

State Significant Development Application Proposed Sikh Grammar School, Rouse Hill

Traffic and Parking Assessment Report

Prepared for: Sikh Grammar School

July 2019

Report No: PT18022r01_Final_V3

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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 6.8	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/dropoff 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 6.5	

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, 6.7	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: • 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.	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.

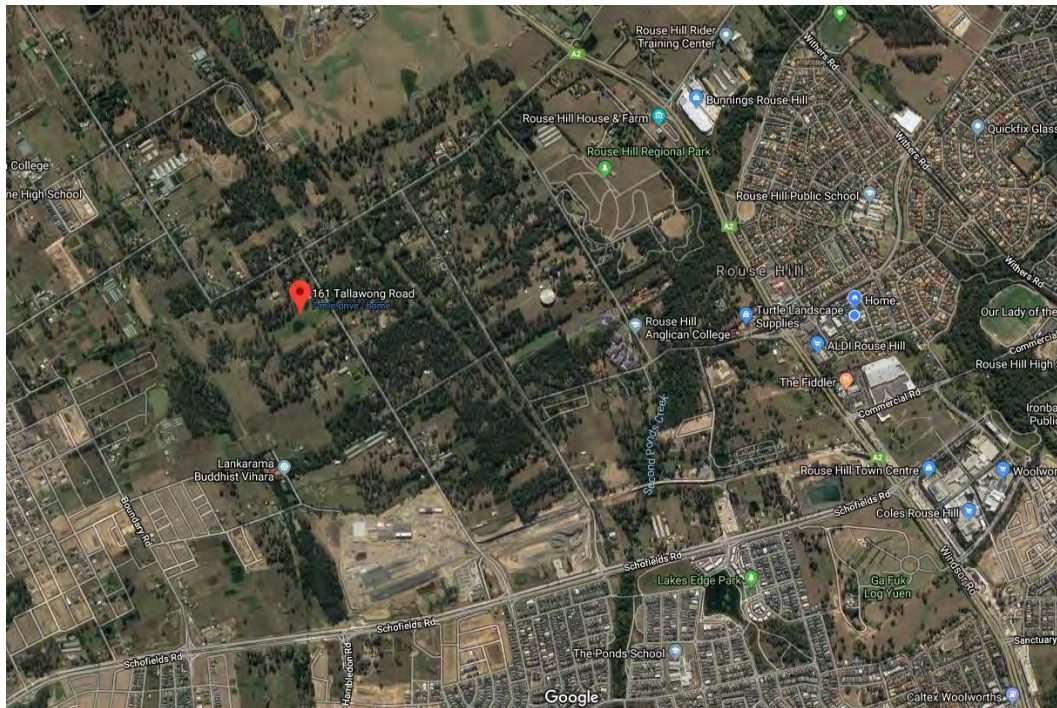
2.1 Site Location

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

There are currently no formal bus services which operate along Tallawong Road. The nearest available bus stops are located near the Schofields Road / Tallawong Road intersection approximately 1.5km walking distance to the school site.

These existing bus stops serve a number of local and regional bus services which are summarised below:

- Bus Route T72 – Blacktown to Rouse Hill Town Centre & Return
 - o 30min frequency services during the AM peak
 - o 30min frequency services during the PM peak
- Bus Route T75 – Blacktown to Rouse Hill via Riverstone
 - o 30min frequency services during the AM peak
 - o 30min frequency services during the PM peak

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.

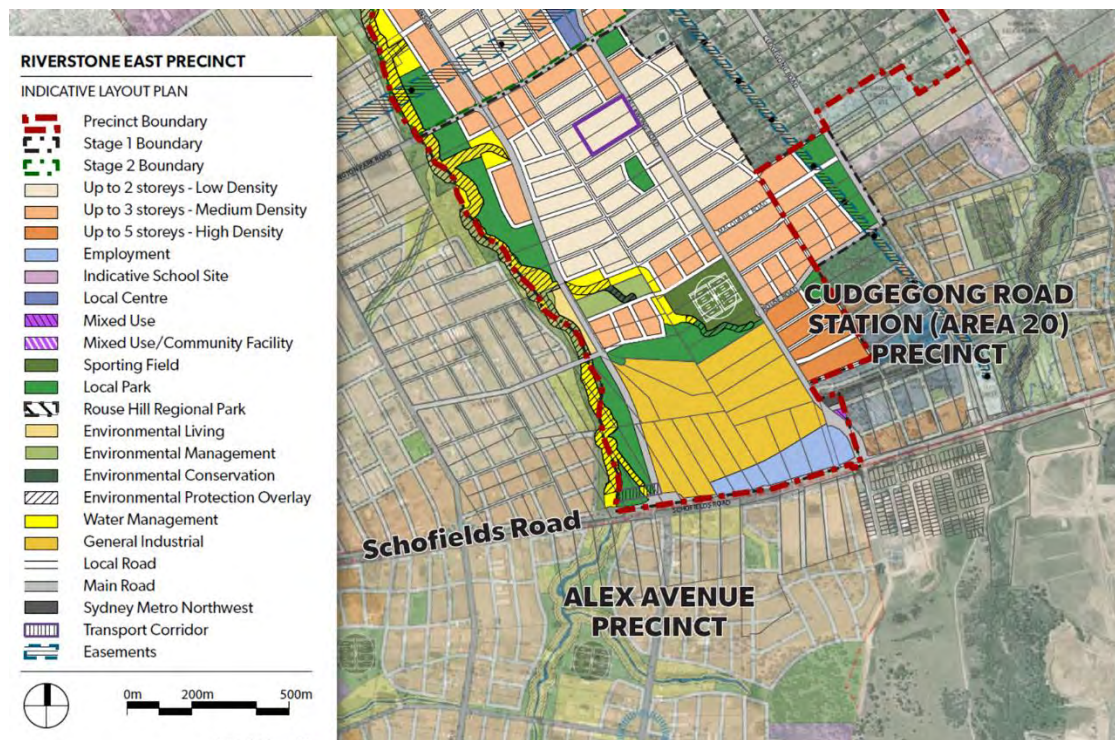
3. Background Report Review

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 report¹ 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:

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

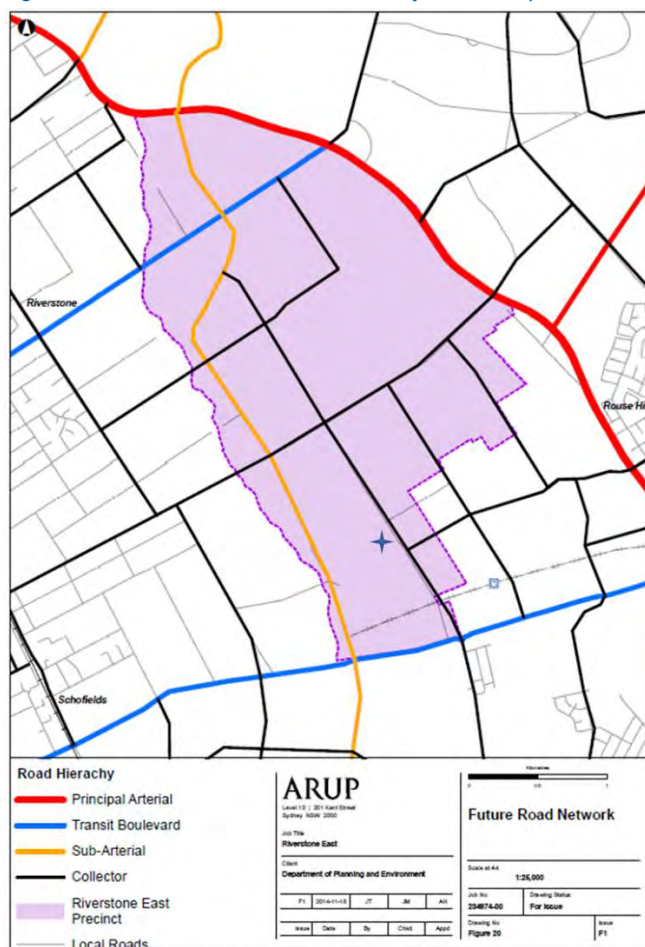
A number of intersections within Riverstone East were analysed using the SIDRA 6 modelling package to assess their future peak-hour operating performance. Traffic signals are recommended to be installed at eight intersections within the precinct, with a further three intersections currently containing 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.

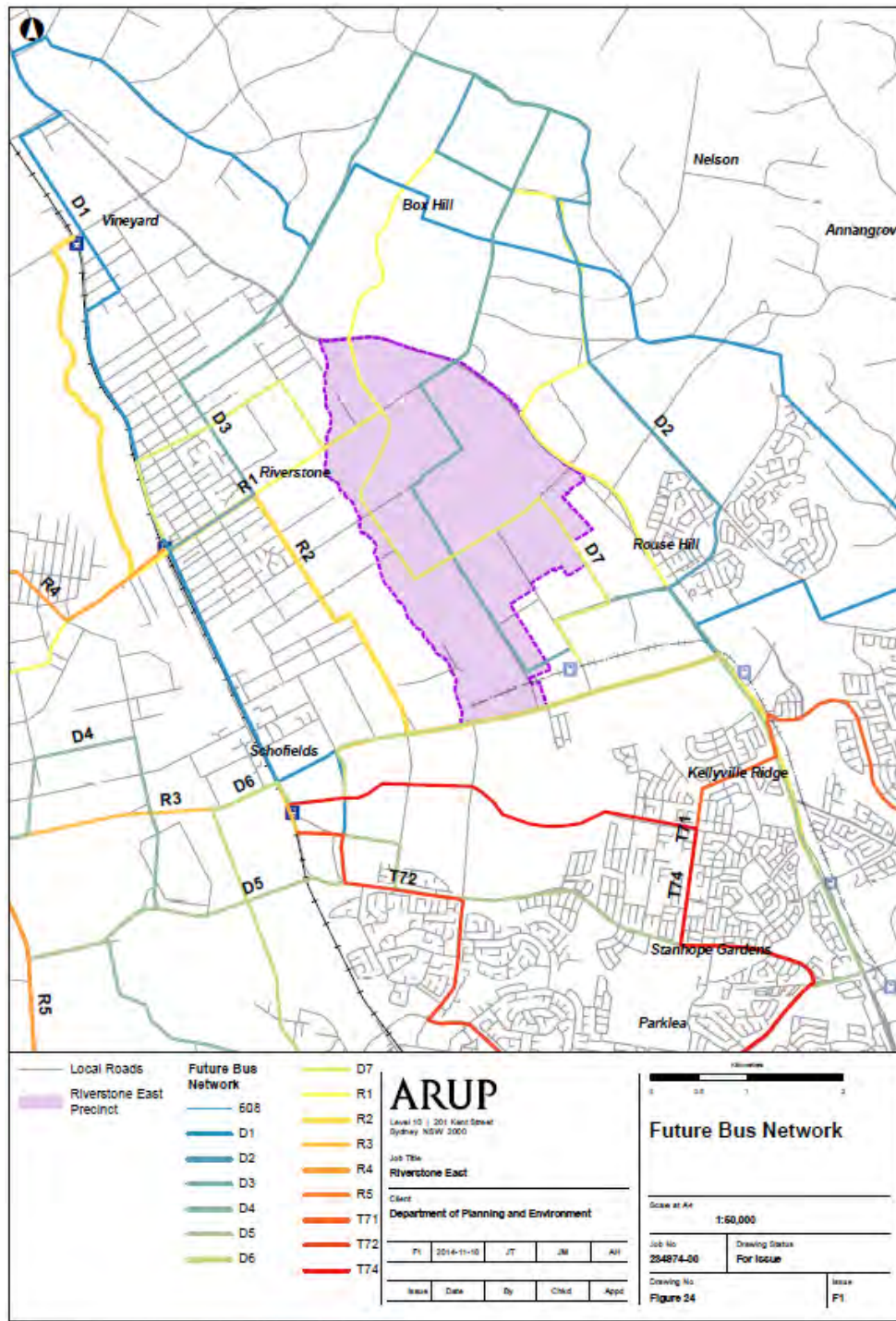
3.1.3 *Future Public Transport Provisions*

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 21,125m² 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 2,710m² (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 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 - Relocatable primary school building - Open space 2 x at grade car parks	168	83
2	- Permanent private school building - Open space - Multi-purpose court (school use)	420	83
3A	- Additional primary school buildings including library - Entry driveway within southern boundary road for future car park access	680	83
3B	- Early learning centre - Early learning centre car park	680 school / 86 early learning centre	83 school / 32 early learning centre
4	- Secondary school - Additional parking	900 school / 86 early learning centre	123 school / 32 early learning centre
5	- Additional Secondary School buildings - 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 - Gurdwara / Langer Worship building - 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 - 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 - New northern local road half construction - Relocatable primary school building - Open space	- Pedestrian pathway along southern side of northern boundary road - Pedestrian pathway along western side of Tallawong Road - 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 - Open space	No change	Permanent driveway access from northern boundary road to north – eastern 34 space car park
3	- Additional primate school buildings - Half western boundary road construction - Southern boundary road future car park access	- Pedestrian pathway along northern side of southern boundary road - Pedestrian pathway along eastern side of western boundary road	- Temporary access driveway to temporary open-air car park in south – west corner - Permanent driveway access from southern boundary road to future basement car park
3B	- Early learning centre - Early learning centre car park	No change	Entry & exit driveway access to Early Learning Centre
4	- Secondary school - Additional parking	No change	No change
5	- Additional Secondary School buildings - 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 - Gurdwara / Langer Worship building - Basement car park with northern and southern boundary road connections	All weather internal pathways connecting Tallawong Road bus bays	No change
8	- Administration building - Boarding house (110 students) - 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 48,500m² 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 way².

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:

- o Early Learning Centre
- o K – 12 School
- o 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.

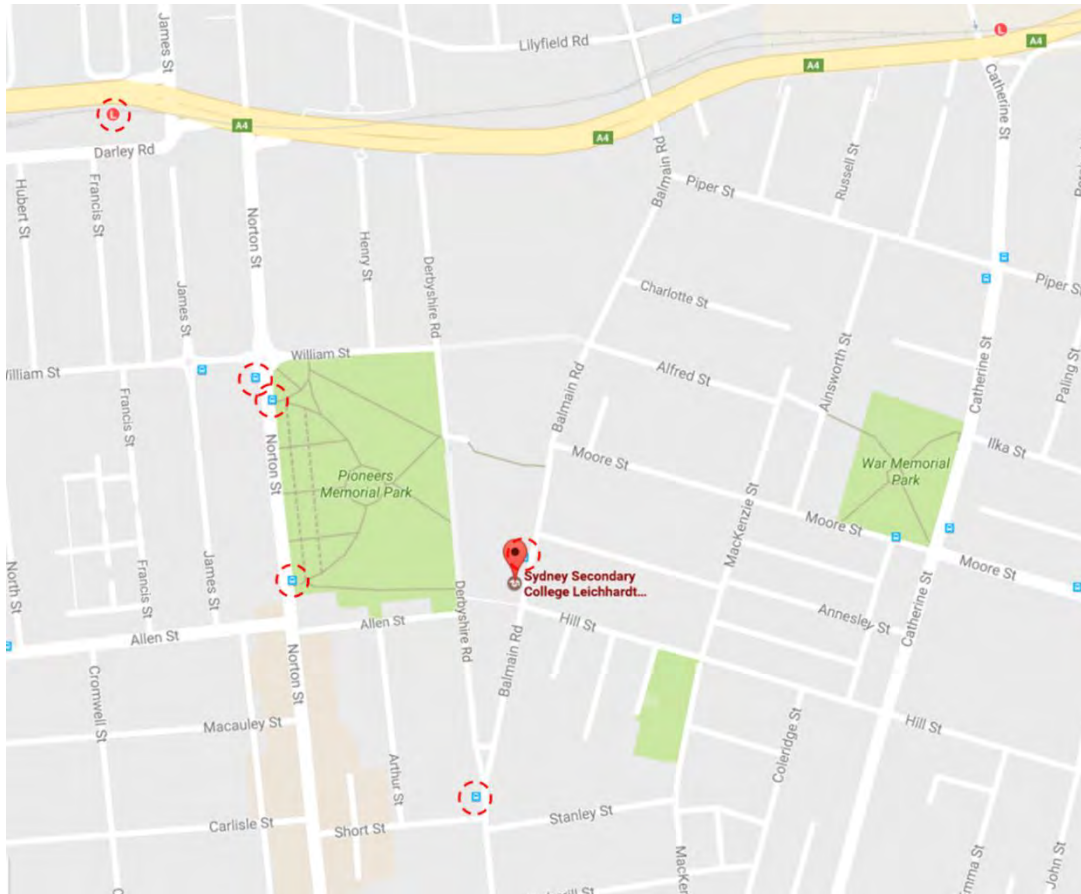
To endeavour to provide an estimate of mode of travel to / from the Sikh Grammar School, Rouse Hill, the information gathered from the mode of travel surveys for the Inner West High School have been utilised as they include surveys of a range of high schools with varying access to public transport. A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

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

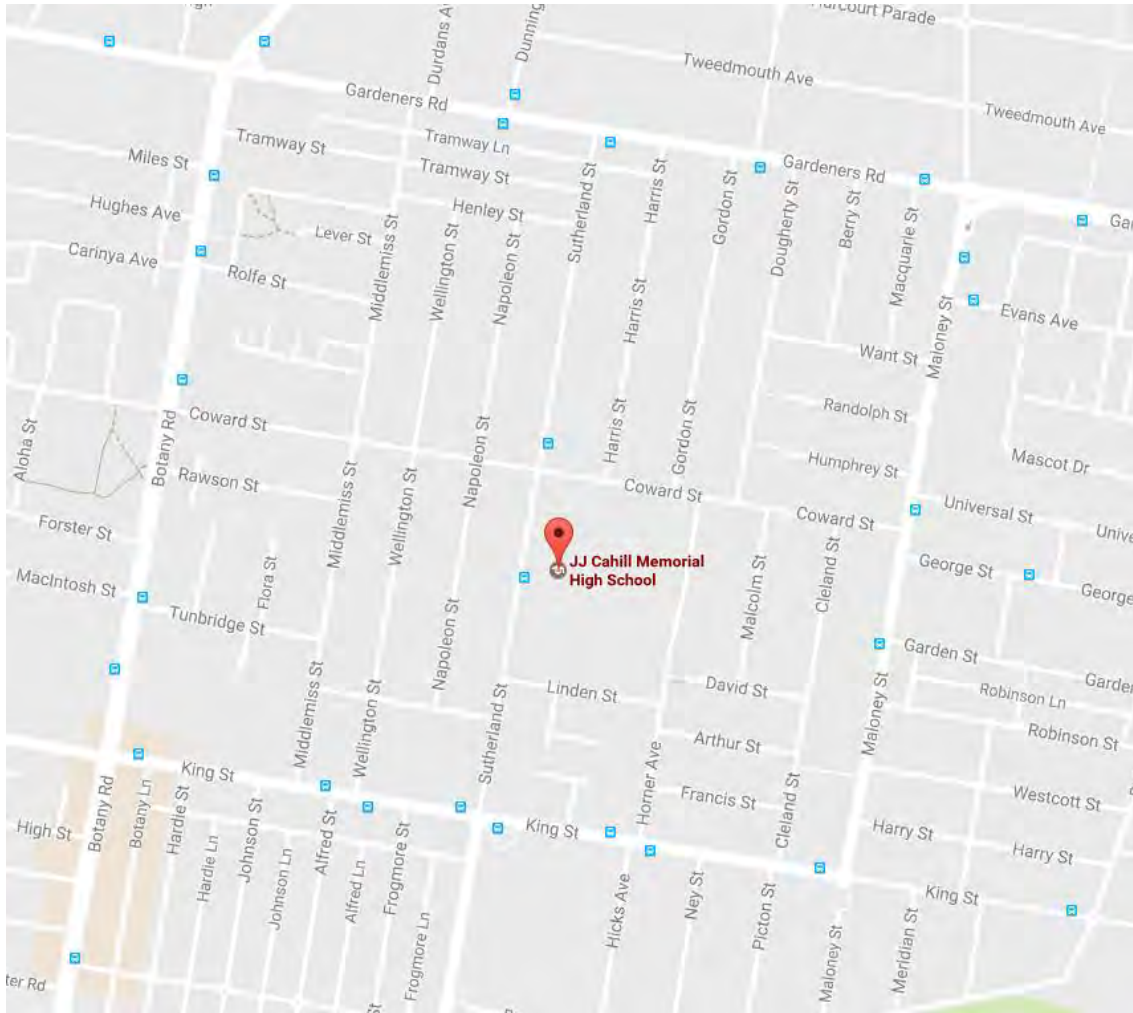
	How did you travel to school today?										
Year / Staff	BOARDER	TRAIN	SELF DRIVE	CAR DROP OFF	MOTOR CYCLE	BUS	WALK	BICYCLE	FERRY	LIGHT RAIL	OTHER
Year 7	0%	0%	0%	15%	0%	38%	38%	4%	0%	0%	4%
Year 8	0%	5%	0%	14%	0%	29%	38%	5%	0%	10%	0%
Year 9	0%	0%	0%	0%	0%	64%	27%	0%	0%	9%	0%
Year 10	0%	16%	0%	8%	0%	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

