Reference: 0760tn01v2

TECHNICAL NOTE

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9 September 2019

TSA
Level 15
207 Kent Street
Sydney NSW 2000

Attention: Kenny Lim

Santa Sophia College

Response to SSDA Submissions

Dear Kenny,

This Technical Note has been prepared by Ason Group on behalf of the Catholic Education Diocese of Paramatta (CEDP) (the Applicant). This accompanies a Response to Submissions Report in support of State Significant Development Application (SSD_9772) for the proposed Santa Sophia Catholic College (the Proposal) located on the corner of Fontana Drive and the future road 'B', between Red Gables Road and Fontana Drive, in Box Hill North (the site).

This Technical Note addresses the issues raised by the community and stakeholders during exhibition of the Environmental Impact Statement (EIS), undertaken between 30 May 2019 and 26 June 2019. During exhibition, agency submissions were received from:

- The Hills Shire Council (Council).
- NSW Department of Planning (DPIE).
- NSW Environment Protection Authority (EPA).
- Heritage Council of New South Wales.
- Office of Environment and Heritage (OEH).
- Roads and Maritime Services (RMS).
- Transport for NSW (TfNSW).
- Sydney Water.

The key matters raised in the agency and public submissions include:

- Height of the proposal;
- Built form and design excellence;
- Carparking; Kiss and drop; Traffic and transport;
- Open space and landscaping;

- Residential amenity;
- Location of the school; and
- Operational matters.

Sections below provide a response to the individual issues raised by The Hills Council (Council); Roads & Maritime Services (RMS) and Transport for NSW (TfNSW), noting that in formulating these responses we have also relied on our recent consultation with TSA; Catholic Education Diocese Parramatta (CEDP); Celestino; and others in the broader Project Team.

Perhaps most importantly, we have referenced our meeting with Council officers on 13 August 2019; this meeting provided the opportunity to discuss the key issues raised by Council (in most instances being the same issues raised by the stakeholders) and provide resolution and/or an agreed way forward in regard to mitigating any future impacts associated with the development of the College.

1 The Hills Council Submission

1.1 Staff Parking

The Council submission provides the following in regard to the staff car park:

Limited detail is provided in relation to the parking relied upon off site. It is noted that the description of the proposal identifies "Off-site staff car parking". Clarification is sought as to whether this forms part of this application or, as anticipated, whether it is intended to be lodged as a future application. In any event the limitations on the use outside of standard school hours are questioned given the limited opportunities for on-site parking or availability of public transport.

Ason Group provides the following response:

The level of staff parking required for the College has been determined in consultation with the CEDP, in turn based on CEDP's understanding of future peak staff parking demand given due consideration of peak staff numbers and future travel modes. Further to these considerations, a total of 110 parking spaces has been identified by the CEDP as the peak total requirement. This parking provision will be supplemented by the provision of a robust Green Travel Plan which will detail strategies to be implemented by the College to encourage the use of alternative modes of transport to travel to and from the Site.

In the short term, this staff parking will be provided within a temporary car park immediately adjacent to the Site (see **Figure 1**) until such time that the permanent parking area is provided. A formal staff car park will be provided within the immediate vicinity of the College, and that the temporary staff car park would remain in place until such time as the new car park is fully operational. The provision of this permanent car park will be subject to future agreement between the CEDP and Celestino; this new car park would be strictly reserved for College staff during school periods, outside of which it could be utilised by the general public.

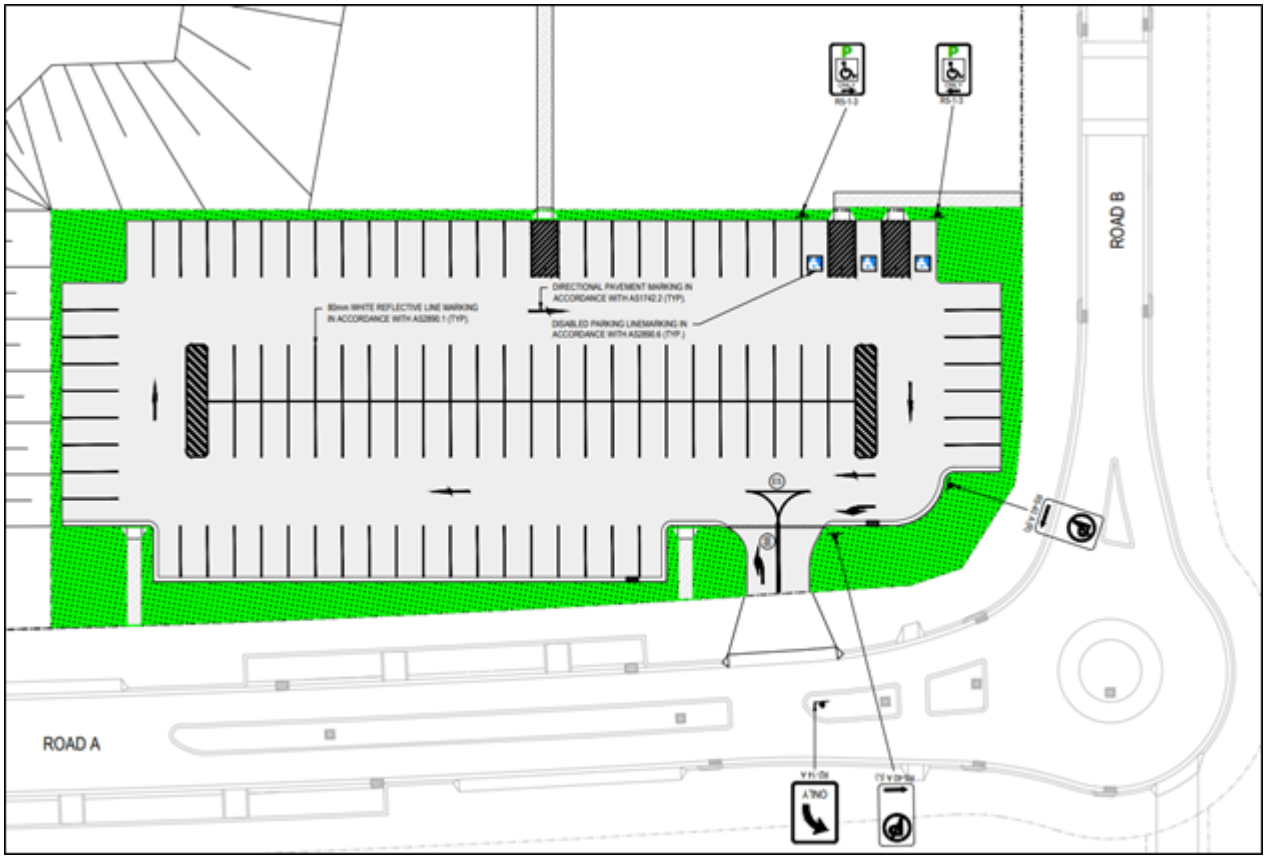


Figure 1: Temporary Carpark

With reference to the broader issue of parking provision – **an issue raised by DPIE and RMS but not Council** – Ason Group notes that in our August 2019 meeting with Council it was agreed that the provision of 110 parking spaces was appropriate for the College, specifically giving consideration of the following:

- A state primary or high school on the Site (or indeed anywhere in Sydney) is generally not required to provide any parking spaces under Department of Education guidelines; as such, the provision of any parking (and again, in the instance of the College a level of parking anticipated to meet staff demand) is an advantage.
- There is significant on-street capacity in the vicinity of the Site; again, it is this general capacity (usually in residential streets within 400m of a school site) that is relied upon by the Department of Education for new public schools. While there is no expectation of the College generating a significant demand for this on-street parking, it nonetheless is available if required; as agreed with Council, the use of this on-street parking would be no different to the use of localised on-street parking in the vicinity of any school across Sydney.

Finally, there is a need to balance the parking demands of staff (and parents / carers) attending the College and visitors and staff of the Town Centre; it would be disadvantageous to both CEDP and Celestino if the parking available for the College, Town Centre and surrounding streets was not sufficient to meet demand, and as such the peak demand (for all users) has been carefully calibrated. It is the case that some parking restrictions will be required within the Town Centre (both on-street in regard to drop-off / pick-up – DOPU –

demand, and off-street through time management) to appropriately cater for competing demands, but this is no different to any other Town Centre or school site.

1.2 Drop-off & Pick-Up

The Council submission provides the following in regard to the provision of drop-off and pick-Up facilities:

It is also noted that the pick-up drop-off area will not be sufficient once the school has reached full capacity. Given the location within the town centre, it is recommended that further measures be put in place to support student pick up and drop off.

Ason Group provides the following response:

The TAIA provides detailed calculations in regard to the peak drop-off / pick-up (DOPU) demand of the College at full capacity, and acknowledges that some of that demand will need to be met elsewhere in the vicinity of the Site; again, this is no different to any other school, although once again it is at least the case that the College is providing significant dedicated DOPU facilities immediately adjacent to the College (where, once again, a public school need not provide any).

In the early years of operation, the DOPU facilities are forecast to provide for all DOPU demand, but demand would exceed capacity after 2 or 3 years of operation. At this time, it is expected that significant on-street capacity would still be available within the immediate vicinity of the Site (i.e. elsewhere on-street in the Town Centre) but regardless, as with general parking, additional on-street capacity for DOPU is readily available within 200m of the Site.

To supplement the DOPU area provided adjacent to the College on Road B, an additional DOPU area with 20 spaces will be provided south of the intersection of Red Gables Road and Fontana Drive along Fontana Drive adjacent to the hockey fields. As agreed with Council, further to the provision of either a pedestrian crossing on Red Gables Road east of Fontana Road (see further below) this area is easily and safely accessible for (senior) students, and is located where a potential overflow of DOPU demand would have little if any significant impact on traffic operations.

Notwithstanding the above, it is also acknowledged that parents / carers will park off-street within the Town Centre, for example in the future supermarket car park (expected to be provided at grade directly to the north of the Site) or in other local streets (without parking restrictions such as proposed within the Town Centre itself). This is perfectly acceptable behaviour, as observed in local centres every morning and afternoon where parents/carers combine a DOPU trip with (most often) a shopping trip. The expected use of the (for example) future supermarket parking spaces should not therefore be seen as providing for the DOPU demand, but as providing for a genuine shared trip demand.

It must again be acknowledged also that while there is expected to be a high proportion of student DOPU demand in the early years of operation, the College will in the medium (and then long) term be centrally located within a residential suburb, with the majority of students being drawn from the local area. Complementing school bus services (see also **Section 4.4**) will be public bus and active transport services and infrastructure within The Gables, all of which will reduce DOPU over time. Ason Group have previously prepared a Memo discussing the Pick-up / Drop-off Demand and is appended in **Attachment 1**.

Finally, and as agreed with Council, the CEDP will need to provide a range of operation management strategies to ensure the safe and efficient operation of the DOPU areas. While final management plans will need to be finalised prior to the opening of the College, Ason Group provides the following broad recommendations:

- All the key roads providing DOPU facilities – including Fontana Drive south of Red Gables Road – must be constructed prior to the opening of the College; this includes kerb, guttering and all footpaths/shared paths so as to ensure that students can access the DOPU facilities from the outset.
- Further to the above, as a minimum a pedestrian crossing will need to be installed across Red Gables Road east of Fontana Drive to ensure safe passage with the College (and the Town Centre more generally) and the Fontana Drive DOPU (and local playing fields and residential areas south of Red Gables Road more generally). The responsibility for the provision of the crossing will require determination further to consultation between Council, CEDP and Celestino.
- The DOPU areas will need to operate under supervision to maximise safety and efficiency. The key components of a future operational management plan for the DOPU areas will include:
    - Staff monitoring student and driver activities;
    - The provision of an 'active' zone within which the DOPU actually occurs so as to prevent vehicles weaving in and out of the DOPU area;
    - Student names on car visors to assist in the efficient operation of the DOPU; and
    - Student marshalling areas away from the roadway to maximise the safety of the DOPU operations.

Finally, it is anticipated that the operation of the DOPU areas would be reviewed at a minimum annually during the first few years of College operations in consultation with Council, RMS and local bus operators.

1.3 Intersection of Red Gables Road & Fontana Drive

The Council submission provides the following in regard to the design of the intersection of Red Gable Drive & Fontana Drive:

The subject application relies upon two underdetermined development applications currently before Council. DA 2051/2018/ZB relates to the reconstruction of Red Gables Road fronting the school and beyond. This application also includes the northern extension of Fontana Drive beyond the school site frontage terminating at a roundabout at Road B and the planned traffic lights at the Red Gables Road and Fontana Drive

intersection. The RMS has objected to those planned traffic lights (even based on projected traffic volumes) on a number of occasions. The applicant for DA 2051/2018/ZB has recently amended that application to replace these traffic lights with a priority control / stop sign intersection however the intent to eventually install traffic lights is still identified in that submission. That intent carries through all the traffic modelling and reporting associated with the current planning proposal lodged over the rest of the town centre site to increase building heights and FSR in response to the school, the separate application 1542/2019/ZB with Council under assessment for the two town centre Roads A and B relied upon for the school and the school SSDA 9772 itself. Until these applications are resolved in association with the RMS, it is recommended that the proposal be held in abeyance. It would be appreciated if any relevant comments from RMS or Transport NSW be forwarded to Council for review.

Ason Group provides the following response:

As previously discussed with Council and RMS, it is view of Ason Group (and Council, CEDP and Celestino) that traffic signals at the intersection are more than appropriate given the high pedestrian demands in the area generated not only by the School but also the Town Centre and adjacent recreational facilities. As such, there remains an intention to continue to advocate for the traffic signals in the future.

However, and as agreed with Council, this issue should not impact on the progression of the application, specifically as modelling undertaken by Ason shows that the intersection will operate at a good Level of Service as a priority intersection even following the development of the College and Town Centre. Again therefore, this issue should not be considered as an impediment to the SSDA.

2 Department of Planning, Industry & Environment Submission

2.1 Parking Provision

The DPIE submission provides the following in regard to the provision of staff parking:

The proposed number of car parking spaces is insufficient for the proposed size of the development. The Hills Development Control Plan 2012 (THDCP) requires the provision of 227 car parking spaces for the proposed development. 110 car parking spaces are proposed to be provided off site in the proposed town centre car parking area through a shared usage agreement organised by the developer. No information has been provided in relation to the design and timing of construction of this car parking or details provided of the shared parking strategy with the owner/developer.

Overall, the proposed development relies heavily upon street parking and the proposed town centre retail parking for users accessing the school. Insufficient justification has been provided to demonstrate that these arrangements would be adequate.

Ason Group provides the following response:

A detailed response to these same issues is provided in **Section 1.1** above, but in summary a future agreement between the CEDP and Celestino guarantees that a formal staff car park will be provided within the immediate vicinity of the College, and that the temporary staff car park would remain in place until such time as the new car park is fully operational.

Importantly, it is also noted that the staff car park will be provided separately to the required parking for the Town Centre, i.e. the provision of the staff car park will not result in a discounted quantum of parking across the Town Centre, which would be provided in accordance with the relevant DCP requirements. Notwithstanding, the staff car park would be available to general visitors outside of school periods, i.e. during holidays and on weekend, where it would essentially provide overflow capacity.

It is our understanding that a DA for the temporary car park (DA 29/2020/HA) was lodged with Council in July 2019.

2.2 Drop-Off & Pick-Up

The DPIE submission provides the following in regard to the provision of drop-off and pick-up facilities:

The Transport and Accessibility Impact Assessment submitted with the EIS identified that the proposed drop-off/pick-up area would be insufficient for the proposed maximum capacity of the school. Additional drop-off/pick-up spaces should be provided, or robust evidence submitted which demonstrates that the number of drop-off/pick-up spaces would be adequate for the proposed size of the development.

Ason Group provides the following response:

A detailed response to these same issues is provided in **Section 1.2** above, but in summary it has been agreed with Council that additional DOPU capacity will be provided in Fontana Drive south of Red Gables Road to meet the peak DOPU demand.

2.3 ELC Design

The DPIE submission provides the following in regard to the design of the Early Learning Centre car park:

The proposed Catholic Early Learning Centre car parking area interferes with the manoeuvrability of the waste management vehicles identified in the waste management report. The car parking area must be redesigned to allow for the safe manoeuvrability of waste management vehicles.

Ason Group provides the following response:

Detailed swept path analysis has been undertaken of a private waste collection vehicle manoeuvring within the Catholic Early Learning Centre (CELC). These are provided in **Attachment 2**. This swept path analysis indicates that Council's waste collection vehicle is able to manoeuvre within the Site safely. Servicing would occur outside of the peak operating hours of the CELC, thereby ensuring that there is no interaction between the waste collection vehicle and other vehicles/pedestrians.

2.4 Bus Layover

The DPIE submission provides the following in regard to the design of the College bus layover:

Details of the location, length and width of the proposed bus layover area on Fontana Drive must be provided.

Ason Group provides the following response:

As discussed in the TAIA, a meeting was held between Celestino, TSA Management, Ason Group, Winim Development, Transport for NSW (TfNSW) and Busways on 17th December 2018 to discuss the requirement for bus facilities on Fontana Drive along the western boundary of the Site. It was established that a minimum of 5 bus bays are to be provided along Fontana Drive along the western boundary of the College to accommodate the future demand of the School. The provision and design of the facilities have been discussed and agreed with TfNSW and Busways. A plan has been provided in **Attachment 3** which details the dimensions of the bus bays.

3 Roads & Maritime Services Submission

3.1 School Zones

The RMS submission provides the following in regard to the provision of appropriate School Zone facilities:

A significant number of vehicles and pedestrians will access the site at the start and end of the school day. School Zones must be installed along all roads with a direct access point (either pedestrian or vehicular) from the school. School Zones must not to be provided along roads adjacent to the school without a direct access point. Road Safety precautions and parking zones should be incorporated into the neighbouring local road network:

- *40km/hr School Zones are to be installed in Fontana Drive, future Road B and Red Gables Road in accordance with the following conditions.*
- *Council should ensure that parking, drop-off and pick-up zones and bus zones incorporated are in accordance with Roads and Maritime standards.*

Roads and Maritime Services (Roads and Maritime) is responsible for speed management along all public roads within the state of New South Wales. That is, Roads and Maritime is the only authorised organisation that can approve speed zoning changes and authorise installation of speed zoning traffic control devices on the road network within New South Wales.

Therefore, the Developer must obtain written authorisation from Roads and Maritime to install the School Zone signs and associated pavement markings and/or remove/relocate any existing Speed Limit signs. To obtain authorisation, the Developer must submit the following for review and approval by Roads and Maritime, at least eight (8) weeks prior to student occupation of the site:

a) A copy of Council's development Conditions of Consent,
b) The proposed school commencement/opening date,
c) Two (2) sets of detailed design plans showing the following:
- *School property boundaries*
- *All adjacent road carriageways to the school property.*
- *All proposed school access points to the public road network and any conditions imposed/proposed on their use.*
- *All existing and proposed pedestrian crossing facilities on the adjacent road network.*
- *All existing and proposed traffic control devices and pavement markings on the adjacent road network (including School Zone signs and pavement markings).*
- *All existing and proposed street furniture and street trees.*

School Zone signs and pavement marking patches must be installed in accordance with Roads and Maritime approval/authorisation, guidelines and specifications

All School signs and pavement markings must be installed prior to student occupation of the site.

The Developer must maintain records of all dates in relation to installing, altering, removing traffic control devices related to speed.

Following installation of all School Zone signs and pavement markings the Developer must arrange an inspection with Roads and Maritime for formal handover of the assets to Roads and Maritime. The installation date information must also be provided to Roads and Maritime at the same time.

Note: Until the assets are formally handed over and accepted by Roads and Maritime, Roads and Maritime takes no responsibility for the School Zones/assets

Ason Group provides the following response:

Ason Group agrees with each of these RMS requirements, which we expect would be mandated under future Conditions of Consent.

3.2 Staff Parking & Traffic Management

The RMS submission provides the following in regard to the provision of staff parking and general traffic management:

Car parking shall be provided to Council's satisfaction. It is noted the proposed on-site car parking spaces are well below the Council's DCP requirements. Roads and Maritime recommends that a Traffic Management Plan to be provided for the proposed development showing the development does not compromise road safety and traffic efficiency on the surrounding road network.

Ason Group provides the following response:

Please refer to the Ason Group response in **Section 1.1** in regard to the provision of staff parking, noting again that Council has specific agreed with the amount of staff parking provided.

With regard to the preparation of a site-specific Traffic Management Plan (TMP), Ason Group and CEDP readily agree that a TMP will be prepared. This is to be an evolving document, to be reviewed annually (or as required) during the first years of the College operations so as to readily respond to the changing College demands and broader development within the Town Centre and indeed across The Gables.

3.3 Bus Services and Facilities

The RMS submission provides the following in regard to the provision of appropriate School Zone facilities:

The proponent is to consult with Transport for New South Wales (TfNSW) and bus companies regarding the proposed bus facilities.

Ason Group provides the following response:

Ason Group agrees with this RMS recommendation; additional discussion in regard to future bus services is provided in **Section 4.4**. As per **Section 1.4**, discussions have been held with TfNSW and Busways which have conformed the suitability of the design and provision of the bus layover area.

3.4 General Provisions

The RMS submission provides the following in regard to general traffic management and safety:

All vehicles are to enter and leave the site in a forward direction.

Suitable pedestrian paths/facilities should be provided within the vehicle accessible areas to corral pedestrians to appropriate crossing locations.

Any proposed landscaping and/or fencing must not restrict sight distance to pedestrians and cyclists travelling along the footpath.

Ason Group provides the following response:

Ason Group agrees with each of these RMS requirements, which we expect would be mandated under future Conditions of Consent.

3.5 Intersection of Red Gables Road & Fontana Drive

The RMS submission provides the following in regard to design of the intersection of Red Gables Road & Fontana Drive:

Furthermore, Roads and Maritime advises that if the intersection of Red Gables Road/Fontana Drive is required to be signalised, consent is required from Roads and Maritime under Section 87 of the Roads Act 1993. The installation of the traffic signals is dependent on general warrants in accordance with Roads and Maritime requirements for Traffic Signal Design – Section 2 Warrants.

Roads and Maritime will review the proposal for traffic signals at this intersection when the general warrants are met at this location and the supporting documents are submitted to Roads and Maritime for review and assessment.

Ason Group provides the following response:

A detailed response to these same issues is provided in **Section 1.3**, but in summary it is agreed with Council that the signalisation of the intersection of Red Gables Road & Fontana Drive is not required as part of the SSDA. Notwithstanding, it remains the contention of other key stakeholders that the signalisation of the intersection should be revisited in the future given the significant safety benefits of providing such in close proximity to the College and Town Centre.

4 Transport for NSW Submission

4.1 Planning Proposal Traffic Assessment

The TfNSW submission provides the following in regard to the transport assessment supporting the SSDA:

The Transport Accessibility & Impact Assessment (TAIA) relies upon the findings of the Gables Town Centre Planning Proposal Traffic Assessment, which was prepared to support the proposal to the Hills Shire Council to amend the planning controls on the site. Section 9.4 of the TAIA makes a comparison between the

estimated traffic generated between both reports to conclude that the future road network would be able to accommodate future movements associated with the development.

However, it is unclear as to whether the findings of the road network assessment have been reviewed by Roads and Maritime or TfNSW.

Recommendation

It is recommended that DP&E request that the planning proposal traffic assessment is included as part of this SSD application.

Ason Group provides the following response:

It is understood that the Planning Proposal upon which the TAIA references is currently on exhibition and currently under review. Furthermore, the Traffic Impact Assessment has been included in **Attachment 4**.

4.2 Trip Generation & Mode Share Assumptions

The TfNSW submission provides the following in regard to the trip generation assumptions used in the SSDA transport assessment:

The assumed trip generation rates, used to assess the traffic impacts of the SSD, have been based upon travel surveys of the St Mark's Catholic College (SMCC) at Stanhope Gardens. It should be noted that the findings of the surveys reflect the site's surrounding land uses, road infrastructure and public transport services.

In this case, the Box Hill North Precinct is undergoing development with dwellings and road infrastructure still under construction. As such, the surrounding urban environment may not result in similar mode share (car passenger, walking, cycling, bus) in the opening years of the new school. It is noted that the land surrounding the school is mostly undeveloped with new subdivisions being constructed to the south and northwest of the site (within 1.5km radius) and as such, there could be a limited walking catchment in the early years of school operations.

Recommendation

Having regard for the above, a sensitivity analysis would be appropriate for this assessment. The analysis could consider a higher car passenger mode share, reduced walking mode share and subsequently higher trip generation rate in the first two years of operation.

Ason Group provides the following response:

A detailed response to this issue is provided in the TAIA, while it is again noted that additional DOPU capacity is to be provided in Fontana Drive south of Red Gables Road which would meet peak College demands. Furthermore, it should be noted that the intersection assessment undertaken in the TAIA determined that the key intersections would operate at a good Level of Service and with sufficient capacity to accommodate additional traffic.

4.3 Drop-Off & Pick-Up Assessment

The TfNSW submission provides the following in regard to the provision of drop-off and pick-Up facilities:

Section 8.4 of the TAIA compares the pick-up and drop-off provisions at SMCC and states that 24 spaces would be required to accommodate the demands generated by the entire school population. The TAIA notes that the 15 pick-up/drop-off spaces at the SMCC are insufficient as a queue of some 80m (approx. 27 car lengths) beyond the school boundaries was observed. A total of 12 on-street pick-up/drop-off spaces are proposed to accommodate the initial stages of the school (not at the 1,860 student capacity) with the intention to expand the provision should future demand require it.

There is the risk, as the precinct develops, that there could be limited scope to expand the on-street pick-up/drop-off facilities due to competing priorities or road space constraints. This could result in on-street queueing and subsequently unsafe pick-up/drop-off behaviours in the future, due to the current provisions being overcapacity. Therefore, appropriate facilities should be reserved for future use, when/if required.

Recommendation

An adequate pick-up/drop-off facility should be provided that accommodates the likely demand generated by the school. Road space, beyond the initial requirements, should be preserved and released for future use as demand increases over time. This allocation would then be reviewed as the school approaches the approved capacity.

Ason Group provides the following response:

Please refer to Ason Group response in **Section 1.2**.

4.4 School Bus Service

The TfNSW submission provides the following in regard to the bus services:

The provision of any new or additional public bus services to the site would be subject to demand and funding. There is the potential that the future provision of public bus services may not align with the completion or

satisfy the operational requirements of the school. In this regard, the Applicant may have to procure school private bus services to accommodate future demands.

Recommendation

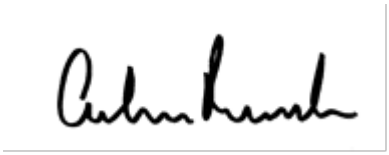
The Applicant should note that school private bus services may need to be funded and implemented by the school.

Ason Group provides the following response:

Discussions have been held with CEDP that highlight the potential future requirement for private bus services as the College student population continues to grow. These private bus services would provide services within the Gables Precinct and would be subsidised by the College as required; a determination in regard to such would be a key area for assessment as part of the ongoing College management reviews.

We trust the above is of assistance to you and the Project Team; please do not hesitate to contact Thomas Lehmann or the undersigned should you or the key stakeholders referenced above have any further queries.

Kind regards,



Anton Reisch
Principal Transport Consultant | Ason Group
Email: anton.reisch@asongroup.com.au

Attachment 1

Pick-Up / Drop-Off Parking Demand Memo

MEMO
0760l05v2

20 August 2019

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Suite 5.02, Level 5, 1 Castlereagh Street
Sydney, NSW 2000
www.asongroup.com.au

Attention: **Kenny Lim; Project Manager**

RE: **Santa Sophia College, The Gables – Pick-up / Drop-off Parking Demand**

Overview

This Memo has been prepared as requested to address the following:

1. Concerns raised by the assessment authority relating to the pick-up and drop-off facilities at full development

2. The growth profile for the school pick-up and drop-off facilities from year of opening 2021 to the projected full capacity at 2030.

Ason Group prepared the Transport Accessibility & Impact Assessment (TAIA) for the proposed Santa Sophia College, The Gables (the School). The School proposed 12 spaces along the northern frontage with Road B and it was identified as part of the TAIA that an annual review of the travel behaviour of students would be undertaken to assess the capacity and demand of the pick-up / drop-off facilities as the school operational characteristics developed. It has been requested that the final solution for pick up and drop off facilities now be submitted to the DPIE.

Further, TfNSW raised comments regarding the adoption of a higher trip generation during the critical AM and PM peak period for the first two years of operation. This increased trip rate has been requested to consider the developing nature of the Gables Precinct with respect to the number of cycling and walking trips.

As such, this Memo provides a discussion of the demand of the pick-up / drop-off area with consideration for the proposed provision. The objective of this memo seeks to;

- To detail the pick-up / drop-off area demand in accordance with TfNSW comments, and
- Assess the capacity of the separate pick-up / drop-off areas for the primary and secondary school.

Findings

- At Year of Opening, the Road B pick-up /drop-off area provides sufficient for the pick-up / drop-off demand.
- As per TfNSW comments, higher trip rates were adopted and these indicate that in 2022, the demand would be 150 and 139 vehicles during the AM and PM peak period respectively. This requires an additional 3 parking spaces. Supplementary parking would need to be provided for pick-up / drop-off and it is anticipated that these could be provided within the Town Centre internal road network.
- The assessment at year 2023 the lower trip rates detailed in the TAIA would apply, however with the growth of the school, a demand of 130 and 118 vehicles would need to be accommodated during the AM and PM peaks respectively. This exceeds the capacity of the Road B pick-up / drop-off area and single supplementary parking space would be required.
- Given the projected growth, the analysis demonstrates that ultimate solution works from a numerical perspective. The strategy to deal with the growth needs to be considered and we would consider this be addressed as part of an annual TMP in response to a condition of consent where the developing operational characteristics are reviewed and submitted to Council to inform the growing demands for pick-up / drop-off.

Technical Assessment

Assessment Characteristics

As per the TAIA, the key characteristics of the proposed School are as follows:

- 1,860 students including:
  - 840 primary school students, and
  - 1,020 secondary school students.
- Trip Generation Rates:
  - Primary School:
    - AM Peak: 0.46 trips per student
    - School PM Peak: 0.48 trips per student
  - Secondary School:
    - AM Peak: 0.35 trips per student
    - School PM Peak: 0.35 trips per student
- 12 pick-up /drop-off spaces on the Road B frontage.

Pick-up / Drop-off Demand – Road B Capacity Assessment

Ason Group has undertaken an assessment of the pick-up / drop-off demand looking at the yearly student population increase for the School until the pick-up / drop-off demand exceeds the capacity of Road B. The population of the School as it grows is detailed in the table below.

Table 1: School Population Growth

Years	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Primary	325	485	560	695	780	840	840	840	840	840
Secondary	195	356	515	661	782	877	949	985	1,002	1,018
Total Students	520	841	1,075	1,356	1,562	1,717	1,789	1,825	1,842	1,858

Of relevance to the assessment of the pick-up / drop-off area, the School also provides a Before & After School Care for between 300-400 primary school students only. This requires students to be signed in/out and operates between 6AM–9AM and 4PM-10PM. While the School population grows, the number of students in the Before & After School Care has been proportionally reduced based on the total number of primary school students. Similarly, information provided by the School indicates that approximately 10% of secondary school students would have before and after school activities. This has been reflected in our analysis by reducing the number primary and secondary school students utilising the pick-up / drop-off area during the critical AM and PM peaks.

