# State Significant Development Application
# Proposed Sikh Grammar School, Rouse Hill

**Traffic and Parking Assessment Report**

Prepared for: Sikh Grammar School

November 2020

Report No: PT18022r01_Final_V6

# TABLE OF CONTENTS

## List of Figures



## List of Tables

## 1. Introduction

This report has been prepared on behalf of the Sikh Grammar School Australia to present findings of a traffic and parking assessment of the proposed Sikh Grammar School in Tallawong Road, Rouse Hill.

The study has assessed existing traffic conditions, parking demands, access arrangements, future traffic conditions, service vehicle provision and design compliance.

The remainder of the report is set out as follows:

- Section 2 describes the existing traffic and parking conditions;
- Section 3 presents a background report review of the precinct;
- Section 4 summarises the proposed development;
- Section 5 reviews the potential traffic impacts of the proposal;
- Section 6 provides a compliance assessment of the proposed car park areas and access arrangements; and
- Section 7 presents the conclusions

For ease of reference, the following table presents each item raised in the SEARS response and the relevant section of this traffic report which responds to each item.

| SEARS Comment | Relevant Traffic Report Section | Comments |
|---|---|---|
| **General Comments** | | |
| accurate details of the current daily and peak hour vehicle, existing and future public transport networks and pedestrian and cycle movement provided on the road network located adjacent to the proposed development | Section 2.3,2.4,3.1.1,3.1.3,3.1.4 | |
| projected student population growth as the site develops | Section 4.1 | |
| details of estimated total daily and peak hour trips generated by the proposal, including vehicle, public transport, pedestrian and bicycle trips based on surveys of the existing and similar schools within the local area | Section 5.2.2, 5.2.2.1, 5.2.2.2, 5.2.2.3, 5.2.2.1, 5.2.3 | |
| the adequacy of existing public transport or any future public transport infrastructure within the vicinity of the site, pedestrian and bicycle networks and associated infrastructure to meet the likely future demand of the proposed development | Section 3.1.3, 3.1.4 | |
| details of design of the surrounding local road network as per the Riverstone East planned precinct | Section 2.3, Section 3.1.1 | |
| trip generation mode share estimates based on surveys and analysis of a similar development | Section 5.2.2, 5.2.2.1, 5.2.2.2, 5.2.2.3, 5.2.2.1, 5.2.3 | |

| SEARS Comment | Relevant Traffic Report Section | Comments |
|---|---|---|
| intersection modelling and analysis for existing and post-development (forecast year 2036 – refer to Transport Study Post Exhibition Report for the Riverstone East planned precinct), which includes Tallawong Road with Guntawong Road and Tallawong Road with Schofields Road | Section 5.4 | |
| measures to integrate the development with the existing/future public transport network | Section 3.1.3, 3.1.4, 5.5 | |
| the impact of trips generated by the development on nearby intersections, with consideration of the cumulative impacts from other approved developments in the vicinity, and the need/associated funding for, and details of, upgrades or road improvement works, if required (Traffic modelling is to be undertaken using SIDRA network modelling for current and future years) | Section 5.4, 5.4.1 | |
| the identification of infrastructure required to ameliorate any impacts on traffic efficiency and road safety impacts associated with the proposed development, including details on improvements required to affected intersections, additional school bus routes along bus capable roads (I minimum 3.5 m wide travel lanes), additional bus stops or bus bays | Section 5.4, 5.4.1, 5.5 | |
| details of travel demand management measures to minimise the impact on general traffic and bus operations, including details of a location specific sustainable travel plan (Green Travel Plan and specific Workplace travel plan) and the provision of facilities to increase the non-car mode share for travel to and from the site | Section 6.9 | A greenfield site with little to no existing bus services / cycling paths / pedestrian networks does not allow development of an appropriate Green Travel Plan. We recommend a condition of consent to prepare such a plan upon approval with potential future bus operators in the area along with State Rail. |
| the proposed walking and cycling access arrangements and connections to public transport services | Section 3.1.3, 3.1.4 | |
| the proposed access arrangements, including car and bus pick-up/drop off facilities, and measures to mitigate any associated traffic impacts and impacts on public transport, pedestrian and bicycle networks, including pedestrian crossings and refuges and speed control devices and zones | Section 4, Table 4 | |
| proposed bicycle parking provision, including end of trip facilities, in secure, convenient, accessible areas close to main entries incorporating lighting and passive surveillance | Section 6.6 | |

| SEARS Comment | Relevant Traffic Report Section | Comments |
|---|---|---|
| proposed number of on-site car parking spaces for teaching staff and visitors and corresponding compliance with existing parking codes and justification for the level of car parking provided on-site | Section 4, 6 | |
| an assessment of the cumulative on-street parking impacts of cars and bus pick-up/drop-off, staff parking and any other parking demands associated with the development | Section 6, 6.8 | Development provides parking in excess of existing policy requirements |
| an assessment of road and pedestrian safety adjacent to the proposed development and the details of required road safety measures and personal safety in line with CPTED | Section 4.2 | See CPTED design report prepared by PMDL |
| emergency vehicle access, service vehicle access, delivery and loading arrangements and estimated service vehicle movements (including vehicle type and the likely arrival and departure times) | Section 4.3 | The site provides a number of driveway access points serving both the school overall and specific developments which cater for both servicing and emergency vehicle access as shown in plans provided in Appendix A |
| the preparation of a preliminary Construction Traffic and Pedestrian Management Plan to demonstrate the proposed management of the impact in relation to construction traffic addressing the following:<br>• assessment of cumulative impacts associated with other construction activities (if any)<br>• an assessment of road safety at key intersection and locations subject to heavy vehicle construction traffic movements and high pedestrian activity<br>• details of construction program detailing the anticipated construction duration and highlighting significant and milestone stages and events during the construction process<br>• details of anticipated peak hour and daily construction vehicle movements to and from the site<br>• details of on-site car parking and access arrangements of construction vehicles, construction workers to and from the site,<br>• emergency vehicles and service vehicle<br>• details of temporary cycling and pedestrian access during construction. | Appendix E | |
| **TfNSW Letter 25/07/2018** | | |
| Projected student population growth as the site develops | Section 4.1 / Appendix A | |

| SEARS Comment | Relevant Traffic Report Section | Comments |
|---|---|---|
| Details of design of the surrounding local road network per the Riverstone East planned Precinct | Section 2.3, Section 3.1.1 | |
| Estimated school catchment area (if any) | N/A | The catchment for this faith based school is unknown at this stage |
| Trip generation and mode share estimates based on surveys and analysis of a similar development | Section 5.2.2, 5.2.2.1, 5.2.2.2, 5.2.2.3, 5.2.2.1, 5.2.3 | |
| Intersection modelling and analysis for existing and post-development (forecast year 2036 – refer to Transport Study Post Exhibition Report for the Riverstone East planned precinct), which includes Tallawong Road with Guntawong Road and Tallawong Road with Schofields Road | Section 5.4 | |

## 2. Existing Development / Conditions

The following presents a summary of existing site and traffic conditions.

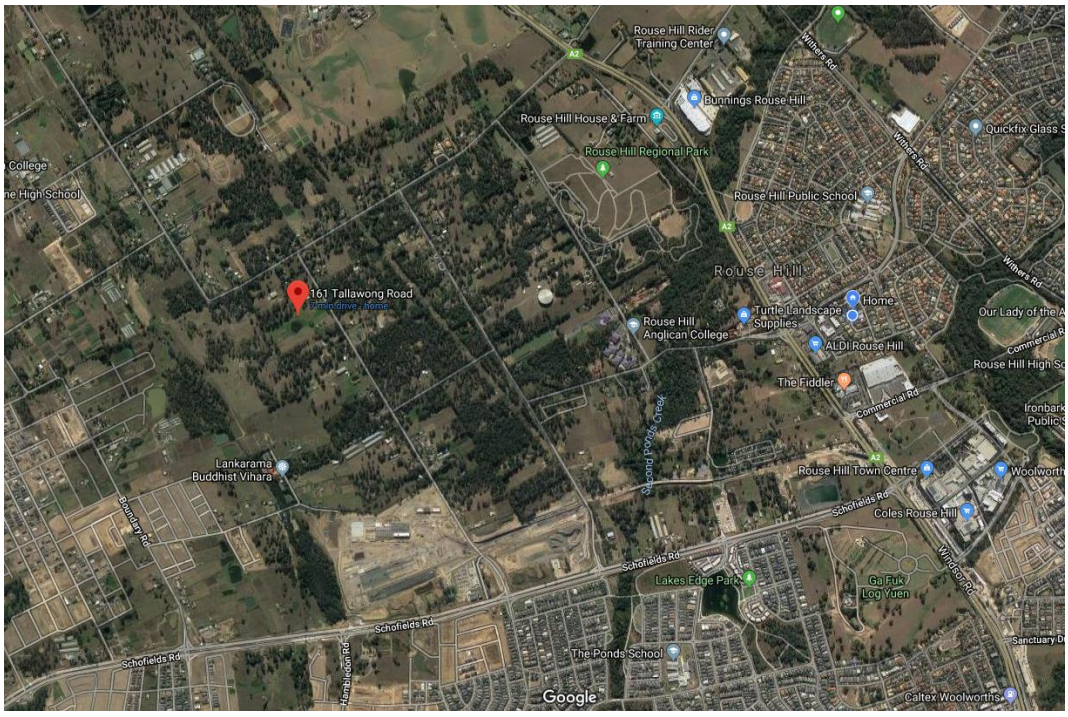
### 2.1 Site Location

The proposed school is located within the Riverstone East release area which is currently under development. Many of the existing properties include rural residential dwellings which would be converted into low – medium density residential development, recreational facilities, education and retail.

The precinct is part of the North Western Sydney Growth Area. At the time of preparing this report only Tallawong Road was in place of which would be subject to a future upgrade to provide additional capacity. The local streets surrounding the proposed school site are currently not constructed with only the southern boundary road under half road construction to serve an adjacent residential development. The formal address of the subject site is 151 – 161 Tallawong Road, Rouse Hill. The Riverstone East Precinct has been subject to extensive traffic modelling to underpin the approval of the release area. This is discussed further below.

The location of the development site is shown in **Figure 1**.

**Figure 1 - Site Location**




*Source: Google maps*

The context of the subject site within the local environment is shown in **Figure 2**.

**Figure 2 – Local Environment of Subject Site**


## 2.2 Classification Criteria

It is usual to classify roads according to a road hierarchy in order to determine their functional role within the road network. Changes to traffic flows on the roads can then be assessed within the context of the road hierarchy. Roads are classified according to the role they fulfil and the volume of traffic they should appropriately carry. The RTA has set down the following guidelines for the functional classification of roads.

- Arterial Road – typically a main road carrying over 15,000 vehicles per day and fulfilling a role as a major inter-regional link (over 1,500 vehicles per hour)
- Sub-arterial Road – defined as secondary inter-regional links, typically carrying volumes between 5,000 and 20,000 vehicles per day (500 to 2,000 vehicles per hour)
- Collector Road – provides a link between local roads and regional roads, typically carrying between 2,000 and 10,000 vehicles per day (250 to 1,000 vehicles per hour). At volumes greater than 5,000 vehicles per day, residential amenity begins to decline noticeably.
- Local Road – provides access to individual allotments, carrying low volumes, typically less than 2,000 vehicles per day (250 vehicles per hour).

## 2.3 Existing Road Network

Tallawong Road – is a local street which links Guntawong Road in the north with Schofields Road in the south. The nature of the existing area with limited route choice, Tallawong Road functions as a local collector road. Across the frontage of the site, the road includes a single travel lane in each direction with unformed road shoulders and a posted speed limit of 50km/hr. The existing nature of the road environment is presented below in **Figure 3**.

**Figure 3 – Tallawong Road Existing Environment**


Guntawong Road – is of a similar nature to Tallawong Road with a single travel lane in each direction, unformed road shoulders and a posted speed limit of 50km/hr. The road provides a left in / left out intersection access with Windsor Road, the main north-south arterial road through the area.

## 2.4 Existing Site Traffic Generation

The existing site includes two (2) rural residential dwellings. Applying the RTA Guide to Traffic Generating Developments residential rate, the existing dwellings would generate two (2) peak hour trips two – way.

## 2.5 Existing Traffic Flows

As stated above, the Riverstone East Precinct has been subject to significant area wide traffic analysis which has been referred to as part of this single site assessment. Given the expected changes to traffic conditions in the only road available, Tallawong Road, formal mid-block and intersection counts were not considered appropriate. This is discussed further in Section **3** of this report.

## 2.6 Public Transport - Buses

Following the opening of the north west rail link, bus services in the vicinity of the development suite have expanded with further expansion in the future as the Riverstone East area continues to develop. These include bus services which now operate along Tallawong Road.

Bus services which currently operate within the Riverstone East precinct and surrounds include:

- Bus Route 732 – Blacktown Station to Rouse Hill Station
- Bus Route 742 – Rouse Hill Station to Riverstone Station via Tallawong Road
- Bus Route 747 – Rouse Hill Station to Marsden Park via Tallawong Road
- Bus Route 751 – Rouse Hill Station to Blacktown Station via Marsden Park

As stated above additional bus services are expected to be introduced as the Riverstone Precinct area develops in the future. The proposed expansion of the public transport operations within and surrounding the Riverstone East Release Area are summarised further in Section **3** of this report.

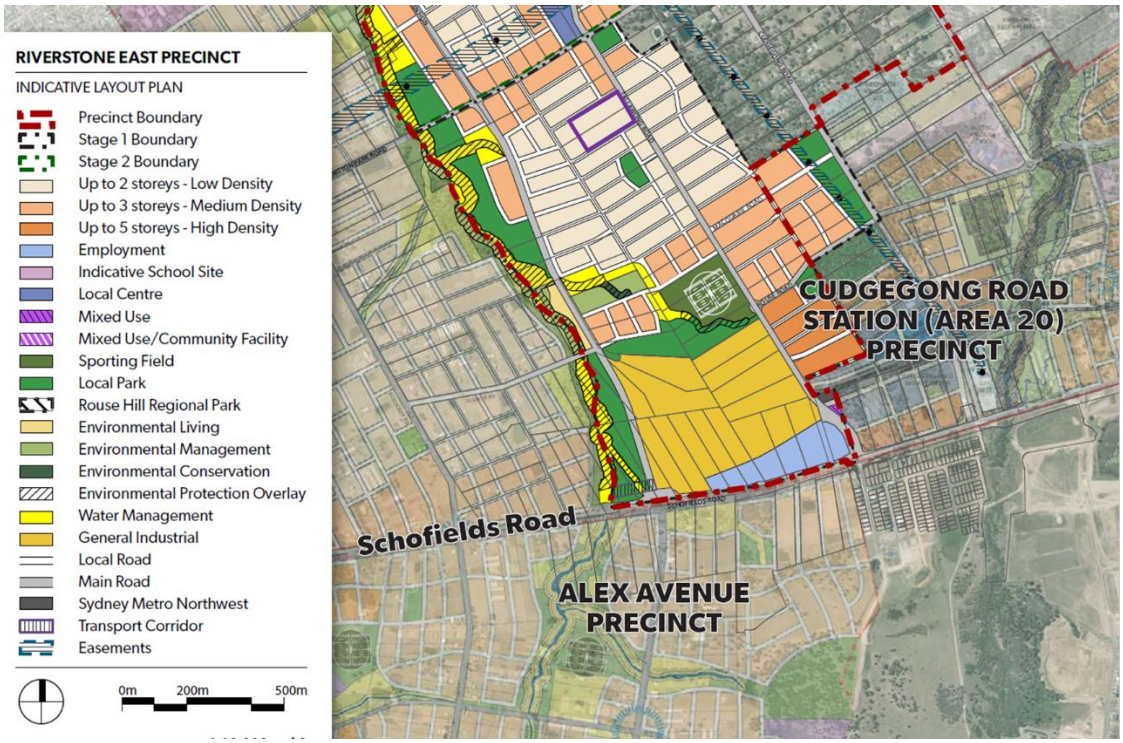
## 3. Background Report Review

As stated above, the delivery of ILP for the Riverstone East precinct has been subject to a large area wide modelling assessment to determine future infrastructure and road network needs. As this development proposes lots and roads in line with the ILP, a formal traffic impact assessment which includes intersection counts and modelling is not considered appropriate.

The following presents a summary of the specific traffic investigations which have accounted for the proposed development site.

The location of the proposed school site within the context of the Riverstone East ILP is shown below in **Figure 4**.

**Figure 4 – Proposed Site Location within Riverstone East ILP**




### 3.1 Riverstone East Precinct Transport Study – Post Exhibition Study Report – ARUP 2015

The Riverstone East Precinct Transport Study report[1] stated the following regarding the traffic impacts of the precinct as a whole (5,784 dwellings):

*This report has provided an assessment of the future transport infrastructure components necessary to support the development of the precinct, based on a series of key objectives. These are summarised below:*

[1] Riverstone East Precinct Transport Study – Post Exhibition Study Report – ARUP 2015

- *Provide a road network that allows for good access to all modes of transport;*
- *Design a physical site layout which encourages walking and cycling;*
- *Ensure the road network provides suitable connections to adjacent*
- *development precincts;*
- *Integrate transport and land use planning;*
- *Provide high quality access to public transport stops to reduce the dependence*
- *on private vehicles;*
- *Develop an appropriate road hierarchy which provides adequate carrying*
- *capacity; and*
- *Protect residential areas from through traffic intrusion, particularly heavy*
- *vehicles.*

***Road Network***

*A strategic transport network model was developed to forecast future year (2036) traffic volumes in the vicinity of the Riverstone East precinct. Based on the traffic modelling outputs, a road network hierarchy was developed to support the future land uses envisaged for Riverstone East. Windsor Road is currently classified as*
*arterial roads and will support the majority of regional traffic movements. Schofields Road and Garfield Road have been identified as transit boulevards and therefore critical links to support regional traffic and bus movements.*

*A number of existing internal roads have been identified for improvement and form the framework for the higher-order (sub-arterial / collector) road network. These roads will accommodate internal traffic, bicycle and pedestrian movements, and include:*

- *Hambledon Road;*
- *Tallawong Road;*
- *Cudgegong Road; and*
- *Guntawong Road.*

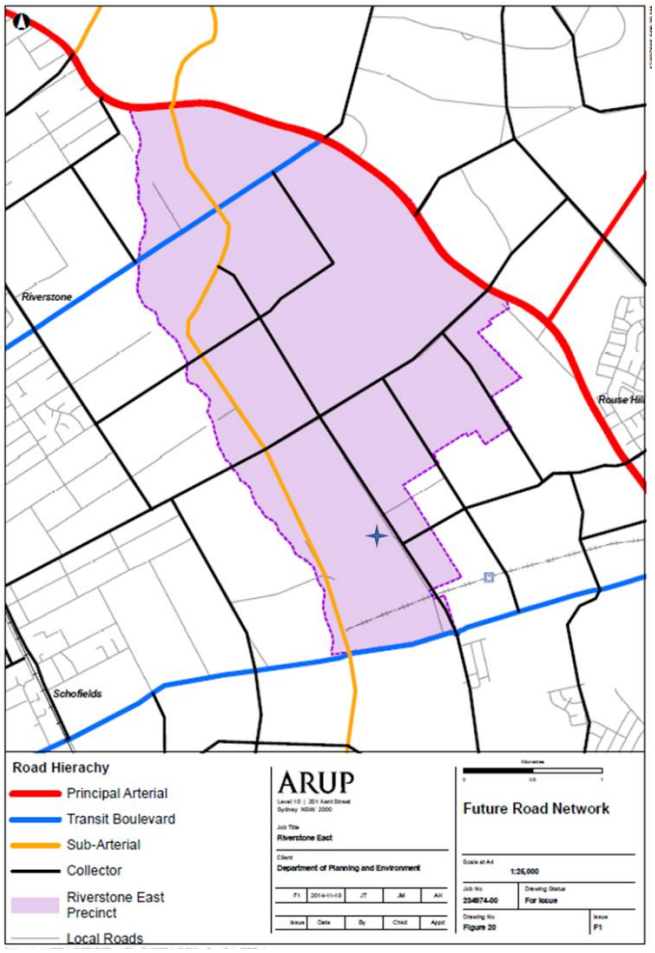
*A number of intersections within Riverstone East were analysed using the SIDRA 6 modelling package to assess their future peak-hour operating performance. Traffic signals are recommended to be installed at eight intersections within the precinct, with a further three intersections currently containing traffic signals identified to be upgraded. The results of the traffic modelling demonstrate, based on the recommended configurations, the intersections will operate satisfactorily during both the AM and PM peak hours for the forecast year 2036.*

That is, over time the road network would include major upgrades including road widenings and intersection upgrades of which benefits cannot be captured in isolation through local intersection assessments. Overall the infrastructure delivery plan developed in the ARUP traffic reports (and underpinned in the contributions plan) would provide adequate capacity into the future.

### *3.1.1 Future Road Network*

The proposed future road network in the vicinity of the site is shown below in **Figure 5**:

**Figure 5 – Future Road Network in vicinity of development site**




As shown in **Figure 6**, Tallawong Road will be upgraded to a 'collector road' classification.

### *3.1.2 Forecast Traffic Demands (2036)– Tallawong Road*

The ARUP report included 2036 forecasts for a number of roads within the Riverstone East precinct including Tallawong Road. The 2036 forecasts for Tallawong Road are presented below in **Table 1**.

**Table 1 - ARUP Report 2036 Tallawong Road Forecast Traffic Flows**

| | | | |
|---|---|---|---|
| Tallawong Road / Guntawong Road | Tallawong Road N | 343 | 451 |
| | Tallawong Road S | 453 | 179 |
| | Guntawong Road E | 604 | 874 |
| | Guntawong Road W | 665 | 329 |

The above table indicates 2036 traffic flows are within expected maximum flows for a collector road.

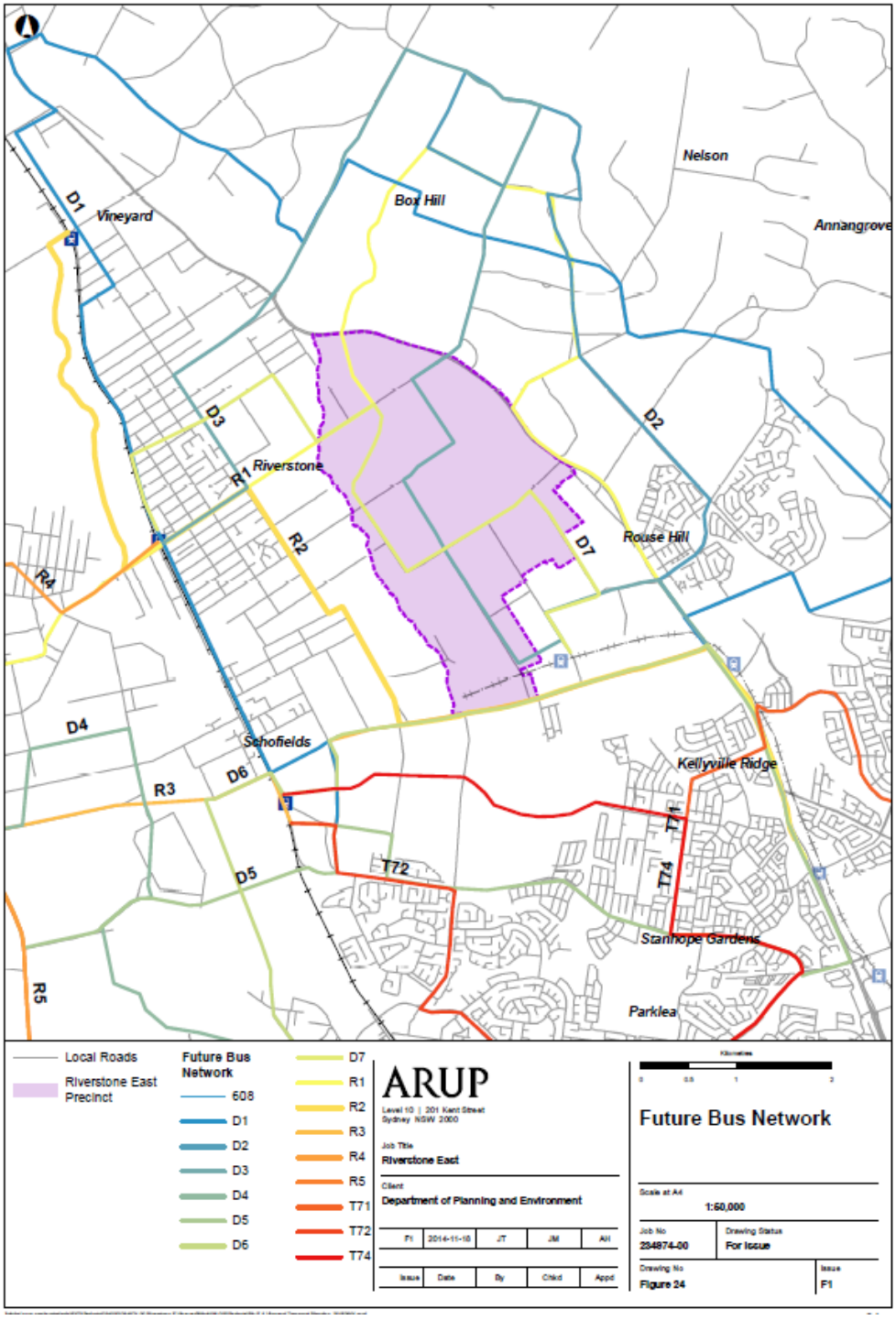
### *3.1.3 Future Public Transport Provisions*

The North-West Sector Bus Servicing Plan, produced in 2012 by McCormick Rankin Cagney for NSW Transport and Infrastructure, provides for a future bus network to service the North-West Growth Centre as a whole The proposed network consists of five regional and twelve district routes, as described below:

- Regional routes are high frequency services intended to connect town and regional centres. These routes were planned to ensure 90% of residents of the NWGCC are within 800m of a service.
- District bus services are less frequent that typically run during the day only, providing further accessibility to village centres and extending bus service provision to the widest area practically possible.

The ARUP report included the preparation of a bus network plan for the Riverstone East precinct based on the above principles and is shown below:

**Figure 6 – Proposed Bus Corridors Near Development Site**




As it can be seen in **Figure 6** new bus services would operate along Tallawong Road and Guntawong Road (some 250m walking distance) to the proposed school site.

### *3.1.4 Future Bicycle Network*

In addition to the improvements to the road and public transport network, the delivery of the Riverstone East ILP would markedly improve facilities for both pedestrians and cyclists. The future

bicycle and pedestrian network (noting all roads would include at least one all-weather footpath in all streets) is shown below in **Figure 7**.

**Figure 7 - Riverstone East ILP Future Pedestrian / Bicycle Network**


As shown in **Figure 7** as new shared pedestrian / bicycle off road pathway is proposed along Tallawong Road directly adjacent to the eastern boundary of the proposed school site. This pathway would extend into Guntawong Road in the north and extend to the recently constructed shared pathways along Schofields Road.

## 4. The Proposed Development

The key components of the proposed development and associated public works are described below.

- A staged construction of a Kindergarten to High School which would achieve a potential capped student population of 1,260 students and total Gross Floor Area of 21,125m$^2$ of floorspace.
- Basement car park with ultimate provision for 203 parking spaces with entry / exit access via the northern and southern local roads which form the boundaries of the site. This car park would also include a 11 space Kiss and Drop facility.
- Early Learning Centre with capacity for 86 children and a 32-space car park with entry / exit access via the southern boundary local street.
- Student accommodation for up to 110 students, 6 staff with 13 space basement car park
- Temporary 43 space car park on the north – western corner of the site which would be removed upon construction of the 203 space basement car park.
- At full development of the site, a total parking provision of 281 parking spaces which includes **249** spaces for school / worship uses and **32** spaces for the Early Learning Centre.
- Gurdwara and Langar Worship Centre with a Gross Floor Area of 2,710m$^2$ (maximum capacity for 700 persons)
- Langer ancillary food preparation area internal to the Gurdwara and Langar Worship Centre
- Indented bus bay with capacity for three (3) full sized buses in Tallawong Road along the eastern boundary of the school.
- A construction program of approximately 10 years.

A summary of the number of persons / staff for each component of the project is presented below in **Table 2**.

**Table 2 - Estimated Student / Staff Numbers by Use**

| Item | Details |
|---|---|
| Early Learning Centre | 86 place / 18 staff |
| Primary School | 588 students (based on 28 per class) + 30 staff |
| Secondary School - 4 Stream | 672 students (based on 28 per class) + 47 staff |
| Administration & Staff | 25 staff |

It should be noted that the proposed large basement car park would serve both school and worship uses on the site. However, to ensure the total available on-site parking is available for each use, the Gurdwara and Langar Worship Centre **would not** be opened during school hours on any weekday.

## 4.1 Development Staging

Detailed staging plans of each component of the development included expected student population is presented in **Appendix A** of this report.

It is noted that construction of the northern, western and southern boundary roads of the school site would be undertaken prior to any commencement of works at the school. It is also noted that construction of these roads has been subject to a separate development application for the proposed residential dwelling lots forming the western boundary of the proposed school.

For ease of reference, the following summary presents the anticipated student population

**Table 3 – Summary of Proposed Staging**

| Stage | Items | Max No. Students | Total On Site Parking Spaces |
|---|---|---|---|
| 1 | • Tallawong Rd Upgrade<br>• Relocatable primary school building<br>• Open space<br>• 2 x at grade car parks | 168 | 83 |
| 2 | • Permanent private school building<br>• Open space<br>• Multi-purpose court (school use) | 420 | 83 |
| 3A | • Additional primary school buildings including library<br>• Entry driveway within southern boundary road for future car park access | 680 | 83 |
| 3B | • Early learning centre<br>• Early learning centre car park | 680 school / 86 early learning centre | 83 school / 32 early learning centre |
| 4 | • Secondary school<br>• Additional parking | 900 school / 86 early learning centre | 123 school / 32 early learning centre |
| 5 | • Additional Secondary School buildings<br>• At Grade Kiss & Drop facilities | 1,150 school / 86 early learning centre | 173 school / 32 early learning centre |
| 6 | • Additional Secondary School buildings | 1,260 school / 86 early learning centre | 173 school / 32 early learning centre |
| 7 | • Multi-purpose hall for school<br>• Gurdwara / Langer Worship building<br>• Basement car park with northern and southern boundary road connections | 1,260 school / 86 early learning centre | 236 school / 32 early learning centre |
| 8 | • Administration building<br>• Staff accommodation (6 dwellings) | 1,260 school / 86 early learning centre | 285 school / 32 early learning centre |
| 9 | • Boarding house (110 students) | 1,260 school / 86 early learning centre | 249 school / 32 early learning centre |

## 4.2 Pedestrian Facilities – Vehicle Access

As the site evolves, a number of pedestrian and vehicle access points would be created. In addition, the development would include internal and external all-weather pedestrian pathways to service the school and general public along the frontages of the development. The following presents a summary by stage:

**Table 4 – Summary of Proposed New Pedestrian / Vehicle Access Facilities**

| Stage | Items | New Pedestrian Facilities | New Vehicle Access |
|---|---|---|---|
| 1 | • Tallawong Rd Upgrade<br>• New northern local road half construction<br>• Relocatable primary school building<br>• Open space | • Pedestrian pathway along southern side of northern boundary road<br>• Pedestrian pathway along western side of Tallwong Road<br>• Pedestrian gate from northern boundary road | • New vehicle driveway access in northern boundary road to serve Stage 1 public school car park. |
| 2 | • Permanent private school building<br>• Open space | • No change | • Permanent driveway access from northern boundary road to north – eastern 34 space car park |
| 3 | • Additional primate school buildings<br>• Half western boundary road construction<br>• Southern boundary road future car park access | • Pedestrian pathway along northern side of southern boundary road<br>• Pedestrian pathway along eastern side of western boundary road | • Temporary access driveway to temporary open-air car park in south – west corner<br>• Permanent driveway access from southern boundary road to future basement car park |
| 3B | • Early learning centre<br>• Early learning centre car park | • No change | • Entry & exit driveway access to Early Learning Centre |
| 4 | • Secondary school<br>• Additional parking | • No change | • No change |
| 5 | • Additional Secondary School buildings<br>• At Grade Kiss & Drop facilities | • No change | • Permanent driveway access to northern boundary road to serve future basement car park |
| 6 | • Additional Secondary School buildings | • No change | • No change |
| 7 | • Multi-purpose hall for school<br>• Gurdwara / Langer Worship building<br>• Basement car park with northern and southern boundary road connections | • All weather internal pathways connecting Tallawong Road bus bays | No change |
| 8 | • Administration building<br>• Boarding house (110 students)<br>• Staff accommodation (6 dwellings) | • No change | • No change |

## 4.3 Servicing

As described above, the pedestrian / vehicle networks within and around the school site would evolve over time as the school developments.

Site servicing also is an important factor which has been accounted for in the design development.

All proposed car parks within the school would include service vehicle facilities in the form of parking bays and loading docks as required by the DCP.

Early Learning Centres are typically served by vans which would be accommodated within the proposed car park serving the development.

The north – eastern car park constructed during Stage 2 also includes service vehicle parking bays. In addition, a loading dock area has been provided in the south – western corner of the north – eastern car park to serve the future Gurdwara and Langar worship centre.

All car parks would also provide a number of access points for utilisation by emergency vehicles including ambulances to reduce distance of travel throughout the school site accordingly.

Overall, the final details of each service facility would be formulated during the development of construction certificate plans for each development proposal within the school site and thus subject to separate applications / assessment.

## 5. Potential Traffic Impact Assessment

### 5.1 Riverstone ILP Assumed Development

As shown in **Figure 4** if this report, the proposed school is located within an area which was identified as low-density housing. With an approximate site area of 48,500m$^2$ and no change to the northern and southern roads which form the boundaries of this proposal. It is expected the site would have delivered some 108 residential lots.

Thus, the potential traffic generation of the site on the basis that it would achieve low density housing would be **102** in the AM peak and **107** in the PM peak vehicle trips two way[2].

### 5.2 Proposed Development

The assessment of potential traffic impacts has been based on full development of the site in approximately 10 years (2028). This has been compared with the traffic forecasts of the Riverstone East Traffic Report which provides ultimate traffic forecasts for the Riverstone East Precinct for the year 2036.

The components of the development would be considered traffic generators include:

- Early Learning Centre
- K – 12 School
- Gurdwara and Langar Worship Centre

The RTA Guide to Traffic Generating Developments does not provide traffic generation rates for either a school or a worship centre. Thus, the potential traffic generation of these uses has been determined from both a first principles assessment and a survey of an existing Worship Centre of the same faith.

#### *5.2.1 Early Learning Centre.*

The RTA Guide to Traffic Generating Developments recommends the following traffic generation rates for an Early Learning Centre (which has been assumed to operate as a Long Day Care centre):

| Peak Vehicle Trips / Child | |
|---|---|
| 7:00am – 9:00am | 0.8 trips |
| 2:30pm – 4:30pm | 0.3 trips |
| 4:00pm – 6:00pm | 0.7 trips |

Therefore, during the morning and afternoon road network peak periods, it is estimated the 86 place Early Learning Centre would generate **69 AM peak** and **60 PM peak** trips two way.

[2] Application of the RTA Technical Direction TDT13-04a peak hour traffic generation rates for low density housing.

### 5.2.2 K-12 Sikh Grammar School

The traffic generated by a school is heavily dependent on the availability of public / private bus services and the proximity to residential areas.

To inform the Masterplan Traffic and Parking Assessment for the Inner West High School in Cleveland Street, Sydney, Positive Traffic Pty Ltd undertook Mode of Travel Surveys of a number of schools with a range of public transport accessibility.

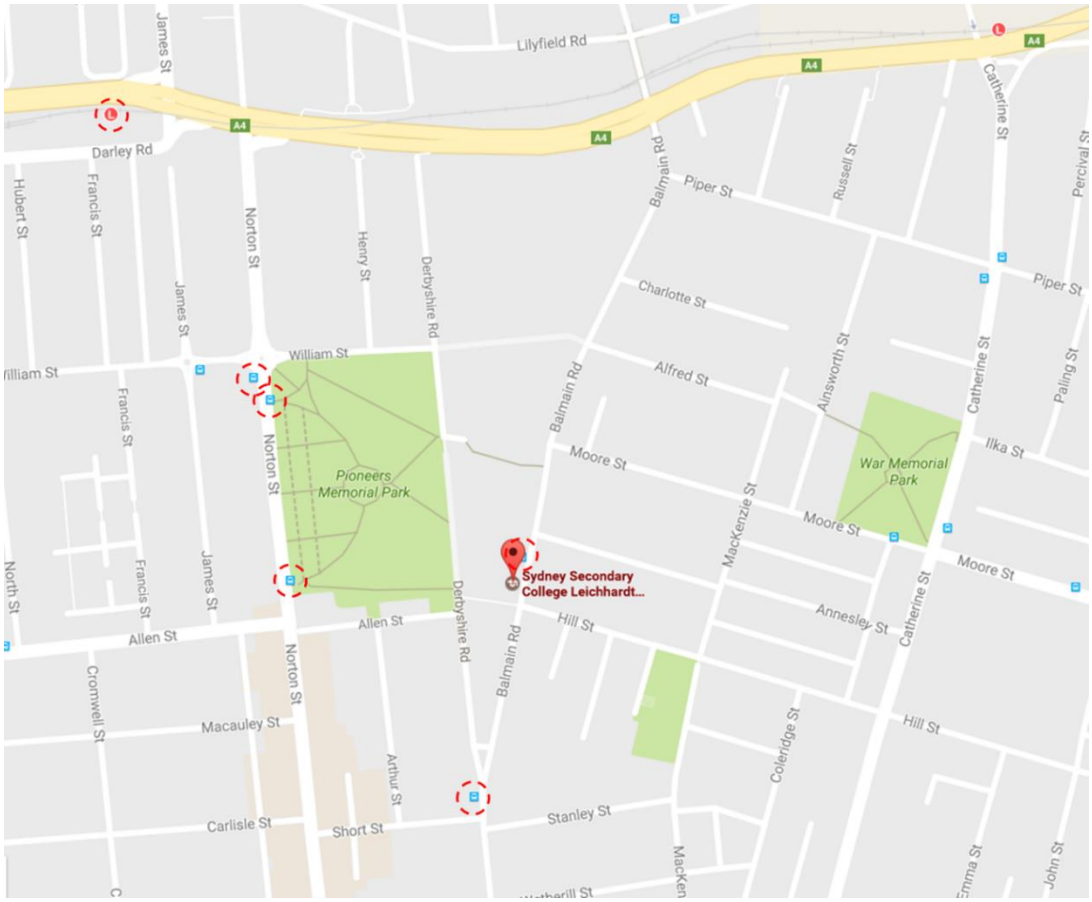
To endeavour to provide an estimate of mode of travel to / from the Sikh Grammar School, Rouse Hill, the information gathered from the mode of travel surveys for the Inner West High School have been utilised as they include surveys of a range of high schools with varying access to public transport. A copy of the mode of travel surveys is provided in **Appendix B** of this report.

The mode of travel survey included a record of the postcode of the student / staff member and the mode of travel they respondent took to and from the school on the survey day. Each student surveyed also had their current year of education recorded as part of the survey.

#### 5.2.2.1 Sydney Secondary College Leichardt

The location of the college is shown below in **Figure 8**.

**Figure 8 – Sydney Secondary College Leichhardt**



The school includes a high school and a student population of some 950 students and only includes Years 7-10. The school is located within 500m of four bus stops and 950m to the Leichhardt Light Rail Station. The school resides in postcode 2040. Parking around the school is generally restricted to 2 hours in Balmain Road and is unrestricted in side streets.