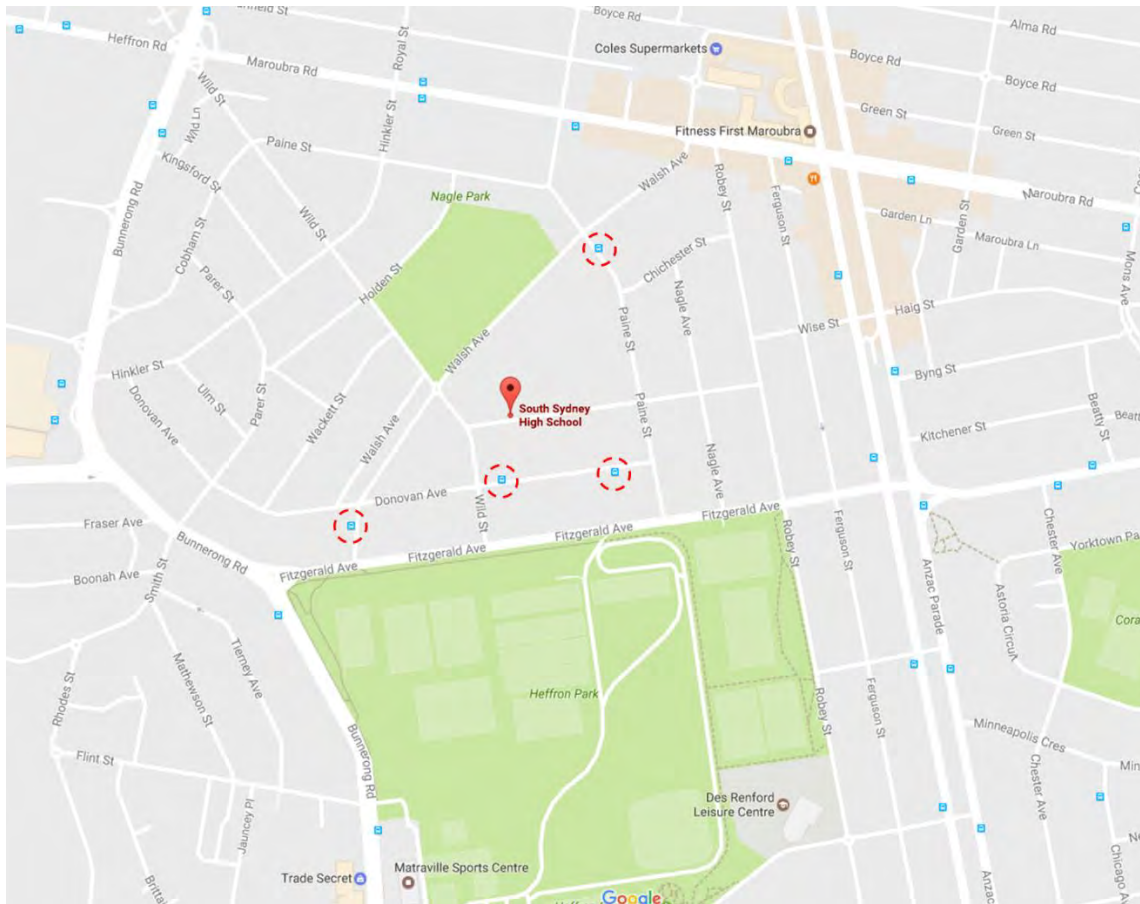
	How did you travel to school today?										
Year / Staff	BOARDER	TRAIN	SELF DRIVE	CAR DROP OFF	MOTOR CYCLE	BUS	WALK	BICYCLE	FERRY	LIGHT RAIL	OTHER
Year 7	0%	2%	0%	36%	0%	14%	48%	0%	0%	0%	0%
Year 8	0%	0%	0%	8%	0%	31%	62%	0%	0%	0%	0%
Year 9	0%	3%	0%	37%	0%	18%	39%	3%	0%	0%	0%
Year 10	0%	8%	0%	18%	0%	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 (2,755m² 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 - Self-Drive	130 (one way)	62 (one way)**	62 (one way)***
Sikh Grammar School - 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.

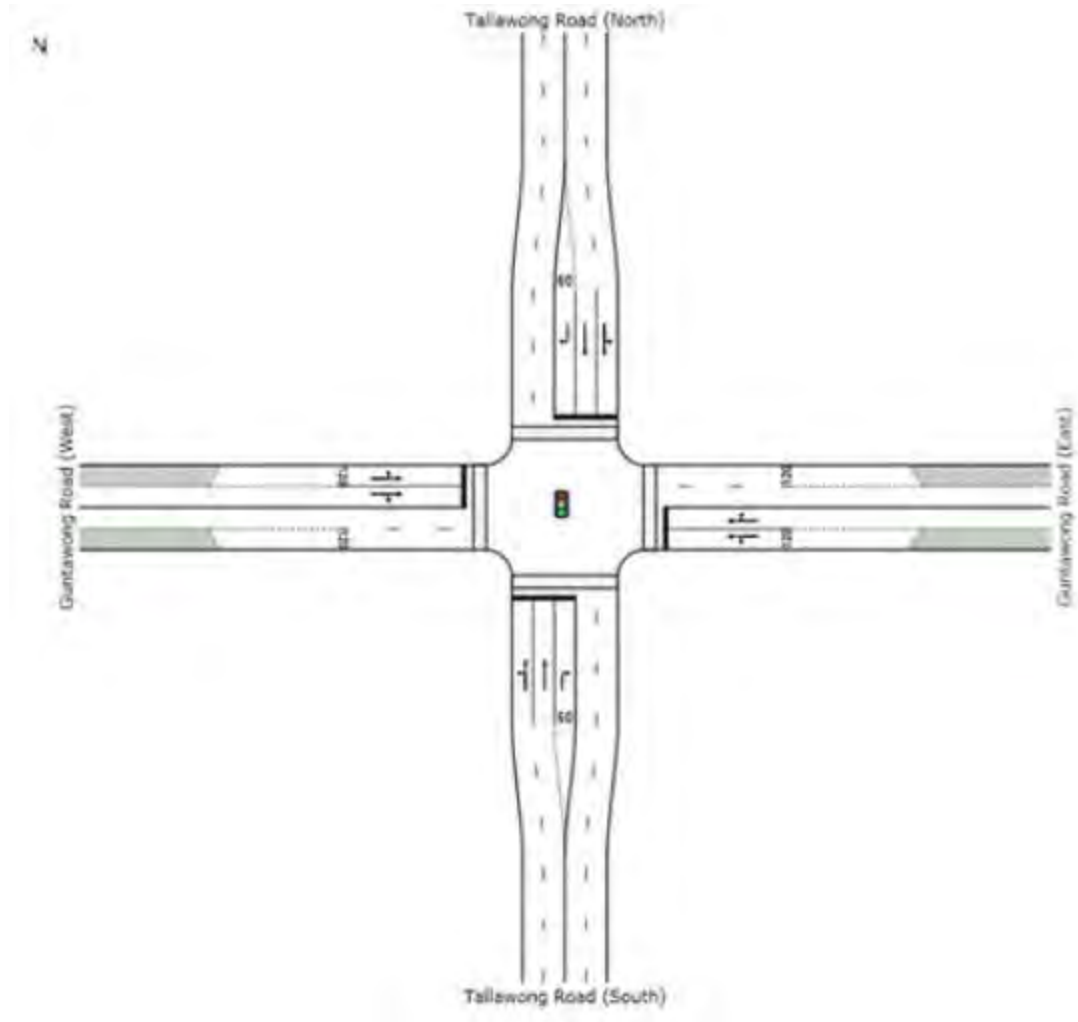
5.4 Future Intersection Modelling Assessment

As noted in the traffic report³, 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.

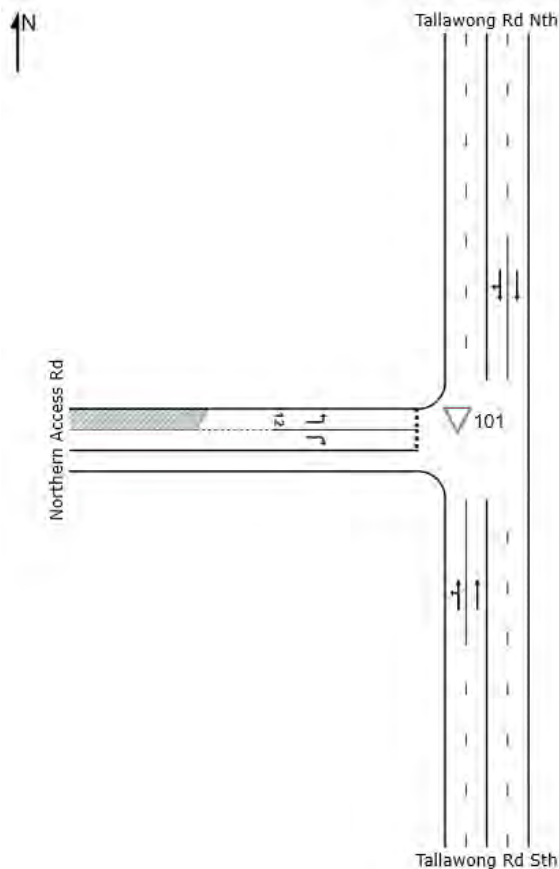
Whilst this would be unlikely to occur as the school would have other minor roads available for travel to and from the school (such as the western boundary road), this approach provides a conservative estimate of future conditions. It has been assumed that trips generated by the school would be 50/50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

Intersection	Control	Morning Peak		Evening Peak	
		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: a) 1:5 in respect of all children who are under the age of 2 years; b) 1:8 in respect of all children who are 2 or more years of age but under 3 years of age; and c) 1:10 in respect of all children who are 3 or more years of age but under 6 years of age 1 designated space for disabled parking/service vehicles located close to the main entrance 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 Plus 1 space per 100 students
Senior High School	1 space per staff member 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 Or 1 space per 10m ² of seating area (whichever is greater)
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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 954m². 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 Motorcycle Parking Provision

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

6.5 Bicycle Parking Provision

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

6.6 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.

6.7 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 facilitates 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.

6.8 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 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.
5. 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.
6. The proposed parking provision for the Early Learning Centre exceeds the minimum requirements of the DCP and is considered satisfactory.
7. The design of the car parking areas and access arrangements complies with AS2890.1 and is considered satisfactory.
8. 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 college until ultimate occupation of the college.

Overall the traffic impacts of the proposal are considered acceptable.

8. Appendix A – Proposed Development Detailed Staging Plans

Half Road construction subject to separate DA

CONSTRUCTION:

- Play space (becomes part of Village Green)
- Tallawong Road upgrade
- Stormwater infrastructure to north-east corner
- North-east corner on-grade carpark

- Relocatable primary school building
- Multi purpose hall
- On-ground parking

- Existing house
- Existing on-ground carpark

Bus Layby to Civil Engineer's detail

Half Road construction subject to separate DA

Existing boundary
New boundary
Extent of current Stage
Temporary school fence

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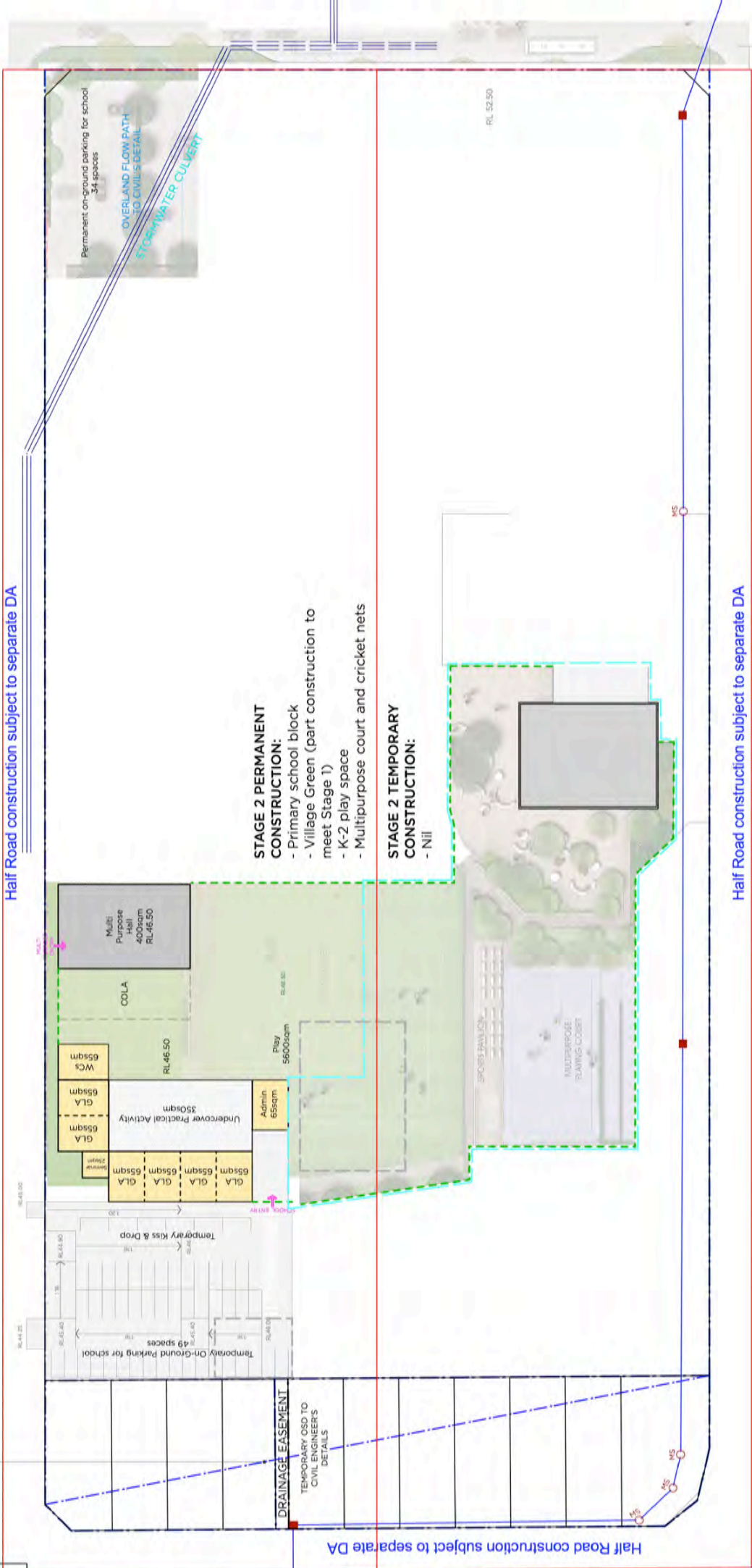
MAR 2019 | Dwg

DA131

ARCHITECTURE
INTERIORS
MASTERPLANNING

Residential subdivision
subject to separate DA

Half Road construction subject to separate DA



Half Road construction subject to separate DA

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 construction
- Temporary school fence

Stage 2

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Scale
2757

Date
1:750@A3

Dwg
MAR 2019

Sikh Grammar School

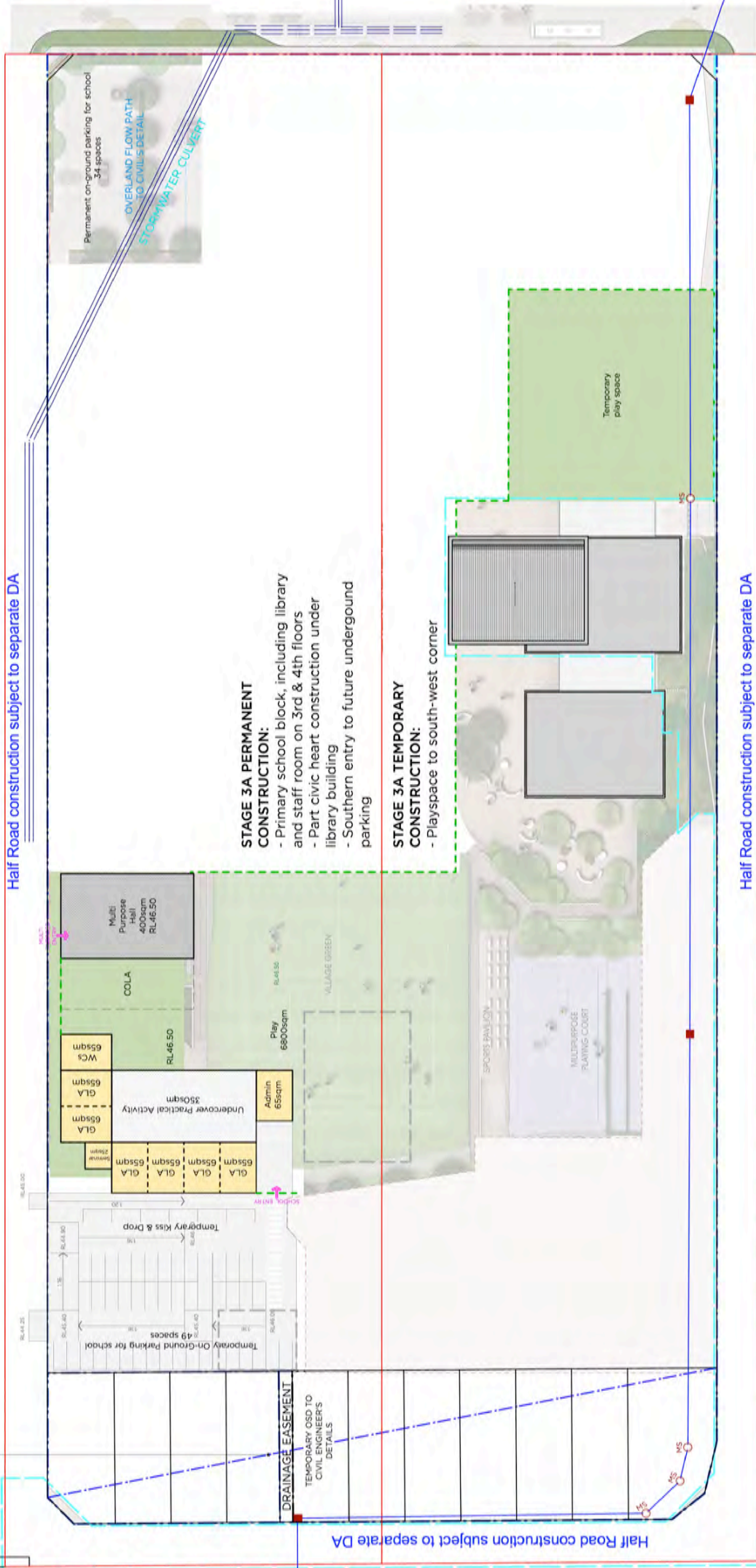
DA132

PM DL
ARCHITECTURE
INTERIORS
MASTERPLANNING



Residential subdivision
subject to separate DA

Half Road construction subject to separate DA



STAGE 3A PERMANENT CONSTRUCTION:

- Primary school block, including library and staff room on 3rd & 4th floors
- Part civic heart construction under library building
- Southern entry to future underground parking

STAGE 3A TEMPORARY CONSTRUCTION:

- Playspace to south-west corner

Half Road construction subject to separate DA

STAGE 3: PRIMARY SCHOOL

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

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

Stage 3A

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Scale
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Date
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Dwg
MAR 2019

Sikh Grammar School

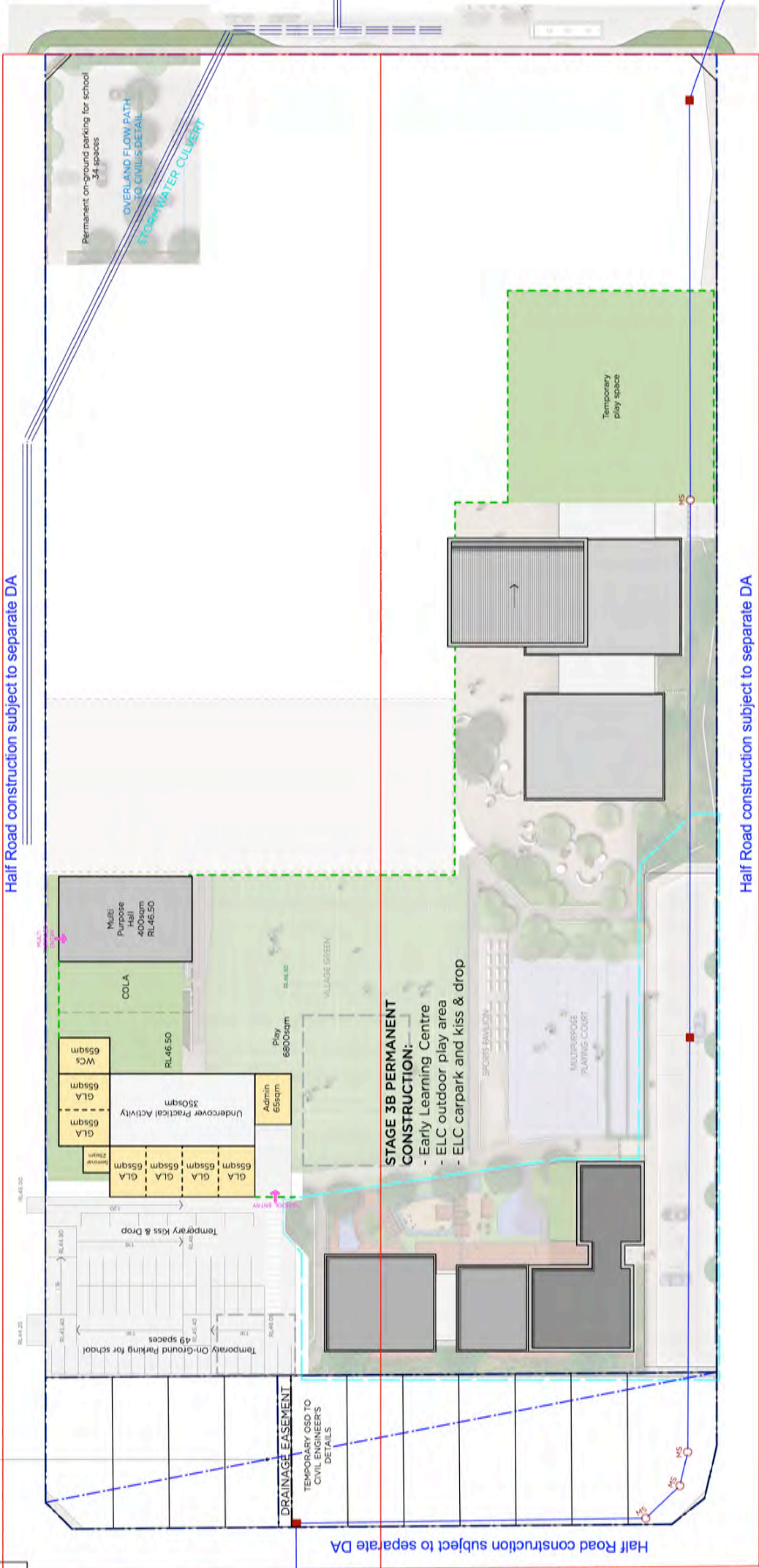
DA133

PMDL ARCHITECTURE
INTERIORS
MASTERPLANNING



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 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 construction
- Temporary school fence

