KINCOPPAL ROSE BAY SCHOOL

TRANSPORT AND ACCESSIBILITY IMPACT ASSESSMENT FOR PROPOSED ALTERATIONS AND ADDITIONS TO KINCOPPAL SCHOOL, ROSE BAY

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1. INTRODUCTION

1.1 Colston Budd Rogers and Kafes Pty Ltd has been commissioned by Kincoppal Rose Bay School to prepare a transport and accessibility impact assessment to support the state significant development application (SSDA) for the proposed alterations and additions to the school. Kincoppal School is located on the corner of New South Head Road and Vaucluse Road, Rose Bay, as shown on Figure 1.

1.2 The proposed alternations and additions to the school will include:

- alterations and additions to the junior school and expansion of the early learning centre;
- alterations and additions to the senior school, including expansion and refurbishment of the North Wing;
- extensions and expansion of the student boarding house;
- upgrades to the main entry to the senior school building, including reconfiguration of the administration and office facilities;
- reconfiguration of the senior school forecourt to improve pedestrian facilities and relocation of the on-site bus set-down and pick-up area;
- provision of a new bus parking area, student set-down/pick-up area and car park adjacent to the senior school forecourt;
- provision of a new driveway crossing on Vaucluse Road to provide access at a new on-site student set-down and pick-up area on the northern side of the senior school.

1.3 The proposed alterations and additions to the school are anticipated to result in an increase in student numbers from some 955 students to some 1,205 students, and staff numbers from some 150 FTE to 185 FTE.

1.4 The Secretary's Environmental Assessment Requirements for the project, dated 14 January 2020, include a number of traffic and parking matters. Table 1.1 includes the SEARs and the relevant sections in Which they are addressed.

Table 1.1: SEARs

SEARs requirement	Section of report
Transport and Accessibility *Include a transport and accessibility impact assessment, which details, but not limited to the following:* - *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;*	Existing traffic flows and the operation of nearby intersections are discussed in paragraphs 2.8 to 2.16. Existing set-down/pick-up operation is discussed in paragraphs 2.17 to 2.30. A description of the existing and future public transport, pedestrian and bicycle network are discussed in paragraphs 2.33 to 2.40 and 3.4 to 3.10.
- *details of estimated total 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;*	These matters are discussed in paragraphs 3.4 to 3.10 and 3.38 to 3.46.
- *the adequacy of existing public transport or any future public transport infrastructure within the vicinity of the site, pedestrian and*	These matters are discussed in paragraphs 3.4 to 3.7 and 4.8 to 3.10.

	bicycle networks and associated infrastructure to meet the likely future demand of the proposed development;	
-	*the impact of trips generated by the development on nearby intersections, with consideration of the cumulative impacts of 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;*	This matter is discussed in paragraphs 3.38 to 3.46.
-	*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.e. minimum 3.5m travel lanes), additional bus stops of bus bays;*	These matters are discussed in paragraphs 3.30 to 3.37 and 3.38 to 3.46. No intersection improvement works are required to cater for the additional development traffic.
-	*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*	This matter is discussed in paragraphs 3.11 to 3.24.

	increase the non-car mode share for travel to and from the site;	
-	*the proposed walking and cycling access arrangements and connections to public transport service;*	These matters are discussed in paragraphs 3.4 to 3.10 and 3.30 to 3.37.
-	*the proposed access arrangements, including car and bus pick-up/drop off facilities, and measures to mitigate any associated traffic impacts and impacts on public transport, pedestrian and bicycle networks, including pedestrian crossings and refuges and speed control devices and zones;*	These matters are discussed in paragraphs 3.4 to 3.10 and 3.30 to 3.37.
-	*proposed bicycle parking provision, including end of trip facilities, in secure, convenient, accessible areas close to main entries incorporating lighting and passive surveillance;*	These matters are discussed in paragraphs 3.8 to 3.10 and 3.25 to 3.29.
-	*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;*	This matters is discussed in paragraphs 3.25 to 3.29.
-	*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;*	These matters are discussed in paragraphs 2.31 to 3.23 and 3.30 to 3.37.
-	*An assessment of road and pedestrian safety adjacent to the proposed*	This matters is being addressed by other study team members. However, facilities

	development and the details of required road safety measures and personal safety in line with CPTED;	for pedestrians and other site users are proposed in association with the development.
-	*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.;*	This matter is discussed in paragraphs 3.30 to 3.37.

