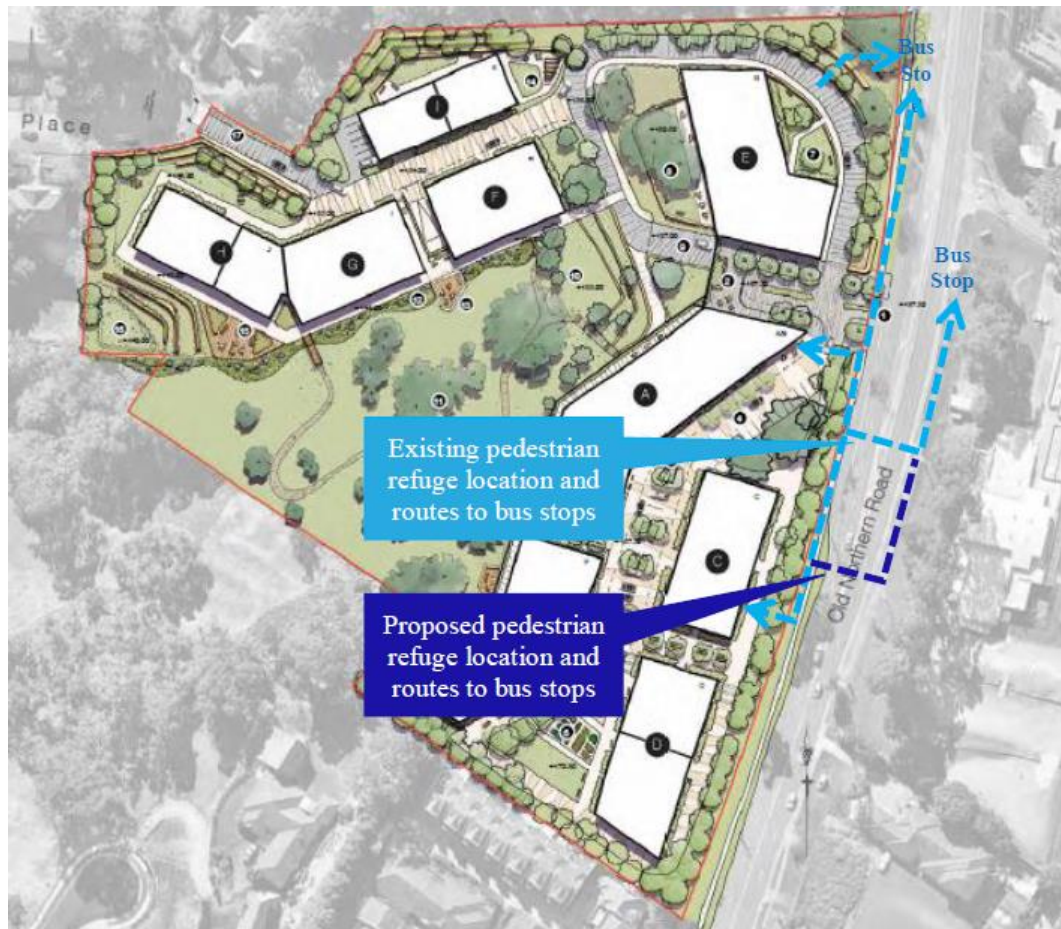


Figure 20: Relocated pedestrian refuge

## 4.3 Parking and service assessment

### 4.3.1 Access to parking

The parking access arrangements of the indicative master plan are shown in Figure 12 with three access points illustrated for access to basement car parks. Off street parking is located over a number of basement level car parks. Entries and exits to the basements are situated at a safe 50 metres away from the entrance, and will be accessed by ramps. All basement access points can be approached from either site gateway. A formal drop-off forecourt is provided adjacent to the Old Northern Road gateway.

### 4.3.2 Service area

A central service area is proposed to be located under Building E with a 4.5m height clearance. The design height is in accordance with the Hills Shire Council DCP (HSDCP) guidelines. The service area will be a centralised point for deliveries and larger waste collections. A secondary service area is available at Building C.

### 4.3.3 Car parking provision

The HSDCP suggests parking rates for Nursing and Convalescent Homes, unless otherwise specified by Seniors Living SEPP.

Given that the proposal is for independent living units, it does not apply to the “hospitals, nursing or convalescent homes” category as referenced in the DCP Parking Provision (Figure 21).