As previously mentioned, TfNSW raised comments regarding the adoption of a higher trip generation during the critical AM and PM peak period for the first two years of operation. This increased trip rate was to consider

the developing nature of the Gables Precinct with respect to the number of cycling and walking trips. The TAIA adopted a future mode share of 23% for cycling and walking combined, as such this has been added to the trip generation rate of the School, however it is anticipated that there would be some cycling and walking trips during the first two years of operations.

The following trip generation rates have been adopted for the first two years of operation:

- Primary School:
  - AM Peak: 0.66 trips per student
  - School PM Peak: 0.768 trips per student
- Secondary School:
  - AM Peak: 0.55 trips per student
  - School PM Peak: 0.55 trips per student

Application of these trip generation rates and the pick-up / drop-off demand to the proposed School capacity at Year of Opening is detailed in **Figure 1** and **Figure 2**.

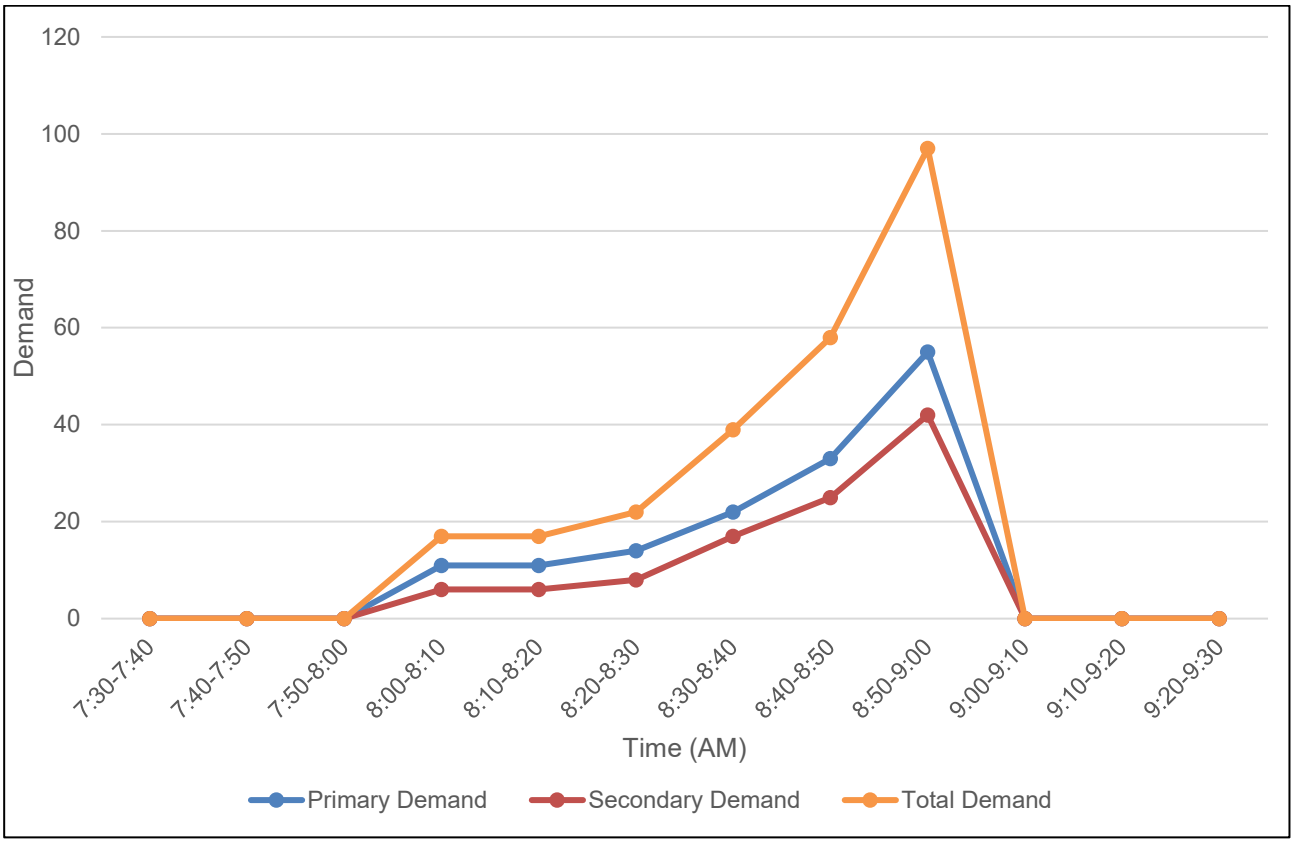


Figure 1: AM Peak Period Pick-Up / Drop-Off Demand – Year of Opening

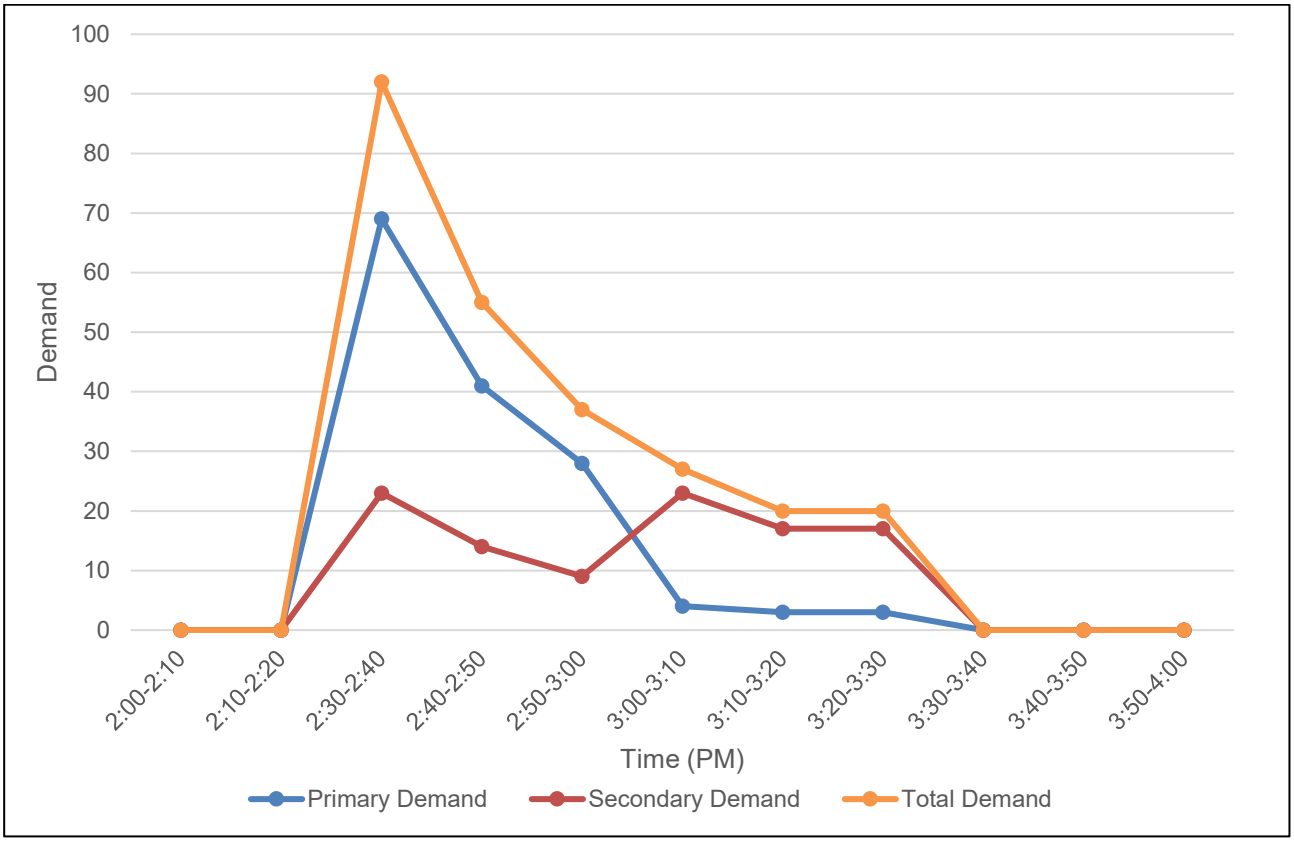


Figure 2: PM Peak Period Pick-Up / Drop-Off Demand – Year of Opening

The above figures indicate that the maximum total demand is 97 and 92 vehicles during the AM and PM peak periods respectively. As discussed in the TAIA, the provision of 12 pick-up / drop-off spaces on-street along Road B, a traffic management plan would also be implemented to facilitate reduced times to pick-up / drop-off students. It is envisaged that a traffic management plan could facilitate a turnover rate of 1 vehicle per space every minute. This corresponds to a capacity of 120 vehicles along the Road B frontage which would accommodate the AM and School PM peak. As such, Road B is able to accommodate the pick-up / drop-off demand at Year of Opening.

With reference to Table 1, **Figure 3** and **Figure 4** detail the pick-up / drop-off demand of the School in 2022.

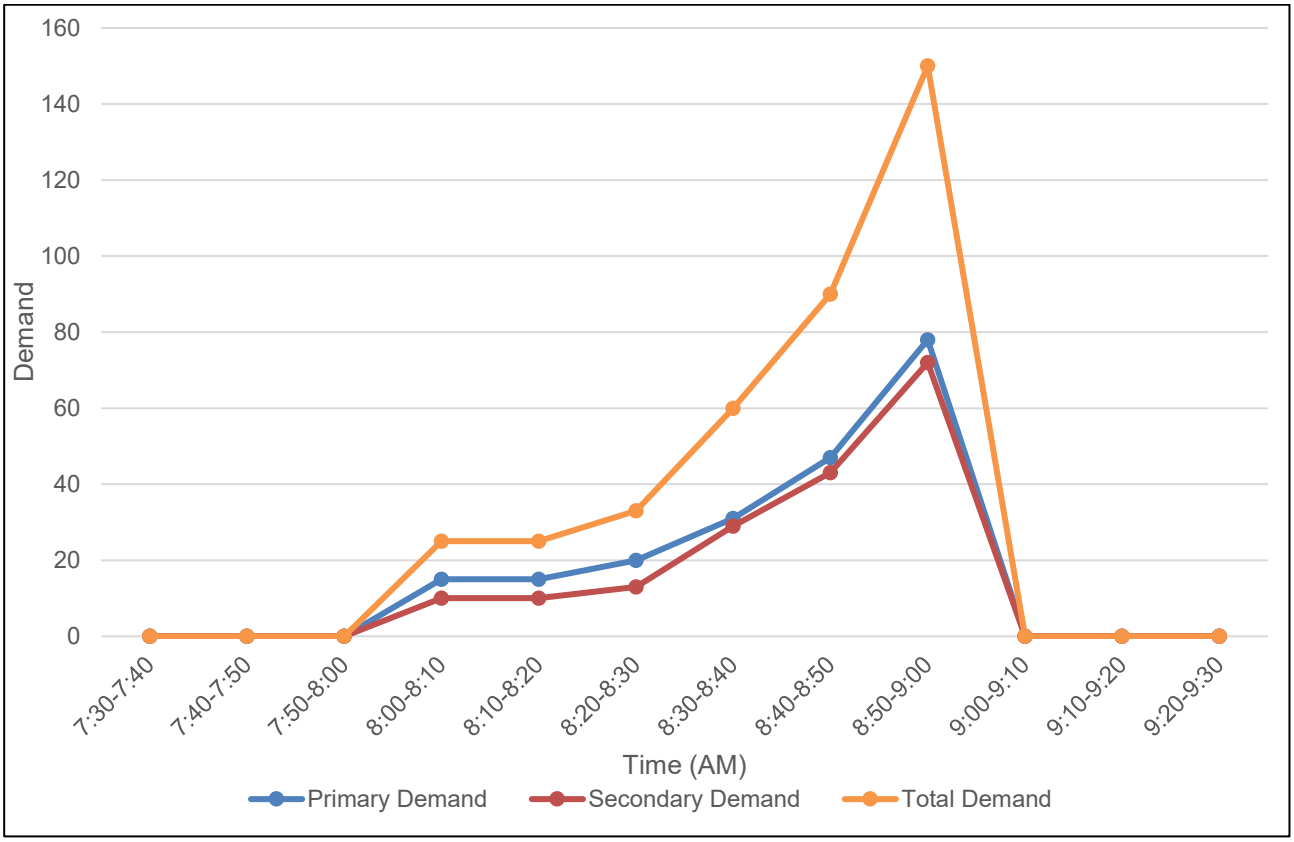


Figure 3: AM Peak Period Pick-Up / Drop-Off Demand, TfNSW Trip Generation Rate – 2022

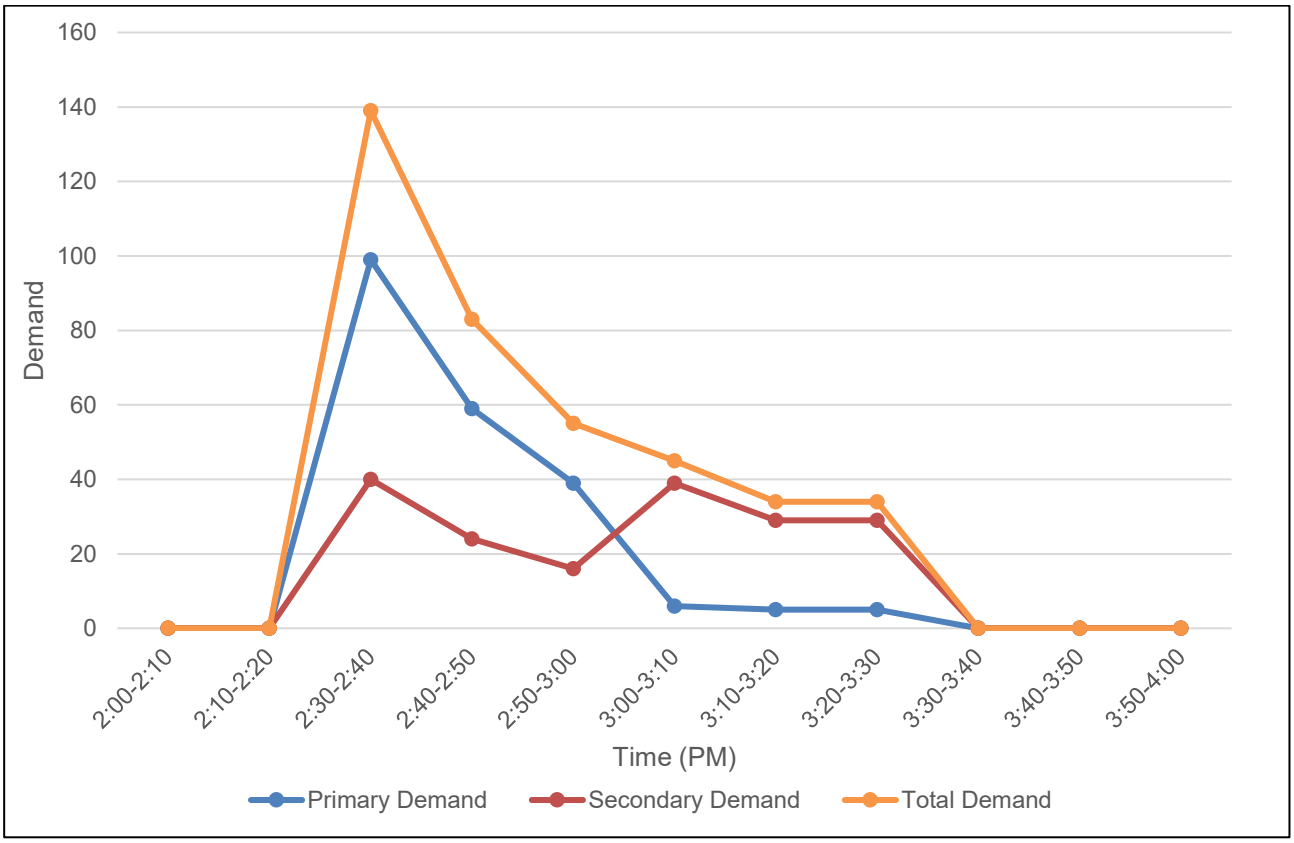


Figure 4: PM Peak Period Pick-Up / Drop-Off Demand, TfNSW Trip Generation Rate – 2022

The above figures indicate that the maximum combined demand is 150 and 139 vehicles during the AM and PM peak periods respectively. This exceeds the capacity of 120 vehicles along the Road B frontage. However, in 2022, the larger Gables precinct would still be under development with the Town Centre unlikely to have been constructed. In this regard, there would be no traffic within the Town Centre internal road network that isn't associated with the School and as such, the School would be able to make use of the available parking. As such, the demand would not impact the operation of the local road network.

Furthermore, it should be noted that as the Gable Precinct continues to be developed, the pick-up / drop-off demand would decrease. Indeed, application of the trip generation rates detailed in the TAIA to the student population in 2022 determines a combined maximum demand of 100 and 96 vehicles during the AM and PM peak periods respectively which can be accommodated with within the Road B pick-up / drop-off area.

However, it should be noted that in 2023, the capacity of the Road B pick-up / drop-off area would be exceeded using the trip generation rates detailed in the TAIA. **Figure 6** and **Figure 7** detail the pick-up / drop-off demand of the School in 2023.

As per the figures overleaf, the maximum combined demand is 130 and 118 vehicles during the AM and PM peak periods respectively. In this regard, the pick-up / drop-off demand would exceed the capacity of the Road B pick-up / drop-off area in 2022 using increased trip generation rates, and in 2023 as per the rates detailed in the TAIA.

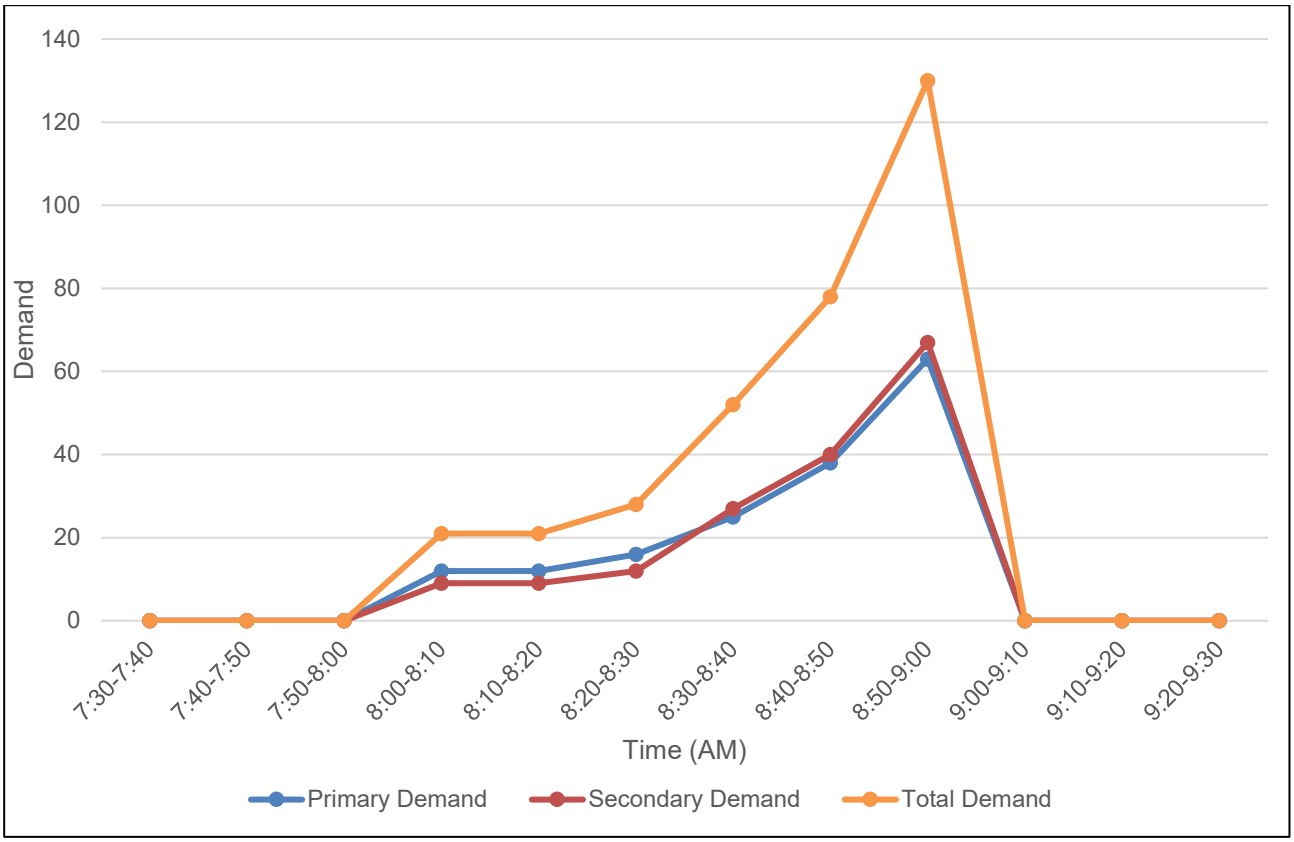


Figure 5: AM Peak Period Pick-Up / Drop-Off Demand – 2023

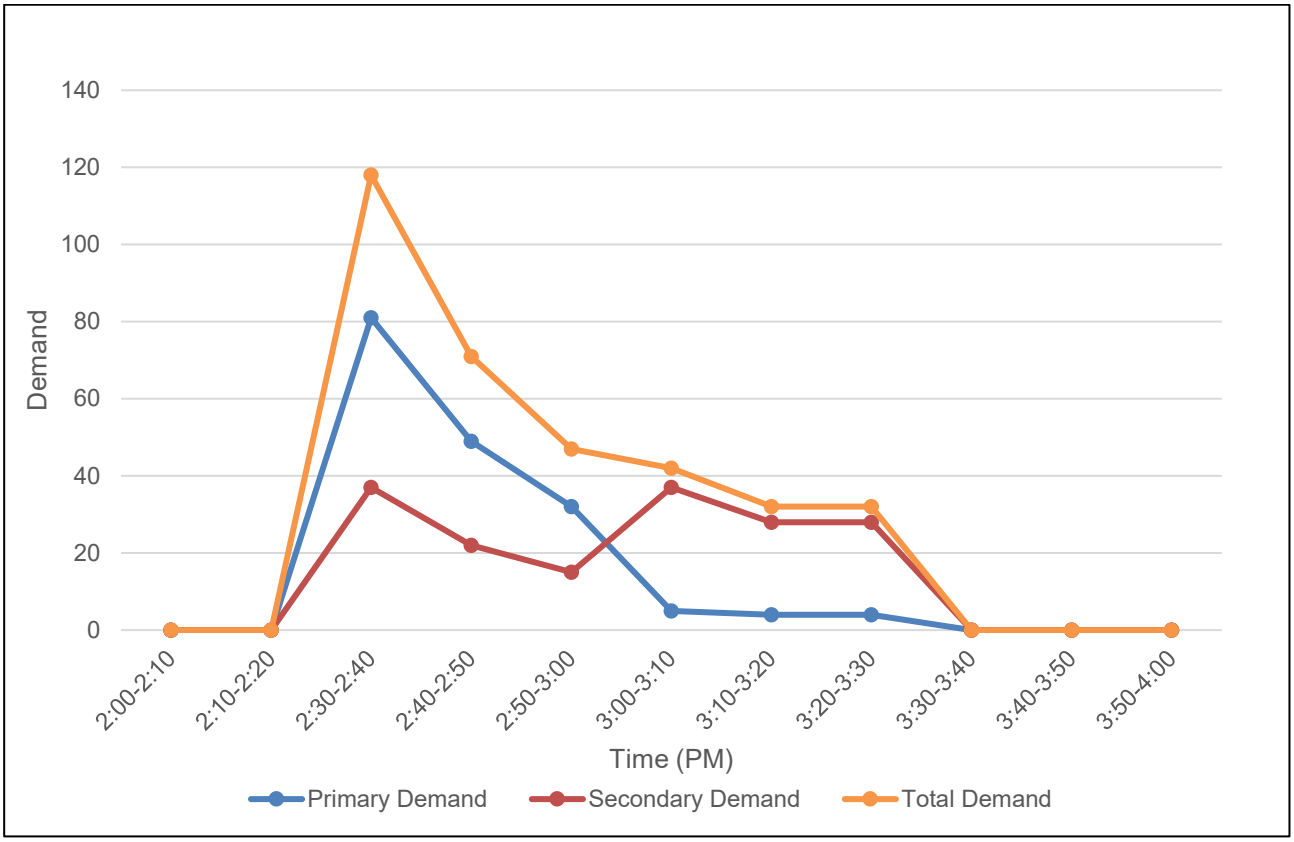


Figure 6: PM Peak Period Pick-Up / Drop-Off Demand – 2023

Pick-up / Drop-off Demand – Full Development

In addition to the above, it is understood that TSA Management, Celestino, and the Catholic Education Diocese of Parramatta (CEDP) have undertaken a discussion to provide a solution that ensures the adequacy of the pick-up / drop-off facilities. In addition to the 12 spaces provided on the northern frontage along Road B, an additional 20 spaces are to be provided along Fontana Drive, south of the intersection of Fontana Drive and Red Gables Road, adjacent to the hockey fields. **Figure 5** details the proposed pick-up / drop-off facilities.

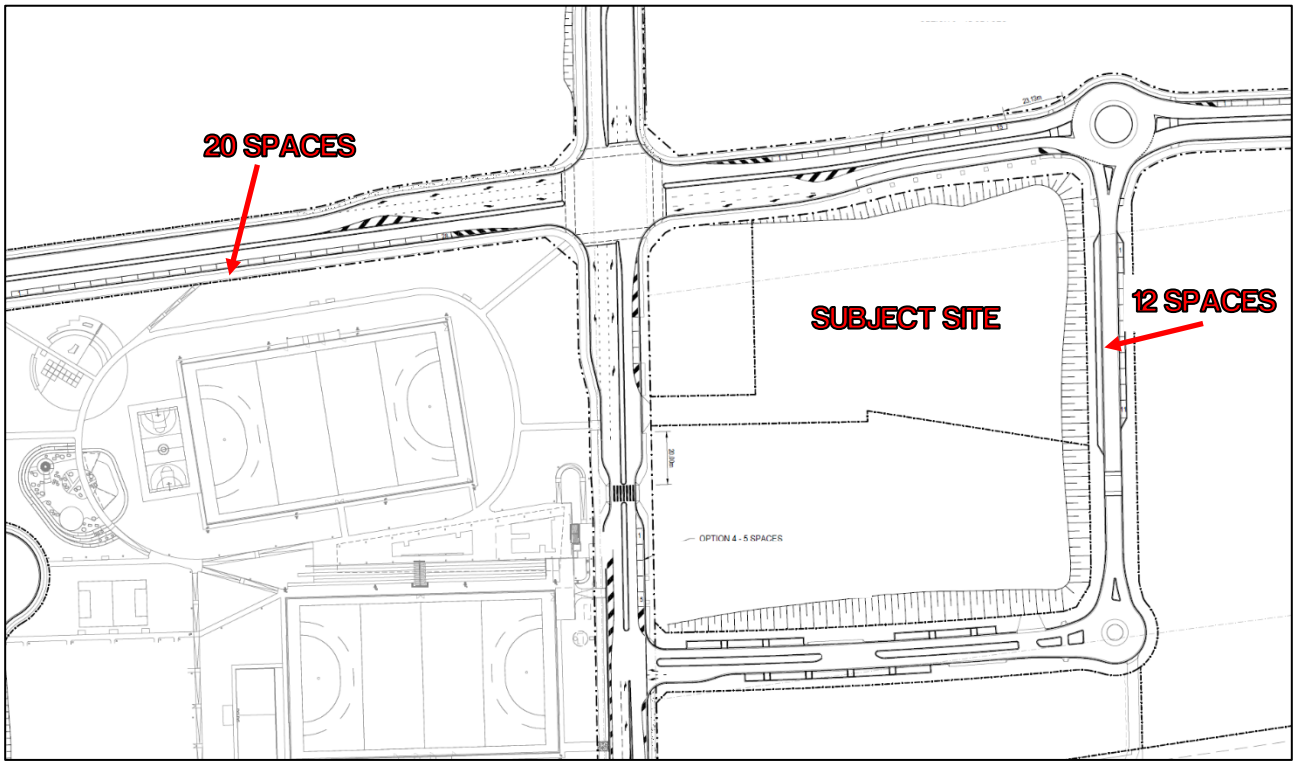


Figure 7: Proposed Pick-Up / Drop-Off Facilities

Due to the location of the second pick-up / drop-off area on Fontana Drive, this area would be for secondary school students, while the Road B pick-up / drop-off area is dedicated for the primary school only.

Application of the pick-up / drop-off demand to the proposed School capacity is detailed in **Figure 6** and **Figure 7**.