1.5 This report assesses the transport and accessibility requirements for the proposed school, including addressing the SEARs, through the following chapters:

- Chapter 2 - describing the existing conditions; and
- Chapter 3 - assessing the transport and accessibility implications of the proposed development.

2. EXISTING CONDITIONS

2.1 Kincoppal School is located on the corner of New South Head Road and Vaucluse Road, Rose Bay, as shown on Figure 1. The site has frontage to these roads. Vehicular access to the site is provided via driveways onto Vaucluse Road and via the formal entry gates onto New South Head Road at its intersection with Vaucluse Road. Land use in the vicinity of the school is primarily residential, comprising a mix of low density and medium density housing. Kambala School is located to the south with access from Tivoli Avenue and New South Head Road.

2.2 The school provides an early learning centre, a junior school (K-Y6) and a senior school (Y7-Y12). The school currently has some 955 students, comprising some 410 students in the junior school (including 80 children in the pre-school/ELC) and some 545 students (including 150 boarders) in the senior school. The school has a total of some 150 full-time equivalent (FTE) staff.

Road Network

2.3 The road network in the vicinity of the site includes New South Head Road, Vaucluse Road, Gilliver Avenue and Towns Road. New South Head Road is located adjacent to the eastern boundary of the school and provides a north-south traffic route linking the Sydney CBD to Rose Bay and Watsons Bay. In the vicinity of the site, it provides an undivided carriageway with two traffic lanes and one parking lane in each direction, clear of intersections. The intersection of New South Head Road and Vaucluse Road is controlled by traffic signals.

2.4 Vaucluse Road is located adjacent to the school with the main school campus on the western side of the road and the Maureen Tudehope Centre (MTC) on the eastern side of the road. A pedestrian tunnel beneath Vaucluse Road links the main school campus to the MTC.

2.5 Vaucluse Road provides an undivided road with one traffic lane in each direction, with no stopping restrictions either side of the road. The intersection of Vaucluse Road and Gilliver Avenue is an unsignalised three-way priority controlled intersection.

2.6 Gilliver Avenue is located to the north and provides a north south connection between Vaucluse Road and Wentworth Road. It provides an undivided road with one traffic lane and one parking lane in each direction, clear of intersections.

2.7 Towns Road is located to the east and provides an east west connection between New South Head Road and Old South Head Road. It provides an undivided road with one traffic lane and one parking lane in each direction, clear of intersections. The intersection of New South Head Road with Towns Road is an unsignalised three-way priority controlled intersection.

Traffic Flows

2.8 In order to gauge the traffic conditions in the vicinity of the site, traffic counts were undertaken during the weekday morning (before school) and weekday afternoon (after school), at the following intersections:

- New South Head Road/Vaucluse Road;

- Vaucluse Road/Gilliver Avenue;
- Vaucluse Road/senior school access;
- Vaucluse Road/junior school access; and
- Vaucluse Road/MTC access.

2.9 The results of the surveys are shown on Figures 2 and 3, and summarised in Table 2.1.

Table 2.1: Existing Two-Way (Sum of Both Directions) Peak Hour Traffic Flows

Road/Location	Morning Peak Period (Vehicles/Hour)	Afternoon Peak Period (Vehicles/Hour)
New South Head Road		
- north of Vaucluse Road	1030	1190
- south of Vaucluse Road	1375	1560
Vaucluse Road		
- west of New South Head Rd	440	475
- south of Gilliver Avenue	300	355
- north of Gilliver Avenue	185	225
Gilliver Avenue		
- east of Vaucluse Road	145	150

2.10 The results in Table 2.1 reveal the following:

- New South Head Road carried some 1,000 to 1,400 vehicles per hour two-way during the morning peak period and some 1,200 to 1,600 vehicles per hour two-way during the afternoon peak period;

- traffic flows in Vaucluse Road, between New South Head Road and Gilliver Avenue, were some 300 to 500 vehicles per hour two-way during the morning and afternoon peak periods. North of Gilliver Avenue flows were some 150 to 250 vehicle per hour two-way at peak times;

- traffic flows in Gilliver Avenue, north of Vaucluse Road, were some 150 vehicles per hour two-way at peak times.

2.11 In addition to the intersection counts, traffic counts at the school access driveways on Vaucluse Road found that currently some 155 and 120 vehicles per hour two-way access the junior school access driveway during the morning and afternoon peak periods respectively. Some 220 and 130 vehicles per hour two-way access the MTC car park and some 15 vehicles (primarily bus movements) exit from the senior school forecourt exit driveway onto Vaucluse Road during the morning and afternoon peak hour periods.