A summary of the mode of travel survey results as shown below in **Table 5**:

**Table 5 - Sydney Secondary College Leichhardt Mode of Travel Survey Results**

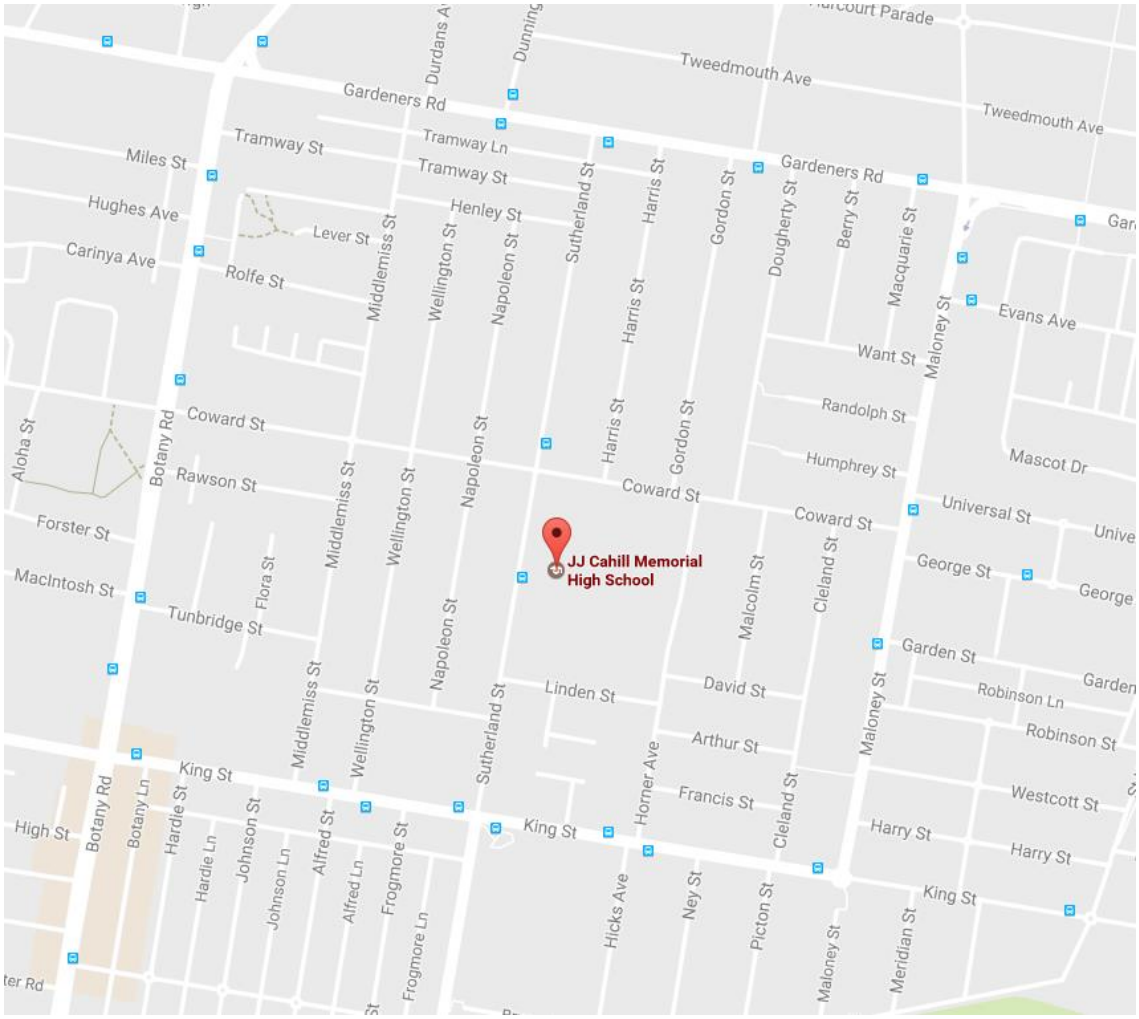
| | How did you travel to school today? | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Year / Staff | BOARDER | TRAIN | SELF DRIVE | CAR DROP OFF | MOTOR CYCLE | BUS | WALK | BICYCLE | FERRY | LIGHT RAIL | OTHER |
| Year 7 | 0% | 0% | 0% | 15% | 0% | 38% | 38% | 4% | 0% | 0% | 4% |
| Year 8 | 0% | 5% | 0% | 14% | 0% | 29% | 38% | 5% | 0% | 10% | 0% |
| Year 9 | 0% | 0% | 0% | 0% | 0% | 64% | 27% | 0% | 0% | 9% | 0% |
| Year 10 | 0% | 16% | 0% | 8% | 0% | 36% | 16% | 4% | 0% | 20% | 0% |
| **AVG** | **0%** | **5%** | **0%** | **9%** | **0%** | **42%** | **30%** | **3%** | **0%** | **10%** | **1%** |
| Staff | 0% | 0% | 85% | 0% | 4% | 4% | 8% | 0% | 0% | 0% | 0% |
| | **How will you travel home today?** | | | | | | | | | | |
| Year / Staff | BOARDER | TRAIN | SELF DRIVE | CAR DROP OFF | MOTOR CYCLE | BUS | WALK | BICYCLE | FERRY | LIGHT RAIL | OTHER |
| Year 7 | 0% | 4% | 0% | 8% | 0% | 46% | 35% | 4% | 0% | 0% | 4% |
| Year 8 | 0% | 5% | 0% | 5% | 0% | 48% | 33% | 0% | 0% | 10% | 0% |
| Year 9 | 0% | 0% | 0% | 0% | 0% | 59% | 32% | 0% | 0% | 9% | 0% |
| Year 10 | 0% | 16% | 0% | 4% | 0% | 32% | 20% | 0% | 0% | 28% | 0% |
| **AVG** | **0%** | **6%** | **0%** | **4%** | **0%** | **46%** | **30%** | **1%** | **0%** | **12%** | **1%** |
| Staff | 0% | 0% | 85% | 0% | 4% | 4% | 8% | 0% | 0% | 0% | 0% |

From **Table 5** it can be seen that no students of this school drove (having regard to their ages) and only 4-9% travelled by car with 92% travelling by either public transport or walking. In contrast 85% of staff drove to / from the school which reflects the availability of all-day parking within easy walking distance to the school.

#### 5.2.2.2 JJ Cahill Memorial High School

The location of the college is shown in **Figure 9**.

**Figure 9 – JJ Cahill Memorial High School**




The school caters for Years 7-10 and is located south of the Sydney CBD near the Sydney Domestic airport. Public transport availability is confined to bus services on a number of streets surrounding the school within 50-500m walking distance of the school. In comparison, the school has a lower public transport accessibility index compared with Sydney Secondary College given students / staff do not have access to rail as a transport mode option.

A summary of the mode of travel survey results as shown below in **Table 6**:

**Table 6 - JJ Cahill Memorial High School Mode of Travel Survey Results**

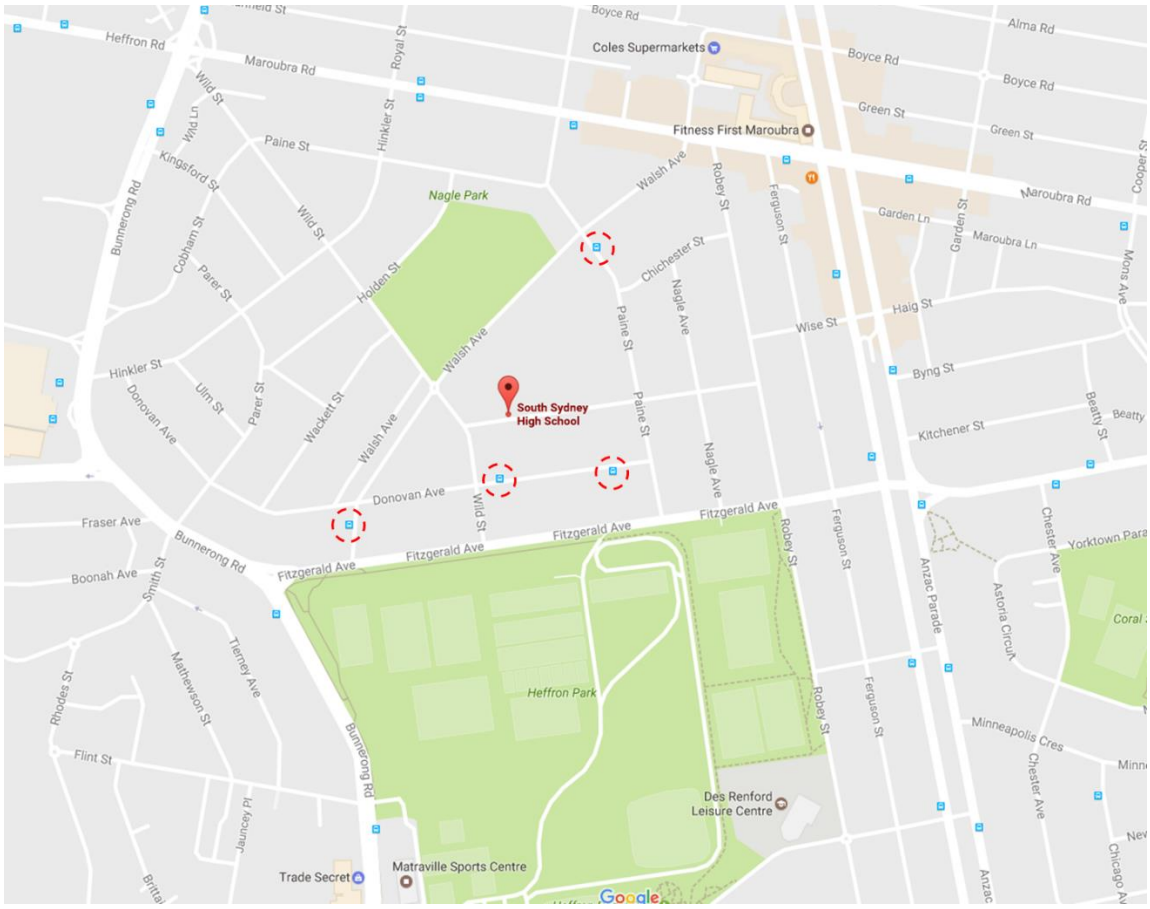
| | How did you travel to school today? | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Year / Staff | BOARDER | TRAIN | SELF DRIVE | CAR DROP OFF | MOTOR CYCLE | BUS | WALK | BICYCLE | FERRY | LIGHT RAIL | OTHER |
| Year 7 | 0% | 2% | 0% | 36% | 0% | 14% | 48% | 0% | 0% | 0% | 0% |
| Year 8 | 0% | 0% | 0% | 8% | 0% | 31% | 62% | 0% | 0% | 0% | 0% |
| Year 9 | 0% | 3% | 0% | 37% | 0% | 18% | 39% | 3% | 0% | 0% | 0% |
| Year 10 | 0% | 8% | 0% | 18% | 0% | 21% | 51% | 3% | 0% | 0% | 0% |
| AVG | 0% | 3% | 0% | 25% | 0% | 21% | 50% | 1% | 0% | 0% | 0% |
| Staff | 0% | 6% | 0% | 16% | 0% | 26% | 52% | 0% | 0% | 0% | 0% |
| | **How will you travel home today?** | | | | | | | | | | |
| Year / Staff | BOARDER | TRAIN | SELF DRIVE | CAR DROP OFF | MOTOR CYCLE | BUS | WALK | BICYCLE | FERRY | LIGHT RAIL | OTHER |
| Year 7 | 2% | 0% | 22% | 17% | 0% | 59% | 0% | 0% | 0% | 0% | 2% |
| Year 8 | 0% | 0% | 0% | 38% | 0% | 62% | 0% | 0% | 0% | 0% | 0% |
| Year 9 | 3% | 0% | 29% | 26% | 0% | 39% | 3% | 0% | 0% | 0% | 3% |
| Year 10 | 8% | 0% | 15% | 15% | 0% | 59% | 3% | 0% | 0% | 0% | 8% |
| AVG | 3% | 0% | 17% | 24% | 0% | 55% | 1% | 0% | 0% | 0% | 3% |
| Staff | 13% | 0% | 13% | 25% | 0% | 50% | 0% | 0% | 0% | 0% | 6% |

Despite having a lower public transport accessibility index than Sydney Secondary School, there were no car driver trips by staff.

#### *5.2.2.3 South Sydney High School*

The location of the college is shown in **Figure 10**.

**Figure 10 – South Sydney High School**




As is the case with JJ Cahill Memorial High School, public transport options for the school are confined to bus. The school caters for Years 7-12 and is located south of the Sydney CBD near Eastgardens Shopping Centre. The school includes a student population of approximately 520. In comparison, the school has a lower public transport accessibility index compared with Sydney Secondary College given students / staff do not have access to rail as a transport mode option and a similar accessibility index to that of JJ Cahill Memorial High School.

Of note, there is little to no parking restrictions on the road network surrounding the school and thus there is an opportunity to students / staff to drive and park all day near the school.

Of note, the survey information was not collected by either year or whether the respondent was a staff member. Thus, the survey responses provide a picture of the overall school mode of travel choices. A summary of the mode of travel survey results as shown below in **Table 7**.

**Table 7 – South Sydney Secondary High School Mode of Travel Survey Results**

| | How did you travel to school today? | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Year / Staff | BOARDER | TRAIN | SELF DRIVE | CAR DROP OFF | MOTOR CYCLE | BUS | WALK | BICYCLE | FERRY | LIGHT RAIL | OTHER |
| AVG | 0.0% | 0.3% | 9.5% | 29.1% | 2.1% | 31.8% | 23.7% | 0.0% | 1.8% | 1.8% | 0.0% |
| | How will you travel home from school today? | | | | | | | | | | |
| Year / Staff | BOARDER | TRAIN | SELF DRIVE | CAR DROP OFF | MOTOR CYCLE | BUS | WALK | BICYCLE | FERRY | LIGHT RAIL | OTHER |
| AVG | 0.0% | 0.9% | 9.1% | 17.3% | 2.1% | 40.1% | 28.4% | 0.0% | 0.6% | 1.8% | 0.0% |

As expected, the school did include a proportion of car drivers to and from the school. However, despite the fact that streets surrounding the school did not include timed parking restrictions, the proportion of car drivers was still less than 10%.

#### *5.2.2.1 Estimated Traffic Generation*

Based on the Mode of Travel Surveys for a number of schools with a range of public transport accessibility, the findings of the surveys for South Sydney Secondary School are considered appropriate to apply to this school development. It is noted that the proportion of bicycle trips to the school was zero in both peak periods which is expected not to be the case for the proposed school.

However, as the proposed school does not include any access to Ferry or Light Rail, these proportions have been added to car drop off for a conservative estimate of potential traffic generation. Therefore, the proposal with a capped maximum student population of 1,260 and 102 staff would generate the following trips by mode.

**Table 8 – Sikh Grammar School Rouse Hill Estimated Trips by Mode**

| Year / Staff | BOARDER | TRAIN | SELF DRIVE | CAR DROP OFF | MOTOR CYCLE | BUS | WALK | BICYCLE | OTHER | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| AVG | 0.0% | 0.3% | 9.5% | 32.6% | 2.1% | 31.8% | 23.7% | 0.0% | 0.0% | |
| No. Trips | 0 | 4 | 130 | 444 | 28 | 434 | 323 | 0 | 0 | 1363 |
| Year / Staff | BOARDER | TRAIN | SELF DRIVE | CAR DROP OFF | MOTOR CYCLE | BUS | WALK | BICYCLE | OTHER | TOTAL |
| AVG | 0.0% | 0.9% | 9.1% | 19.4% | 2.1% | 40.1% | 28.4% | 0.0% | 0.0% | |
| No. Trips | 0 | 13 | 124 | 265 | 28 | 546 | 387 | 0 | 0 | 1363 |

From **Table 8** it is estimated 444 person trips in the AM peak and 265 person trips in the school afternoon peak would be generated by the proposal. Further, some 124-130 single trips to / from the school by self-drive car would occur.

Of note, each of the 444 and 265 drop off trips would not be single persons in each car as vehicle occupancy rates for school are generally high (accounting for travelling with siblings). Assuming a vehicle occupancy rate of say 1.5 students per vehicle would equate to **296 vehicle trips** two way in the AM peak and **176 vehicle trips** two way in the school afternoon peak (prior to the road network peak).

As is typical for schools which include Kindergarten to Year 12 students, morning and afternoon start and finish times would be staggered to spread vehicle demands during these times over longer periods.

### *5.2.3 Gurdwara and Langar Worship Centre Traffic Generation*

As stated above, the Gurdwara and Langar Worship building would not be open during school hours or school peak periods. The traffic generated by this component of the development would occur during the later evening periods on a weekday and weekends.

The RTA Guide to Traffic Generating Developments does not provide any traffic generation rates for a place of worship. Therefore, as recommended by the RTA guide, surveys of a similar development were undertaken.

Whilst of a slightly larger scale (2,755m$^2$ GFA), the existing Gurdwara and Langar Sahib Sikh Temple in Meurants Lane, Glenwood provides a direct comparison of potential traffic generation of the Gurdwara and Langar Temple within the Sikh Grammar College. The location of the existing temple is shown below in **Figure 11**.

**Figure 11 - Gurdwara and Langar Sahib Sikh Temple Glenwood**

The existing Sikh Temple in Meurants Lane includes an open-air car park with 289 parking spaces. To gauge both traffic and parking demands of this temple, traffic and parking demand surveys were undertaken on a Friday between the hours of 8:00am – 6:00pm and on a Saturday between 2:00pm to 8:00pm. A copy of these surveys are provided in Appendix C of this report.

A summary of the survey findings is presented below:

- A total of 793 persons were recorded to **enter** the temple between 9:00am – 6:00pm on a Friday.
- A total of 607 persons were recorded to **exit** the temple between 9:00am – 6:00pm on a Friday.
- A total of 2,495 persons were recorded to **enter** the temple between 2:00pm – 8:00pm on a Saturday.
- A total of 1,507 persons were recorded to **exit** the temple between 9:00am – 6:00pm on a Saturday.
- A total of 327 vehicles were recorded to **enter** the car park between 9:00am – 6:00pm on a Friday.
- A total of 300 vehicles were recorded to **exit** the car park between 9:00am – 6:00pm on a Friday.
- A total of 753 vehicles were recorded to **enter** the car park between 2:00pm – 8:00pm on a Saturday.
- A total of 552 vehicles were recorded to **exit** the temple between 9:00am – 6:00pm on a Saturday.
- The weekday AM peak hour traffic generation of the temple occurred between 9:15am – 10:15am and included **28 vehicles entering and 28 vehicles exiting**.
- The weekday PM peak hour traffic generation of the temple occurred between 12:45pm – 1:45pm and included **53 vehicles entering and 64 vehicles exiting**.
- The Saturday PM peak hour traffic generation of the temple occurred between 7:00pm – 8:00pm and included **204 vehicles entering and 192 vehicles exiting**.

From the above summary it is noted that the existing temple generated little to no traffic during the morning or afternoon road network peaks. The same would occur at the proposed Gurdwara and Langar Temple within the Sikh Grammar College. The hourly traffic generated by the temple on the Friday is shown below:

**Table 9 - Weekday Hourly Volumes - Existing Sikh Temple Glenwood**

| Approach | SITE3 - East Access | | | | Total | SITE4 - West Access | | | | Total | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Direction | IN | | OUT | | | IN | | OUT | | | |
| Time Period | Lights | Heavies | Lights | Heavies | | Lights | Heavies | Lights | Heavies | | |
| 9:00 to 10:00 | 23 | 0 | 29 | 0 | **52** | 0 | 0 | 0 | 0 | **0** | **52** |
| 9:15 to 10:15 | 26 | 0 | 28 | 0 | **54** | 0 | 0 | 0 | 0 | **0** | **54** |
| 9:30 to 10:30 | 29 | 0 | 25 | 0 | **54** | 0 | 0 | 0 | 0 | **0** | **54** |

| Approach | SITE3 - East Access | | | | Total | SITE4 - West Access | | | | Total | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Direction | IN | | OUT | | | IN | | OUT | | | |
| Time Period | Lights | Heavies | Lights | Heavies | | Lights | Heavies | Lights | Heavies | | |
| 9:45 to 10:45 | 37 | 0 | 17 | 0 | **54** | 0 | 0 | 0 | 0 | **0** | **54** |
| 10:00 to 11:00 | 35 | 0 | 15 | 0 | **50** | 0 | 0 | 0 | 0 | **0** | **50** |
| 10:15 to 11:15 | 33 | 0 | 17 | 0 | **50** | 0 | 0 | 0 | 0 | **0** | **50** |
| 10:30 to 11:30 | 30 | 0 | 23 | 0 | **53** | 0 | 0 | 0 | 0 | **0** | **53** |
| 10:45 to 11:45 | 23 | 0 | 22 | 0 | **45** | 0 | 0 | 0 | 0 | **0** | **45** |
| 11:00 to 12:00 | 27 | 0 | 18 | 0 | **45** | 0 | 0 | 0 | 0 | **0** | **45** |
| 11:15 to 12:15 | 31 | 0 | 21 | 0 | **52** | 0 | 0 | 0 | 0 | **0** | **52** |
| 11:30 to 12:30 | 29 | 0 | 16 | 0 | **45** | 0 | 0 | 0 | 0 | **0** | **45** |
| 11:45 to 12:45 | 32 | 0 | 26 | 0 | **58** | 0 | 0 | 0 | 0 | **0** | **58** |
| 12:00 to 13:00 | 38 | 0 | 36 | 0 | **74** | 0 | 0 | 0 | 0 | **0** | **74** |
| 12:15 to 13:15 | 47 | 0 | 40 | 0 | **87** | 0 | 0 | 0 | 0 | **0** | **87** |
| 12:30 to 13:30 | 47 | 1 | 50 | 0 | **98** | 0 | 0 | 0 | 0 | **0** | **98** |
| 12:45 to 13:45 | 53 | 1 | 64 | 1 | **119** | 0 | 0 | 0 | 0 | **0** | **119** |
| 13:00 to 14:00 | 42 | 1 | 58 | 1 | **102** | 0 | 0 | 0 | 0 | **0** | **102** |
| 13:15 to 14:15 | 31 | 1 | 62 | 1 | **95** | 0 | 0 | 0 | 0 | **0** | **95** |
| 13:30 to 14:30 | 37 | 0 | 55 | 1 | **93** | 0 | 0 | 0 | 0 | **0** | **93** |
| 13:45 to 14:45 | 30 | 0 | 41 | 0 | **71** | 0 | 0 | 0 | 0 | **0** | **71** |
| 14:00 to 15:00 | 36 | 0 | 43 | 0 | **79** | 0 | 0 | 0 | 0 | **0** | **79** |
| 14:15 to 15:15 | 36 | 0 | 39 | 0 | **75** | 0 | 0 | 0 | 0 | **0** | **75** |
| 14:30 to 15:30 | 29 | 0 | 39 | 0 | **68** | 0 | 0 | 0 | 0 | **0** | **68** |
| 14:45 to 15:45 | 29 | 0 | 32 | 0 | **61** | 0 | 0 | 0 | 0 | **0** | **61** |
| 15:00 to 16:00 | 33 | 0 | 33 | 0 | **66** | 0 | 0 | 0 | 0 | **0** | **66** |
| 15:15 to 16:15 | 37 | 0 | 34 | 0 | **71** | 0 | 0 | 0 | 0 | **0** | **71** |
| 15:30 to 16:30 | 35 | 0 | 32 | 0 | **67** | 0 | 0 | 0 | 0 | **0** | **67** |
| 15:45 to 16:45 | 42 | 0 | 37 | 0 | **79** | 0 | 0 | 0 | 0 | **0** | **79** |
| 16:00 to 17:00 | 38 | 0 | 33 | 0 | **71** | 0 | 0 | 0 | 0 | **0** | **71** |
| 16:15 to 17:15 | 37 | 0 | 32 | 0 | **69** | 0 | 0 | 0 | 0 | **0** | **69** |
| 16:30 to 17:30 | 46 | 0 | 34 | 0 | **80** | 0 | 0 | 0 | 0 | **0** | **80** |
| 16:45 to 17:45 | 48 | 0 | 35 | 0 | **83** | 0 | 0 | 0 | 0 | **0** | **83** |
| 17:00 to 18:00 | 55 | 0 | 35 | 0 | **90** | 0 | 0 | 0 | 0 | **0** | **90** |
| **9hrs Total** | **327** | **1** | **300** | **1** | **629** | **0** | **0** | **0** | **0** | **0** | **629** |

From **Table 9** it can be seen that between the hours of 9:00am – 10:00am the existing temple generated 52 vehicle trips and 90 trips in the road network PM peak of 5:00pm – 6:00pm.

As the proposed temple would not be open during the AM peak or during school hours, only the PM peak traffic generation would apply.

### *5.2.4 Overall Traffic Generation*

Having regard to the traffic generation estimates presented below, the following presents the estimated weekday AM and PM peak hour traffic generation of the proposed Sikh Grammar School, Rouse Hill.

**Table 10 - School / Road Network Peak Traffic Generation Estimates**

| Use | AM Peak Hour Traffic Generation (8:00am – 9:00am) | School PM Peak Hour Traffic Generation (3:00 – 4:00pm) | Road Network PM Peak Hour Traffic Generation (5:00pm – 6:00pm) |
|---|---|---|---|
| Early Learning Centre | 69 | 60 | 61* |
| Sikh Grammar School<br>- Self-Drive | 130 (one way) | 62 (one way)** | 62 (one way)*** |
| Sikh Grammar School<br>- Drop Off | 296 (two way) | 176 (two way) | 0 |
| Gurdwara and Langar Worship Centre | 0 | 0 | 90 |
| **Total** | **791** | **474** | **213** |

*RTA Guide 0.7 trips per child between 4:00pm – 6:00pm

** Assumes driving age students leave during school afternoon peak hours

*** Assumes staff leave during road network peak hours

As estimated in **Table 10** above, the development is estimated to generate 791 vehicle trips in the AM road network peak, 474 vehicle trips in the school afternoon peak and 213 vehicle trips in the PM road network peak.

However, having regard to the potential development of the site as residential housing, the net increase in traffic generation of the site would be 689 vehicle trips in the AM road network peak, 474 vehicle trips in the school afternoon peak and 106 vehicle trips in the PM road network peak.

## 5.3 Commentary on Potential Traffic Impacts

As presented in **Table 1** if this report, the ARUP traffic report for full development of the Riverstone East Precinct estimated the following 2036 AM and PM peak hour traffic flows for Tallawong Road and Guntawong Road

| | | | |
|---|---|---|---|
| Tallawong Road / Guntawong Road | Tallawong Road N | 343 | 451 |
| | Tallawong Road S | 453 | 179 |
| | Guntawong Road E | 604 | 874 |
| | Guntawong Road W | 665 | 329 |

Also as stated above, Tallawong Road following its upgrade would be designated as 'collector' road status and thus according to the RMS guidelines would include an environmental capacity of some 2,000 – 10,000 vehicles per day.

On a conservative basis that *all* traffic generated by the development used Tallawong Road evenly from the north and south (which not be the case as the school would be supported by a surrounding local road system) the future traffic flows on Tallawong Road North would increase to

**Table 11 – Tallawong Road N/S 2036 Traffic Flows + Sikh Grammar School Net Traffic Generation**

| Direction | ARUP 2036 Forecast AM Peak Flows | ARUP 2036 Forecast AM Peak Flows | ARUP 2036 Forecast AM Peak Flows + School | ARUP 2036 Forecast AM Peak Flows + School |
|---|---|---|---|---|
| Tallawong Road N | 343 | 451 | 688* | 504** |
| Tallawong Road S | 453 | 179 | 798* | 232** |

*50% of net school AM road network peak traffic generation

**50% of net school PM road network peak traffic generation

As a general rule, peak hour traffic flows typically equate to 8-12% of the daily flows or 10% as an average, the forecast peak hour traffic flows for Tallawong Road North and South would in turn be 6,880 and 7,980 vehicles per day respectively for the AM peak.

These forecasts with the additional traffic generated by the Sikh Grammar School would still be well below the environmental capacity of the future Tallawong Road.

Overall, the traffic impacts of the proposal are considered acceptable and would be accommodated within the delivery of the future road network of the Riverstone East Precinct as currently planned.

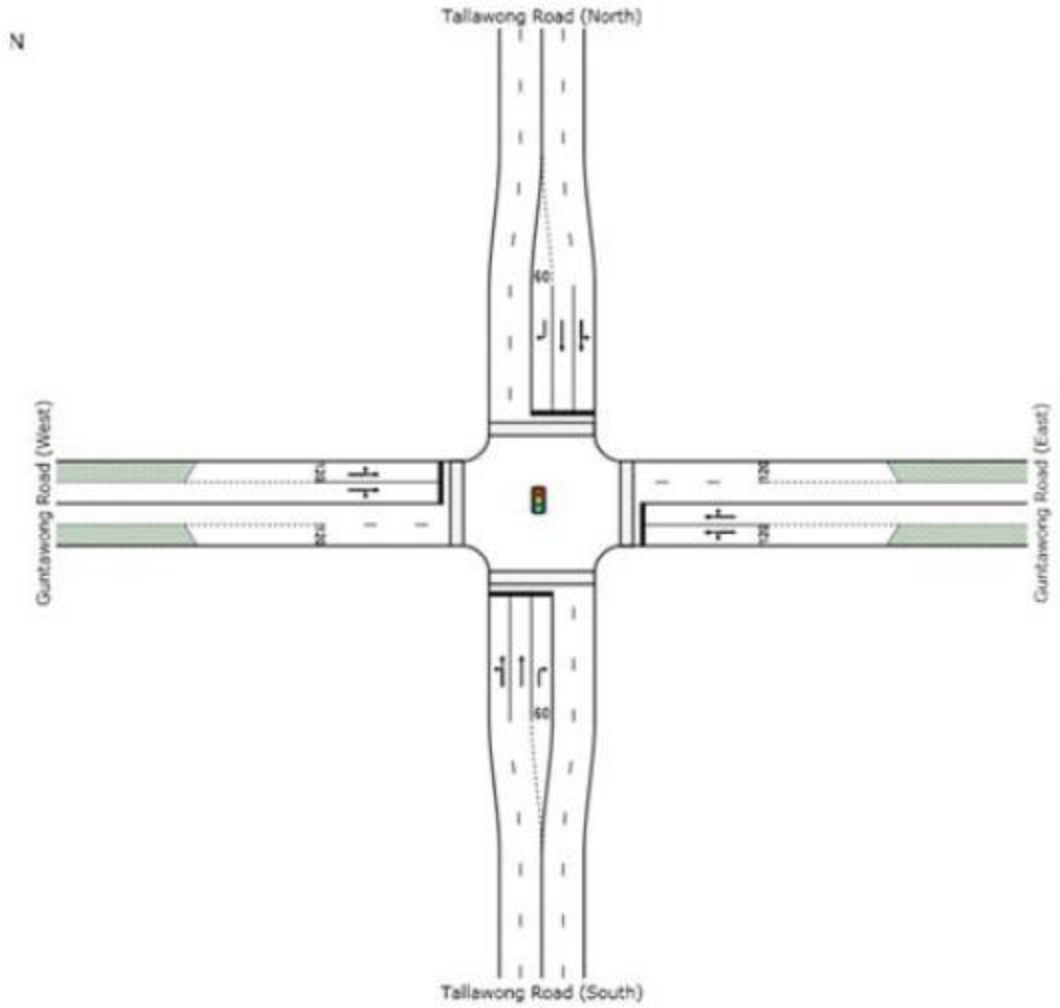
## 5.4 Future Intersection Modelling Assessment

As noted in the traffic report[3], the forecast traffic flows for the Riverstone East Precinct were based on an area wide modelling assessment using NETANAL. In addition, the distribution of all trips of all development within the Riverstone East Precinct is not publicly known.

On the matter of future performance of key intersections noted in the TfNSW letter dated 25 July 2017, the traffic report included a 2036 analysis of the intersection of Tallawong Road / Guntawong Road where traffic signals were recommended and the following intersection configuration:

[3] Riverstone East Precinct Transport Study – Post Exhibition Report – ARUP 3 November 2015

**Figure 12 – 2036 ARUP Report Recommended Tallawong Rd / Guntawong Rd Signalised Intersection Arrangement**




The traffic report found that in 2036, the intersection of Tallawong Road / Guntawong Road would operate at a Level of Service B in both the AM and PM peak periods. Overall, the 2036 operating conditions at this intersection would be such that it would include spare capacity.

### *5.4.1 School Access Road Intersection Modelling Assessment*

Whilst the assumptions and trip distributions of the NETANAL modelling for the Riverstone East Precinct are not known, the following presents an assessment of the future intersection operating conditions (2036) of the northern and southern boundary roads of the school with Tallwong Road.

As presented in Section **5.2.4** of this report, the net traffic generation of the school as a whole at full development would be an additional **689** vehicle trips in the AM road network peak and **106** vehicle trips two way in the PM road network peak. The forecast traffic flows during the afternoon school peak are not known for the Riverstone East Precinct.

However, as the afternoon school peak occurs outside the road network peak it is expected that there would be spare capacity in the network at this time.

For a conservative estimate of future intersection operating conditions of the northern and southern boundary roads with Tallawong Road, *all* school generated traffic is assumed to pass through these intersections.

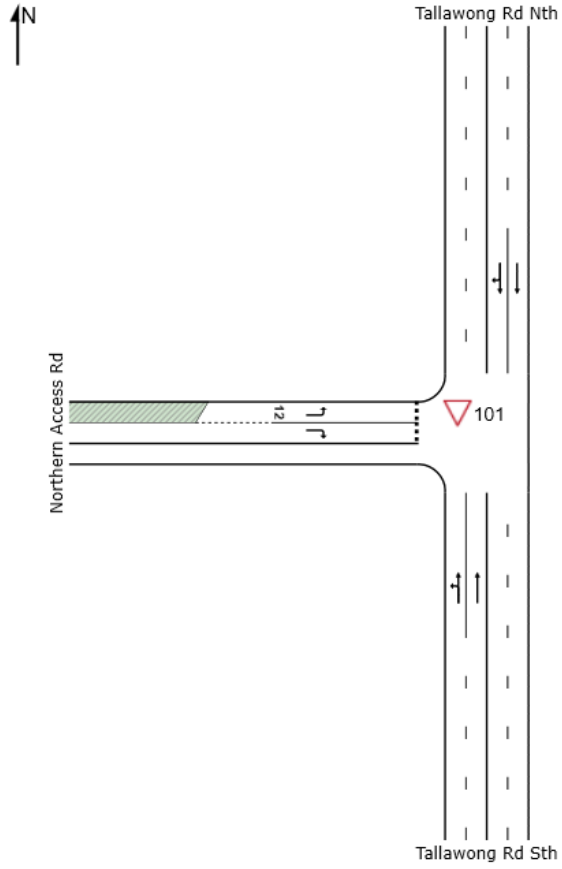
Whilst this would be unlikely to occur as the school would have other minor roads available for travel to and from the school (such as the western boundary road), this approach provides a conservative estimate of future conditions. It has been assumed that trips generated by the school would be 50/50 evenly split to the north and south of the school via Tallawong Road. This would equate to the following:

**Table 12 – Full School Development Net Traffic Increase by Direction**

| Location | Inbound AM Trips | Outbound Trips | Inbound PM Trips | Outbound PM Trips |
|---|---|---|---|---|
| Tallawong Rd - north of northern access road | 173 | 173 | 27 | 27 |
| Tallawong Road - south of southern access road | 173 | 173 | 27 | 27 |

Further, it has also been assumed a 50/50 split between left turn and right turn traffic at each intersection. The intersection modelling assumed the following intersection configuration for each:

**Figure 13 – Assumed Northern / Southern Bdy Road – Tallawong Rd Intersection Arrangement**



The intersections surveyed have been analysed using the Sidra Intersection analysis program. Sidra Intersection determines the average delay that vehicles encounter, the degree of saturation of the intersection, and the level of service. The degree of saturation is the ratio of the arrival rate of vehicles to the capacity of the approach. Sidra Intersection provides analysis of the operating conditions which can be compared to the performance criteria set out in **Table 13**.

**Table 13 – Level of Service Criteria**

| Level of Service | Average Delay per Vehicle (secs/veh) | Signals & Roundabouts | Give Way & Stop Signs |
|---|---|---|---|
| A | less than 14 | Good operation | Good operation |
| B | 15 to 28 | Good with acceptable delays & spare capacity | Acceptable delays & Spare capacity |
| C | 29 to 42 | Satisfactory | Satisfactory, but accident study required |
| D | 43 to 56 | Operating near capacity | Near capacity & accident study required |
| E | 57 to 70 | At capacity; at signals, incidents will cause excessive delays Roundabouts require other control mode | At capacity, requires other control mode |
| F | > 70 | Extra capacity required | Extreme delay, traffic signals or other major treatment required |

Adapted from RTA Guide to Traffic Generating Developments, 2002.

For roundabouts and priority intersections, the reported average delay is for the individual movement with the highest average delay per vehicle. At signalised intersections, the reported average delay is over all movements.

The future intersection operating conditions of each access road are presented in **Table 14**. Average delay is expressed in seconds per vehicle.

**Table 14 – Future Weekday AM / PM Intersection Operating Conditions**

| | | Morning Peak | | Evening Peak | |
|---|---|---|---|---|---|
| Intersection | Control | Av Delay | LOS | Av Delay | LOS |
| Tallawong Rd / Northern Access Rd | Priority | 22.0 | B | 12.1 | A |
| Tallawong Rd / Southern Access Rd | Priority | 22.0 | B | 12.1 | A |

Avg Delay (sec/veh) is over all movements at signals, and for worst movement at priority and roundabouts

Overall, as shown in **Table 14**, assuming a conservative demand that *all* generated school traffic would use either the northern or southern road intersections with Tallawong Road, both intersections would operate at a satisfactory level of service. The SIDRA outputs are provided in **Appendix D** of this report.

The traffic impacts of the school as a whole are considered satisfactory.

### 5.5 Future Public Transport

As summarised in Section 3.1.3 of this report, the Riverstone East Precinct will include upon full development an integrated public transport system which includes both the new North West Rail Link and regional / local bus services operating throughout the precinct and in the vicinity of the new school. Some buses currently operate close to existing schools such as the Rouse Hill Anglican College.

The design of the school with the proposed three (3) bay indented bus facility along the site frontage in Tallawong Road has been specifically undertaken to accommodate both school specific buses and regional / local bus services operating in Tallawong Road. The emphasis on an integrated facility at the school frontage heightens the availability of public transport operations for students. Further, it provides an attractive all weather facility for public transport uses and bus operators to operate to / from and via the school.

## 6. Parking, Access and Design Compliance Assessment

### 6.1 Early Learning Centre

For Child Care Centres, the Blacktown Council Growth Centres Precinct Development Control Plan (DCP) requires the following parking provision:

| | |
|---|---|
| **Car parking spaces** | 1 space per employee based on the following ratio of primary contact staff to children being provided, as stipulated in the Children's Services Regulation 2004:<br>a) 1:5 in respect of all children who are under the age of 2 years;<br>b) 1:8 in respect of all children who are 2 or more years of age but under 3 years of age; and<br>c) 1:10 in respect of all children who are 3 or more years of age but under 6 years of age<br>1 designated space for disabled parking/service vehicles located close to the main entrance<br>Possible dwelling component: min. 2 spaces - at least one space needs to be covered |
| **Visitor Car Parking** | 1 space per 6 children |

As the time of preparing this masterplan the breakdown of the ages of potential children attending the Early Learning Centre is not known. Based on an average employee parking rate of 1 space per 7.5 children, the 86-place centre would require 12 parking spaces for staff. Further, application of the DCP rate for visitors, the centre would require 15 spaces for visitors or a total of 27 on-site parking spaces.

As the centre has identified a **32** space off street car park, the proposed provision exceeds the minimum requirements of the DCP and is considered satisfactory.

Further, the proposed car parking includes an accessible parking space and service vehicle space for compliance with the DCP.

Overall, the parking provision and parking arrangements of the Early Learning Centre complies with the requirements of Council's DCP and is considered satisfactory.

### 6.2 Sikh Grammar School

As confirmed in the staging plans provided in **Appendix A** of this report, the proposed Sikh Grammar School would include as a capped maximum 680 primary school children and 580 high school children. The number of Senior School (Year 12) is not known but assuming an even proportion of students across Years 7-12, it is estimated the Year 12 student population would be 96 students.

For schools, the Blacktown Council Growth Centres Precinct DCP requires the following parking provision:

| | |
|---|---|
| Primary and Secondary Schools | 1 space per staff member<br>Plus<br>1 space per 100 students |
| Senior High School | 1 space per staff member<br>1 space per 5 students in Year 12 |

Therefore, the proposed Sikh Grammar School would require the following:

| | |
|---|---|
| Primary / Secondary School: | 102 staff spaces |
| | 13 student spaces |
| Senior High School | 0 staff spaces (accounted for above) |
| | 20 student spaces |
| **Total** | **135 parking spaces.** |

As the school at ultimate development would provide basement parking for **249** parking spaces plus 11 Kiss and Drop parking spaces, the proposed parking provision serving the school exceeds the minimum requirements of the DCP and is considered satisfactory.

### 6.3 Gurdwara and Langar Worship Building

As stated above, the Gurdwara and Langar Worship Centre would not be open to the public during school hours including morning and afternoon school peak periods. Whilst it is expected that a small number of staff may be in attendance at the centre, the parking assessment of the school uses presented above confirm spare capacity in the car park serving the school would be available.

For Places of Public Worship, the Blacktown Council Growth Centres Precinct DCP requires the following parking provision:

| | |
|---|---|
| Places of Public Worship | 1 space per 4 seats<br>Or<br>1 space per 10m² of seating area (whichever is greater) |

It should be noted that the Sikh Temple is not a seated venue with parishioners sitting on the ground in generally ordered fashion. The available space for the seating of parishioners is 954m$^2$. Thus, applying Council's parking rate of 1 space per 10m2 of seating area, the Gurdwara and Langar Worship Centre would require 96 parking spaces.

As the parking available to the Gurdwara and Langar Worship Centre would be 162 spaces, the proposed parking provision well exceeds the requirements of the DCP and is considered satisfactory.

### 6.4 Parking Provision Assessment of School by Stage

Further to the parking provision compliance review presented above in Sections 6.1 to 6.3, the following presents and overall summary by stage for the number of staff / students on site and associated parking provision which would be made available for each stage.

**Table 15 - Proposed School Parking Provision Compliance Assessment Summary by Stage**

| Stage | Primary Students | Secondary Students | Year 12 Numbers | Student Numbers | Staff Numbers | No. Parking Spaces Req. | No. Parking Spaces Provided | Complies |
|---|---|---|---|---|---|---|---|---|
| **1** | 112 | | | 112 | 8 | 9 | 83 | Y |
| **2** | 168 | | | 168 | 12 | 13 | 83 | Y |
| **3A** | 392 | | | 392 | 27 | 31 | 83 | Y |
| **4** | 448 | 224 | | 672 | 51 | 56 | 83 | Y |
| **5** | 532 | 420 | 56 | 952 | 92 | 84 | 123 | Y |
| **6** | 588 | 504 | 84 | 1092 | 85 | 108 | 173 | Y |
| **7** | 588 | 672 | 112 | 1260 | 102 | 131 | 249 | Y |

From **Table 15** it is noted that the parking provision available for school use by stage would exceed the DCP requirements for each and every stage of construction / expansion of the school.