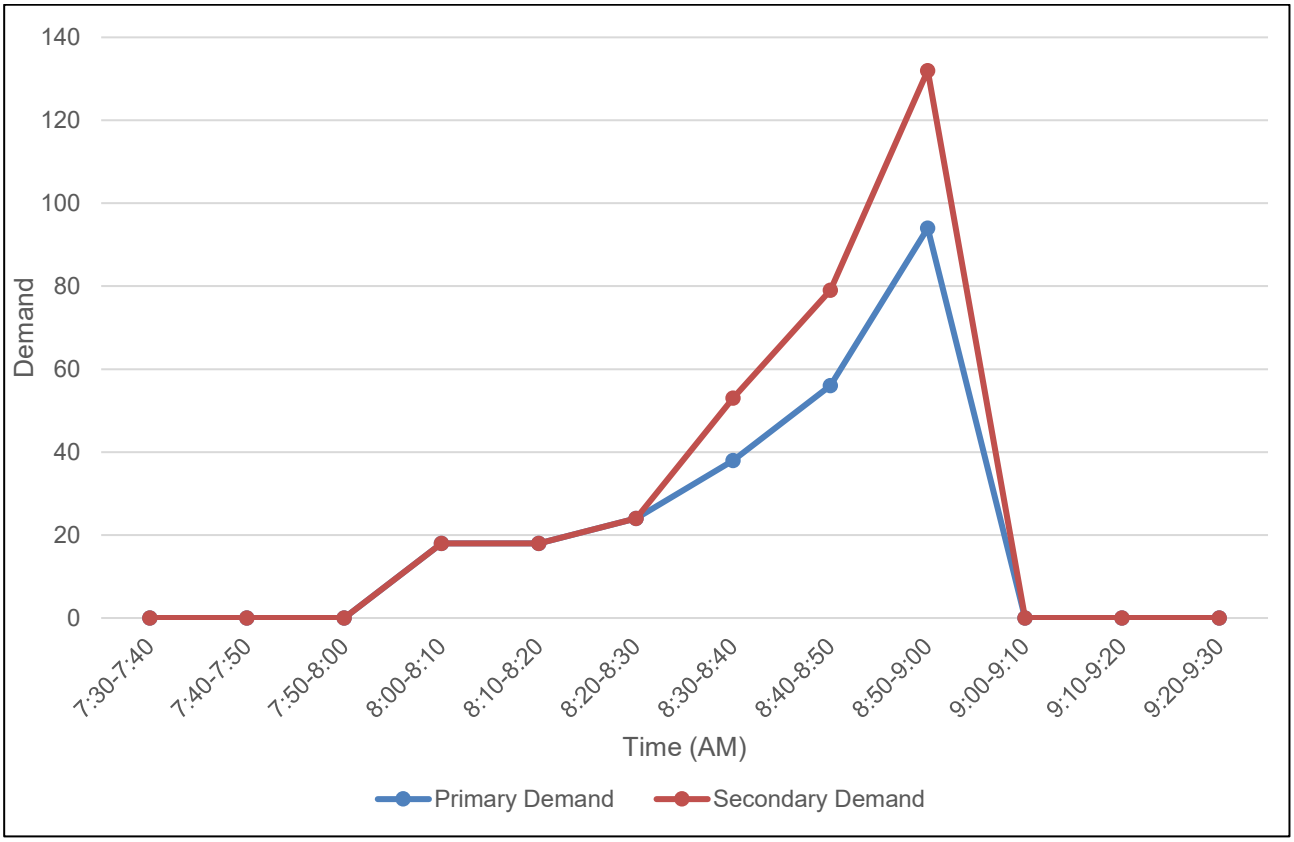


Figure 8: AM Peak Period Pick-Up / Drop-Off Demand – Full Development

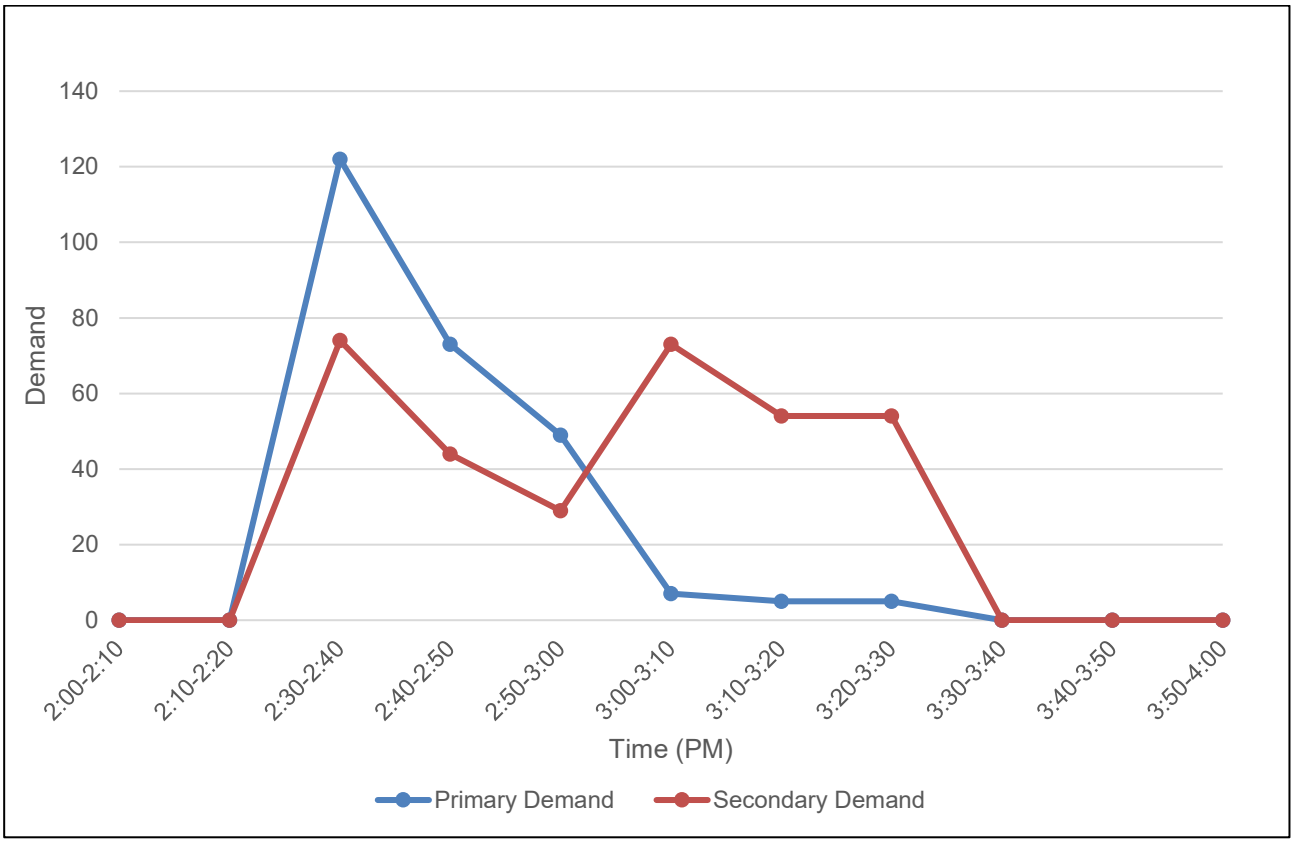


Figure 9: PM Peak Period Pick-Up / Drop-Off Demand – Full Development

The above figures detail the following peak demands:

- Primary School:
  - AM Peak: 94 vehicles
  - School PM Peak: 122 vehicles
- Secondary School:
  - AM Peak: 132 vehicles
  - School PM Peak: 74 vehicles

The AM peak demand for both the primary and secondary school would occur during the 10-minute period prior to commencement of school, while the PM peak demand would occur during the 10-minute after the final school bell.

As mentioned above, the provision of 12 pick-up / drop-off spaces on-street along the northern frontage, a traffic management plan would also be implemented to facilitate reduced times to pick-up / drop-off students. It is envisaged that a traffic management plan could facilitate a turnover rate of 1 vehicle per space every minute. This corresponds to a capacity of 120 vehicles along the Road B frontage which would accommodate the AM and School PM peak. It is noted that school PM peak exceeds 120, however this is by 2 vehicles and would be accommodated after the 10-minute peak after the school bell (i.e. 10 minutes after the final school bell) as this timeframe only has a demand of 73 vehicles in that 10-minute period.

Similarly, the adoption of a traffic management plan mentioned above, would provide the secondary school pick-up / drop-off area with a capacity of 200 vehicles during the 10-minute period prior to school commencement. This would adequately accommodate the maximum demand of 132 vehicles.

Traffic Management and Operation

Traffic management measures have been discussed and agreed with Council, the CEDP will need to provide a range of operation management strategies to ensure the safe and efficient operation of the pick-up / drop-off areas. While final management plans will need to be finalised prior to the opening of the School, Ason Group provides the following broad recommendations:

- All the key roads providing pick-up / drop-off facilities – including Fontana Drive south of Red Gables Road – must be constructed prior to the opening of the College; this includes kerb, guttering and all footpaths/shared paths so as to ensure that students can access the pick-up / drop-off facilities from the outset.
- Further to the above, as a minimum a pedestrian crossing will need to be installed across Red Gables Road east of Fontana Drive to ensure safe passage with the College (and the Town Centre more generally) and the Fontana Drive pick-up / drop-off (and local playing fields and residential areas south of Red Gables Road more generally). The responsibility for the provision of the crossing will require determination further to consultation between Council, CEDP and Celestino.
- The pick-up / drop-off areas will need to operate under supervision to maximise safety and efficiency; key component of a future operational management plan for the pick-up / drop-off areas is expected to include:
  - Staff monitoring student and driver activities;
  - The provision of an ‘active’ zone within which the pick-up / drop-off actually occurs so as to prevent vehicles weaving in and out of the pick-up / drop-off area;
  - Student names on car visors to assist in the efficient operation of the pick-up / drop-off; and
  - Student marshalling areas away from the roadway to maximise the safety of the pick-up / drop-off operations.

It is anticipated that the operation of the pick-up / drop-off areas would be reviewed at a minimum annually during the first few years of College operations in consultation with Council, RMS and local bus operators. Investigations into the public transport provision and modal splits of students will also provide insight into potential methods at accommodating the demand of the pick-up / drop-off area. This traffic management plan will be an evolving document which will undergo renewal and revision.

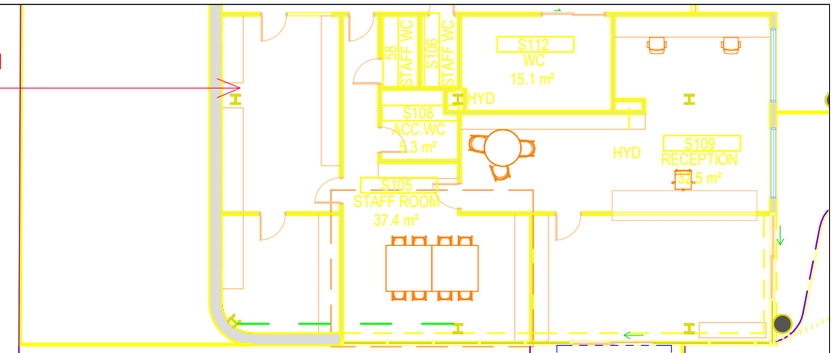
Notwithstanding the above, it is also acknowledged that parents / carers will park off-street within the Town Centre, for example in the future supermarket car park (expected to be provided at grade directly to the north of the Site) or in other local streets (without parking restrictions such as proposed within the Town Centre itself). This is perfectly acceptable behaviour, as observed in local centres every morning and afternoon where parents/carers combine a DOPU trip with (most often) a shopping trip. The expected use of the (for example) future supermarket parking spaces should not therefore be seen as providing for the pick-up / drop-off demand, but as providing for a genuine shared trip demand.

It must again be acknowledged also that while there is expected to be a high proportion of student pick-up / drop-off demand in the early years of operation, the College will in the medium (and then long) term be centrally located within a residential suburb, with the majority of students being drawn from the local area. Complementing school bus services will be public bus and active transport services and infrastructure within The Gables, all of which will reduce pick-up / drop-off over time.

Attachment 2

Swept Path Analysis

ALLOW FOR MECH EXHAUST TO KITCHEN SPACE



BUILDING SOUTH

BLD 4F

Suez Front Loader

Suez Front Loader

Suez Front Loader

CEILC DROP OFF

2.700

WASTE ENCLOSURE

BIKE RACK AREA

BLD 4E

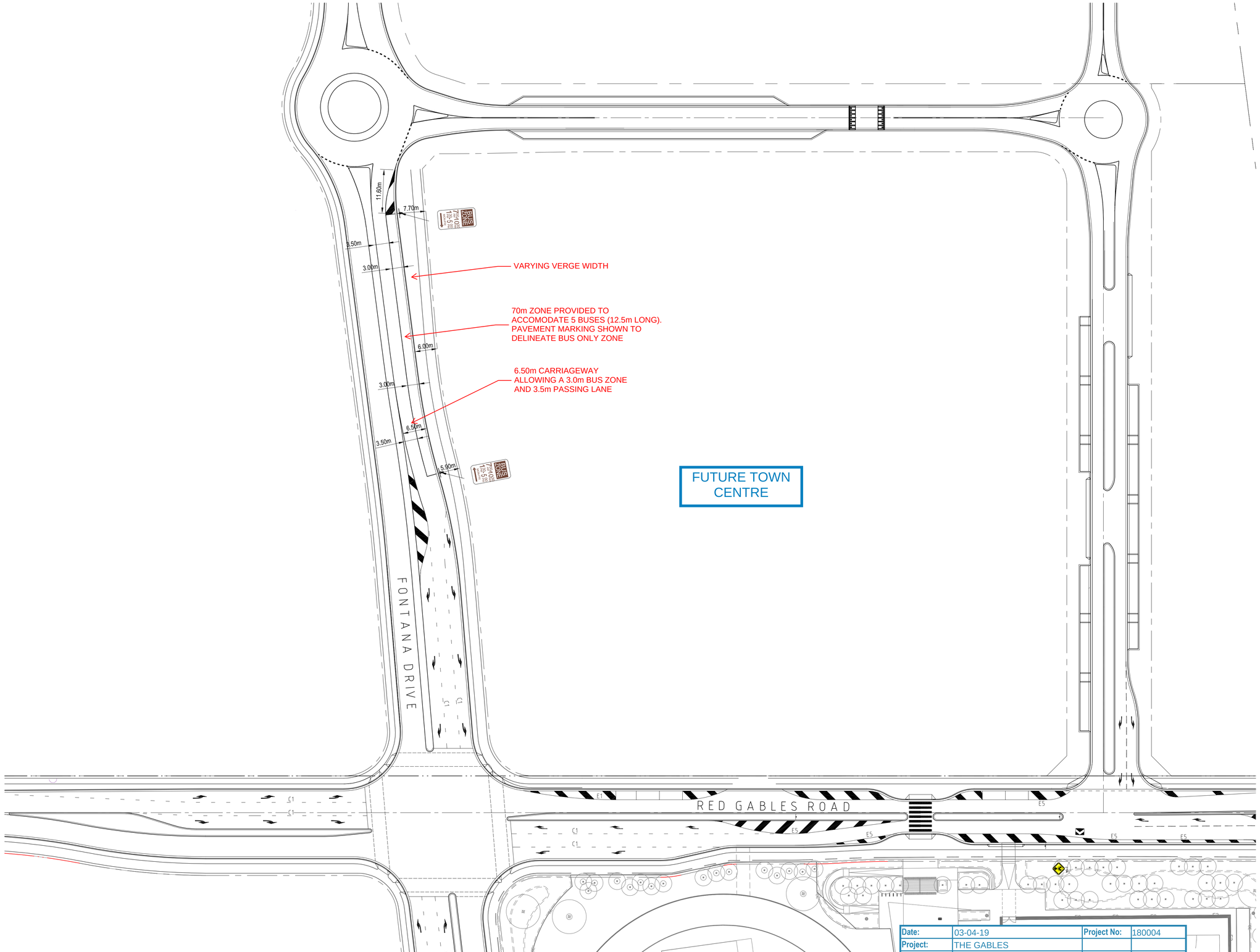
Revision notes:		
Rev:	Date:	Notes:

For information purposes only - not for construction

Drawn By: TL	Project: 0760 Santa Sophia Catholic College	Date: 26/08/19	asongroup	
Client: TSA Management	Drawing Title: Suez Front Loader	Scale @ A3: 1:200	Suite 5.02, Level 5, 1 Castlereagh Street Sydney NSW 2000	
		Drawing Number: 01	info@asongroup.com.au	

Attachment 3

Bus Bay Design



Date:	03-04-19	**Project No:**	180004
Project:	THE GABLES		
Title:	FONTANA NORTH PLAN		
Drawing No:	HSKE076	**Revision:**	3
Drawn:	RWH	**Scale:**	1:500 (A1)

enspire

Attachment 4

Planning Proposal Traffic Impact Assessment

Prepared for

CELESTINO DEVELOPMENT PTY LTD

Planning Proposal

Traffic Impact Assessment

The Gables Town Centre, Box Hill North

Ref: 0392r04v4
14/08/2018

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Document Control

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Project: The Gables Town Centre, Box Hill North

Client: Celestino Development Pty Ltd

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A	8/08/2018	Issue I	T. Lehmann	J. Mulhaire
B	8/08/2018	Issue II	T. Lehmann	T. Lehmann
C	10/08/2018	Issue III	T. Lehmann	T, Lehmann
D	14/08/2018	Issue IV	T. Lehmann	T. Lehmann

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1 Introduction

1.1 Overview

Ason Group has been commissioned by Celestino Development Pty Ltd to provide a Traffic Impact Assessment (TIA) report in support of a Planning Proposal for a Town Centre (the Proposal) in the Box Hill North Precinct on the corner of Fontana Drive and Red Gables Road (the Site). The Site is located within the Hills Shire (Council) Local Government Area (LGA). Under Council's Local Environmental Plan (LEP) 2012, the Site is zoned B2 Local Centre, has a Floor pace Ratio (FSR) of 1:1, and Height of Building Control of 16m.

A reference scheme has been prepared by Rothelowman with an indicative development yield adopted to inform the traffic assessment of the Planning Proposal.

1.2 Study Objectives

The key objectives of this Traffic Impact Assessment are as follows:

- Demonstrate the traffic generation associated with the reference scheme could be accommodated within the surrounding road network.
- Confirm that the Proposal would continue to align with the key traffic, parking and transport objectives of the Box Hill North DCP.

The Proposal has been designed with consideration of the key objectives within Council's Development Control Plan (DCP) Part D Section 17 detailed below:

- *To focus business and community activities in and around the Town Centre with a mix of retail, commercial, and community uses.*
- *Create a mixed-use Town Centre which has main street characters, is pedestrian friendly and offers high level amenity for residents, workers, and visitors.*
- *Provide a high quality, integrated and ecologically sustainable urban environment integrated with good public transport accessibility, open space, community facilities and employment opportunities.*
- *Ensure that development will not detrimentally affect the environment by ensuring that satisfactory measures are incorporated to ameliorate any impacts arising from the proposed development.*
- *To create a compact, vibrant, safe and prosperous town centre*
- *To ensure that pedestrian streetscapes are provided through the Town Centre which are of a high amenity and provide effective pedestrian and cycle connections and minimise walking distances.*

This TIA report provides an assessment of the relevant traffic, transport and parking implications of the Proposal with consideration for the above objectives.

1.3 Reference Documentation

In preparing this TIA, Ason Group has referenced key planning documents, these include

- The Hills Shire Development Control Plan 2012 (Council's DCP)
- The Hills Shire Local Environmental Plan 2012 (Council's LEP)
- Box Hill and Box Hill Industrial Precincts – Transport and Access Study prepared by GHD; February 2011 (the GHD Report)
- Box Hill North Planning Proposal – Transport and Access Impact Assessment Addendum Report prepared by GTA; 9 December 2013. (The Addendum Traffic Report)
- Box Hill Master Plan Development Application, Traffic Impact Assessment prepared by GTA; 1 May 2015. (The DA Traffic Report)

This TIA also references general access, traffic, and parking guidelines, including:

- RMS (formerly RTA), *Guide to Traffic Generating Developments* (RMS Guide)
- RMS, *Guide to Traffic Generating Developments: Updated Traffic Surveys*, 2013 (RMS TDT2013/04)
- Traffic Signal Design Guidelines
- Australian Standard 2890.1 (2004): Off-street Car Parking (AS2890.1)
- Australian Standard 2890.2 (2002): Off-street Commercial Vehicle Facilities (AS2890.2)
- Australian Standard 2890.6 (2009): Off-street Parking for People with Disabilities (AS2890.6)

1.4 Report Structure

- Section 2 provides a summary of the proposed development
- Section 3 describes the existing site conditions and land use
- Section 4 details the strategic and planning context of the Site
- Section 5 outlines the parking requirements applicable to the proposed development
- Section 6 assess the traffic impacts of the development including the Site's projected trip generation and forecasted network performance
- Section 7 discusses the site access and internal design of the development
- Section 8 provides a summary of the key conclusions

2 Overview of Proposal

A detailed description of the Proposal is provided in the Planning report and architectural plans prepared by Rothloweman. The key aspects of the concept scheme from a traffic perspective with indicative development yield are summarised below:

Table 1: Planning Proposal Development Yield

Land Use	Yield
High Density Residential	Approximately 570 dwellings
Retail (GFA)	
Supermarket	4,000 m^2
Speciality Retail	3,700 m^2
Mixed Use – Community Space	3,000 m^2
Commercial (GFA)	4,890 m^2
Proposed Education Establishment	
Primary Education Establishment	10,000 m^2 (approximately 1,000 students)
Secondary Education Establishment	10,000 m^2 (approximately 1,000 students)

Figure 1 illustrates the layout of the proposed Town Centre. Detailed plans are also provided in **Appendix A**.

As detailed above, the Proposal provides a number of opportunities for numerous land uses, which will be carefully selected to provide a holistic Town Centre experience while providing employment and residences for the local community as per the objectives detailed in Section 1.2.

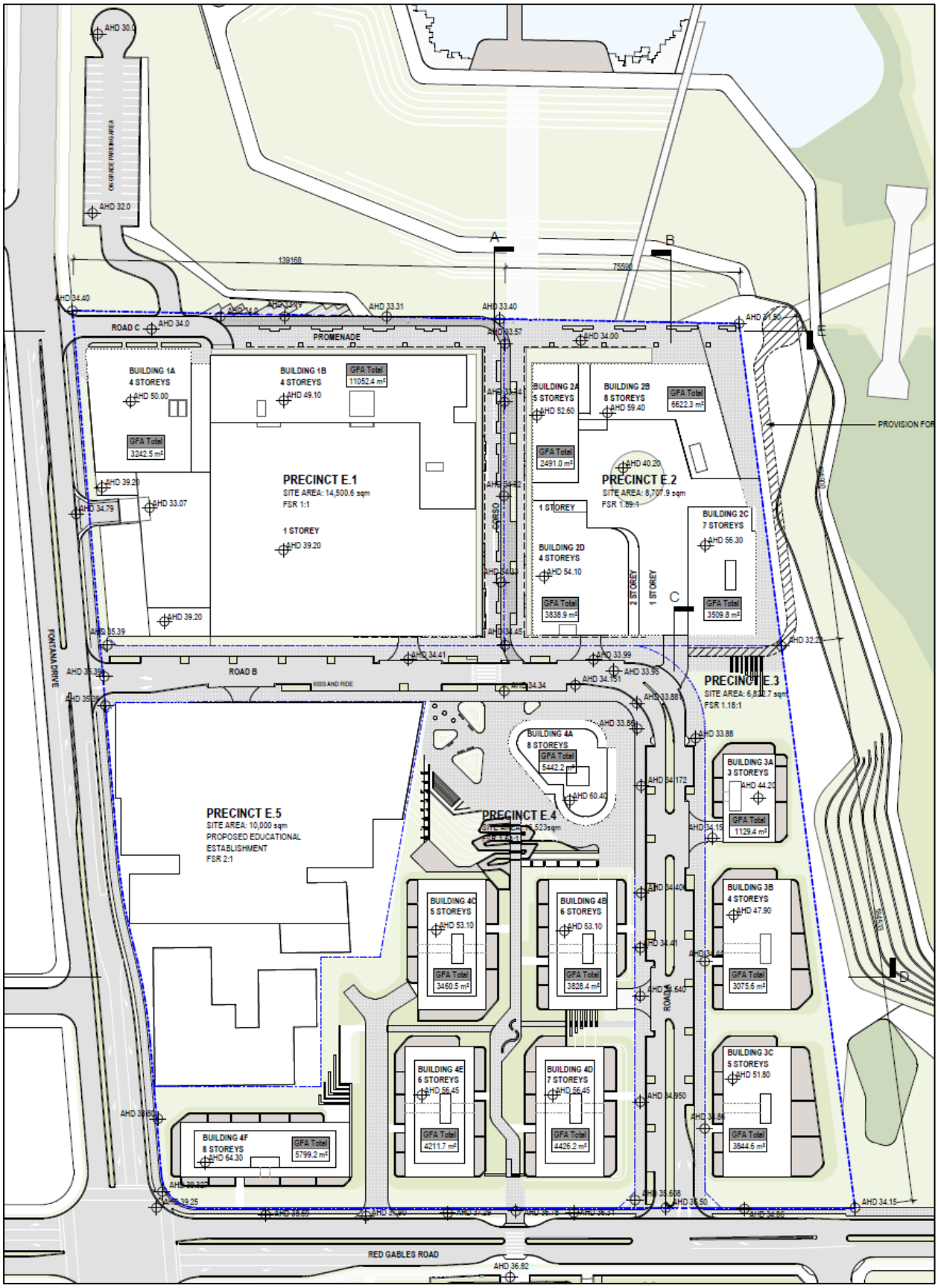


Figure 1: Town Centre Layout

3 Existing Conditions

3.1 Site & Location

The Site is located at 5-7 Red Gables Road, Box Hill North within The Hills Shire LGA in Box Hill North approximately 39 kilometres northwest of Sydney CBD and 23 kilometres northeast of Penrith. The Site has an area of 63,652 m^2 with greenfield sites surrounding the Site in all directions. The Site has a frontage to Red Gables Road to the south. A Site Plan is presented in **Figure 2** which provides an appreciation of the site and the existing conditions.

The Site is currently zoned B2 Local Centre under Council's LEP and is legally known as Lot 26 DP255616. The Site is presently vacant.

3.2 Road Hierarchy

The key roads providing in the vicinity of the site are summarised below:

- Windsor Road – A classified RMS Main Road (MR184) that generally runs in a northwest-southeast direction to the south of the Site. The road has a divided carriageway and is subject to an 80 km/h speed zoning. The road carries approximately 55,000 vehicles per day (vpd) (Station 71024)
- Boundary Road – An unclassified Regional Road (7205) that generally runs in a northeast-southeast direction to the west of the Site. It connects to Windsor Road in the south and Cattai Right Road to the north and carries one lane of traffic in each direction and is subject to a speed limit of 80 km/h.
- Old Pitt Town Road – A local collector road that traverses in an east-west direction to the south of the Site and is subject to a speed limit of 60 km/hr.
- Red Gables Road – A local road that runs parallel to Old Pitt Town Road and connects to Boundary Road in the west and Janpieter Road in the east. It forms the southern frontage of the Site and carries one lane of traffic in both directions with a speed limit of 60 km/hr.
- Fontana Drive – A local road that runs parallel to Boundary Road which generally runs in the north-south direction and forms the western frontage of the Site. The road has a divided carriageway and is subject to a speed limit of 60 km/hr. It should be noted that Fontana Drive is undergoing construction and construction has not yet commenced in vicinity of the Proposal.

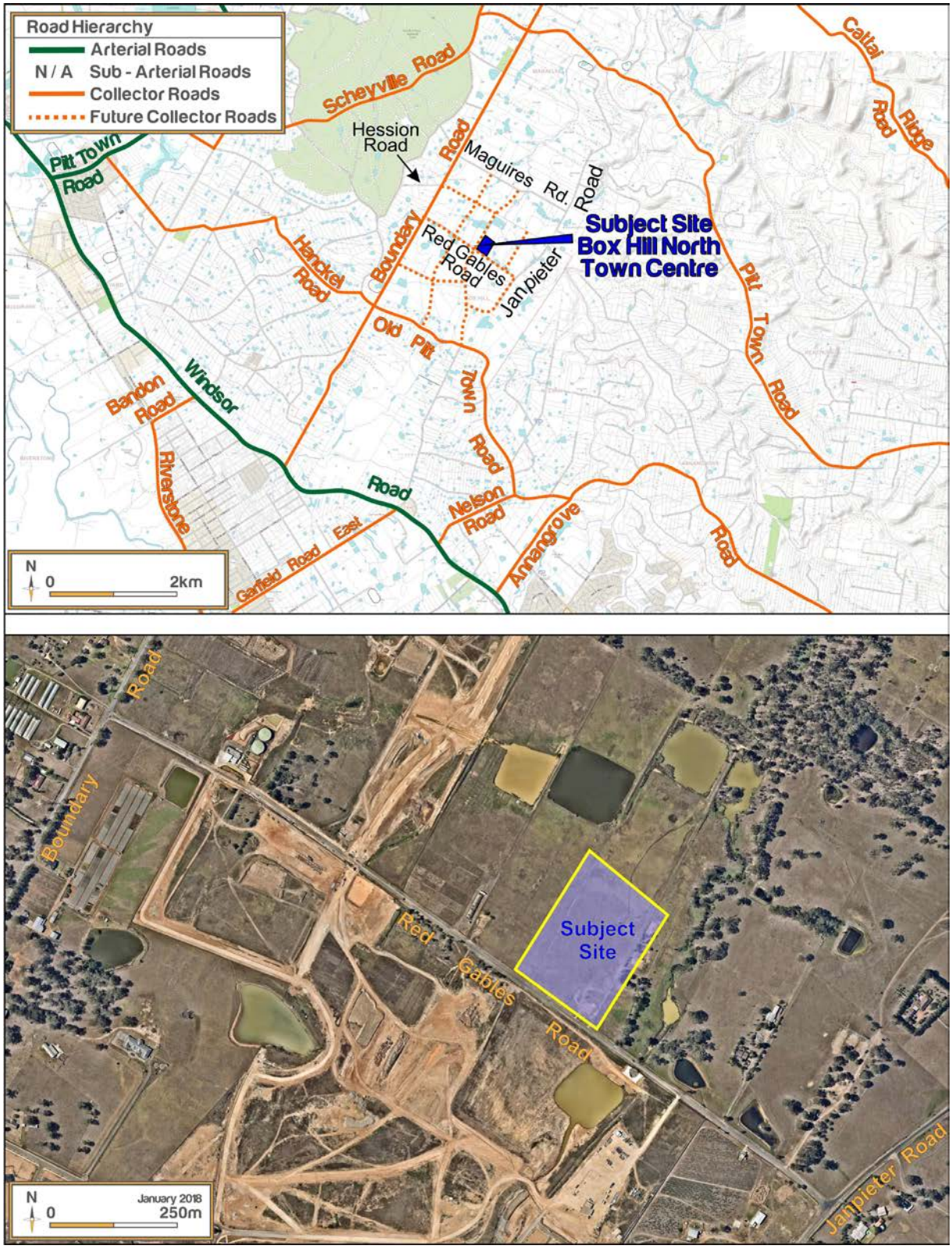


Figure 2: Site and Road Hierarchy

4 Strategic & Planning Context

4.1 North West Priority Growth Area

The Site is located to the north of the North West Growth Area (NWGA), which spreads across The Hills Shire, Blacktown City and Hawksbury City local government areas identified by the NSW State Government for broad urban development. The NWGA is divided into 16 'Precincts' which include the Box Hill Precinct and the Box Hill Industrial Precinct which are located to the south of the site. Over time, it is estimated that the NWGA will accommodate some 33,000 dwellings and 250,000 residents. Fundamentally, the NWGA is supported – and indeed to a large extent made possible – by the future provision of the new Sydney Metro Northwest infrastructure at Tallawong and Rouse Hill, which will be delivered in 2019 along with other regional infrastructure upgrades. The broader NWGA is shown in **Figure 3**.

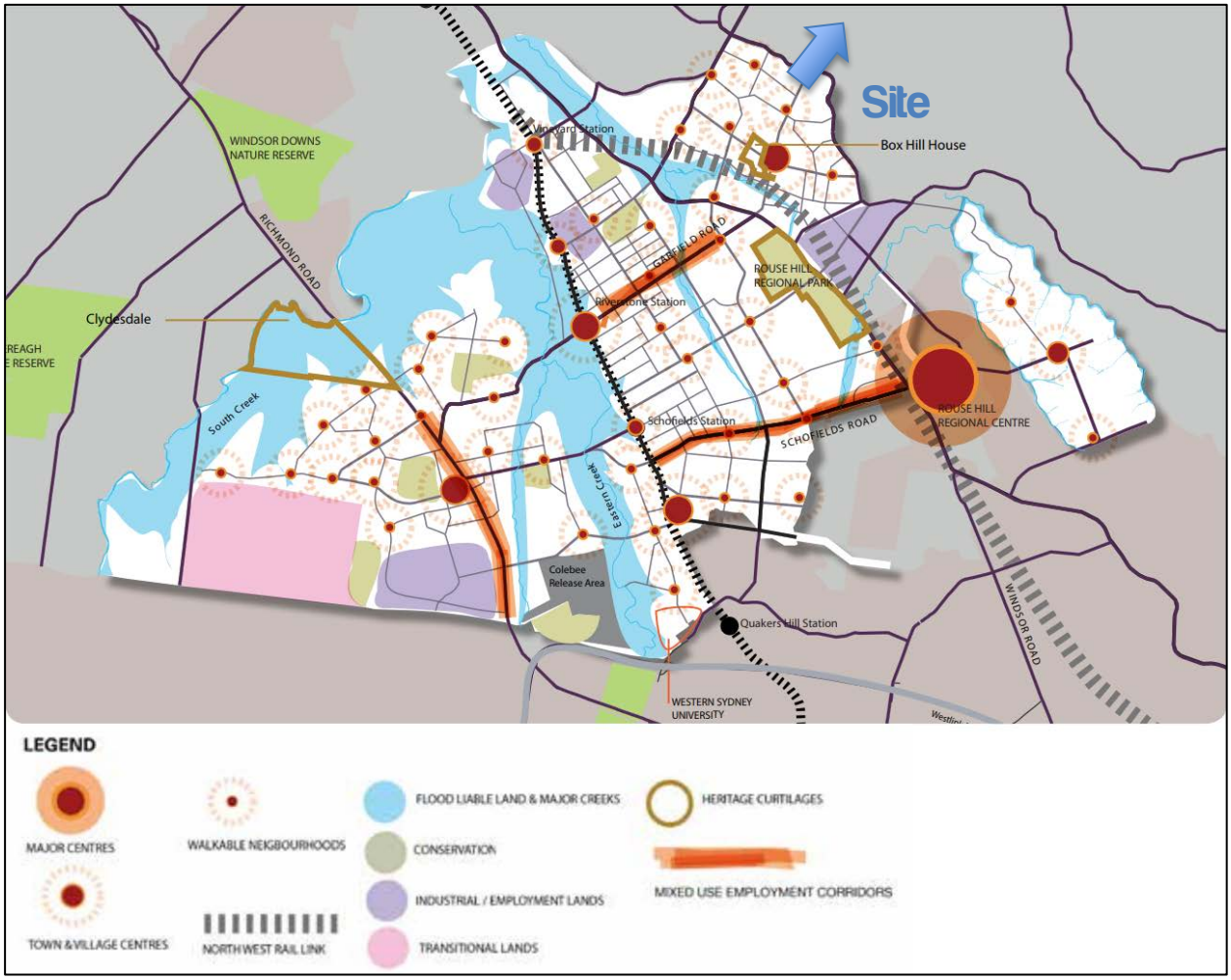


Figure 3: North West Growth Area

As mentioned above, the Box Hill and Box Hill Industrial Precinct, detailed in **Figure 4**, is located to the south of the Box Hill North Precinct and will contain about approximately 9,600 new dwellings and employment for about 16,000 people.