Intersection Operation

2.12 The capacity of the road network is largely determined by the capacity of its intersections to cater for peak period traffic flows. The surveyed intersections have been analysed using the SIDRA program for the traffic flows shown in Figures 2 and 3.

2.13 SIDRA simulates the operations of intersections to provide a number of performance measures. The most useful measure provided is average delay per vehicle expressed in seconds per vehicle. Based on average delay per vehicle, SIDRA estimates the following levels of service (LOS):

- For traffic signals, the average delay per vehicle in seconds is calculated as delay/(all vehicles), for roundabouts the average delay per vehicle in seconds is selected for the movement with the highest average delay per vehicle, equivalent to the following LOS:

0 to 14	=	"A"	Good
15 to 28	=	"B"	Good with minimal delays and spare capacity
29 to 42	=	"C"	Satisfactory with spare capacity
43 to 56	=	"D"	Satisfactory but operating near capacity
57 to 70	=	"E"	At capacity and incidents will cause excessive delays. Roundabouts require other control mode.
>70	=	"F"	Unsatisfactory and requires additional capacity

- For give way and stop signs, the average delay per vehicle in seconds is selected from the movement with the highest average delay per vehicle, equivalent to following LOS:

0 to 14	=	"A"	Good
15 to 28	=	"B"	Acceptable delays and spare capacity
29 to 42	=	"C"	Satisfactory but accident study required
43 to 56	=	"D"	Near capacity and accident study required
57 to 70	=	"E"	At capacity and requires other control mode
>70	=	"F"	Unsatisfactory and requires other control mode

2.14 It should be noted that for roundabouts, give way and stop signs, in some circumstances, simply examining the highest individual average delay can be misleading. The size of the movement with the highest average delay per vehicle

should also be taken into account. Thus, for example, an intersection where all movements are operating at a level of service A, except one which is at level of service E, may not necessarily define the intersection level of service as E if that movement is very small. That is, longer delays to a small number of vehicles may not justify upgrading an intersection unless a safety issue was also involved.

2.15 The analysis found that the signalised intersection of New South Head Road and Vaucluse Road operates with average delays of less than 25 seconds per vehicle during morning and afternoon peak periods. This represents level of service B, a good level of intersection operation.

2.16 The unsignalised intersection of Vaucluse Road and Gilliver Avenue is operating with average delays, for the movement with the highest average delay, of less than 10 seconds per vehicle during peak periods. This represents level of service A, a good level of intersection operation.

Set-Down and Pick-Up Operation

2.17 The school provides an early learning centre, a junior school (K-Y6) and a senior school (Y7-Y12). The school currently has some 955 students, comprising some 410 students in the junior school (including 80 children in the ELC) and some 545 students (including 150 boarders) in the senior school. The school has a total of some 150 full-time equivalent (FTE) staff. Classes start at 8.30am on school days and generally finish at 3.15pm.

2.18 The school operates before and after school care from the junior school and co-curricular/sport activity for the senior school. These services operate from 7.00am to 8.30am and 3.30pm to 6.00pm on school days.

2.19 Surveys were undertaken of the number of cars visiting the school during the morning arrival and afternoon departure periods. The surveys also identified the number of cars parked to drop off and pick up students during these periods. A questionnaire was completed by all classes to establish the mode of travel to and from the school by students and staff.

2.20 The questionnaire survey found that the modes of travel of students (excluding boarders) and staff, to and from the school, were as shown in Tables 2.2 and 2.3.

Table 2.2: Kincoppal Junior School – Existing Mode of Travel (Percentage)

Mode of Travel	To School	From School	Staff
Car Driver	-	-	87%
Car Passenger (car Line)	76%	76%	-
Train (plus KRB shuttle)	15%	16%	9%
Public Bus and KRB Bus	4%	5%	-
Walk	3%	2%	-
Other	2%	1%	-

Table 2.3: Kincoppal Senior School – Existing Mode of Travel (Percentage)

Mode of Travel	To School	From School	Staff
Car Driver	2%	2%	75%
Car Passenger	37%	30%	2%
Train (plus KRB shuttle)	16%	18%	12%
Public Bus and KRB Bus	31%	36%	5%
Walk	12%	12%	5%
Other	2%	2%	1%

2.21 It can be seen from Tables 2.2 and 2.3 that the majority of junior school students travel to and from school by car, equivalent to some 76% of students during the morning and afternoon peak periods. This compares to senior school students, with a much lower proportion of some 37% and 30% during the morning and afternoon periods respectively.