### 6.5 Motorcycle Parking Provision

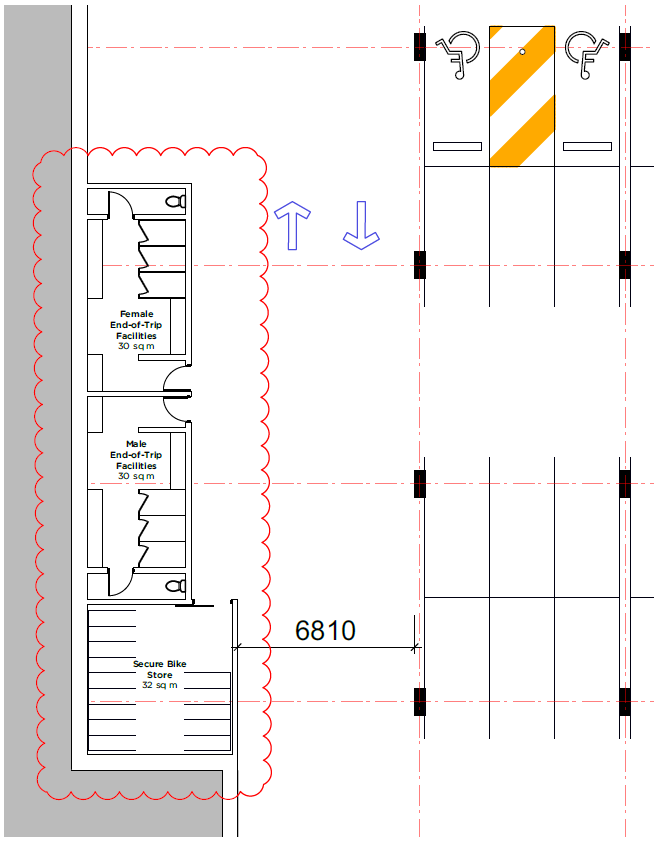
The Blacktown Growth Centres DCP does not require any motorcycle parking for an educational / place of worship development.

### 6.6 Bicycle Parking Provision

The Blacktown Growth Centres DCP does not require any bicycle parking for an educational / place of worship development.

However, the proposed basement car parking area would include both secure bicycle parking facilities (total of **15** lockers) and end of trip facilities for staff as shown below in **Figure 14**.

**Figure 14 – Proposed Secure Bicycle Parking / End of Trip Facilities for Staff**




Thus, the proposed bicycle parking would exceed the minimum requirements of the DCP.

## 6.7 Car Park Design

All elements of the proposed car parking areas design have been reviewed for compliance with AS2890.1 and were found to be satisfactory. All parking space widths, lengths, aisle widths and ramp grades comply with AS2890.1. Overall the car park design is considered satisfactory.

Overall the design of the basement parking area, access ramp complies with the relevant Australian Standards and is considered satisfactory.

## 6.8 Bus Parking Provision

As stated above, the proposal includes an indented bus bay which can accommodate three (3) full sized buses along the eastern boundary of the site within Tallawong Road.

The strategy behind the placement of the indented bus bay is to provide not only a bus facility which can accommodate school specific services, but one which can also accommodate local / regional route buses which would utilise Tallawong Road as identified in the ARUP Traffic Report.

The positioning of the indented bus bay in Tallawong Road also facilities the corralling of students within the school grounds on all weather services and provides access to building awnings during inclement weather.

The location of the indented bus bay negates the need for any bus to travel within adjacent residential streets to service the school and the worship centre.

With a provision for up to three (3) full sized buses, the proposed indented bus bay has the capacity for some 180 -195 students / staff per pick up (60-65 students per full size bus). Allowing for 10 minutes per loading of buses, the bus facility could accommodate nine (9) buses within a 30 minute period after school (540 – 585 students)

With an estimated 30-40% mode share to buses of the ultimate student population of 1,150 whom need to travel (accounting for the maximum of 1,260 students minus the 110 students boarding at the school), the proposed bus facility in Tallawong Road would more than cater for the bus demands of the school to bump out students within the maximum 30 minute period. This conservatively assumes both the primary school and secondary school bus demands would occur at the same time whereas the proposal includes staggered finishing times to spread demands during afternoon school peak periods.

Overall, the proposed bus arrangements for the school and worship centre are considered appropriate.

### 6.9 Green Travel Plan

Unlike school developments which are located within brown field sites or greenfield sites where public transport networks are established, this proposal is located within a developing precinct where only proposed corridors are known.

That is, contracted bus company, service frequencies, local / regional routes, and placement of bus stops are all unknown at this stage of planning for the precinct.

As discussed above, the proposed design of the development ensures maximum convenience for future route bus services by providing three (3) indented bus bays in Tallawong Road to cater for both school specific buses and general route buses without the need to travel within the local street network.

Further, it is in the best interests of future bus operators in the area to service the school.

Another factor of consideration is the uptake of surrounding residential development which can be influenced by market conditions and thus development of the surrounding road networks can be delayed which in turn impacts on potential bus operations.

As with the recent Inner West High School, it is recommended that as part of the condition of consent an ongoing Green Travel Plan is prepared once populating of the school commences.

Based on an approximate 10 year construction program, it is recommended the a Green Travel Plan be prepared prior to occupation of Stage 1 of the development and further updates to this plan be a requirement every two (2) years until full occupation of the school.

The above approach ensures capture of the most up to date public transport information and network knowledge for inclusion in the plan to maximise the plans benefit to both staff and students.

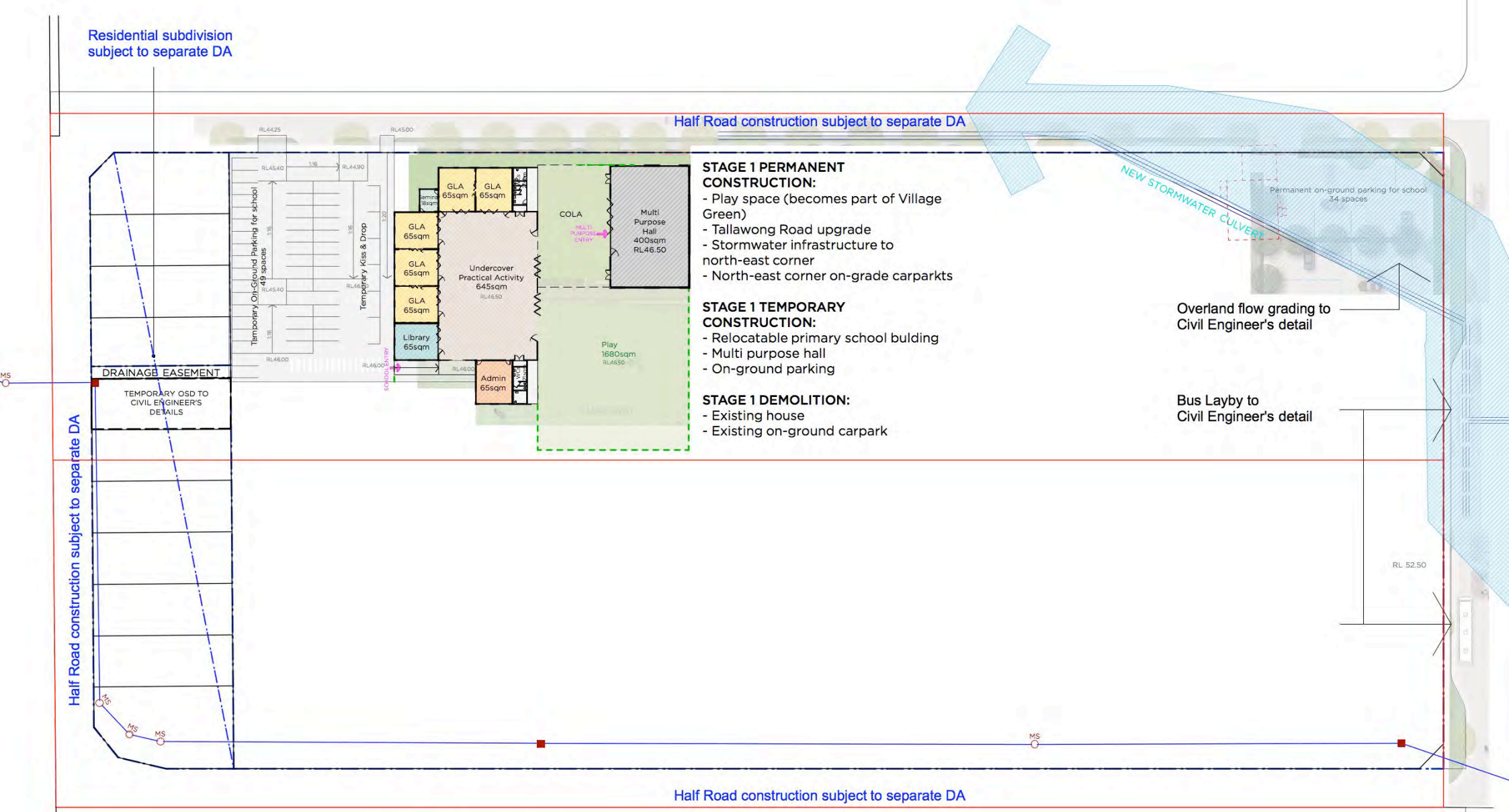
## 7. Conclusions

This report has reviewed the potential traffic impacts of the proposed Sikh Grammar School, Rouse Hill. The findings of this review are presented below:

1. Whilst the development would increase the net traffic generation of the site compared with a residential proposal, the proposed improvements to the road network within the Riverstone East Precinct would more than cater for the expected traffic demands of the school / place of worship.
2. The proposed northern and southern road access intersections would operate at a satisfactory level of service in 2036 at both full development of the Riverstone East Precinct and the School.
3. The development provides adequate parking provision for compliance with the DCP for all components of the development.
4. The development would also include sufficient parking for proposed uses by stage throughout the expansion of the site.
5. The restriction of the operation of the Gurdwara and Langar Worship Centre during school hours ensures adequate parking provision for school uses during their period of operation and adequate parking provision for the place of worship during the later evening periods when peak operation would occur.
6. The proposal facilities good access for buses whether school route specific or local / regional bus services through the provision of a three (3) bus indented bay in Tallawong Road.
7. The proposed parking provision for the Early Learning Centre exceeds the minimum requirements of the DCP and is considered satisfactory.
8. The design of the car parking areas and access arrangements complies with AS2890.1 and is considered satisfactory.
9. It is recommended as a condition of consent a Green Travel Plan report is prepared prior to occupation of Stage 1 of the proposed development and this report is updated every two (2) years by the collage until ultimate occupation of the college.

Overall the traffic impacts of the proposal are considered acceptable.

## 8. Appendix A – Proposed Development Detailed Staging Plans




## STAGE 1: PRIMARY SCHOOL

| | | | |
|---|---|---|---|
| Maximum students | 168 | GFA | 1085sqm |
| Outdoor space | 1680sqm | Roof area | 1140sqm |
| Total Parking spaces | 83 | Hardscape | 2000sqm |

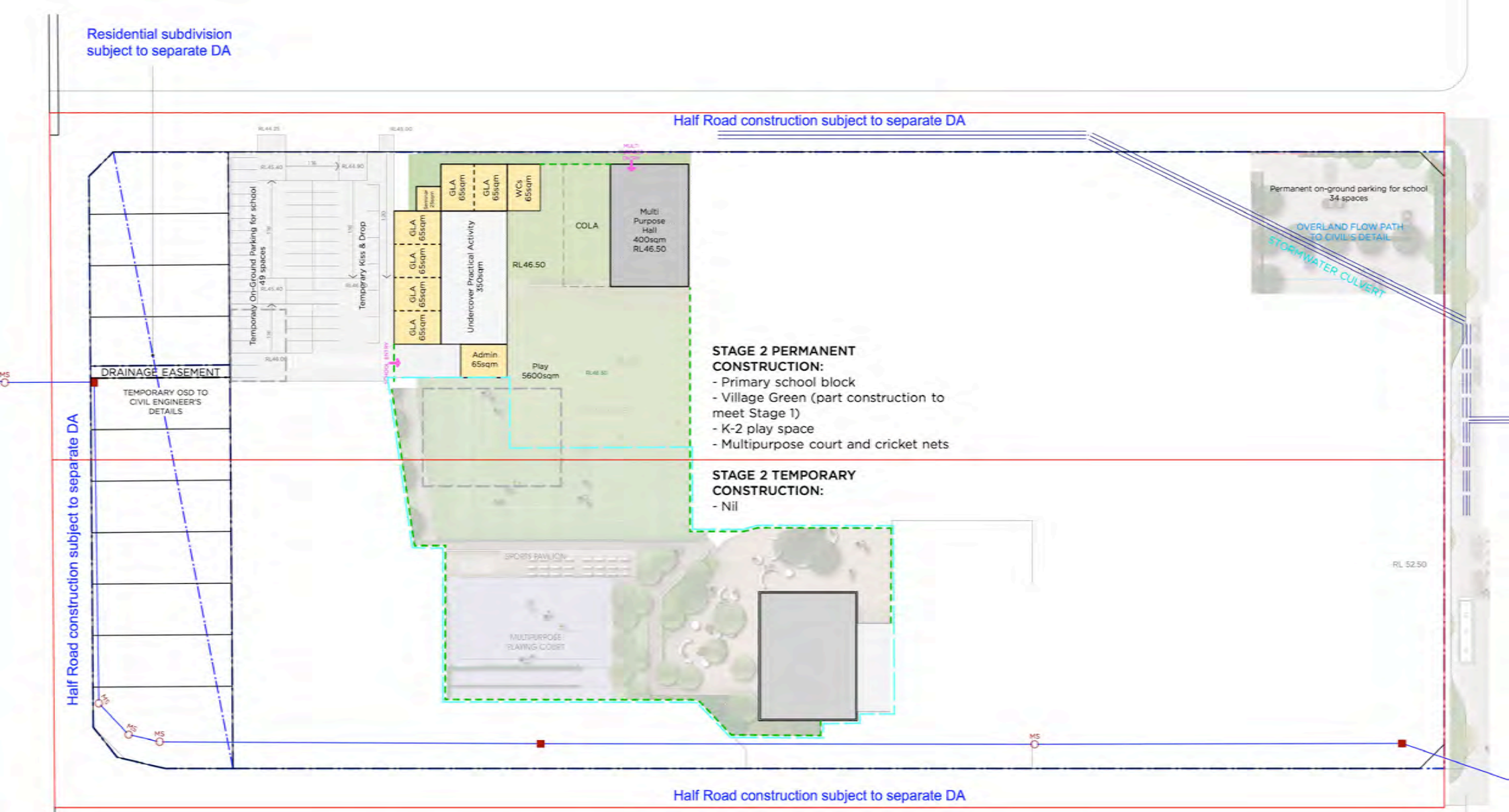
Existing boundary
New boundary
Extent of current Stage
Temporary school fence

PMDL ARCHITECTURE INTERIORS MASTERPLANNING

**Stage 1**

**Sikh Grammar School**


pmdl.com.au | Project 2757 | Scale 1:750@A3 | Date MAR 2019 | Dwg DA131




## STAGE 2: PRIMARY SCHOOL

| | | | |
|---|---|---|---|
| Maximum students | 420 | GFA | 2763sqm |
| Outdoor space | 4200sqm | Roof area | 1795sqm |
| Total Parking spaces | 83 | Hardscape | 4840sqm |

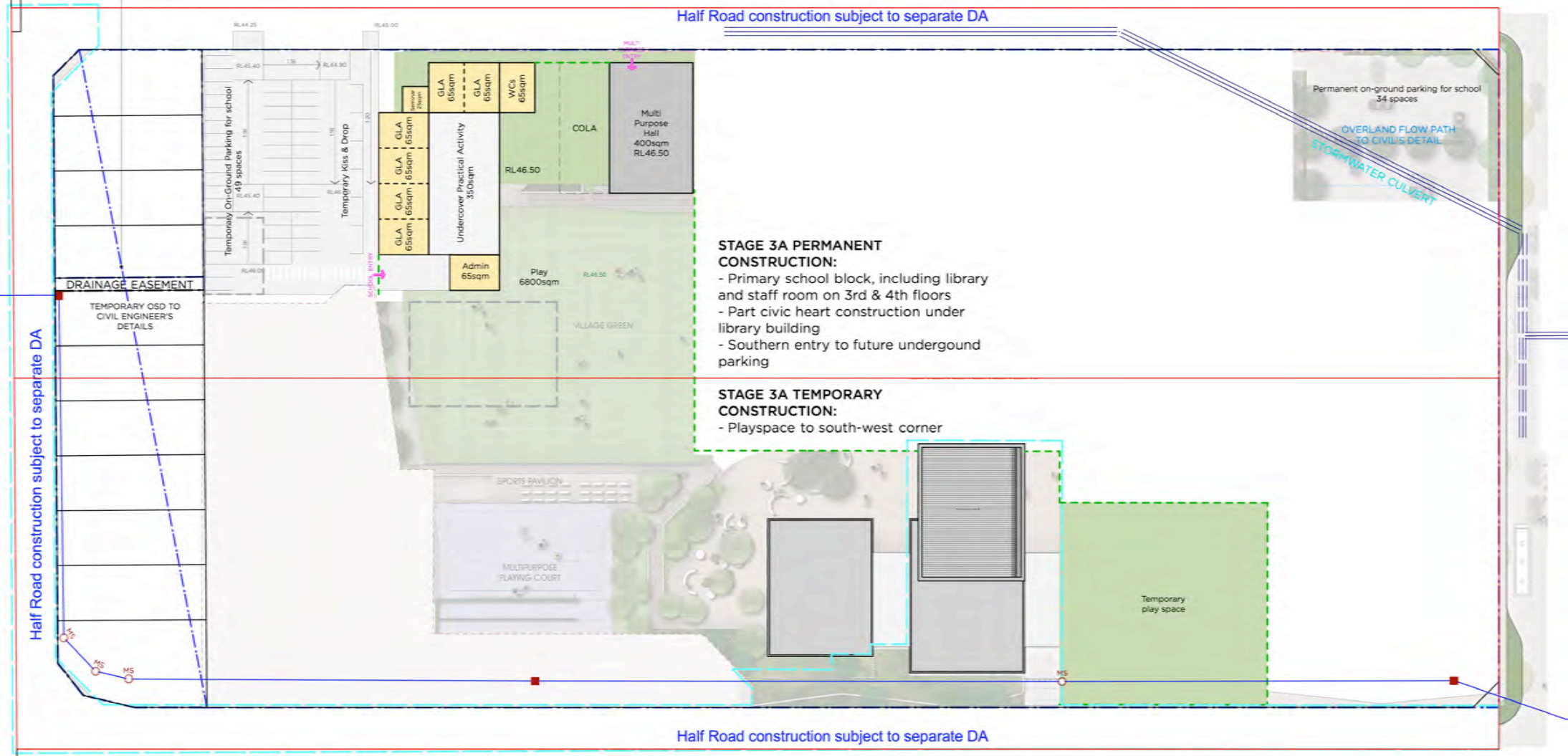
Existing boundary
New boundary
Extent of current Stage
Future contruction
Temporary school fence

**Stage 2**

PMDL ARCHITECTURE INTERIORS MASTERPLANNING

**Sikh Grammar School**

| © PMDL | Project | Scale | Date | Dwg |
|---|---|---|---|---|
| pmdl.com.au | 2757 | 1:750@A3 | MAR 2019 | DA132 |




## STAGE 3: PRIMARY SCHOOL

| | | | |
|---|---|---|---|
| Maximum students | 680 | GFA | 5668sqm |
| Outdoor space | 6800sqm | Roof area | 2860sqm |
| **Total Parking spaces** | **83** | Hardscape | 5410sqm |

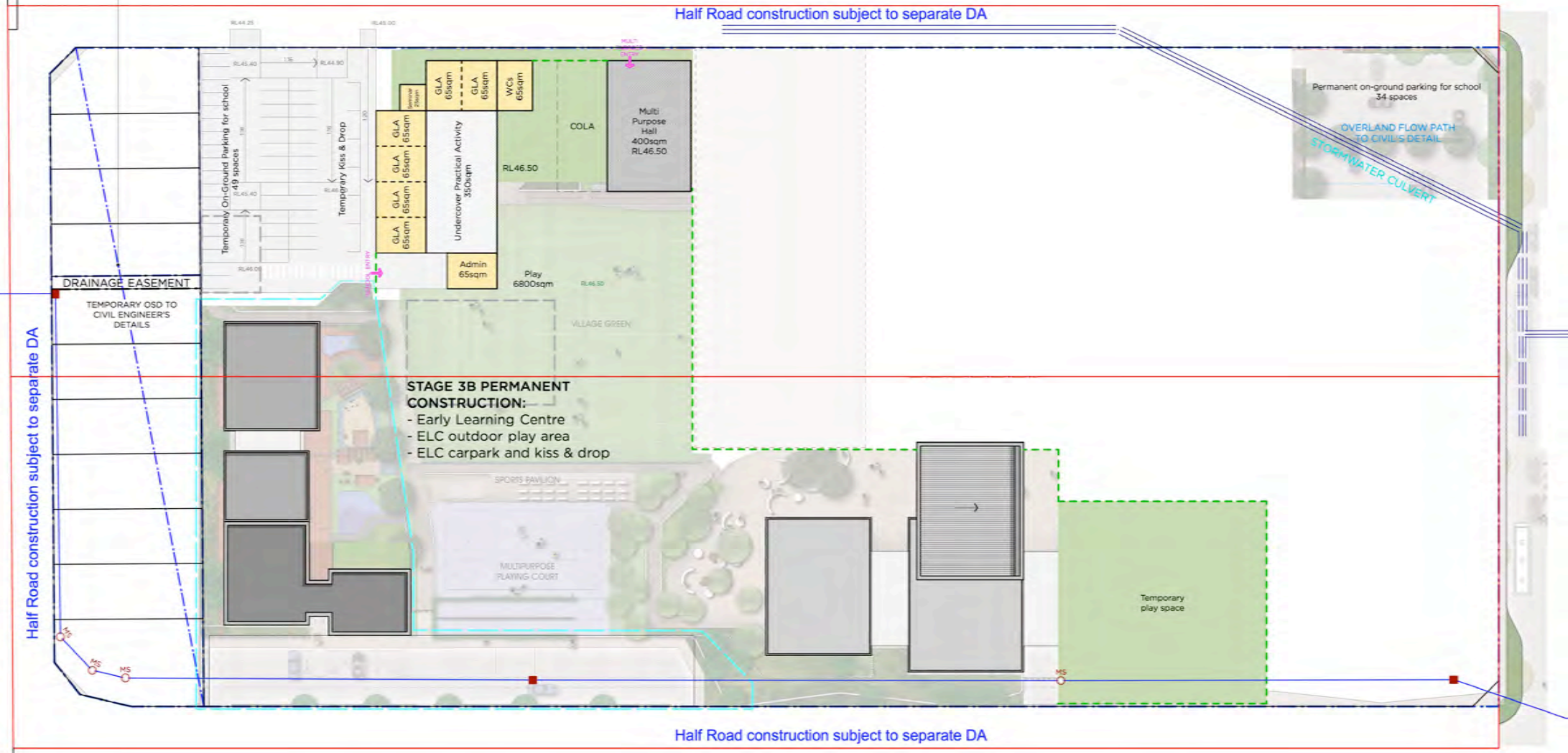
Existing boundary
New boundary
Extent of current Stage
Future contruction
Temporary school fence

PMDL ARCHITECTURE INTERIORS MASTERPLANNING

**Stage 3A**

Sikh Grammar School

| © PMDL | Project | Scale | Date | Dwg |
|---|---|---|---|---|
| pmdl.com.au | 2757 | 1:750@A3 | MAR 2019 | DA133 |




## STAGE 3B: EARLY LEARNING CENTRE

| | | | |
|---|---|---|---|
| Maximum students | 86 | GFA | 7403sqm |
| Outdoor space | 860sqm | Roof area | 3840sqm |
| Parking spaces | | Hardscape | 6670sqm |
| **Total Parking Spaces:** | **115** | | |

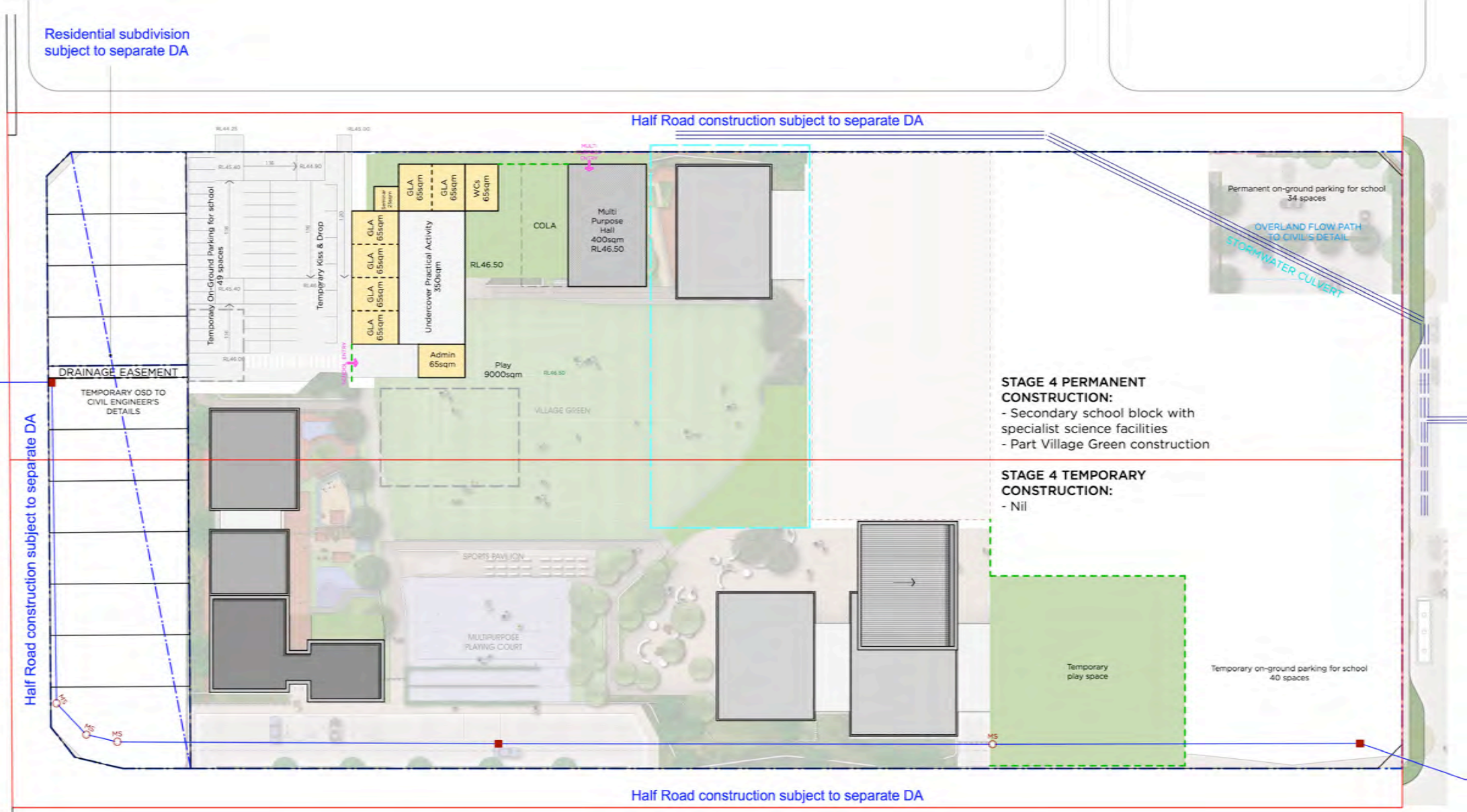
Existing boundary
New boundary
Extent of current Stage
Future contruction
Temporary school fence

**Stage 3B**

PMDL ARCHITECTURE INTERIORS MASTERPLANNING

**Sikh Grammar School**


pmdl.com.au | Project 2757 | Scale 1:750@A3 | Date MAR 2019 | Dwg DA134




## STAGE 4: SECONDARY SCHOOL

| | | | |
|---|---|---|---|
| Maximum students | 900 | GFA | 9123sqm |
| Outdoor space | 9000sqm | Roof area | 4495sqm |
| Total Parking spaces | 155 | Hardscape | 240sqm |

Existing boundary
New boundary
Extent of current Stage
Future contruction
Temporary school fence

**Stage 4**

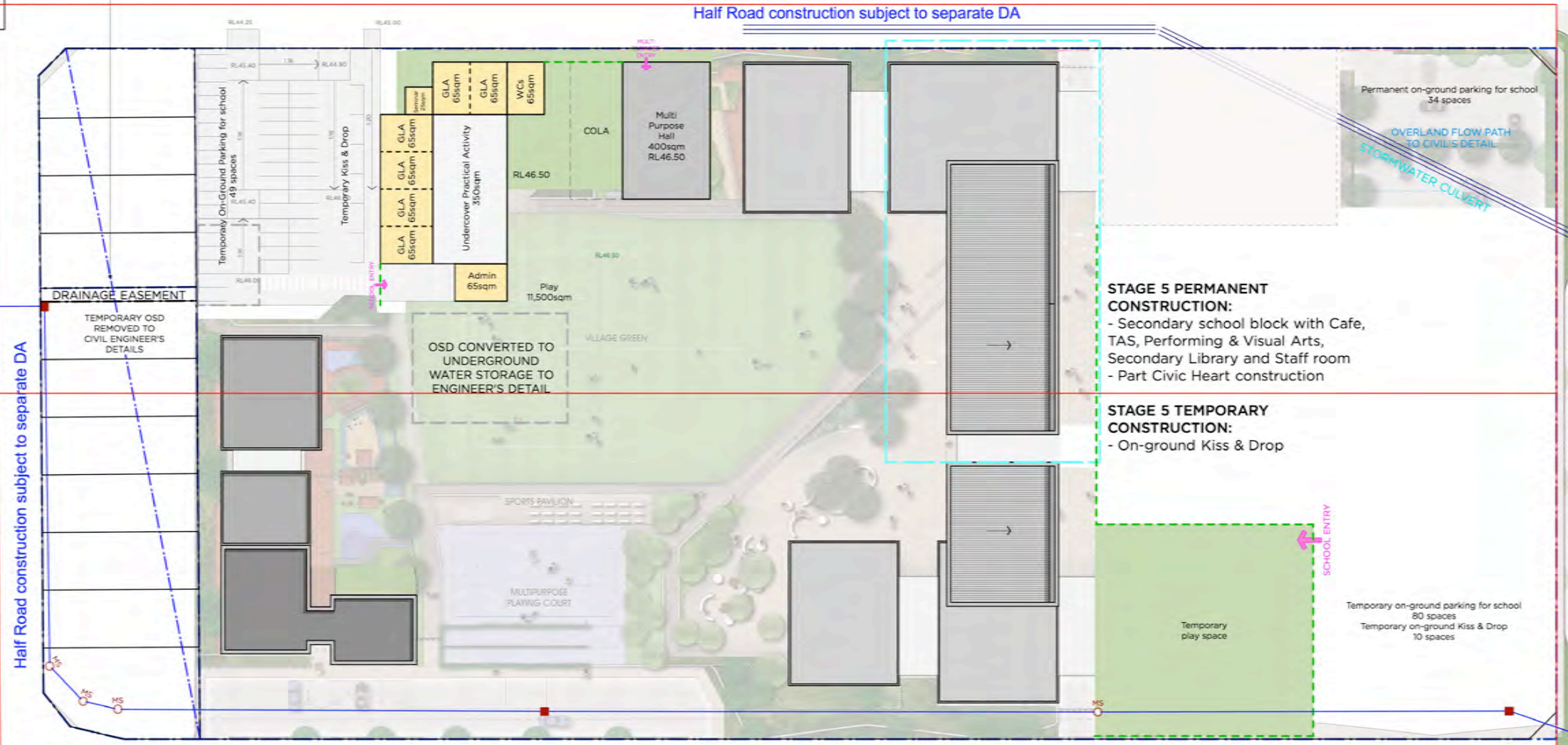
PMDL ARCHITECTURE INTERIORS MASTERPLANNING

**Sikh Grammar School**

| © PMDL | Project | Scale | Date | Dwg |
|---|---|---|---|---|
| pmdl.com.au | 2757 | 1:750@A3 | MAR 2019 | DA135 |

Residential subdivision
subject to separate DA

Half Road construction subject to separate DA




Half Road construction subject to separate DA

Half Road construction subject to separate DA

## STAGE 5: SECONDARY SCHOOL

| | | | |
|---|---|---|---|
| Maximum students | 1150 | GFA | 12,310sqm |
| Outdoor space | 11,500sqm | Roof area | 5625sqm |
| Total Parking spaces | 205 | Hardscape | 8950sqm |

Existing boundary
New boundary
Extent of current Stage
Future contruction
Temporary school fence

**Stage 5**

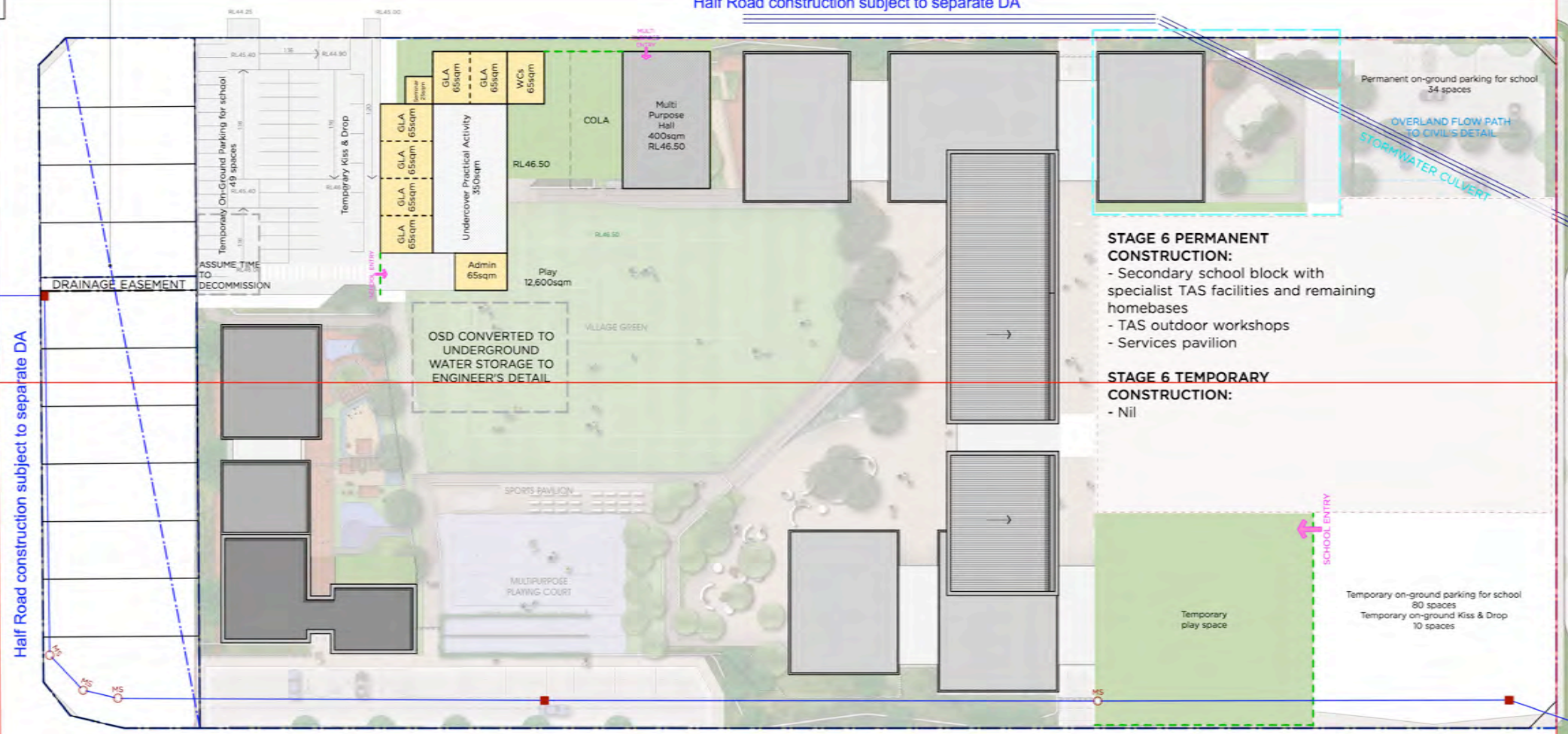
PMDL ARCHITECTURE INTERIORS MASTERPLANNING

**Sikh Grammar School**

 pmdl.com.au | Project 2757 | Scale 1:750@A3 | Date MAR 2019 | Dwg DA136

Residential subdivision
subject to separate DA

Half Road construction subject to separate DA




Half Road construction subject to separate DA

Half Road construction subject to separate DA

## STAGE 6: SECONDARY SCHOOL

| | | | |
|---|---|---|---|
| Maximum students | 1260 | GFA | 14,735sqm |
| Outdoor space | 12,600sqm | Roof area | 6170sqm |
| Parking spaces | 205 | Hardscape | 9510sqm |

Existing boundary
New boundary
Extent of current Stage
Future contruction
Temporary school fence

**Stage 6**

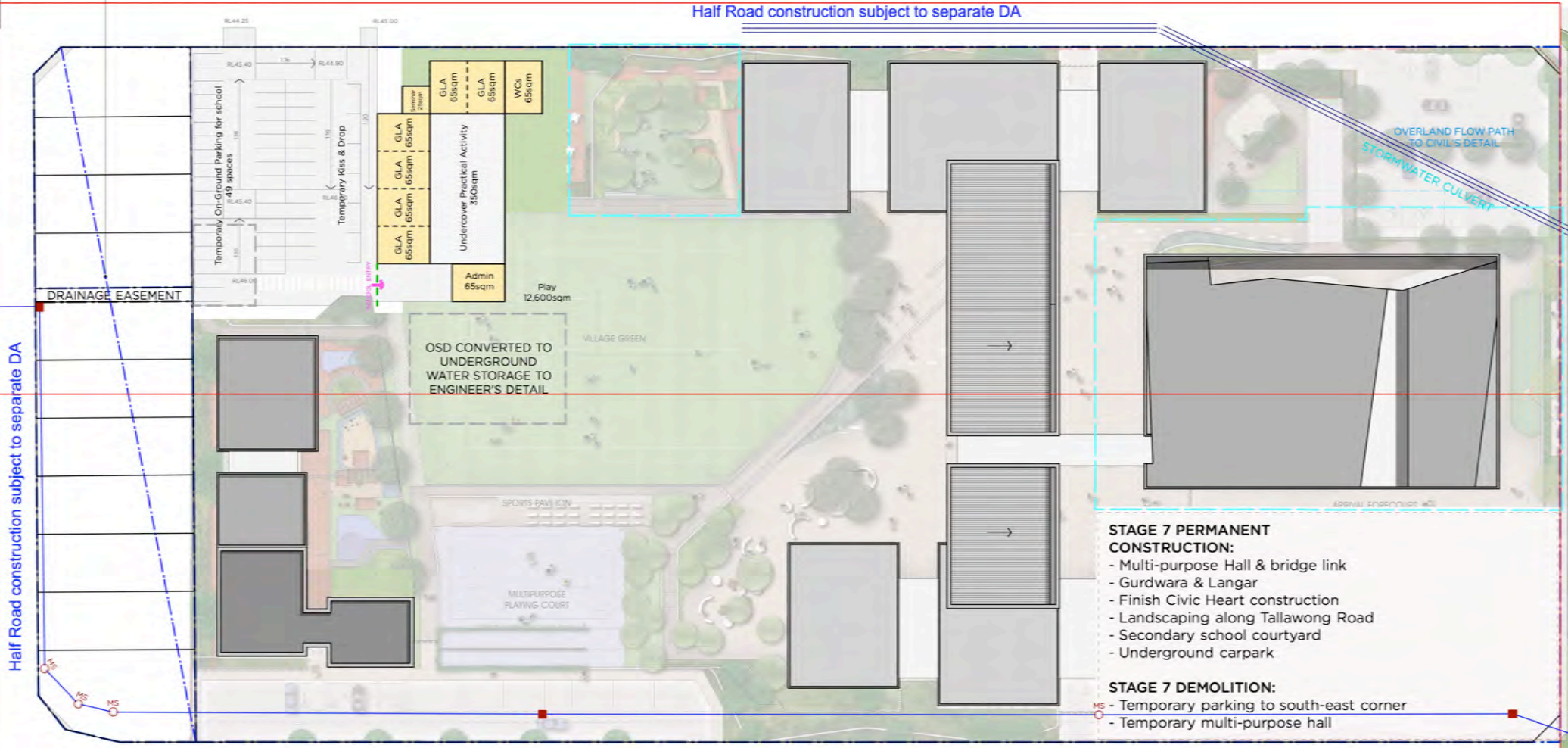
PMDL ARCHITECTURE INTERIORS MASTERPLANNING

**Sikh Grammar School**

| © PMDL | Project | Scale | Date | Dwg |
|---|---|---|---|---|
| pmdl.com.au | 2757 | 1:750@A3 | MAR 2019 | DA137 |

Residential subdivision
subject to separate DA

Half Road construction subject to separate DA




**STAGE 7 PERMANENT CONSTRUCTION:**
- Multi-purpose Hall & bridge link
- Gurdwara & Langar
- Finish Civic Heart construction
- Landscaping along Tallawong Road
- Secondary school courtyard
- Underground carpark

**STAGE 7 DEMOLITION:**
- Temporary parking to south-east corner
- Temporary multi-purpose hall

## STAGE 7: MULTI-PURPOSE HALL & GURDWARA

| | | | |
|---|---|---|---|
| Capacity | 700 | GFA | 19,840sqm |
| Total Parking spaces | 268 | Roof area | 8600sqm |
| | | Hardscape | 12,310sqm |