4.2 Box Hill North Precinct

In 2011 the NSW State Government commenced an initiative to invite land owners to submit expressions of interest to develop their land to assist with housing affordability and supply issues. Sites were assessed against infrastructure provision, consistency with local, state and national strategies, plans and policies and the viability of the land to support urban development. Box Hill North was identified as a site suitable for this initiative by the NSW State Government.

The Box Hill North Precinct is located to the north of the Box Hill and Box Hill Industrial Precinct with an approximate area of 380 hectares. Box Hill North is generally bound by Maguires Road to the north, Boundary Road to the west, Janpieter Road to the east and Old Pitt Town Road to the south.

A Planning Proposal was submitted to Council in 2014 to amend The Hills Local Environmental Plan 2012 which sought to amend the RU6 Transition to a range of zones to aid in the development of approximately 4,100 dwellings, a local centre, a primary school, community and sporting facilities. The Indicative Layout Plan of Box Hill North is detailed in **Figure 5**.

This was accompanied by the Addendum Traffic Report which is discussed in further detail below.

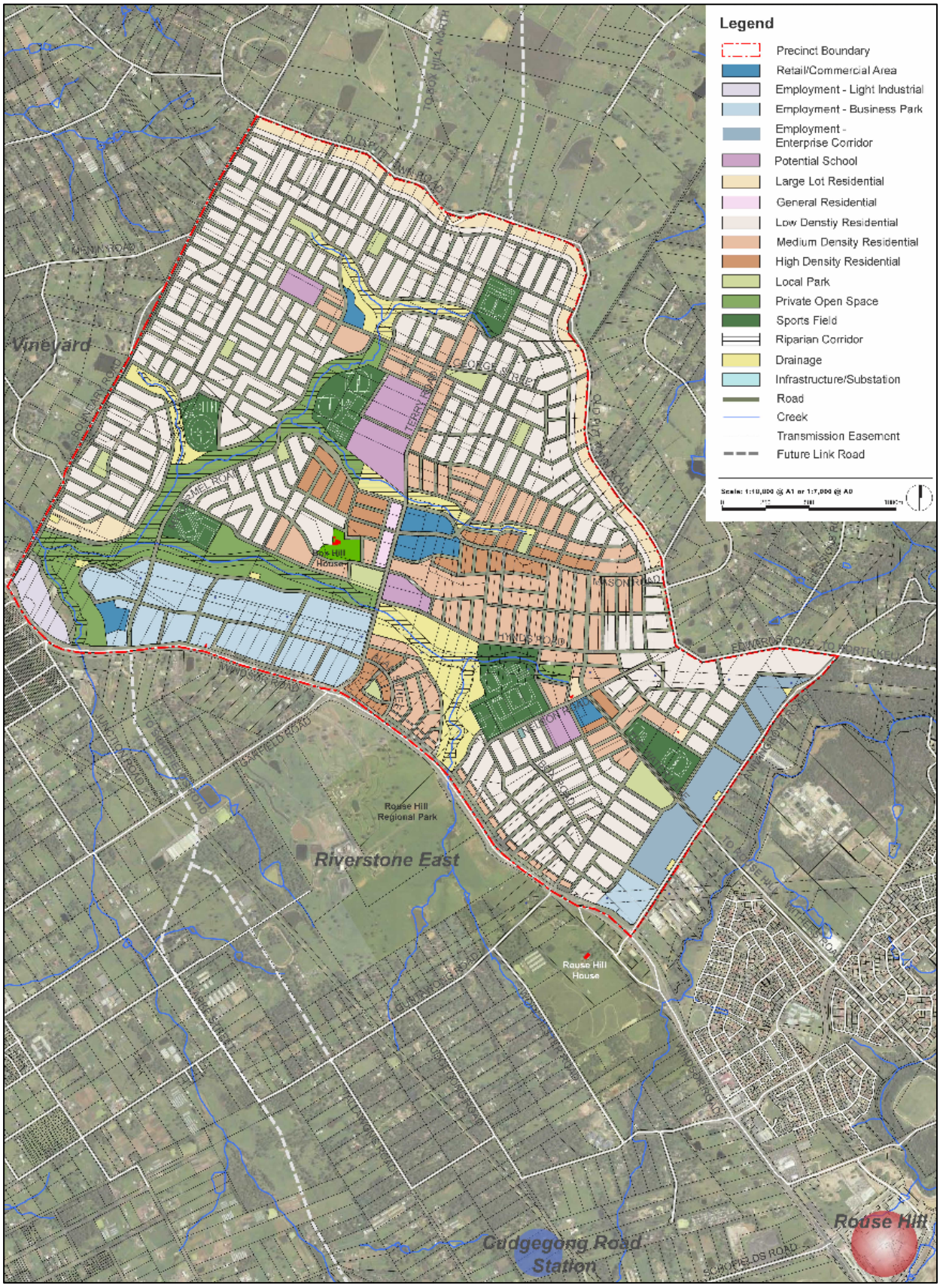


Figure 4: Box Hill and Box Hill Industrial Precinct

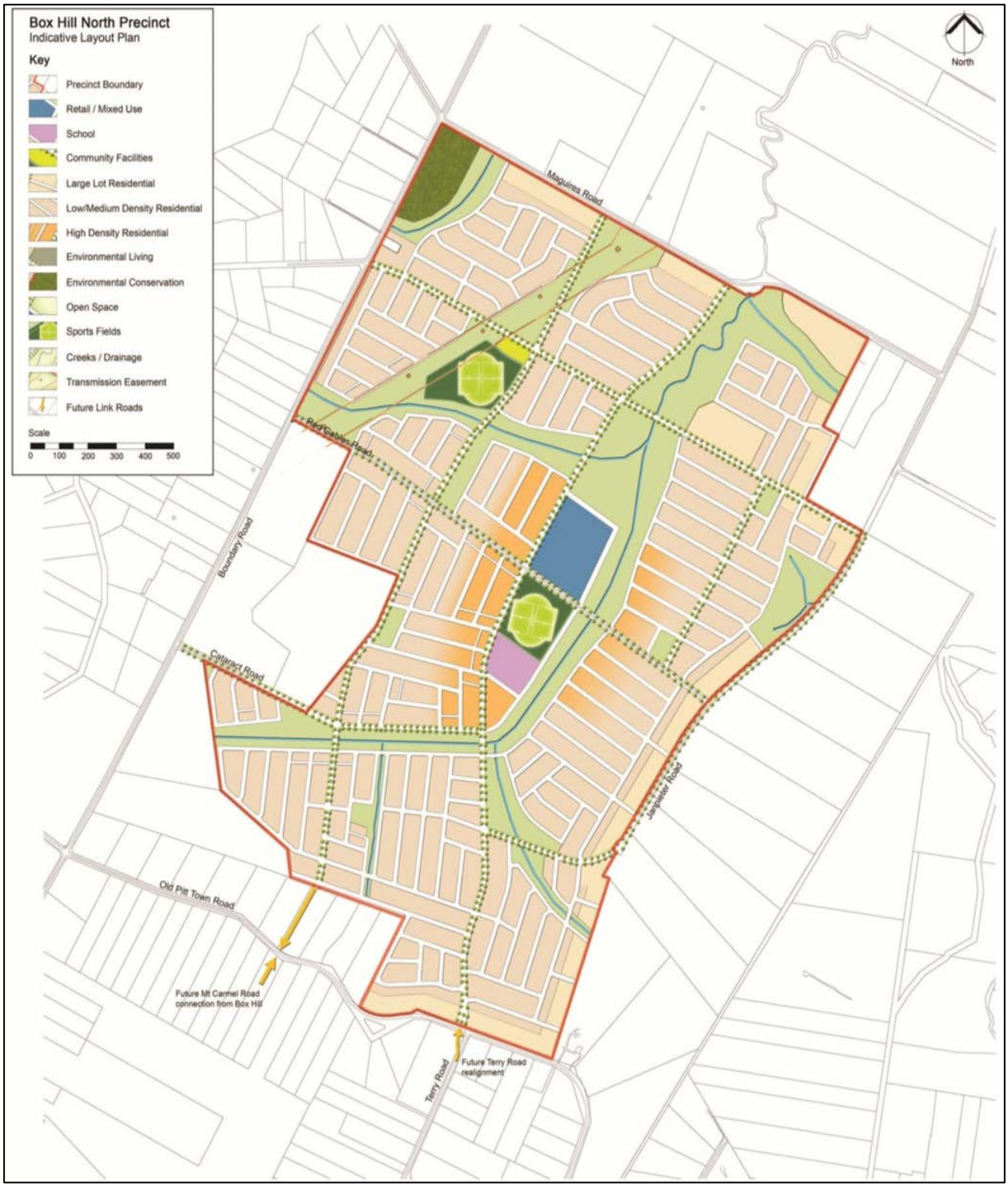


Figure 5: Box Hill North ILP

4.3 Sydney Metro Northwest

The Sydney Metro Northwest forms a key component of the NWGA infrastructure upgrades, delivering 8 new railway stations and 4,000 commuter car parking spaces. The new metro line has a target capacity of 40,000 customers per hour and will provide services every 4 minutes during peak periods. With the delivery of the new metro stations, improved cycling and pedestrian amenities will be provided thereby further improving the Growth Centres provision of amenities directed at encouraging residents and employees to use alternative modes of transport.

The nearest stations to the Site are the Tallawong Railway Station and Rouse Hill Station which are located on the corner of Tallawong Road and Schofields Road, and the corner of Rouse Hill Drive and Windsor Road respectively. **Figure 6** details the location of the stations in relation to the Site. Construction is currently underway at both stations and is due for completion within the first half of 2019.

Upon completion of the Tallawong Railway Station the following amenities will be provided:

- 4 bus bays,
- 9 taxi spaces,
- Parking and storage of 55 bicycles,
- 15 Kiss and Ride Spaces, and
- 1,000 commuter parking spaces.

Upon completion of the Rouse Hill Station the following amenities will be provided:

- 8 bus bays,
- 9 taxi spaces,
- Parking and storage of 45 bicycles, and
- 25 Kiss and Ride Spaces.

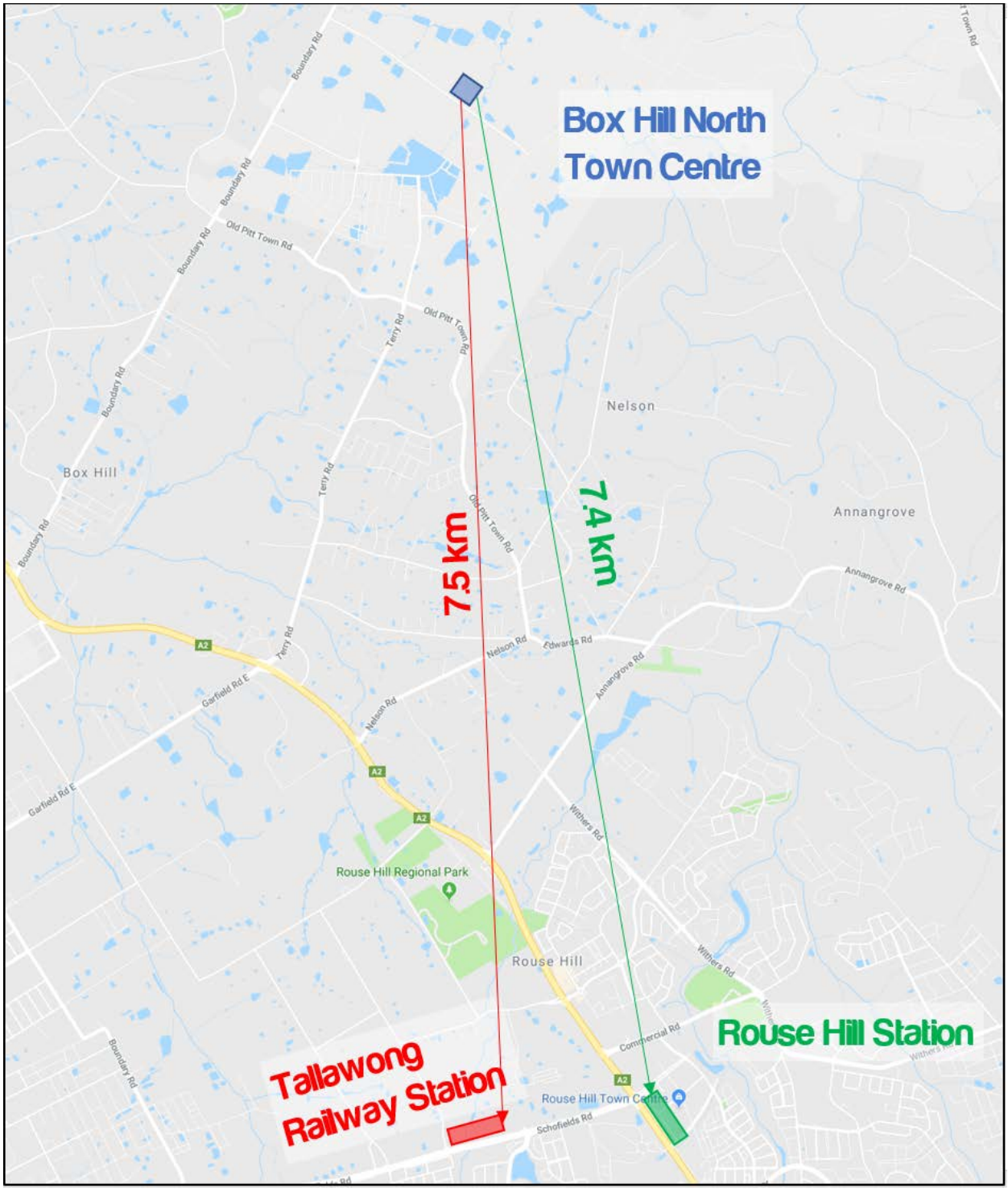


Figure 6: Northwest Metro Station Proximity

4.4 Future Bus Services

To accommodate the future transport demands of the NWGA and the Box Hill North Precinct, the North West Sector Bus Servicing Plan was adopted to increase the level of accessibility of public transport. **Figure 7** details the proposed bus network and routes detailed in the North West Sector Bus Servicing Plan.

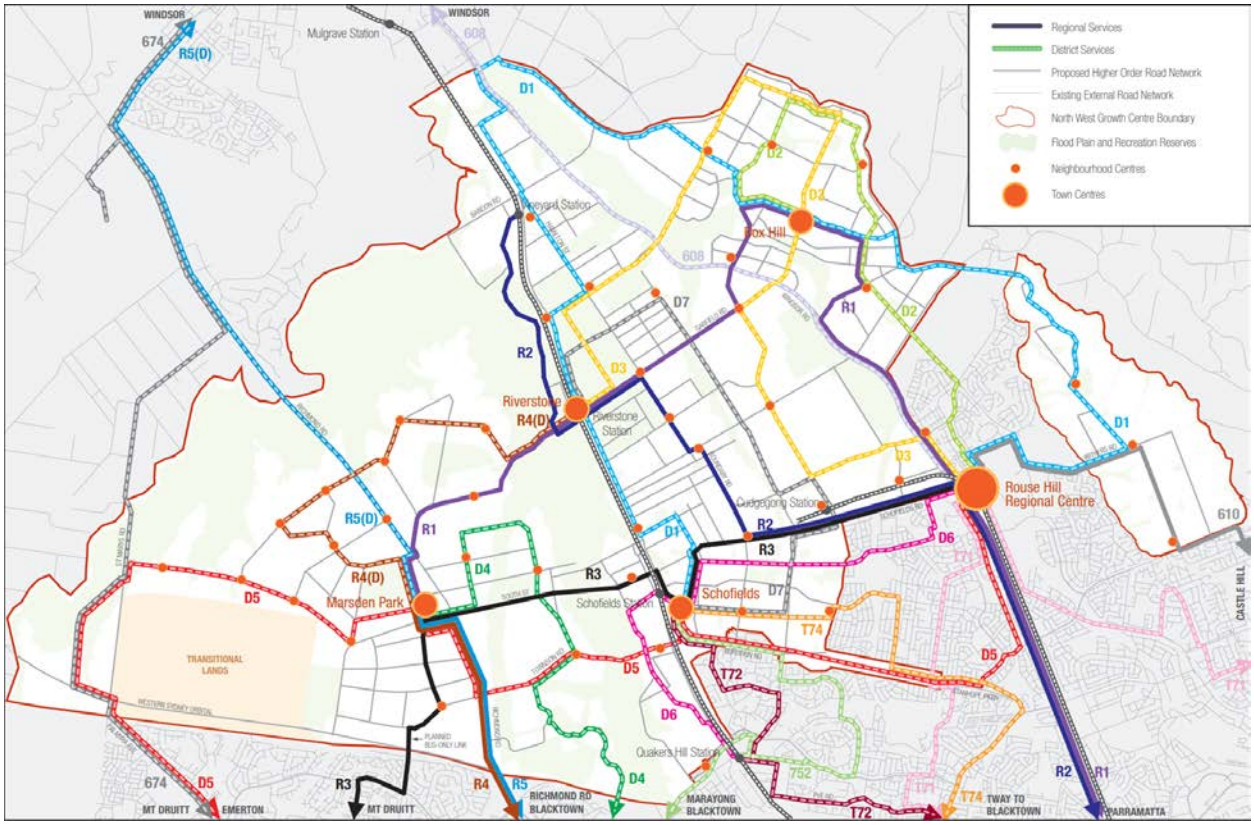


Figure 7: North West Sector Bus Servicing Plan

Council has approved a Development Plan and Transport Plan **Figure 8** which identifies two indicative District Bus Routes within the Precinct Bus Route 1 does not traverse the road network which bounds the Town Centre Precinct requiring public transport patrons to walk to the centre, thereby requiring usage of the Fontana Drive / Red Gables Road intersection. It is acknowledged that the bus routes are indicative and subject to final confirmation by TfNSW however the Transport Plan indicates that pedestrian demands, and desire lines would further be substantiated by the public transport linkages.

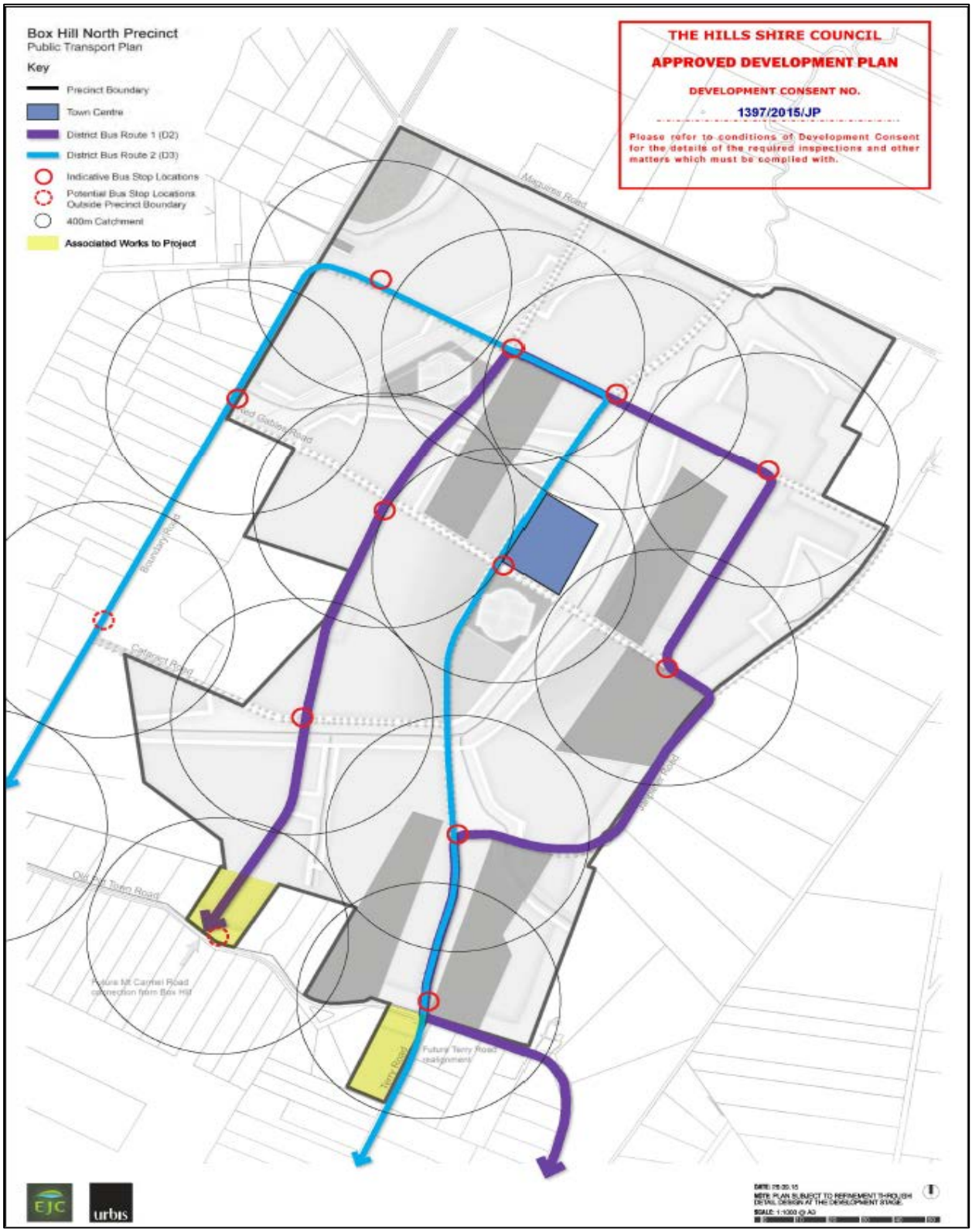


Figure 8: Approved Future Public Transport Plan

4.5 Outer Sydney Orbital

TfNSW is currently investigating the Outer Sydney Orbital (M9) corridor with the intention to preserve land for this key motorway and freight rail spine in the future. **Figure 9** details the proposed route for the Outer Sydney Orbital. This will provide a north-south bypass between northern and southern NSW to avoid the more congested roads of Sydney and alleviate pressure on the existing road networks. The Outer Sydney Orbital corridor will support the growing logistics and freight businesses in Western Sydney and provide additional traffic capacity for the increasing population of Western Sydney. This motorway would provide an important strategic link between the North West and South West Growth Areas.

The motorway would start between Scheyville National Park and Boundary Road and the proposed alignment would then pass along the north-western side of the North West Growth Area, with key interchanges at Windsor Road and Richmond Road. The Gables Town Centre would be approximately 4km from the nearest interchange at Windsor Road. There are ongoing investigations to extend the northern section of the Outer Sydney Orbital corridor to continue towards the Central Coast. **Figure 10** frames the Outer Sydney Orbital motorway in the locality of Box Hill.

The future Outer Sydney Orbital corridor will connect the North West Growth Area to the Western Sydney Parklands, Badgerys Creek Aerotropolis, the South West Growth Area, the Western Sydney Employment Area and Central Coast regions. The improved travel links would decrease transportation time and costs to enhance the freight productivities for the burgeoning Western Sydney industries.

Figure 9: Proposed Outer Sydney Orbital Corridor

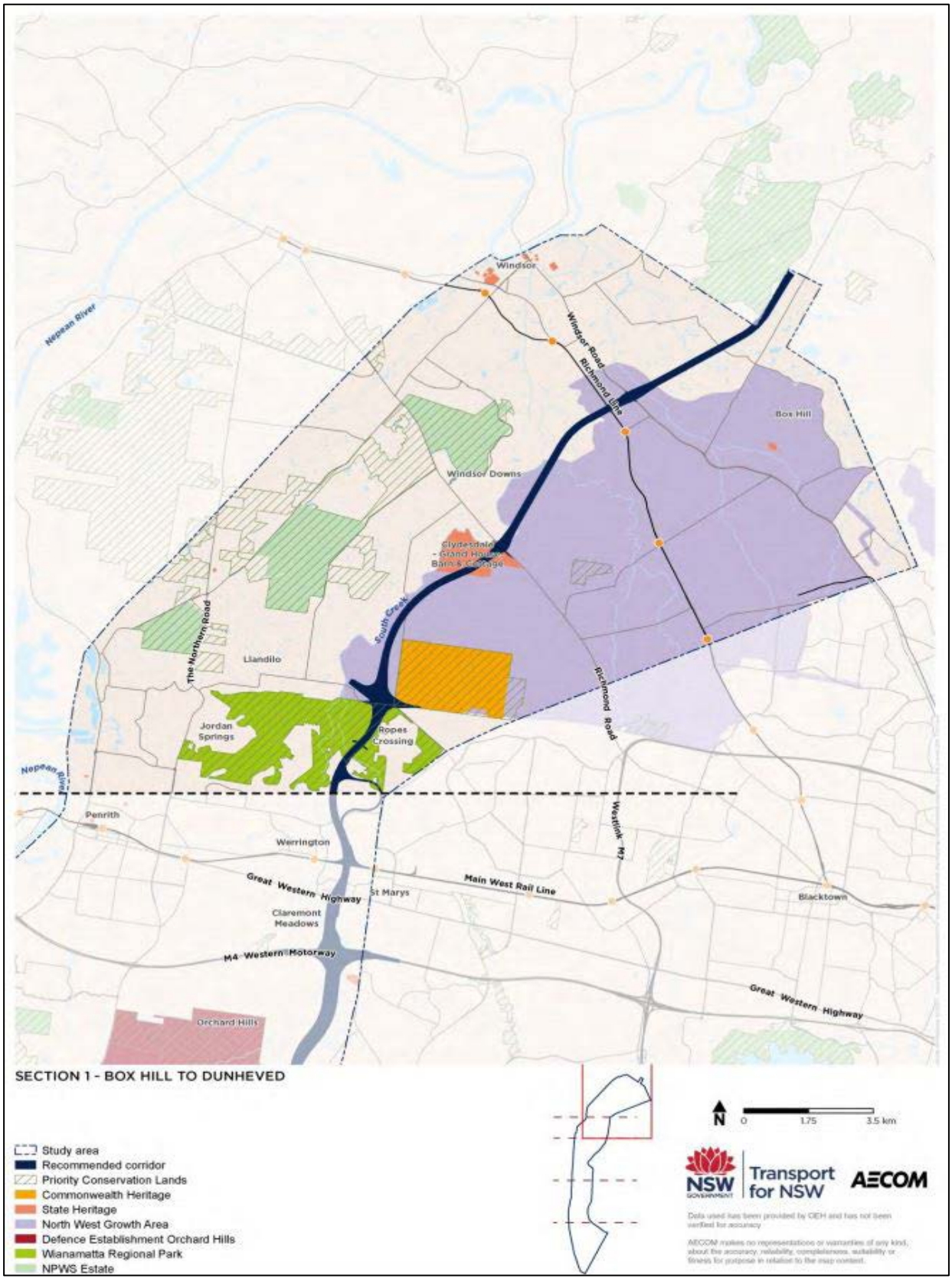


Figure 10: Outer Sydney Orbital Corridor near Box Hill

4.6 Regional Road Network Improvements

The Box Hill and Box Hill Industrial Precincts – Transport and Access Study (GHD, February 2011) (The GHD Report) was prepared for the then Department of Planning and the purpose of the study was to:

- Assess the transport implications of the Box Hill and Box Hill Industrial ILP; and
- Identify transport improvements required to accommodate the future (2036) travel demand requirements of the Box Hill and Box Hill Industrial ILP.

The GHD Report identified several intersection capacity and road widening improvements to the local and regional road network. The regional road network improvements as identified in the GHD Report have been included as part of the State Infrastructure Contribution (SIC) levies for Box Hill and the broader North West Growth Centre or alternative funding arrangements. The works include capacity improvements at key intersections along Windsor Road, namely:

- Boundary Road – conversion to a four-way intersection with re-alignment of Loftus;
- Terry Road / Garfield Road – additional right-turn lane along Windsor Road East, two lanes (one through, one right turn) along Terry Road and Garfield Road;

It is also understood that funding will be available to upgrade the vertical road alignment along Boundary Road between Windsor Road and Old Pitt Town Road with the widening of Boundary Road to 4 lanes. It is noted that these regional and local road network improvements are required to accommodate future growth excluding the Box Hill North Precinct.

4.7 Box Hill North Planning Proposal - Traffic Assessment

To support the Planning Proposal (2014) and subsequent Masterplan Development Application (2015), GTA Consultants provided accompanying traffic reports detailing the anticipated traffic and transport implications of the development of the Box Hill North Precinct. The DA Report assessed a yield of 4,800 units and determined the peak hour traffic generation of the Precinct detailed in **Table 2**.

Table 2: External Traffic Generation

Residential Density	Dwellings	Trip Generation Rate (car trips per dwelling)		Total Traffic Generation	
		AM Peak	PM Peak	AM Peak	PM Peak
Low-density	2,045	0.90	0.99	1841	2025
Medium-density	1,911	0.40	0.48	764	917
High-density	1,289	0.40	0.48	516	619
Total	4,600			3121	3561
Mode shift			0%	-	-
Trip containment			20%	-624	-712
Total external trips				**2,496**	**2,849**
Inbound				499	2279
Outbound				1997	570

As detailed in the above table, a total of 3,121 and 3,561 vehicles during the AM and PM peak periods respectively would be generated by the development of the Precinct. A trip containment of 20% was adopted which corresponds to 624 and 712 trips during the AM and PM peak periods respectively. This trip containment included traffic demand associated with multiple uses within the Box Hill North Precinct, namely education facilities, retail and commercial uses. As such, 2,496 and 2,849 vehicles during the AM and PM peak periods respectively were estimated to impact the external intersections.

To determine the trip distribution of traffic generated by the Box Hill Precinct, a mesoscopic assignment model of the traffic conditions using a Netanal model was developed. The model utilises defined travel demand (both vehicle and persons) between zonal pairs, represented as assimilated traffic movements, throughout the Sydney Metropolitan Area. The program is a logit type, incremental assignment mesoscopic program, consigning vehicular traffic onto a, computer-based road network, developing link demand forecasts on each modelled section of road.