2.22 Some 19% to 21% of junior school students and some 47% to 54% of senior school students were found to travel to and from school by public transport (including the KRB mini bus service). A proportion of Year 12 students drive to the school (some 2% of the senior school students).

2.23 A proportion of students were found to travel in the same car as other students. The average car occupancy rate was found to be some 1.7 students per car for both the junior school and senior school.

2.24 It can be seen from Tables 2.2 and 2.3 that some 87% of junior school staff and some 75% of senior school staff drive a car to work.

2.25 The surveys found that no student or staff members currently cycle to the school. Given the location of the school, in terms of safety and topography, the school is not conveniently located for access by bicycle.

2.26 The school currently provides two on-site student set-down/pick-up areas. The first is located adjacent to the junior school, within the main school campus, and the other adjacent to the MTC car park, on the western side of Vaucluse Road.

2.27 The set-down and pick-up facilities provide formalised drive through operations. During the afternoon period Kindergarten to Year 2 students (including siblings) are marshalled adjacent to the lower access road, adjacent to the junior school. All other students are marshalled within the MTC basement car park. Vehicles collecting students are required to queue and proceed through the supervised student pick-up areas. When vehicles arrive at the head of the queue, staff escort the students to the waiting vehicle and supervise the student pick-up operation.

2.28 The current set-down/pick-up operations at the school generates some relatively intense activity in the vicinity of the school for a relatively short duration at the start and end of the school day. This is particularly the case during the afternoon peak period, as it takes longer to collect students than to drop them off. During the afternoon, vehicles generally arrive before the finishing time of the school and hence are required to wait.

2.29 In order to reduce the number of cars in the vicinity of the school at any given time and also to better manage student movements, the school currently staggers the start and finish times of the ELC/pre-school, junior school and senior school. Traffic queues were observed to develop on Vaucluse Road, within the western kerbside lane, on approach to the set-down/pick-up areas during the afternoon peak period. During the afternoon some 10 to 12 vehicles were observe to queue in Vaucluse Road for a short duration on approach to the junior school set-down/pick-up area.

2.30 Whilst the majority of students were observed to be dropped off and picked up from the designated set-down/pick-up areas, some students were also observed to be dropped off and collected on-street from New South Head Road. This was

mainly observed during the morning peak period with students being dropped off at the school. During the morning and afternoon peak periods, pedestrian facilities on New South Head Road, the existing pedestrian crossing in Vaucluse Road adjacent to the school and the pedestrian crossing facility at the New South Head Road traffic signals are supervised by staff.

Parking

2.31 The ability of the school to provide off-street parking is constrained by the existing development of the site and the physical form of the site, particularly the steep fall across the site. The school currently provides off-street parking for some 103 vehicles. The main parking area within the school is located beneath the sports playing field, adjacent to MTC, providing parking for some 53 vehicles. Other off-street parking areas are located adjacent to the junior school, along the internal access roads within the main school campus and adjacent to the main administration building.

2.32 In addition, the school has frontage to New South Head Road. There are some 30 unrestricted on-street parking spaces on the western side of New South Head Road, along the school frontage. Given the off-street parking constraints of the site, it is considered appropriate that these on-street parking spaces be used by the school.

Public Transport

2.33 The site is well located for public transport services. These services include bus services which operate along New South Head Road and Vaucluse Road, linking

the school to other line haul bus and rail services operating from Bondi Junction interchange, Edgecliff interchange and the city.

2.34 Bus services in the vicinity of the school are provided by Sydney Buses. These services include:

- Route 324 - Walsh Bay to Watsons Bay via Old South Head Road;
- Route 325 - Walsh Bay to Watsons Bay via Vaucluse Road;
- Route 386 - Vaucluse to Bondi Junction via New South Head Road;
- Route L24 - Limited stop service Vaucluse to the city.

2.35 These bus routes combine to provide convenient and regular services to and from the school, with bus frequencies of one bus every 6 minutes during the morning set-down and afternoon pick-up periods at the school.

2.36 Bus stops in the vicinity of the school are located on either side of New South Head Road, immediately south of Vaucluse Road (for northbound services) and south of Towns Road (for southbound services). These bus stops are conveniently located and provide direct access to the school, with students utilising the pedestrian crossing facilities within existing traffic signals on New South Head Road to access the school and bus stops.

2.37 Students can transfer from bus services to rail/train services at Bondi Junction interchange, Edgecliff interchange and CBD railway stations, providing access to the Sydney metropolitan area. Students can also catch ferry services from Circular Quay to Rose Bay Wharf, which is located close to the school. Students

can then transfer to bus services 324 and 325 from New South Head Road, to access to school.