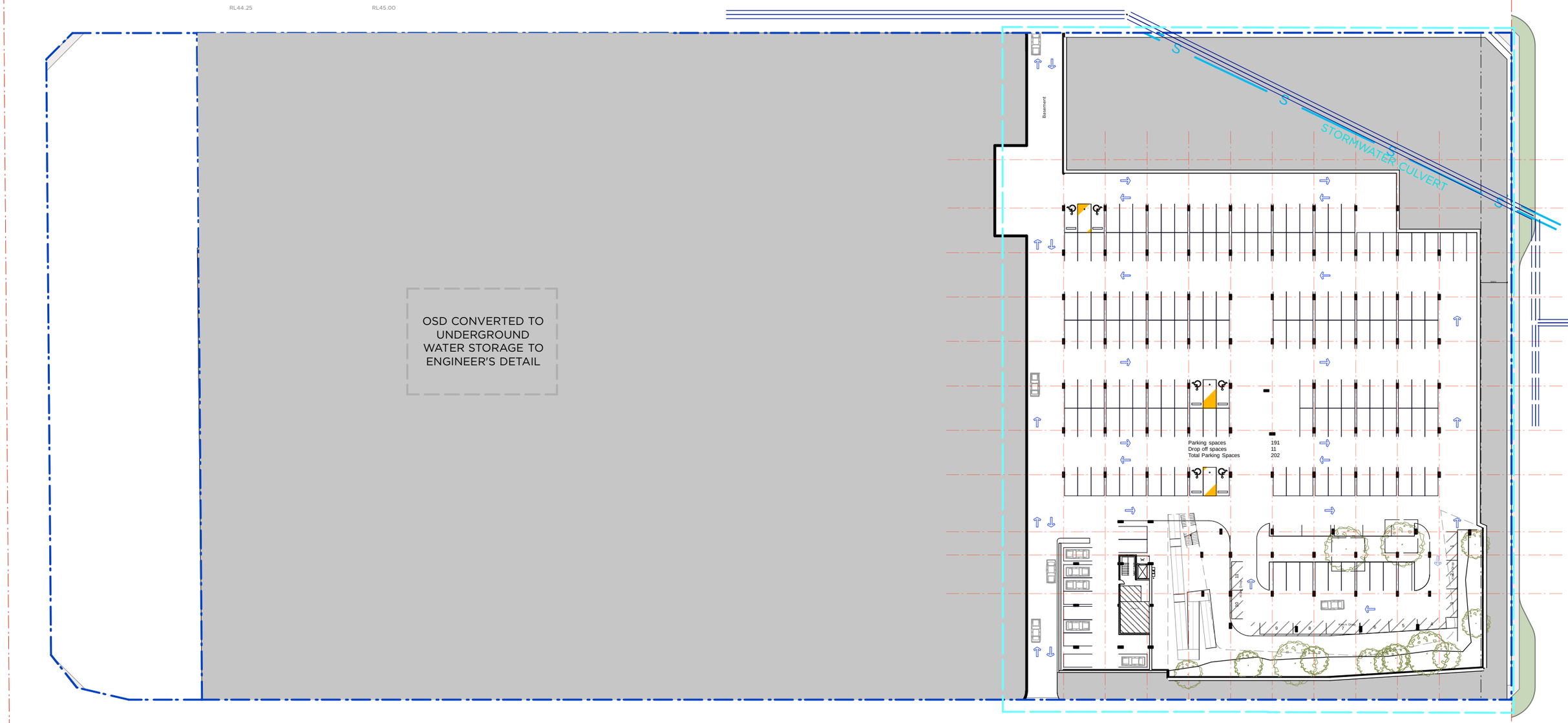
Existing boundary
New boundary
Extent of current Stage
Future contruction
Temporary school fence

PMDL ARCHITECTURE INTERIORS MASTERPLANNING

**Stage 7 And Basement**

Sikh Grammar School

| © PMDL | Project | Scale | Date | Dwg |
|---|---|---|---|---|
| pmdl.com.au | 2757 | 1:750@A3 | MAR 2019 | DA138 |




## STAGE 7: MULTI-PURPOSE HALL & GURDWARA

| | | | |
|---|---|---|---|
| Capacity | **700** | GFA | **19,840sqm** |
| Total Parking spaces | **317** | Roof area | **8600sqm** |
| | | Hardscape | **12,310sqm** |

0 10 20 30 40 50 M

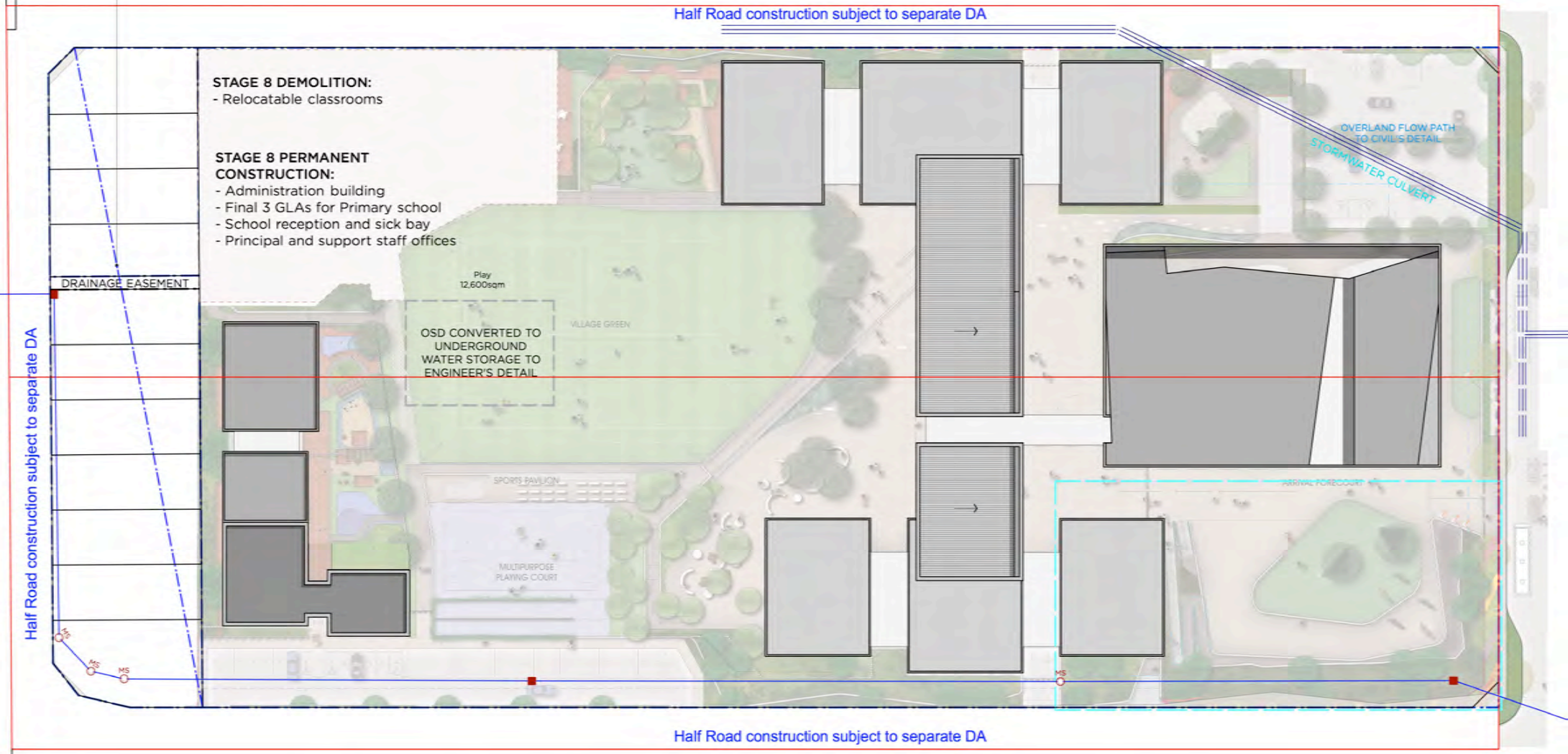
- Existing boundary
- New boundary
- Extent of current Stage
- Future contruction
- Temporary school fence

PMDL ARCHITECTURE INTERIORS MASTERPLANNING

# Stage 7 -Basement/Parking Plan

Sikh Grammar School


pmdl.com.au | Project 2757 | Scale 1:750@A3 | Date MAR 2019 | Dwg **DA139**




## STAGE 8: ADMINISTRATION BUILDING & FORECOURT

| | | | |
|---|---|---|---|
| Maximum students | 1260 | GFA | 21,125sqm |
| Outdoor space | 12,600sqm | Roof area | 9130sqm |
| Parking spaces | 317 | Hardscape | 14,710sqm |

Existing boundary
New boundary
Extent of current Stage
Future contruction
Temporary school fence

**Stage 8**

PMDL ARCHITECTURE INTERIORS MASTERPLANNING

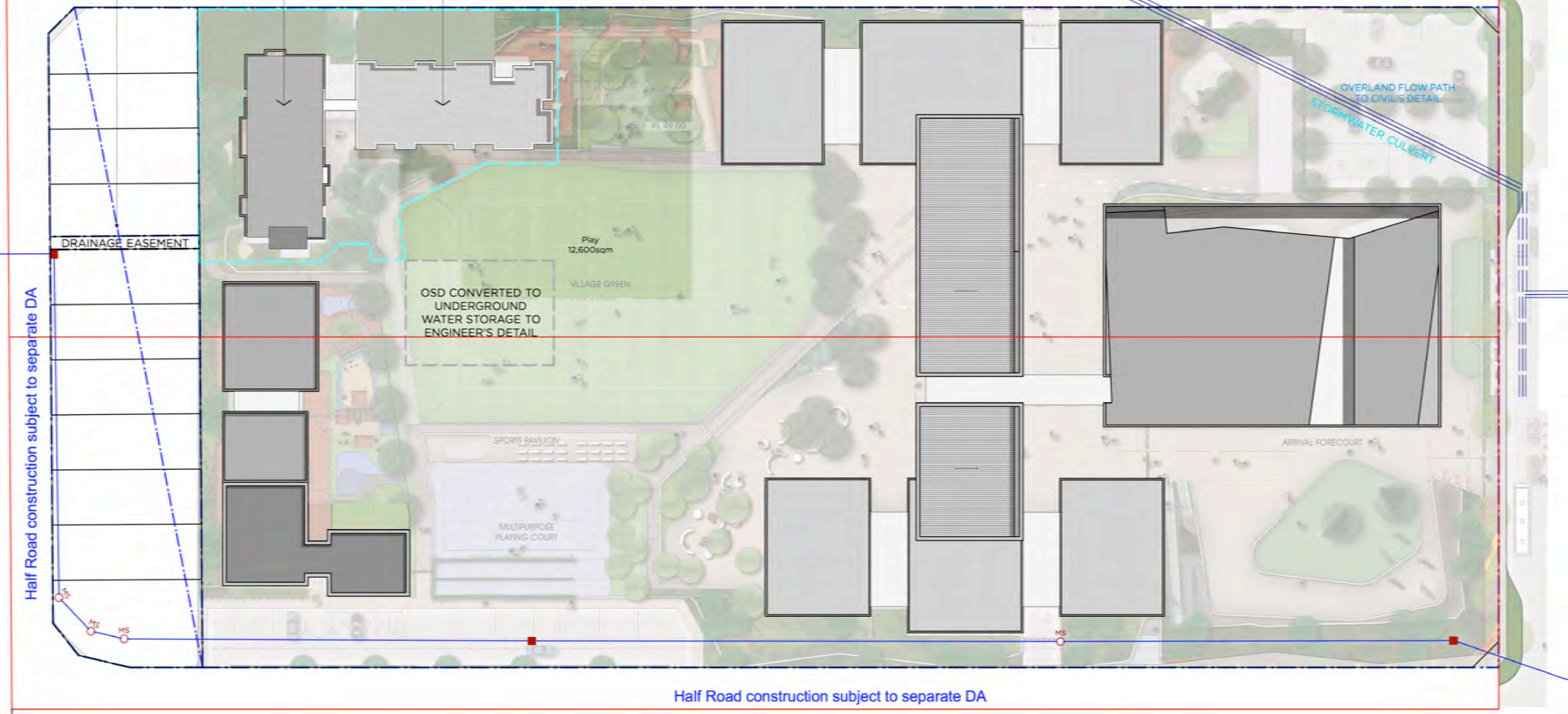
**Sikh Grammar School**

| © PMDL | Project | Scale | Date | Dwg |
|---|---|---|---|---|
| pmdl.com.au | 2757 | 1:750@A3 | MAR 2019 | DA140 |

Residential subdivision subject to separate DA

**STAGE 9 PERMANENT CONSTRUCTION:**
- Demolish temporary carpark
- Boarding house
- Staff apartments
- Undercroft parking for boarding house

Half Road construction subject to separate DA




Half Road construction subject to separate DA

## STAGE 9: STUDENT BOARDING HOUSE

| | | | |
|---|---|---|---|
| Maximum students | **110** | GFA | **1233sqm** |
| Staff apartments | 6 | Roof area | **1233sqm** |
| Outdoor space | 1052**sqm** | Hardscape | **682sqm** |
| Total Parking spaces | 281 | | |

Existing boundary
New boundary
Extent of current Stage
Future contruction
Temporary school fence

**Stage 9**

PMDL ARCHITECTURE INTERIORS MASTERPLANNING

**Sikh Grammar School**

| © PMDL | Project | Scale | Date | Dwg |
|---|---|---|---|---|
| pmdl.com.au | 2757 | 1:750@A3 | MAR 2019 | DA141 |

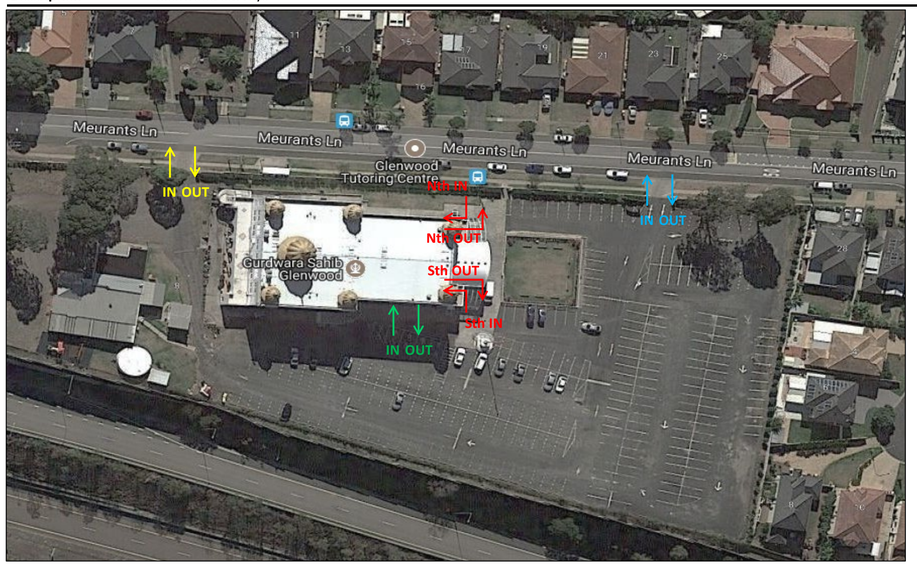
## 9. Appendix B – Mode of Travel Survey Form

# Mode of Travel Survey - KINDERGARTEN

| Student | How did you travel to school today? | | | | | | | | | | How will you travel home today? | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BOARDER | TRAIN | SELF DRIVE | CAR DROP OFF | MOTOR CYCLE | BUS | WALK | BICYCLE | FERRY | OTHER | BOARDER | TRAIN | SELF DRIVE | CAR DROP OFF | MOTOR CYCLE | BUS | WALK | BICYCLE | FERRY | OTHER |
| 1 | | | | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | | | | | | | | | |
| 35 | | | | | | | | | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | | | | | | | | | |
| 41 | | | | | | | | | | | | | | | | | | | | |
| 42 | | | | | | | | | | | | | | | | | | | | |
| 43 | | | | | | | | | | | | | | | | | | | | |
| 44 | | | | | | | | | | | | | | | | | | | | |
| 45 | | | | | | | | | | | | | | | | | | | | |
| 46 | | | | | | | | | | | | | | | | | | | | |
| 47 | | | | | | | | | | | | | | | | | | | | |
| 48 | | | | | | | | | | | | | | | | | | | | |
| 49 | | | | | | | | | | | | | | | | | | | | |
| 50 | | | | | | | | | | | | | | | | | | | | |

## 10. Appendix C – Sikh Temple Glenwood Traffic Surveys

| | |
|---|---|
| **Client** | Positive Traffic Pty Ltd |
| **Location** | Glenwood |
| **Date** | Fri, 27th & Sat, 28th July 2018 |
| **Survey Time** | Fri, 9am-6pm(9hrs) / Sat, 2pm-8pm(6hrs) |
| **Description** | Glenwood Surveys |




N

**[Location]**

- SITE1 - Access from North and South Steps at Front
- SITE2 - Side Entrance in / out
- SITE3 - East Access
- SITE4 - West Access

| | |
|---|---|
| **Client** | Positive Traffic Pty Ltd |
| **Location** | Glenwood |
| **Date** | Fri, 27th July 2018 |
| **Survey Time** | 9am-6pm(9hrs) |
| **Description** | Glenwood Surveys |

**[15mins interval]**

| Approach | | | SITE1 - Access from North and South Steps at Front | | | | Total | SITE2 - Side Entrance in / out | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Period | | | North IN | North Out | South IN | South Out | | IN | OUT | |
| 9:00 | to | 9:15 | 10 | 4 | 5 | 4 | **23** | 3 | 0 | **3** |
| 9:15 | to | 9:30 | 8 | 7 | 7 | 3 | **25** | 2 | 3 | **5** |
| 9:30 | to | 9:45 | 3 | 2 | 8 | 2 | **15** | 7 | 0 | **7** |
| 9:45 | to | 10:00 | 4 | 2 | 17 | 12 | **35** | 3 | 5 | **8** |
| 10:00 | to | 10:15 | 5 | 3 | 16 | 6 | **30** | 1 | 1 | **2** |
| 10:15 | to | 10:30 | 22 | 6 | 13 | 5 | **46** | 0 | 0 | **0** |
| 10:30 | to | 10:45 | 20 | 14 | 8 | 7 | **49** | 0 | 0 | **0** |
| 10:45 | to | 11:00 | 3 | 10 | 40 | 22 | **75** | 0 | 2 | **2** |
| 11:00 | to | 11:15 | 12 | 5 | 21 | 10 | **48** | 0 | 0 | **0** |
| 11:15 | to | 11:30 | 11 | 2 | 13 | 6 | **32** | 0 | 0 | **0** |
| 11:30 | to | 11:45 | 5 | 10 | 5 | 3 | **23** | 4 | 1 | **5** |
| 11:45 | to | 12:00 | 5 | 10 | 11 | 5 | **31** | 1 | 0 | **1** |
| 12:00 | to | 12:15 | 6 | 3 | 8 | 10 | **27** | 4 | 0 | **4** |
| 12:15 | to | 12:30 | 14 | 11 | 4 | 11 | **40** | 3 | 0 | **3** |
| 12:30 | to | 12:45 | 4 | 1 | 9 | 5 | **19** | 1 | 8 | **9** |
| 12:45 | to | 13:00 | 8 | 9 | 22 | 20 | **59** | 3 | 2 | **5** |
| 13:00 | to | 13:15 | 7 | 7 | 21 | 12 | **47** | 2 | 2 | **4** |
| 13:15 | to | 13:30 | 7 | 4 | 7 | 21 | **39** | 3 | 2 | **5** |
| 13:30 | to | 13:45 | 3 | 8 | 15 | 35 | **61** | 1 | 1 | **2** |
| 13:45 | to | 14:00 | 7 | 6 | 5 | 17 | **35** | 0 | 0 | **0** |
| 14:00 | to | 14:15 | 9 | 2 | 8 | 7 | **26** | 0 | 0 | **0** |
| 14:15 | to | 14:30 | 3 | 4 | 21 | 9 | **37** | 4 | 7 | **11** |
| 14:30 | to | 14:45 | 18 | 12 | 5 | 17 | **52** | 0 | 1 | **1** |
| 14:45 | to | 15:00 | 11 | 15 | 15 | 10 | **51** | 0 | 2 | **2** |
| 15:00 | to | 15:15 | 4 | 6 | 11 | 6 | **27** | 2 | 3 | **5** |
| 15:15 | to | 15:30 | 4 | 6 | 3 | 10 | **23** | 1 | 1 | **2** |
| 15:30 | to | 15:45 | 8 | 2 | 3 | 11 | **24** | 3 | 0 | **3** |
| 15:45 | to | 16:00 | 14 | 5 | 14 | 14 | **47** | 4 | 1 | **5** |
| 16:00 | to | 16:15 | 8 | 5 | 9 | 7 | **29** | 0 | 2 | **2** |
| 16:15 | to | 16:30 | 5 | 0 | 6 | 4 | **15** | 0 | 0 | **0** |
| 16:30 | to | 16:45 | 5 | 12 | 20 | 8 | **45** | 6 | 0 | **6** |
| 16:45 | to | 17:00 | 8 | 2 | 14 | 10 | **34** | 1 | 4 | **5** |
| 17:00 | to | 17:15 | 11 | 4 | 15 | 12 | **42** | 1 | 5 | **6** |
| 17:15 | to | 17:30 | 19 | 12 | 14 | 6 | **51** | 3 | 0 | **3** |
| 17:30 | to | 17:45 | 25 | 6 | 18 | 18 | **67** | 7 | 4 | **11** |
| 17:45 | to | 18:00 | 17 | 11 | 29 | 14 | **71** | 1 | 1 | **2** |
| **9hrs Total** | | | **333** | **228** | **460** | **379** | **1,400** | **71** | **58** | **129** |

AM
PM

[Hourly Summary]

| Approach | | | SITE1 - Access from North and South Steps at Front | | | | Total | SITE2 - Side Entrance in / out | | Total | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Time Period | | | North IN | North Out | South IN | South Out | | IN | OUT | | |
| 9:00 | to | 10:00 | 25 | 15 | 37 | 21 | **98** | 15 | 8 | **23** | **121** |
| 9:15 | to | 10:15 | 20 | 14 | 48 | 23 | **105** | 13 | 9 | **22** | **127** |
| 9:30 | to | 10:30 | 34 | 13 | 54 | 25 | **126** | 11 | 6 | **17** | **143** |
| 9:45 | to | 10:45 | 51 | 25 | 54 | 30 | **160** | 4 | 6 | **10** | **170** |
| 10:00 | to | 11:00 | 50 | 33 | 77 | 40 | **200** | 1 | 3 | **4** | **204** |
| 10:15 | to | 11:15 | 57 | 35 | 82 | 44 | **218** | 0 | 2 | **2** | **220** |
| 10:30 | to | 11:30 | 46 | 31 | 82 | 45 | **204** | 0 | 2 | **2** | **206** |
| 10:45 | to | 11:45 | 31 | 27 | 79 | 41 | **178** | 4 | 3 | **7** | **185** |
| 11:00 | to | 12:00 | 33 | 27 | 50 | 24 | **134** | 5 | 1 | **6** | **140** |
| 11:15 | to | 12:15 | 27 | 25 | 37 | 24 | **113** | 9 | 1 | **10** | **123** |
| 11:30 | to | 12:30 | 30 | 34 | 28 | 29 | **121** | 12 | 1 | **13** | **134** |
| 11:45 | to | 12:45 | 29 | 25 | 32 | 31 | **117** | 9 | 8 | **17** | **134** |
| 12:00 | to | 13:00 | 32 | 24 | 43 | 46 | **145** | 11 | 10 | **21** | **166** |
| 12:15 | to | 13:15 | 33 | 28 | 56 | 48 | **165** | 9 | 12 | **21** | **186** |
| 12:30 | to | 13:30 | 26 | 21 | 59 | 58 | **164** | 9 | 14 | **23** | **187** |
| 12:45 | to | 13:45 | 25 | 28 | 65 | 88 | **206** | 9 | 7 | **16** | **222** |
| 13:00 | to | 14:00 | 24 | 25 | 48 | 85 | **182** | 6 | 5 | **11** | **193** |
| 13:15 | to | 14:15 | 26 | 20 | 35 | 80 | **161** | 4 | 3 | **7** | **168** |
| 13:30 | to | 14:30 | 22 | 20 | 49 | 68 | **159** | 5 | 8 | **13** | **172** |
| 13:45 | to | 14:45 | 37 | 24 | 39 | 50 | **150** | 4 | 8 | **12** | **162** |
| 14:00 | to | 15:00 | 41 | 33 | 49 | 43 | **166** | 4 | 10 | **14** | **180** |
| 14:15 | to | 15:15 | 36 | 37 | 52 | 42 | **167** | 6 | 13 | **19** | **186** |
| 14:30 | to | 15:30 | 37 | 39 | 34 | 43 | **153** | 3 | 7 | **10** | **163** |
| 14:45 | to | 15:45 | 27 | 29 | 32 | 37 | **125** | 6 | 6 | **12** | **137** |
| 15:00 | to | 16:00 | 30 | 19 | 31 | 41 | **121** | 10 | 5 | **15** | **136** |
| 15:15 | to | 16:15 | 34 | 18 | 29 | 42 | **123** | 8 | 4 | **12** | **135** |
| 15:30 | to | 16:30 | 35 | 12 | 32 | 36 | **115** | 7 | 3 | **10** | **125** |
| 15:45 | to | 16:45 | 32 | 22 | 49 | 33 | **136** | 10 | 3 | **13** | **149** |
| 16:00 | to | 17:00 | 26 | 19 | 49 | 29 | **123** | 7 | 6 | **13** | **136** |
| 16:15 | to | 17:15 | 29 | 18 | 55 | 34 | **136** | 8 | 9 | **17** | **153** |
| 16:30 | to | 17:30 | 43 | 30 | 63 | 36 | **172** | 11 | 9 | **20** | **192** |
| 16:45 | to | 17:45 | 63 | 24 | 61 | 46 | **194** | 12 | 13 | **25** | **219** |
| 17:00 | to | 18:00 | 72 | 33 | 76 | 50 | **231** | 12 | 10 | **22** | **253** |
| **9hrs Total** | | | **333** | **228** | **460** | **379** | **1,400** | **71** | **58** | **129** | **1,529** |

[Peak Hr Summary]

| Approach | | | SITE1 - Access from North and South Steps at Front | | | | Total | SITE2 - Side Entrance in / out | | Total | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Time Period | | | North IN | North Out | South IN | South Out | | IN | OUT | | |
| 10:15 | to | 11:15 | 57 | 35 | 82 | 44 | **218** | 0 | 2 | **2** | **220** |
| 17:00 | to | 18:00 | 72 | 33 | 76 | 50 | **231** | 12 | 10 | **22** | **253** |

| | |
|---|---|
| **Client** | Positive Traffic Pty Ltd |
| **Location** | Glenwood |
| **Date** | Sat, 28th July 2018 |
| **Survey Time** | 2pm-8pm(6hrs) |
| **Description** | Glenwood Surveys |

**[15mins interval]**

| Approach | | | SITE1 - Access from North and South Steps at Front | | | | Total | SITE2 - Side Entrance in / out | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Period | | | North IN | North Out | South IN | South Out | | IN | OUT | |
| 14:00 | to | 14:15 | 9 | 24 | 17 | 17 | **67** | 3 | 5 | **8** |
| 14:15 | to | 14:30 | 34 | 23 | 27 | 32 | **116** | 0 | 3 | **3** |
| 14:30 | to | 14:45 | 27 | 12 | 28 | 27 | **94** | 0 | 3 | **3** |
| 14:45 | to | 15:00 | 25 | 13 | 31 | 37 | **106** | 6 | 0 | **6** |
| 15:00 | to | 15:15 | 23 | 17 | 34 | 23 | **97** | 1 | 2 | **3** |
| 15:15 | to | 15:30 | 29 | 22 | 18 | 28 | **97** | 1 | 5 | **6** |
| 15:30 | to | 15:45 | 28 | 17 | 26 | 19 | **90** | 0 | 2 | **2** |
| 15:45 | to | 16:00 | 17 | 13 | 31 | 31 | **92** | 5 | 6 | **11** |
| 16:00 | to | 16:15 | 7 | 12 | 27 | 26 | **72** | 1 | 1 | **2** |
| 16:15 | to | 16:30 | 14 | 6 | 32 | 12 | **64** | 2 | 3 | **5** |
| 16:30 | to | 16:45 | 5 | 9 | 32 | 16 | **62** | 1 | 7 | **8** |
| 16:45 | to | 17:00 | 24 | 14 | 21 | 41 | **100** | 9 | 2 | **11** |
| 17:00 | to | 17:15 | 39 | 10 | 35 | 30 | **114** | 10 | 0 | **10** |
| 17:15 | to | 17:30 | 33 | 25 | 37 | 25 | **120** | 3 | 0 | **3** |
| 17:30 | to | 17:45 | 37 | 16 | 75 | 26 | **154** | 3 | 1 | **4** |
| 17:45 | to | 18:00 | 71 | 25 | 87 | 40 | **223** | 27 | 6 | **33** |
| 18:00 | to | 18:15 | 81 | 21 | 70 | 74 | **246** | 7 | 7 | **14** |
| 18:15 | to | 18:30 | 25 | 36 | 78 | 53 | **192** | 8 | 7 | **15** |
| 18:30 | to | 18:45 | 97 | 41 | 165 | 54 | **357** | 10 | 4 | **14** |
| 18:45 | to | 19:00 | 63 | 24 | 140 | 40 | **267** | 3 | 4 | **7** |
| 19:00 | to | 19:15 | 34 | 33 | 152 | 114 | **333** | 17 | 20 | **37** |
| 19:15 | to | 19:30 | 42 | 25 | 132 | 80 | **279** | 6 | 8 | **14** |
| 19:30 | to | 19:45 | 53 | 42 | 141 | 91 | **327** | 2 | 7 | **9** |
| 19:45 | to | 20:00 | 79 | 51 | 163 | 70 | **363** | 7 | 14 | **21** |
| **6hrs Total** | | | **896** | **531** | **1,599** | **1,006** | **4,032** | **132** | **117** | **249** |

MATRIX
Traffic and Transport Data

[Hourly Summary]

| Approach | SITE1 - Access from North and South Steps at Front | | | | Total | SITE2 - Side Entrance in / out | | Total | Grand Total |
|---|---|---|---|---|---|---|---|---|---|
| Time Period | North IN | North Out | South IN | South Out | | IN | OUT | | |
| 14:00 to 15:00 | 95 | 72 | 103 | 113 | **383** | 9 | 11 | **20** | **403** |
| 14:15 to 15:15 | 109 | 65 | 120 | 119 | **413** | 7 | 8 | **15** | **428** |
| 14:30 to 15:30 | 104 | 64 | 111 | 115 | **394** | 8 | 10 | **18** | **412** |
| 14:45 to 15:45 | 105 | 69 | 109 | 107 | **390** | 8 | 9 | **17** | **407** |
| 15:00 to 16:00 | 97 | 69 | 109 | 101 | **376** | 7 | 15 | **22** | **398** |
| 15:15 to 16:15 | 81 | 64 | 102 | 104 | **351** | 7 | 14 | **21** | **372** |
| 15:30 to 16:30 | 66 | 48 | 116 | 88 | **318** | 8 | 12 | **20** | **338** |
| 15:45 to 16:45 | 43 | 40 | 122 | 85 | **290** | 9 | 17 | **26** | **316** |
| 16:00 to 17:00 | 50 | 41 | 112 | 95 | **298** | 13 | 13 | **26** | **324** |
| 16:15 to 17:15 | 82 | 39 | 120 | 99 | **340** | 22 | 12 | **34** | **374** |
| 16:30 to 17:30 | 101 | 58 | 125 | 112 | **396** | 23 | 9 | **32** | **428** |
| 16:45 to 17:45 | 133 | 65 | 168 | 122 | **488** | 25 | 3 | **28** | **516** |
| 17:00 to 18:00 | 180 | 76 | 234 | 121 | **611** | 43 | 7 | **50** | **661** |
| 17:15 to 18:15 | 222 | 87 | 269 | 165 | **743** | 40 | 14 | **54** | **797** |
| 17:30 to 18:30 | 214 | 98 | 310 | 193 | **815** | 45 | 21 | **66** | **881** |
| 17:45 to 18:45 | 274 | 123 | 400 | 221 | **1,018** | 52 | 24 | **76** | **1,094** |
| 18:00 to 19:00 | 266 | 122 | 453 | 221 | **1,062** | 28 | 22 | **50** | **1,112** |
| 18:15 to 19:15 | 219 | 134 | 535 | 261 | **1,149** | 38 | 35 | **73** | **1,222** |
| 18:30 to 19:30 | 236 | 123 | 589 | 288 | **1,236** | 36 | 36 | **72** | **1,308** |
| 18:45 to 19:45 | 192 | 124 | 565 | 325 | **1,206** | 28 | 39 | **67** | **1,273** |
| 19:00 to 20:00 | 208 | 151 | 588 | 355 | **1,302** | 32 | 49 | **81** | **1,383** |
| **6hrs Total** | **896** | **531** | **1,599** | **1,006** | **4,032** | **132** | **117** | **249** | **4,281** |

[Peak Hr Summary]

| Approach | SITE1 - Access from North and South Steps at Front | | | | Total | SITE2 - Side Entrance in / out | | Total | Grand Total |
|---|---|---|---|---|---|---|---|---|---|
| Time Period | North IN | North Out | South IN | South Out | | IN | OUT | | |
| 19:00 to 20:00 | 208 | 151 | 588 | 355 | **1,302** | 32 | 49 | **81** | **1,383** |

| | |
|---|---|
| **Client** | Positive Traffic Pty Ltd |
| **Location** | Glenwood |
| **Date** | Fri, 27th July 2018 |
| **Survey Time** | 9am-6pm(9hrs) |
| **Description** | Glenwood Surveys |

**[15mins interval]**

| Approach | | | SITE3 - East Access | | | | Total | SITE4 - West Access | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Direction | | | IN | | OUT | | | IN | | OUT | | |
| Time Period | | | Lights | Heavies | Lights | Heavies | | Lights | Heavies | Lights | Heavies | |
| 9:00 | to | 9:15 | 4 | 0 | 4 | 0 | **8** | 0 | 0 | 0 | 0 | **0** |
| 9:15 | to | 9:30 | 8 | 0 | 5 | 0 | **13** | 0 | 0 | 0 | 0 | **0** |
| 9:30 | to | 9:45 | 4 | 0 | 11 | 0 | **15** | 0 | 0 | 0 | 0 | **0** |
| 9:45 | to | 10:00 | 7 | 0 | 9 | 0 | **16** | 0 | 0 | 0 | 0 | **0** |
| 10:00 | to | 10:15 | 7 | 0 | 3 | 0 | **10** | 0 | 0 | 0 | 0 | **0** |
| 10:15 | to | 10:30 | 11 | 0 | 2 | 0 | **13** | 0 | 0 | 0 | 0 | **0** |
| 10:30 | to | 10:45 | 12 | 0 | 3 | 0 | **15** | 0 | 0 | 0 | 0 | **0** |
| 10:45 | to | 11:00 | 5 | 0 | 7 | 0 | **12** | 0 | 0 | 0 | 0 | **0** |
| 11:00 | to | 11:15 | 5 | 0 | 5 | 0 | **10** | 0 | 0 | 0 | 0 | **0** |
| 11:15 | to | 11:30 | 8 | 0 | 8 | 0 | **16** | 0 | 0 | 0 | 0 | **0** |
| 11:30 | to | 11:45 | 5 | 0 | 2 | 0 | **7** | 0 | 0 | 0 | 0 | **0** |
| 11:45 | to | 12:00 | 9 | 0 | 3 | 0 | **12** | 0 | 0 | 0 | 0 | **0** |
| 12:00 | to | 12:15 | 9 | 0 | 8 | 0 | **17** | 0 | 0 | 0 | 0 | **0** |
| 12:15 | to | 12:30 | 6 | 0 | 3 | 0 | **9** | 0 | 0 | 0 | 0 | **0** |
| 12:30 | to | 12:45 | 8 | 0 | 12 | 0 | **20** | 0 | 0 | 0 | 0 | **0** |
| 12:45 | to | 13:00 | 15 | 0 | 13 | 0 | **28** | 0 | 0 | 0 | 0 | **0** |
| 13:00 | to | 13:15 | 18 | 0 | 12 | 0 | **30** | 0 | 0 | 0 | 0 | **0** |
| 13:15 | to | 13:30 | 6 | 1 | 13 | 0 | **20** | 0 | 0 | 0 | 0 | **0** |
| 13:30 | to | 13:45 | 14 | 0 | 26 | 1 | **41** | 0 | 0 | 0 | 0 | **0** |
| 13:45 | to | 14:00 | 4 | 0 | 7 | 0 | **11** | 0 | 0 | 0 | 0 | **0** |
| 14:00 | to | 14:15 | 7 | 0 | 16 | 0 | **23** | 0 | 0 | 0 | 0 | **0** |
| 14:15 | to | 14:30 | 12 | 0 | 6 | 0 | **18** | 0 | 0 | 0 | 0 | **0** |
| 14:30 | to | 14:45 | 7 | 0 | 12 | 0 | **19** | 0 | 0 | 0 | 0 | **0** |
| 14:45 | to | 15:00 | 10 | 0 | 9 | 0 | **19** | 0 | 0 | 0 | 0 | **0** |
| 15:00 | to | 15:15 | 7 | 0 | 12 | 0 | **19** | 0 | 0 | 0 | 0 | **0** |
| 15:15 | to | 15:30 | 5 | 0 | 6 | 0 | **11** | 0 | 0 | 0 | 0 | **0** |
| 15:30 | to | 15:45 | 7 | 0 | 5 | 0 | **12** | 0 | 0 | 0 | 0 | **0** |
| 15:45 | to | 16:00 | 14 | 0 | 10 | 0 | **24** | 0 | 0 | 0 | 0 | **0** |
| 16:00 | to | 16:15 | 11 | 0 | 13 | 0 | **24** | 0 | 0 | 0 | 0 | **0** |
| 16:15 | to | 16:30 | 3 | 0 | 4 | 0 | **7** | 0 | 0 | 0 | 0 | **0** |
| 16:30 | to | 16:45 | 14 | 0 | 10 | 0 | **24** | 0 | 0 | 0 | 0 | **0** |
| 16:45 | to | 17:00 | 10 | 0 | 6 | 0 | **16** | 0 | 0 | 0 | 0 | **0** |
| 17:00 | to | 17:15 | 10 | 0 | 12 | 0 | **22** | 0 | 0 | 0 | 0 | **0** |
| 17:15 | to | 17:30 | 12 | 0 | 6 | 0 | **18** | 0 | 0 | 0 | 0 | **0** |
| 17:30 | to | 17:45 | 16 | 0 | 11 | 0 | **27** | 0 | 0 | 0 | 0 | **0** |
| 17:45 | to | 18:00 | 17 | 0 | 6 | 0 | **23** | 0 | 0 | 0 | 0 | **0** |
| **9hrs Total** | | | **327** | **1** | **300** | **1** | **328** | **0** | **0** | **0** | **0** | **0** |

[Hourly Summary]

| Approach | SITE3 - East Access | | | | Total | SITE4 - West Access | | | | Total | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Direction | IN | | OUT | | | IN | | OUT | | | |
| Time Period | Lights | Heavies | Lights | Heavies | | Lights | Heavies | Lights | Heavies | | |
| 9:00 to 10:00 | 23 | 0 | 29 | 0 | **52** | 0 | 0 | 0 | 0 | **0** | **52** |
| 9:15 to 10:15 | 26 | 0 | 28 | 0 | **54** | 0 | 0 | 0 | 0 | **0** | **54** |
| 9:30 to 10:30 | 29 | 0 | 25 | 0 | **54** | 0 | 0 | 0 | 0 | **0** | **54** |
| 9:45 to 10:45 | 37 | 0 | 17 | 0 | **54** | 0 | 0 | 0 | 0 | **0** | **54** |
| 10:00 to 11:00 | 35 | 0 | 15 | 0 | **50** | 0 | 0 | 0 | 0 | **0** | **50** |
| 10:15 to 11:15 | 33 | 0 | 17 | 0 | **50** | 0 | 0 | 0 | 0 | **0** | **50** |
| 10:30 to 11:30 | 30 | 0 | 23 | 0 | **53** | 0 | 0 | 0 | 0 | **0** | **53** |
| 10:45 to 11:45 | 23 | 0 | 22 | 0 | **45** | 0 | 0 | 0 | 0 | **0** | **45** |
| 11:00 to 12:00 | 27 | 0 | 18 | 0 | **45** | 0 | 0 | 0 | 0 | **0** | **45** |
| 11:15 to 12:15 | 31 | 0 | 21 | 0 | **52** | 0 | 0 | 0 | 0 | **0** | **52** |
| 11:30 to 12:30 | 29 | 0 | 16 | 0 | **45** | 0 | 0 | 0 | 0 | **0** | **45** |
| 11:45 to 12:45 | 32 | 0 | 26 | 0 | **58** | 0 | 0 | 0 | 0 | **0** | **58** |
| 12:00 to 13:00 | 38 | 0 | 36 | 0 | **74** | 0 | 0 | 0 | 0 | **0** | **74** |
| 12:15 to 13:15 | 47 | 0 | 40 | 0 | **87** | 0 | 0 | 0 | 0 | **0** | **87** |
| 12:30 to 13:30 | 47 | 1 | 50 | 0 | **98** | 0 | 0 | 0 | 0 | **0** | **98** |
| 12:45 to 13:45 | 53 | 1 | 64 | 1 | **119** | 0 | 0 | 0 | 0 | **0** | **119** |
| 13:00 to 14:00 | 42 | 1 | 58 | 1 | **102** | 0 | 0 | 0 | 0 | **0** | **102** |
| 13:15 to 14:15 | 31 | 1 | 62 | 1 | **95** | 0 | 0 | 0 | 0 | **0** | **95** |
| 13:30 to 14:30 | 37 | 0 | 55 | 1 | **93** | 0 | 0 | 0 | 0 | **0** | **93** |
| 13:45 to 14:45 | 30 | 0 | 41 | 0 | **71** | 0 | 0 | 0 | 0 | **0** | **71** |
| 14:00 to 15:00 | 36 | 0 | 43 | 0 | **79** | 0 | 0 | 0 | 0 | **0** | **79** |
| 14:15 to 15:15 | 36 | 0 | 39 | 0 | **75** | 0 | 0 | 0 | 0 | **0** | **75** |
| 14:30 to 15:30 | 29 | 0 | 39 | 0 | **68** | 0 | 0 | 0 | 0 | **0** | **68** |
| 14:45 to 15:45 | 29 | 0 | 32 | 0 | **61** | 0 | 0 | 0 | 0 | **0** | **61** |
| 15:00 to 16:00 | 33 | 0 | 33 | 0 | **66** | 0 | 0 | 0 | 0 | **0** | **66** |
| 15:15 to 16:15 | 37 | 0 | 34 | 0 | **71** | 0 | 0 | 0 | 0 | **0** | **71** |
| 15:30 to 16:30 | 35 | 0 | 32 | 0 | **67** | 0 | 0 | 0 | 0 | **0** | **67** |
| 15:45 to 16:45 | 42 | 0 | 37 | 0 | **79** | 0 | 0 | 0 | 0 | **0** | **79** |
| 16:00 to 17:00 | 38 | 0 | 33 | 0 | **71** | 0 | 0 | 0 | 0 | **0** | **71** |
| 16:15 to 17:15 | 37 | 0 | 32 | 0 | **69** | 0 | 0 | 0 | 0 | **0** | **69** |
| 16:30 to 17:30 | 46 | 0 | 34 | 0 | **80** | 0 | 0 | 0 | 0 | **0** | **80** |
| 16:45 to 17:45 | 48 | 0 | 35 | 0 | **83** | 0 | 0 | 0 | 0 | **0** | **83** |
| 17:00 to 18:00 | 55 | 0 | 35 | 0 | **90** | 0 | 0 | 0 | 0 | **0** | **90** |
| **9hrs Total** | **327** | **1** | **300** | **1** | **629** | **0** | **0** | **0** | **0** | **0** | **629** |