SIDRA intersection analysis of the above intersections was undertaken of the following two development scenarios:

- **Base:** Existing + Background Growth (2036) + Full Development of Box Hill and Box Hill North Industrial Precincts; and
- **Full Development:** Base + Full Development of Box Hill North.

Intersection improvement works were proposed by GTA to accommodate the additional traffic generated by the Box Hill North Precinct. The improvements are detailed in **Table 3** and **Table 4**.

Table 3: Intersection Improvements

Item No. (see Figure 4.6)	Intersection Location	Previous Proposed Improvement Works	Additional Improvement Works (Identified by Revised Assessment)	Comments
Windsor Road Intersections				
1	Windsor Rd / Boundary Rd / Loftus Street	Extension of turning lane lengths: - Windsor Rd westbound right turn lane - Boundary Rd southbound left and right turn lanes	Additional Turn Bay length required on Loftus Road Approach (+220m)	
2	Windsor Rd / Mt Carmel Rd	Extension of turning lane lengths: - Windsor Rd eastbound left turn lane - Mount Carmel Rd southbound right turn lane	Additional Turn Bay length required (+30m)	This is a new intersection proposed as part of the Box Hill and Box Hill Industrial Precincts.
3	Windsor Rd / Terry Rd / Garfield Rd	Extension of turning lane lengths: - Windsor Rd westbound right turn lane - Terry Rd southbound left turn lane	Additional Turn Bay length required (+135m)	
4	Windsor Rd / Box Rd/ Guntawong Rd	Extension of turning lane length: - Guntawong Rd northbound left turn lane	Additional Turn Bay length required (+30m)	Additional storage capacity required on Guntawong Rd to accommodate additional through traffic along Windsor Rd associated with Box Hill North development.
5	Windsor Rd / Annangrove Rd	Extension of turning lane length: - Windsor Rd westbound right turn lane		
Boundary Road Intersections				
6	Boundary Rd / Maguires Rd (BHN Access)	Give Way Control – localised pavement widening to accommodate turn lanes		
7	Boundary Rd / BHN Site Access / Hession Rd	Give Way Control – localised pavement widening to accommodate turn lanes		
8	Boundary Rd / Red Gables Rd (BHN Access)	Give Way Control – localised pavement widening to accommodate turn lanes		
9	Boundary Rd / Cataract Rd / BHN Site Access	Give Way Control – localised pavement widening to accommodate turn lanes		
10	Boundary Rd / Old Pitt Town Rd	Upgrade existing 1 lane roundabout to a dual (2) lane roundabout	Signalisation of Intersection Required	Subject to further discussions with The Hills Shire Council this intersection could be upgraded with traffic signals. However, roundabout provides better operational performance with Box Hill North traffic distribution. A two lane roundabout also would incur a higher cost than traffic signals and thus the recommendation is considered financially.

Table 4: Intersection Improvements cont.

Item No. (see Figure 4.6)	Intersection Location	Previous Proposed Improvement Works	Additional Improvement Works (Identified by Revised Assessment)	Comments
				conservative.
Old Pitt Town Road Intersections				
11	Old Pitt Town Rd / BHN Access Rd (west)	Provide a new dual (2) lane roundabout		Consideration was given to the provision of traffic signals at this location. However roundabout was selected due to proximity to Old Pitt Town Rd / Terry Rd intersection (approx. 150m).
12	Old Pitt Town Rd / Terry Rd	Upgrade existing intersection to a dual (2) lane roundabout		Consideration was given to the provision of traffic signals at this location. However roundabout was selected due to proximity to BHN access roads.
13	Old Pitt Town Rd / BHN Access Rd (east)	Provide a new dual (2) lane roundabout		Consideration was given to the provision of traffic signals at this location. However roundabout was selected due to proximity to Old Pitt Town Rd / Terry Rd intersection (approx. 150m).
Other Intersections				
14	Annangrove Rd / The Water Lane / Withers Rd	Provision of left turn slip lane on Annangrove Road northbound		

With the provision of the above upgrades, the Windsor Road intersections would operate at the same LOS and operating conditions as during the Base development scenario. All other intersections would operate at a LOS of D or better.

Subsequent to the above recommendations, it should be noted that the intersections of Old Pitt Town Road / Box Hill North Access west (herein referred to as Fontana Drive) (11), and Old Pitt Town Road / Terry Road (12) have been combined as one priority-controlled intersection, and Old Pitt Town Road / Box Hill North Access Road (east) (13) has been removed.

5 Parking & Servicing Requirements

5.1 Car & Motorcycle Parking

The parking provision for the proposed Town Centre would be assessed in accordance with Council's DCP Part C Section 1 Table 1 & Table 2 with the relevant parking rates detailed below.

Table 5: Car & Motorcycle Parking Rates

Land Use	Parking Rate
Car Parking	
Residential Flat Buildings	1 space per 1-bedroom unit 2 spaces per 2 or 3-bedroom unit 2 visitor spaces per 5 units 1 car wash bay (can be utilised as a visitor space)
Retail Premises	1 space per 18.5 m^2 Gross Leasable Floor Area (GLFA) A set down area is required
Commercial (Centre Commercial)	1 space per 40 m^2 GFA
Education Establishment (School)	1 space per employee, plus 1 space per 8 Year 12 students, plus 1 space per 30 students enrolled for visitors and / or parent parking. A set down area is required
Accessible Parking	
Retail / Commercial	2% of total car parking
Education Establishment (school)	3% of total car parking
Pram Parking (retail only)	1 space per 100 spaces
Motorcycle Parking	1 motorcycle parking space for every 50 car parking spaces provided or part thereof

5.2 Bicycle Parking

Bicycle parking has been assessed with regard to Council's DCP Part C Section 1 Table 3 with rates detailed below.

Table 6: Bicycle Parking Rates

Land Use	Parking Rate
Commercial premises	2 spaces plus 5% of the total number of parking required where new developments exceed 5,000 m^2 GFA
Retail premises	2 spaces plus 5% of the total number of parking where required new developments exceed 5,000 m^2 GFA
Education Establishment (school)	1 space per 5 pupils over Year 4

Further to the above, all developments that provide bicycle parking are required to provide change and shower facilities.

5.3 Loading Bays

The loading bay requirements would be provided in accordance with Council's DCP Part C Section 1 Table 5 with the rates detailed below.

Table 7: Council's Loading Bay Rates

Land Use	Parking Rate
Supermarket	2 for the first 930 m^2, + 2 for the next 930 m^2, + 1 for each extra 930 m^2
Mixed Small Shops (specialty retail)	2 for the first 465 m^2, + 2 for the next 465 m^2, + 1 for each extra 530 m^2
Commercial	1 for the first 1,860 m^2, + 1 for the next 3,720 m^2, + 1 for the next 3,720 m^2, + 1 for each extra 9,250 m^2

Table 8: RMS Loading Bay Rates

Land Use	Parking Rate
Supermarkets, shops, and restaurants (all spaces adequate for trucks)	1 space per 400 m^2 under 2,000 m^2 OR 5 spaces + 1 per 1,000 m^2 over 2,000 m^2
Commercial premises (50% of spaces adequate for trucks)	1 space per 4,000 m^2 under 20,000 m^2 OR 5 spaces + 1 per 8,000 m^2 over 20,000 m^2
Residential flat building (50% of spaces adequate for trucks)	1 space per 50 units under 200 units OR 4 spaces + 1 per 100 units over 200

5.4 Parking Summary

A key objective of any future Development Application would seek compliance with Council's DCP parking provisions. With regard to the loading bay requirements, both Council and RMS rates have been documented and there would be opportunity to further investigate the service vehicle provisions based on merit through consolidated loading facilities and implementation of detailed Loading Dock Management Plans within the individual Precincts. Adequate provision of parking is important to the delivery of a Town Centre and would promote a vibrant area while preventing excessive on-street parking demand.

This matter will be assessed in greater detail at DA stage in liaison with Council and compliance with Council's parking requirements are proposed.

6 Traffic Assessment

6.1 Traffic Generation

The traffic impacts of the proposed development have been assessed with regard for the RMS Guide and the RMS TDT2013/04a. The adopted residential trip rate maintains the trip rate endorsed for all previous studies within the Box Hill North Precinct.

The Supermarket and Speciality Retail PM trip rates are consistent with the RMS Guide. For the AM trip 40% of the PM trip generation rate has been adopted. A trip rate of 2 trips per 100 m^2 has been adopted for the Mixed-Use Community space. The Mixed-Use Community space would be subject to further detail and assessment at the relevant DA stage.

With regard to the Proposed Education Establishment, a recent RMS study undertook traffic surveys of a total of 22 schools within the greater Sydney metropolitan area and regional NSW to determine traffic generation rates. The study determined that the following trip generation rates for Primary and Secondary schools within the Sydney Metropolitan area:

- Primary School:
  - AM Peak Period: 0.67 trips per student.
  - PM Peak Period: 0.53 trips per student.
- Secondary School:
  - AM Peak Period: 0.51 trips per student.
  - PM Peak Period: 0.28 trips per student.

It was noted within the RMS study, that the PM peak period for schools generally occurred between 2.00-4.00PM, outside of the road network peak period. As such, a reduced PM trip generation rate of 10% the surveyed traffic generation rate has been adopted. It should also be noted that the schools surveyed were selected due to their location in isolated / residential precincts and not adjacent to retail and business precincts. As such, the adopted rates may be considered conservative given that the proposed education establishment is located within a Town Centre that provides retail, commercial, and residential land uses within close proximity. Noting the above, the following tables detail the traffic generation of the Proposal during the AM and PM road network peak periods which would generally occur from 7.00-9.00AM and 4.00-6.00PM.

Finally, the development scenario tested as part of the modelling analysis incorporated 720 units. The Traffic generation analysis and subsequent modelling conclusions could therefore be considered a worst-case assessment.

Table 9: Planning Proposal: Traffic Generation

Land Use	Period	Yield	Trip Rate	Traffic Generation
High Density Residential	AM	720 units*	0.4 trips per unit	288 (58 in, 230 out)
	PM		0.48 trips per unit	346 (277 in, 69 out)
Retail				
Supermarket	AM	4,000 m^2 GFA	6.2 trips per 100 m^2	186 (74 in, 112 out)
	PM		15.5 trips per 100 m^2	465 (279 in, 186 out)
Speciality Retail	AM	3,700 m^2 GFA	1.84 trips per 100 m^2	51 (23 in, 28 out)
	PM		4.6 trips per 100 m^2	128 (70 in, 58 out)
Mixed Use – Community Space	AM	3,000 m^2 GFA	2 trips per 100 m^2	60 (30 in, 30 out)
	PM		2 trips per 100 m^2	60 (30 in, 30 out)
Commercial	AM	4,890 m^2 GFA	1.6 trips per 100 m^2	78 (66 in, 12 out)
	PM		1.2 trips per 100 m^2	59 (9 in, 50 out)
Proposed Education Establishment				
Primary Education Establishment	AM	1,000 students	0.67 trips per student	670 (369 in, 301 out)
	PM		0.053 trips per student	53 (24 in, 29 out)
Secondary Education Establishment	AM	1,000 students	0.51 trips per student	510 (281 in, 229 out)
	PM		0.028 trips per student	28 (13 in 15 out)

This corresponds to the following total trip generation:

- AM Peak Period: 1,843 trips (901 arrival trips, 942 departure trips)
- PM Peak Period: 1,139 trips (702 arrival trips, 437 departure trips)

6.2 Trip Distribution

Ason Group engaged Road Delay Solutions to prepare a mesoscopic assignment model of the traffic conditions pertaining to the proposed Gables Development, Box Hill. The Netanal model utilises defined travel demand (both vehicle and persons) between zonal pairs, represented as assimilated traffic movements, throughout the Sydney Metropolitan Area. The program is a logit type, incremental assignment mesoscopic program, consigning vehicular traffic onto a, computer-based road network, developing link demand forecasts on each modelled section of road. It is noted that Road Delay Solutions has prepared multiple mesoscopic assignment models within the North West Growth Area on behalf of government authorities and this model formed an extension of the endorsed Box Hill model. The purpose of the model was utilised to determine the projected turn movements at Fontana Drive and Red Gables Road under full development of The Gables. The modelling assessment identified the future transport trends within the Gables Development precinct.

Traffic surveys were undertaken on Thursday 19 October 2017, to validate against those produced within the base year 2017 morning (AM) and evening (PM) peak models. The model was validated against the collected travel times on Windsor Road between Schofields Road, to the south, and Brandon Road, to the north.

The development scenario assessed by the Netanal model evaluated the 2026 traffic volumes which assumed full development of Box Hill, Box Hill Industrial Precinct, and the Box Hill North Precinct.

6.3 Traffic Impacts

6.3.1 External Intersections

Traffic volumes were extracted from the Netanal model to assess the following intersections in further detail using SIDRA software:

- Boundary Road / Red Gables Road;
- Boundary Road / Cataract Road;
- Red Gables Road / Janpieter Road;
- Old Pitt Town Road / Boundary Road;
- Old Pitt Town Road / Valletta Drive;
- Old Pitt Town Road / Terry Road / Fontana;
- Windsor Road / Boundary Road / Loftus
- Windsor / Terry Road / Garfield Road East.

The intersection layouts used to assess the traffic impacts have been adopted based on the Addendum Traffic Report and the Box Hill North Precinct S94 Contributions Plan. These intersection layouts are detailed in **Figure 11**, **Figure 12**, and **Figure 13**.

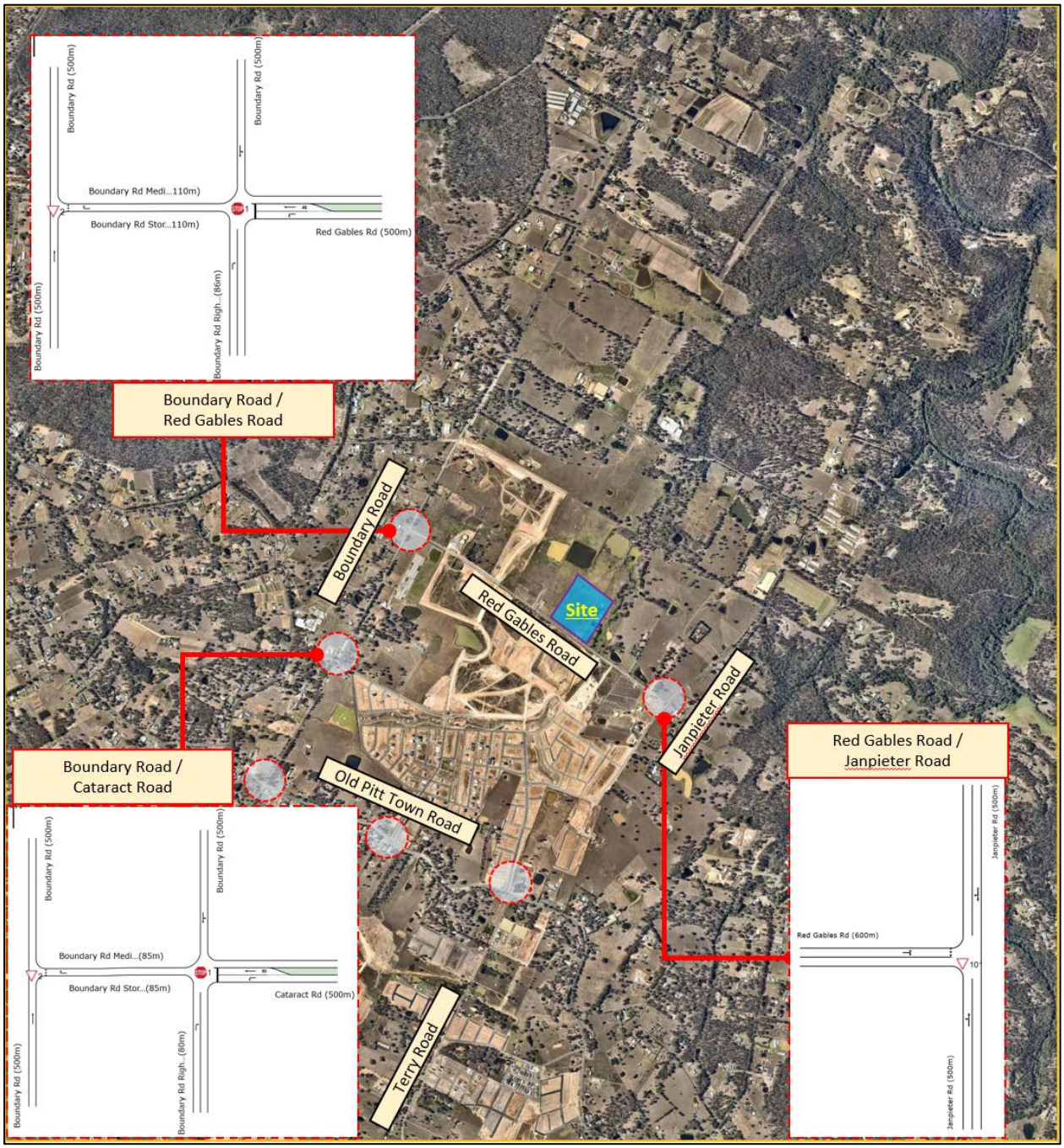


Figure 11: Box Hill North Precinct Intersections

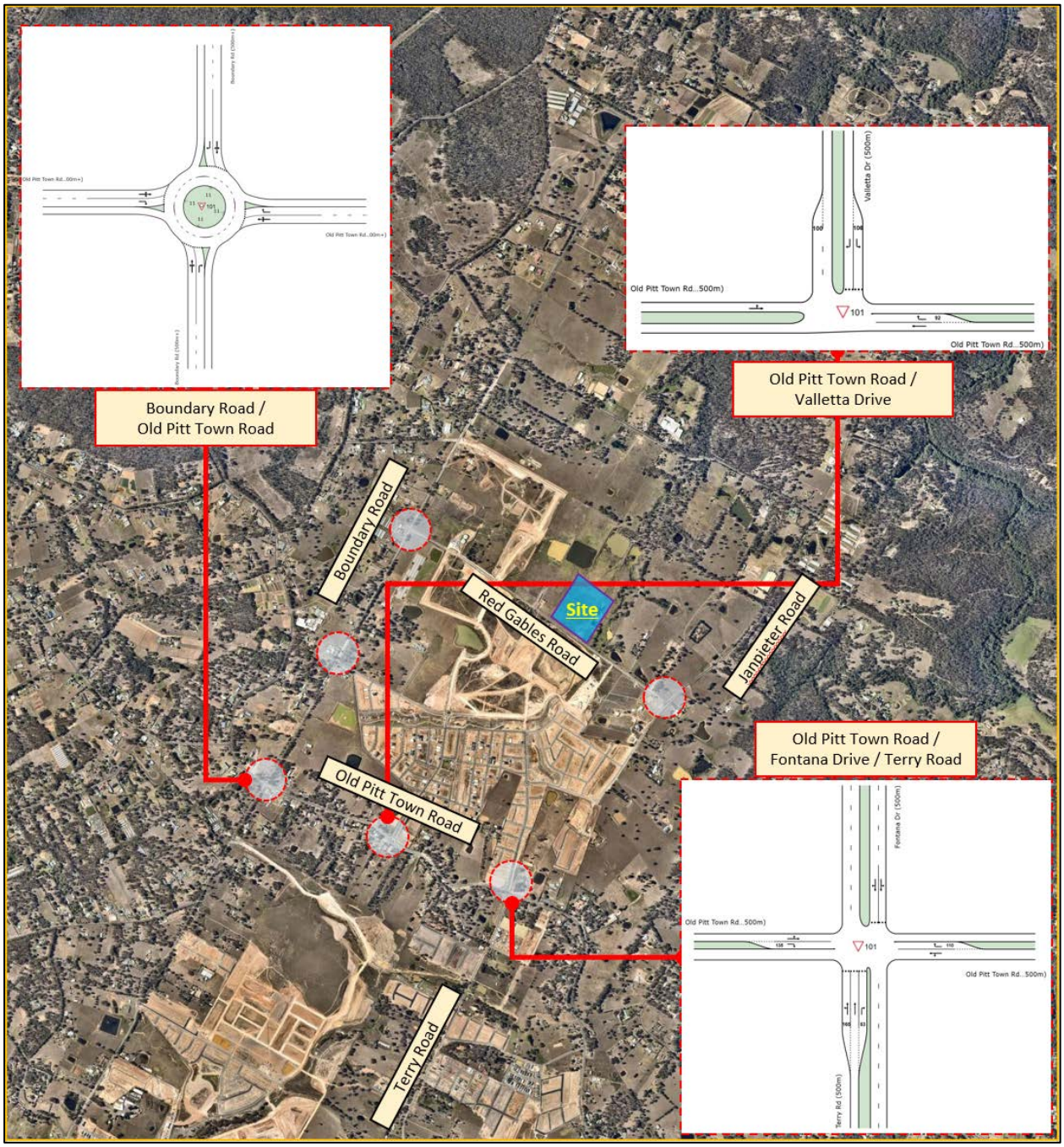


Figure 12: Old Pitt Town Road Intersections

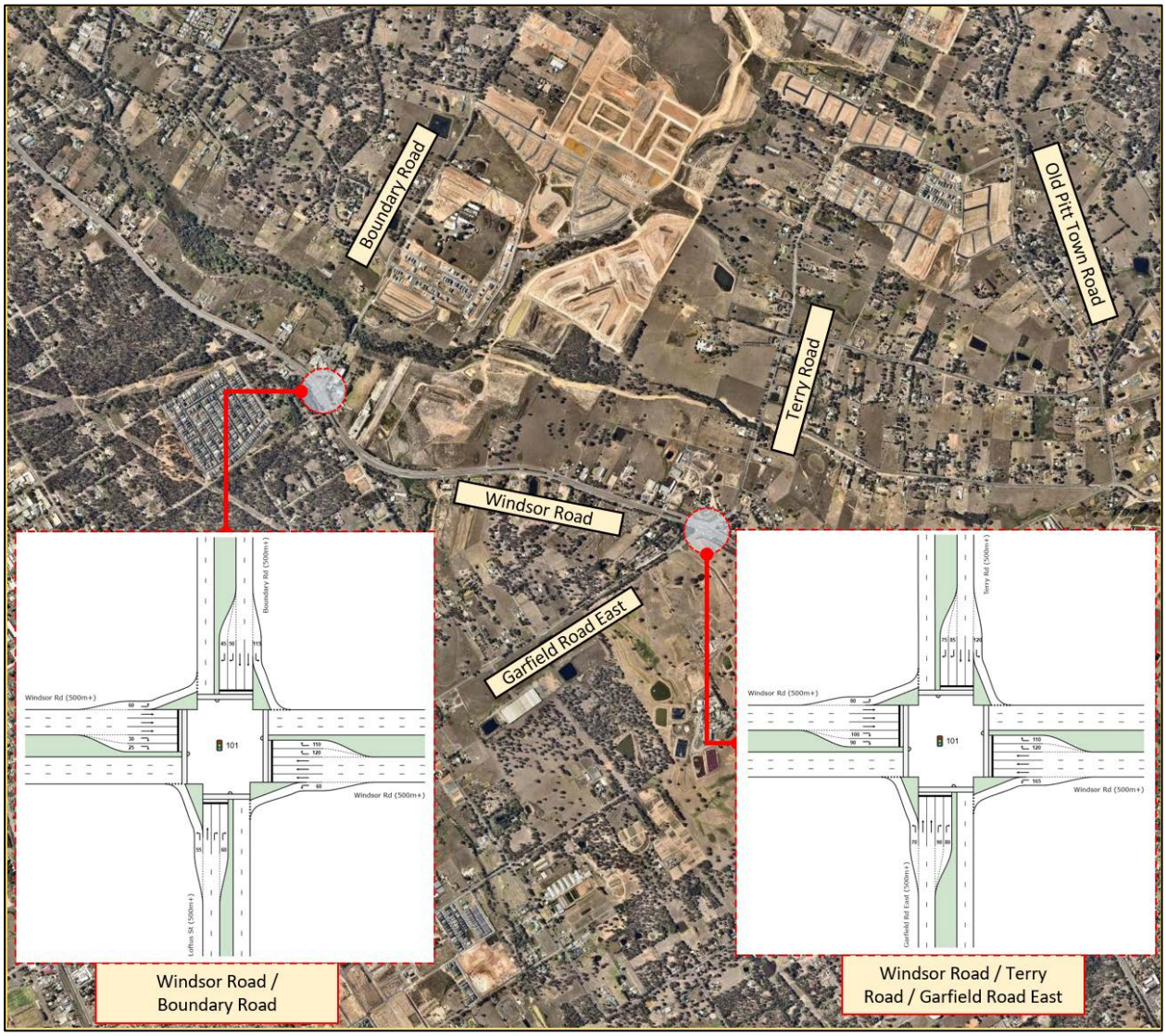


Figure 13: Windsor Road External Intersections

Based on the Netanal results and the using the above intersection layouts, **Table 11** details the results of the traffic assessment.

Table 10: SIDRA Intersection Results – External Intersections

Intersection	Period	Average Vehicle Delay (AVD) (secs)	LOS
Boundary Rd / Red Gables Rd	AM	18.8	B
	PM	15.9	B
Boundary Rd / Cataract Rd	AM	26.3	B
	PM	17.4	B

Red Gables Rd / Janpieter Rd	AM	7.8	A
	PM	7.5	A
Old Pitt Town Rd / Boundary Rd	AM	26.7	B
	PM	35.1	C
Old Pitt Town Rd / Valletta Dr	AM	9.2	A
	PM	9.5	A
Old Pitt Town Rd / Terry Rd / Fontana Dr	AM	33.6	C
	PM	34.9	C
Windsor Rd / Boundary Rd / Loftus Street	AM	83.7	F
	PM	228.5	F
Windsor Rd / Terry Rd / Garfield Road East	AM	43.7	D
	PM	36.0	C

The SIDRA analysis indicates that generally the external intersections would operate within acceptable limits of performance.

While the intersections of Windsor Road / Boundary Road / Loftus Street underperforms, it is noteworthy that the development traffic represents 8% and 5% of the total traffic utilising these intersections during the AM and PM peak periods respectively. Furthermore, the intersection would operate at the same Level of Service as those detailed in the Addendum Traffic Reports accompanying the approved Planning Proposal for the Box Hill North Precinct.

In summary, the traffic impact analysis concludes that the external intersections would generally operate within acceptable limits of performance at a LOS of D or better. The intersection of Windsor Road / Boundary Road / Loftus Street would operate as per the modelling undertaken within the Addendum Traffic Report which would operate at the same LOS and operating conditions identified in the Base development scenario (which included Full Development of Box Hill and Box Hill North Industrial Precincts).

Further analysis of the critical intersections would be undertaken at the DA stage however the development is supported on traffic planning grounds and remains consistent with the modelling conclusions of previous assessments for the entire precinct.

Detailed SIDRA Outputs are attached in **Appendix B**.

6.3.2 Town Centre Intersections

To determine the road layout and geometry adjacent to the Town Centre, a SIDRA Intersection analysis of the following intersections was undertaken:

- Red Gables Road / Fontana Drive;
- Red Gables Road / Road A;
- Fontana Drive / Road B; and
- Fontana Drive / Road C.

For the purpose of this assessment, the signalised intersection of Red Gables Road / Fontana Drive, which is subject to a separate DA, has been adopted. The below figures detail the traffic volumes utilising the above intersections adjacent to the Town Centre during the AM and PM peak periods.

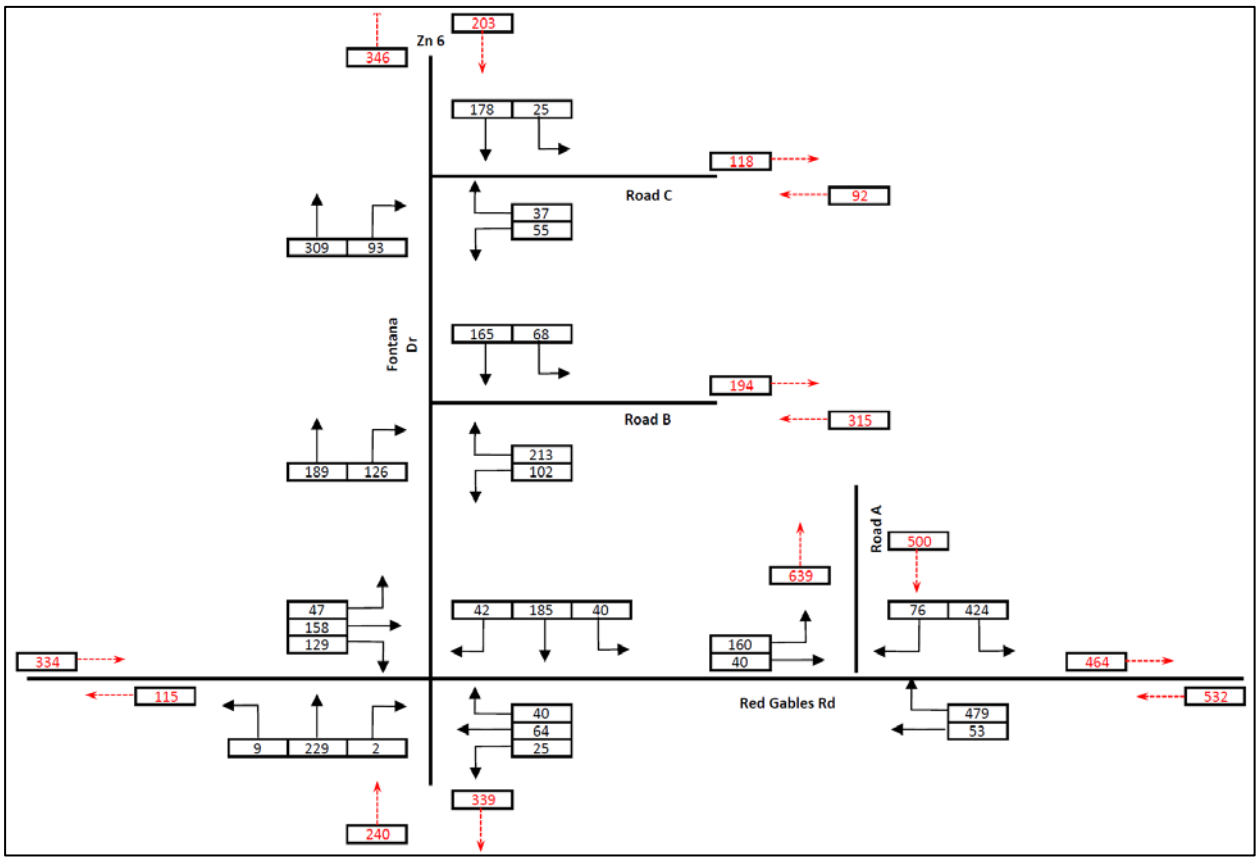


Figure 14: Town Centre Traffic Volumes – AM Peak Period

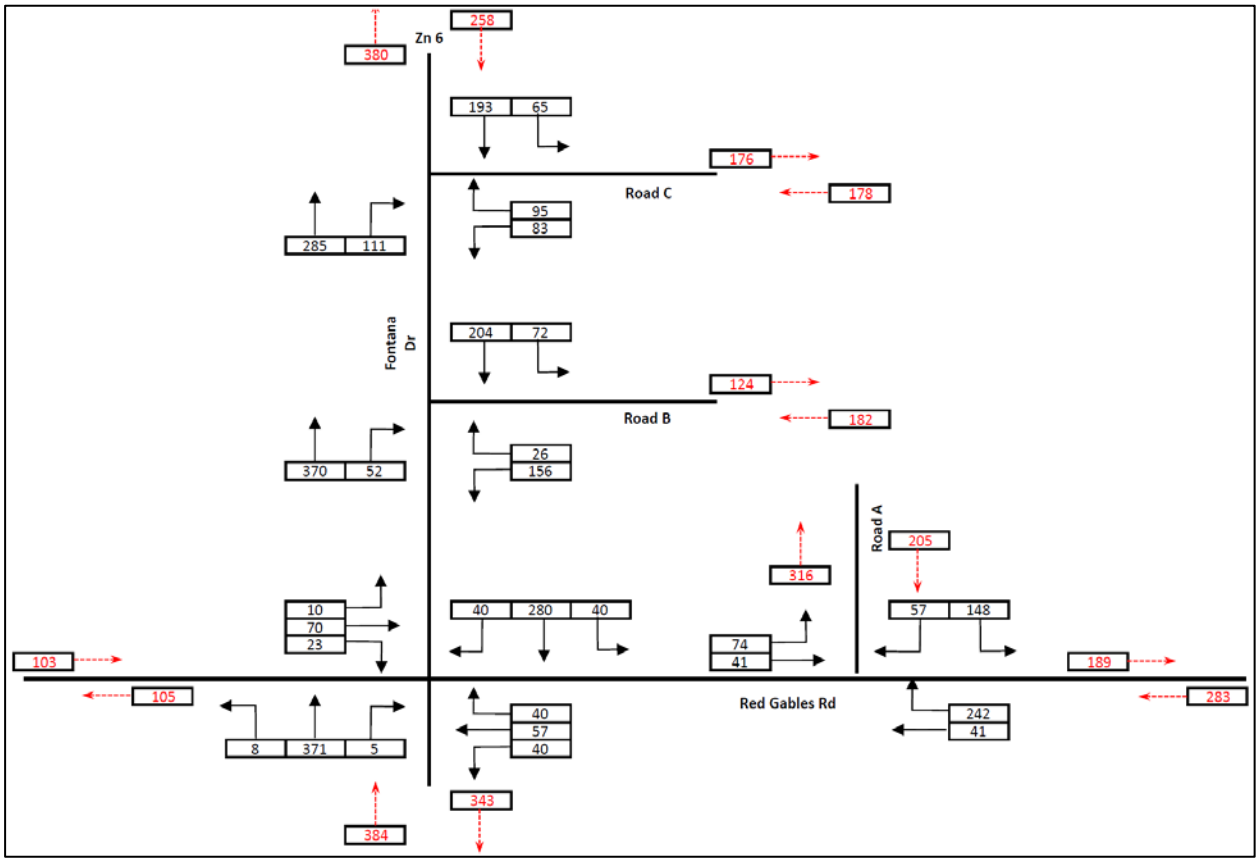


Figure 15: Town Centre Traffic Volumes – PM Peak Period

Based on the above traffic volumes, an iterative traffic modelling assessment was undertaken to determine the layouts and geometric design of the Town Centre intersections. The network layout is detailed in **Figure 16**.