Stage 3B

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MAR 2019

Sikh Grammar School

DA134

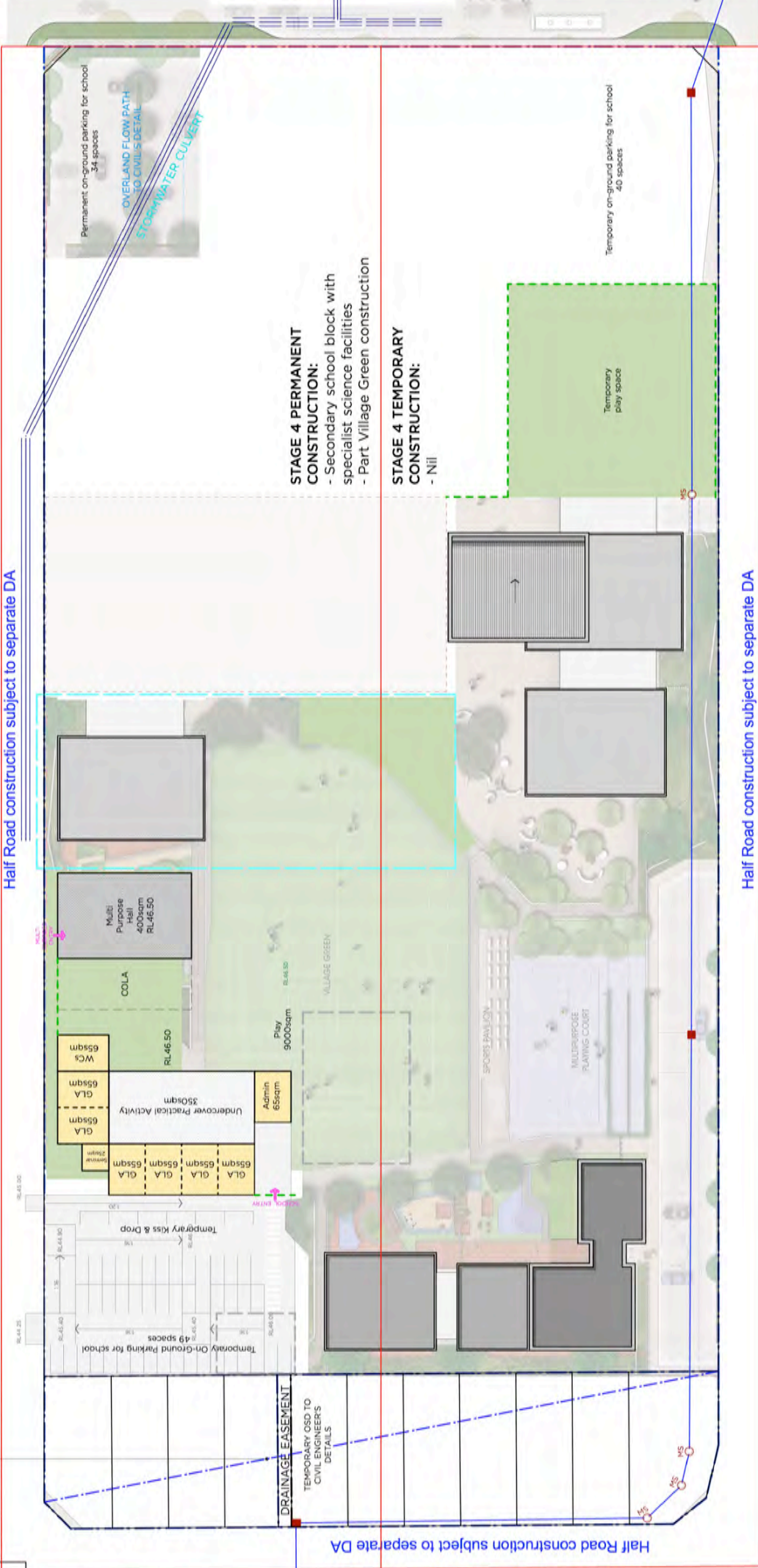
PMDL

ARCHITECTURE
INTERIORS
MASTERPLANNING



Residential subdivision
subject to separate DA

Half Road construction subject to separate DA



STAGE 4 PERMANENT CONSTRUCTION:
- Secondary school block with specialist science facilities
- Part Village Green construction

STAGE 4 TEMPORARY CONSTRUCTION:
- Nil

Half Road construction subject to separate DA

STAGE 4: SECONDARY SCHOOL

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

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

Stage 4

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MAR 2019

Sikh Grammar School

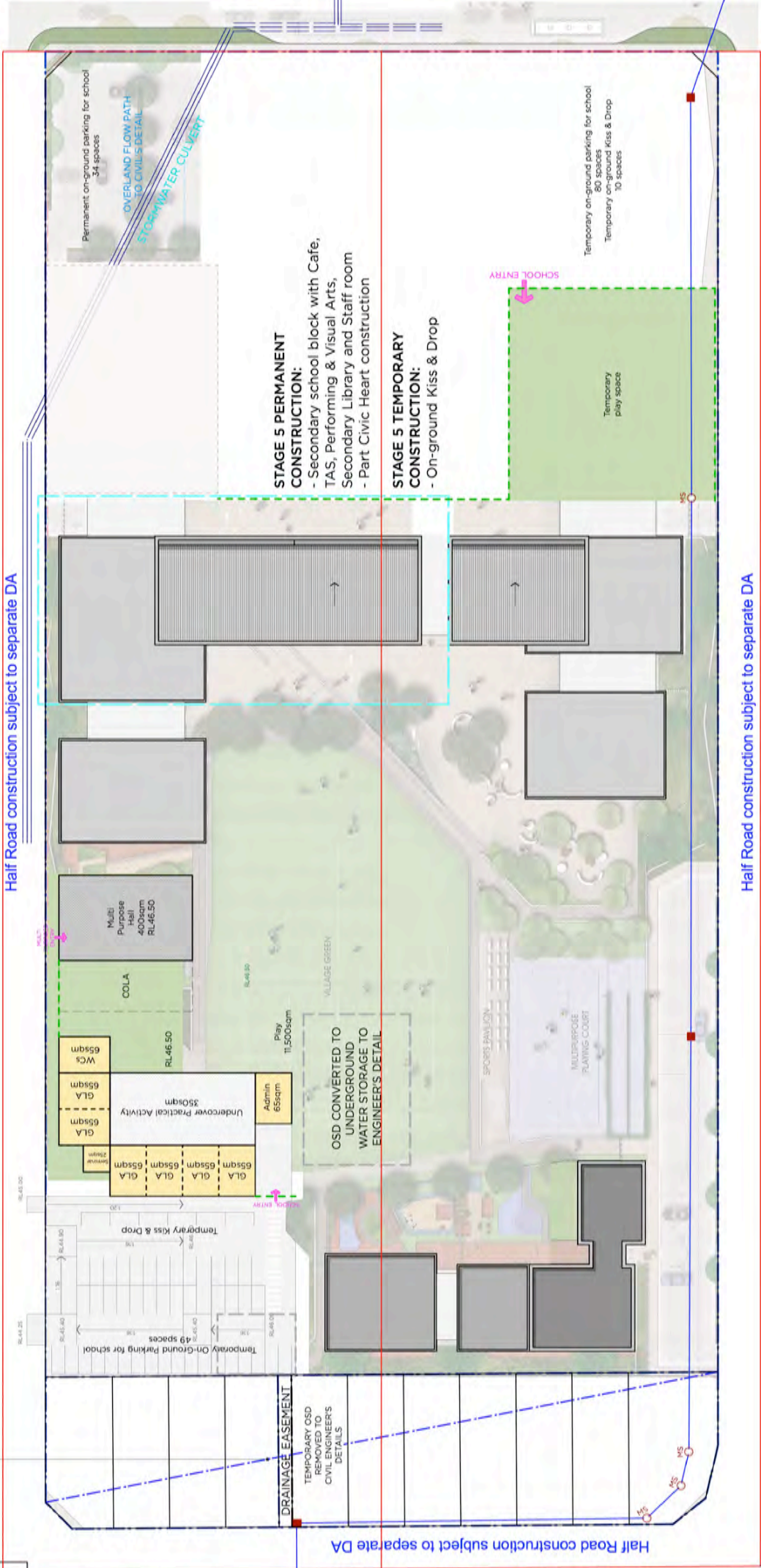
DA135

PMDL
ARCHITECTURE
INTERIORS
MASTERPLANNING



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 construction
- Temporary school fence

Stage 5

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Date
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Dwg
MAR 2019

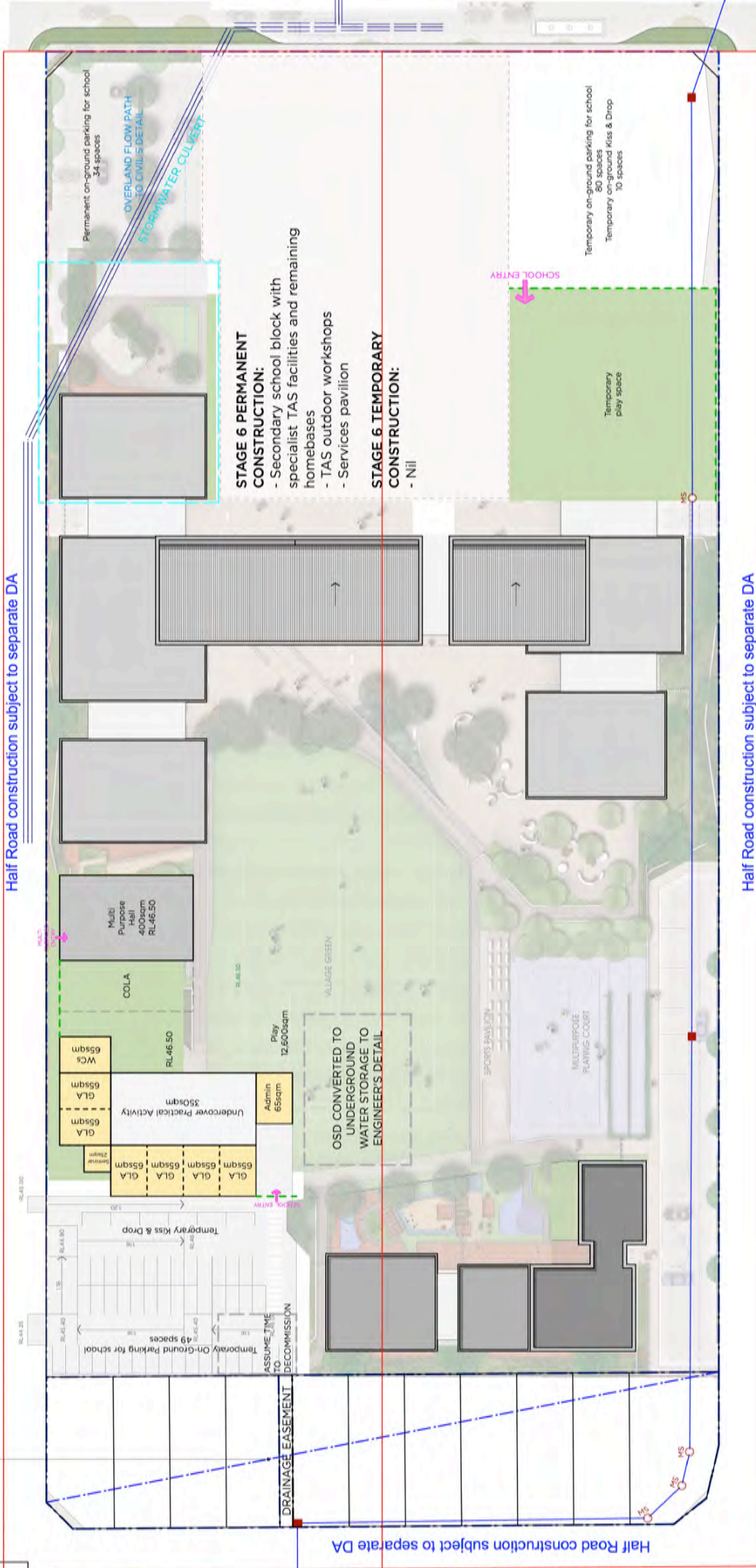
Sikh Grammar School

DA136

PMDL
ARCHITECTURE
INTERIORS
MASTERPLANNING

Residential subdivision
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 construction
- Temporary school fence

Stage 6

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Project

Scale

Date

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Sikh Grammar School

DA137

PMDL ARCHITECTURE
INTERIORS
MASTERPLANNING



Half Road construction subject to separate DA



Stage 7 And Basement

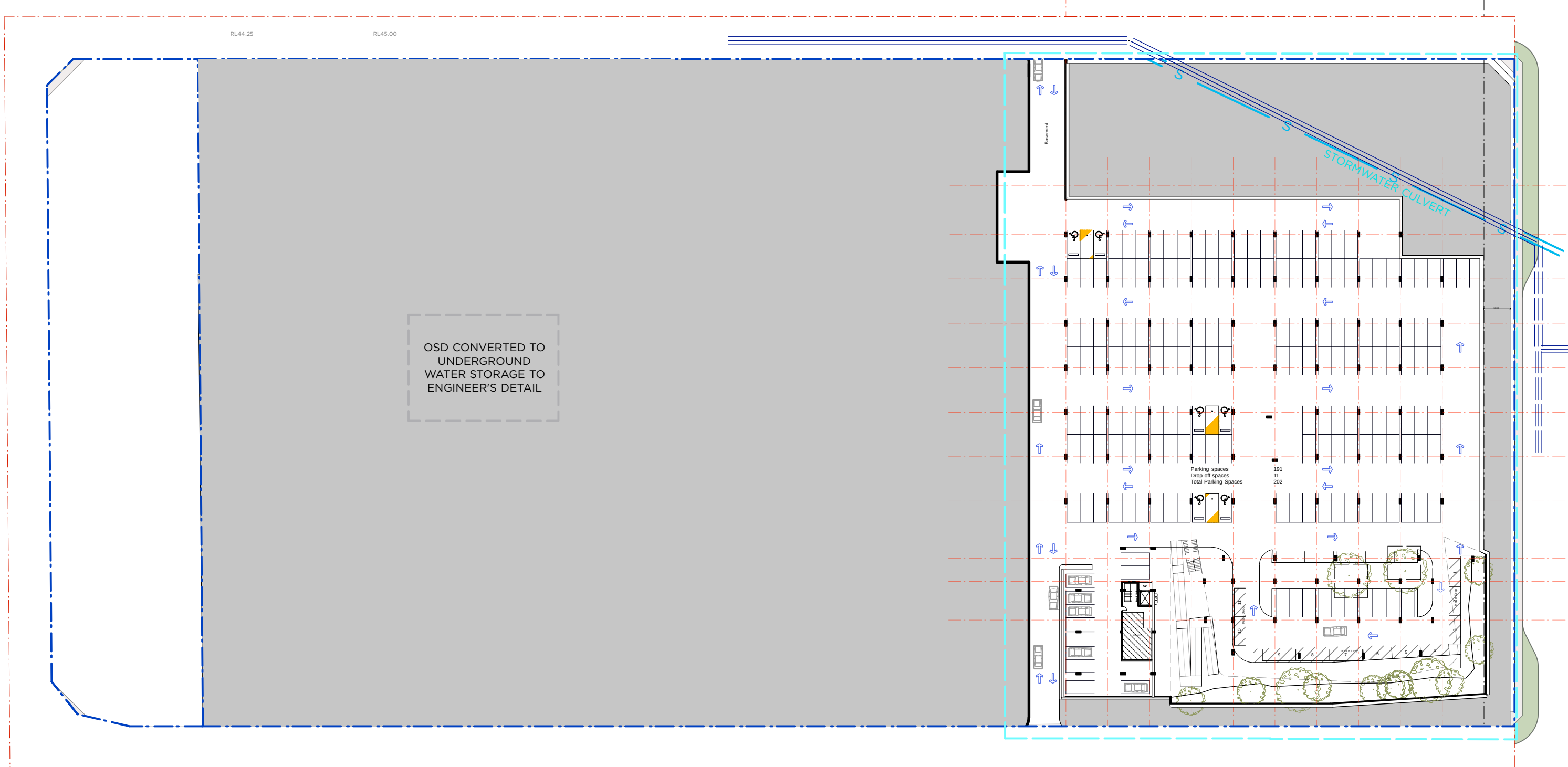
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MAR 2019 | Dwg

DA138

Sikh Grammar School



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 construction
- Temporary school fence

Stage 7 -Basement/Parking Plan



Sikh Grammar School



Half Road construction subject to separate DA

STAGE 8 DEMOLITION:
- Relocatable classrooms

- Relocatable classrooms

**STAGE 8 PERMANENT
CONSTRUCTION:**

- Administration building
- Final 3 GLAs for Primary school
- School reception and sick bay
- Principal and support staff offices

Play
12.600.com

OSD CONVERTED TO UNDERGROUND WATER STORAGE TO ENGINEER'S DETAIL

Half Road construction subject to separate DA

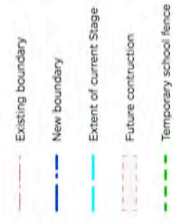
OVERLAND FLOW PATH
TO CIVIL'S DETAIL

OVERLAND FLOW
TO CIVIL'S DETAIL

STORMWATER CULVERT

STAGE 8: ADMINISTRATION BUILDING & FORECOURT

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



Stage 8

1.0 PMDL

Project

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Date _____

1210

PMDL  ARCHITECTURE
INTERIORS
MASTERPLANNING

Sikh Grammar School

1210

Date _____

Scale

Project

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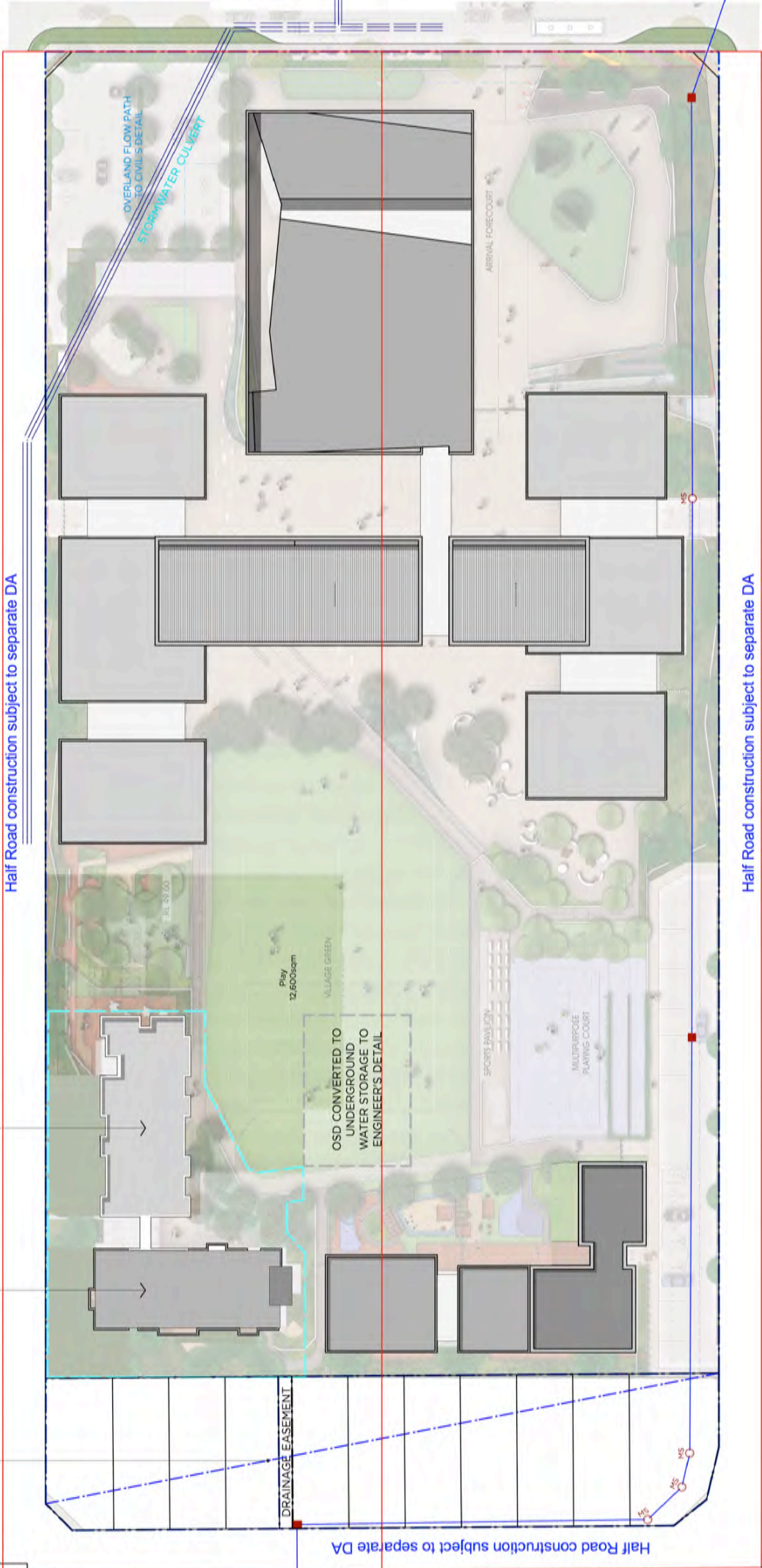
1.0 PMDL