2.38 In addition to the local bus services, the school provides dedicated KRB mini bus services. These services include:

- Little Bay/Maroubra/Coogee/Bronte/Bondi/school;
- Marrickville/Paddington/Woollahra/Bondi/school;
- Seaforth/Balmoral/Mosman/Neutral Bay/Edgcliff/school;
- Rozelle/Hunters Hill/Lane Cove/Kings Cross/school;
- Willoughby/Northbridge/Cammeray/Double Bay/school;
- Stanmore/Annandale/Balmain/City/Woollahra/Double Bay/school.

2.39 These KRB mini bus services operate before and after school, setting down and picking up students on-site from the main senior school forecourt, off Vaucluse Road. The KRB mini buses enter the site via the main school access driveway on New South Head Road, adjacent to the signalised intersection of New South Head Road and Vaucluse Road, and exit via the northern access driveway onto Vaucluse Road. The mini buses are currently stored off-site and access the school during the morning and afternoon to set-down and pick-up students.

2.40 The school also provides a staff shuttle bus service to Edgecliff interchange. Three services operate during the morning and afternoon periods, at the start and end of the school day. The school therefore has good access to regular public transport services.

3. IMPLICATIONS OF PROPOSED DEVELOPMENT

3.1 The proposed alterations and additions to the school, as shown on Figure 4, include:

- alterations and additions to the junior school and expansion of the early learning centre;
- alterations and additions to the senior school, including expansion and refurbishment of the North Wing;
- extensions and expansion of the student boarding house;
- upgrades to the main entry to the senior school building, including reconfiguration of the administration and office facilities;
- reconfiguration of the senior school forecourt to improve pedestrian facilities and relocation of the on-site bus set-down and pick-up area;
- provision of a new bus parking area, student set-down/pick-up area and car park adjacent to the senior school forecourt;
- provision of a new driveway crossing on Vaucluse Road to provide access at a new on-site student set-down and pick-up area on the northern side of the senior school.

3.2 The proposed alterations and additions to the school will result in an increase in student numbers from some 955 students to some 1,205 students (including an increase in ELC of 50 children, increase in junior school of 50 students, increase in senior school of 105 day students and 40 additional Year 12 boarders). Staff numbers will increase from some 150 FTE to 185 FTE.

3.3 This chapter assesses the transport and accessibility implications of the proposed alterations and additions to the school through the following sections:

- public transport;
- active transport;
- travel demand management;
- parking provision;
- access, servicing and internal layout;
- traffic generation and effects;
- response to SEARs; and
- summary.

Public Transport

3.4 As discussed in Chapter 2, the school has good access to public transport services. These include public bus services along New South Head Road and dedicated KRB mini bus services, which provide public transport access to and from the school. Students can transfer from bus services to rail/train services at Bondi Junction interchange, Edgecliff interchange and CBD railway stations, providing access to the Sydney metropolitan area. This is consistent with government policy and planning principles of:

(a) improving accessibility to employment and services by walking and public transport;

(b) improving the choice of transport and reducing dependence solely on cars for travel purposes;

(c) moderating growth in the demand for travel and the distances travelled, especially by car; and

(d) supporting the efficient and viable operation of public transport services.

3.5 Based on travel mode surveys discussed in Chapter 2, the proposed increase in student numbers at the school would generate an additional some 60 to 70 trips by bus during the morning and afternoon periods. These trips would be spread across the three main bus routes that service the area (which provide an average of 10 buses per hour during peak periods) and the six KRB mini bus services. When these additional trips are spread across these services, it would result in average increases of some 4 passengers per bus. Such an increase would not have noticeable effects on the operation of existing bus services in the area.

3.6 A new mini bus parking and student set-down/pick-up area will be provided within the school to replace the existing student set-down/pick-up area located within the main senior school forecourt. This will improve pedestrian arrangements within the school and will allow for the storage of the buses on-site during the day. This will reduce the frequency of bus movements on and off the site. The new facility will provide for seven KRB mini buses, plus appropriate draw-in and draw-out manoeuvring areas for the buses.

3.7 As part of the orientation for new students to the school, parents/carers would be advised of the available means of travelling to and from the site, including access by means other than car. As noted above, the school will be readily accessible by public transport.

Active Transport

3.8 The school is located adjacent to a well established footpath network along News South Head Road and Vaucluse Road, a marked pedestrian crossing in Vaucluse Road and pedestrian facilities at the existing traffic signals on New South Head Road.