[Peak Hr Summary]

| | Approach | SITE3 - East Access | | | | Total | SITE4 - West Access | | | | Total | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Direction | IN | | OUT | | | IN | | OUT | | | |
| | Time Period | Lights | Heavies | Lights | Heavies | | Lights | Heavies | Lights | Heavies | | |
| AM | 9:15 to 10:15 | 26 | 0 | 28 | 0 | **54** | 0 | 0 | 0 | 0 | **0** | **54** |
| PM | 12:45 to 13:45 | 53 | 1 | 64 | 1 | **119** | 0 | 0 | 0 | 0 | **0** | **119** |

| | |
|---|---|
| **Client** | Positive Traffic Pty Ltd |
| **Location** | Glenwood |
| **Date** | Sat, 28th July 2018 |
| **Survey Time** | 2pm-8pm(6hrs) |
| **Description** | Glenwood Surveys |

**[15mins interval]**

***** WEST ACCESS CLOSED ALL DAY ON SAT**

| Approach | SITE3 - East Access | | | | Total | SITE4 - West Access | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Direction | IN | | OUT | | | IN | | OUT | | |
| Time Period | Lights | Heavies | Lights | Heavies | | Lights | Heavies | Lights | Heavies | |
| 14:00 to 14:15 | 14 | 0 | 22 | 0 | **36** | 0 | 0 | 0 | 0 | **0** |
| 14:15 to 14:30 | 22 | 0 | 18 | 0 | **40** | 0 | 0 | 0 | 0 | **0** |
| 14:30 to 14:45 | 20 | 0 | 18 | 0 | **38** | 0 | 0 | 0 | 0 | **0** |
| 14:45 to 15:00 | 17 | 0 | 19 | 0 | **36** | 0 | 0 | 0 | 0 | **0** |
| 15:00 to 15:15 | 20 | 0 | 16 | 0 | **36** | 0 | 0 | 0 | 0 | **0** |
| 15:15 to 15:30 | 13 | 0 | 12 | 0 | **25** | 0 | 0 | 0 | 0 | **0** |
| 15:30 to 15:45 | 28 | 0 | 23 | 0 | **51** | 0 | 0 | 0 | 0 | **0** |
| 15:45 to 16:00 | 29 | 0 | 16 | 0 | **45** | 0 | 0 | 0 | 0 | **0** |
| 16:00 to 16:15 | 17 | 0 | 22 | 0 | **39** | 0 | 0 | 0 | 0 | **0** |
| 16:15 to 16:30 | 16 | 0 | 8 | 0 | **24** | 0 | 0 | 0 | 0 | **0** |
| 16:30 to 16:45 | 12 | 0 | 13 | 0 | **25** | 0 | 0 | 0 | 0 | **0** |
| 16:45 to 17:00 | 9 | 0 | 18 | 0 | **27** | 0 | 0 | 0 | 0 | **0** |
| 17:00 to 17:15 | 27 | 0 | 16 | 0 | **43** | 0 | 0 | 0 | 0 | **0** |
| 17:15 to 17:30 | 24 | 0 | 14 | 0 | **38** | 0 | 0 | 0 | 0 | **0** |
| 17:30 to 17:45 | 36 | 0 | 15 | 0 | **51** | 0 | 0 | 0 | 0 | **0** |
| 17:45 to 18:00 | 42 | 0 | 22 | 0 | **64** | 0 | 0 | 0 | 0 | **0** |
| 18:00 to 18:15 | 38 | 0 | 24 | 0 | **62** | 0 | 0 | 0 | 0 | **0** |
| 18:15 to 18:30 | 54 | 0 | 22 | 0 | **76** | 0 | 0 | 0 | 0 | **0** |
| 18:30 to 18:45 | 64 | 0 | 16 | 0 | **80** | 0 | 0 | 0 | 0 | **0** |
| 18:45 to 19:00 | 47 | 1 | 26 | 0 | **74** | 0 | 0 | 0 | 0 | **0** |
| 19:00 to 19:15 | 58 | 0 | 30 | 0 | **88** | 0 | 0 | 0 | 0 | **0** |
| 19:15 to 19:30 | 58 | 0 | 51 | 1 | **110** | 0 | 0 | 0 | 0 | **0** |
| 19:30 to 19:45 | 50 | 0 | 52 | 0 | **102** | 0 | 0 | 0 | 0 | **0** |
| 19:45 to 20:00 | 38 | 0 | 59 | 0 | **97** | 0 | 0 | 0 | 0 | **0** |
| **6hrs Total** | **753** | **1** | **552** | **1** | **1,307** | **0** | **0** | **0** | **0** | **0** |

[Hourly Summary]

| Approach | SITE3 - East Access | | | | Total | SITE4 - West Access | | | | Total | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Direction | IN | | OUT | | | IN | | OUT | | | |
| Time Period | Lights | Heavies | Lights | Heavies | | Lights | Heavies | Lights | Heavies | | |
| 14:00 to 15:00 | 73 | 0 | 77 | 0 | **150** | 0 | 0 | 0 | 0 | **0** | **150** |
| 14:15 to 15:15 | 79 | 0 | 71 | 0 | **150** | 0 | 0 | 0 | 0 | **0** | **150** |
| 14:30 to 15:30 | 70 | 0 | 65 | 0 | **135** | 0 | 0 | 0 | 0 | **0** | **135** |
| 14:45 to 15:45 | 78 | 0 | 70 | 0 | **148** | 0 | 0 | 0 | 0 | **0** | **148** |
| 15:00 to 16:00 | 90 | 0 | 67 | 0 | **157** | 0 | 0 | 0 | 0 | **0** | **157** |
| 15:15 to 16:15 | 87 | 0 | 73 | 0 | **160** | 0 | 0 | 0 | 0 | **0** | **160** |
| 15:30 to 16:30 | 90 | 0 | 69 | 0 | **159** | 0 | 0 | 0 | 0 | **0** | **159** |
| 15:45 to 16:45 | 74 | 0 | 59 | 0 | **133** | 0 | 0 | 0 | 0 | **0** | **133** |
| 16:00 to 17:00 | 54 | 0 | 61 | 0 | **115** | 0 | 0 | 0 | 0 | **0** | **115** |
| 16:15 to 17:15 | 64 | 0 | 55 | 0 | **119** | 0 | 0 | 0 | 0 | **0** | **119** |
| 16:30 to 17:30 | 72 | 0 | 61 | 0 | **133** | 0 | 0 | 0 | 0 | **0** | **133** |
| 16:45 to 17:45 | 96 | 0 | 63 | 0 | **159** | 0 | 0 | 0 | 0 | **0** | **159** |
| 17:00 to 18:00 | 129 | 0 | 67 | 0 | **196** | 0 | 0 | 0 | 0 | **0** | **196** |
| 17:15 to 18:15 | 140 | 0 | 75 | 0 | **215** | 0 | 0 | 0 | 0 | **0** | **215** |
| 17:30 to 18:30 | 170 | 0 | 83 | 0 | **253** | 0 | 0 | 0 | 0 | **0** | **253** |
| 17:45 to 18:45 | 198 | 0 | 84 | 0 | **282** | 0 | 0 | 0 | 0 | **0** | **282** |
| 18:00 to 19:00 | 203 | 1 | 88 | 0 | **292** | 0 | 0 | 0 | 0 | **0** | **292** |
| 18:15 to 19:15 | 223 | 1 | 94 | 0 | **318** | 0 | 0 | 0 | 0 | **0** | **318** |
| 18:30 to 19:30 | 227 | 1 | 123 | 1 | **352** | 0 | 0 | 0 | 0 | **0** | **352** |
| 18:45 to 19:45 | 213 | 1 | 159 | 1 | **374** | 0 | 0 | 0 | 0 | **0** | **374** |
| 19:00 to 20:00 | 204 | 0 | 192 | 1 | **397** | 0 | 0 | 0 | 0 | **0** | **397** |
| **6hrs Total** | **753** | **1** | **552** | **1** | **1,307** | **0** | **0** | **0** | **0** | **0** | **1,307** |

[Peak Hr Summary]

| Approach | SITE3 - East Access | | | | Total | SITE4 - West Access | | | | Total | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Direction | IN | | OUT | | | IN | | OUT | | | |
| Time Period | Lights | Heavies | Lights | Heavies | | Lights | Heavies | Lights | Heavies | | |
| 19:00 to 20:00 | 204 | 0 | 192 | 1 | **397** | 0 | 0 | 0 | 0 | **0** | **397** |

## 11. Appendix D – SIDRA Modelling Outputs

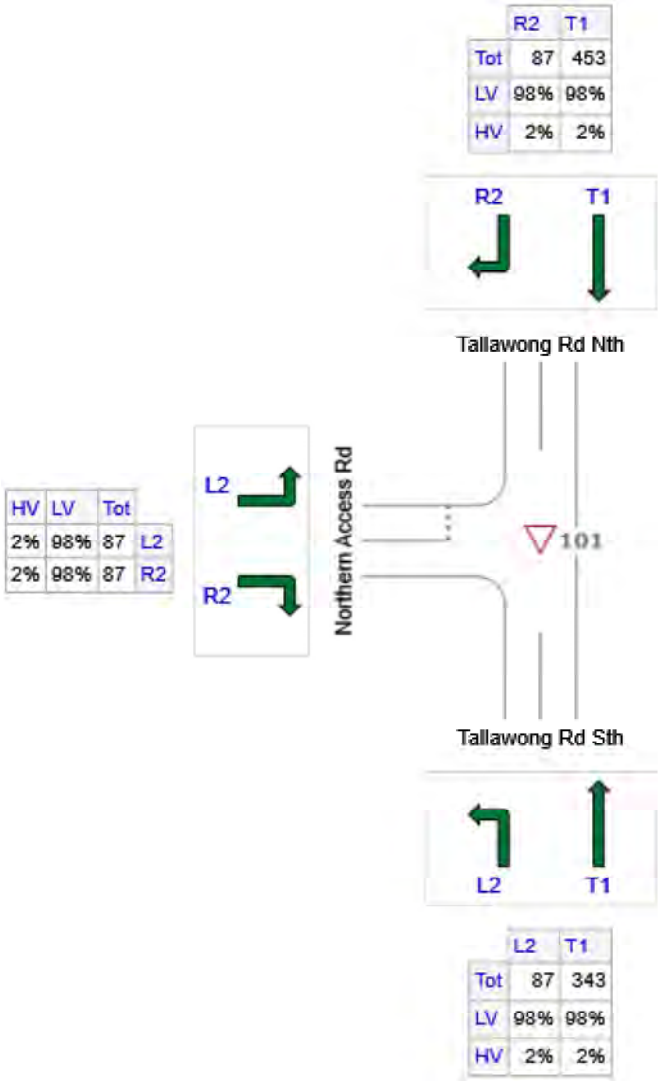
# INPUT VOLUMES

## Vehicles and pedestrians per 60 minutes

### Site: 101 [Tallawong Rd / Northern Rd_AM]

New Site
Giveway / Yield (Two-Way)

**Volume Display Method: Total and %**




| | All MCs | Light Vehicles (LV) | Heavy Vehicles (HV) |
|---|---|---|---|
| S: Tallawong Rd Sth | 430 | 421 | 9 |
| N: Tallawong Rd Nth | 540 | 529 | 11 |
| W: Northern Access Rd | 174 | 171 | 3 |
| Total | 1144 | 1121 | 23 |

# LANE FLOWS

## Site: 101 [Tallawong Rd / Northern Rd_AM]

New Site
Giveway / Yield (Two-Way)

| Approach Lane Flows (veh/h) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| South: Tallawong Rd Sth | | | | | | | | | |
| Mov. From S To Exit: | L2 W | T1 N | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
| Lane 1 | 92 | 132 | 224 | 2.0 | 1885 | 0.119 | 100 | NA | NA |
| Lane 2 | - | 229 | 229 | 2.0 | 1925 | 0.119 | 100 | NA | NA |
| Approach | 92 | 361 | 453 | 2.0 | | 0.119 | | | |
| North: Tallawong Rd Nth | | | | | | | | | |
| Mov. From N To Exit: | T1 S | R2 W | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
| Lane 1 | 338 | - | 338 | 2.0 | 1925 | 0.176 | 100 | NA | NA |
| Lane 2 | 139 | 92 | 230 | 2.0 | 1311 | 0.176 | 100 | NA | NA |
| Approach | 477 | 92 | 568 | 2.0 | | 0.176 | | | |
| West: Northern Access Rd | | | | | | | | | |
| Mov. From W To Exit: | L2 N | R2 S | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
| Lane 1 | 92 | - | 92 | 2.0 | 1166 | 0.079 | 100 | 0.0 | 2 |
| Lane 2 | - | 92 | 92 | 2.0 | 261 | 0.351 | 100 | NA | NA |
| Approach | 92 | 92 | 183 | 2.0 | | 0.351 | | | |
| | Total | %HV | Deg.Satn (v/c) | | | | | | |
| Intersection | 1204 | 2.0 | 0.351 | | | | | | |

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

# LANE LEVEL OF SERVICE

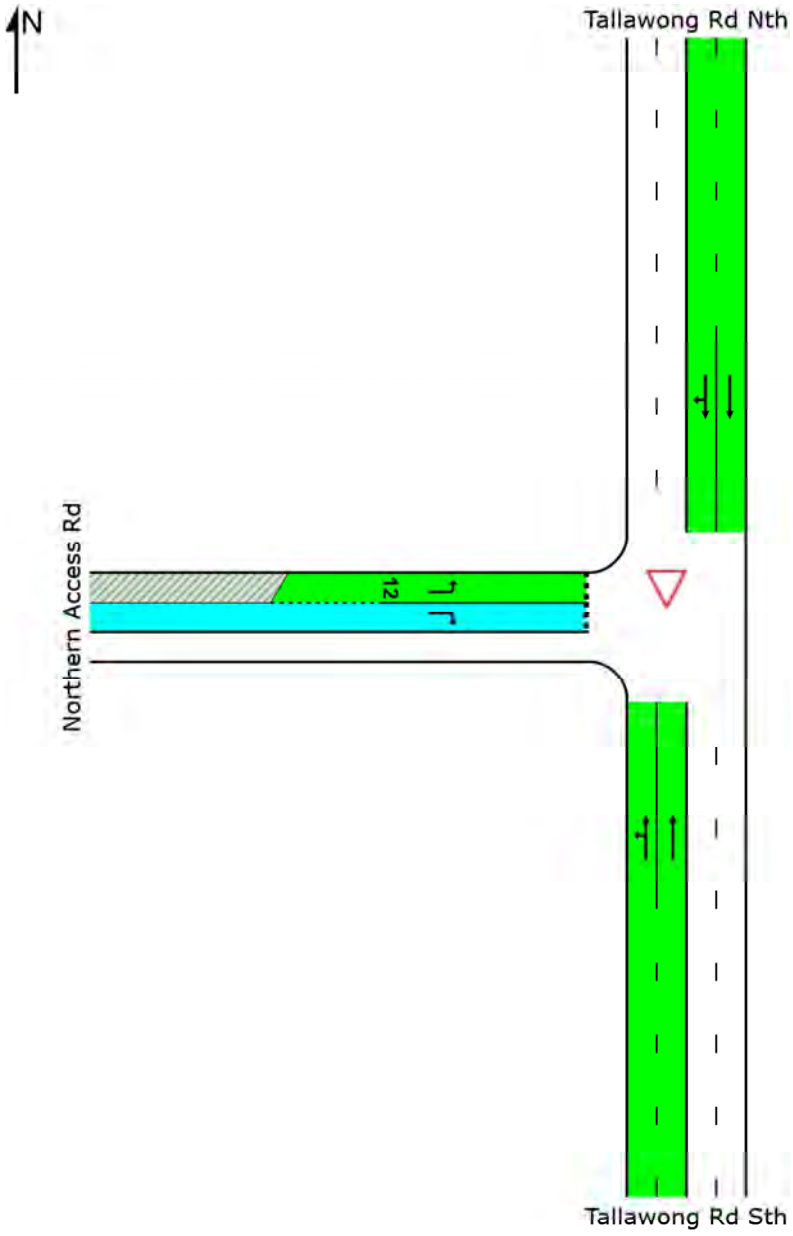
## Lane Level of Service

### Site: 101 [Tallawong Rd / Northern Rd_AM]

New Site
Giveway / Yield (Two-Way)

**All Movement Classes**

| | South | North | West | Intersection |
|---|---|---|---|---|
| LOS | NA | NA | A | NA |




Colour code based on Level of Service

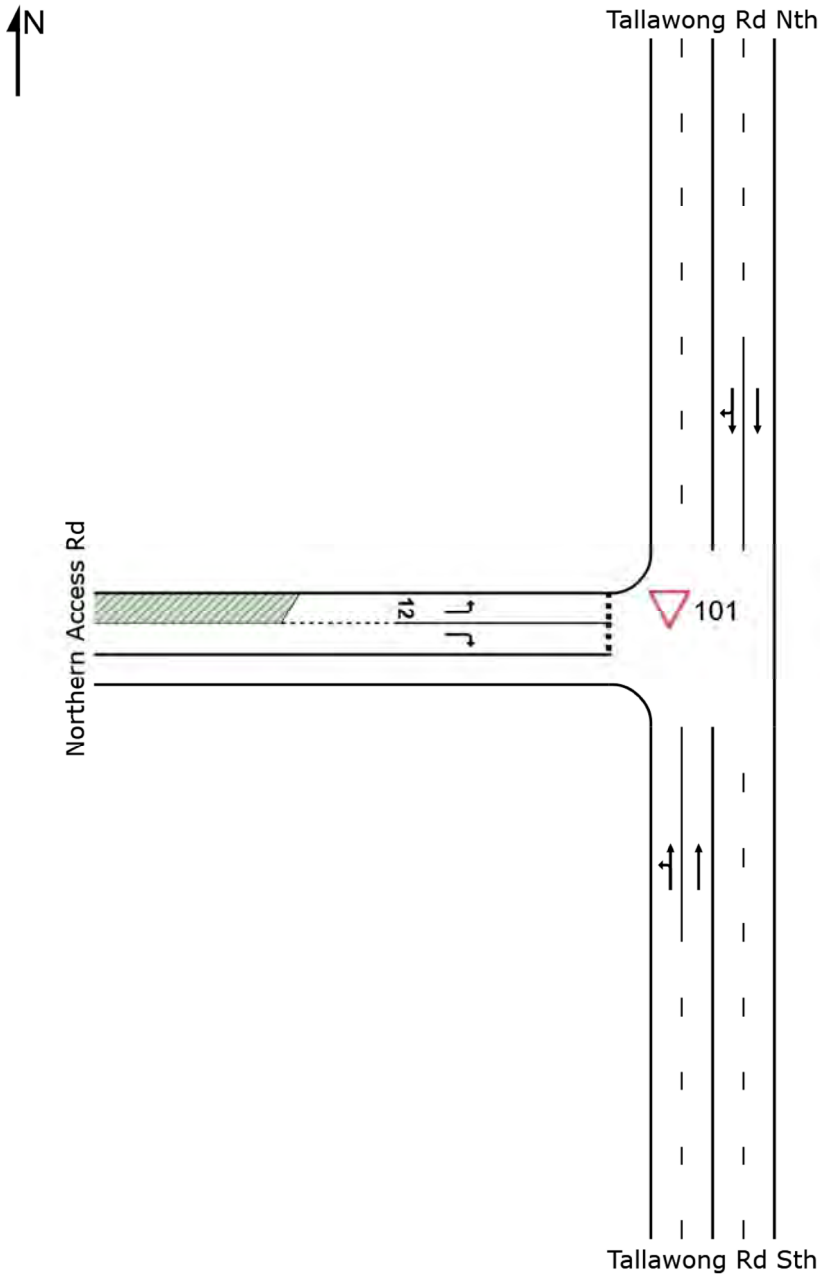
LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab). SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

# SITE LAYOUT

## Site: 101 [Tallawong Rd / Northern Rd_AM]

New Site
Giveway / Yield (Two-Way)



# LANE LEVEL OF SERVICE

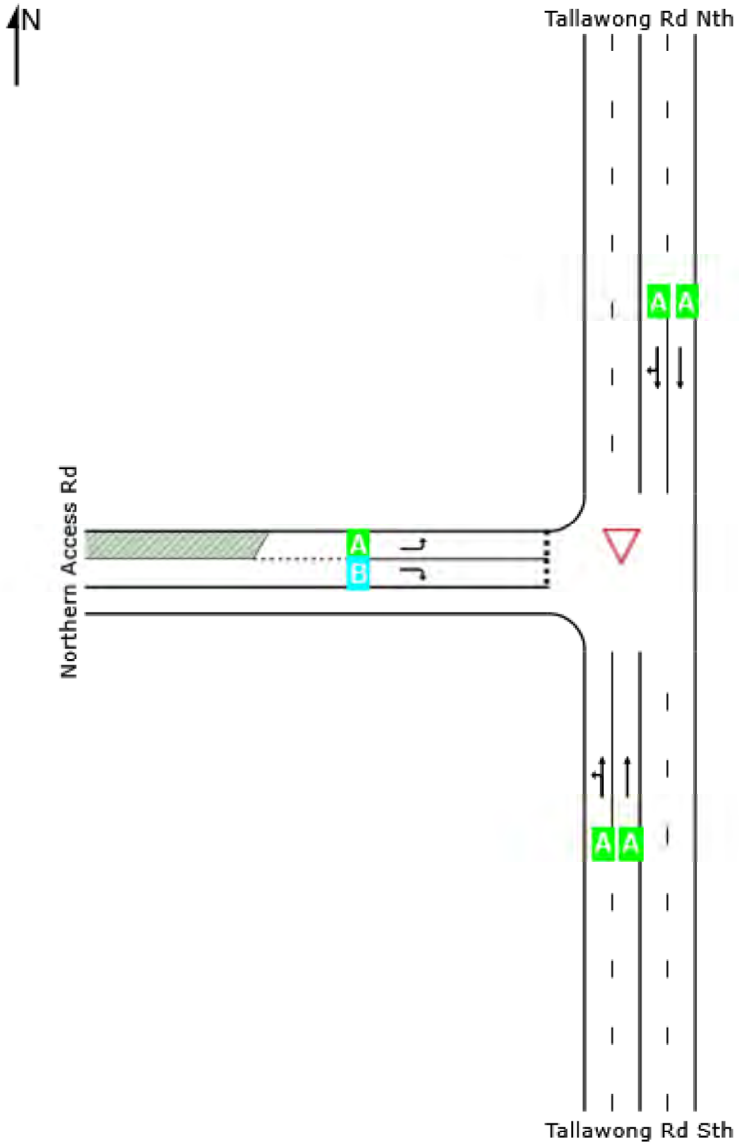
## Lane Level of Service

### Site: 101 [Tallawong Rd / Northern Rd_AM]

New Site
Giveway / Yield (Two-Way)

**All Movement Classes**

| | South | North | West | Intersection |
|---|---|---|---|---|
| LOS | NA | NA | A | NA |




Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

# MOVEMENT SUMMARY

## Site: 101 [Tallawong Rd / Northern Rd_AM]

New Site
Giveway / Yield (Two-Way)

| Movement Performance - Vehicles | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| South: Tallawong Rd Sth | | | | | | | | | | | |
| 1 | L2 | 92 | 2.0 | 0.119 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.24 | 56.2 |
| 2 | T1 | 361 | 2.0 | 0.119 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.09 | 59.2 |
| Approach | | 453 | 2.0 | 0.119 | 1.1 | NA | 0.0 | 0.0 | 0.00 | 0.12 | 58.5 |
| North: Tallawong Rd Nth | | | | | | | | | | | |
| 8 | T1 | 477 | 2.0 | 0.176 | 0.5 | LOS A | 0.9 | 6.3 | 0.12 | 0.08 | 58.8 |
| 9 | R2 | 92 | 2.0 | 0.176 | 8.0 | LOS A | 0.9 | 6.3 | 0.42 | 0.28 | 54.6 |
| Approach | | 568 | 2.0 | 0.176 | 1.7 | NA | 0.9 | 6.3 | 0.17 | 0.11 | 58.1 |
| West: Northern Access Rd | | | | | | | | | | | |
| 10 | L2 | 92 | 2.0 | 0.079 | 6.1 | LOS A | 0.3 | 2.1 | 0.23 | 0.56 | 52.8 |
| 12 | R2 | 92 | 2.0 | 0.351 | 22.0 | LOS B | 1.4 | 10.1 | 0.83 | 0.98 | 43.0 |
| Approach | | 183 | 2.0 | 0.351 | 14.1 | LOS A | 1.4 | 10.1 | 0.53 | 0.77 | 47.4 |
| All Vehicles | | 1204 | 2.0 | 0.351 | 3.4 | NA | 1.4 | 10.1 | 0.16 | 0.22 | 56.3 |

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.

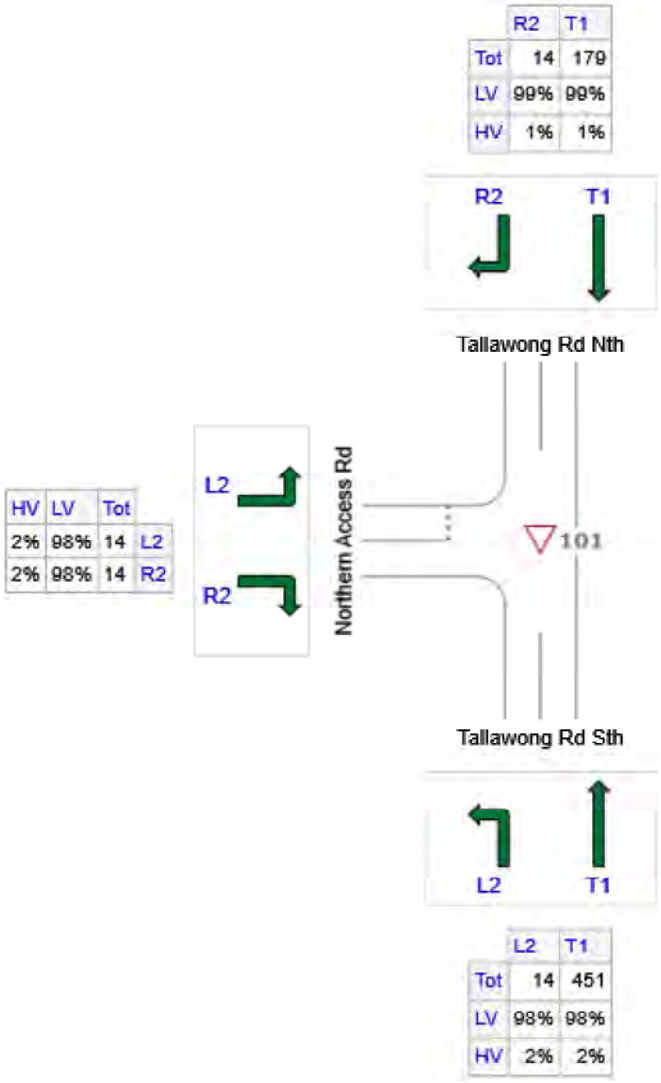
# INPUT VOLUMES

## Vehicles and pedestrians per 60 minutes

### Site: 101 [Tallawong Rd / Northern Rd_PM]

New Site
Giveway / Yield (Two-Way)

**Volume Display Method: Total and %**




| | All MCs | Light Vehicles (LV) | Heavy Vehicles (HV) |
|---|---|---|---|
| S: Tallawong Rd Sth | 465 | 456 | 9 |
| N: Tallawong Rd Nth | 193 | 191 | 2 |
| W: Northern Access Rd | 28 | 27 | 1 |
| Total | 686 | 674 | 12 |

# INTERSECTION SUMMARY

## Site: 101 [Tallawong Rd / Northern Rd_PM]

New Site
Giveway / Yield (Two-Way)

| Intersection Performance - Hourly Values | | | | |
|---|---|---|---|---|
| **Performance Measure** | **Vehicles** | | **Persons** | |
| Travel Speed (Average) | 59.1 | km/h | 59.1 | km/h |
| Travel Distance (Total) | 731.7 | veh-km/h | 878.1 | pers-km/h |
| Travel Time (Total) | 12.4 | veh-h/h | 14.9 | pers-h/h |
| Demand Flows (Total) | 722 | veh/h | 867 | pers/h |
| Percent Heavy Vehicles (Demand) | 1.7 | % | | |
| Degree of Saturation | 0.127 | | | |
| Practical Spare Capacity | 669.6 | % | | |
| Effective Intersection Capacity | 5671 | veh/h | | |
| Control Delay (Total) | 0.15 | veh-h/h | 0.18 | pers-h/h |
| Control Delay (Average) | 0.7 | sec | 0.7 | sec |
| Control Delay (Worst Lane) | 12.1 | sec | | |
| Control Delay (Worst Movement) | 12.1 | sec | 12.1 | sec |
| Geometric Delay (Average) | 0.5 | sec | | |
| Stop-Line Delay (Average) | 0.3 | sec | | |
| Idling Time (Average) | 0.1 | sec | | |
| Intersection Level of Service (LOS) | NA | | | |
| 95% Back of Queue - Vehicles (Worst Lane) | 0.2 | veh | | |
| 95% Back of Queue - Distance (Worst Lane) | 1.2 | m | | |
| Queue Storage Ratio (Worst Lane) | 0.00 | | | |
| Total Effective Stops | 38 | veh/h | 46 | pers/h |
| Effective Stop Rate | 0.05 | per veh | 0.05 | per pers |
| Proportion Queued | 0.04 | | 0.04 | |
| Performance Index | 12.9 | | 12.9 | |
| Cost (Total) | 267.42 | $/h | 267.42 | $/h |
| Fuel Consumption (Total) | 46.4 | L/h | | |
| Carbon Dioxide (Total) | 109.7 | kg/h | | |
| Hydrocarbons (Total) | 0.008 | kg/h | | |
| Carbon Monoxide (Total) | 0.137 | kg/h | | |
| NOx (Total) | 0.086 | kg/h | | |

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection 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.

| Intersection Performance - Annual Values | | | | |
|---|---|---|---|---|
| **Performance Measure** | **Vehicles** | | **Persons** | |
| Demand Flows (Total) | 346,611 | veh/y | 415,933 | pers/y |
| Delay | 71 | veh-h/y | 86 | pers-h/y |
| Effective Stops | 18,270 | veh/y | 21,924 | pers/y |
| Travel Distance | 351,238 | veh-km/y | 421,486 | pers-km/y |
| Travel Time | 5,941 | veh-h/y | 7,130 | pers-h/y |
| Cost | 128,359 | $/y | 128,359 | $/y |
| Fuel Consumption | 22,269 | L/y | | |
| Carbon Dioxide | 52,632 | kg/y | | |
| Hydrocarbons | 4 | kg/y | | |
| Carbon Monoxide | 66 | kg/y | | |
| NOx | 41 | kg/y | | |

# LANE FLOWS

## Site: 101 [Tallawong Rd / Northern Rd_PM]

New Site
Giveway / Yield (Two-Way)

**Approach Lane Flows (veh/h)**

South: Tallawong Rd Sth

| Mov. From S To Exit: | L2 W | T1 N | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 15 | 230 | 244 | 2.0 | 1919 | 0.127 | 100 | NA | NA |
| Lane 2 | - | 245 | 245 | 2.0 | 1925 | 0.127 | 100 | NA | NA |
| Approach | 15 | 475 | 489 | 2.0 | | 0.127 | | | |

North: Tallawong Rd Nth

| Mov. From N To Exit: | T1 S | R2 W | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 111 | - | 111 | 1.0 | 1937 | 0.057 | 100 | NA | NA |
| Lane 2 | 77 | 15 | 92 | 1.0 | 1606 | 0.057 | 100 | NA | NA |
| Approach | 188 | 15 | 203 | 1.0 | | 0.057 | | | |

West: Northern Access Rd

| Mov. From W To Exit: | L2 N | R2 S | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 15 | - | 15 | 2.0 | 1055 | 0.014 | 100 | 0.0 | 2 |
| Lane 2 | - | 15 | 15 | 2.0 | 422 | 0.035 | 100 | NA | NA |
| Approach | 15 | 15 | 29 | 2.0 | | 0.035 | | | |

| | Total | %HV | Deg.Satn (v/c) |
|---|---|---|---|
| Intersection | 722 | 1.7 | 0.127 |

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

# LANE LEVEL OF SERVICE

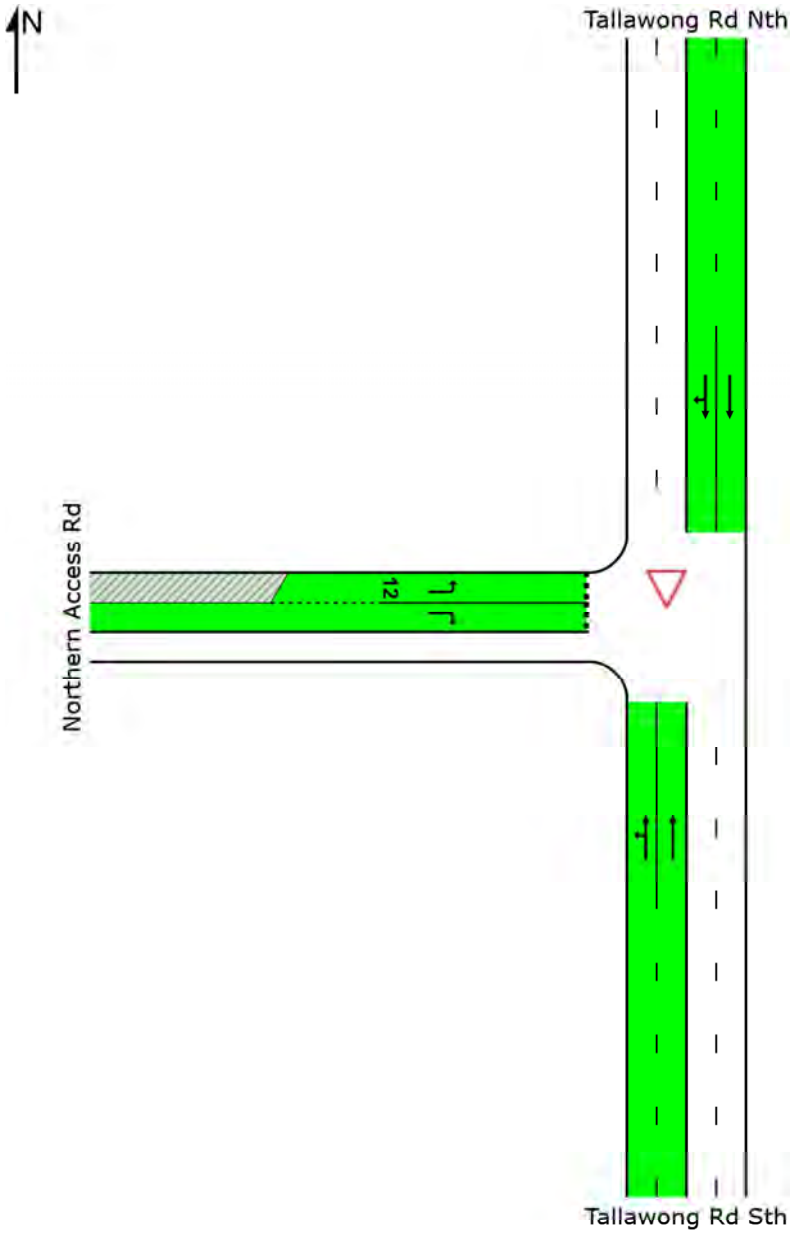
## Lane Level of Service

### Site: 101 [Tallawong Rd / Northern Rd_PM]

New Site
Giveway / Yield (Two-Way)

**All Movement Classes**

| | South | North | West | Intersection |
|---|---|---|---|---|
| LOS | NA | NA | A | NA |




Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab). SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

# LANE SUMMARY

## Site: 101 [Tallawong Rd / Northern Rd_PM]

New Site
Giveway / Yield (Two-Way)

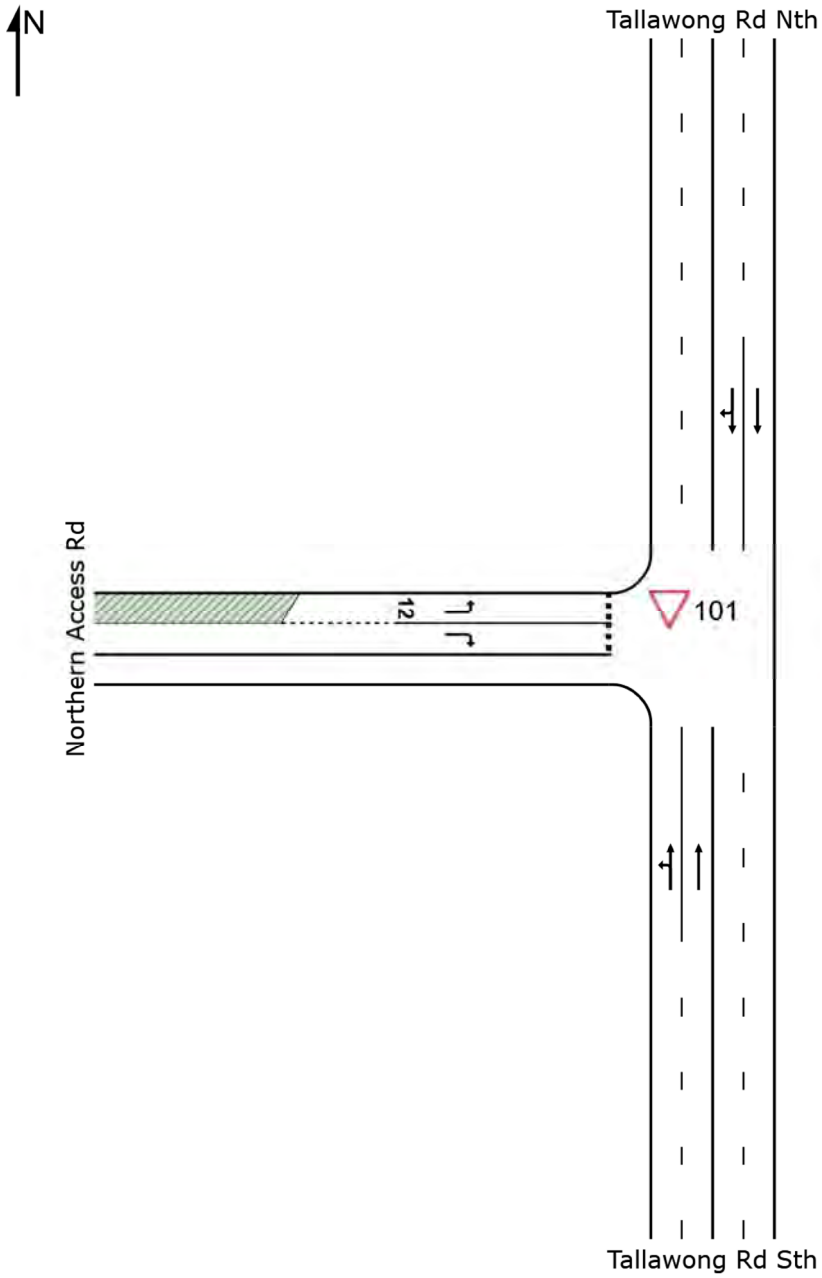
| Lane Use and Performance | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand Flows | | Cap. | Deg. Satn | Lane Util. | Average Delay | Level of Service | 95% Back of Queue | | Lane Config | Lane Length | Cap. Adj. | Prob. Block. |
| | Total veh/h | HV % | veh/h | v/c | % | sec | | Veh | Dist m | | m | % | % |
| South: Tallawong Rd Sth | | | | | | | | | | | | | |
| Lane 1 | 244 | 2.0 | 1919 | 0.127 | 100 | 0.3 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 2 | 245 | 2.0 | 1925 | 0.127 | 100 | 0.0 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Approach | 489 | 2.0 | | 0.127 | | 0.2 | NA | 0.0 | 0.0 | | | | |
| North: Tallawong Rd Nth | | | | | | | | | | | | | |
| Lane 1 | 111 | 1.0 | 1937 | 0.057 | 100 | 0.0 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 2 | 92 | 1.0 | 1606 | 0.057 | 100 | 1.9 | LOS A | 0.2 | 1.2 | Full | 500 | 0.0 | 0.0 |
| Approach | 203 | 1.0 | | 0.057 | | 0.9 | NA | 0.2 | 1.2 | | | | |
| West: Northern Access Rd | | | | | | | | | | | | | |
| Lane 1 | 15 | 2.0 | 1055 | 0.014 | 100 | 6.5 | LOS A | 0.0 | 0.3 | Short (P) | 12 | 0.0 | NA |
| Lane 2 | 15 | 2.0 | 422 | 0.035 | 100 | 12.1 | LOS A | 0.1 | 0.9 | Full | 500 | 0.0 | 0.0 |
| Approach | 29 | 2.0 | | 0.035 | | 9.3 | LOS A | 0.1 | 0.9 | | | | |
| Intersection | 722 | 1.7 | | 0.127 | | 0.7 | NA | 0.2 | 1.2 | | | | |

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

# SITE LAYOUT

## Site: 101 [Tallawong Rd / Northern Rd_PM]

New Site
Giveway / Yield (Two-Way)



# LANE LEVEL OF SERVICE

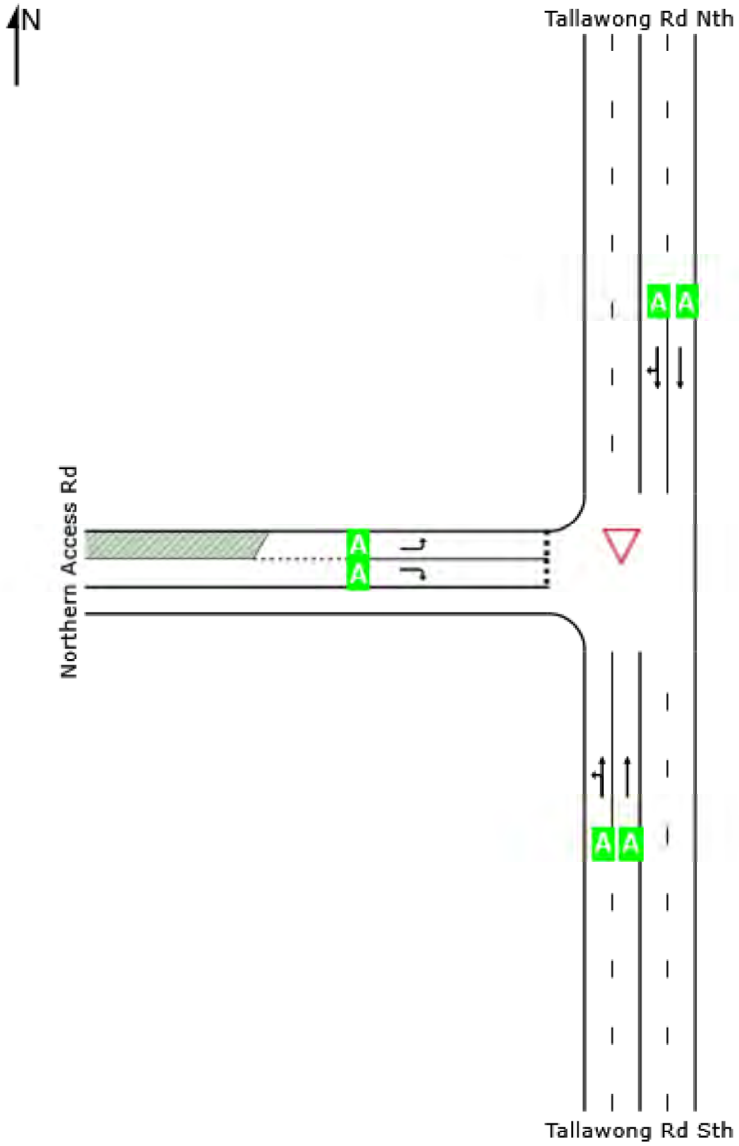
## Lane Level of Service

### Site: 101 [Tallawong Rd / Northern Rd_PM]

New Site
Giveway / Yield (Two-Way)

**All Movement Classes**

| | South | North | West | Intersection |
|---|---|---|---|---|
| LOS | NA | NA | A | NA |




Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

# MOVEMENT SUMMARY

## Site: 101 [Tallawong Rd / Northern Rd_PM]

New Site
Giveway / Yield (Two-Way)

| Movement Performance - Vehicles | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| South: Tallawong Rd Sth | | | | | | | | | | | |
| 1 | L2 | 15 | 2.0 | 0.127 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.04 | 57.9 |
| 2 | T1 | 475 | 2.0 | 0.127 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.02 | 59.8 |
| Approach | | 489 | 2.0 | 0.127 | 0.2 | NA | 0.0 | 0.0 | 0.00 | 0.02 | 59.8 |
| North: Tallawong Rd Nth | | | | | | | | | | | |
| 8 | T1 | 188 | 1.0 | 0.057 | 0.3 | LOS A | 0.2 | 1.2 | 0.08 | 0.04 | 59.2 |
| 9 | R2 | 15 | 1.0 | 0.057 | 7.9 | LOS A | 0.2 | 1.2 | 0.20 | 0.10 | 56.6 |
| Approach | | 203 | 1.0 | 0.057 | 0.9 | NA | 0.2 | 1.2 | 0.09 | 0.05 | 59.0 |
| West: Northern Access Rd | | | | | | | | | | | |
| 10 | L2 | 15 | 2.0 | 0.014 | 6.5 | LOS A | 0.0 | 0.3 | 0.31 | 0.56 | 52.6 |
| 12 | R2 | 15 | 2.0 | 0.035 | 12.1 | LOS A | 0.1 | 0.9 | 0.62 | 0.79 | 48.6 |
| Approach | | 29 | 2.0 | 0.035 | 9.3 | LOS A | 0.1 | 0.9 | 0.46 | 0.68 | 50.5 |
| All Vehicles | | 722 | 1.7 | 0.127 | 0.7 | NA | 0.2 | 1.2 | 0.04 | 0.05 | 59.1 |

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.