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

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	1052sqm	Hardscape	682sqm
	Total Parking spaces	281		



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

Stage 9

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Date
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MAR 2019

Sikh Grammar School

DA141

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INTERIORS
MASTERPLANNING

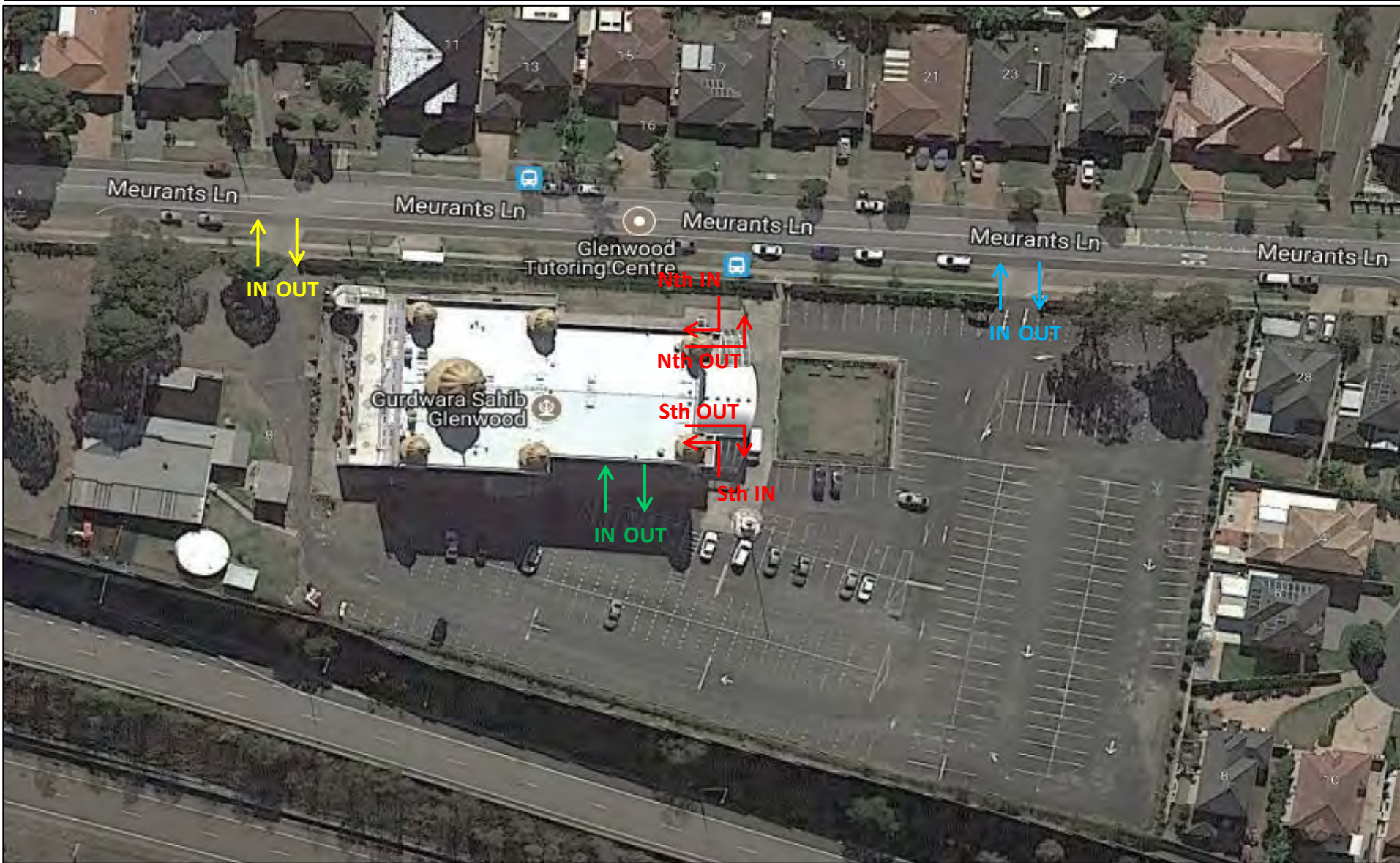
9. Appendix B – Mode of Travel Survey Form

Mode of Travel Survey - KINDERGARTEN

[illegible]

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



- [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	

[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

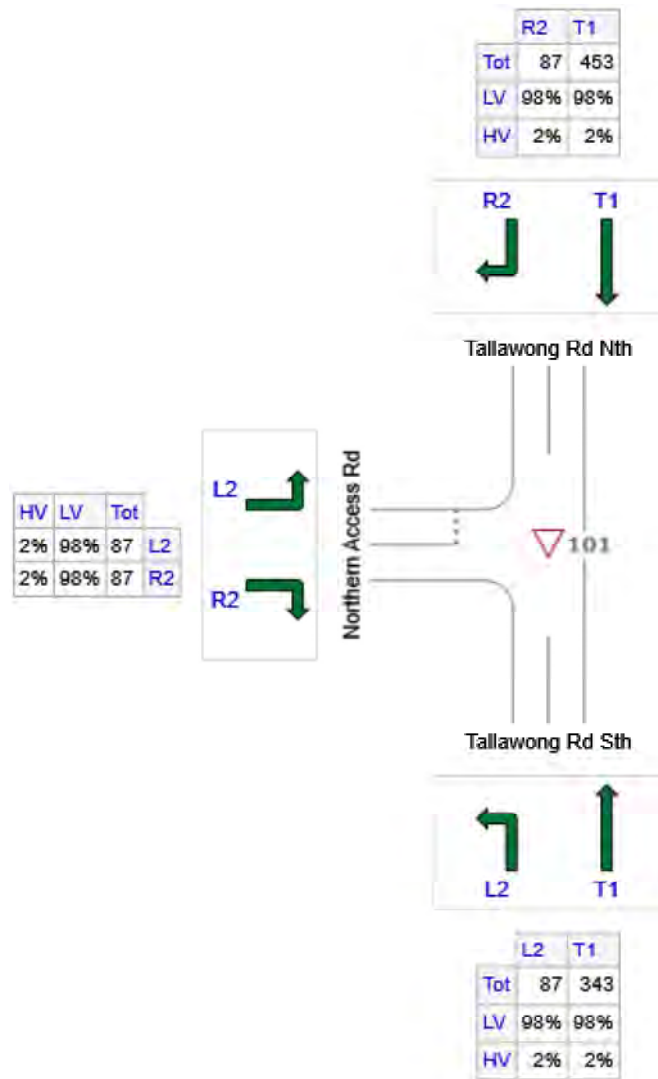
Vehicles and pedestrians per 60 minutes

▽ 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

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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.	L2	T1	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.	
From S					veh/h	Satn	Util.	SL	Ov.	Lane
To Exit:	W	N				v/c	%	%	%	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.	T1	R2	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.	
From N					veh/h	Satn	Util.	SL	Ov.	Lane
To Exit:	S	W				v/c	%	%	%	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.	L2	R2	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.	
From W					veh/h	Satn	Util.	SL	Ov.	Lane
To Exit:	N	S				v/c	%	%	%	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

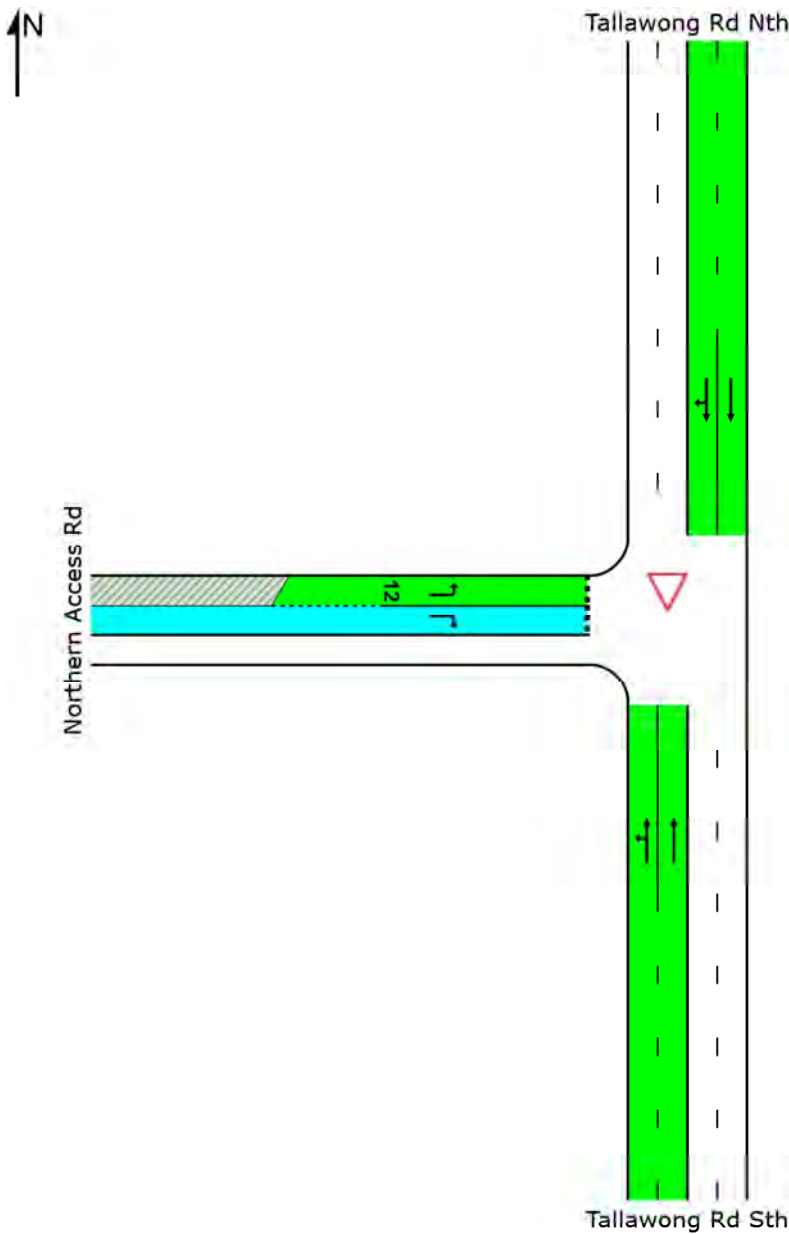
Lane Level of Service

▽ Site: 101 [Tallawong Rd / Northern Rd_AM]

New Site
Giveaway / Yield (Two-Way)

All Movement Classes

	South	North	West	Intersection
LOS	NA	NA	A	NA



Colour code based on Level of Service



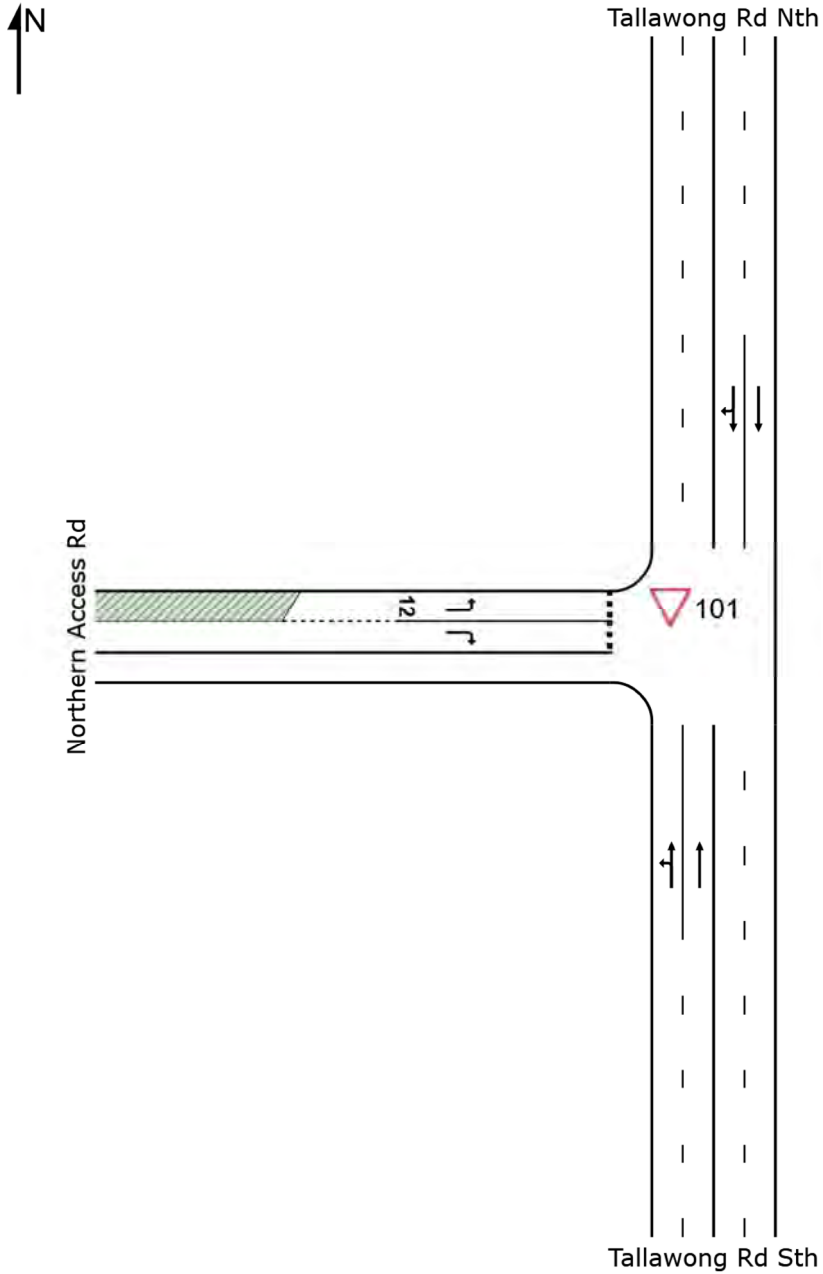
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

SITE LAYOUT

▽ Site: 101 [Tallawong Rd / Northern Rd_AM]

New Site

Giveway / Yield (Two-Way)



LANE LEVEL OF SERVICE

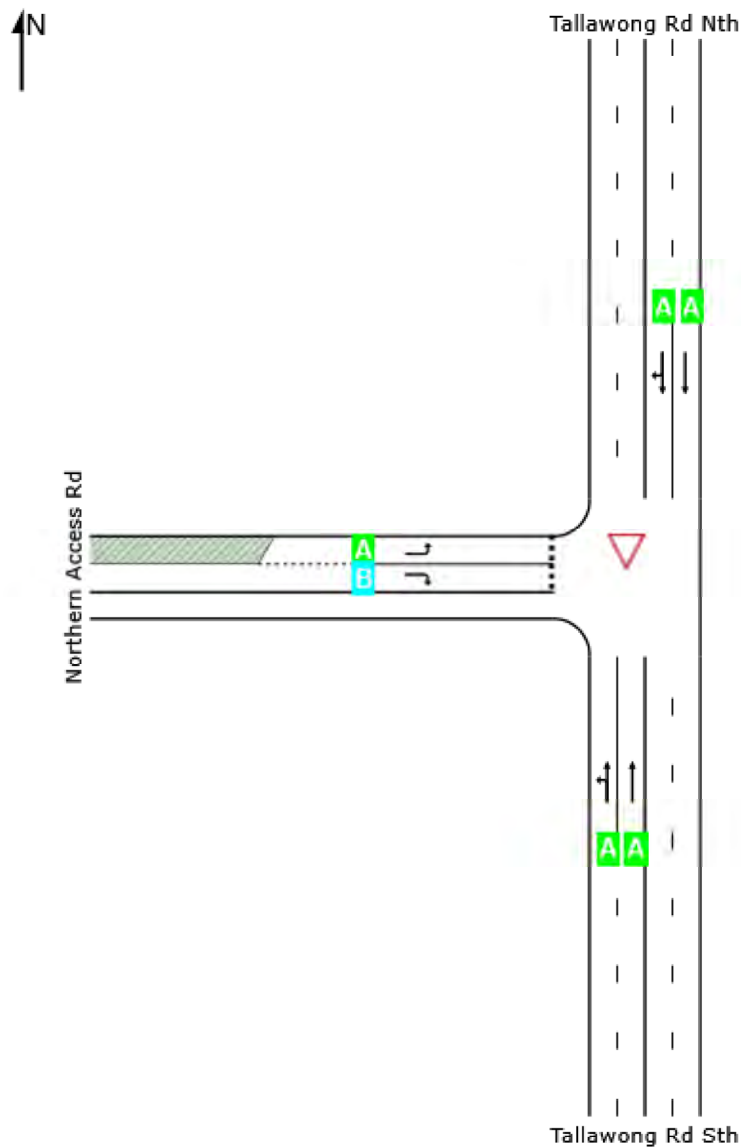
Lane Level of Service

▽ Site: 101 [Tallawong Rd / Northern Rd_AM]

New Site
Giveaway / 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 Total veh/h	Flows 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.

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INPUT VOLUMES

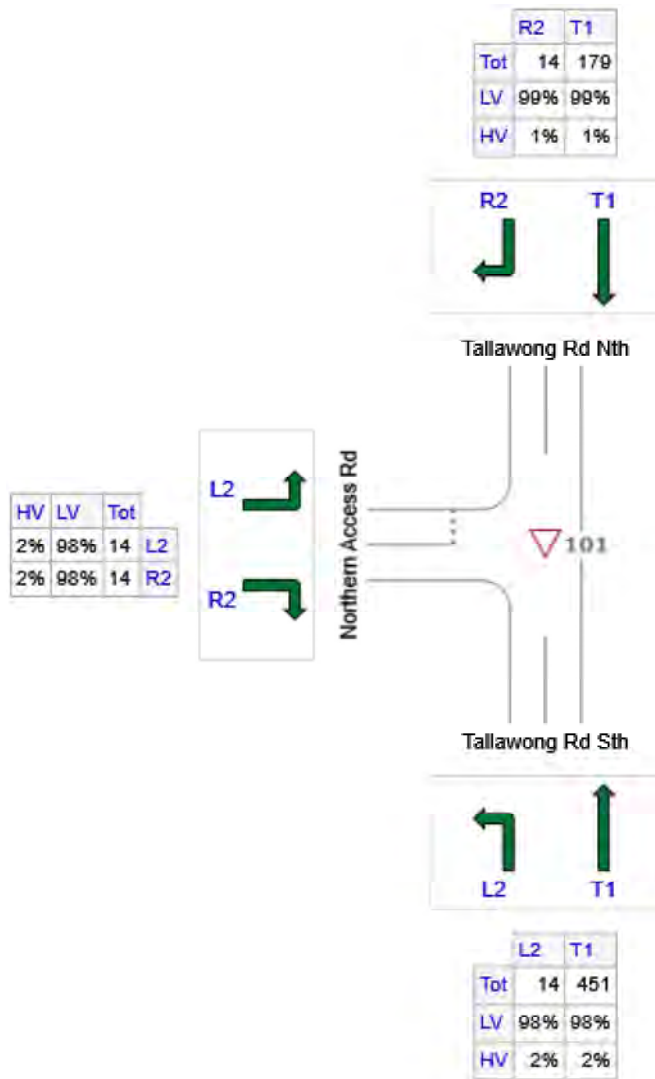
Vehicles and pedestrians per 60 minutes

▽ 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

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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	

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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.	L2	T1	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.	
From S					veh/h	Satn	Util.	SL	Ov.	Lane
To Exit:	W	N				v/c	%	%	%	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.	T1	R2	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.	
From N					veh/h	Satn	Util.	SL	Ov.	Lane
To Exit:	S	W				v/c	%	%	%	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.	L2	R2	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.	
From W					veh/h	Satn	Util.	SL	Ov.	Lane
To Exit:	N	S				v/c	%	%	%	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

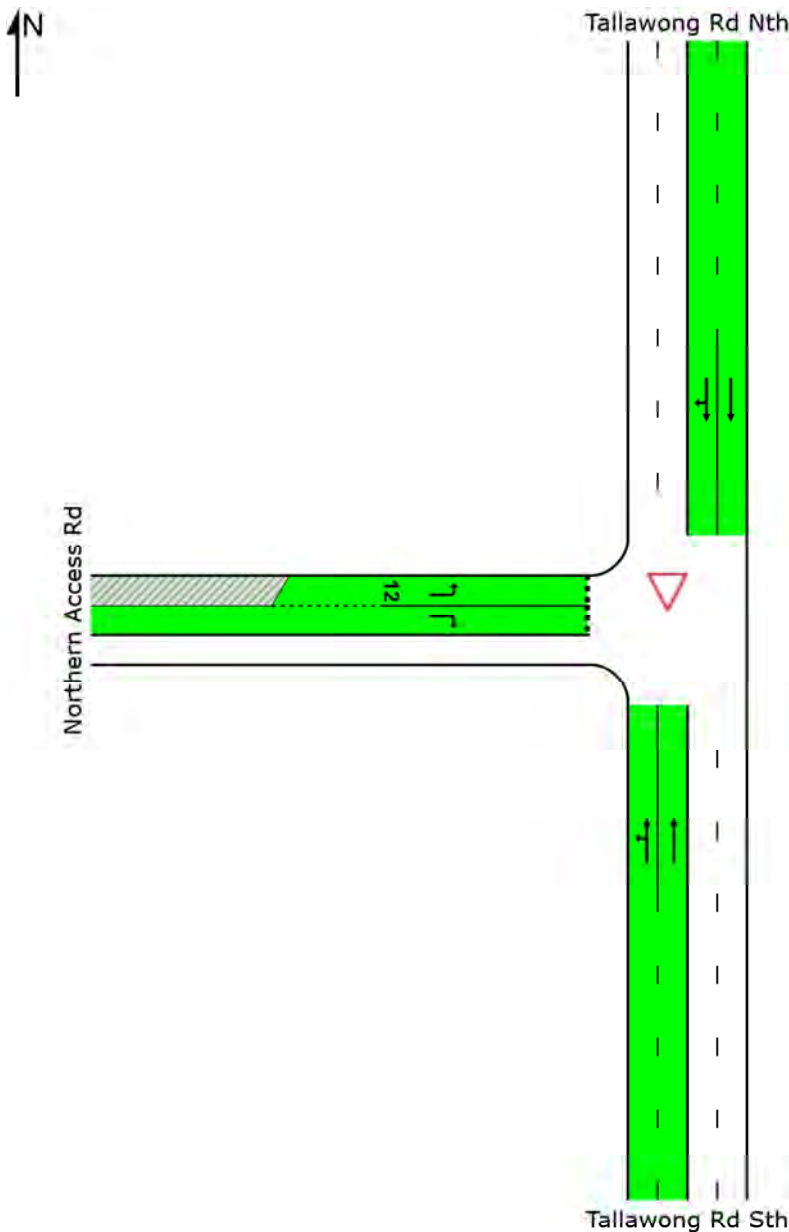
Lane Level of Service

▽ 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



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.