Land Use Class	Land Use	Required Minimum Provision
Health	Hospital	1 space per 2 beds for visitors plus
	Nursing and Convalescent Homes	1 space per 1.5 employees plus 1 space per 2.5 visiting medical officers Unless otherwise specified by Seniors Living SEPP.

Figure 21: HSDCP Table 1 parking rates for hospital / nursing and convalescent homes (does not apply for proposal)

Additionally, the SEPP Seniors Living does not apply to the site as the proposal is not seeking a change in land use, which is currently zoned E4. The SEPP guideline provides a rate of 0.5 car spaces per bedroom (Paragraph 50 of the Seniors Living SEPP).

Based on the characteristics of the proposal, the residential buildings rate has also been considered. The parking rate under the “Residential Flat Buildings and Multi Dwelling Housing” under the HSDCP, is shown in Figure 22. Based on this rate, a parking provision of approximately 600 spaces is recommended by the HSDCP.



Land Use Class	Land Use	Required Minimum Provision
Residential	Dwelling	1 space per dwelling
	Residential Flat Buildings and Multi Dwelling Housing	1 space per 1 bedroom unit 2 spaces per 2 or 3 bedroom unit 2 visitor spaces per 5 units

Figure 22: HSDCP Table 1 parking rates for residential developments

The provision of 600 car spaces is considered excessive considering the nature of the development. As such, a car parking provision rate between the SEPP and the HSDCP residential rate will be considered to be suitable.

The proposal will utilise a rate of 1.3 car spaces per apartment, or a total provision of 388 car parking spaces (Table 2). This rate is based on an average of the SEPP rate and the HSDCP rate for residential developments.

Table 2: Proposed parking provision

Master plan proposed	Rate	Parking provision
247 units	1.3 spaces per unit	321 spaces

#### 4.3.3.1 Summary of likely parking requirement

Parking guidelines from the Seniors Living SEPP and HSDCP rates have been considered for the proposal. An average rate of 1.3 car spaces per bedroom has been derived based on both guidelines. This equates to a total provision of 388 car parking spaces.

## 4.4 Village Bus

The existing village bus will be available for regular outings and for on-demand use by residents. This provides an ongoing alternative to the use of private vehicles for trips by groups of residents and can be booked as an on-demand service by village residents.

## 4.5 Road network analysis

This section investigates the impacts the site would have on the following key intersections:

- First Farm Drive / Palisander Place
- Old Northern Road / Old Castle Hill Road

Based on the traffic surveys, the following peak hours (highest traffic volume through the intersection) were found:

- AM Peak - 7:45am to 8:45am
- PM Peak - 5:00pm to 6:00pm
- Saturday Peak - 11:45am to 12:45pm

For the purpose of this study, the above peak hour times will be used in the traffic modelling.

### 4.5.1 Forecast traffic generation

#### Using RMS Guidelines

The RMS Guide to Traffic Developments provides indicative traffic generation rates for “Housing for aged and disabled persons”. The rates recommended are:

- 2.1 vehicle trips per dwelling per day
- 0.4 trips per dwelling during weekday peaks

Based on the 247 proposed units, the site would generate some 519 trips per day.

#### Using first principles

The proposal is an increase of 2.2 times the number of existing units. Weekly survey counts found the average number of daily trips to the site to be 277 trips per day. By factoring up the number of existing daily trips by the increase in number of proposed units, an estimated 610 trips per day is estimated upon completion of the site.

Table 3: Existing attributes compared to future

Scenario	Number of units	Two-way daily trips
Existing	113 units	277 trips
Completion of site	247 units	610 trips

## Arrival profile

As a conservative estimate to traffic generation, the 610 additional trips using first principles will be used.

The existing profile in which residents arrive and leave the site can be assessed based on the seven day counts discussed in section 2.6. The traffic generated in each peak hour, by the completion of the site, is shown in Table 4.

This is derived by multiplying the daily 610 trips generated, by the proportion of residents arriving during the peak hour. As a conservative estimate, it is assumed that trips generated to the site would leave within the same hour.

Table 4: Arrival profile and traffic generated

Road network peak period	Existing proportion of daily arrivals and departures to site during the hour	Existing two-way trips generated by site during the hour (trips)	Trips generated by master plan (daily trips multiplied by proportion)	Additional trips generated
AM - 7:45am to 8:45am	6%	16 trips	37 trips	21 trips
PM - 5:00pm to 6:00pm	6%	16 trips	37 trips	21 trips
Saturday - 11:45am to 12:45pm	12%	23 trips	74 trips	51 trips



### 4.5.2 Trip distribution

The proportion of trips generated to the site in each direction is shown in Figure 23. It is assumed that a similar split will be adopted for trips leaving the site.