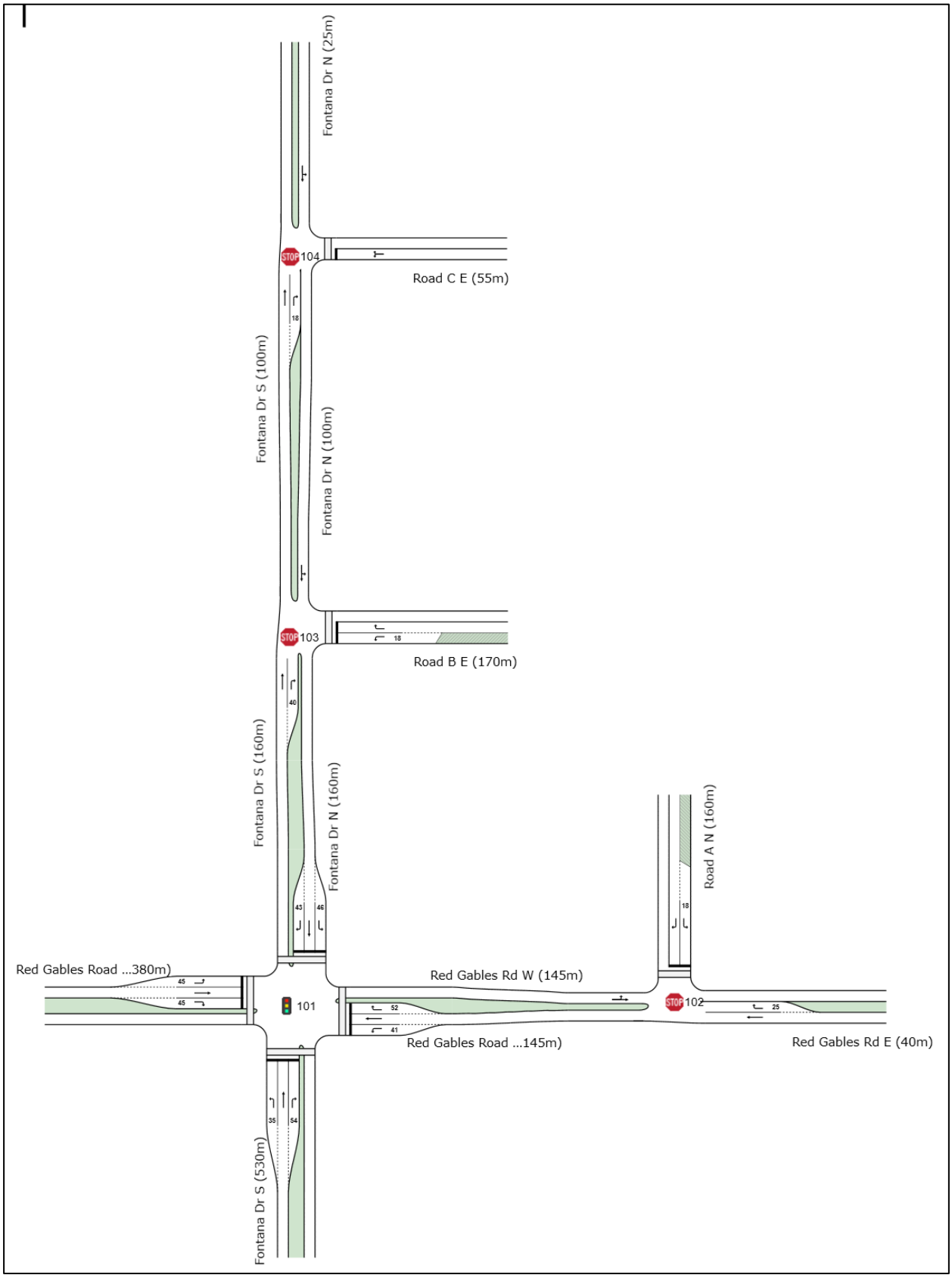


Figure 16: The Gables Town Centre – Network Layout

The following table details the results of the SIDRA intersection assessment using the above Town Centre network layout.

Table 11: SIDRA Intersection Results – Town Centre Intersections

Intersection	Period	Average Vehicle Delay (AVD) (secs)	LOS
Red Gables Rd / Fontana Dr	AM	31.8	C
	PM	37.4	C
Red Gables Rd / Road A	AM	15.5	B
	PM	10.5	A
Fontana Dr / Road B	AM	13.4	A
	PM	12.9	A
Fontana Dr / Road C	AM	12.6	A
	PM	13.8	A

Detailed SIDRA Outputs are attached in **Appendix C**.

As detailed above, the intersection of Red Gables Road / Fontana Drive would operate at a Level of Service C during both peak periods. The intersections of Red Gables Road / Road A, Fontana Drive / Road B, and Fontana Drive / Road C would generally operate at a Level of Service B or better. The geometric design of the intersections is detailed further below.

In summary, the traffic impact analysis concludes that the traffic generation of the Proposal can be accommodated on the external and internal road networks.

7 Design Commentary

7.1 Relevant Design Standards

The site access, car park, and loading areas would be designed to comply with the following relevant Australian Standards:

- AS2890.1 for car parking areas;
- AS2890.2 for commercial vehicle loading areas; and
- AS2890.6 for accessible (disabled) parking.

7.2 Town Centre Access

As detailed in Section 6.2.2, to prevent queuing impacts and achieve a Town Centre with main street character while also prioritising pedestrian movement, turning bay facilities are recommended for the Road A and Road B. In this regard, the turning facilities were designed to accommodate the traffic volumes of vehicles turning and thereby improve traffic flow and alleviate any queues. The SIDRA intersection layouts are detailed in the figures below.

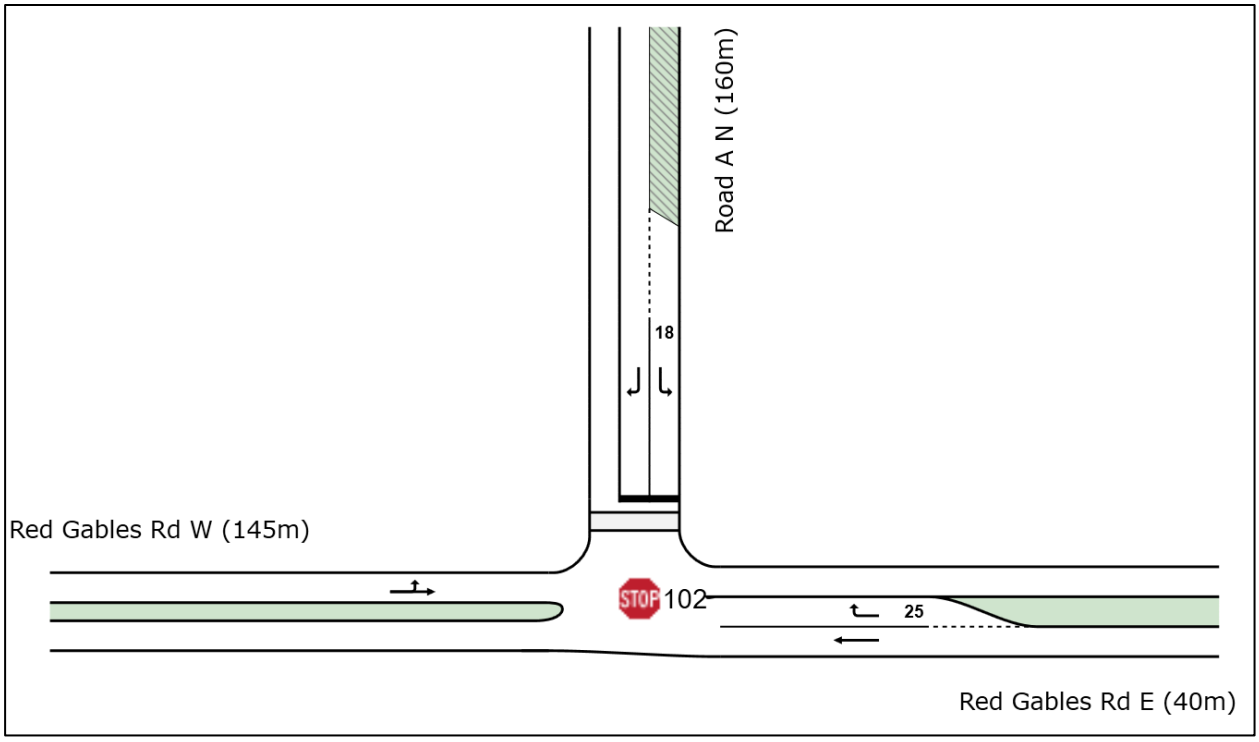


Figure 17: Red Gables Road / Road A Intersection Layout

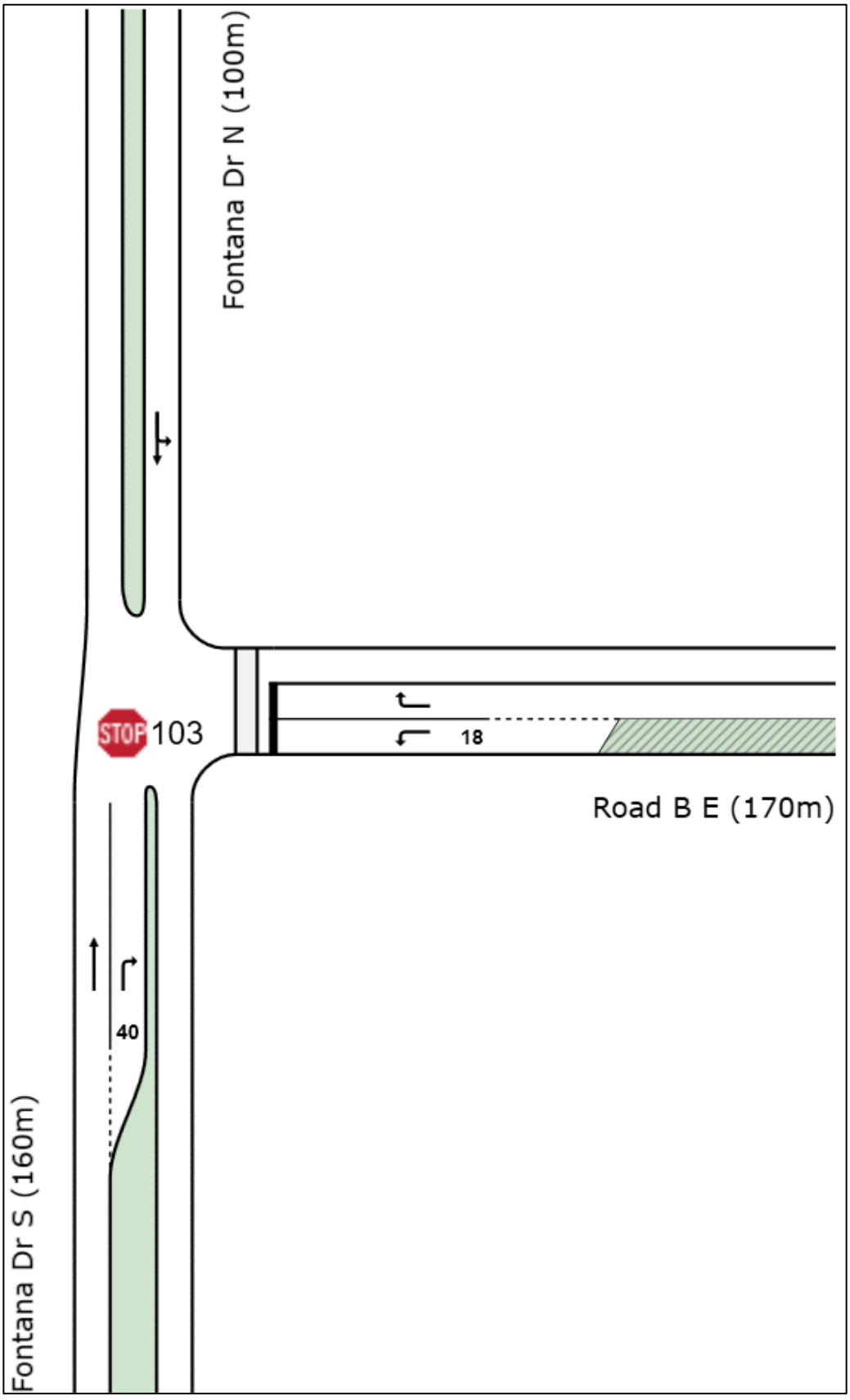


Figure 18: Fontana Drive / Road B Intersection Layout

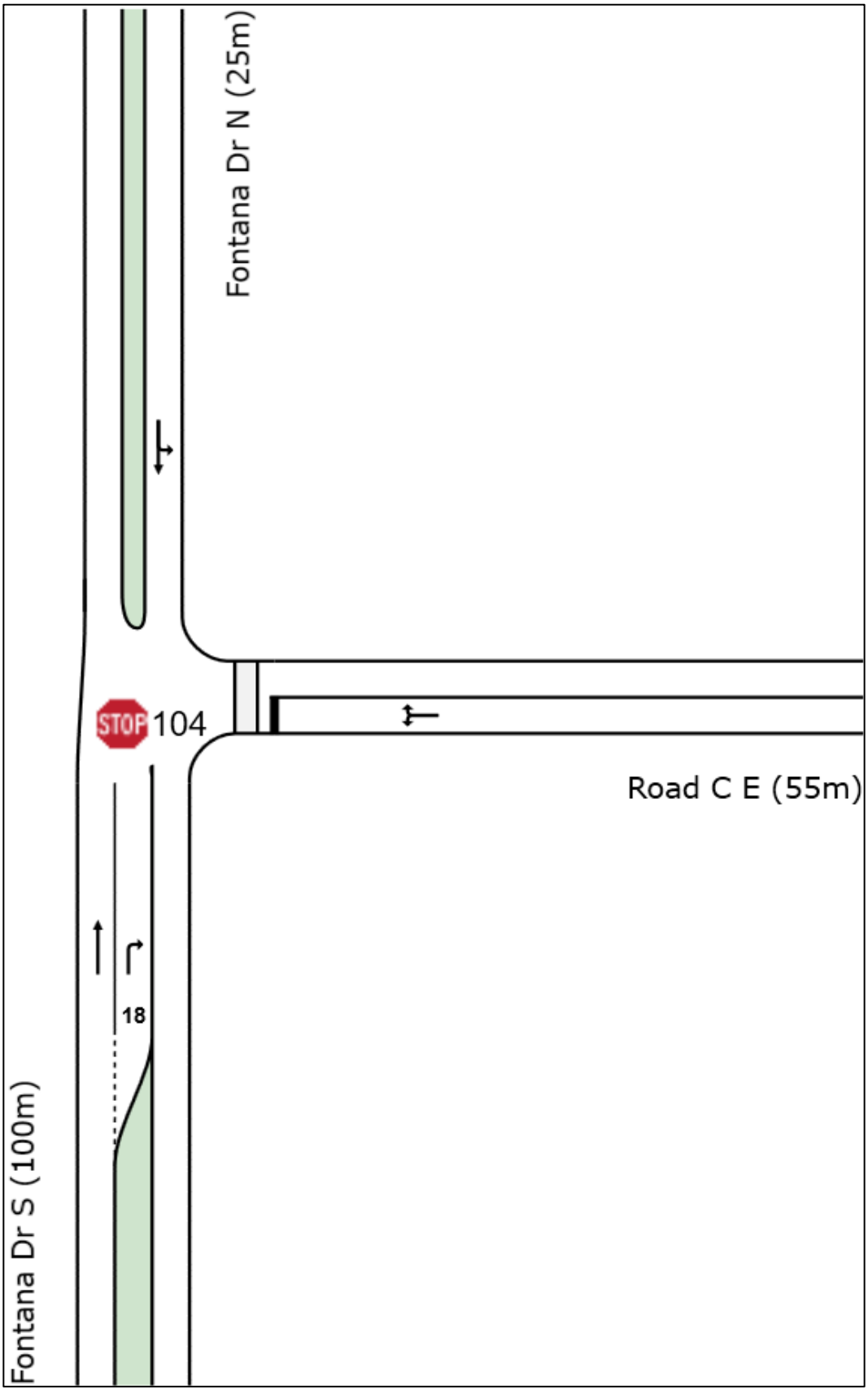


Figure 19: Fontana Drive / Road C Intersection Layout

7.3 Internal Road Design

The layout of the proposed Road A, Road B, Road C, and The Promenade has been designed by Aecom and is detailed in the figures below.

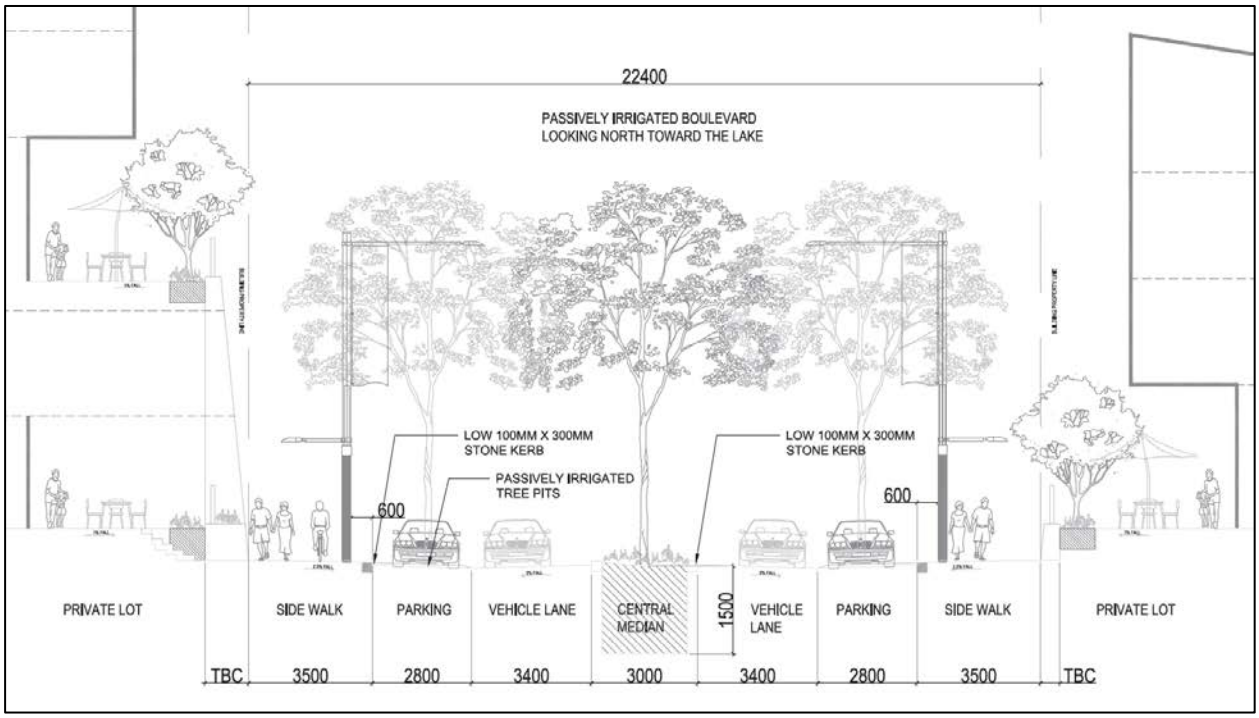


Figure 20: Road A Cross Section

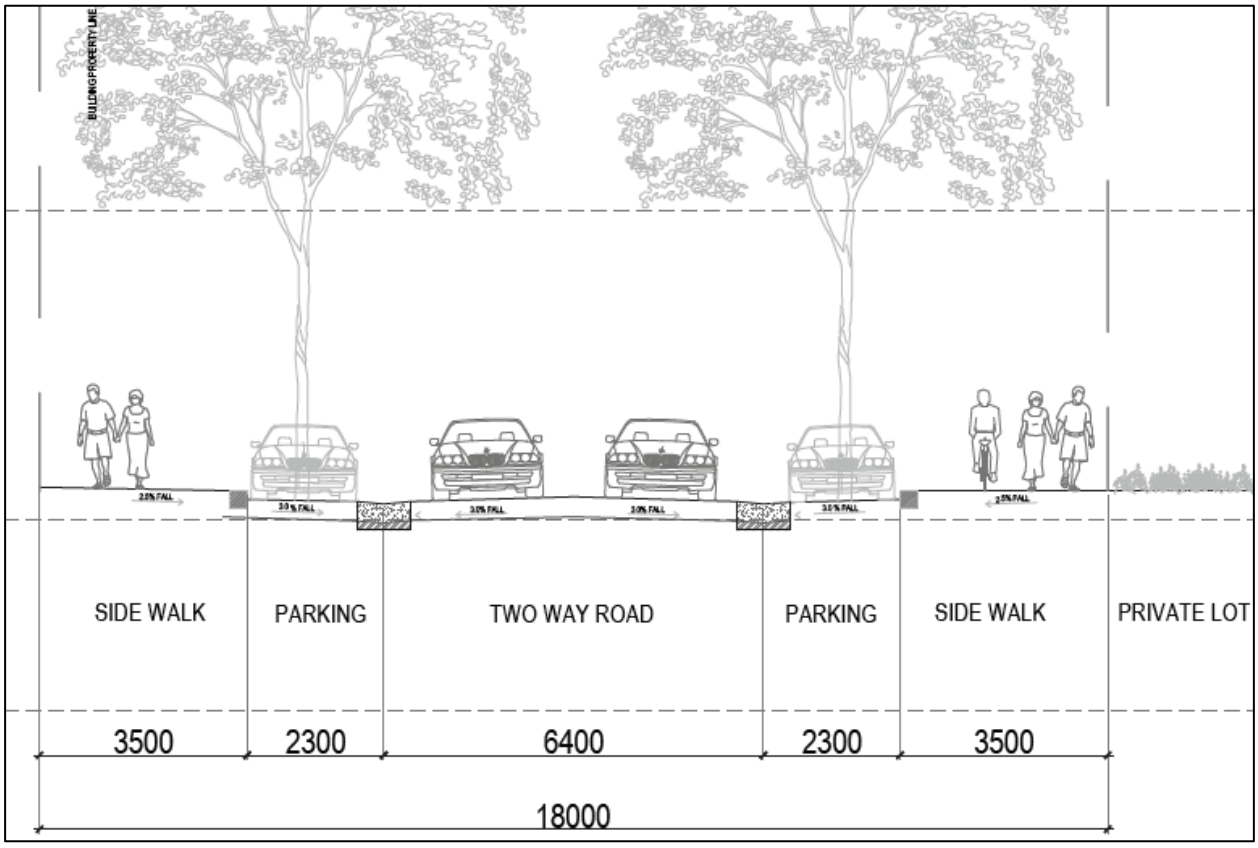


Figure 21: Road B Cross Section

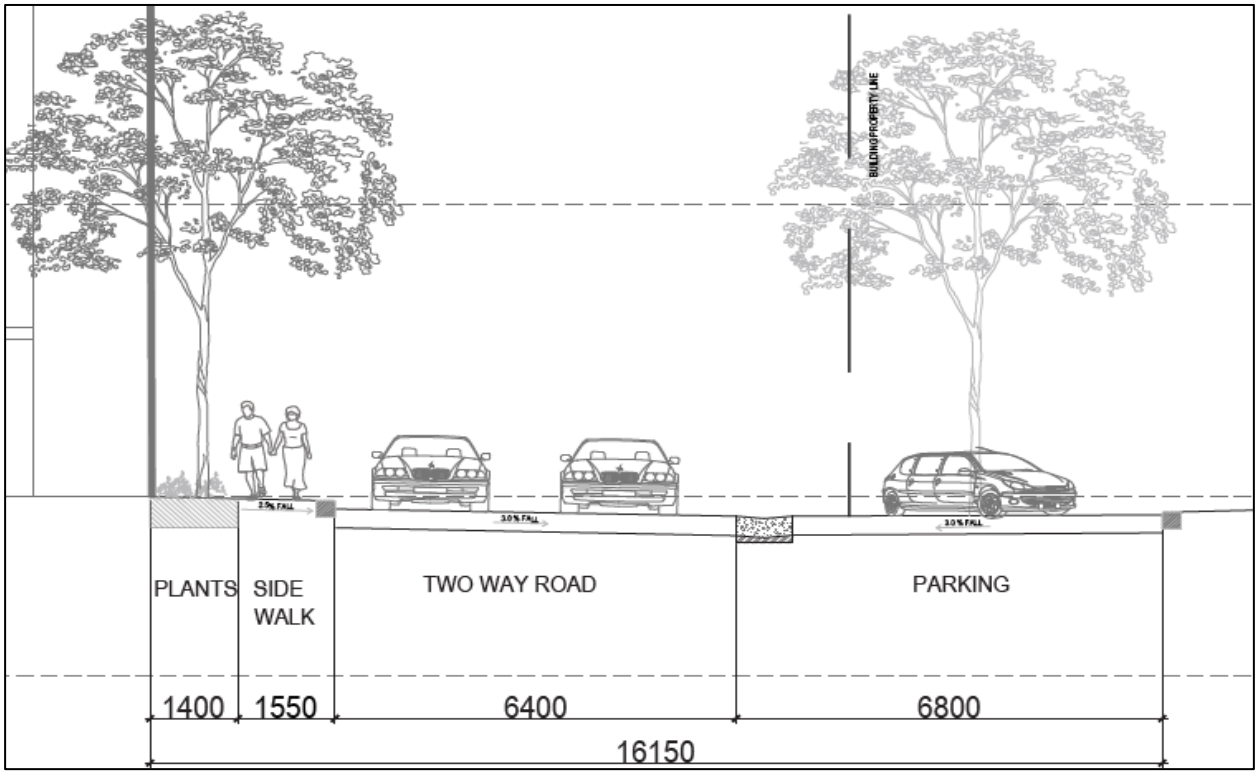


Figure 22: Road C Cross Section

While these cross-sections detail dimensions that differ from those detailed in Council's site specific DCP Box Hill North, the above designs provide a more pedestrian friendly environment while also creating main street character within the Town Centre. These designs are considered favourable and meet the objectives detailed in Council's DCP in Section 1.2.

7.4 Pick Up / Drop Off Area(s)

Council's DCP Part C Section 1 Clause 2.6 requires a set down area be provided in close proximity to busy centres, to provide safe and convenient designated set down areas for passengers to arrive close to their destination. The clause specifically mentions that set down areas are required for Education Establishments (schools) and shopping centres. It is noted however, that no rates are provided for the pick-up /drop-off area for either component.

To determine an appropriate pick-up / drop-off parking facility provision Ason Group undertook a review of recently approved schools within the Hills LGA. The recently approved (November 2017) Kellyville South Public-School is a combined primary and secondary school (K-Y12) that provides pick-up / drop-off facilities at a rate of **1 space per 30 children**. Application of this rate to the proposed 2,000 student education establishment determines a required provision of 66 pick-up / drop-off spaces. Subject to further detailed design analysis at the respective DA stage, it is intended to allocate these pick-up / drop-off facilities both on and off street. This parking strategy is applied in many cases to service differing demands. On street pick up and drop off facilities would generally be used be an older student demographic and internal (off street) provisions would service the younger students. The objective for any future DA associated with the proposed education establishment would seek to achieve a 50/50 balance of off/on street parking for pick up/ drop off facilities and would be subject to further development with the end user.

7.5 Internal Site Access

7.5.1 Car Park Access

Access to the internal car parking for each precinct will be provided via access driveways off the Town Centre internal roads. These driveways would generally be designed in accordance with AS2890.1 which determines the driveway dimensions based on the total number of car parking spaces and the relevant user class of the vehicles accessing the development.

Detailed analysis of the necessary access provisions will be undertaken during the subsequent DA stages. Each Precinct will be assessed on merit with the objective to reduce the design widths where possible based on alternative solutions (including but not limited to swept path analysis and queuing theory analysis) to ensure satisfactory operation. The reduction in access driveway width would promote a more pedestrian friendly environment and meet the study objectives detailed in Section 1.2.

7.6 Car Park Design

Noting the potential land uses within the Town Centre, parking modules with separate User Class designations are required. The design requirements of User Class 1,1A (residential and employees) and 3 (short term, high-turnover) are attached in **Appendix D**. The following characteristics are noteworthy with regard to the design of the carpark:

- A single entry/exit driveway for residential and commercial vehicles that is to be designed in accordance with AS2890.1 and AS2890.2 design standards.
- All resident/employee parking spaces are designed in accordance with a User Class 1A and are to be provided with a minimum space length of 5.4m, a minimum width of 2.4m, and a minimum 5.8m aisle width.
- All short-term parking spaces are designed in accordance with a User Class 3A and are to be provided with a minimum space length of 5.4m, a minimum space width of 2.6m, and a minimum 6.6m aisle width or a minimum space width of 2.7m and a minimum aisle width of 6.2m.
- Dead-end aisles are provided with the required 1.0m aisle extension in accordance with Figure 2.3 of AS2890.1.
- All disabled and adaptable parking spaces are to be provided in accordance with AS2890.6, which requires a space with a clear width of 2.4m and located adjacent to a minimum shared area of 2.4m.