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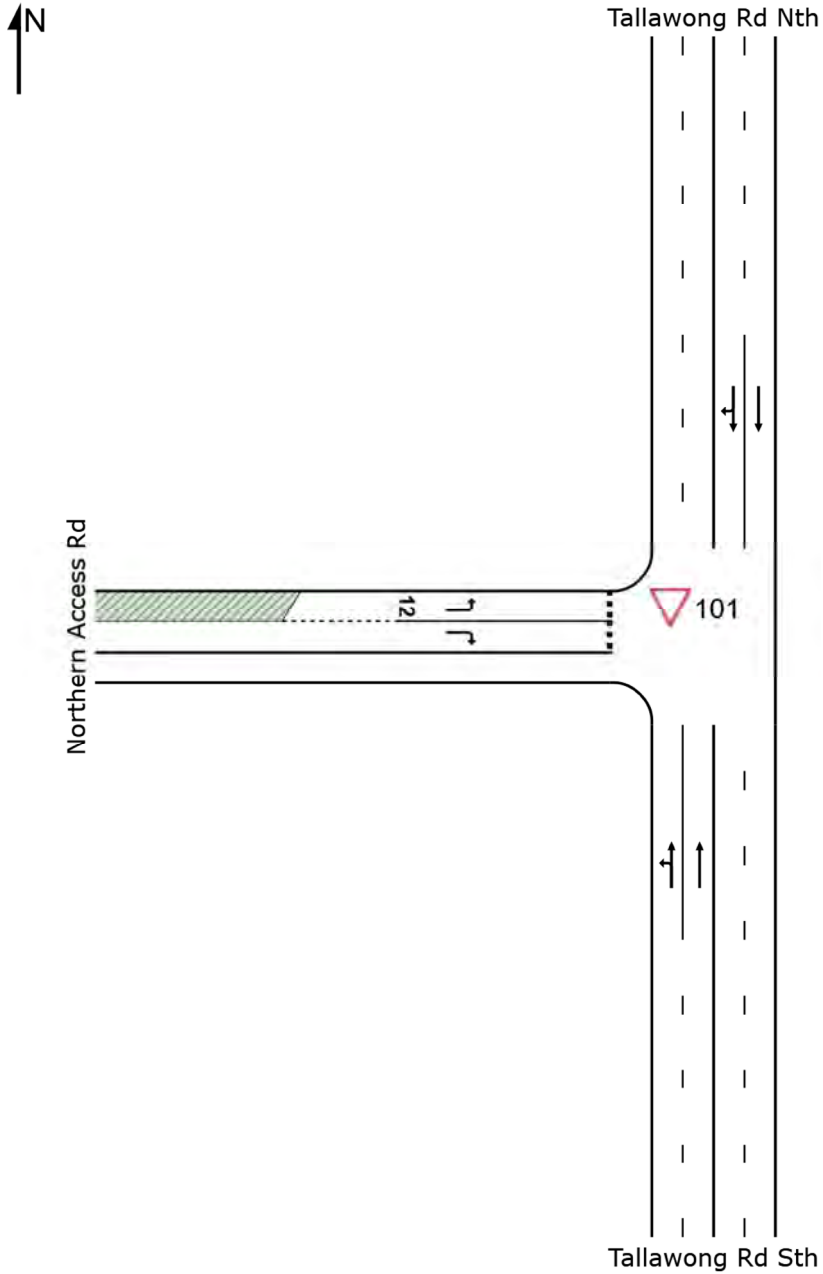
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SITE LAYOUT

▽ Site: 101 [Tallawong Rd / Northern Rd_PM]

New Site
Giveway / Yield (Two-Way)



LANE LEVEL OF SERVICE

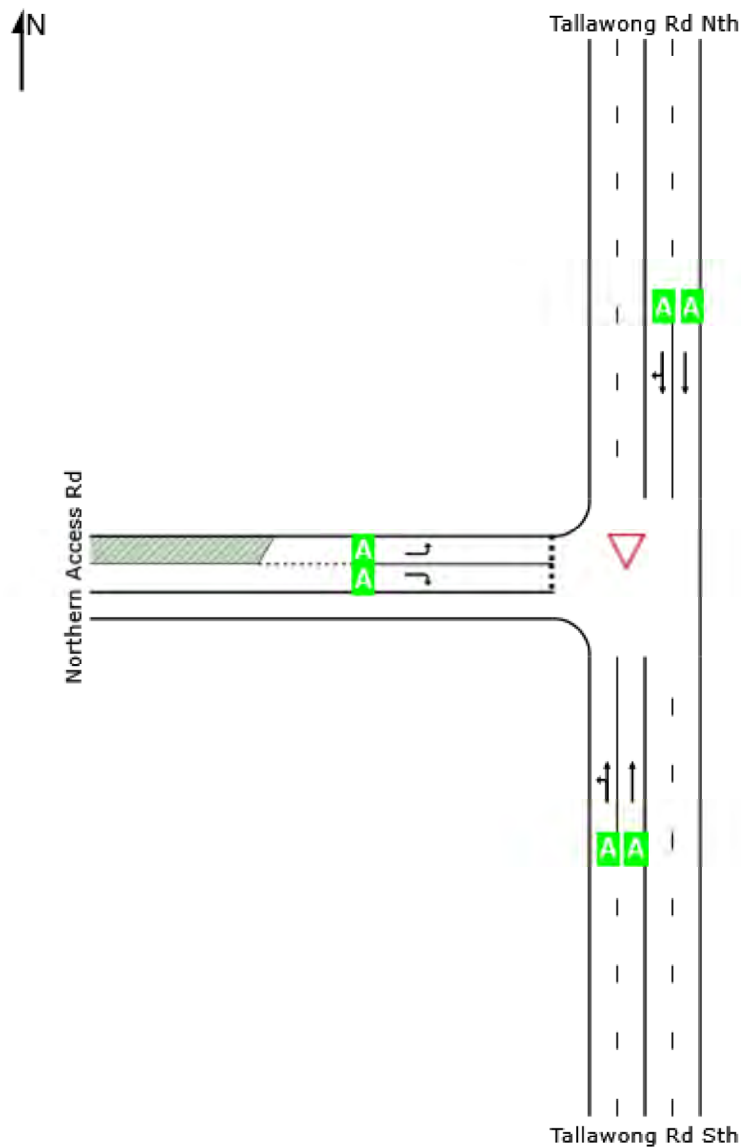
Lane Level of Service

▽ Site: 101 [Tallawong Rd / Northern Rd_PM]

New Site
Giveaway / 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 Total veh/h	Flows 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.

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INPUT VOLUMES

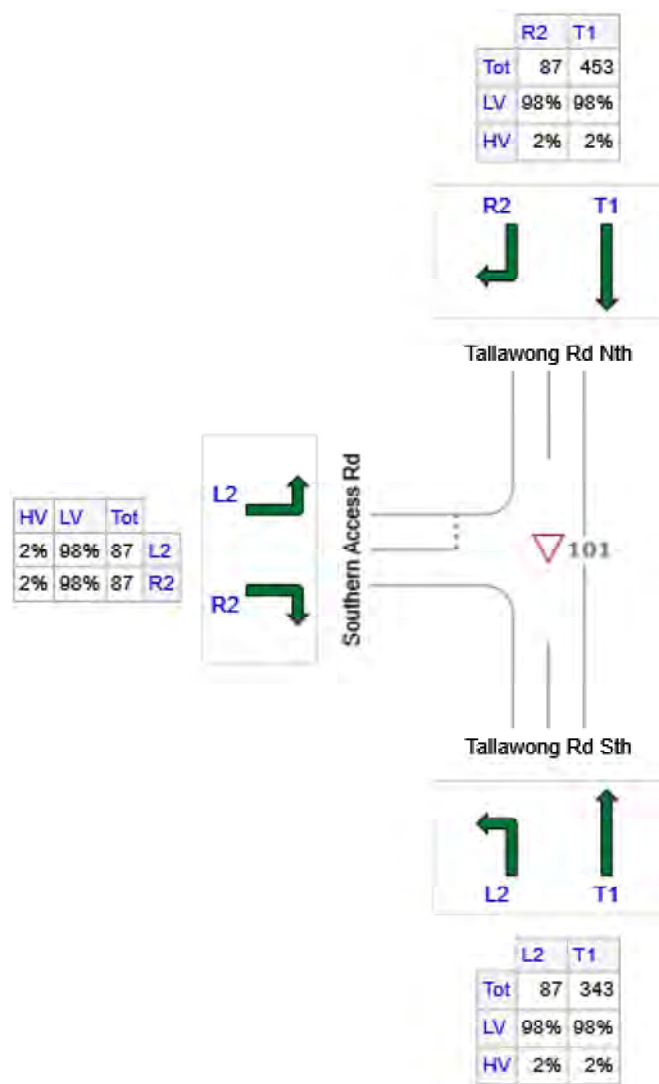
Vehicles and pedestrians per 60 minutes

▽ 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

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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	

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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.	L2	T1	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.	
From S					veh/h	Satn	Util.	SL	Ov.	Lane
To Exit:	W	N				v/c	%	%	%	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.	T1	R2	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.	
From N					veh/h	Satn	Util.	SL	Ov.	Lane
To Exit:	S	W				v/c	%	%	%	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.	L2	R2	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.	
From W					veh/h	Satn	Util.	SL	Ov.	Lane
To Exit:	N	S				v/c	%	%	%	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

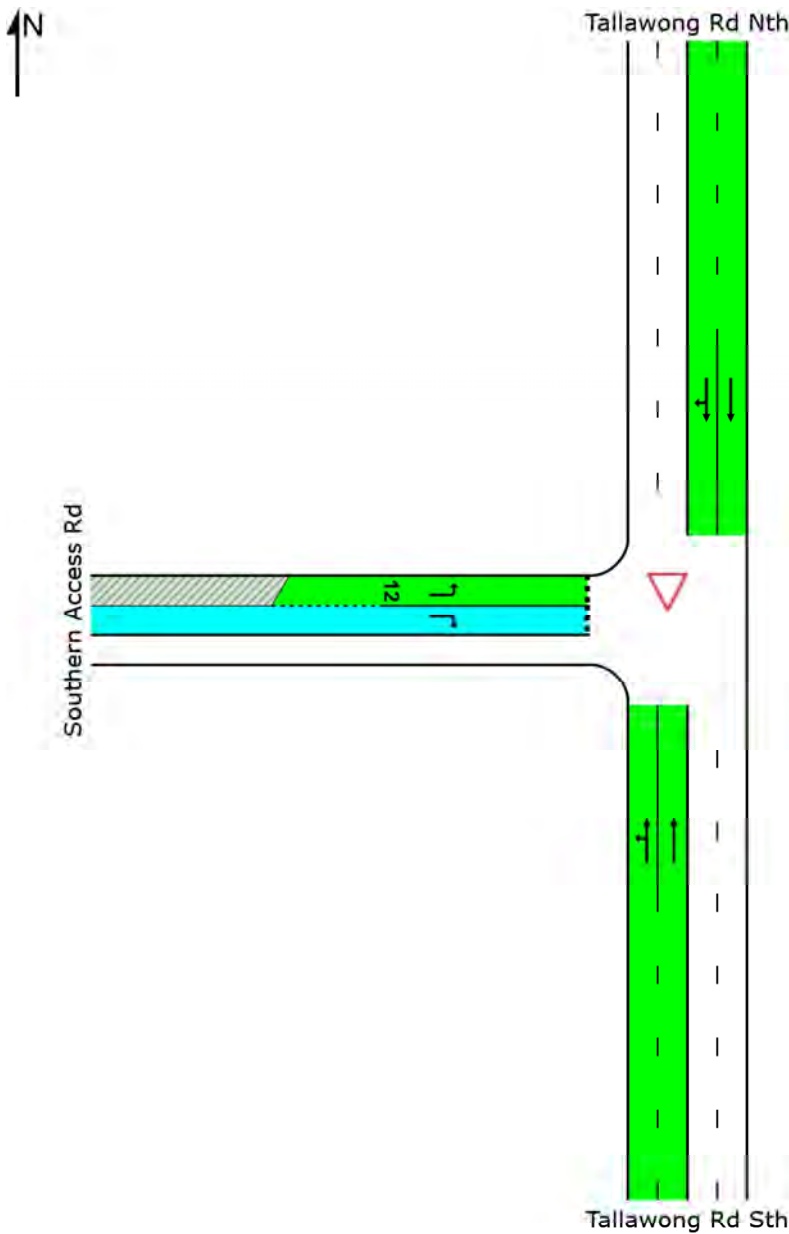
Lane Level of Service

▽ Site: 101 [Tallawong Rd / Southern Rd_AM]

New Site
Giveaway / Yield (Two-Way)

All Movement Classes

	South	North	West	Intersection
LOS	NA	NA	A	NA



Colour code based on Level of Service



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.

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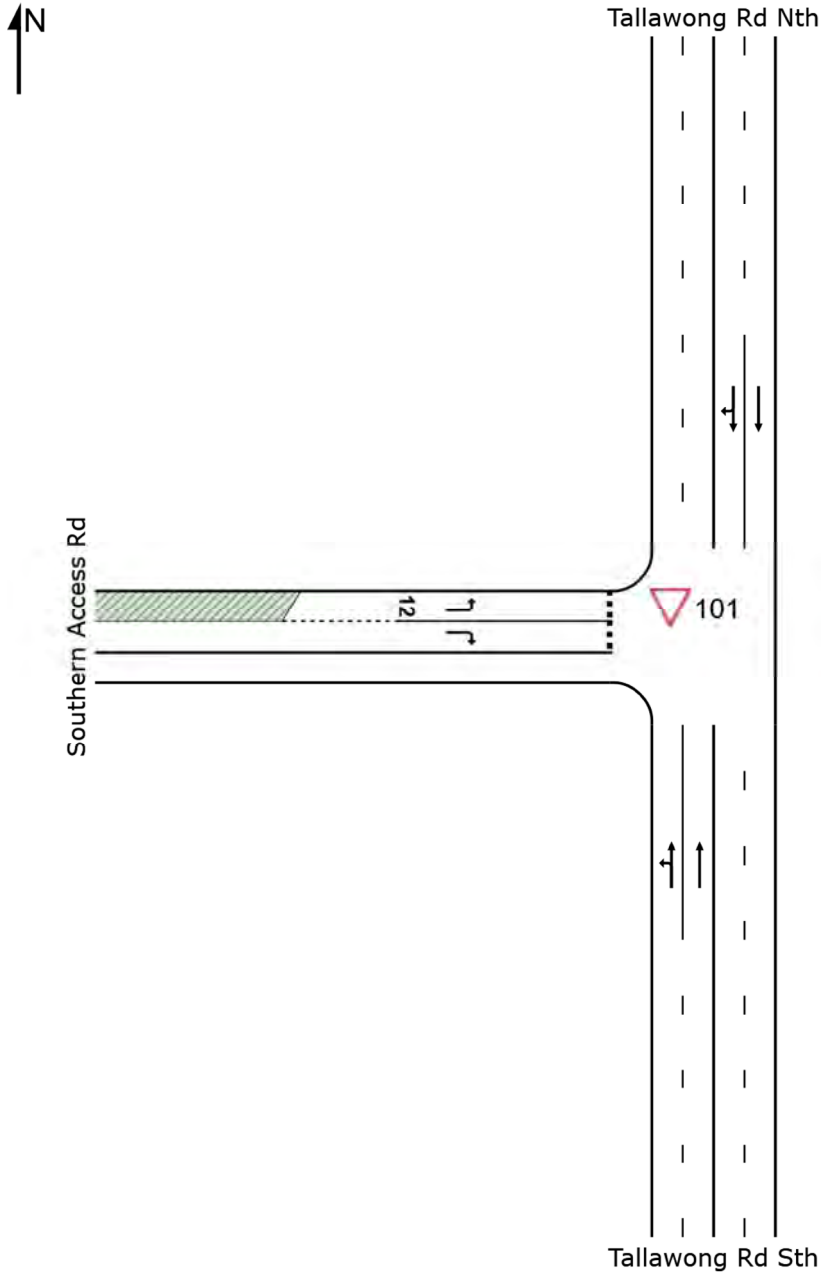
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SITE LAYOUT

▽ Site: 101 [Tallawong Rd / Southern Rd_AM]

New Site
Giveway / Yield (Two-Way)



LANE LEVEL OF SERVICE

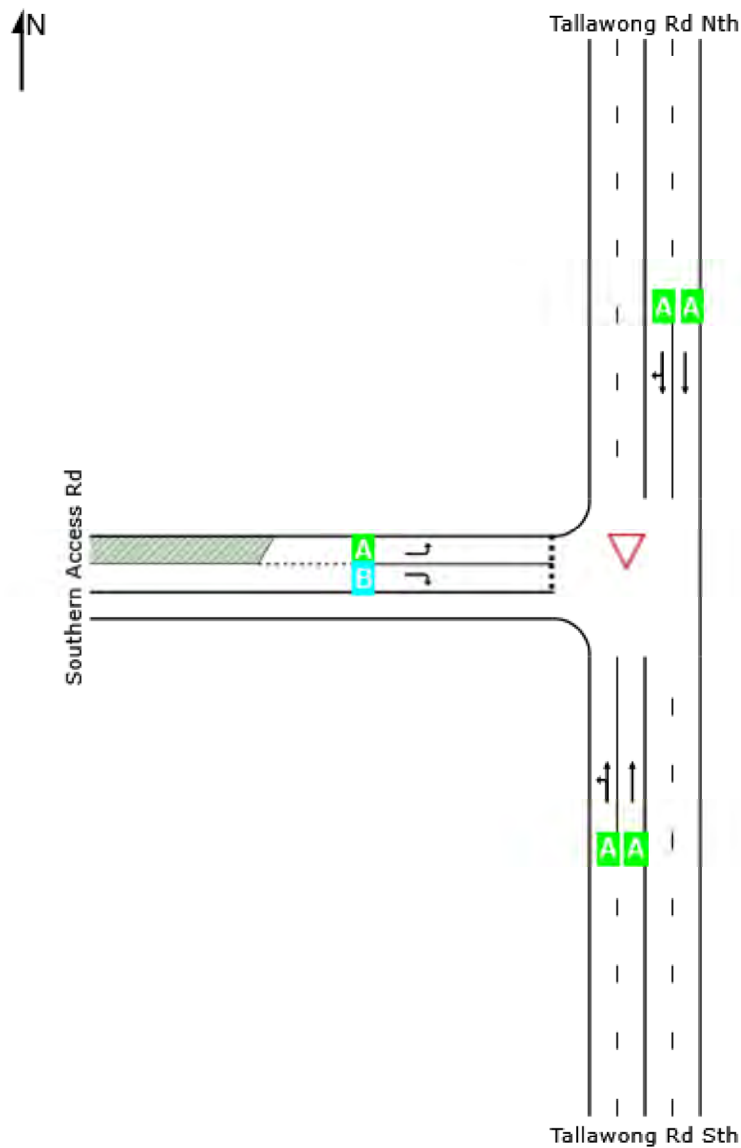
Lane Level of Service

▽ 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 Total veh/h	Flows 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.