Entrance 1 along Old Northern Road was found to be used more frequently than Entrance 2 along Palisander Place. The trip distribution, shown in Figure 23 is based on the proportion of vehicles travelling through each intersection and access entry.

As there is no right turn permitted into the site from the Old Northern Road, vehicles coming from the north of the site would use the Palisander Place entrance. The remainder would use the main entrance along the Old Northern Road. It is assumed that vehicles would exit using the same access they used to enter the site.

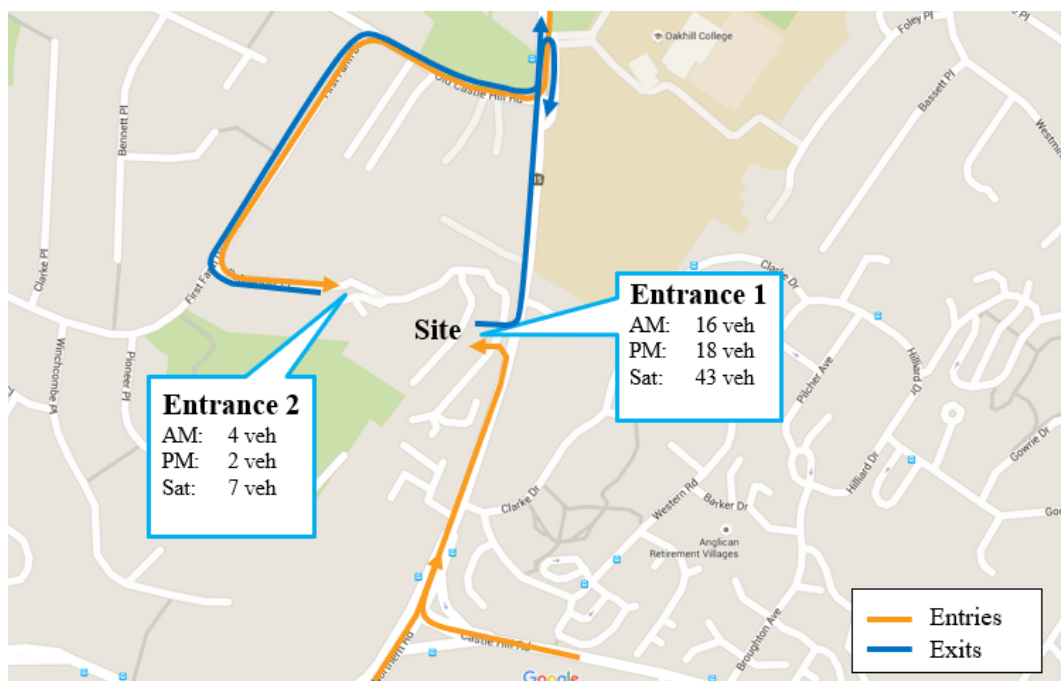


Figure 23: Additional Trip distribution to the site

### 4.5.3 Site access via Palisander Place

The internal site road system currently allows vehicles to circulate to either access point and this will be maintained with the proposed design. This means that drivers will choose the most appropriate access point based on approach and departure routes. Based on the existing pattern of traffic activity we have assigned future peak hour trips that are predicted to use Entrance 2 to Palisander Place as shown in Table 5. These traffic flows are well within the environmental capacity of a local street of 200 vehicles per hour as defined in the Guide to Traffic Generating Developments (RMS).

It is not uncommon for local streets to allow parking on both sides of the street requiring cars to wait to pass other cars. Given the extremely low traffic volumes, this practice is considered acceptable.

Table 5: Palisander Place existing and future traffic flows

	Eastbound vehicles/hour				Westbound vehicles/ hour			
	Palisander Place Existing	Existing development	Additional development traffic	Total future traffic	Palisander Place Existing	Existing development	Additional development traffic	Total future traffic
AM Peak	3	0	4	7	13	6	0	19
PM Peak	15	0	0	15	9	1	2	12
Sat Peak	7	1	6	14	9	3	6	18

#### 4.5.4 Traffic modelling

The intersections have been assessed using RMS approved SIDRA software. The existing intersection performance is assessed in this report in terms of the following three factors for each intersection.