It is expected all future DA architectural plans would be designed to comply with AS2890.1.

7.7 Commercial Vehicle Facilities

The commercial (heavy) vehicle facilities of the development would be designed having regard for the operational requirements of the future tenant and the requirements of AS2890.2. The design of the access and servicing area would be designed in accordance with AS2890.2 and Council's controls. The following characteristics are noteworthy with regard to the design of the commercial vehicle access:

- Service vehicle parking spaces would be located near vehicle entry points and lifts.
- Bays are to be located completely within the boundary of the Site, clear of parked vehicles and through traffic.
- Ramps are to be designed in accordance with AS2890.2 widths, grades, and radius.
- Access and servicing area would be designed to accommodate the largest vehicle entering the Site.

The design requirements for a development to accommodate a 19m AV and a 12.5m Heavy Rigid Vehicle (HRV) in accordance with AS2890.2 are attached in **Appendix E**.

8 Conclusions

The Study objectives of this Traffic Impact Assessment (TIA) seek to:

- Demonstrate the traffic generation associated with the Planning Proposal reference scheme could be accommodated within the surrounding road network.
- Confirm that the Planning Proposal would continue to align with the key traffic, parking and transport objectives of the Box Hill North DCP.

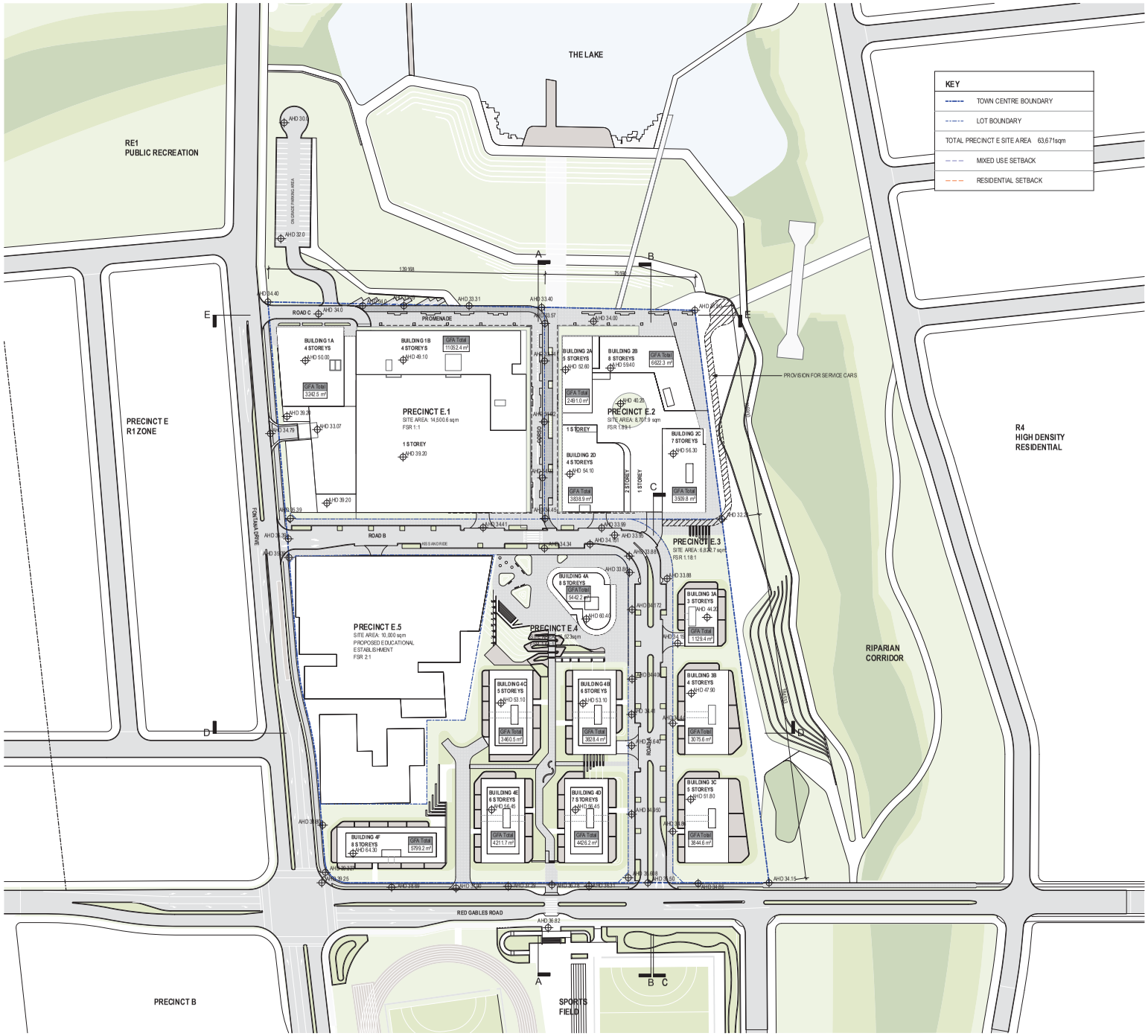
Taking these objectives into account, the key findings of this TIA report are:

- The Site is located within the Box Hill North Precinct, directly to the north of the North West Growth Area which includes the Box Hill and Box Hill Industrial Precincts. The NWGA includes the provision of 33,000 dwellings for 250,000 new residents. The Box Hill North Precinct will deliver 4,800 new dwellings and the Town Centre, which is the Site under consideration as part of this Planning Proposal application.
- The proposed Town Centre includes residential, commercial, retail, and community land uses which will provide a holistic Town Centre experience while also providing a pedestrian and transport orientated area.
- The accessibility of the Box Hill North Precinct would be improved with the extension of bus routes within the Precinct, as well as the delivery of the Sydney Metro Northwest stations in early 2019. Although not yet approved, the Outer Sydney Orbital would provide connections with the South West Growth Area and Badgerys Creek Aerotropolis and allow for improved access to Broader Western Sydney.
- Previous traffic assessments of the Box Hill North Precinct have indicated the requirement for infrastructure upgrades for key intersections along Windsor Road and Boundary Road. Of key importance are infrastructure upgrades to the intersections of Windsor Road / Boundary Road / Loftus Street, Windsor Road / Terry Road / Garfield East, and Boundary Road / Old Pitt Town Road. These upgrades have been subsequently incorporated within the Box Hill North Contributions Plan.
- Parking would be provided in accordance with Council's DCP and could be accommodated on-site. The parking provision of the individual Precincts will be investigated in further detail subject to each Development Application, however compliance with Council's DCP would be the primary objective for car parking.
- The forecast traffic generation of the Town Centre has been determined using the RMS Guide and RMS TDT2013/04a. It was established that 1,843 and 1,139 vehicles trips would be generated during the AM and PM peaks respectively.

- A Netanal modelling assessment was undertaken to establish the traffic volumes of the key external intersections. The assessment assumed full development of Box Hill, Box Hill Industrial, and Box Hill North Precincts.
- SIDRA intersection analysis of the key external intersections determined that they would generally operate within acceptable operating conditions. The intersection of Windsor Road / Boundary Road / Loftus Street is projected to underperform consistent with previous traffic assessments undertaken for the Precinct which considered the full development of the Box Hill, Box Hill Industrial, and Box Hill North Precincts. As such, the Proposal meets the key objective of not having a detrimental impact on the surrounding road network and the traffic generated by the Proposal can be accommodated on the wider road network.
- SIDRA modelling of the Town Centre Local intersections determined that they would operate within acceptable operating conditions. The network design was determined through an iterative process which aimed at mitigating and reducing queuing along the public roadways and within the Precinct. All Town Centre local intersection operate in a satisfactory manner.
- The internal road network has been designed to provide a pedestrian friendly environment by providing cycleways, and pedestrians paths while also reducing the road width and provision of on-street parking.
- The access and basement design would generally be designed having regard for the relevant Australian standards. Detailed assessment of the design ensure compliance with AS2890 and relevant Council controls would be undertaken as part of the DA documentation.

It is therefore concluded that the Planning Proposal meets the Study Objectives where the traffic generation could be accommodated with the surrounding road network consistent with previous assessments and the Proposal would continue to align the with key objectives of Council's DCP.

Appendix A – Reduced Plans



PRELIMINARY

Revisions			
-	08.08.18	FOR PLANNING PROPOSAL	JLi
A	14.08.18	REVISED FOR PLANNING PROPOSAL	JLi

14/08/2018 10:13:58 AM

Project / **THE GABLES TOWN CENTRE, BOX HILL**
121 OLD PITT TOWN ROAD , BOX HILL NSW 2765

Drawing / **MASTER SITE/ ROOF PLAN**

Project No. / **217130**

Date / **23.05.18**

Author / **JLi**

Scale: @ A1 / **1 : 1000**

Drawing No. / **TP00.01 A**

rothelowman

Brisbane, Melbourne, Sydney
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Appendix B – SIDRA (External)

MOVEMENT SUMMARY

Site: 101 [Boundary Rd x Old Pitt Town Rd_AM]

Boundary Rd x Old Pitt Town Rd
AM Traffic
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
South: Boundary Rd (500m+)												
1	L2	396	3.0	0.982	26.6	LOS B	32.1	230.3	1.00	1.28	2.11	46.0
2	T1	681	3.0	0.982	26.7	LOS B	32.1	230.3	1.00	1.28	2.11	48.4
3	R2	6	3.0	0.011	11.6	LOS A	0.0	0.3	0.42	0.69	0.42	57.9
Approach		1083	3.0	0.982	26.6	LOS B	32.1	230.3	1.00	1.28	2.10	47.6
East: Old Pitt Town Rd (500m+)												
4	L2	5	3.0	0.032	8.1	LOS A	0.1	0.9	0.61	0.72	0.61	59.0
5	T1	18	3.0	0.032	7.9	LOS A	0.1	0.9	0.61	0.72	0.61	58.0
6	R2	5	3.0	0.013	13.5	LOS A	0.0	0.3	0.62	0.80	0.62	55.5
Approach		28	3.0	0.032	9.0	LOS A	0.1	0.9	0.61	0.74	0.61	57.7
North: Boundary Rd (500m+)												
7	L2	81	3.0	0.740	11.1	LOS A	7.0	50.3	0.82	0.97	1.04	57.1
8	T1	596	3.0	0.740	11.2	LOS A	7.0	50.3	0.82	0.97	1.04	60.9
9	R2	300	3.0	0.431	12.7	LOS A	2.3	16.2	0.64	0.90	0.68	57.0
Approach		977	3.0	0.740	11.7	LOS A	7.0	50.3	0.77	0.95	0.93	59.3
West: Old Pitt Town Rd (500m+)												
10	L2	166	3.0	0.781	15.2	LOS B	8.8	63.5	0.98	1.14	1.40	53.4
11	T1	384	3.0	0.781	15.0	LOS B	8.8	63.5	0.98	1.14	1.40	52.6
12	R2	111	3.0	0.277	14.3	LOS A	1.3	9.4	0.72	0.92	0.72	54.9
Approach		661	3.0	0.781	14.9	LOS B	8.8	63.5	0.94	1.10	1.29	53.2
All Vehicles		2749	3.0	0.982	18.3	LOS B	32.1	230.3	0.90	1.11	1.47	52.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Old Pitt Town Rd x Terry Rd x Fontana Dr_AM]

Old Pitt Town Rd x Terry Rd x Fontana Dr
AM Traffic
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
South: Terry Rd (500m)												
1	L2	174	3.0	0.499	7.3	LOS A	4.0	28.4	0.04	0.55	0.05	49.8
2	T1	461	3.0	0.499	13.4	LOS A	4.0	28.4	0.42	0.80	0.65	49.1
3	R2	26	3.0	0.099	17.9	LOS B	0.3	2.4	0.74	0.89	0.74	45.4
Approach		661	3.0	0.499	12.0	LOS A	4.0	28.4	0.33	0.74	0.49	49.1
East: Old Pitt Town Rd (500m)												
4	L2	89	3.0	0.050	5.6	LOS A	0.0	0.0	0.00	0.55	0.00	53.7
5	T1	5	3.0	0.050	0.0	LOS A	0.0	0.0	0.00	0.55	0.00	55.2
6	R2	5	3.0	0.003	5.6	LOS A	0.0	0.1	0.10	0.55	0.10	53.0
Approach		100	3.0	0.050	5.3	NA	0.0	0.1	0.01	0.55	0.01	53.8
North: Fontana Dr (500m)												
7	L2	5	3.0	0.303	6.3	LOS A	1.5	10.4	0.51	0.78	0.59	49.3
8	T1	283	3.0	0.303	11.6	LOS A	1.5	10.4	0.58	0.82	0.68	49.3
9	R2	5	3.0	0.303	33.6	LOS C	1.4	10.1	0.66	0.87	0.78	48.7
Approach		294	3.0	0.303	11.9	LOS A	1.5	10.4	0.58	0.82	0.68	49.3
West: Old Pitt Town Rd (500m)												
10	L2	5	3.0	0.016	5.6	LOS A	0.0	0.0	0.00	0.11	0.00	57.3
11	T1	24	3.0	0.016	0.0	LOS A	0.0	0.0	0.00	0.11	0.00	59.0
12	R2	409	3.0	0.251	6.0	LOS A	1.4	9.9	0.24	0.54	0.24	52.9
Approach		439	3.0	0.251	5.6	NA	1.4	9.9	0.22	0.51	0.22	53.2
All Vehicles		1494	3.0	0.499	9.7	NA	4.0	28.4	0.33	0.68	0.42	50.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model 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 SUMMARY

Site: 101 [Old Pitt Town Rd x Valletta Dr_AM]

Old Pitt Town Rd x Valletta Dr
AM Traffic
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
East: Old Pitt Town Rd (500m)												
5	T1	18	3.0	0.010	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	39	3.0	0.036	7.4	LOS A	0.1	1.1	0.49	0.65	0.49	51.8
Approach		57	3.0	0.036	5.1	NA	0.1	1.1	0.33	0.45	0.33	54.2
North: Valletta Dr (500m)												
7	L2	136	3.0	0.135	7.6	LOS A	0.5	3.8	0.49	0.71	0.49	52.0
9	R2	1	3.0	0.002	9.2	LOS A	0.0	0.0	0.53	0.60	0.53	50.6
Approach		137	3.0	0.135	7.6	LOS A	0.5	3.8	0.49	0.71	0.49	51.9
West: Old Pitt Town Rd (500m)												
10	L2	1	3.0	0.247	5.6	LOS A	0.0	0.0	0.00	0.00	0.00	58.2
11	T1	471	3.0	0.247	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		472	3.0	0.247	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
All Vehicles		665	3.0	0.247	2.0	NA	0.5	3.8	0.13	0.18	0.13	57.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model 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 SUMMARY

Site: 101 [Red Gables Rd x Janpieter Rd_AM]

Red Gables Rd x Janpieter Rd
AM Traffic
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
South: Janpieter Rd (500m)												
1	L2	327	3.0	0.223	5.6	LOS A	0.0	0.0	0.00	0.47	0.00	54.8
2	T1	82	3.0	0.223	0.0	LOS A	0.0	0.0	0.00	0.47	0.00	55.9
Approach		409	3.0	0.223	4.5	NA	0.0	0.0	0.00	0.47	0.00	55.0
North: Janpieter Rd (500m)												
8	T1	14	3.0	0.175	1.8	LOS A	0.8	5.9	0.49	0.65	0.49	53.9
9	R2	196	3.0	0.175	7.2	LOS A	0.8	5.9	0.49	0.65	0.49	52.6
Approach		209	3.0	0.175	6.9	NA	0.8	5.9	0.49	0.65	0.49	52.6
West: Red Gables Rd (600m)												
10	L2	4	3.0	0.202	5.9	LOS A	0.7	5.1	0.43	0.73	0.43	52.5
12	R2	164	3.0	0.202	7.8	LOS A	0.7	5.1	0.43	0.73	0.43	52.0
Approach		168	3.0	0.202	7.7	LOS A	0.7	5.1	0.43	0.73	0.43	52.0
All Vehicles		787	3.0	0.223	5.8	NA	0.8	5.9	0.22	0.57	0.22	53.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model 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 SUMMARY

Site: 101 [Windsor Rd x Boundary Rd x Loftus St_AM]

Windsor Rd x Boundary Rd x Loftus St
AM Traffic
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
South: Loftus St (500m+)												
1	L2	122	2.0	0.158	23.6	LOS B	4.4	31.5	0.57	0.71	0.57	42.8
2	T1	329	2.0	0.968	96.3	LOS F	30.1	214.2	1.00	1.16	1.44	23.5
3	R2	208	2.0	0.275	59.5	LOS E	6.4	45.7	0.88	0.77	0.88	30.4
Approach		660	2.0	0.968	71.2	LOS F	30.1	214.2	0.88	0.95	1.10	27.8
East: Windsor Rd (500m+)												
4	L2	67	2.0	0.053	11.3	LOS A	1.3	9.5	0.32	0.62	0.32	50.0
5	T1	1748	8.4	0.985	95.2	LOS F	60.7	455.8	1.00	1.18	1.39	26.1
6	R2	307	26.6	0.984	120.0	LOS F	14.8	126.8	1.00	1.05	1.62	21.0
Approach		2123	10.9	0.985	96.1	LOS F	60.7	455.8	0.98	1.14	1.39	25.6
North: Boundary Rd (500m+)												
7	L2	35	11.8	0.040	20.5	LOS B	1.0	7.9	0.46	0.68	0.46	50.8
8	T1	656	2.0	0.977	101.4	LOS F	34.5	245.3	1.00	1.18	1.46	22.8
9	R2	282	23.5	0.459	66.1	LOS E	9.2	77.7	0.93	0.80	0.93	30.7
Approach		973	8.6	0.977	88.3	LOS F	34.5	245.3	0.96	1.05	1.27	25.1
West: Windsor Rd (500m+)												
10	L2	49	21.1	0.046	15.2	LOS B	1.1	9.1	0.37	0.67	0.37	53.0
11	T1	1704	6.1	0.937	73.1	LOS F	51.3	377.8	1.00	1.07	1.24	31.0
12	R2	121	2.0	0.331	74.9	LOS F	4.2	30.1	0.97	0.76	0.97	26.9
Approach		1875	6.2	0.937	71.7	LOS F	51.3	377.8	0.98	1.04	1.20	31.0
All Vehicles		5631	7.9	0.985	83.7	LOS F	60.7	455.8	0.97	1.07	1.27	27.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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
P1	South Full Crossing	53	69.3	LOS F	0.2	0.2	0.96	0.96
P2	East Full Crossing	53	69.3	LOS F	0.2	0.2	0.96	0.96
P3	North Full Crossing	53	69.3	LOS F	0.2	0.2	0.96	0.96
P4	West Full Crossing	53	69.3	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		211	69.3	LOS F			0.96	0.96

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.

MOVEMENT SUMMARY

Site: 101 [Windsor Rd x Terry Rd x Garfield Rd E_AM]

Windsor Rd x Terry Rd x Garfield Rd E
AM Traffic
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 135 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
South: Garfield Rd East (500m+)												
1	L2	64	32.8	0.073	9.4	LOS A	0.9	8.3	0.28	0.61	0.28	49.1
2	T1	301	19.6	0.470	53.5	LOS D	9.0	73.3	0.94	0.77	0.94	32.2
3	R2	246	13.7	0.819	55.3	LOS D	6.5	50.8	1.00	0.91	1.33	32.0
Approach		612	18.6	0.819	49.6	LOS D	9.0	73.3	0.90	0.81	1.03	33.3
East: Windsor Rd (500m+)												
4	L2	351	8.8	0.273	9.7	LOS A	4.5	34.1	0.27	0.68	0.27	57.1
5	T1	1192	11.1	0.526	31.5	LOS C	19.4	148.5	0.80	0.70	0.80	47.6
6	R2	571	11.5	0.831	70.3	LOS E	19.7	151.4	1.00	0.91	1.16	29.6
Approach		2113	10.8	0.831	38.4	LOS C	19.7	151.4	0.77	0.76	0.81	41.8
North: Terry Rd (500m+)												
7	L2	906	28.1	0.972	64.4	LOS E	71.0	616.8	0.97	1.07	1.29	28.6
8	T1	380	4.7	0.542	54.2	LOS D	11.5	83.4	0.96	0.79	0.96	32.0
9	R2	63	18.9	0.217	44.3	LOS D	1.5	11.9	0.96	0.72	0.96	35.0
Approach		1349	21.1	0.972	60.6	LOS E	71.0	616.8	0.97	0.97	1.18	29.8
West: Windsor Rd (500m+)												
10	L2	27	9.5	0.026	13.3	LOS A	0.5	3.8	0.35	0.66	0.35	54.1
11	T1	1146	6.5	0.788	29.6	LOS C	15.4	114.0	0.99	0.88	1.05	48.8
12	R2	65	17.7	0.223	71.4	LOS F	2.1	16.7	0.96	0.73	0.96	29.3
Approach		1239	7.1	0.788	31.4	LOS C	15.4	114.0	0.97	0.86	1.03	47.2
All Vehicles		5313	13.5	0.972	43.7	LOS D	71.0	616.8	0.88	0.84	0.98	37.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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
P1	South Full Crossing	53	61.8	LOS F	0.2	0.2	0.96	0.96
P2	East Full Crossing	53	61.8	LOS F	0.2	0.2	0.96	0.96
P3	North Full Crossing	53	30.1	LOS D	0.1	0.1	0.91	0.91
P4	West Full Crossing	53	61.8	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		211	53.9	LOS E			0.95	0.95

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.

MOVEMENT SUMMARY

Site: 1 [Boundary Rd x Cataract Rd_AM_Stage 1]

Network: N101 [Boundary Rd x Cataract Rd_AM_Seagull Intersection]

Boundary Rd x Cataract Rd
AM Traffic
Stage 1
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	Aver. Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Boundary Rd Right Turn Bay (80m)														
3	R2	126	3.0	126	3.0	0.248	11.2	LOS A	0.4	2.8	0.70	0.89	0.78	19.9
Approach		126	3.0	126	3.0	0.248	11.2	NA	0.4	2.8	0.70	0.89	0.78	19.9
East: Cataract Rd (500m)														
4	L2	195	3.0	195	3.0	0.508	20.3	LOS B	1.0	6.9	0.81	1.12	1.22	37.7
5	T1	5	0.0	5	0.0	0.029	26.3	LOS B	0.0	0.3	0.83	1.02	0.83	33.4
Approach		200	2.9	200	2.9	0.508	20.5	LOS B	1.0	6.9	0.81	1.11	1.21	37.6
North: Boundary Rd (500m)														
7	L2	1	3.0	1	3.0	0.401	5.6	LOS A	0.0	0.0	0.00	0.00	0.00	58.1
8	T1	765	3.0	765	3.0	0.401	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		766	3.0	766	3.0	0.401	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
All Vehicles		1093	3.0	1093	3.0	0.508	5.1	NA	1.0	6.9	0.23	0.31	0.31	44.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model 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 SUMMARY

Site: 1 [Red Gables Rd x Boundary Rd_AM_Stage 1]

Network: N101 [Red Gables Rd x Boundary Rd_AM_Seagull Intersection]

Red Gables Rd x Boundary Rd
AM Traffic
Stage 1
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	Aver. Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Boundary Rd Right Turn Bay (86m)														
3	R2	216	3.0	216	3.0	0.265	7.9	LOS A	0.5	3.3	0.56	0.79	0.58	20.7
Approach		216	3.0	216	3.0	0.265	7.9	NA	0.5	3.3	0.56	0.79	0.58	20.7
East: Red Gables Rd (500m)														
4	L2	80	3.0	80	3.0	0.123	11.6	LOS A	0.2	1.3	0.52	0.97	0.52	44.0
5	T1	37	3.0	37	3.0	0.122	18.8	LOS B	0.2	1.3	0.73	1.03	0.73	38.6
Approach		117	3.0	117	3.0	0.123	13.9	LOS A	0.2	1.3	0.58	0.99	0.58	42.3
North: Boundary Rd (500m)														
7	L2	4	3.0	4	3.0	0.253	5.6	LOS A	0.0	0.0	0.00	0.01	0.00	58.1
8	T1	479	3.0	479	3.0	0.253	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.9
Approach		483	3.0	483	3.0	0.253	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.8
All Vehicles		816	3.0	816	3.0	0.265	4.1	NA	0.5	3.3	0.23	0.35	0.24	38.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model 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 SUMMARY

Site: 101 [Boundary Rd x Old Pitt Town Rd_PM]

Boundary Rd x Old Pitt Town Rd
PM Traffic
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
South: Boundary Rd (500m+)												
1	L2	528	3.0	0.957	7.9	LOS A	25.7	184.6	1.00	0.58	1.02	50.3
2	T1	801	3.0	0.957	7.4	LOS A	25.7	184.6	1.00	0.58	1.02	51.5
3	R2	12	3.0	0.016	8.7	LOS A	0.1	0.4	0.23	0.63	0.23	51.6
Approach		1341	3.0	0.957	7.6	LOS A	25.7	184.6	0.99	0.58	1.02	51.0
East: Old Pitt Town Rd (500m+)												
4	L2	1	3.0	0.028	6.4	LOS A	0.1	0.7	0.43	0.58	0.43	52.2
5	T1	25	3.0	0.028	5.9	LOS A	0.1	0.7	0.43	0.58	0.43	53.5
6	R2	5	3.0	0.010	10.9	LOS A	0.0	0.2	0.48	0.71	0.48	50.3
Approach		32	3.0	0.028	6.8	LOS A	0.1	0.7	0.44	0.60	0.44	52.9
North: Boundary Rd (500m+)												
7	L2	208	3.0	0.579	7.6	LOS A	4.1	29.1	0.66	0.78	0.73	51.4
8	T1	351	3.0	0.579	7.1	LOS A	4.1	29.1	0.66	0.78	0.73	52.7
9	R2	74	3.0	0.134	10.8	LOS A	0.5	3.7	0.51	0.79	0.51	50.3
Approach		633	3.0	0.579	7.7	LOS A	4.1	29.1	0.65	0.78	0.70	52.0
West: Old Pitt Town Rd (500m+)												
10	L2	276	3.0	0.950	35.1	LOS C	19.0	136.3	1.00	1.59	2.56	37.3
11	T1	306	3.0	0.950	34.6	LOS C	19.0	136.3	1.00	1.59	2.56	37.9
12	R2	94	3.0	0.271	14.4	LOS A	1.3	9.3	0.76	0.92	0.76	48.0
Approach		676	3.0	0.950	32.0	LOS C	19.0	136.3	0.97	1.49	2.31	38.8
All Vehicles		2681	3.0	0.957	13.8	LOS A	25.7	184.6	0.90	0.86	1.26	47.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Old Pitt Town Rd x Terry Rd x Fontana Dr_PM]

Old Pitt Town Rd x Terry Rd x Fontana Dr
AM Traffic
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
South: Terry Rd (500m)												
1	L2	174	3.0	0.511	7.5	LOS A	4.1	29.7	0.10	0.57	0.15	49.6
2	T1	461	3.0	0.511	14.0	LOS A	4.1	29.7	0.46	0.82	0.71	48.8
3	R2	26	3.0	0.101	18.2	LOS B	0.3	2.5	0.75	0.89	0.75	45.2
Approach		661	3.0	0.511	12.4	LOS A	4.1	29.7	0.37	0.76	0.56	48.8
East: Old Pitt Town Rd (500m)												
4	L2	89	3.0	0.055	5.6	LOS A	0.0	0.0	0.00	0.49	0.00	54.2
5	T1	16	3.0	0.055	0.0	LOS A	0.0	0.0	0.00	0.49	0.00	55.7
6	R2	11	3.0	0.006	5.6	LOS A	0.0	0.2	0.12	0.54	0.12	52.9
Approach		116	3.0	0.055	4.8	NA	0.0	0.2	0.01	0.50	0.01	54.2
North: Fontana Dr (500m)												
7	L2	11	3.0	0.346	6.6	LOS A	1.8	12.7	0.45	0.75	0.55	48.9
8	T1	283	3.0	0.346	12.4	LOS A	1.8	12.7	0.55	0.82	0.69	48.4
9	R2	16	3.0	0.346	34.9	LOS C	1.6	11.6	0.70	0.92	0.89	47.0
Approach		309	3.0	0.346	13.3	LOS A	1.8	12.7	0.56	0.82	0.70	48.3
West: Old Pitt Town Rd (500m)												
10	L2	16	3.0	0.022	5.6	LOS A	0.0	0.0	0.00	0.23	0.00	56.3
11	T1	24	3.0	0.022	0.0	LOS A	0.0	0.0	0.00	0.23	0.00	57.9
12	R2	400	3.0	0.248	6.0	LOS A	1.3	9.7	0.25	0.54	0.25	52.8
Approach		440	3.0	0.248	5.7	NA	1.3	9.7	0.23	0.51	0.23	53.2
All Vehicles		1526	3.0	0.511	10.1	NA	4.1	29.7	0.34	0.68	0.45	50.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model 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 SUMMARY

Site: 101 [Old Pitt Town Rd x Valletta Dr_PM]

Old Pitt Town Rd x Valletta Dr
AM Traffic
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
East: Old Pitt Town Rd (500m)												
5	T1	25	3.0	0.014	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	148	3.0	0.125	7.1	LOS A	0.6	4.0	0.47	0.67	0.47	51.9
Approach		174	3.0	0.125	6.1	NA	0.6	4.0	0.40	0.57	0.40	52.9
North: Valletta Dr (500m)												
7	L2	35	3.0	0.032	7.0	LOS A	0.1	0.9	0.42	0.62	0.42	52.2
9	R2	1	3.0	0.002	9.5	LOS A	0.0	0.0	0.54	0.61	0.54	50.4
Approach		36	3.0	0.032	7.1	LOS A	0.1	0.9	0.42	0.62	0.42	52.1
West: Old Pitt Town Rd (500m)												
10	L2	5	3.0	0.208	5.6	LOS A	0.0	0.0	0.00	0.01	0.00	58.1
11	T1	392	3.0	0.208	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.9
Approach		397	3.0	0.208	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.9
All Vehicles		606	3.0	0.208	2.2	NA	0.6	4.0	0.14	0.20	0.14	57.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model 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 SUMMARY

Site: 101 [Red Gables Rd x Janpieter Rd_PM]

Red Gables Rd x Janpieter Rd
AM Traffic
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
South: Janpieter Rd (500m)												
1	L2	204	3.0	0.244	5.6	LOS A	0.0	0.0	0.00	0.26	0.00	56.3
2	T1	252	3.0	0.244	0.0	LOS A	0.0	0.0	0.00	0.26	0.00	57.6
Approach		456	3.0	0.244	2.5	NA	0.0	0.0	0.00	0.26	0.00	57.0
North: Janpieter Rd (500m)												
8	T1	74	3.0	0.043	0.2	LOS A	0.1	0.4	0.08	0.04	0.08	59.3
9	R2	5	3.0	0.043	7.3	LOS A	0.1	0.4	0.08	0.04	0.08	57.2
Approach		79	3.0	0.043	0.7	NA	0.1	0.4	0.08	0.04	0.08	59.1
West: Red Gables Rd (600m)												
10	L2	12	3.0	0.119	6.5	LOS A	0.4	2.9	0.41	0.70	0.41	52.7
12	R2	92	3.0	0.119	7.5	LOS A	0.4	2.9	0.41	0.70	0.41	52.2
Approach		103	3.0	0.119	7.4	LOS A	0.4	2.9	0.41	0.70	0.41	52.3
All Vehicles		638	3.0	0.244	3.1	NA	0.4	2.9	0.08	0.31	0.08	56.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model 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 SUMMARY

Site: 101 [Windsor Rd x Boundary Rd x Loftus St_PM]

Windsor Rd x Boundary Rd x Loftus St
PM Traffic
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
South: Loftus St (500m+)												
1	L2	129	2.0	0.162	22.2	LOS B	4.6	32.7	0.55	0.70	0.55	43.5
2	T1	657	2.0	1.343	376.5	LOS F	124.7	887.9	1.00	2.25	2.71	8.2
3	R2	203	2.0	0.194	48.6	LOS D	5.6	39.5	0.80	0.75	0.80	33.4
Approach		989	2.0	1.343	262.8	LOS F	124.7	887.9	0.90	1.74	2.03	11.1
East: Windsor Rd (500m+)												
4	L2	124	2.0	0.086	8.0	LOS A	1.6	11.4	0.23	0.61	0.23	52.3
5	T1	2484	0.6	1.322	356.0	LOS F	165.5	1164.1	1.00	2.08	2.63	8.9
6	R2	526	8.8	1.075	133.2	LOS F	24.5	184.2	1.00	1.11	1.85	16.1
Approach		3135	2.0	1.322	304.8	LOS F	165.5	1164.1	0.97	1.86	2.40	10.0
North: Boundary Rd (500m+)												
7	L2	17	14.1	0.016	13.1	LOS A	0.3	2.5	0.32	0.65	0.32	56.1
8	T1	365	12.5	0.617	63.2	LOS E	12.8	98.9	0.98	0.81	0.98	29.7
9	R2	142	18.0	0.259	66.9	LOS E	4.6	36.9	0.91	0.77	0.91	30.8
Approach		524	14.0	0.617	62.6	LOS E	12.8	98.9	0.94	0.79	0.94	30.5
West: Windsor Rd (500m+)												
10	L2	111	9.1	0.125	26.1	LOS B	4.0	30.0	0.57	0.72	0.57	47.6
11	T1	987	3.3	0.900	75.9	LOS F	28.9	208.1	1.00	1.00	1.25	30.3
12	R2	96	2.3	0.655	88.7	LOS F	3.8	26.8	1.00	0.79	1.12	24.4
Approach		1194	3.8	0.900	72.3	LOS F	28.9	208.1	0.96	0.96	1.17	30.7
All Vehicles		5842	3.4	1.343	228.5	LOS F	165.5	1164.1	0.95	1.56	1.96	12.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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
P1	South Full Crossing	53	69.3	LOS F	0.2	0.2	0.96	0.96
P2	East Full Crossing	53	69.3	LOS F	0.2	0.2	0.96	0.96
P3	North Full Crossing	53	69.3	LOS F	0.2	0.2	0.96	0.96
P4	West Full Crossing	53	69.3	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		211	69.3	LOS F			0.96	0.96

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.