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INPUT VOLUMES

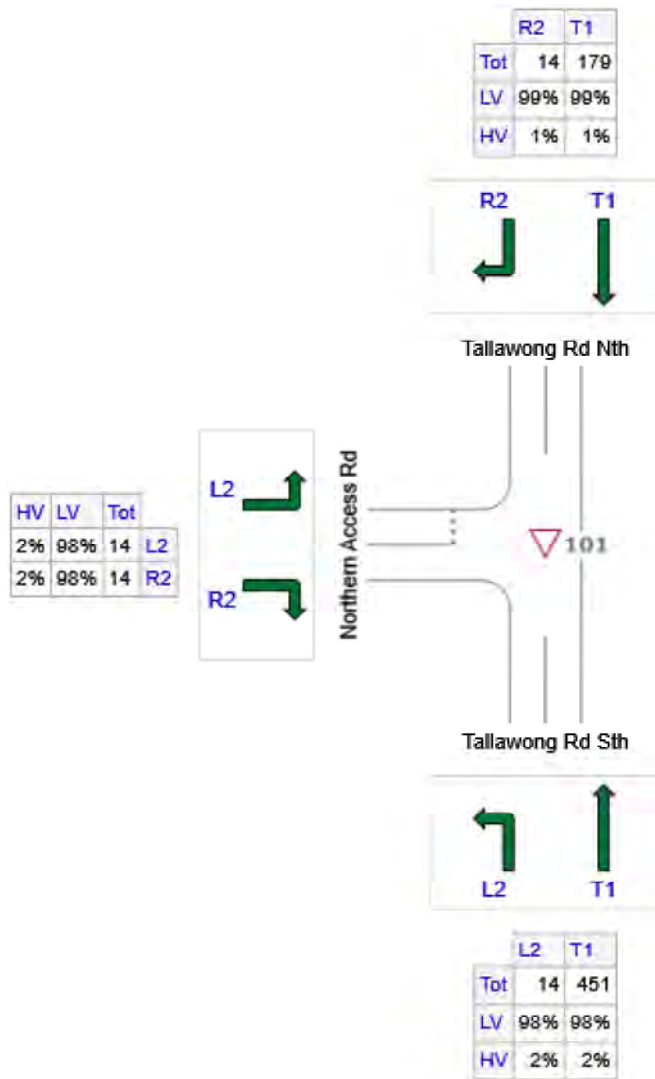
Vehicles and pedestrians per 60 minutes

▽ 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

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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	

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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.	L2	T1	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.	
From S					veh/h	Satn	Util.	SL	Ov.	Lane
To Exit:	W	N				v/c	%	%	%	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.	T1	R2	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.	
From N					veh/h	Satn	Util.	SL	Ov.	Lane
To Exit:	S	W				v/c	%	%	%	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.	L2	R2	Total	%HV	Cap.	Deg.	Lane	Prob.	Ov.	
From W					veh/h	Satn	Util.	SL	Ov.	Lane
To Exit:	N	S				v/c	%	%	%	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

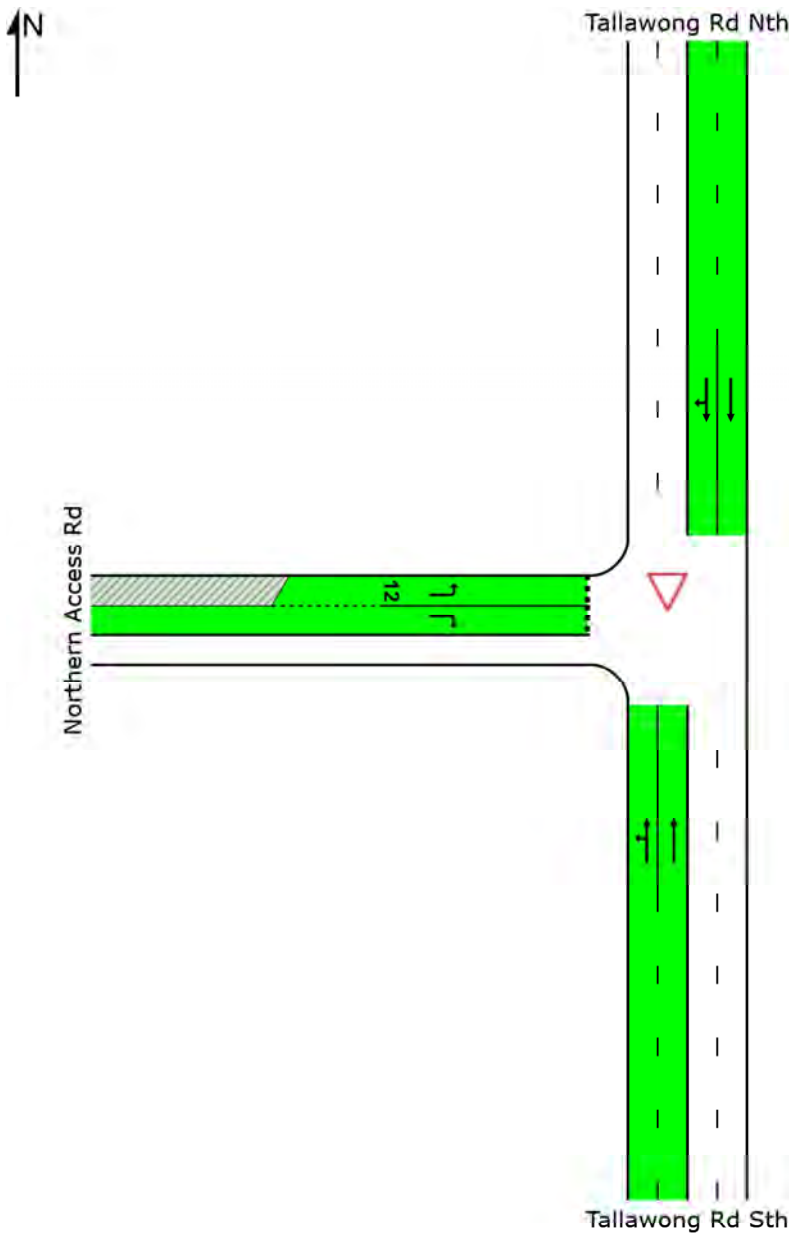
Lane Level of Service

▽ Site: 101 [Tallawong Rd / Southern Rd_PM]

New Site
Giveaway / Yield (Two-Way)

All Movement Classes

	South	North	West	Intersection
LOS	NA	NA	A	NA



Colour code based on Level of Service



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.

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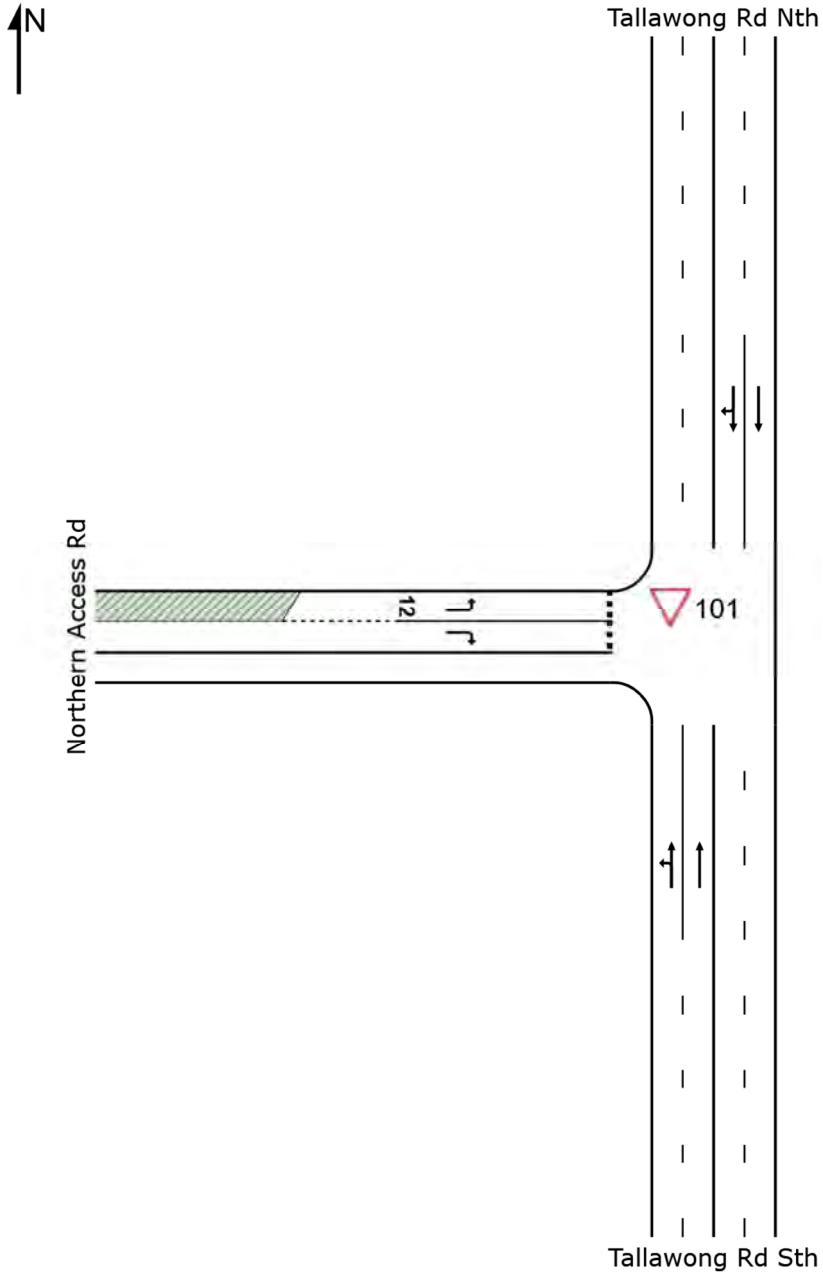
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SITE LAYOUT

 Site: 101 [Tallawong Rd / Southern Rd_PM]

New Site

Giveway / Yield (Two-Way)



LANE LEVEL OF SERVICE

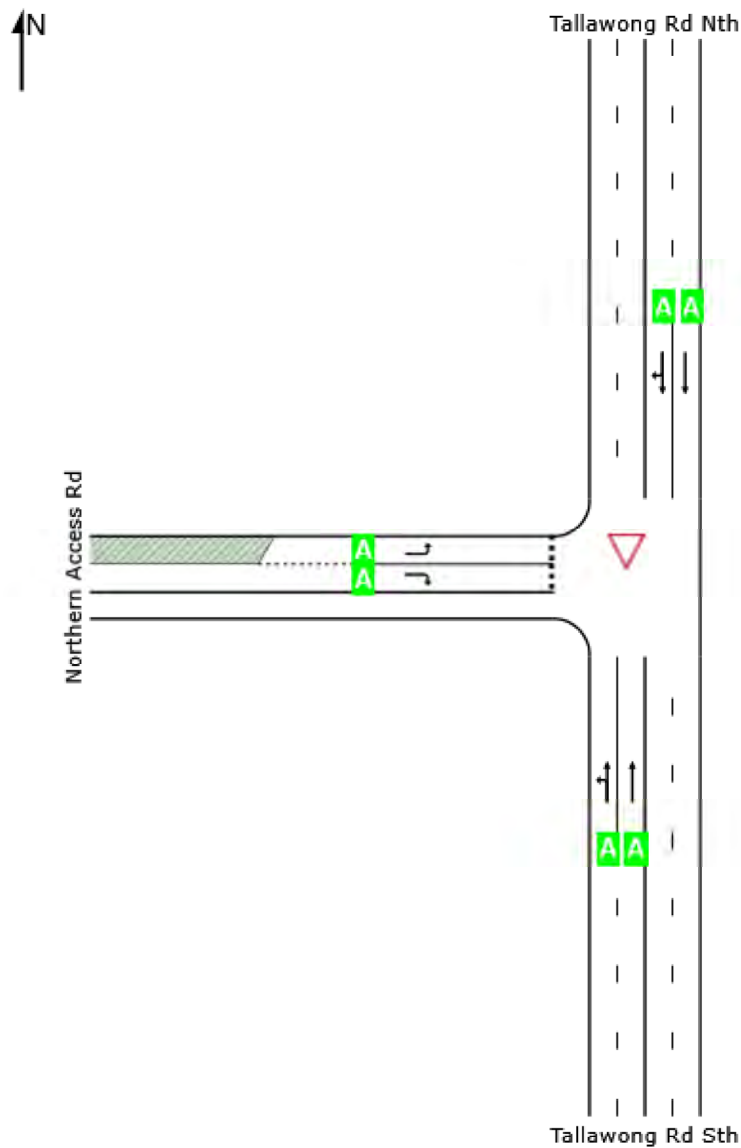
Lane Level of Service

▽ Site: 101 [Tallawong Rd / Southern Rd_PM]

New Site
Giveaway / 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 Total veh/h	Flows 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

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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.

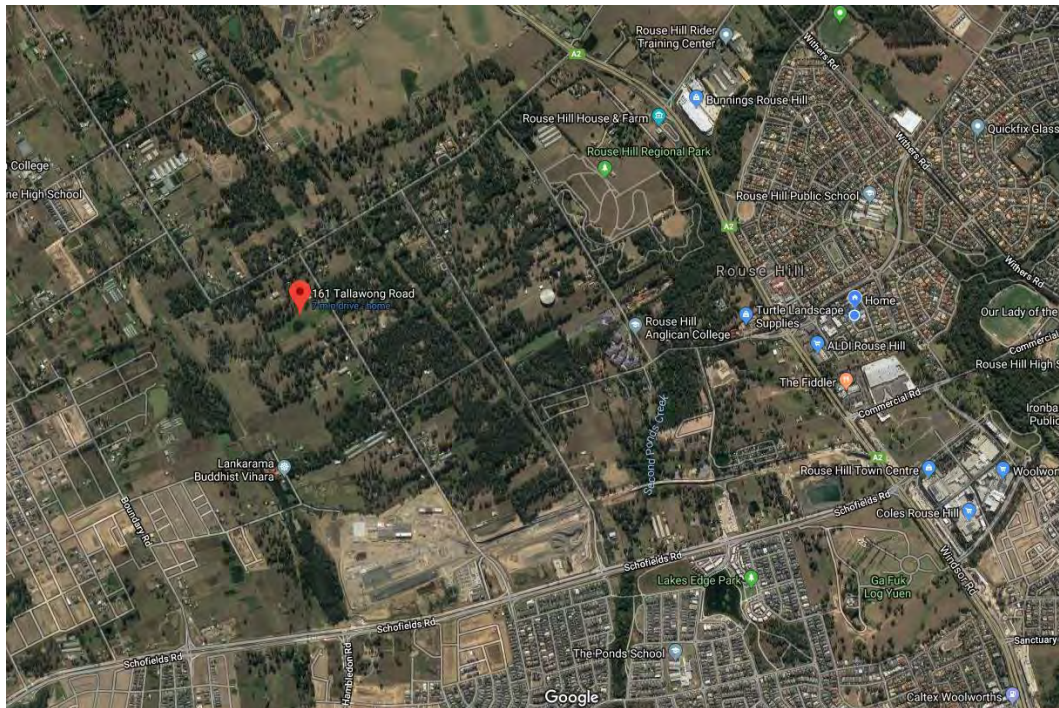
2.1 Site Location

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

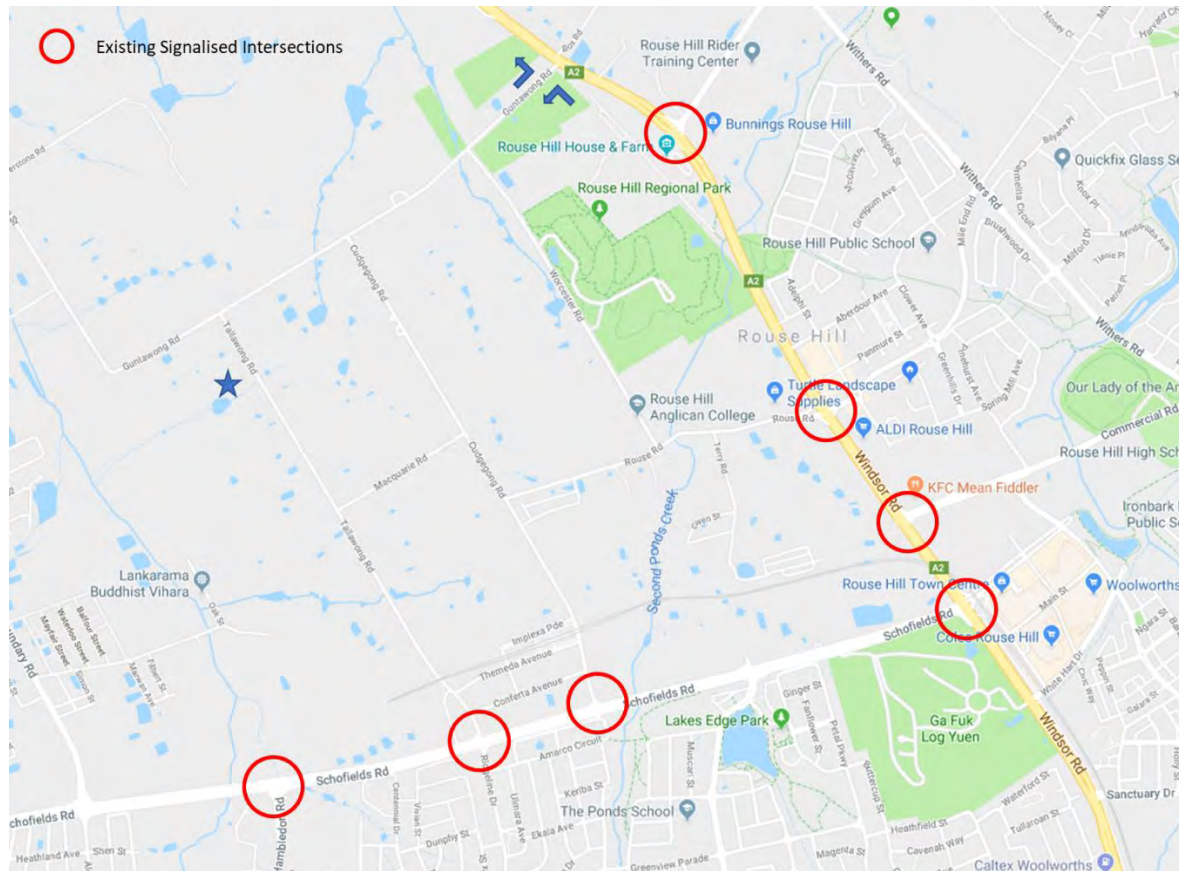


Guntawong Road – is of a similar nature to Tallawong Road with a single travel lane in each direction, unformed road shoulders and a posted speed limit of 50km/hr. The road provides a left in / left out intersection access with Windsor Road, the main north-south arterial road through the area.