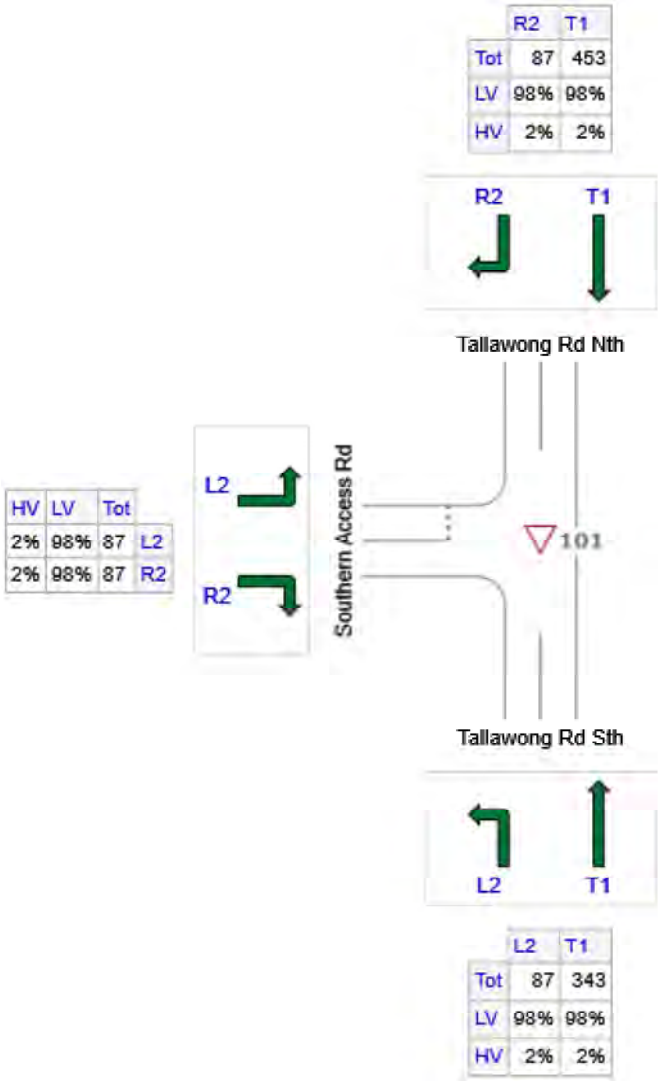
# INPUT VOLUMES

## Vehicles and pedestrians per 60 minutes

### Site: 101 [Tallawong Rd / Southern Rd_AM]

New Site
Giveway / Yield (Two-Way)

**Volume Display Method: Total and %**




| | All MCs | Light Vehicles (LV) | Heavy Vehicles (HV) |
|---|---|---|---|
| S: Tallawong Rd Sth | 430 | 421 | 9 |
| N: Tallawong Rd Nth | 540 | 529 | 11 |
| W: Southern Access Rd | 174 | 171 | 3 |
| Total | 1144 | 1121 | 23 |

# INTERSECTION SUMMARY

## Site: 101 [Tallawong Rd / Southern Rd_AM]

New Site
Giveway / Yield (Two-Way)

| Intersection Performance - Hourly Values | | | | |
|---|---|---|---|---|
| **Performance Measure** | **Vehicles** | | **Persons** | |
| Travel Speed (Average) | 56.3 | km/h | 56.3 | km/h |
| Travel Distance (Total) | 1220.8 | veh-km/h | 1464.9 | pers-km/h |
| Travel Time (Total) | 21.7 | veh-h/h | 26.0 | pers-h/h |
| Demand Flows (Total) | 1204 | veh/h | 1445 | pers/h |
| Percent Heavy Vehicles (Demand) | 2.0 | % | | |
| Degree of Saturation | 0.351 | | | |
| Practical Spare Capacity | 128.2 | % | | |
| Effective Intersection Capacity | 3435 | veh/h | | |
| Control Delay (Total) | 1.13 | veh-h/h | 1.36 | pers-h/h |
| Control Delay (Average) | 3.4 | sec | 3.4 | sec |
| Control Delay (Worst Lane) | 22.0 | sec | | |
| Control Delay (Worst Movement) | 22.0 | sec | 22.0 | sec |
| Geometric Delay (Average) | 1.7 | sec | | |
| Stop-Line Delay (Average) | 1.7 | sec | | |
| Idling Time (Average) | 1.0 | sec | | |
| Intersection Level of Service (LOS) | NA | | | |
| 95% Back of Queue - Vehicles (Worst Lane) | 1.4 | veh | | |
| 95% Back of Queue - Distance (Worst Lane) | 10.1 | m | | |
| Queue Storage Ratio (Worst Lane) | 0.01 | | | |
| Total Effective Stops | 260 | veh/h | 312 | pers/h |
| Effective Stop Rate | 0.22 | per veh | 0.22 | per pers |
| Proportion Queued | 0.16 | | 0.16 | |
| Performance Index | 25.2 | | 25.2 | |
| Cost (Total) | 514.69 | $/h | 514.69 | $/h |
| Fuel Consumption (Total) | 87.4 | L/h | | |
| Carbon Dioxide (Total) | 206.6 | kg/h | | |
| Hydrocarbons (Total) | 0.016 | kg/h | | |
| Carbon Monoxide (Total) | 0.248 | kg/h | | |
| NOx (Total) | 0.201 | kg/h | | |

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection 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.

| Intersection Performance - Annual Values | | | | |
|---|---|---|---|---|
| **Performance Measure** | **Vehicles** | | **Persons** | |
| Demand Flows (Total) | 578,021 | veh/y | 693,625 | pers/y |
| Delay | 543 | veh-h/y | 651 | pers-h/y |
| Effective Stops | 124,876 | veh/y | 149,851 | pers/y |
| Travel Distance | 585,976 | veh-km/y | 703,171 | pers-km/y |
| Travel Time | 10,406 | veh-h/y | 12,487 | pers-h/y |
| Cost | 247,052 | $/y | 247,052 | $/y |
| Fuel Consumption | 41,935 | L/y | | |
| Carbon Dioxide | 99,157 | kg/y | | |
| Hydrocarbons | 8 | kg/y | | |
| Carbon Monoxide | 119 | kg/y | | |
| NOx | 96 | kg/y | | |

# LANE FLOWS

## Site: 101 [Tallawong Rd / Southern Rd_AM]

New Site
Giveway / Yield (Two-Way)

**Approach Lane Flows (veh/h)**

South: Tallawong Rd Sth

| Mov. From S To Exit: | L2 W | T1 N | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 92 | 132 | 224 | 2.0 | 1885 | 0.119 | 100 | NA | NA |
| Lane 2 | - | 229 | 229 | 2.0 | 1925 | 0.119 | 100 | NA | NA |
| Approach | 92 | 361 | 453 | 2.0 | | 0.119 | | | |

North: Tallawong Rd Nth

| Mov. From N To Exit: | T1 S | R2 W | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 338 | - | 338 | 2.0 | 1925 | 0.176 | 100 | NA | NA |
| Lane 2 | 139 | 92 | 230 | 2.0 | 1311 | 0.176 | 100 | NA | NA |
| Approach | 477 | 92 | 568 | 2.0 | | 0.176 | | | |

West: Southern Access Rd

| Mov. From W To Exit: | L2 N | R2 S | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 92 | - | 92 | 2.0 | 1166 | 0.079 | 100 | 0.0 | 2 |
| Lane 2 | - | 92 | 92 | 2.0 | 261 | 0.351 | 100 | NA | NA |
| Approach | 92 | 92 | 183 | 2.0 | | 0.351 | | | |

| | Total | %HV | Deg.Satn (v/c) |
|---|---|---|---|
| Intersection | 1204 | 2.0 | 0.351 |

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

# LANE LEVEL OF SERVICE

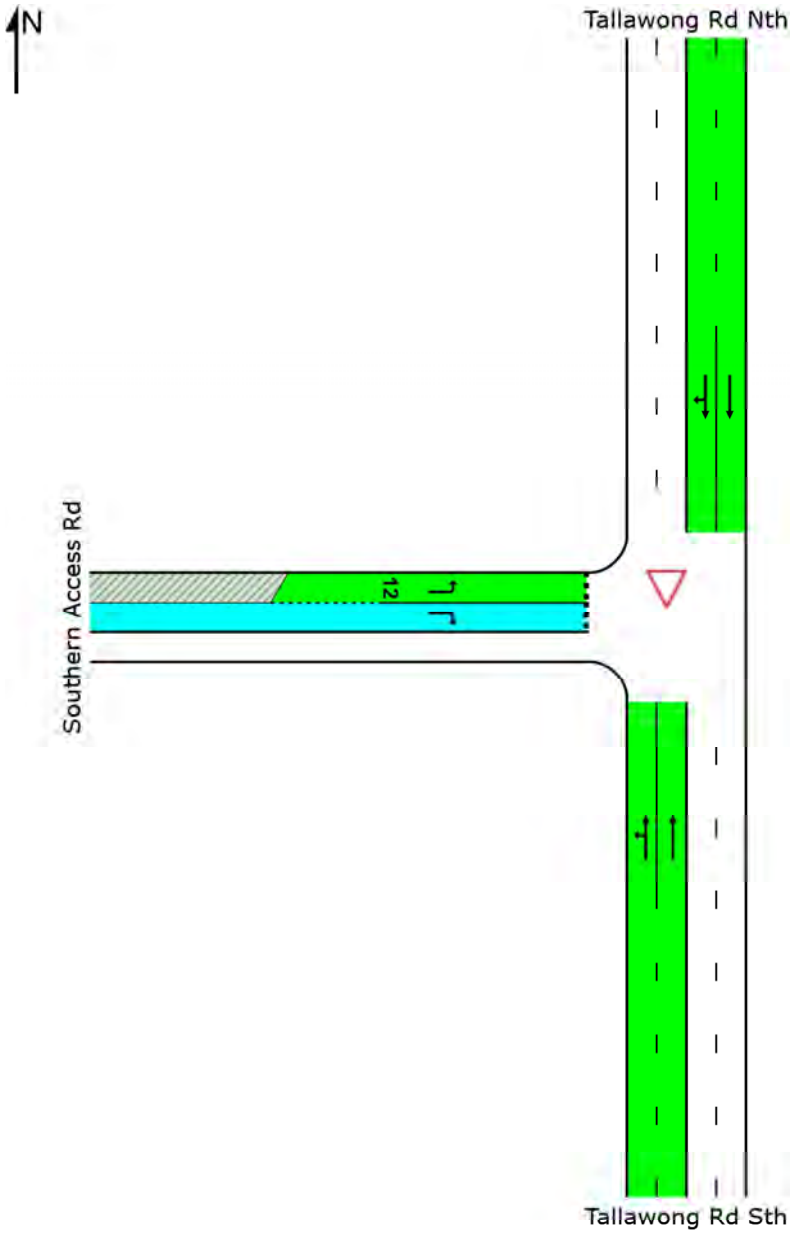
## Lane Level of Service

### Site: 101 [Tallawong Rd / Southern Rd_AM]

New Site
Giveway / Yield (Two-Way)

**All Movement Classes**

| | South | North | West | Intersection |
|---|---|---|---|---|
| LOS | NA | NA | A | NA |




Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab). SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

# LANE SUMMARY

## Site: 101 [Tallawong Rd / Southern Rd_AM]

New Site
Giveway / Yield (Two-Way)

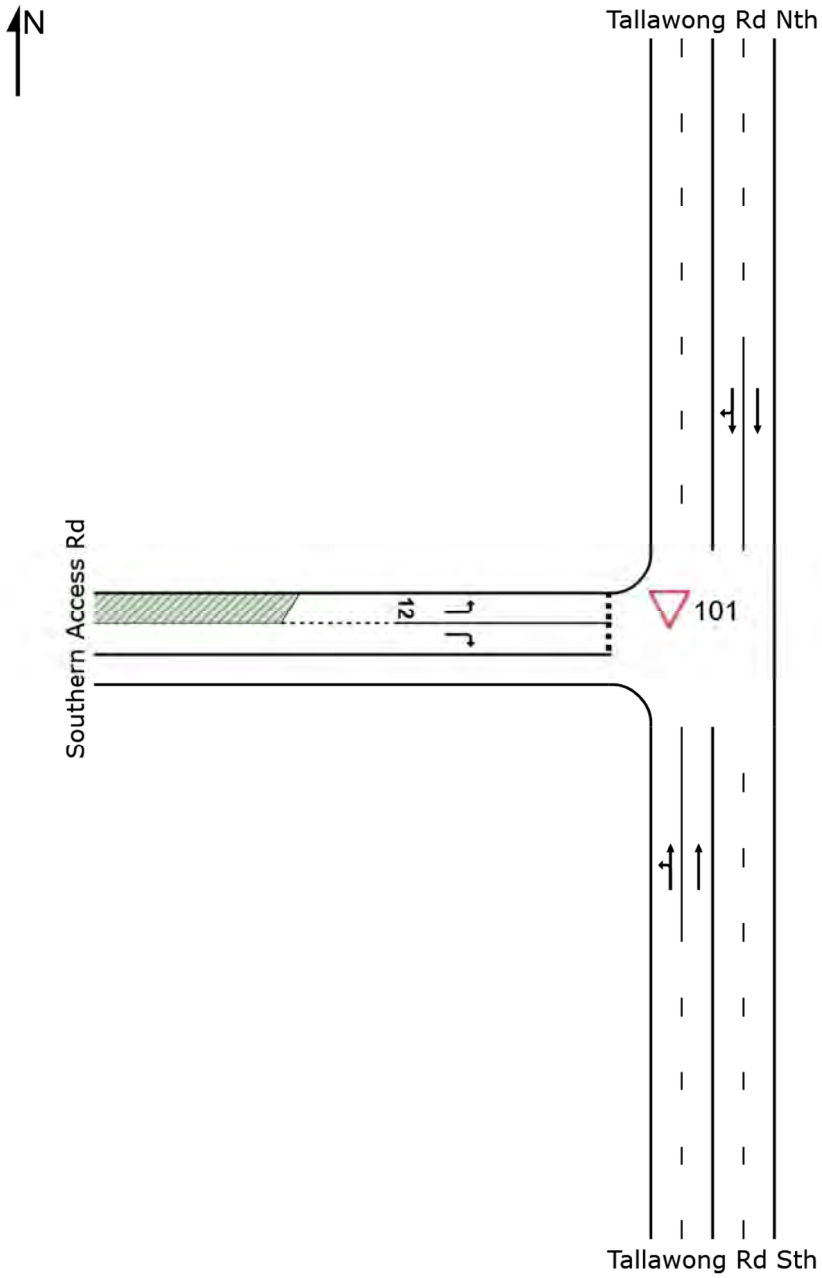
| Lane Use and Performance | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand Flows | | Cap. | Deg. Satn | Lane Util. | Average Delay | Level of Service | 95% Back of Queue | | Lane Config | Lane Length | Cap. Adj. | Prob. Block. |
| | Total veh/h | HV % | veh/h | v/c | % | sec | | Veh | Dist m | | m | % | % |
| South: Tallawong Rd Sth | | | | | | | | | | | | | |
| Lane 1 | 224 | 2.0 | 1885 | 0.119 | 100 | 2.3 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 2 | 229 | 2.0 | 1925 | 0.119 | 100 | 0.0 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Approach | 453 | 2.0 | | 0.119 | | 1.1 | NA | 0.0 | 0.0 | | | | |
| North: Tallawong Rd Nth | | | | | | | | | | | | | |
| Lane 1 | 338 | 2.0 | 1925 | 0.176 | 100 | 0.0 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 2 | 230 | 2.0 | 1311 | 0.176 | 100 | 4.2 | LOS A | 0.9 | 6.3 | Full | 500 | 0.0 | 0.0 |
| Approach | 568 | 2.0 | | 0.176 | | 1.7 | NA | 0.9 | 6.3 | | | | |
| West: Southern Access Rd | | | | | | | | | | | | | |
| Lane 1 | 92 | 2.0 | 1166 | 0.079 | 100 | 6.1 | LOS A | 0.3 | 2.1 | Short (P) | 12 | 0.0 | NA |
| Lane 2 | 92 | 2.0 | 261 | 0.351 | 100 | 22.0 | LOS B | 1.4 | 10.1 | Full | 500 | 0.0 | 0.0 |
| Approach | 183 | 2.0 | | 0.351 | | 14.1 | LOS A | 1.4 | 10.1 | | | | |
| Intersection | 1204 | 2.0 | | 0.351 | | 3.4 | NA | 1.4 | 10.1 | | | | |

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

# SITE LAYOUT

## Site: 101 [Tallawong Rd / Southern Rd_AM]

New Site
Giveway / Yield (Two-Way)



# LANE LEVEL OF SERVICE

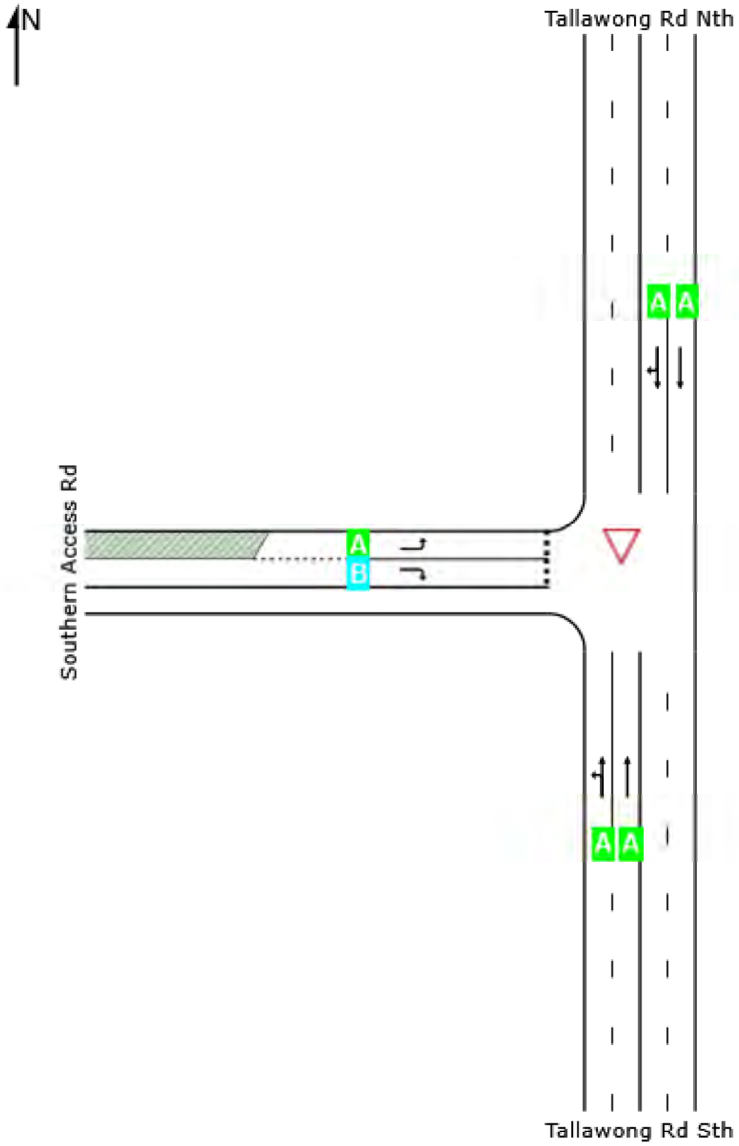
## Lane Level of Service

### Site: 101 [Tallawong Rd / Southern Rd_AM]

New Site
Giveway / Yield (Two-Way)

**All Movement Classes**

| | South | North | West | Intersection |
|---|---|---|---|---|
| LOS | NA | NA | A | NA |




Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

# MOVEMENT SUMMARY

## Site: 101 [Tallawong Rd / Southern Rd_AM]

New Site
Giveway / Yield (Two-Way)

| Movement Performance - Vehicles | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| South: Tallawong Rd Sth | | | | | | | | | | | |
| 1 | L2 | 92 | 2.0 | 0.119 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.24 | 56.2 |
| 2 | T1 | 361 | 2.0 | 0.119 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.09 | 59.2 |
| Approach | | 453 | 2.0 | 0.119 | 1.1 | NA | 0.0 | 0.0 | 0.00 | 0.12 | 58.5 |
| North: Tallawong Rd Nth | | | | | | | | | | | |
| 8 | T1 | 477 | 2.0 | 0.176 | 0.5 | LOS A | 0.9 | 6.3 | 0.12 | 0.08 | 58.8 |
| 9 | R2 | 92 | 2.0 | 0.176 | 8.0 | LOS A | 0.9 | 6.3 | 0.42 | 0.28 | 54.6 |
| Approach | | 568 | 2.0 | 0.176 | 1.7 | NA | 0.9 | 6.3 | 0.17 | 0.11 | 58.1 |
| West: Southern Access Rd | | | | | | | | | | | |
| 10 | L2 | 92 | 2.0 | 0.079 | 6.1 | LOS A | 0.3 | 2.1 | 0.23 | 0.56 | 52.8 |
| 12 | R2 | 92 | 2.0 | 0.351 | 22.0 | LOS B | 1.4 | 10.1 | 0.83 | 0.98 | 43.0 |
| Approach | | 183 | 2.0 | 0.351 | 14.1 | LOS A | 1.4 | 10.1 | 0.53 | 0.77 | 47.4 |
| All Vehicles | | 1204 | 2.0 | 0.351 | 3.4 | NA | 1.4 | 10.1 | 0.16 | 0.22 | 56.3 |

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.

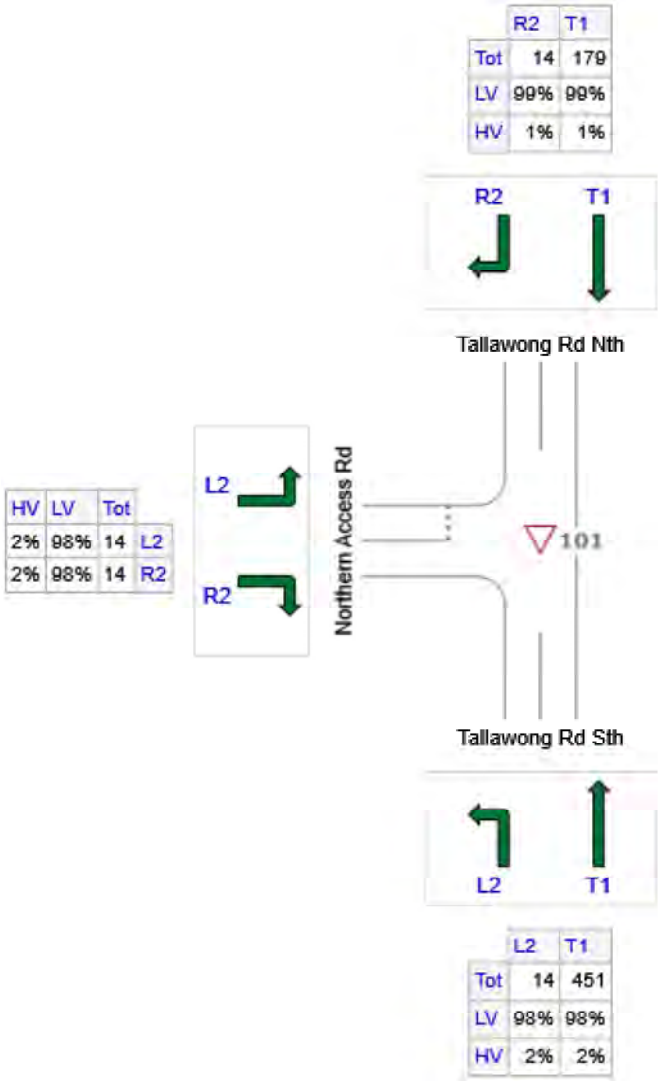
# INPUT VOLUMES

## Vehicles and pedestrians per 60 minutes

### Site: 101 [Tallawong Rd / Southern Rd_PM]

New Site
Giveway / Yield (Two-Way)

**Volume Display Method: Total and %**




| | All MCs | Light Vehicles (LV) | Heavy Vehicles (HV) |
|---|---|---|---|
| S: Tallawong Rd Sth | 465 | 456 | 9 |
| N: Tallawong Rd Nth | 193 | 191 | 2 |
| W: Northern Access Rd | 28 | 27 | 1 |
| Total | 686 | 674 | 12 |

# INTERSECTION SUMMARY

## Site: 101 [Tallawong Rd / Southern Rd_PM]

New Site
Giveway / Yield (Two-Way)

| Intersection Performance - Hourly Values | | | | |
|---|---|---|---|---|
| **Performance Measure** | **Vehicles** | | **Persons** | |
| Travel Speed (Average) | 59.1 | km/h | 59.1 | km/h |
| Travel Distance (Total) | 731.7 | veh-km/h | 878.1 | pers-km/h |
| Travel Time (Total) | 12.4 | veh-h/h | 14.9 | pers-h/h |
| Demand Flows (Total) | 722 | veh/h | 867 | pers/h |
| Percent Heavy Vehicles (Demand) | 1.7 | % | | |
| Degree of Saturation | 0.127 | | | |
| Practical Spare Capacity | 669.6 | % | | |
| Effective Intersection Capacity | 5671 | veh/h | | |
| Control Delay (Total) | 0.15 | veh-h/h | 0.18 | pers-h/h |
| Control Delay (Average) | 0.7 | sec | 0.7 | sec |
| Control Delay (Worst Lane) | 12.1 | sec | | |
| Control Delay (Worst Movement) | 12.1 | sec | 12.1 | sec |
| Geometric Delay (Average) | 0.5 | sec | | |
| Stop-Line Delay (Average) | 0.3 | sec | | |
| Idling Time (Average) | 0.1 | sec | | |
| Intersection Level of Service (LOS) | NA | | | |
| 95% Back of Queue - Vehicles (Worst Lane) | 0.2 | veh | | |
| 95% Back of Queue - Distance (Worst Lane) | 1.2 | m | | |
| Queue Storage Ratio (Worst Lane) | 0.00 | | | |
| Total Effective Stops | 38 | veh/h | 46 | pers/h |
| Effective Stop Rate | 0.05 | per veh | 0.05 | per pers |
| Proportion Queued | 0.04 | | 0.04 | |
| Performance Index | 12.9 | | 12.9 | |
| Cost (Total) | 267.42 | $/h | 267.42 | $/h |
| Fuel Consumption (Total) | 46.4 | L/h | | |
| Carbon Dioxide (Total) | 109.7 | kg/h | | |
| Hydrocarbons (Total) | 0.008 | kg/h | | |
| Carbon Monoxide (Total) | 0.137 | kg/h | | |
| NOx (Total) | 0.086 | kg/h | | |

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection 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.

| Intersection Performance - Annual Values | | | | |
|---|---|---|---|---|
| **Performance Measure** | **Vehicles** | | **Persons** | |
| Demand Flows (Total) | 346,611 | veh/y | 415,933 | pers/y |
| Delay | 71 | veh-h/y | 86 | pers-h/y |
| Effective Stops | 18,270 | veh/y | 21,924 | pers/y |
| Travel Distance | 351,238 | veh-km/y | 421,486 | pers-km/y |
| Travel Time | 5,941 | veh-h/y | 7,130 | pers-h/y |
| Cost | 128,359 | $/y | 128,359 | $/y |
| Fuel Consumption | 22,269 | L/y | | |
| Carbon Dioxide | 52,632 | kg/y | | |
| Hydrocarbons | 4 | kg/y | | |
| Carbon Monoxide | 66 | kg/y | | |
| NOx | 41 | kg/y | | |

# LANE FLOWS

## Site: 101 [Tallawong Rd / Southern Rd_PM]

New Site
Giveway / Yield (Two-Way)

**Approach Lane Flows (veh/h)**

South: Tallawong Rd Sth

| Mov. From S To Exit: | L2 W | T1 N | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 15 | 230 | 244 | 2.0 | 1919 | 0.127 | 100 | NA | NA |
| Lane 2 | - | 245 | 245 | 2.0 | 1925 | 0.127 | 100 | NA | NA |
| Approach | 15 | 475 | 489 | 2.0 | | 0.127 | | | |

North: Tallawong Rd Nth

| Mov. From N To Exit: | T1 S | R2 W | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 111 | - | 111 | 1.0 | 1937 | 0.057 | 100 | NA | NA |
| Lane 2 | 77 | 15 | 92 | 1.0 | 1606 | 0.057 | 100 | NA | NA |
| Approach | 188 | 15 | 203 | 1.0 | | 0.057 | | | |

West: Northern Access Rd

| Mov. From W To Exit: | L2 N | R2 S | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 15 | - | 15 | 2.0 | 1055 | 0.014 | 100 | 0.0 | 2 |
| Lane 2 | - | 15 | 15 | 2.0 | 422 | 0.035 | 100 | NA | NA |
| Approach | 15 | 15 | 29 | 2.0 | | 0.035 | | | |

| | Total | %HV | Deg.Satn (v/c) |
|---|---|---|---|
| Intersection | 722 | 1.7 | 0.127 |

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

# LANE LEVEL OF SERVICE

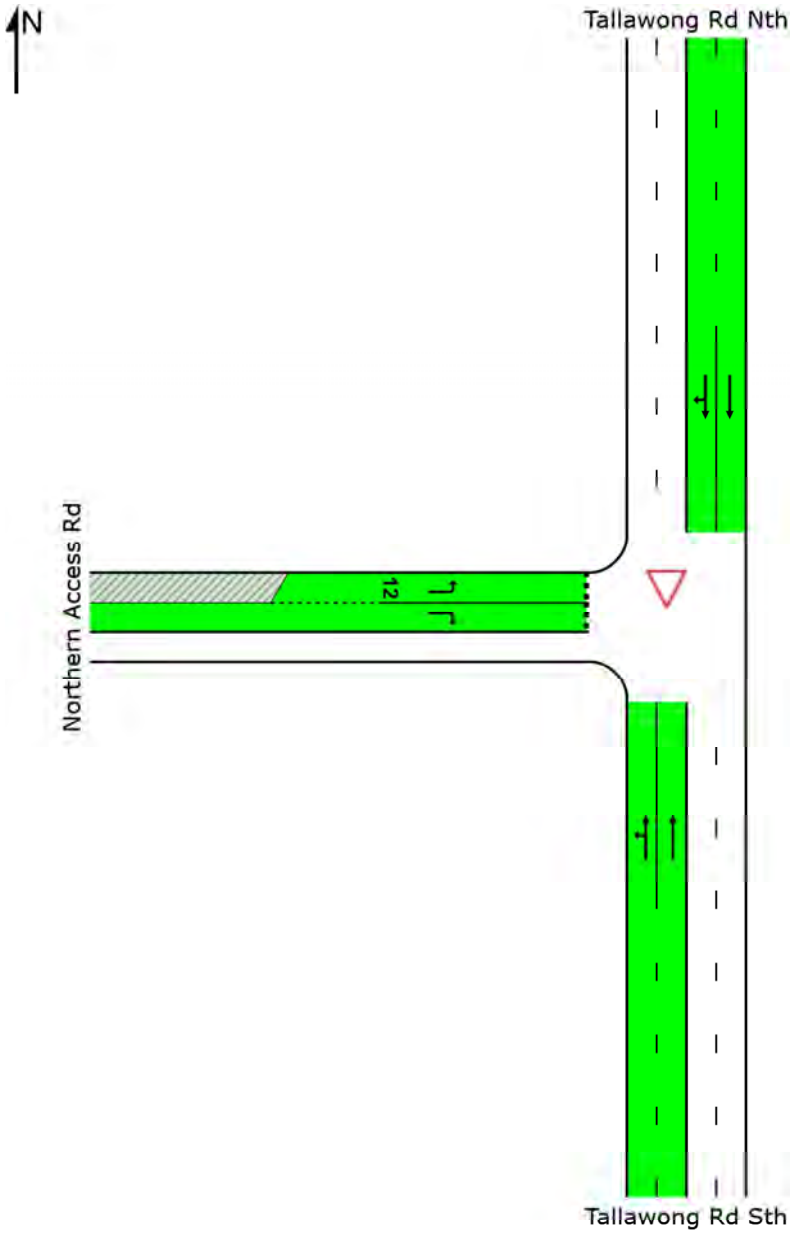
## Lane Level of Service

### Site: 101 [Tallawong Rd / Southern Rd_PM]

New Site
Giveway / Yield (Two-Way)

**All Movement Classes**

| | South | North | West | Intersection |
|---|---|---|---|---|
| LOS | NA | NA | A | NA |




Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab). SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

# LANE SUMMARY

## Site: 101 [Tallawong Rd / Southern Rd_PM]

New Site
Giveway / Yield (Two-Way)

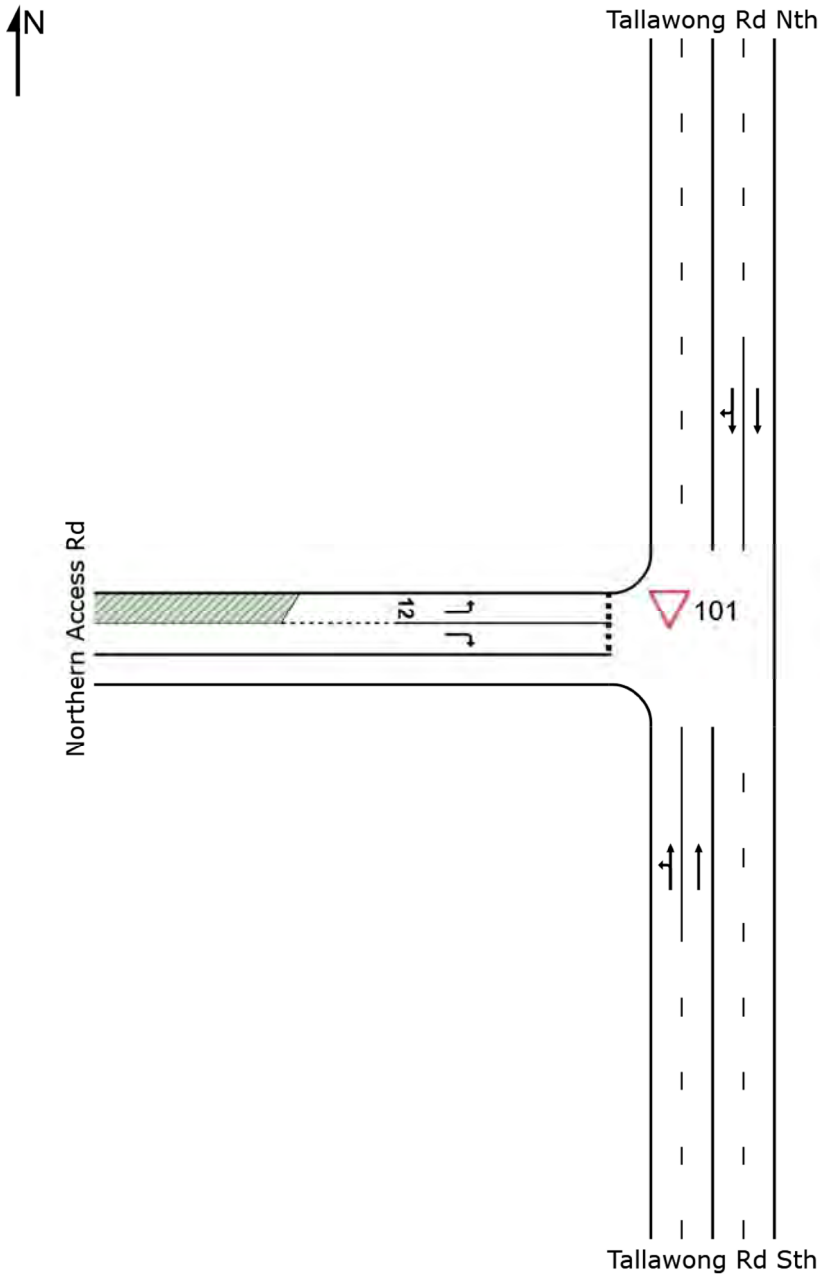
| Lane Use and Performance | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand Flows | | Cap. | Deg. Satn | Lane Util. | Average Delay | Level of Service | 95% Back of Queue | | Lane Config | Lane Length | Cap. Adj. | Prob. Block. |
| | Total veh/h | HV % | veh/h | v/c | % | sec | | Veh | Dist m | | m | % | % |
| South: Tallawong Rd Sth | | | | | | | | | | | | | |
| Lane 1 | 244 | 2.0 | 1919 | 0.127 | 100 | 0.3 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 2 | 245 | 2.0 | 1925 | 0.127 | 100 | 0.0 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Approach | 489 | 2.0 | | 0.127 | | 0.2 | NA | 0.0 | 0.0 | | | | |
| North: Tallawong Rd Nth | | | | | | | | | | | | | |
| Lane 1 | 111 | 1.0 | 1937 | 0.057 | 100 | 0.0 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 2 | 92 | 1.0 | 1606 | 0.057 | 100 | 1.9 | LOS A | 0.2 | 1.2 | Full | 500 | 0.0 | 0.0 |
| Approach | 203 | 1.0 | | 0.057 | | 0.9 | NA | 0.2 | 1.2 | | | | |
| West: Northern Access Rd | | | | | | | | | | | | | |
| Lane 1 | 15 | 2.0 | 1055 | 0.014 | 100 | 6.5 | LOS A | 0.0 | 0.3 | Short (P) | 12 | 0.0 | NA |
| Lane 2 | 15 | 2.0 | 422 | 0.035 | 100 | 12.1 | LOS A | 0.1 | 0.9 | Full | 500 | 0.0 | 0.0 |
| Approach | 29 | 2.0 | | 0.035 | | 9.3 | LOS A | 0.1 | 0.9 | | | | |
| Intersection | 722 | 1.7 | | 0.127 | | 0.7 | NA | 0.2 | 1.2 | | | | |

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
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.