3.9 Convenient access for students and staff within the school grounds and access to public transport on New South Head Road are provided through the following:

- existing pedestrian underpass beneath Vaucluse Road;
- improved pedestrian facilities within the senior school forecourt;
- improved pedestrian links to the junior school and to the new student set-down/pick-up area.

3.10 As previously discussed, given the location of the school, in terms of topography, the school is not conveniently located for access by bicycles. Showers, change rooms and bicycle facilities are however provided in the MTC building, for those students and staff who choose to cycle to the school.

Travel Demand Management

3.11 To promote sustainable transport options, the school currently implements a number of travel demand management measures to encourage students and staff to use travel modes other than private vehicle. These include:

- encouraging the use of public transport;
- provision of pedestrian facilities;

- provision of KRB mini bus services for students travelling to and from suburbs that are not easily accessible by public transport; and
- provision of shuttle bus services for staff to and from Edgecliff Station.

3.12 To further encourage sustainable travel modes, the existing measures will be refined and expanded through the preparation of a Green Travel Plan (GTP). The primary purpose of the GTP for the school is to provide a site-specific set of measures and strategies for managing travel demand for sustainable transport, minimizing negative transport impacts, maintaining and improving viability of existing public transport services, encouraging active transport and ensuring that students and staff feel safe, secure and well informed about travel to and from the site.

Benefits of Green Travel Plan

3.13 The provision of a GTP creates a number of social, economic, environmental and health benefits for students and staff at the school. These include:

- promoting the use of sustainable transport modes by increasing awareness of public transport routes and facilities;

- the provision of car parking should be reflected in the schools proximity to public transport and the ability of the school to provide alternative travel modes for students and staff by encouraging non car based travel;

- the cost of providing car parking at KRB is significant and therefore there is a strong economic benefit to reduce the demand for parking by encouraging public and active transport;

- reducing the growth in greenhouse gas emissions will result in significant benefits for the environment as a result of reducing car based travel. The reduction in greenhouse gases will also result in improved health benefits;

- encourage healthier travel options for students and staff, such as walking and cycling;

- promoting the use of sustainable transport modes can provide a more affordable means of transport and provide travel cost savings;

- promoting the use of sustainable transport modes will provide alternative travel options for staff and student families that have less access to private vehicles;

- convenient transport access and high quality education facilities creates an attractive workplace for staff and a convenient study environment for students;

- education facilities with appropriate environmental study programs have the opportunity to teach students about the benefits of sustainable travel modes and the health benefits of non car based travel; and

- the implementation of a successful GTP can reduce traffic impacts on the surrounding road network by reducing the number of vehicles travelling to and from the school, resulting in improved intersection operation.

Objectives of Green Travel Plan

3.14 The GTP will comprise a package of measures designed to address the specific travel needs of the site. The main objectives of the GTP include:

- encourage the use of more sustainable travel modes;
- reduce the number of car trips to and from the school;
- provide facilities for student and staff to commute by sustainable transport modes;
- advise all new students and staff of the available public transport options at the school;
- reduce the environmental footprint of the development; and
- promote the health benefits of active transport and create a more active social culture.

Mode Split Targets

3.15 For educational facilities a mode shift target from private car of up to 5% to other travel modes for students and staff is considered appropriate. This rate has been adopted at other educational facilities. The mode shift target should be specific, measurable and achievable.

3.16 As set out in Chapter 2, some 76% of junior school students and some 39% of senior school students travel to and from school by car. In addition, some 87% of junior school staff and some 75% of senior school staff drive a car to work.

3.17 The GTP for KRB has adopted an initial mode shift target from private car to other travel modes (for students and staff) of 5%. This mode shift target will be monitored and reviewed. If successful, the mode shift target will be updated to reflect changing circumstances of student and staff travel behavior.

3.18 The mode shift target away from private vehicle trips by staff and students would generate lower peak hour traffic flows in the future, equivalent to a reduction in traffic generation of some 100 vehicles two-way during the morning and afternoon periods. The reduction in traffic generation would result in an overall improvement in the operation of the surrounding road network and intersections in the vicinity of the site during peak periods.