- Degree of Saturation
- Average Delay (Seconds per vehicle)
- Level of Service

In urban areas, the traffic capacity of the major road network is generally a function of the performance of key intersections. This performance is quantified in terms of Level of Service (LoS), is based on the average delay per vehicle. LoS ranges from A = very good to F = unsatisfactory (see Table 6).

Table 6: Level of service criteria for intersections

Level of Service	Average delay (seconds)	Description
A	Less than 14	Good operation
B	15 to 28	Good with acceptable delays and spare capacity
C	29 to 42	Satisfactory
D	43 to 56	Operating near capacity
E	57 to 70	At Capacity. At signals, incidents will cause excessive delays. Roundabouts require other control mode
F	Greater than 71	Unsatisfactory with excessive queuing

Another common measure of intersection performance is the degree of saturation (DoS), which provides an overall measure of the capability of the intersection to accommodate additional traffic. A DoS of 1.0 indicates that an intersection is operating at capacity. The desirable maximum degree of saturation for an intersection is 0.9.

### 4.5.5 Traffic assessment

The results of the surrounding intersections are summarised in Table 7. This includes the following scenarios:

- Existing 2016 scenario to calibrate to existing traffic conditions
- Existing 2016 traffic with addition of site generated traffic

The existing condition of the intersections operate at an efficient level of service B or C.

The analysis has assumed the existing intersection configurations. The upgrades being considered by The Hills Shire Council are likely to improve operations of these intersections.

Based on a conservative modelling approach, the completion of the site is unlikely to affect the key intersections modelled with no change in the level of service. The SIDRA results are shown in Table 7.

Table 7: SIDRA results

Intersection	Scenario		LoS	Delay	DoS
Old Northern Road / Old Castle Hill Road	AM Peak	Existing	B	26	0.81
		Existing+Development	B	27	0.83
	PM Peak	Existing	B	21	0.83
		Existing+Development	B	22	0.83
	Saturday Peak	Existing	B	22	0.70
		Existing+Development	B	22	0.70
First Farm Drive / Palisander Place	AM Peak	Existing	C	43	0.69
		Existing+Development	C	47	0.73
	PM Peak	Existing	C	34	0.62
		Existing+Development	C	35	0.63
	Saturday Peak	Existing	B	21	0.37
		Existing+Development	B	26	0.52



## 5 Conclusion

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The site sits within the Hills Council local government area. This Traffic and Transport Assessment accompanies the master plan produced by Architectus, which involves the staged renewal of the Castle Ridge Resort in Castle Hill. The Master Plan seeks to amend the land use height and FSR controls for the site. Key findings are:

- The master plan proposes to introduce ‘seniors housing’ as an additional permitted use in the existing E4 zone.
- The maximum building height is proposed to be amended from 9 metres to a maximum of 24 metres with a proposed maximum FSR of 1:1 across the site.
- Seven day counts indicate that peak arrivals and departures from the site occurred around 10am. This confirms that residents avoid the network peak hours on weekdays.
- The site has an efficient bus route which services the various key locations directly.
- The existing village bus will be available for regular outings and for on-demand use by residents providing an ongoing alternative to the use of private vehicles.
- Pedestrian access to the site is generally poor and relatively undesirable due to the steep topography of the area although there is a footpath along Old Northern Road leading to the site from the Town Centre.
- The master plan proposes improving accessibility for both pedestrians and vehicles in the site. This provides an efficient network to provision the future building arrangements.
- Off street parking is located in basement car parking areas, with four different access points within the site.
- Parking guidelines from the Seniors Living SEPP and HSDCP rates have been considered for the proposal. An average rate of 1.3 car spaces per bedroom has been derived based on both guidelines.
- The proposal will utilise a rate of 1.3 car spaces per bedroom, or a total provision of 321 car parking spaces
- A service area, located at a lower level car park, with 4.5m clearance is proposed.
- Some on-street parking is proposed to be distributed around the site for general visitor use.
- The existing condition of the intersections operate at an efficient level of service B or C. Based on a conservative modelling approach, the completion of the site is unlikely to affect the key intersections modelled.
- The existing driveway access on Old Northern Road is proposed to be retained as the main site entry and exit point. Give the increase in activity on the site, a left turn deceleration lane could be provide to improve access arrangements and reduce the impact on northbound traffic.