# SITE LAYOUT

## Site: 101 [Tallawong Rd / Southern Rd_PM]

New Site
Giveway / Yield (Two-Way)



# LANE LEVEL OF SERVICE

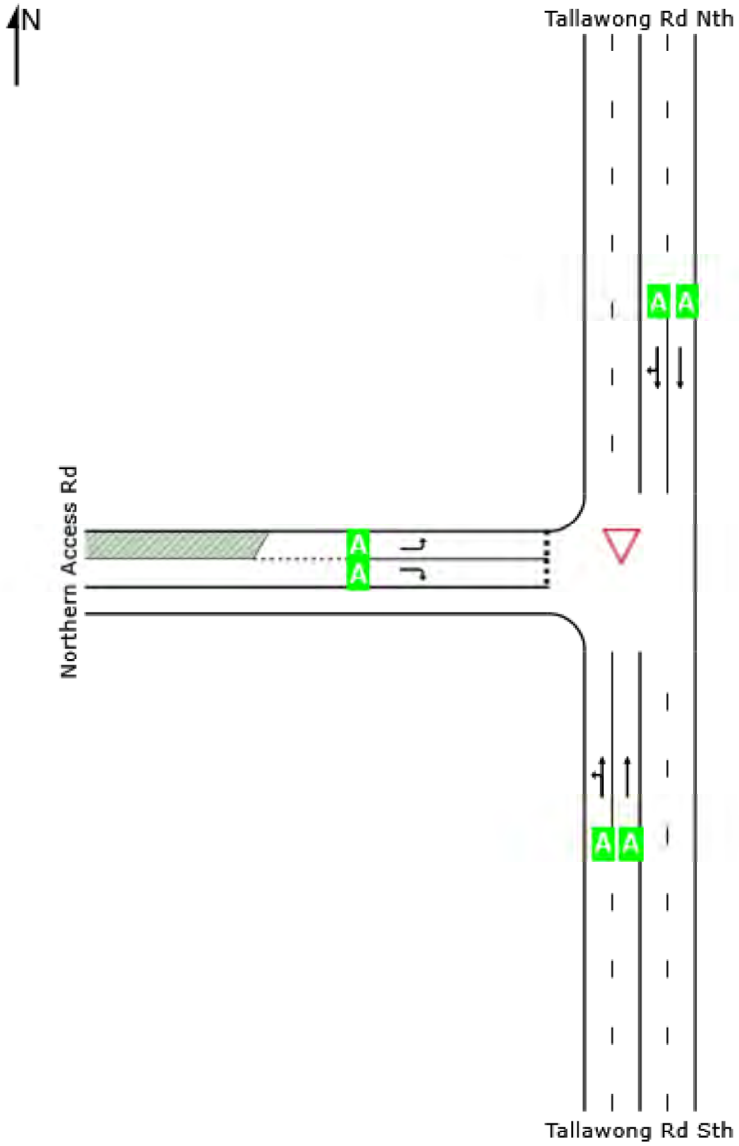
## Lane Level of Service

### Site: 101 [Tallawong Rd / Southern Rd_PM]

New Site
Giveway / Yield (Two-Way)

**All Movement Classes**

| | South | North | West | Intersection |
|---|---|---|---|---|
| LOS | NA | NA | A | NA |




Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

# MOVEMENT SUMMARY

## Site: 101 [Tallawong Rd / Southern Rd_PM]

New Site
Giveway / Yield (Two-Way)

| Movement Performance - Vehicles | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| South: Tallawong Rd Sth | | | | | | | | | | | |
| 1 | L2 | 15 | 2.0 | 0.127 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.04 | 57.9 |
| 2 | T1 | 475 | 2.0 | 0.127 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.02 | 59.8 |
| Approach | | 489 | 2.0 | 0.127 | 0.2 | NA | 0.0 | 0.0 | 0.00 | 0.02 | 59.8 |
| North: Tallawong Rd Nth | | | | | | | | | | | |
| 8 | T1 | 188 | 1.0 | 0.057 | 0.3 | LOS A | 0.2 | 1.2 | 0.08 | 0.04 | 59.2 |
| 9 | R2 | 15 | 1.0 | 0.057 | 7.9 | LOS A | 0.2 | 1.2 | 0.20 | 0.10 | 56.6 |
| Approach | | 203 | 1.0 | 0.057 | 0.9 | NA | 0.2 | 1.2 | 0.09 | 0.05 | 59.0 |
| West: Northern Access Rd | | | | | | | | | | | |
| 10 | L2 | 15 | 2.0 | 0.014 | 6.5 | LOS A | 0.0 | 0.3 | 0.31 | 0.56 | 52.6 |
| 12 | R2 | 15 | 2.0 | 0.035 | 12.1 | LOS A | 0.1 | 0.9 | 0.62 | 0.79 | 48.6 |
| Approach | | 29 | 2.0 | 0.035 | 9.3 | LOS A | 0.1 | 0.9 | 0.46 | 0.68 | 50.5 |
| All Vehicles | | 722 | 1.7 | 0.127 | 0.7 | NA | 0.2 | 1.2 | 0.04 | 0.05 | 59.1 |

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.

## 12. Appendix E – Preliminary Draft Construction Traffic Management Plan (CTMP)

# State Significant Development Application
# Proposed Sikh Grammar School, Rouse Hill

## Preliminary Construction Traffic Management Plan

Prepared for: Sikh Grammar School

April 2019

Report No: PT18022r02_V1

# TABLE OF CONTENTS

## List of Figures



## List of Tables

## 1. Introduction

This Preliminary Construction Management Plan (PCMP) has been prepared as required by the SEARs issued for the SSDA for the proposed development of the Sikh Grammar School, Rouse Hill behalf of the Sikh Grammar School Australia. This report presents a preliminary Construction Traffic Management Plan (CTMP) (including Preliminary Construction Traffic & Pedestrian Management Plan) for the staged construction of the Sikh Grammar School, Rouse Hill.

The SSDA submission (9472) is a State Significant Development Application under Section 4.12(8) of the Environmental Planning and Assessment Act & Schedule 2 of the Environmental Planning and Assessment Regulation 200083B of the EP&A Act, and addresses the SEARs issued by the Department of Planning on 6 August 2018 for the staged development of Sikh Grammar School, Rouse Hill.

The SSDA seeks consent for the staged development of the Sikh Grammar School based on:

- Multiple staged construction of school facilities including buildings, open space, car parking areas and bus facilities.
- Early Learning Centre
- Boarding House with capacity for 110 students
- Gurdwara & Langer Worship Centre

A presentation of each stage is provided in Section 3.1 of this report.

This PCMP is intended to describe the Project's key construction characteristics as requested in the SEARS, including

- *assessment of cumulative impacts associated with other construction activities (if any)*
- *an assessment of road safety at key intersection and locations subject to heavy vehicle construction traffic movements and high pedestrian activity*
- *details of construction program detailing the anticipated construction duration and highlighting significant and milestone stages and events during the construction process*
- *details of anticipated peak hour and daily construction vehicle movements to and from the site*
- *details of on-site car parking and access arrangements of construction vehicles, construction workers to and from the site,*
- *emergency vehicles and service vehicle*
- *details of temporary cycling and pedestrian access during construction.*

## 2. Existing Development / Conditions

The following presents a summary of existing site and traffic conditions.

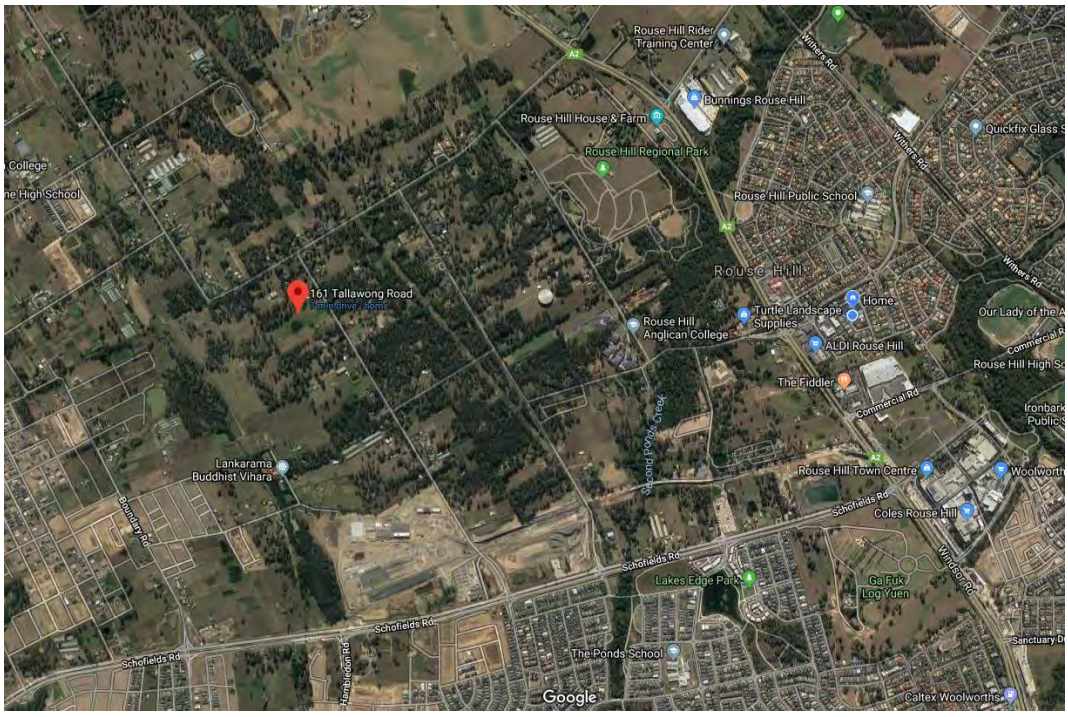
### 2.1 Site Location

The proposed school is located within the Riverstone East release area which is currently under development. Many of the existing properties include rural residential dwellings which would be converted into low – medium density residential development, recreational facilities, education and retail.

The precinct is part of the North Western Sydney Growth Area. At the time of preparing this report only Tallawong Road was in place of which would be subject to a future upgrade to provide additional capacity. The local streets surrounding the proposed school site are currently not constructed with only the southern boundary road under half road construction to serve an adjacent residential development. The formal address of the subject site is 151 – 161 Tallawong Road, Rouse Hill. The Riverstone East Precinct has been subject to extensive traffic modelling to underpin the approval of the release area. This is discussed further below.

The location of the development site is shown in Figure 1.

Figure 1 - Site Location




*Source: Google maps*

The context of the subject site within the local environment is shown in Figure 2.

Figure 2 – Local Environment of Subject Site


## 2.2 Existing Road Network

Tallawong Road – is a local street which links Guntawong Road in the north with Schofields Road in the south. The nature of the existing area with limited route choice, Tallawong Road functions as a local collector road. Across the frontage of the site, the road includes a single travel lane in each direction with unformed road shoulders and a posted speed limit of 50km/hr. The existing nature of the road environment is presented below in Figure 3.

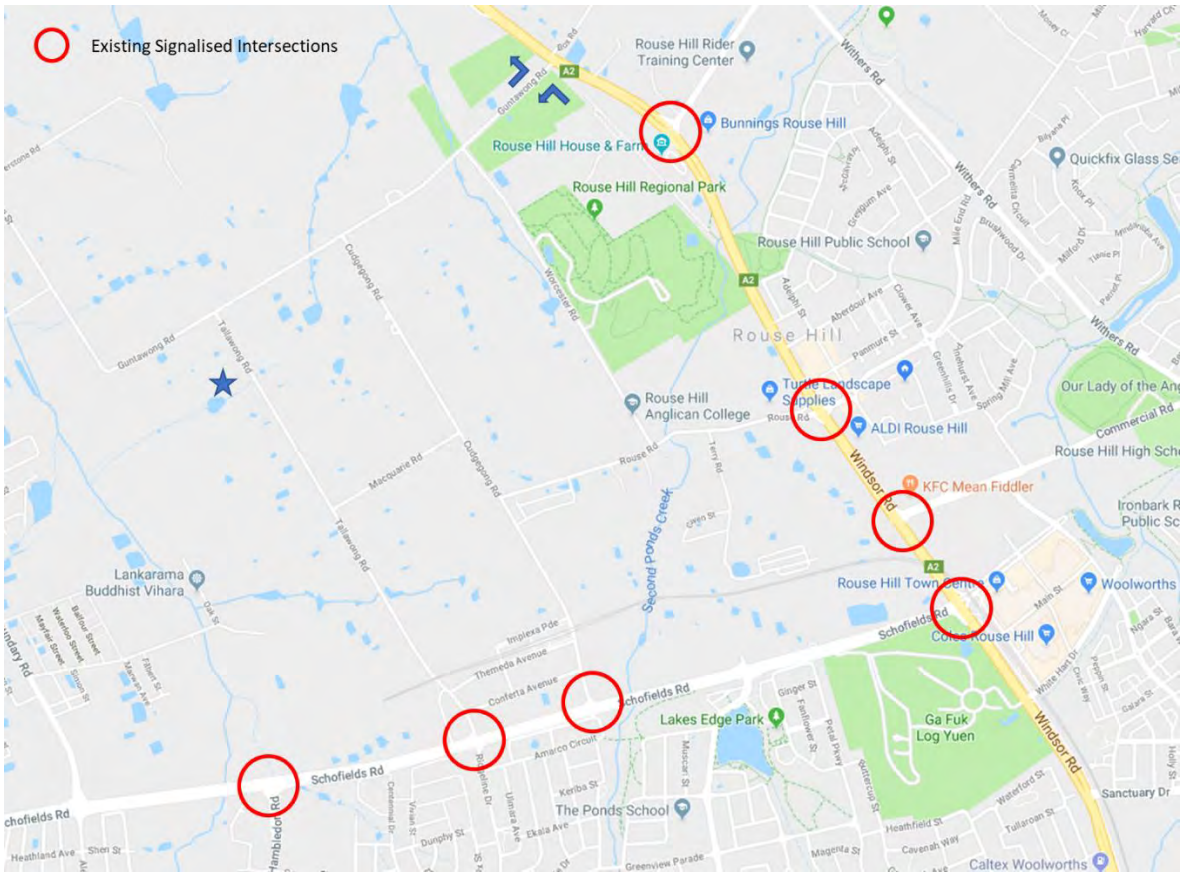
Figure 3 – Tallawong Road Existing Environment


Guntawong Road – is of a similar nature to Tallawong Road with a single travel lane in each direction, unformed road shoulders and a posted speed limit of 50km/hr. The road provides a left in / left out intersection access with Windsor Road, the main north-south arterial road through the area.

Schofields Road – is the main east-west sub arterial road through the area and has recently been subject to extensive upgrades and direct connection to Richmond Road in the west. The road now consists of two travel lanes in each direction with the majority of intersections controlled by traffic signals including Schofields Road / Tallawong Road and Schofields Road / Gudgegong Road.

The existing traffic controls at intersections in the vicinity of the proposed Sikh Grammar School, Rouse Hill is presented in

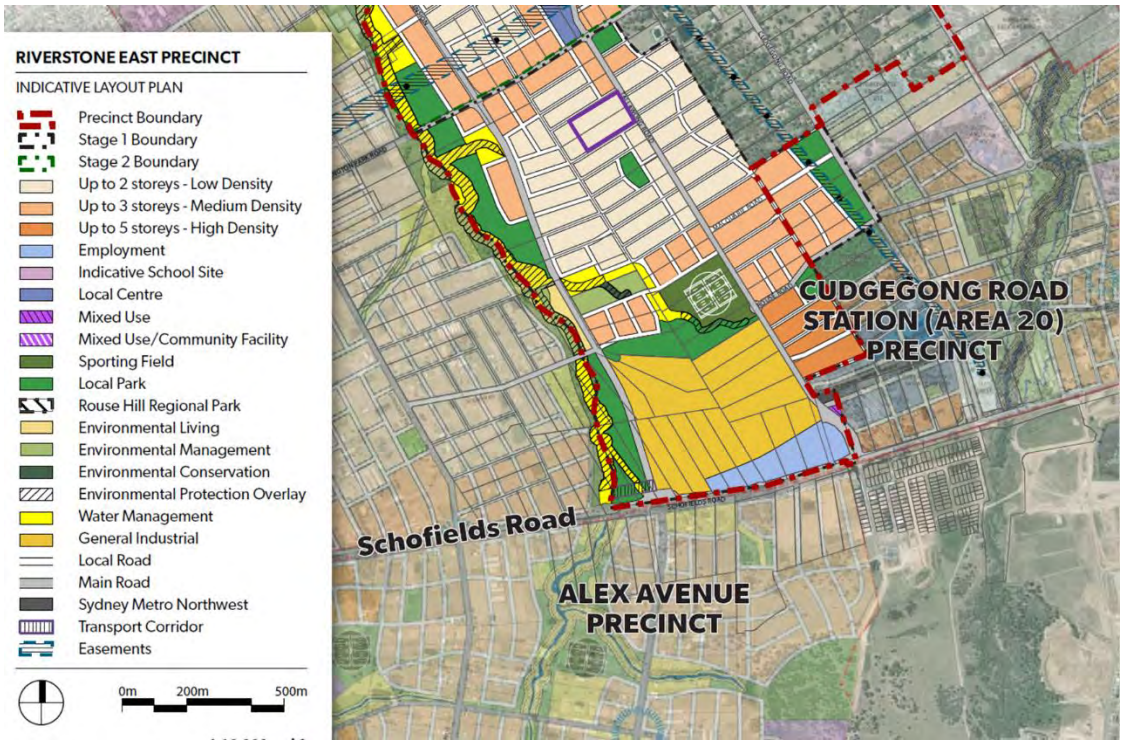
Figure 4 – Existing Intersection Traffic Controls




## 2.3 Future Road Network

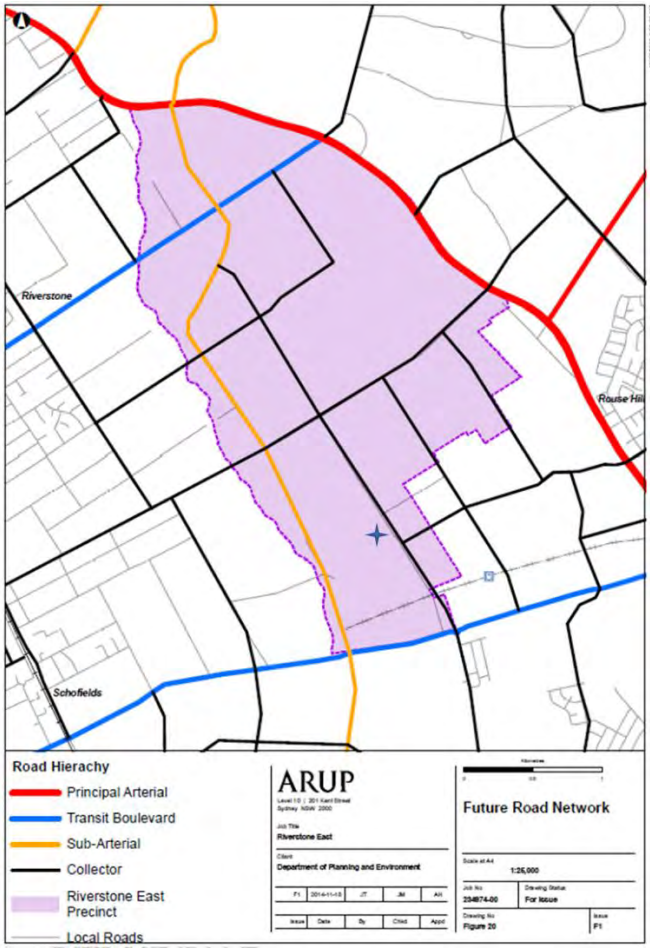
The site is located within the Riverstone East Precinct which is currently experiencing growth in development including improvements to some of the road networks. The location of the proposed school site within the context of the Riverstone East ILP is shown below in Figure 5.

Figure 5 – Proposed Site Location within Riverstone East ILP




The delivery of the Riverstone East Precinct will include upgrades to key roads in the area including Tallawong Road / Gundgegong Road as the precinct evolves. The proposed future road network in the vicinity of the site is shown below in Figure 6:

Figure 6 – Future Road Network in vicinity of development site




As shown in Figure 6, Tallawong Road will be upgraded to a 'collector road' classification for its entire length between Schofields Road and Guntawong Road.

## 3. The Proposed Development

The key components of the proposed development and associated public works are described below.

- A staged construction of a Kindergarten to High School which would achieve a potential capped student population of 1,260 students and total Gross Floor Area of 21,125m² of floorspace
- Basement car park with ultimate provision for 162 parking spaces with entry / exit access via the northern and southern local roads which form the boundaries of the site. This car park would also include a 11 space Kiss and Drop facility.
- Early Learning Centre with capacity for 86 children and a 33-space car park with entry / exit access via the southern boundary local street.
- Student accommodation for up to 110 students, 6 staff with 13 space basement car park
- Temporary 43 space car park on the north – western corner of the site which would be removed upon construction of the 162-space basement car park.
- Gurdwara and Langar Worship Centre with a Gross Floor Area of 2,710m² (maximum capacity for 700 persons)
- Langer ancillary food preparation area internal to the Gurdwara and Langar Worship Centre
- Indented bus bay with capacity for three (3) full sized buses in Tallawong Road along the eastern boundary of the school.
- A construction program of approximately 10 years.

A summary of the number of persons / staff for each component of the project is presented below in Table 1.

Table 1 - Estimated Student / Staff Numbers by Use

| Item | Details |
|---|---|
| Early Learning Centre | 86 place / 18 staff |
| Primary School | 588 students (based on 28 per class) + 30 staff |
| Secondary School - 4 Stream | 672 students (based on 28 per class) + 47 staff |
| Administration & Staff | 25 staff |

It should be noted that the proposed large basement car park would serve both school and worship uses on the site. However, to ensure the total available on-site parking is available for each use, the Gurdwara and Langar Worship Centre would not be opened during school hours on any weekday.

### 3.1 Development Staging

Detailed staging plans of each component of the development included expected student population is presented in Appendix A of this report.

For ease of reference, the following summary presents the anticipated student population

Table 2 – Summary of Proposed Staging

| Stage | Items | Max No. Students | No. Parking Spaces |
|---|---|---|---|
| 1 | • Tallawong Rd Upgrade<br>• New northern local road half construction<br>• Relocatable primary school building<br>• Open space | 168 | 19 |
| 2 | • Permanent private school building<br>• Open space | 420 | 47 |
| 3 | • Additional primate school buildings<br>• Half western boundary road construction<br>• Southern boundary road future car park access | 680 | 75 |
| 3B | • Early learning centre<br>• Early learning centre car park | 680 school / 86 early learning centre | 75 school / 36 early learning centre |
| 4 | • Secondary school<br>• Additional parking | 900 school / 86 early learning centre | 111 school / 36 early learning centre |
| 5 | • Additional Secondary School buildings<br>• At Grade Kiss & Drop facilities | 1,150 school / 86 early learning centre | 139 school / 36 early learning centre |
| 6 | • Additional Secondary School buildings | 1,260 school / 86 early learning centre | 162 school / 36 early learning centre |
| 7 | • Multi purpose hall for school<br>• Gurdwara / Langer Worship building<br>• Basement car park with northern and southern boundary road connections | 1,260 school / 86 early learning centre | 162 school / 36 early learning centre |
| 8 | • Administration building<br>• Boarding house (110 students)<br>• Staff accommodation (6 dwellings) | 1,260 school / 86 early learning centre | 162 school / 36 early learning centre / 13 space boarding house |

# 4. Preliminary Construction Traffic Management Plan

## 4.1 Introduction

At this stage of planning and without a construction company formally commissioned to undertake any stage of the proposal, finer grain details of expected construction traffic demands are not known. These details include volumes of materials removed and taken to the site for each stage, number of construction workers and all relevant information which would underpin traffic demand forecasts.

Thus, it is expected that for each stage of the development a separate Construction Traffic Management Plan / Pedestrian Management Plan would be prepared accordingly and submitted for approval.

The anticipated construction program for the school as a whole is 10years. The time for each stage of the project is not available at the time of preparing this preliminary CTMP.

## 4.2 Vehicle Access

- No vehicle access would be permitted via the Tallawong Road site frontage at any stage of the construction program.
- It is anticipated that the construction contractor(s) will update the construction traffic & pedestrian management plan for each stage of the project prior to obtaining a construction certificate.
- The contractor will monitor and coordinate all vehicles entering and exiting the Construction sites.
- Not road closures of any kind is envisaged throughout the life of the construction of the school.
- Appropriate traffic controls will be put in place during construction to separate construction activities from the public. In addition, traffic controllers will be engaged to manage the interface between pedestrians and to direct vehicles entering and leaving the site.
- Any work from neighbouring properties will be managed and coordinated with these stakeholders to maintain access and amenity.
- The number and path of vehicle movements will vary during the construction period of the project. The majority of construction vehicles will access directly onto the work sites.

## 4.3 Construction Vehicle Routes of Travel

The existing and enhanced road network of the Riverstone East Precinct enables larger vehicles to travel to / from the school without the need to do so via a local street network to any great extent.

The northern and southern local street boundary roads of the school would be utilised throughout the development of the school. The placement of the bus facilities directly in Tallawong Road enables construction activities to occur around school operations without the need to impact on pedestrian access to bus operations.

All heavy vehicles involved in the demolition, excavation and construction of the proposed development would approach and depart the site as shown in Figure 7and Figure 8.

Figure 7 – Proposed Inbound Truck Routes

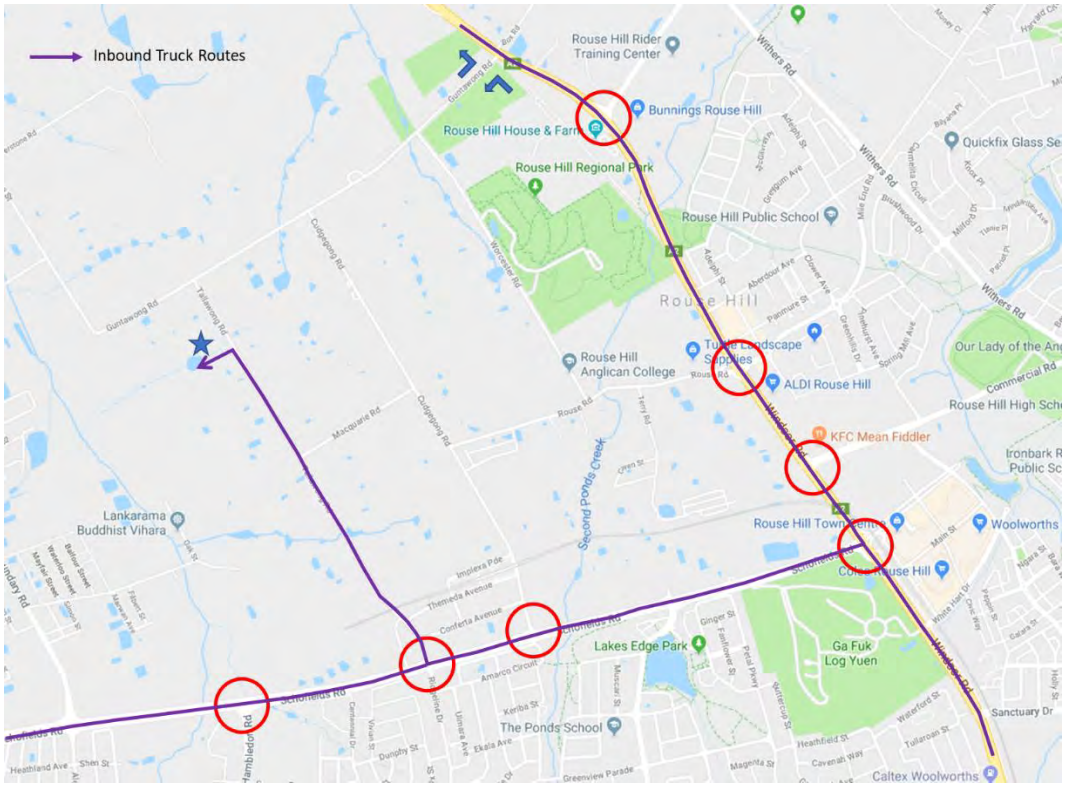
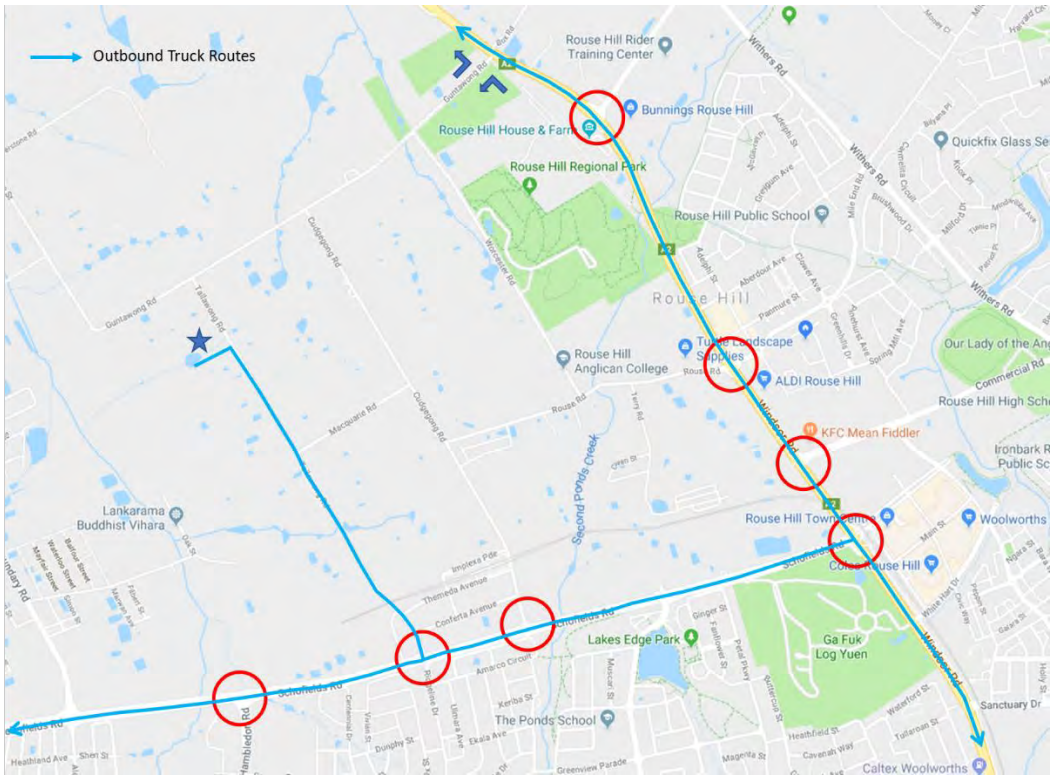



Figure 8 – Proposed Outbound Truck Routes



- The site manager will ensure that the route map is prominently displayed on the site and that all contractors and employees are given a copy of the route map and understand their obligations as part of their site induction procedure.
- Light traffic roads and those subject to load or height limits will be avoided as well as minimising heavy vehicle movements during school peak periods.

## 4.4 Loading / Unloading

- No loading or unloading of any vehicle would occur via the Tallawong Road frontage during any stage of the construction project.
- Whilst working on site can occur during the abovementioned construction hours, the site manager will endeavour to restrict truck loading/unloading outside peak school drop-off/pick-up periods.
- Construction material delivery trucks, including concrete pumping, will occur within the site where possible or from potential Works Zones typically using small and medium rigid trucks.
- As necessary, RMS-accredited traffic controllers will be in place at all times during truck movements to ensure the safety of pedestrians and minimise disruption to local traffic.
- The site manager will co-ordinate the work such that two deliveries do not occur at the same time, unless they can be both accommodated on site or within the potential Works Zones.
- All materials are to be stored on site. At no time are materials to be stored on any road or Council property unless prior approval is granted by Blacktown City Council.

## 4.5 Neighbouring Properties

- All neighbouring properties are to have their access maintained at all times.
- All nearby residents and businesses will be updated on a regular basis and at key construction stages with respect to the construction process, particularly in relation to construction vehicles movements, and be provided with a phone number to contact the site manager.
- Furthermore, the site manager must liaise with the site managers of any nearby construction sites to ensure that appropriate measures are in place to prevent the combined impact of construction activities, such as (but not limited to) concrete pours, crane lifts and spoil truck routes.
- Along with Council's and other statutory requirements, a minimum seven (7) days notification should be provided to adjoining property owners prior to the implementation of any temporary traffic control measures.

## 4.6 General Matters

### *4.6.1 Site Fencing, Hoardings and Accommodation*

- Temporary Site fencing and gates will be installed around all internal and external construction site areas.
- Temporary B-Class hoardings and scaffold systems will be installed to boundaries adjoining the Demolition and overhead Construction site areas.
- Site accommodation will be established subject to the amount of personnel working on site by stage.

- Temporary hoardings and signage will be adopted in working areas at all times during construction.

### 4.6.2 Temporary Utilities and Services

- All existing services in the construction area will be identified and located to minimise disruption to the construction works and to adjacent facilities. Thorough investigation and staging of works will be undertaken to ensure that any capping and removal of services does not affect other Stages of the School.
- All existing services and utilities shall be disconnected and /or diverted around building work areas prior to demolition or construction works commencing. These services works will be carried out with the relevant utilities or services provider.
- Reticulated power and lighting installations will comply to the requirements of the WH&S Regulations, Electricity Supply Authority and the Code of Practice for Temporary Electrical Installations on Building and Construction Sites.
- Noise, air and vibration monitoring units will be established to manage air quality and vibration movement during the demolition and construction of the Project.

### 4.6.3 Cranage and Materials Handling

- It is expected that Mobile cranes will also be intermittently required to facilitate some of the loading of materials on to the sites.
- Although lifting will most likely be from construction delivery vehicles and contractor laydown areas within the site, in some instances, crane(s) will need to be capable of lifting from construction vehicles from approved work zones.
- Demolition and Excavation material disposal and delivery of small items will be undertaken via designated gates at site boundaries for each stage of construction.
- Delivery of Structural Steel frames and beams will most likely occur using a table top semi-trailer, prime mover.
- Smaller building elements can be lifted from within the site or approved work zones, delivered via smaller table top trucks.

### 4.6.4 Site Safety Management and Work Method Statements

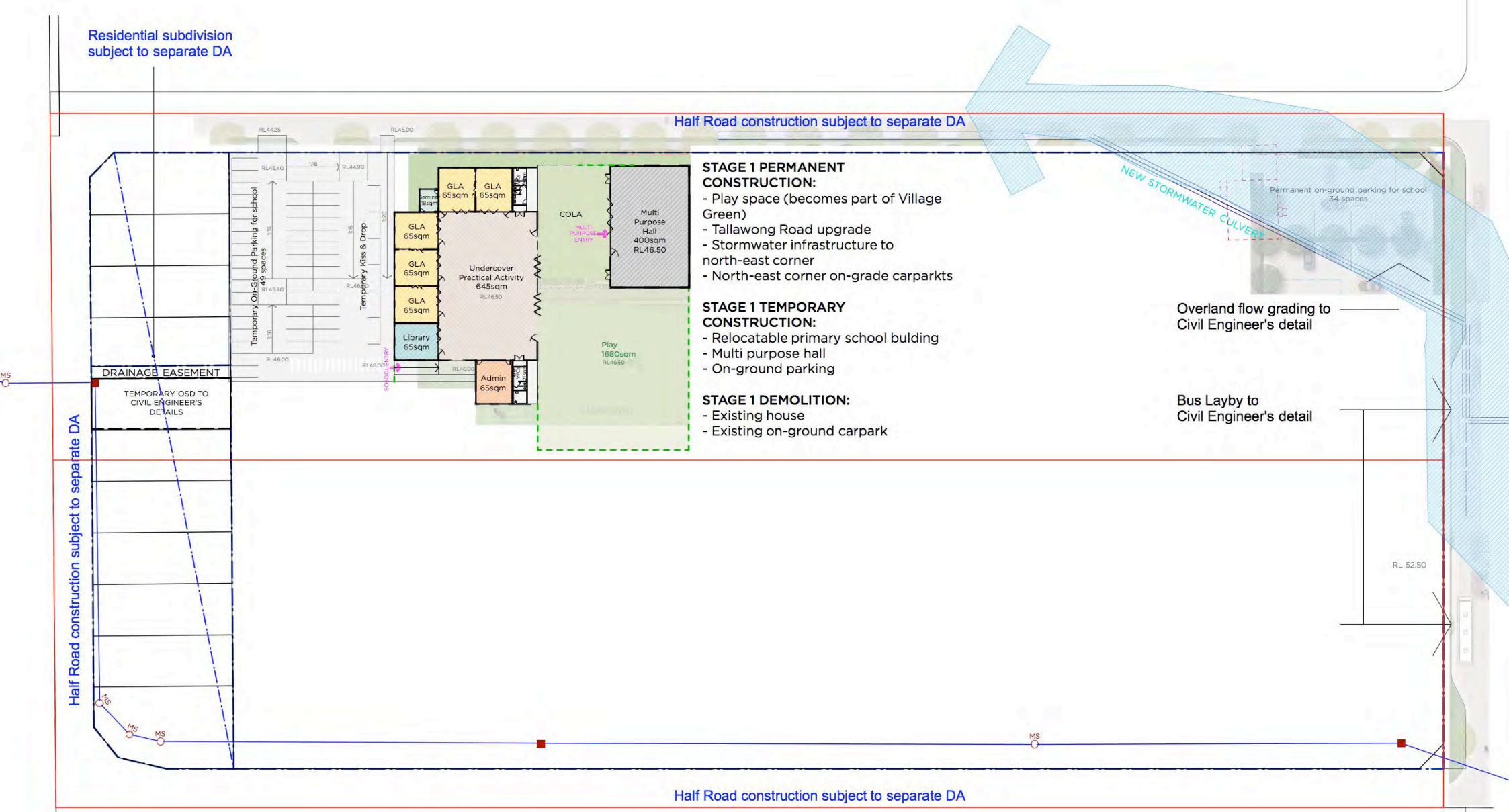
- A Site Safety Plan and safe work method statements will be developed by the Construction Contractor to demonstrate the commitment to Work Health & Safety (WH&S) prior to construction of any stage of the project.
- The site safety plan is required to identify the scope of work to be undertaken, the hazards associated with the work and the risk assessment processes and risk control measures to be used in the execution of the project activities.
- Objectives for a Site Safety Plan include the following:
  a) maintain lost time injury reporting and review positive performance indicators,
  b) report all incidents and near misses and develop corrective action plans,
  c) conduct Senior Management and WH&S Group reviews,
  d) develop required WH&S resources,

e) formalise regular senior management reviews of WH&S systems and implement relevant improvements,
f) continually develop WH&S systems, policies, procedures and WH&S Plans to comply with statutory requirements and industry best practice,
g) maintain an Audit Programme to comply with system's requirements,
h) ensure all corrective actions and Non-Conformances are closed out,
i) meet or exceed the requirements of AS 4801 certification and Federal Safety commission accreditation,
j) adopt a zero tolerance safety philosophy,
k) provide Safety Awareness and other appropriate WH&S training,
l) continue to implement ongoing induction procedures on all Projects,
m) hold regular Consultative Committee meetings, maintain minutes and record actions,
n) issue Safety Alerts to all staff and other stakeholders according to requirements,
o) conduct and record regular toolbox meetings on site.

- A Site Safety Plan would also outline the key responsibilities for achieving the above objectives. A statement of responsibilities by the Construction Contractor would identify who will be responsible for the following:
  a) undertake audits to ensure appropriate implementation of the WH&S Plan occurs,
  b) coordinate WH&S training,
  c) establish, implement and maintain procedures for controlling all relevant documents and data required,
  d) implement WH&S matters in construction design and planning,
  e) make all reasonable endeavours to ensure that the WH&S management system is established, implemented and maintained on the Project,
  f) monitor and constantly review risk management to the site,
  g) ensure all Work Method Statements have been received on site prior to the commencement of work.
- 72 The Site Safety Plan would also address the following requirements, as required:
  a) Working with Children legislation and school policies.
  b) WH&S training – identification of WH&S training needs of all personnel, induction training, refresher training, attendance of WH&S committee personnel at consultation training etc;

  c) incident management – identifies who will be available during and outside normal working hours to prevent, prepare for, respond to and recover from illness/ injury and incidents;
  d) site safety rules – As a minimum will include induction and safety training, PPE, Site access and security, emergency procedures, illness and injury, protection of personnel and the public, work at elevated areas, safe working, hazardous materials and dangerous goods etc;
  e) Safe Work Method Statements – All activities assessed as having WH&S risks require a SWMS to be prepared and implemented.