MOVEMENT SUMMARY

Site: 101 [Windsor Rd x Terry Rd x Garfield Rd E_PM]

Windsor Rd x Terry Rd x Garfield Rd E
PM Traffic
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 100 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
South: Garfield Rd East (500m+)												
1	L2	89	18.8	0.089	10.9	LOS A	1.4	11.2	0.39	0.64	0.39	50.6
2	T1	642	4.1	0.768	42.7	LOS D	15.7	113.6	1.00	0.91	1.10	35.5
3	R2	307	6.5	0.787	58.1	LOS E	8.1	59.7	1.00	0.92	1.23	31.8
Approach		1039	6.1	0.787	44.5	LOS D	15.7	113.6	0.95	0.89	1.08	35.2
East: Windsor Rd (500m+)												
4	L2	226	6.4	0.163	8.7	LOS A	1.7	12.5	0.23	0.67	0.23	58.1
5	T1	1439	5.5	0.796	36.8	LOS C	22.8	167.4	0.98	0.91	1.06	44.5
6	R2	566	0.0	0.762	33.0	LOS C	9.4	65.6	1.00	0.87	1.10	42.3
Approach		2232	4.2	0.796	33.0	LOS C	22.8	167.4	0.91	0.87	0.99	45.0
North: Terry Rd (500m+)												
7	L2	524	6.5	0.453	11.8	LOS A	10.3	76.2	0.51	0.72	0.51	52.4
8	T1	212	20.0	0.279	35.4	LOS C	4.4	35.7	0.87	0.70	0.87	38.2
9	R2	19	4.1	0.048	49.5	LOS D	0.4	3.1	0.92	0.67	0.92	34.6
Approach		755	10.2	0.453	19.4	LOS B	10.3	76.2	0.63	0.71	0.63	46.9
West: Windsor Rd (500m+)												
10	L2	29	4.8	0.030	14.6	LOS B	0.5	3.8	0.45	0.67	0.45	53.2
11	T1	780	3.7	0.803	48.2	LOS D	13.4	96.5	1.00	0.92	1.18	39.2
12	R2	78	20.3	0.218	53.3	LOS D	1.8	14.9	0.95	0.74	0.95	34.1
Approach		887	5.2	0.803	47.5	LOS D	13.4	96.5	0.98	0.89	1.13	39.0
All Vehicles		4913	5.7	0.803	36.0	LOS C	22.8	167.4	0.88	0.86	0.98	41.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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
P1	South Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P2	East Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P3	North Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		211	44.3	LOS E			0.94	0.94

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.

MOVEMENT SUMMARY

Site: 1 [Boundary Rd x Cataract Rd_PM_Stage 1]

Network: N101 [Boundary Rd x Cataract Rd_PM_Seagull Intersection]

Boundary Rd x Cataract Rd
AM Traffic
Stage 1
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	Aver. Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Boundary Rd Right Turn Bay (80m)														
3	R2	20	3.0	20	3.0	0.030	8.1	LOS A	0.0	0.3	0.55	0.72	0.55	20.5
Approach		20	3.0	20	3.0	0.030	8.1	NA	0.0	0.3	0.55	0.72	0.55	20.5
East: Cataract Rd (500m)														
4	L2	77	3.0	77	3.0	0.146	13.2	LOS A	0.2	1.5	0.59	1.00	0.59	42.6
5	T1	5	3.0	5	3.0	0.016	16.9	LOS B	0.0	0.2	0.68	0.95	0.68	40.1
Approach		82	3.0	82	3.0	0.146	13.5	LOS A	0.2	1.5	0.60	1.00	0.60	42.5
North: Boundary Rd (500m)														
7	L2	5	3.0	5	3.0	0.319	5.6	LOS A	0.0	0.0	0.00	0.01	0.00	58.1
8	T1	604	3.0	604	3.0	0.319	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.8
Approach		609	3.0	609	3.0	0.319	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.8
All Vehicles		712	3.0	712	3.0	0.319	1.9	NA	0.2	1.5	0.08	0.14	0.08	54.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model 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 SUMMARY

Site: 1 [Red Gables Rd x Boundary Rd_PM_Stage 1]

Network: N101 [Red Gables Rd x Boundary Rd_PM_Seagull Intersection]

Red Gables Rd x Boundary Rd
AM Traffic
Stage 1
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	Aver. Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Boundary Rd Right Turn Bay (86m)														
3	R2	100	3.0	100	3.0	0.125	7.6	LOS A	0.2	1.4	0.52	0.73	0.52	20.8
Approach		100	3.0	100	3.0	0.125	7.6	NA	0.2	1.4	0.52	0.73	0.52	20.8
East: Red Gables Rd (500m)														
4	L2	56	3.0	56	3.0	0.088	11.6	LOS A	0.1	0.9	0.51	0.96	0.51	44.0
5	T1	18	3.0	18	3.0	0.049	15.9	LOS B	0.1	0.5	0.65	1.00	0.65	41.0
Approach		74	3.0	74	3.0	0.088	12.6	LOS A	0.1	0.9	0.55	0.97	0.55	43.3
North: Boundary Rd (500m)														
7	L2	2	3.0	2	3.0	0.258	5.6	LOS A	0.0	0.0	0.00	0.00	0.00	58.1
8	T1	491	3.0	491	3.0	0.258	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		493	3.0	493	3.0	0.258	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
All Vehicles		666	3.0	666	3.0	0.258	2.6	NA	0.2	1.4	0.14	0.22	0.14	45.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model 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.

Appendix C – SIDRA (Town Centre Access)

MOVEMENT SUMMARY

Site: 101 [Red Gables Rd x Fontana Dr_AM]

Network: N101 [Network_AM]

Red Gables Rd x Fontana Dr
AM Traffic
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 80 seconds (Network Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	Aver. Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Fontana Dr S (530m)														
1	L2	9	3.0	9	3.0	0.016	24.1	LOS B	0.2	1.1	0.70	0.64	0.70	36.4
2	T1	241	3.0	241	3.0	0.593	31.5	LOS C	5.3	38.4	0.95	0.79	0.95	27.8
3	R2	2	3.0	2	3.0	0.015	42.9	LOS D	0.0	0.3	0.94	0.61	0.94	23.9
Approach		253	3.0	253	3.0	0.593	31.3	LOS C	5.3	38.4	0.94	0.78	0.94	28.2
East: Red Gables Road E (145m)														
4	L2	26	3.0	26	3.0	0.040	22.2	LOS B	0.4	2.9	0.67	0.67	0.67	34.2
5	T1	67	3.0	67	3.0	0.108	20.3	LOS B	1.1	8.1	0.73	0.57	0.73	32.9
6	R2	42	3.0	42	3.0	0.265	43.7	LOS D	1.0	7.2	0.97	0.73	0.97	10.5
Approach		136	3.0	136	3.0	0.265	27.9	LOS B	1.1	8.1	0.79	0.64	0.79	26.9
North: Fontana Dr N (160m)														
7	L2	42	3.0	42	3.0	0.074	25.4	LOS B	0.7	5.1	0.73	0.69	0.73	16.6
8	T1	195	3.0	195	3.0	0.479	30.5	LOS C	4.2	30.1	0.93	0.76	0.93	31.2
9	R2	44	3.0	44	3.0	0.324	45.2	LOS D	1.1	7.7	0.98	0.73	0.98	23.3
Approach		281	3.0	281	3.0	0.479	32.1	LOS C	4.2	30.1	0.91	0.74	0.91	28.7
West: Red Gables Road W (380m)														
10	L2	49	3.0	49	3.0	0.075	22.5	LOS B	0.8	5.6	0.68	0.69	0.68	27.9
11	T1	166	3.0	166	3.0	0.268	21.6	LOS B	3.0	21.3	0.78	0.64	0.78	28.4
12	R2	136	3.0	136	3.0	0.853	51.8	LOS D	3.7	26.9	1.00	1.01	1.47	28.0
Approach		352	3.0	352	3.0	0.853	33.4	LOS C	3.7	26.9	0.85	0.79	1.03	28.1
All Vehicles		1021	3.0	1021	3.0	0.853	31.8	LOS C	5.3	38.4	0.88	0.76	0.94	28.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
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
P1	South Full Crossing	316	26.8	LOS C	0.6	0.6	0.82	0.82
P2	East Full Crossing	632	35.2	LOS D	1.4	1.4	0.95	0.95
P3	North Full Crossing	316	26.8	LOS C	0.6	0.6	0.82	0.82
P4	West Full Crossing	211	34.5	LOS D	0.4	0.4	0.93	0.93

All Pedestrians	1474	31.5	LOS D	0.89	0.89

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.

MOVEMENT SUMMARY

Site: 102 [Red Gables Rd x New Rd A_AM]

Network: N101 [Network_AM]

Red Gables Rd x New Rd A
AM Traffic
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	Aver. Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
East: Red Gables Rd E (40m)														
5	T1	56	3.0	56	3.0	0.029	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
6	R2	504	3.0	504	3.0	0.355	4.7	LOS A	0.9	6.8	0.46	0.57	0.46	33.2
Approach		560	3.0	560	3.0	0.355	4.2	NA	0.9	6.8	0.41	0.52	0.41	33.5
North: New Road A N (160m)														
7	L2	446	3.0	446	3.0	0.341	7.3	LOS A	0.9	6.1	0.26	0.86	0.26	28.6
9	R2	80	3.0	80	3.0	0.216	15.5	LOS B	0.3	2.4	0.71	1.02	0.74	20.9
Approach		526	3.0	526	3.0	0.341	8.6	LOS A	0.9	6.1	0.33	0.88	0.33	27.4
West: Red Gables Rd W (145m)														
10	L2	168	3.0	168	3.0	0.148	4.8	LOS A	0.2	1.7	0.11	0.41	0.11	38.8
11	T1	42	3.0	42	3.0	0.148	0.2	LOS A	0.2	1.7	0.11	0.41	0.11	38.9
Approach		211	3.0	211	3.0	0.148	3.9	NA	0.2	1.7	0.11	0.41	0.11	38.8
All Vehicles		1297	3.0	1297	3.0	0.355	5.9	NA	0.9	6.8	0.33	0.65	0.33	31.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model 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 SUMMARY

Site: 103 [Fontana Dr x New Rd B_AM]

Network: N101 [Network_AM]

Fontana Dr x New Rd B
AM Traffic
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	Aver. Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Fontana Dr S (160m)														
2	T1	199	3.0	199	3.0	0.105	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
3	R2	133	3.0	133	3.0	0.100	5.7	LOS A	0.2	1.1	0.28	0.57	0.28	36.9
Approach		332	3.0	332	3.0	0.105	2.3	NA	0.2	1.1	0.11	0.23	0.11	41.6
East: New Rd B E (170m)														
4	L2	107	3.0	107	3.0	0.095	7.8	LOS A	0.2	1.1	0.34	0.88	0.34	28.2
6	R2	224	3.0	224	3.0	0.410	13.4	LOS A	0.9	6.7	0.65	1.11	0.88	22.9
Approach		332	3.0	332	3.0	0.410	11.6	LOS A	0.9	6.7	0.55	1.03	0.70	24.4
North: Fontana Dr N (100m)														
7	L2	72	3.0	72	3.0	0.145	4.8	LOS A	0.2	1.4	0.09	0.15	0.09	41.0
8	T1	174	3.0	174	3.0	0.145	0.1	LOS A	0.2	1.4	0.09	0.15	0.09	41.3
Approach		245	3.0	245	3.0	0.145	1.5	NA	0.2	1.4	0.09	0.15	0.09	41.2
All Vehicles		908	3.0	908	3.0	0.410	5.5	NA	0.9	6.7	0.27	0.50	0.32	33.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model 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 SUMMARY

Site: 104 [Fontana Dr x The Promenade_AM]

Network: N101 [Network_AM]

Fontana Dr x The Promenade
AM Traffic
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	Aver. Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Fontana Dr S (100m)														
2	T1	325	3.0	325	3.0	0.171	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
3	R2	98	3.0	98	3.0	0.067	5.3	LOS A	0.1	0.9	0.33	0.56	0.33	31.1
Approach		423	3.0	423	3.0	0.171	1.2	NA	0.1	0.9	0.08	0.13	0.08	42.9
East: The Promenade E (55m)														
4	L2	58	3.0	58	3.0	0.136	7.4	LOS A	0.2	1.5	0.41	0.91	0.41	19.5
6	R2	39	3.0	39	3.0	0.136	12.6	LOS A	0.2	1.5	0.41	0.91	0.41	20.8
Approach		97	3.0	97	3.0	0.136	9.4	LOS A	0.2	1.5	0.41	0.91	0.41	20.1
North: Fontana Dr N (25m)														
7	L2	26	3.0	26	3.0	0.112	2.8	LOS A	0.0	0.0	0.00	0.06	0.00	20.5
8	T1	187	3.0	187	3.0	0.112	0.0	LOS A	0.0	0.0	0.00	0.06	0.00	44.1
Approach		214	3.0	214	3.0	0.112	0.3	NA	0.0	0.0	0.00	0.06	0.00	33.8
All Vehicles		734	3.0	734	3.0	0.171	2.1	NA	0.2	1.5	0.10	0.21	0.10	37.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model 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 SUMMARY

Site: 101 [Red Gables Rd x Fontana Dr_PM]

Network: N101 [Network_PM]

Red Gables Rd x Fontana Dr
PM Traffic
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 80 seconds (Network Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	Aver. Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Fontana Dr S (530m)														
1	L2	8	3.0	8	3.0	0.014	24.1	LOS B	0.1	1.0	0.70	0.64	0.70	36.4
2	T1	391	3.0	391	3.0	0.916	48.4	LOS D	11.7	84.2	1.00	1.18	1.46	22.4
3	R2	5	3.0	5	3.0	0.039	43.3	LOS D	0.1	0.9	0.95	0.64	0.95	23.8
Approach		404	3.0	404	3.0	0.916	47.8	LOS D	11.7	84.2	0.99	1.16	1.44	22.7
East: Red Gables Road E (145m)														
4	L2	42	3.0	42	3.0	0.064	22.4	LOS B	0.7	4.7	0.68	0.68	0.68	34.1
5	T1	60	3.0	60	3.0	0.097	20.2	LOS B	1.0	7.2	0.73	0.56	0.73	32.9
6	R2	42	3.0	42	3.0	0.309	45.1	LOS D	1.0	7.4	0.98	0.73	0.98	10.2
Approach		144	3.0	144	3.0	0.309	28.2	LOS B	1.0	7.4	0.79	0.65	0.79	27.3
North: Fontana Dr N (160m)														
7	L2	42	3.0	42	3.0	0.077	26.2	LOS B	0.7	5.2	0.75	0.70	0.75	16.3
8	T1	295	3.0	295	3.0	0.686	32.2	LOS C	6.8	48.6	0.97	0.85	1.02	30.6
9	R2	42	3.0	42	3.0	0.309	45.1	LOS D	1.0	7.4	0.98	0.73	0.98	23.3
Approach		379	3.0	379	3.0	0.686	32.9	LOS C	6.8	48.6	0.95	0.82	0.98	29.0
West: Red Gables Road W (380m)														
10	L2	11	3.0	11	3.0	0.016	22.0	LOS B	0.2	1.1	0.66	0.64	0.66	28.3
11	T1	74	3.0	74	3.0	0.119	20.4	LOS B	1.2	8.9	0.74	0.57	0.74	29.1
12	R2	24	3.0	24	3.0	0.178	44.4	LOS D	0.6	4.2	0.97	0.70	0.97	29.8
Approach		108	3.0	108	3.0	0.178	25.9	LOS B	1.2	8.9	0.78	0.61	0.78	29.3
All Vehicles		1036	3.0	1036	3.0	0.916	37.4	LOS C	11.7	84.2	0.93	0.91	1.11	26.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
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
P1	South Full Crossing	316	26.8	LOS C	0.6	0.6	0.82	0.82
P2	East Full Crossing	632	34.2	LOS D	1.3	1.3	0.94	0.94
P3	North Full Crossing	316	26.8	LOS C	0.6	0.6	0.82	0.82
P4	West Full Crossing	211	33.6	LOS D	0.4	0.4	0.92	0.92

All Pedestrians	1474	30.9	LOS D	0.89	0.89

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.

MOVEMENT SUMMARY

Site: 102 [Red Gables Rd x New Rd A_PM]

Network: N101 [Network_PM]

Red Gables Rd x New Rd A
PM Traffic
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	Aver. Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
East: Red Gables Rd E (40m)														
5	T1	43	3.0	43	3.0	0.023	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
6	R2	255	3.0	255	3.0	0.166	4.0	LOS A	0.4	2.8	0.31	0.51	0.31	33.9
Approach		298	3.0	298	3.0	0.166	3.5	NA	0.4	2.8	0.27	0.44	0.27	34.3
North: New Road A N (160m)														
7	L2	60	3.0	60	3.0	0.046	7.1	LOS A	0.1	0.6	0.20	0.88	0.20	28.6
9	R2	156	3.0	156	3.0	0.253	10.5	LOS A	0.4	3.1	0.56	0.98	0.57	24.8
Approach		216	3.0	216	3.0	0.253	9.6	LOS A	0.4	3.1	0.46	0.95	0.46	26.0
West: Red Gables Rd W (145m)														
10	L2	78	3.0	78	3.0	0.081	4.8	LOS A	0.1	0.9	0.11	0.33	0.11	39.8
11	T1	43	3.0	43	3.0	0.081	0.2	LOS A	0.1	0.9	0.11	0.33	0.11	40.5
Approach		121	3.0	121	3.0	0.081	3.1	NA	0.1	0.9	0.11	0.33	0.11	39.9
All Vehicles		635	3.0	635	3.0	0.253	5.5	NA	0.4	3.1	0.30	0.59	0.30	32.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model 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 SUMMARY

Site: 103 [Fontana Dr x New Rd B_PM]

Network: N101 [Network_PM]

Fontana Dr x New Rd B
PM Traffic
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	Aver. Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Fontana Dr S (160m)														
2	T1	389	3.0	389	3.0	0.205	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
3	R2	55	3.0	55	3.0	0.043	5.8	LOS A	0.1	0.4	0.29	0.57	0.29	36.8
Approach		444	3.0	444	3.0	0.205	0.7	NA	0.1	0.4	0.04	0.07	0.04	46.3
East: New Rd B E (170m)														
4	L2	164	3.0	164	3.0	0.153	8.1	LOS A	0.3	1.8	0.39	0.89	0.39	28.0
6	R2	27	3.0	27	3.0	0.062	12.9	LOS A	0.1	0.7	0.61	0.97	0.61	23.3
Approach		192	3.0	192	3.0	0.153	8.8	LOS A	0.3	1.8	0.42	0.90	0.42	27.2
North: Fontana Dr N (100m)														
7	L2	76	3.0	76	3.0	0.170	4.8	LOS A	0.2	1.6	0.09	0.14	0.09	41.3
8	T1	215	3.0	215	3.0	0.170	0.1	LOS A	0.2	1.6	0.09	0.14	0.09	42.0
Approach		291	3.0	291	3.0	0.170	1.3	NA	0.2	1.6	0.09	0.14	0.09	41.7
All Vehicles		926	3.0	926	3.0	0.205	2.6	NA	0.3	1.8	0.13	0.26	0.13	39.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model 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 SUMMARY

Site: 104 [Fontana Dr x The Promenade_PM]

Network: N101 [Network_PM]

Fontana Dr x The Promenade
PM Traffic
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	Aver. Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Fontana Dr S (100m)														
2	T1	300	3.0	300	3.0	0.158	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
3	R2	117	3.0	117	3.0	0.085	5.6	LOS A	0.2	1.1	0.38	0.58	0.38	30.8
Approach		417	3.0	417	3.0	0.158	1.6	NA	0.2	1.1	0.11	0.16	0.11	41.6
East: The Promenade E (55m)														
4	L2	87	0.0	87	0.0	0.298	7.8	LOS A	0.5	3.8	0.50	0.94	0.55	17.4
6	R2	100	0.0	100	0.0	0.298	13.8	LOS A	0.5	3.8	0.50	0.94	0.55	19.1
Approach		187	0.0	187	0.0	0.298	11.0	LOS A	0.5	3.8	0.50	0.94	0.55	18.4
North: Fontana Dr N (25m)														
7	L2	68	3.0	68	3.0	0.144	2.8	LOS A	0.0	0.0	0.00	0.13	0.00	20.1
8	T1	203	3.0	203	3.0	0.144	0.0	LOS A	0.0	0.0	0.00	0.13	0.00	39.5
Approach		272	3.0	272	3.0	0.144	0.7	NA	0.0	0.0	0.00	0.13	0.00	27.4
All Vehicles		876	2.4	876	2.4	0.298	3.3	NA	0.5	3.8	0.16	0.32	0.17	32.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model 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.

Appendix D – AS2890.1 Requirements

Car Park Type	Public Car Park
User Class	-
Number of spaces	-
Number of Accesses	-
Access Road	Local
Access Road Speed	40

Basement Parking for Precinct E1&E2

Section	Description	AS2890.1 Requirement	Provided	Compliance
Parking Module Design				
2.4.1	Parking module	Resi / comm (User Class 1,1A): 2.4m x 5.4m Retail (User Class 3,3A): 2.6m x 5.4m OR 2.7m x 5.4m		
2.4.1	Aisle width	Resi / comm (User Class 1,1A): 6.2m OR 5.8m Retail (User Class 3,3A): 6.6m OR 6.2m		
2.4.1(b)	Additional parking module clearence	300mm		
2.4.1 (b) iii	Disabled parking			
2.4.2 (c)	Blind aisle	1.0m Aisle Extension		
2.4.6	Gradients within parking module	Max 1:20 Parallel to angle of parking		
2.4.7	Gradients within parking module	Max 1:16 in any other direction		
2.4.7	Motorcycle parking	Min dimension of 2.5m x 1.2m		
Circulation Roadways				
2.5.2 (a)	Straight - One-way road or ramp	Minimum 3.0m between kerbs		
2.5.2 (a)	Straight - Two-way road or ramp	Minimum 5.5m between kerbs		
2.5.2 (b)	Curved -One-way roadway or ramp	Compliance with Table 2.2		
2.5.2 (c)	Circulation roadway Intersection	Provision for B99 vehicle to pass a B85 Vehicle		
2.5.3 (a) / (b)	Max grade longer than 20m	-		
2.5.3 (c)	Max grade up to 20m	-		
	Max grade curved ramp	-(measured along inside kerb / shortest distance)		
2.5.3 (d)	Changes in grade - summit	1 in 8 (12.5%)		
	Changes in grade - Sag	1 in 6.7 (15%)		
2.5.2 (e)	Grade transition	Grade transition of min 2.0m		
Driveway Width Requirements				
3.2.1	Driveway width (Entry)	#N/A		
3.2.3	Access driveway location	Compliance with Figure 3.1		
3.2.4 (a)	Sightdistances at access driveway	Min. SSD: 35m		
3.2.4 (b)	Minimum sight lines for pedestrian saftey	Visual splay at property boundary (Fig 3.3)		
3.3 (a)	Gradient at property line	Max grade of 1 in 20 (5%) for fist 6.0m		
3.3 (b)	Gradient at vehicle control point	Max grade of 1 in 20 (5%) for fist 6.0m prior to control point		
3.3 (c)	Gradient at queuing area	Max Grade of 1 in 10 for not less than 0.8 of queue length		
Additional Parking Structure Requirements				
5.2	Column location and spacing	Compliance with Figure 5.2		
5.3	Headroom requirements - General	min clearence of 2.2m		
	Headroom requirements - Disabled	min clearence of 2.5m		

TABLE 3.1

SELECTION OF ACCESS FACILITY CATEGORY

Class of parking facility (see Table 1.1)	Frontage road type	Access facility category — Number of parking spaces (Note 1)				
		<25	25 to 100	101 to 300	301 to 600	>600
1,1A	Arterial	1	2	3	4	5
	Local	1	1	2	3	4
2	Arterial	2	2	3	4	5
	Local	1	2	3	4	4
3,3A	Arterial	2	3	4	4	5
	Local	1	2	3	4	4

NOTES:

1 When a car park has multiple access points, each access should be designed for the number of parking spaces effectively served by that access.

2 This Table does not imply that certain types of development are necessarily suitable for location on any particular frontage road type. In particular, access to arterial roads should be limited as far as practicable, and in some circumstances it may be preferable to allow left-turn-only movements into and out of the access driveway.

TABLE 3.2

ACCESS DRIVEWAY WIDTHS

metres

Category	Entry width	Exit width	Separation of driveways
1	3.0 to 5.5	(Combined) (see Note)	N/A
2	6.0 to 9.0	(Combined) (see Note)	N/A
3	6.0	4.0 to 6.0	1 to 3
4	6.0 to 8.0	6.0 to 8.0	1 to 3
5	To be provided as an intersection, not an access driveway, see Clause 3.1.1.		

NOTE: Driveways are normally combined, but if separate, both entry and exit widths should be 3.0 m min.

TABLE 2.2

MINIMUM ROADWAY WIDTHS ON CURVED ROADWAYS AND RAMPS

metres

Turn radius R_o (Note 1)	Single lane		Two-way, no separator All cases (Note 3)
	Public facilities (Note 2)	Domestic property	
7.6 to 11.9	3.9	3.6	—
12.0 to 19.9	3.4	3.1	6.7 (Note 4)
20.0 to 50.0	3.2	3.0	6.3
>50.0	3.0	3.0	5.5

NOTES:

1 See Figure 2.9 for Dimension R_o.

2 In New Zealand only, the widths shown for domestic property shall apply also to public facilities.

3 For parallel roadways with a median or separator, each roadway width shall be determined separately as a single lane.

4 Applies to R_o range 15.0 m to 19.9 m only (see Clause 2.5.2(b)).

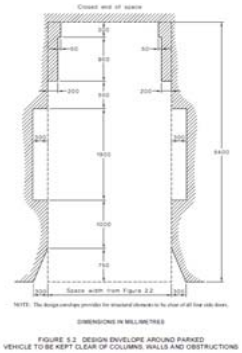

FIGURE 5.2 DESIGN ENVELOPE AROUND PARKED VEHICLE TO BE KEPT CLEAR OF COLUMNS, WALLS AND OBSTRUCTIONS

Appendix E – AS2890.2 Requirements

Largest design vehicle	AV
Access road	Minor
Road frontage speed	50km/hr
Carriageway curve radius (m)	1000

Section	Description	AS2890.2 Requirement	Compliance	Comments
	Design Vehicle			
2.2	**Description and Dimensions**			
	Overall length	19m		
	Design width	2.5m		
	Wheel base	14.5m		
	Clearance height	4.5m		
	Platform height	1.1m to 1.4m		
	Access Driveway and Circulation			
3.3.1	**Minimum circulation width (kerb to kerb)**			
	Single Lane	3.5m		
	Two-way (with intervisibility)	6.5m		
	Two-way (without intervisibility)	6.5m		
3.3.3	**Maximum Gradients**			
	Max forward manoeuvre roadway / ramp grade	1:6.5 (15.4%)		
	Max reverse manoeuvre roadway / ramp grade	1:8 (12.5%)		
	Max rate of change of grade	1:16 (6.25%) in 10.0m of travel		
3.4.3	**Driveway Layout Design Requirements**			
	Access Width	12.5m, see Figure 3.2 (Note 1)		
3.4.4	**Maximum Driveway Gradient**	1:20 (5%) for SRV, MRV and HRV		
3.4.5	**Sight distance**			
3.4.5 (a)	Sight distance to oncoming traffic			
	5 sec gsp	69m		
	8 sec gap	111m		
3.4.5 (b)	Sight distance to pedestrians	2.5m (from property boundary) x 2m (from driveway)		
	Service Areas			
4.2	**Dimensions of Service Bays**			
	Bay Length	19m		
	Bay Width	3.5		
	Platform Height	1.1m to 1.4m		
	Vertical Clearance	4.5m		
	Max service bay gradient	1:25 (4%)		
4.3.2 (e)	Maximum gradient on service areas	1:6.5 (15.4%) Forward manoeuvres 1:8 (12.5%) Reverse manoeuvres		
	Cleaarances			
5.4	**Manoeuvring Clearances**			
5.4 (a)	Low speed e.g service bay access	300mm on both sides of vehicle		
5.4 (b)	Higher speed e.g Site access and circulation	an additional 300mm		
5.4 (c)	Two vehicles passing one another	300mm on both sides of both vehicle plus a further 300mm		