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

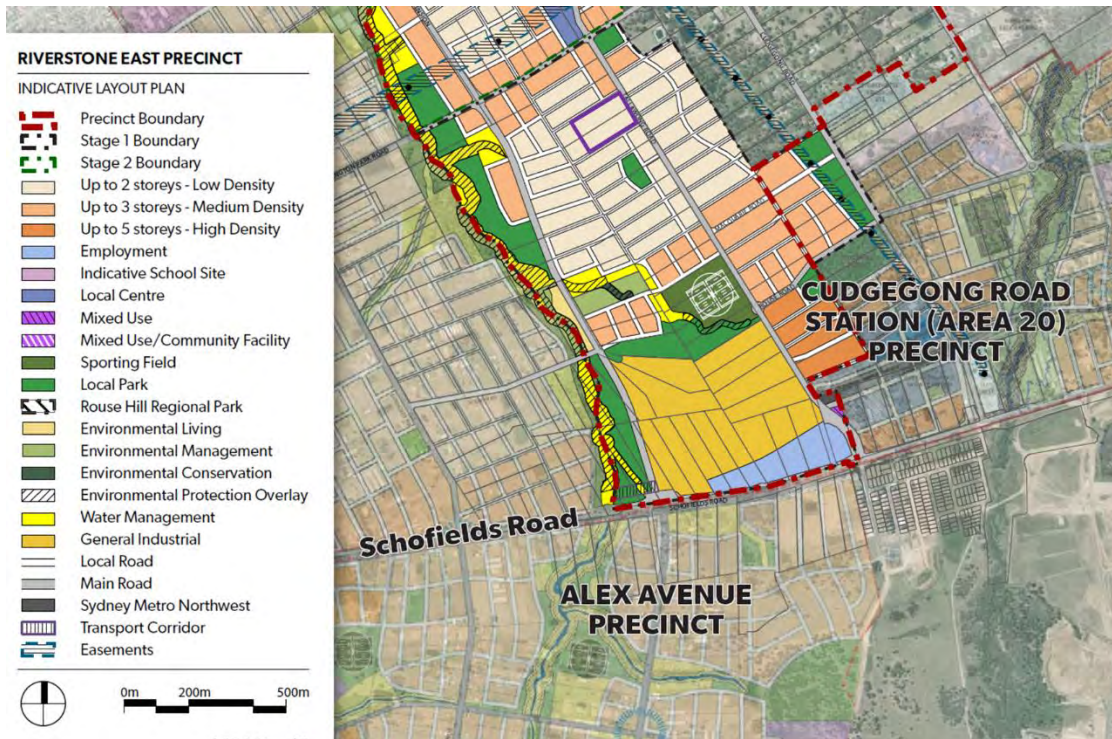
Figure 4 – Existing Intersection Traffic Controls



2.3 Future Road Network

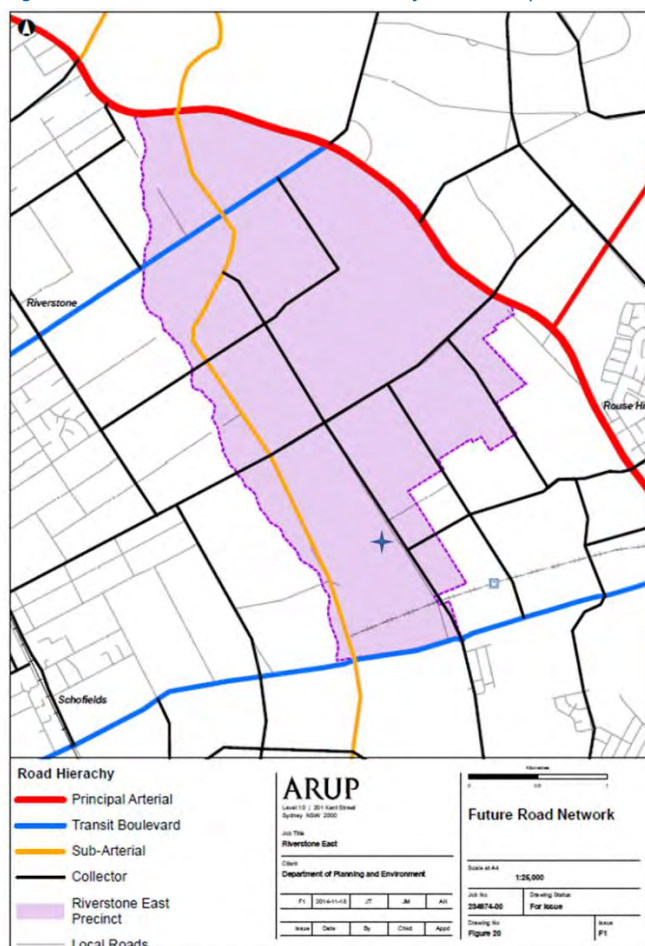
The site is located within the Riverstone East Precinct which is currently experiencing growth in development including improvements to some of the road networks. The location of the proposed school site within the context of the Riverstone East ILP is shown below in [Figure 5](#).

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 / Gundegong 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 - New northern local road half construction - Relocatable primary school building - Open space	168	19
2	- Permanent private school building - Open space	420	47
3	- Additional primary school buildings - Half western boundary road construction - Southern boundary road future car park access	680	75
3B	- Early learning centre - Early learning centre car park	680 school / 86 early learning centre	75 school / 36 early learning centre
4	- Secondary school - Additional parking	900 school / 86 early learning centre	111 school / 36 early learning centre
5	- Additional Secondary School buildings - 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 - Gurdwara / Langer Worship building - 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 - Boarding house (110 students) - 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 7](#) and [Figure 8](#).

Figure 7 – Proposed Inbound Truck Routes

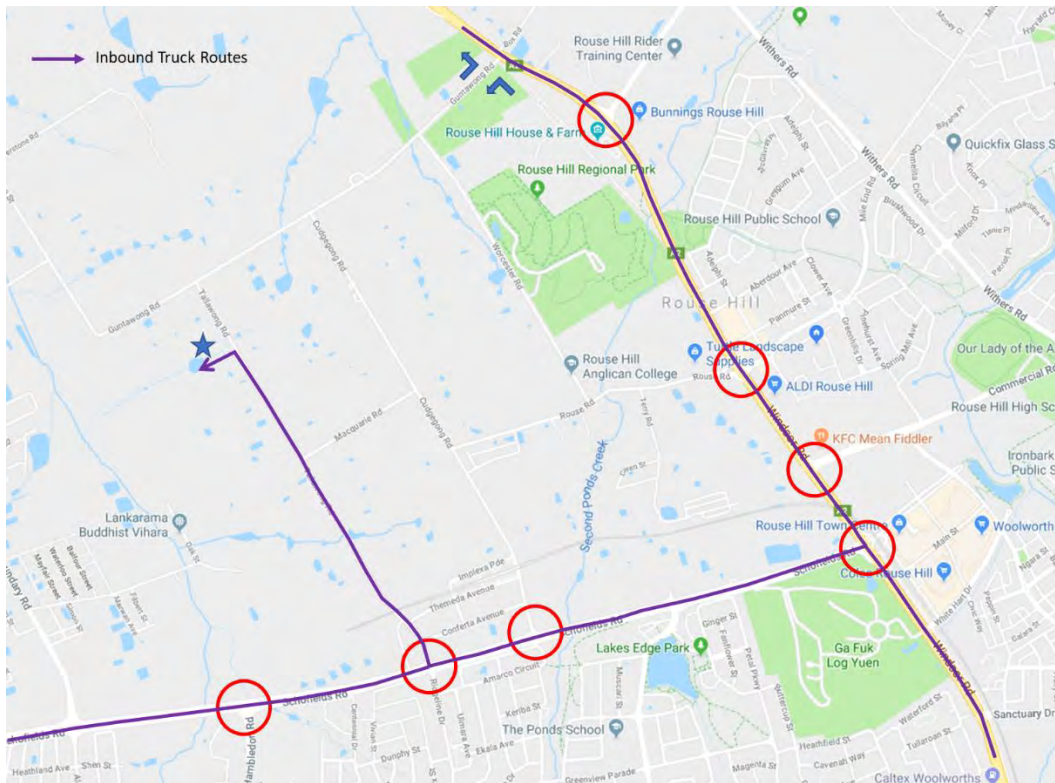
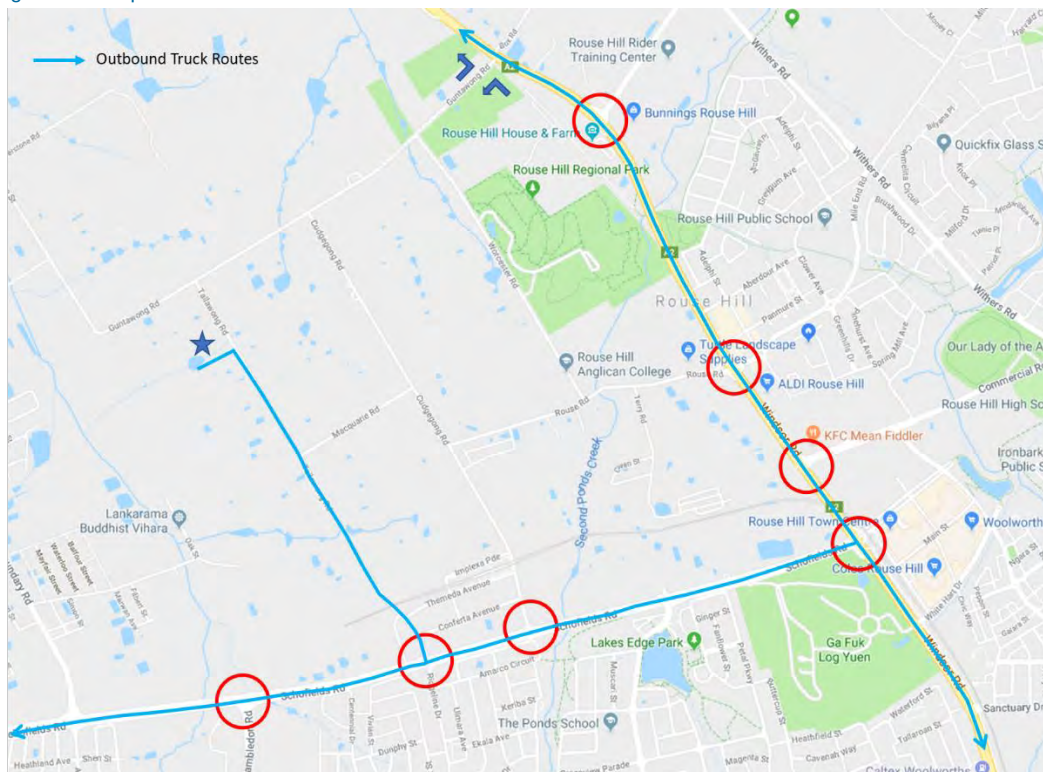


Figure 8 – Proposed Outbound Truck Routes



- 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,

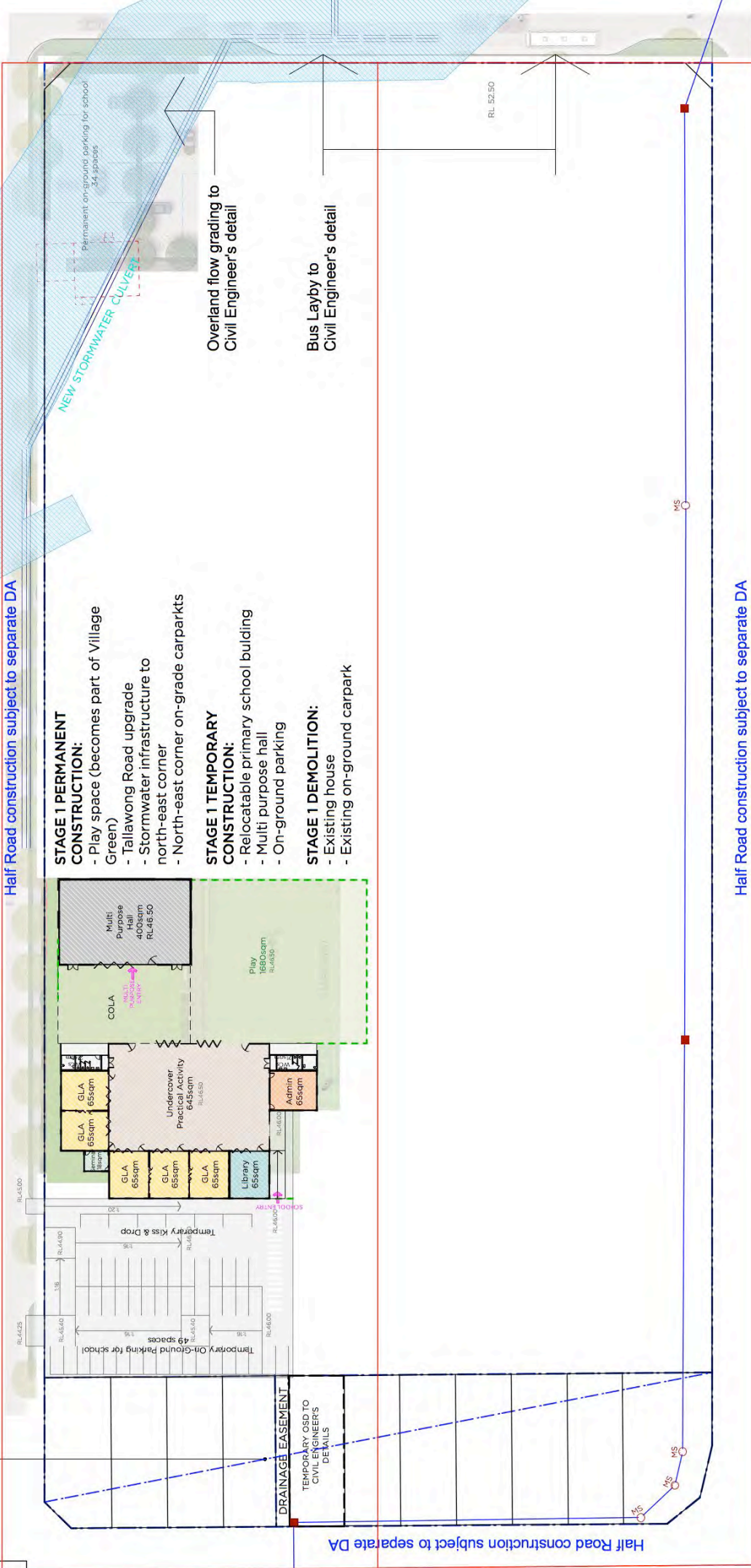
- e) formalise regular senior management reviews of WH&S systems and implement relevant improvements,
- f) continually develop WH&S systems, policies, procedures and WH&S Plans to comply with statutory requirements and industry best practice,
- g) maintain an Audit Programme to comply with system's requirements,
- 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



Residential subdivision
subject to separate DA

Half Road construction subject to separate DA



- STAGE 1 PERMANENT CONSTRUCTION:**
- Play space (becomes part of Village Green)
 - Tallawong Road upgrade
 - Stormwater infrastructure to north-east corner
 - North-east corner on-grade carparks
- STAGE 1 TEMPORARY CONSTRUCTION:**
- Relocatable primary school building
 - Multi purpose hall
 - On-ground parking
- STAGE 1 DEMOLITION:**
- Existing house
 - Existing on-ground carpark

Overland flow grading to Civil Engineer's detail

Bus Layby to Civil Engineer's detail

Half Road construction subject to separate DA

STAGE 1: PRIMARY SCHOOL

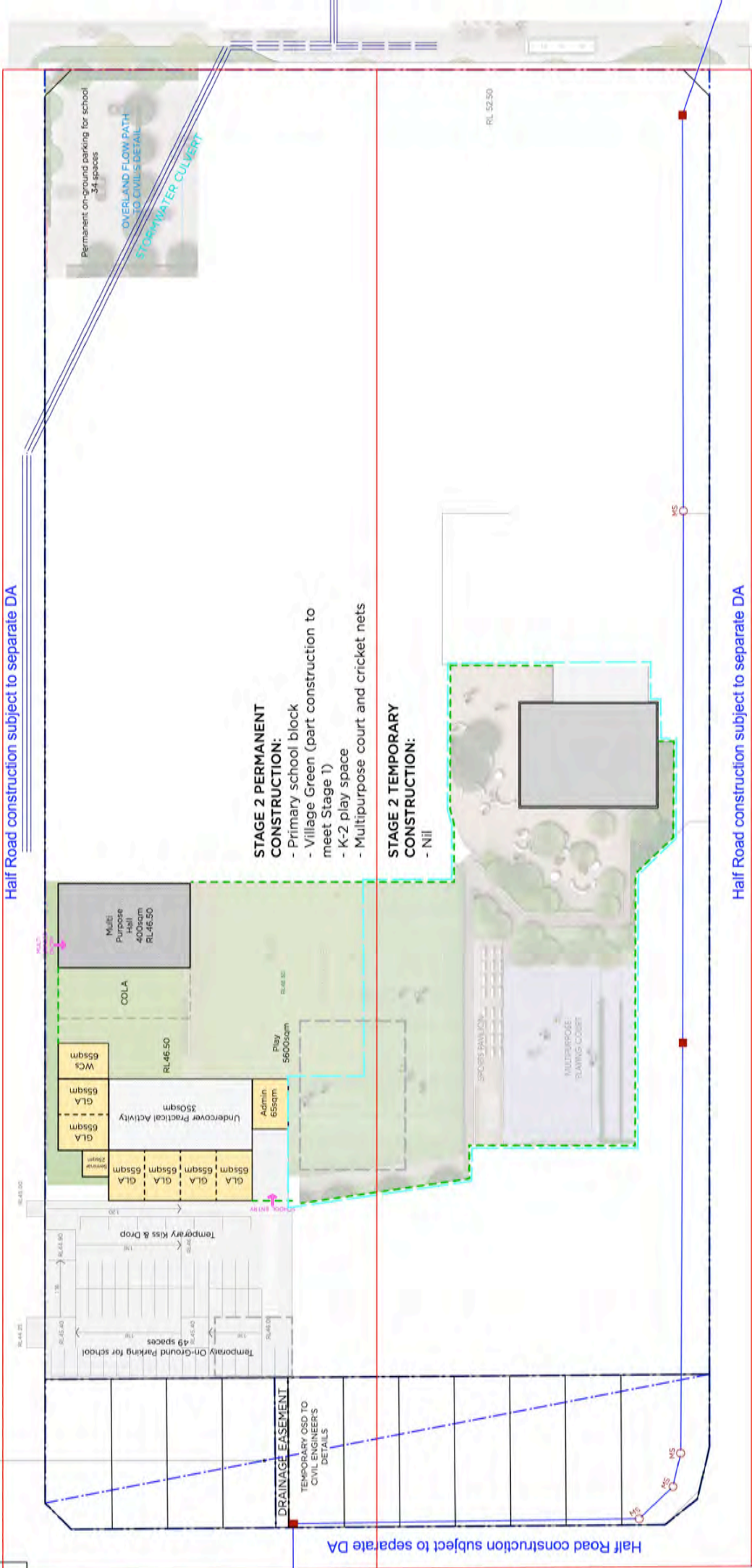
	GFA	1085sqm
Maximum students	168	
Outdoor space	1680sqm	1140sqm
Total Parking spaces	83	2000sqm

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



Residential subdivision
subject to separate DA

Half Road construction subject to separate DA



STAGE 2 PERMANENT CONSTRUCTION:

- Primary school block
- Village Green (part construction to meet Stage 1)
- K-2 play space
- Multipurpose court and cricket nets

STAGE 2 TEMPORARY CONSTRUCTION:

- Nil

Half Road construction subject to separate DA

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 construction
- Temporary school fence

Stage 2

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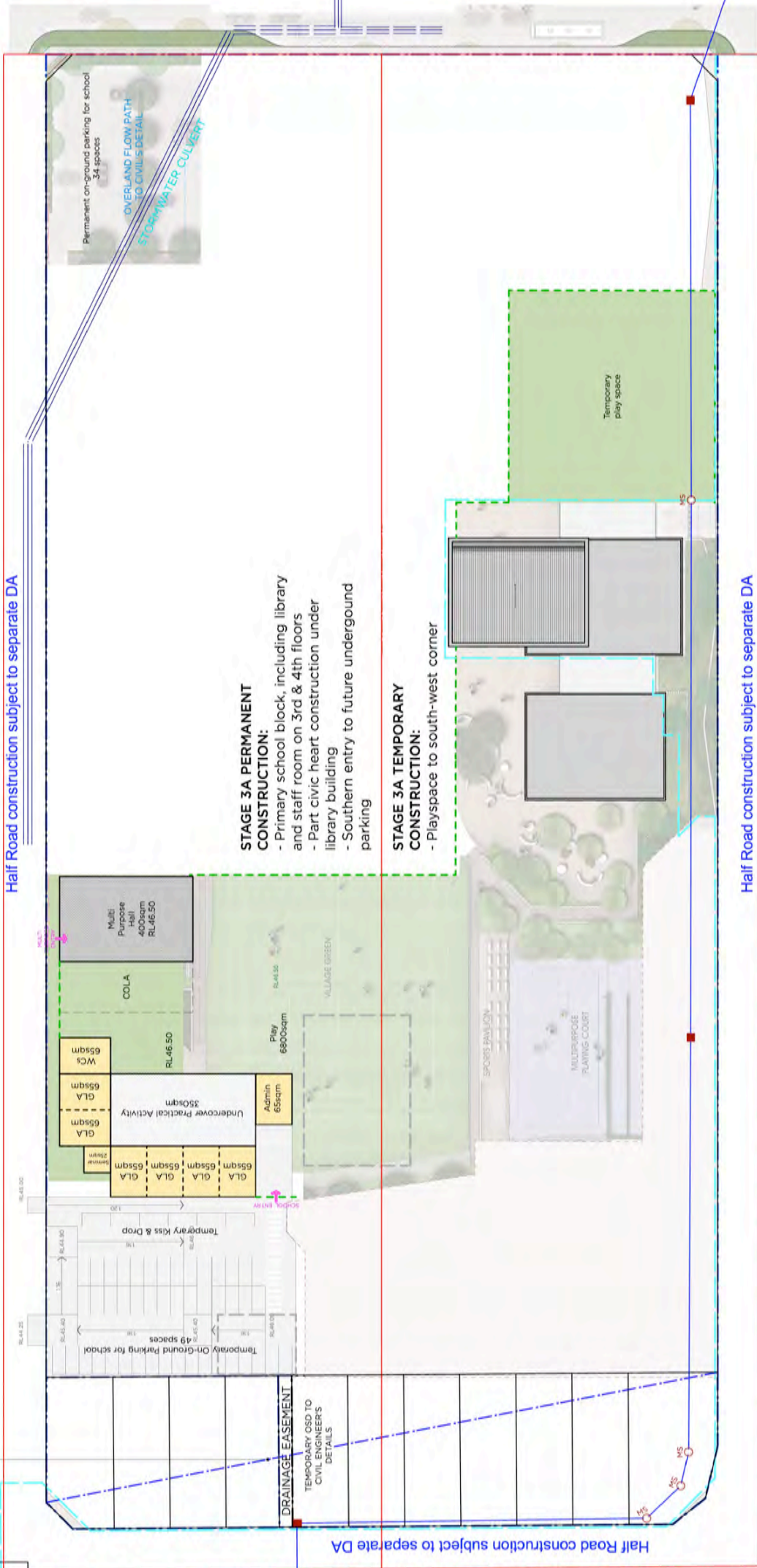
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Residential subdivision
subject to separate DA

Half Road construction subject to separate DA



STAGE 3A PERMANENT CONSTRUCTION:

- Primary school block, including library and staff room on 3rd & 4th floors
- Part civic heart construction under library building
- Southern entry to future underground parking

STAGE 3A TEMPORARY CONSTRUCTION:

- Playspace to south-west corner

Half Road construction subject to separate DA

STAGE 3: PRIMARY SCHOOL

	GFA	5668sqm
Maximum students	680	
Outdoor space	6800sqm	
Total Parking spaces	83	

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

Stage 3A

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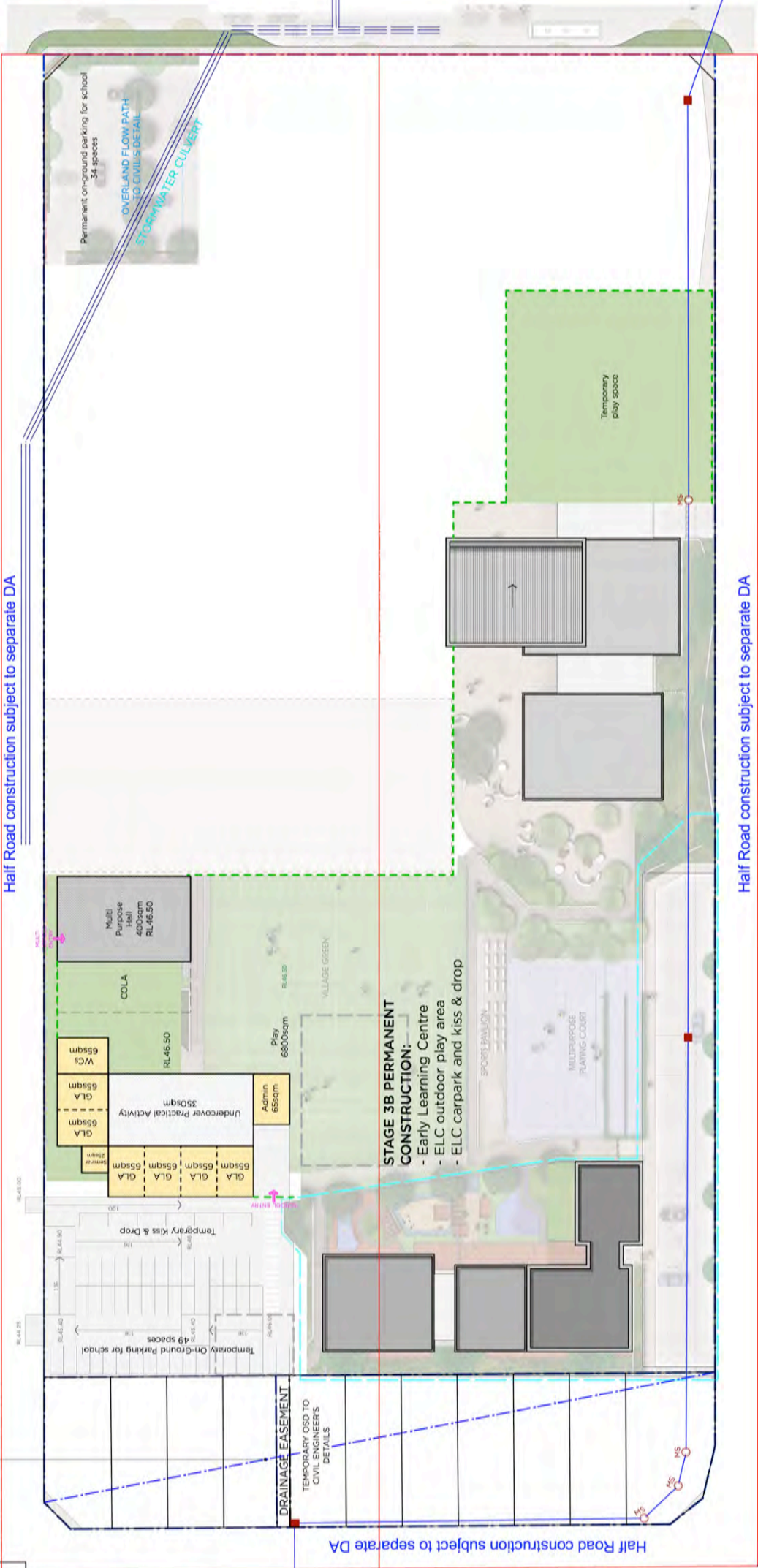
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Residential subdivision
subject to separate DA

Half Road construction subject to separate DA



Half Road construction subject to separate DA

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 construction
- Temporary school fence

Stage 3B

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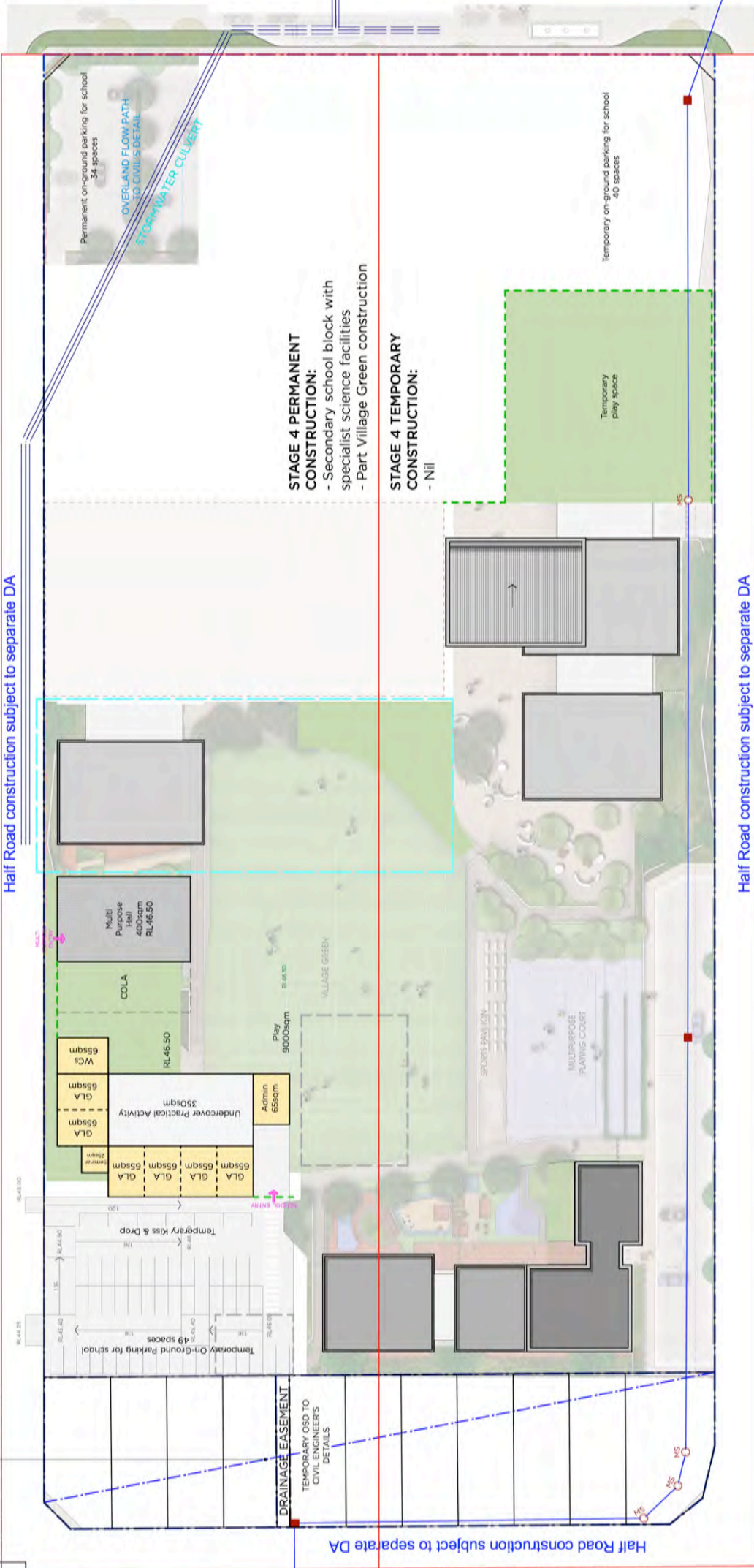
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subject to separate DA

Half Road construction subject to separate DA



STAGE 4 PERMANENT CONSTRUCTION:
- Secondary school block with specialist science facilities
- Part Village Green construction

STAGE 4 TEMPORARY CONSTRUCTION:
- Nil

Half Road construction subject to separate DA

STAGE 4: SECONDARY SCHOOL

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

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

Stage 4

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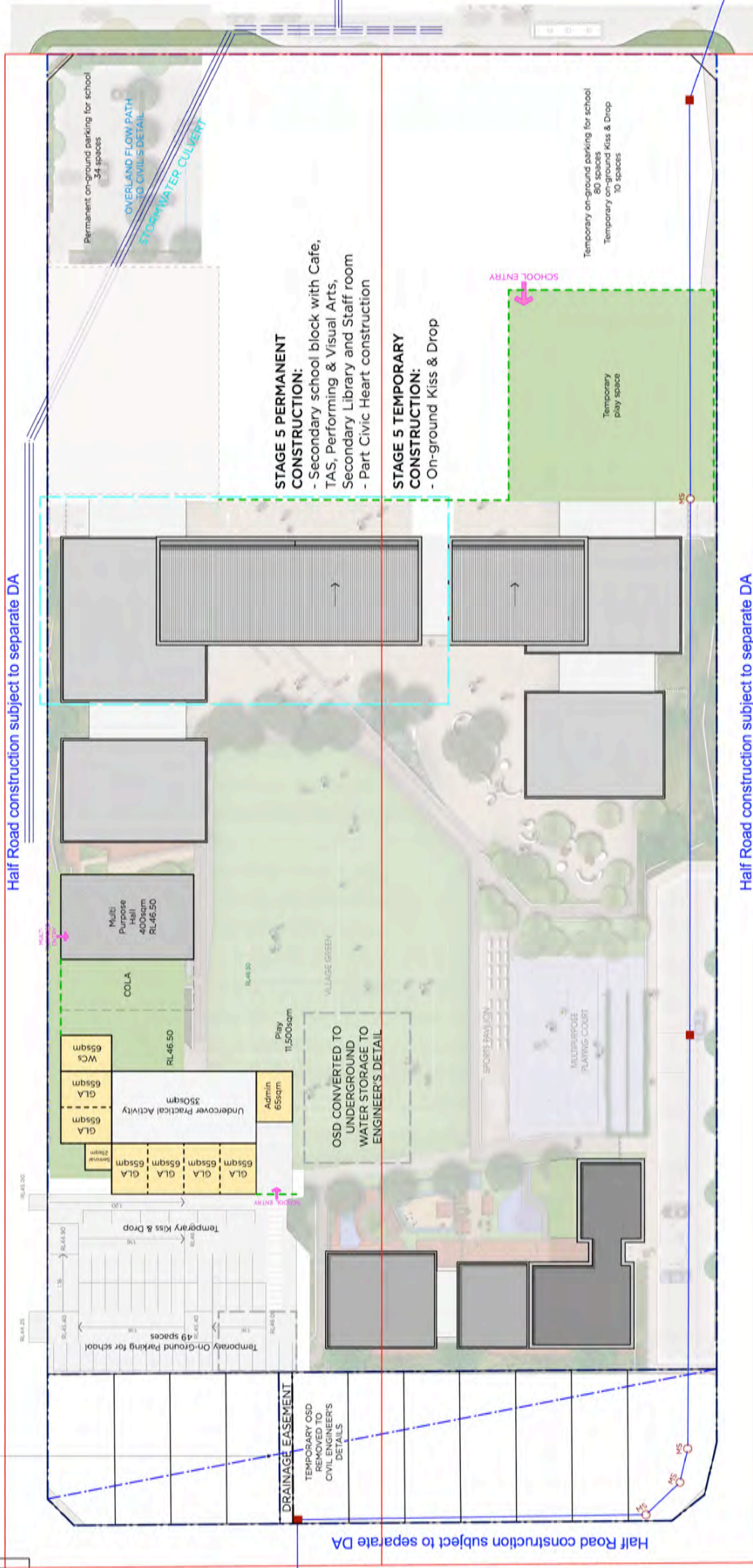
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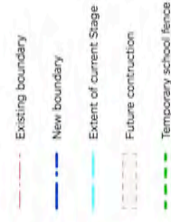
Half Road construction subject to separate DA



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



Stage 5

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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 construction
Temporary school fence

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Half Road construction subject to separate DA



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



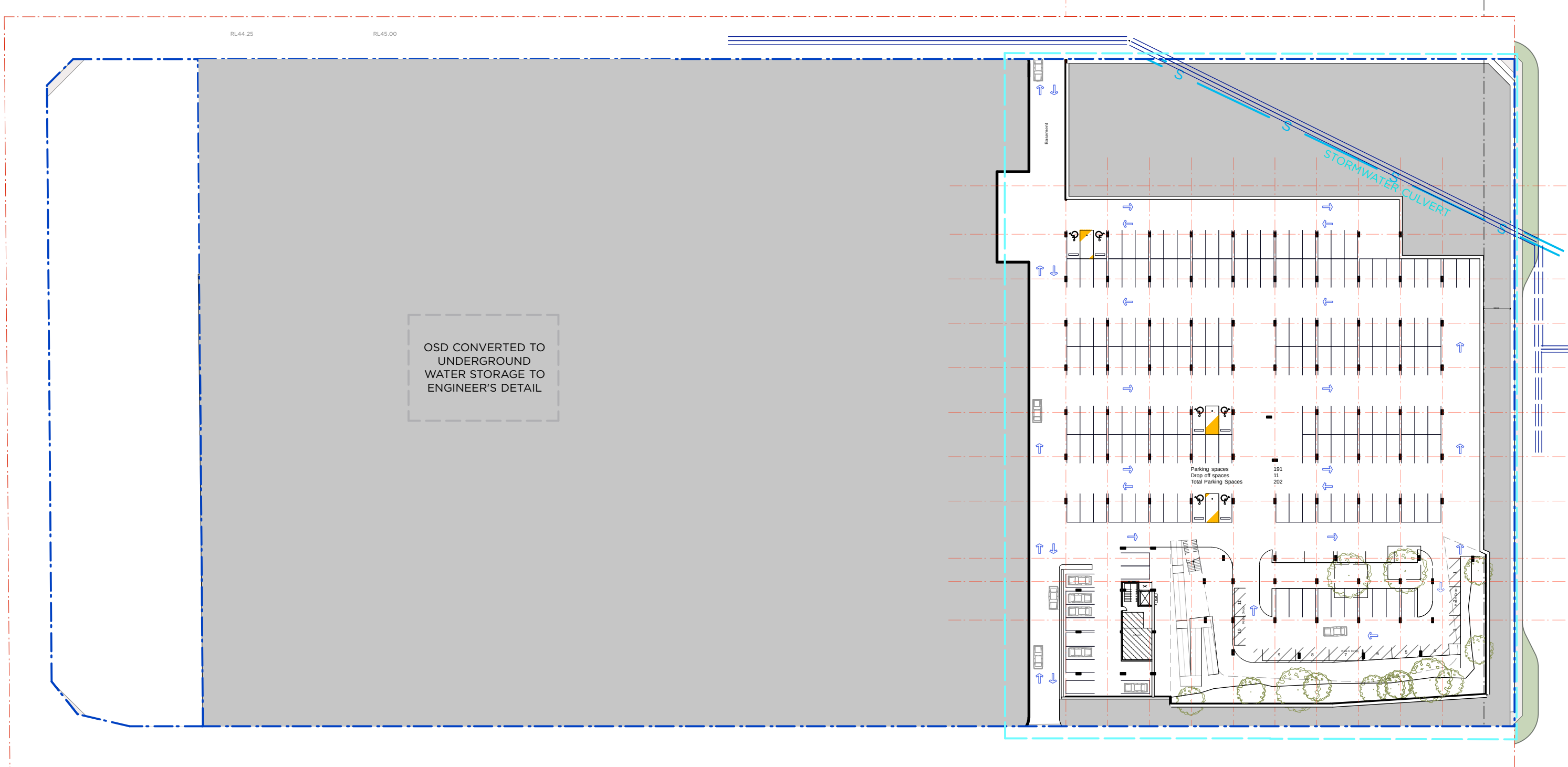
- Existing boundary
New boundary
Extent of current Stage
Future construction
Temporary school fence

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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 construction
- Temporary school fence

Stage 7 -Basement/Parking Plan



Half Road construction subject to separate DA

STAGE 8 DEMOLITION:
- Relocatable classrooms

- Relocatable classrooms

**STAGE 8 PERMANENT
CONSTRUCTION:**

- Administration building
- Final 3 GLAs for Primary school
- School reception and sick bay
- Principal and support staff offices

Play
12.600.com

OSD CONVERTED TO UNDERGROUND WATER STORAGE TO ENGINEER'S DETAIL

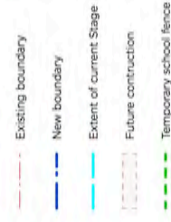
Half Road construction subject to separate DA

OVERLAND FLOW PATH
TO CIVIL'S DETAIL

TO CIVIL'S DATA
STORMWATER CULVERT

STAGE 8: ADMINISTRATION BUILDING & FORECOURT

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



Stage 8

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Project

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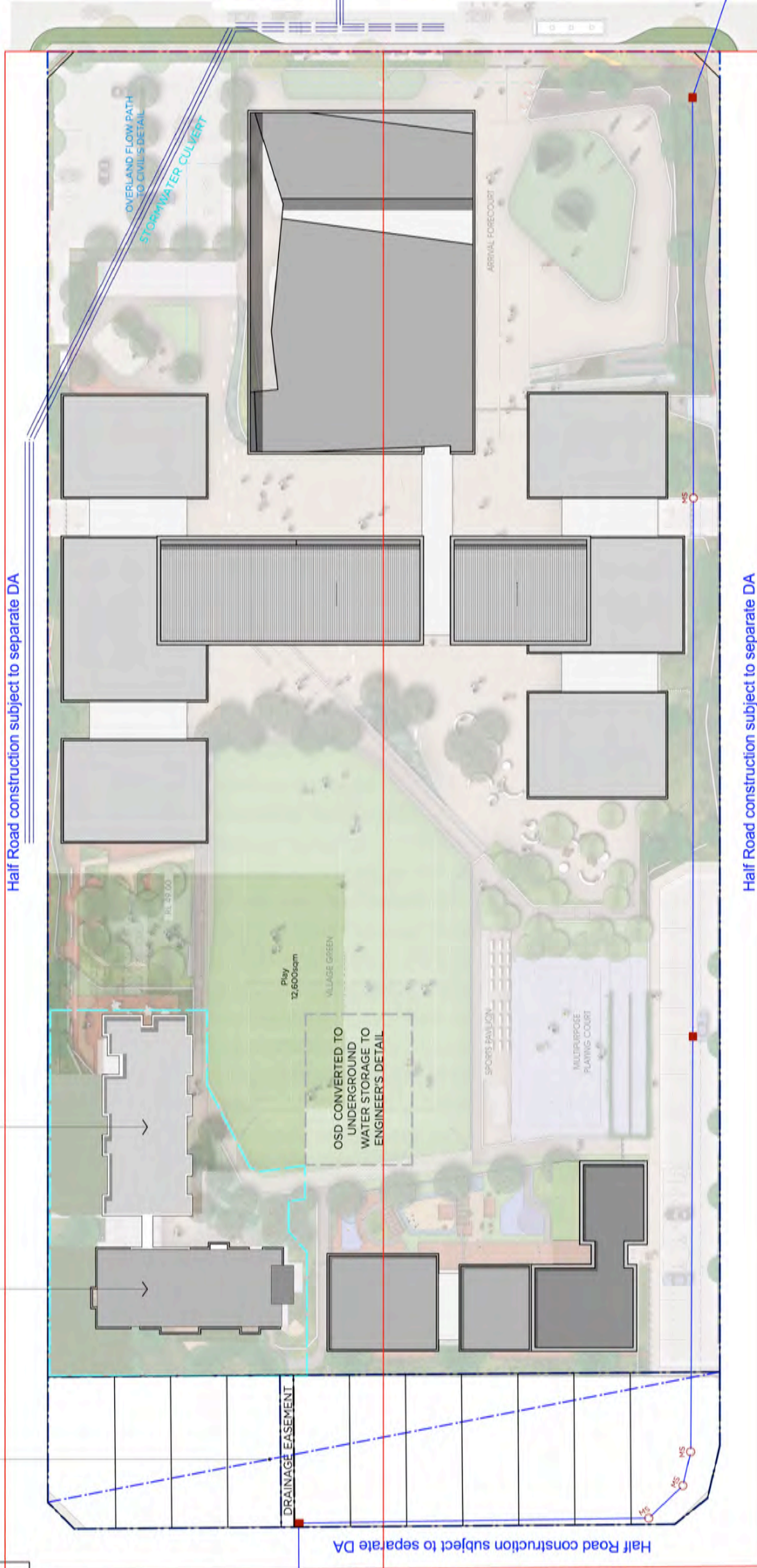
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- STAGE 9 PERMANENT CONSTRUCTION:**
- Demolish temporary carpark
 - Boarding house
 - Staff apartments
 - Undercroft parking for boarding house

Half Road construction subject to separate DA



Half Road construction subject to separate DA

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	1052sqm	Hardscape	682sqm
	Total Parking spaces	281		

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

Stage 9

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