## 5. Appendix A – Proposed Development Detailed Staging Plans




## STAGE 1: PRIMARY SCHOOL

| | | | |
|---|---|---|---|
| Maximum students | 168 | GFA | 1085sqm |
| Outdoor space | 1680sqm | Roof area | 1140sqm |
| Total Parking spaces | 83 | Hardscape | 2000sqm |

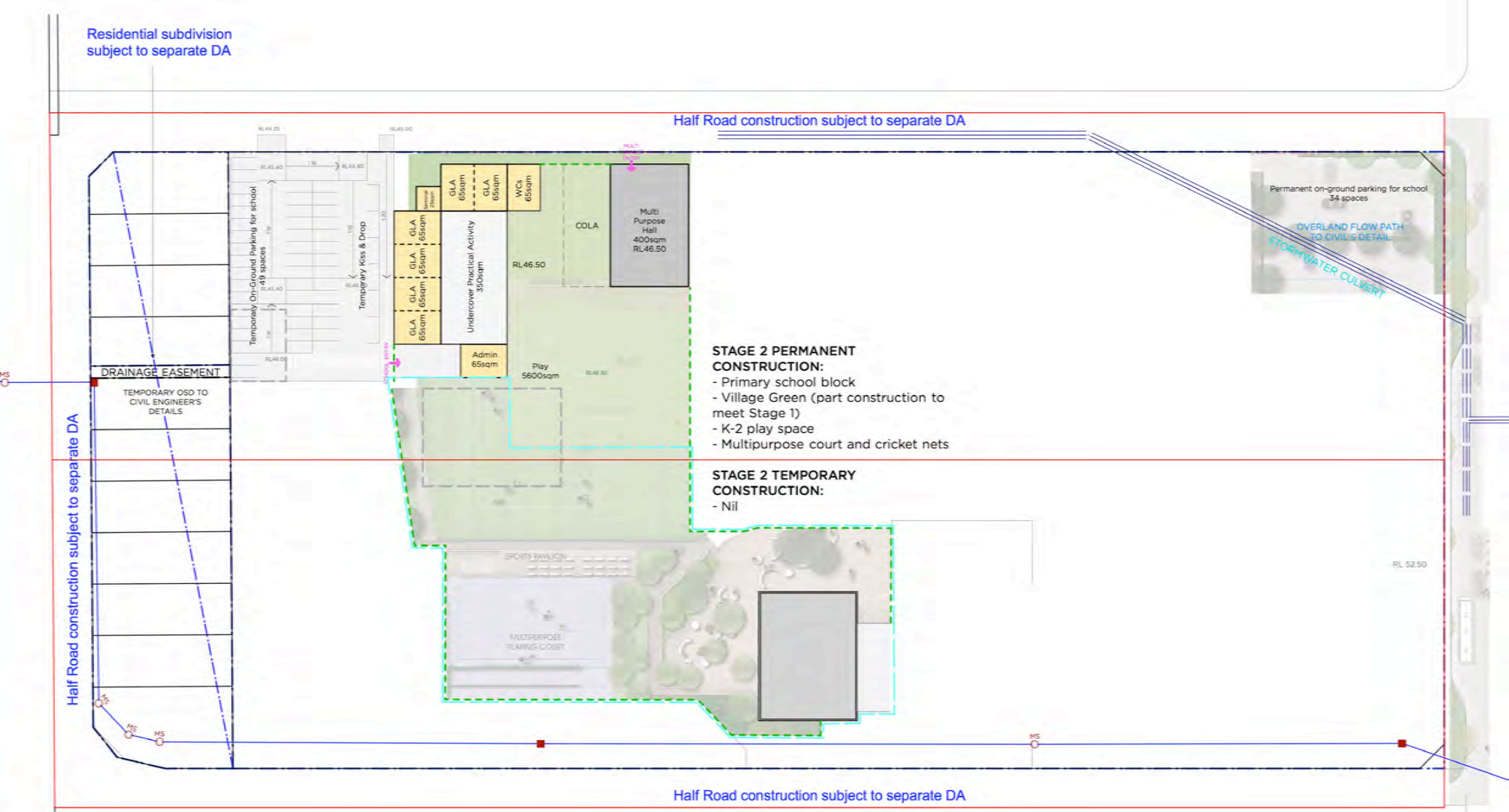
Existing boundary
New boundary
Extent of current Stage
Temporary school fence

PMDL ARCHITECTURE INTERIORS MASTERPLANNING

**Stage 1**

**Sikh Grammar School**


pmdl.com.au | Project 2757 | Scale 1:750@A3 | Date MAR 2019 | Dwg DA131




## STAGE 2: PRIMARY SCHOOL

| | | | |
|---|---|---|---|
| Maximum students | 420 | GFA | 2763sqm |
| Outdoor space | 4200sqm | Roof area | 1795sqm |
| Total Parking spaces | 83 | Hardscape | 4840sqm |

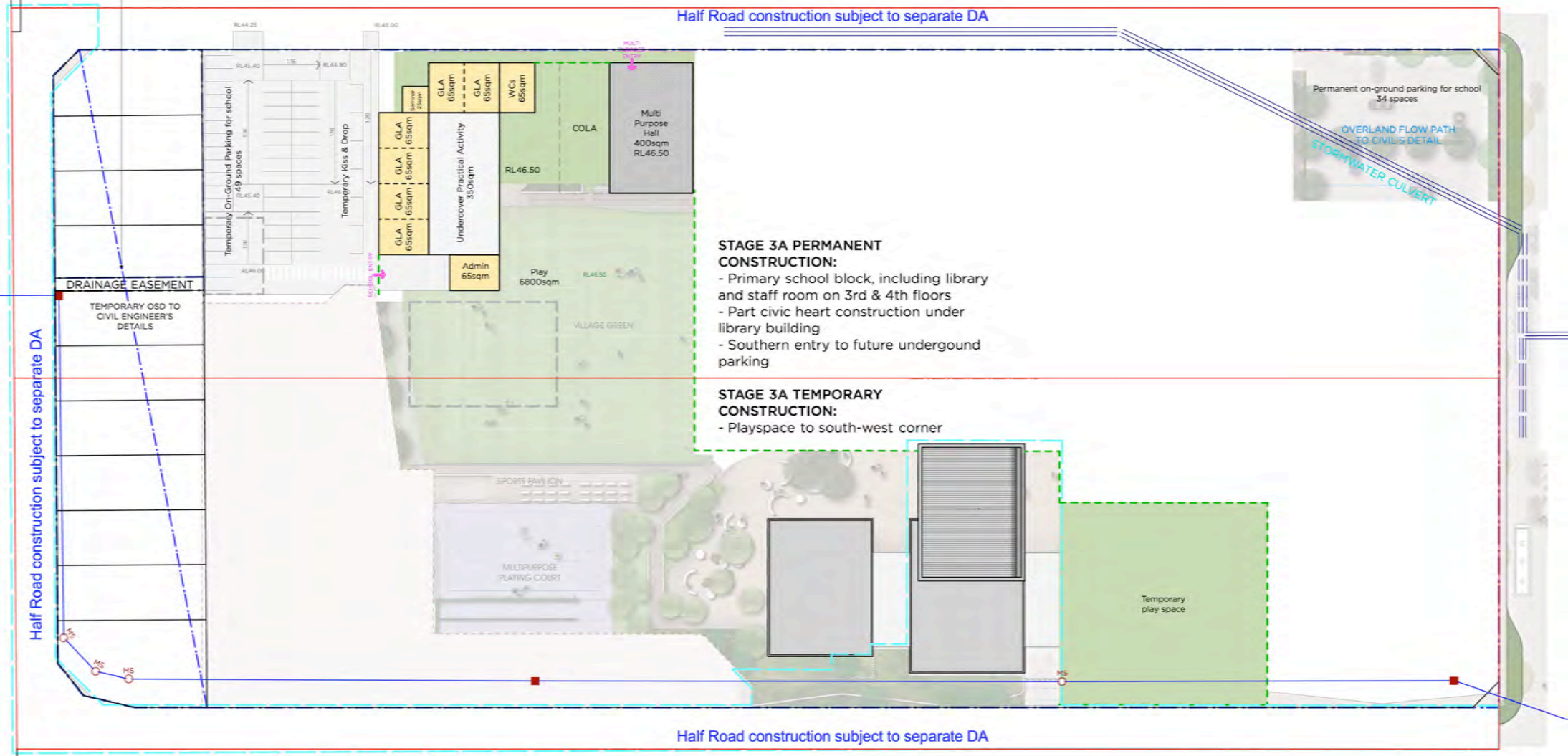
Existing boundary
New boundary
Extent of current Stage
Future contruction
Temporary school fence

**Stage 2**

PMDL ARCHITECTURE INTERIORS MASTERPLANNING

**Sikh Grammar School**

| © PMDL | Project | Scale | Date | Dwg |
|---|---|---|---|---|
| pmdl.com.au | 2757 | 1:750@A3 | MAR 2019 | DA132 |




## STAGE 3: PRIMARY SCHOOL

| | | | |
|---|---|---|---|
| Maximum students | 680 | GFA | 5668sqm |
| Outdoor space | 6800sqm | Roof area | 2860sqm |
| **Total Parking spaces** | **83** | Hardscape | 5410sqm |

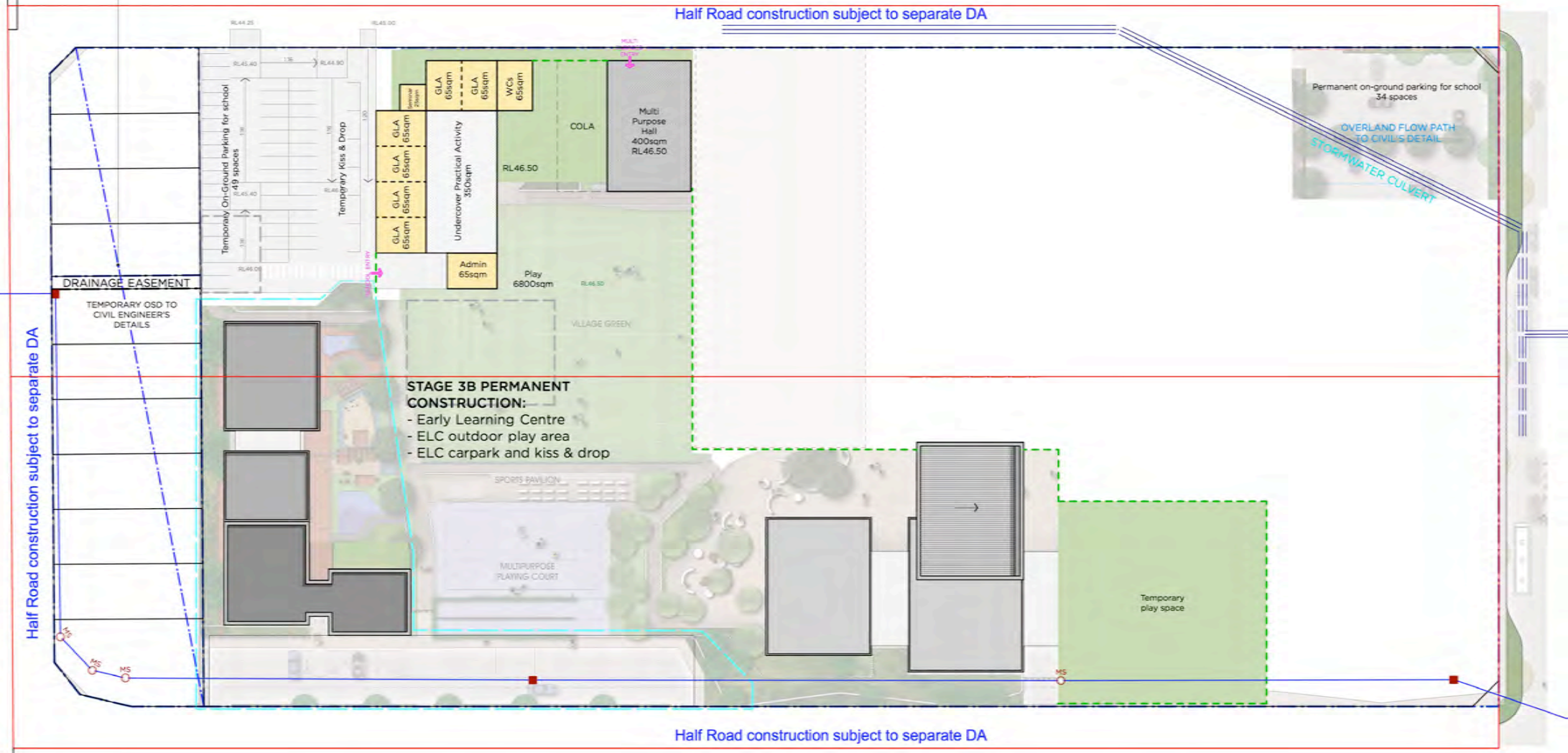
Existing boundary
New boundary
Extent of current Stage
Future contruction
Temporary school fence

PMDL ARCHITECTURE INTERIORS MASTERPLANNING

**Stage 3A**

Sikh Grammar School

| © PMDL | Project | Scale | Date | Dwg |
|---|---|---|---|---|
| pmdl.com.au | 2757 | 1:750@A3 | MAR 2019 | DA133 |




## STAGE 3B: EARLY LEARNING CENTRE

| | | | |
|---|---|---|---|
| Maximum students | 86 | GFA | 7403sqm |
| Outdoor space | 860sqm | Roof area | 3840sqm |
| Parking spaces | | Hardscape | 6670sqm |
| **Total Parking Spaces:** | **115** | | |

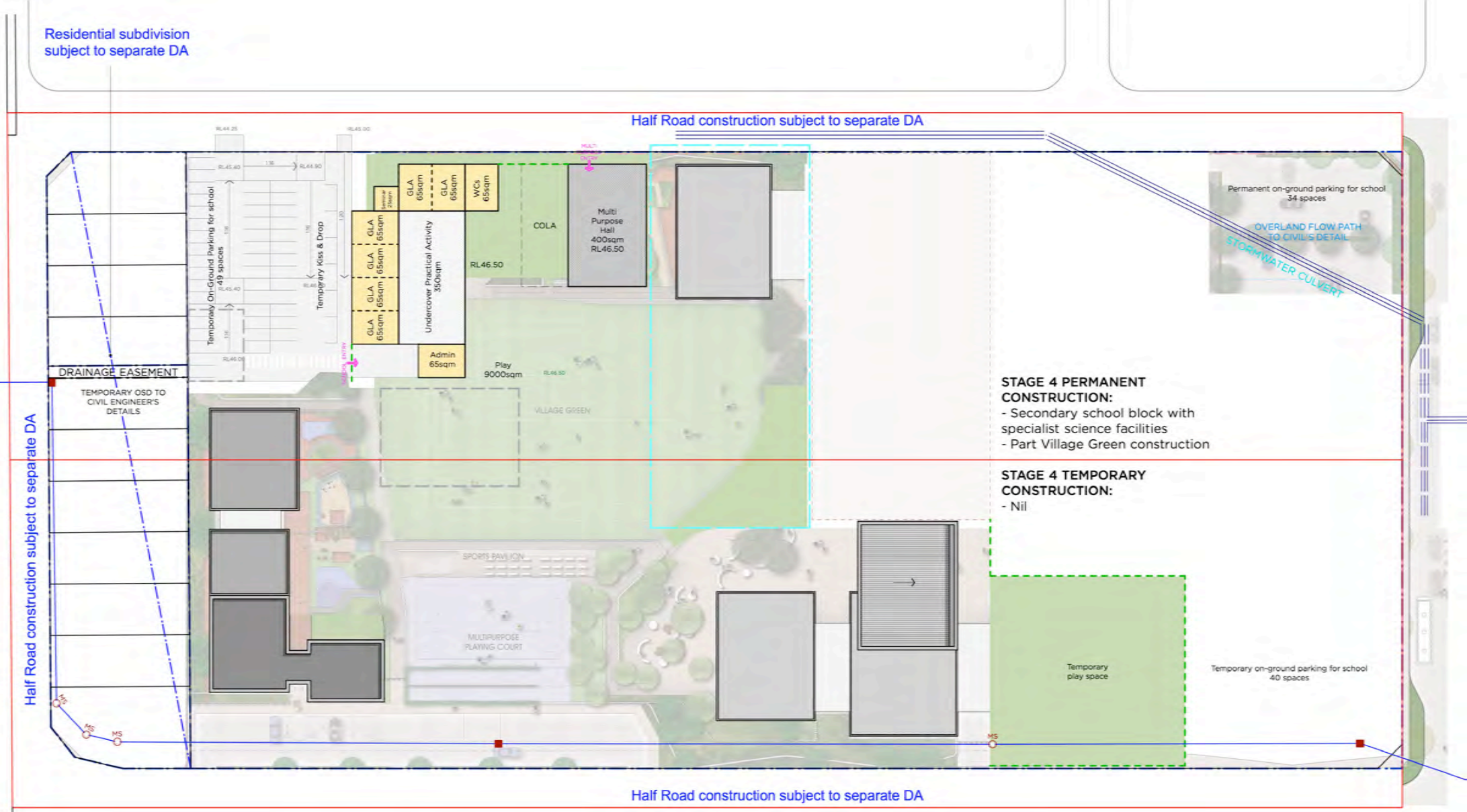
Existing boundary
New boundary
Extent of current Stage
Future contruction
Temporary school fence

**Stage 3B**

PMDL ARCHITECTURE INTERIORS MASTERPLANNING

**Sikh Grammar School**


pmdl.com.au | Project 2757 | Scale 1:750@A3 | Date MAR 2019 | Dwg DA134




## STAGE 4: SECONDARY SCHOOL

| | | | |
|---|---|---|---|
| Maximum students | 900 | GFA | 9123sqm |
| Outdoor space | 9000sqm | Roof area | 4495sqm |
| Total Parking spaces | 155 | Hardscape | 240sqm |

Existing boundary
New boundary
Extent of current Stage
Future contruction
Temporary school fence

**Stage 4**

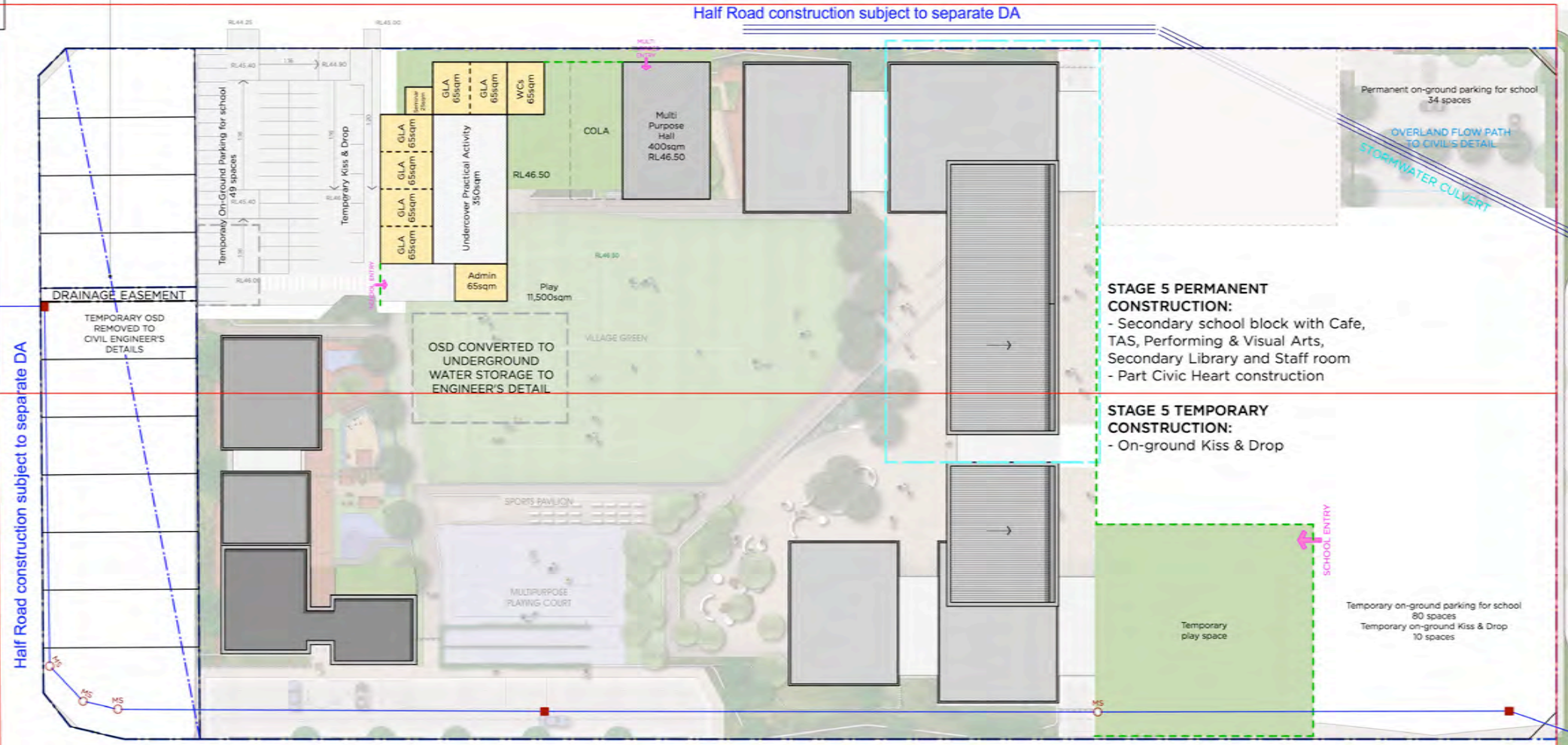
PMDL ARCHITECTURE INTERIORS MASTERPLANNING

**Sikh Grammar School**

| © PMDL | Project | Scale | Date | Dwg |
|---|---|---|---|---|
| pmdl.com.au | 2757 | 1:750@A3 | MAR 2019 | DA135 |

Residential subdivision
subject to separate DA

Half Road construction subject to separate DA




Half Road construction subject to separate DA

Half Road construction subject to separate DA

## STAGE 5: SECONDARY SCHOOL

| | | | |
|---|---|---|---|
| Maximum students | 1150 | GFA | 12,310sqm |
| Outdoor space | 11,500sqm | Roof area | 5625sqm |
| Total Parking spaces | 205 | Hardscape | 8950sqm |

Existing boundary
New boundary
Extent of current Stage
Future contruction
Temporary school fence

**Stage 5**

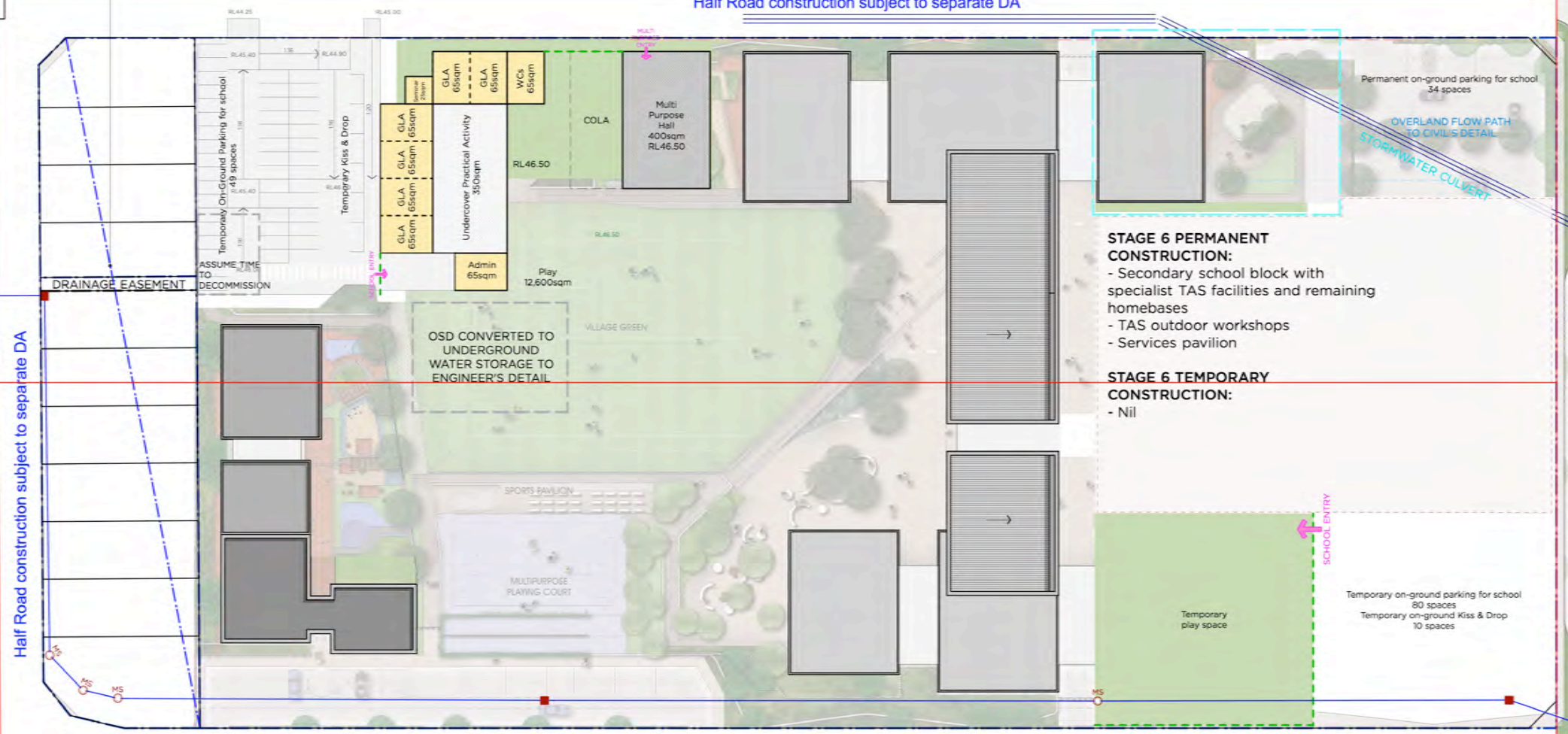
PMDL ARCHITECTURE INTERIORS MASTERPLANNING

**Sikh Grammar School**

 pmdl.com.au | Project 2757 | Scale 1:750@A3 | Date MAR 2019 | Dwg DA136

Residential subdivision
subject to separate DA

Half Road construction subject to separate DA




Half Road construction subject to separate DA

Half Road construction subject to separate DA

## STAGE 6: SECONDARY SCHOOL

| | | | |
|---|---|---|---|
| Maximum students | 1260 | GFA | 14,735sqm |
| Outdoor space | 12,600sqm | Roof area | 6170sqm |
| Parking spaces | 205 | Hardscape | 9510sqm |

Existing boundary
New boundary
Extent of current Stage
Future contruction
Temporary school fence

**Stage 6**

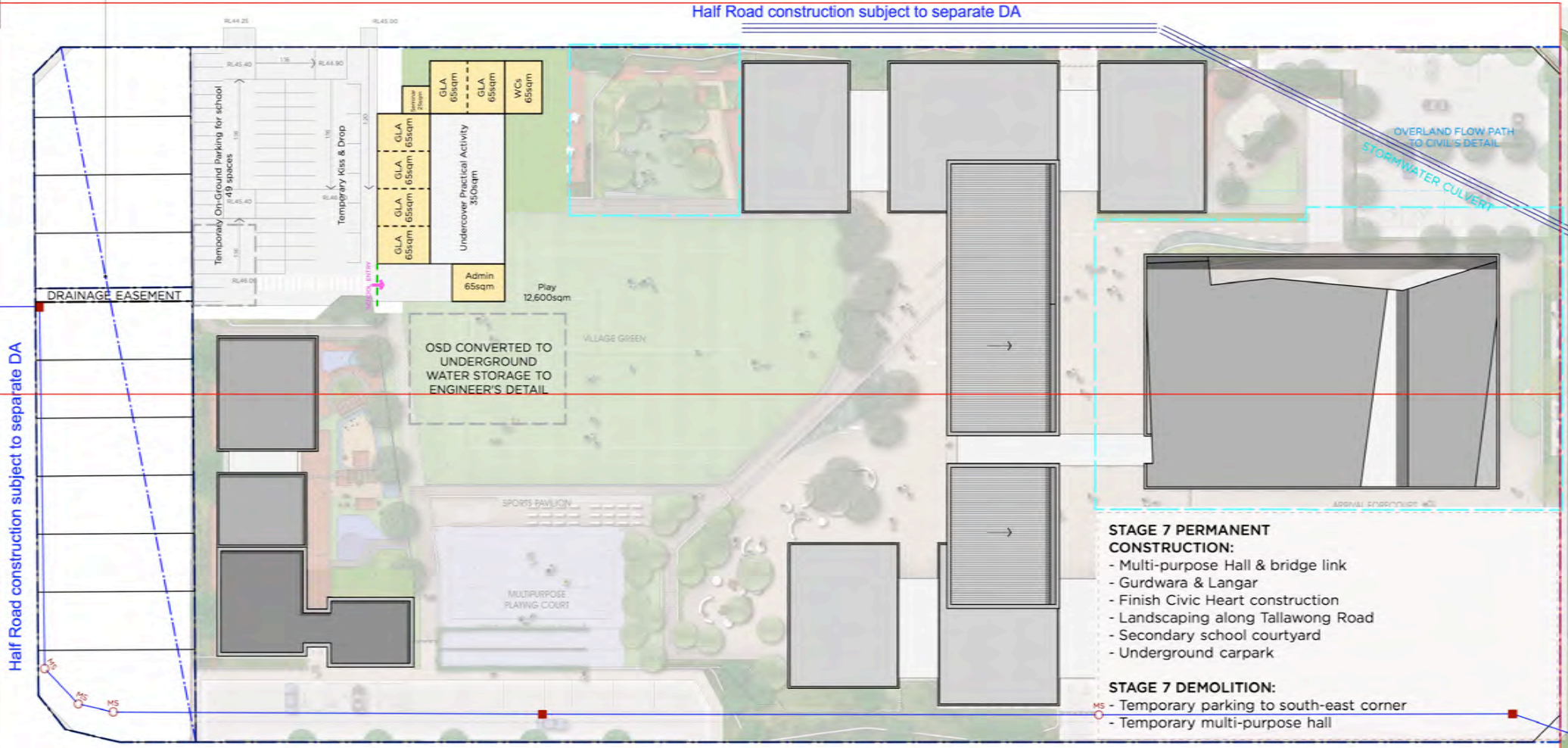
PMDL ARCHITECTURE INTERIORS MASTERPLANNING

**Sikh Grammar School**

| © PMDL | Project | Scale | Date | Dwg |
|---|---|---|---|---|
| pmdl.com.au | 2757 | 1:750@A3 | MAR 2019 | DA137 |

Residential subdivision
subject to separate DA

Half Road construction subject to separate DA




**STAGE 7 PERMANENT CONSTRUCTION:**
- Multi-purpose Hall & bridge link
- Gurdwara & Langar
- Finish Civic Heart construction
- Landscaping along Tallawong Road
- Secondary school courtyard
- Underground carpark

**STAGE 7 DEMOLITION:**
- Temporary parking to south-east corner
- Temporary multi-purpose hall

## STAGE 7: MULTI-PURPOSE HALL & GURDWARA

| | | | |
|---|---|---|---|
| Capacity | 700 | GFA | 19,840sqm |
| Total Parking spaces | 268 | Roof area | 8600sqm |
| | | Hardscape | 12,310sqm |

Existing boundary
New boundary
Extent of current Stage
Future contruction
Temporary school fence

PMDL ARCHITECTURE INTERIORS MASTERPLANNING

**Stage 7 And Basement**

Sikh Grammar School

| © PMDL | Project | Scale | Date | Dwg |
|---|---|---|---|---|
| pmdl.com.au | 2757 | 1:750@A3 | MAR 2019 | DA138 |

RL44.25

RL45.00

OSD CONVERTED TO UNDERGROUND WATER STORAGE TO ENGINEER'S DETAIL

Basement

STORMWATER CULVERT

Parking spaces 191
Drop off spaces 11
Total Parking Spaces 202

0 10 20 30 40 50 M

## STAGE 7: MULTI-PURPOSE HALL & GURDWARA

| | | | |
|---|---|---|---|
| Capacity | **700** | GFA | **19,840sqm** |
| Total Parking spaces | **317** | Roof area | **8600sqm** |
| | | Hardscape | **12,310sqm** |

- Existing boundary
- New boundary
- Extent of current Stage
- Future contruction
- Temporary school fence

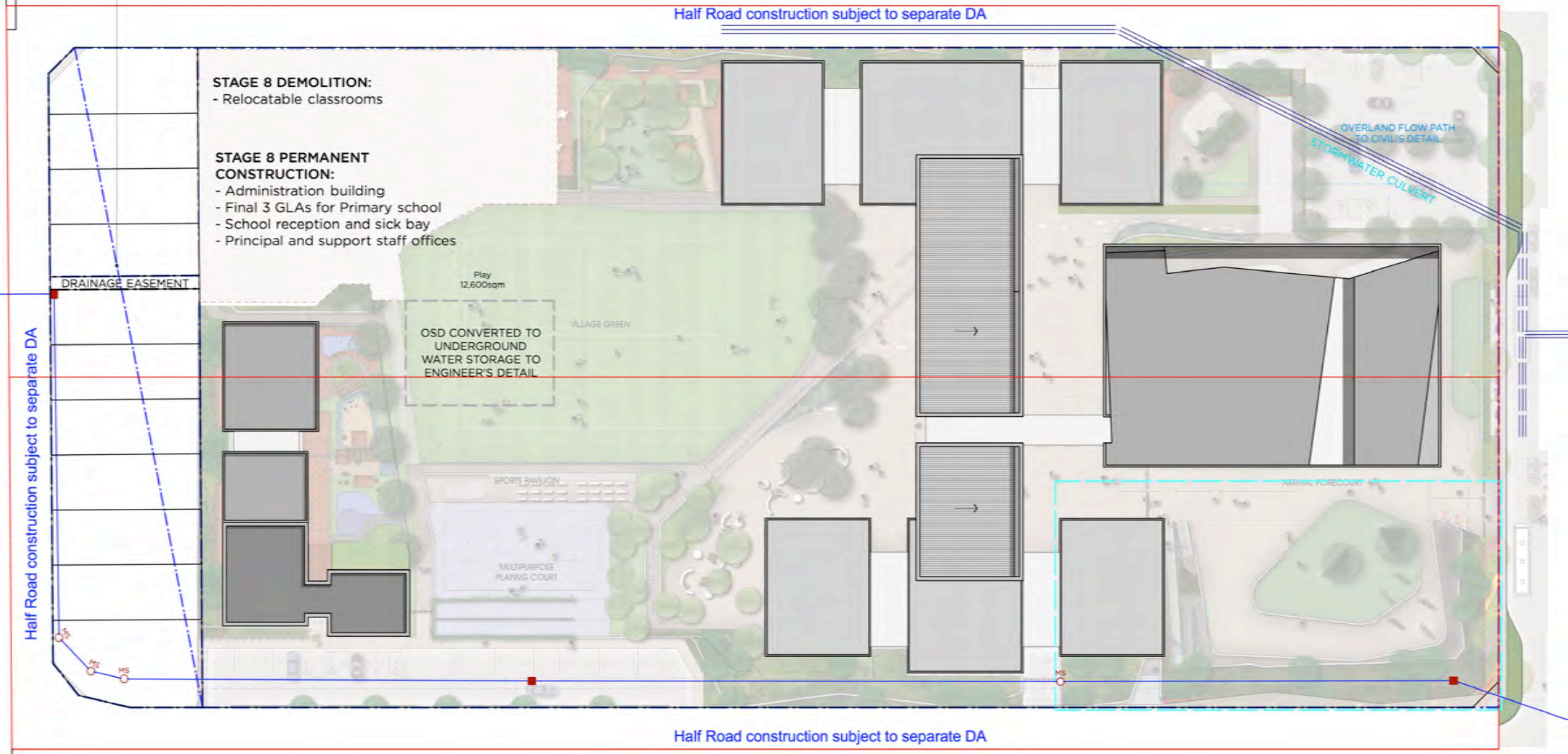
PMDL ARCHITECTURE INTERIORS MASTERPLANNING

# Stage 7 -Basement/Parking Plan

Sikh Grammar School



pmdl.com.au | Project 2757 | Scale 1:750@A3 | Date MAR 2019 | Dwg DA139




## STAGE 8: ADMINISTRATION BUILDING & FORECOURT

| | | | |
|---|---|---|---|
| Maximum students | 1260 | GFA | 21,125sqm |
| Outdoor space | 12,600sqm | Roof area | 9130sqm |
| Parking spaces | 317 | Hardscape | 14,710sqm |

Existing boundary
New boundary
Extent of current Stage
Future contruction
Temporary school fence

**Stage 8**

PMDL ARCHITECTURE INTERIORS MASTERPLANNING

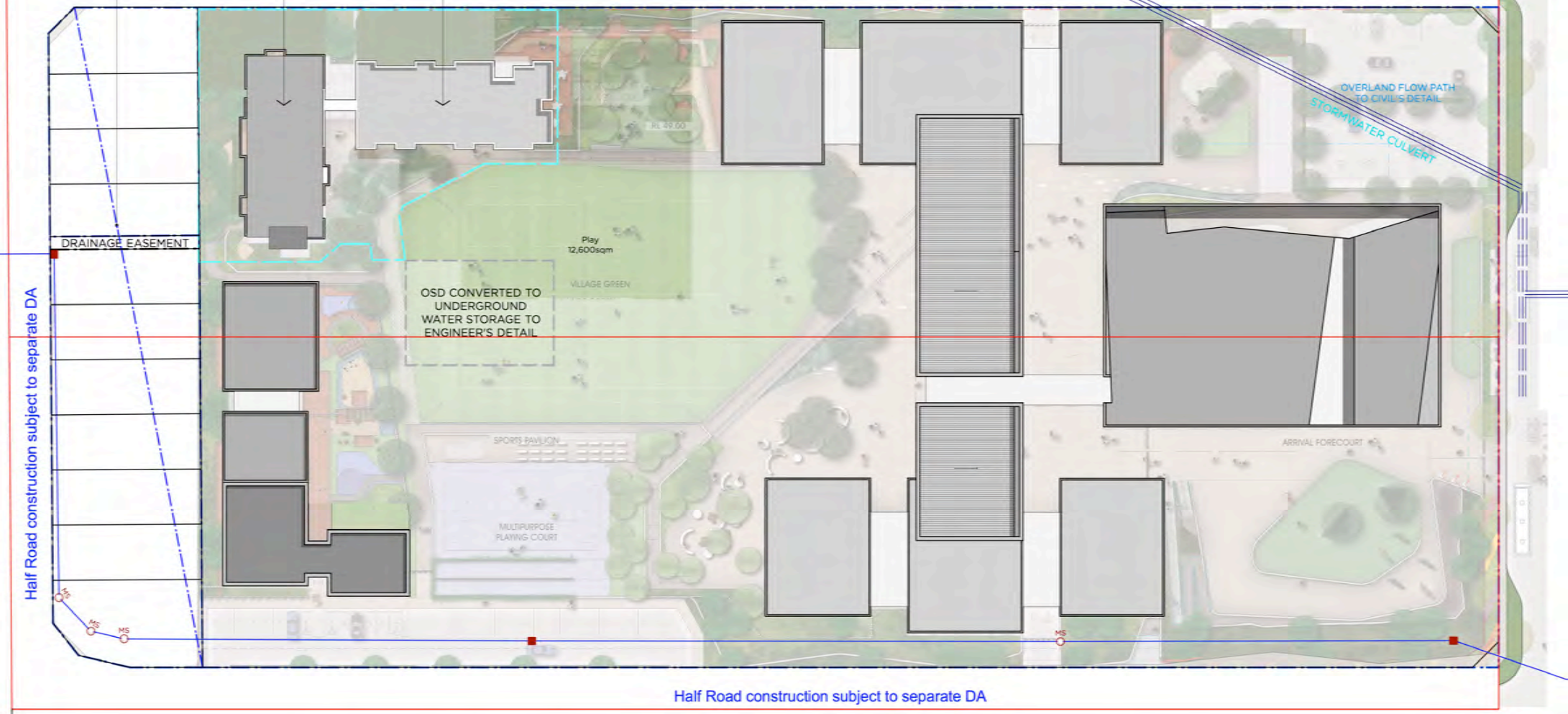
**Sikh Grammar School**

| © PMDL | Project | Scale | Date | Dwg |
|---|---|---|---|---|
| pmdl.com.au | 2757 | 1:750@A3 | MAR 2019 | DA140 |

Residential subdivision subject to separate DA

**STAGE 9 PERMANENT CONSTRUCTION:**
- Demolish temporary carpark
- Boarding house
- Staff apartments
- Undercroft parking for boarding house

Half Road construction subject to separate DA




Half Road construction subject to separate DA

## STAGE 9: STUDENT BOARDING HOUSE

| | | | |
|---|---|---|---|
| Maximum students | **110** | GFA | **1233sqm** |
| Staff apartments | 6 | Roof area | **1233sqm** |
| Outdoor space | 1052**sqm** | Hardscape | **682sqm** |
| Total Parking spaces | 281 | | |

Existing boundary
New boundary
Extent of current Stage
Future contruction
Temporary school fence

**Stage 9**

PMDL ARCHITECTURE INTERIORS MASTERPLANNING

**Sikh Grammar School**

| © PMDL | Project | Scale | Date | Dwg |
|---|---|---|---|---|
| pmdl.com.au | 2757 | 1:750@A3 | MAR 2019 | DA141 |