Green Travel Plan (GTP)

3.19 The GTP, to be developed by the school in consultation with council, TfNSW, public transport operators and other stakeholders, includes the following measures:

- encourage the use of public transport, including increasing the frequency of the staff shuttle bus service to/from Edgecliff interchange;

- encourage students to use the KRB mini bus service and review the need for additional routes;

- work with public transport providers to improve services;

- introduce a staff car pool register. This will inform staff of the travel characteristics of other staff members with similar travel destinations. New staff will be advised of the register and encouraged to car pool with other staff;

- develop an online student and parent platform to encourage students to travel in groups with other students that live in the same area;

- encourage parents/carers to allow older students to travel by public transport to and from school;

- introduce a buddy system at the school were younger students are partnered with senior students that live in the same area and can travel together on public transport;

- encourage students and parents to use the school online platform or alternative mobile app, such as 'Skoolbag', to provide easily accessible information about the school activities, including the use of the various student set-down/pick-up areas;

- encourage public transport use by staff and visitors through the development of a school transport access guide, which will provide public transport information, maps, car share vehicle locations and public transport timetables;

- provide appropriate on-site parking provision, consistent with the objective of reducing traffic generation; and

- provide appropriate bicycle parking and end of trip facilities for those students and staff who choose to cycle to the school.

3.20 Additionally, the school also staggers the start and finish times of the junior and senior schools, to reduce the number of cars present at the school at any given time, during the morning and afternoon set-down and pick-up periods. This measure provides for the efficient use of the on-site parking areas and the student set-down and pick-up operations.

3.21 As will be discussed in the following sections, a new on-site student set-down and pick-up area will be provided on the northern side of the senior school. This will improve the efficiency of the existing set-down and pick-up operations during the morning and afternoon periods, reduce traffic congestion and improve traffic conditions on Vaucluse Road. Student and parents can use the school online platform or alternative mobile app, to receive real-time school transport service information and student set-down and pick-up operations.

3.22 The GTP will assist in delivering sustainable transport objectives by considering the means available for reducing dependence solely on cars for travel purposes, encouraging the use of public transport and supporting the efficient and viable operation of public transport services. The initiatives of the GTP and more importantly the success of the GTP should be advertised on noticeboards within the school, newsletters, social media and on the school's transport access guide.

Monitoring and Reviewing the GTP

3.23 Monitoring and reviewing the GTP is a critical component of the travel planning process. The GTP for KRB will be monitored to ensure that the plan is meeting its objectives and having the intended impact on car use and transport choices for students and staff. The GTP will be reviewed annually through student and staff travel mode surveys, and via student, staff and parent consultation. The plan will be updated to reflect changing circumstances and to identify which initiatives are having an impact or need to be modified to ensure appropriate student and staff travel behavior.

3.24 KRB will appoint a travel plan coordinator (TPC) to oversee the measures and resultant impacts of the GTP at the school. New students and staff will be advised of the transport options available and the requirements of the GTP.

Parking Provision

3.25 The Woollahra Development Control Plan 2015 includes the following parking requirements for schools:

- Pre-Schools, Early Learning Centre and Child Care Centre
  - staff parking of 0.5 spaces per 100m^2 gross floor area;
- Schools
  - one space 100m^2 gross floor area;
  - on-site parking for disabled persons is to be provided at a minimum rate of one car space per 50 cars spaces or part thereof.

3.26 The proposed alterations and additions to the school will result in an increase in gross floor area of some 150m^2 for the ELC and some 1,800m^2 for the school. Based on the above, the proposed modifications will result in an additional car parking requirement of some 20 spaces.

3.27 As discussed in Chapter 2, currently some 87% of staff at the junior school and some 75% of staff at the senior school drive to work. Based on these percentages, the increase in staff from some 150 FTE to 185 FTE (some 10 in the ELC, some 10 in the junior school and some 15 in the senior school), will generate an additional parking demand of some 20 spaces for the junior and senior schools.

3.28 With regards to the number of spaces required for the ELC, the RMS Guide to Traffic Generating Developments suggests a rate of one space per four children in attendance. With an increase in some 50 children, some 13 additional spaces will be required for parents/carers and staff. These spaces will be shared with the junior school.

3.29 The proposed alterations and additions to the school will provide an additional 28 on-site parking spaces for staff and visitors, satisfying Council's DCP. Appropriate disabled parking will be provided in accordance with the DCP requirements.

Access, Servicing and Internal Layout

3.30 Vehicular access to the school by cars, service vehicles and emergency vehicles will be maintained via the existing driveway crossings on New South Head Road and Vaucluse Road. In addition, a new driveway crossing will be provided on Vaucluse Road providing access to the new on-site student set-down and pick-up area on the northern side of the senior school building. The new driveway will

only be available during the morning and afternoon periods to provide for the set-down and pick-up of students. The new access driveway will be closed at other times. Access to the school during the day will therefore be maintained via the existing access driveways.

3.31 The internal road accessing the new set-down and pick-up area will provide a one-way circulation though the site with vehicles entering via the new driveway and exiting via the existing junior school driveway to the north.

3.32 The new driveway and internal road will be provided in accordance with the Australian Standard for Parking Facilities (Part 1: Off-street car parking), AS 2890.1:2004, to cater for one-way traffic flow, as well as the swept path of cars and small service vehicles.

3.33 The new on-site student set-down and pick-up facility will provide on-site queuing for some 12 vehicles. It will improve the efficiency of the existing set-down and pick-up operations during the morning and afternoon periods, improve on-road traffic conditions and reduce traffic queues in Vaucluse Road.

3.34 The existing on-site student set-down and pick-up operations at the junior school and adjacent to the MTC car park will be maintained. Students will be distributed by year group to one of the three set-down/pick-up locations, which will be managed by school staff during the morning and afternoon periods.

3.35 The new bus parking area and car park will be provided adjacent to the reconfigured senior school forecourt. The upper level will provide parking for seven KRB mini buses and the lower level will provide 30 car parking spaces. Mini bus parking arrangements will be provided with bays of 8.8 metres long and 3.5

metres wide, plus appropriate on-site draw-in and draw-out manoeuvring areas for the buses. The buses will continue to access the school via the existing access driveways on New South Head Road and Vaucluse Road.

3.36 Within parking areas, car spaces will be a minimum of 5.4 metres long by 2.4 metres wide. Spaces with adjacent obstructions will be 0.3 metres wider to appropriately provide for doors to open. Circulation aisles will be 5.8 to 6.1 metres wide. Disabled spaces will be 2.4 metres wide, with a 2.4 metre wide adjacent area for wheelchairs. Height clearances will be 2.5 metres for disabled parking and 2.2 metres for standard car parking spaces. These dimensions are considered appropriate, being in accordance with AS2890.1-2004 and AS2890.6-2009.

3.37 Servicing of the school will be maintained via the existing loading areas within the main school campus and MTC building. A new waste collection area will be provided adjacent to the senior school. It will provide for small to medium rigid trucks to enter the site, circulate and exit in a forward direction. The access driveway, loading and manoeuvring areas will be provided to accommodate the swept paths of these vehicles, in accordance with AS2890.2-2002. Swept paths are attached in Appendix A. The number of service vehicles to the school will be less than 10 per day. Service vehicles are scheduled to arrive outside school start and finish times.

Traffic Generation and Effects

3.38 Based on travel mode surveys discussed in Chapter 2, some 76% of junior school students travel to and from school by car during the morning and afternoon peak periods. This compares to senior school students of some 39% and 32%

(including students that drive to school) during the morning and afternoon periods respectively. The average car occupancy rate was found to be some 1.7 students per car for both the junior school and senior school. Some 87% of junior school staff and some 75% of senior school staff drive a car to work.

3.39 Taking into consideration before and after school co-curricular activities, sport and absenteeism, some 80% of students could be expected to travel to and from school during the peak hour period before and after school.

3.40 As discussed in Chapter 2, in order to reduce the number of cars in the vicinity of the school at any given time and also to better manage student movements, the school will continue to stagger the start and finish times of the ELC/pre-school, junior school and senior school. The set-down and pick up activity of the ELC will be managed to not coincide with set-down and pick-up activities of the junior and senior schools. In addition, a GTP has been prepared for the school to promote sustainable transport options and to encourage student and staff to use travel modes other than private vehicle, including the use of public transport active transport.

3.41 The increase in student and staff numbers would be expected to generate some 100 vehicles per hour two-way during the morning and afternoon peak periods.

3.42 The additional traffic generated by the school has been assigned to the road network as shown on Figures 2 and 3, with the results summarised in Table 3.1.

Table 3.1: Existing Plus Additional Peak Hour Two-Way (Sum of Both Directions) Traffic Flows				
Road/Location	**Morning Peak Period (Vehicles/Hour)**		**Afternoon Peak Period (Vehicles/Hour)**	
	Existing	**Plus Development**	**Existing**	**Plus Development**
New South Head Road				
- north of Vaucluse Road	1030	+20	1190	+20
- south of Vaucluse Road	1375	+60	1560	+60
Vaucluse Road				
- west of New South Head Rd	440	+80	475	+80
- south of Gilliver Avenue	300	+20	355	+20
- north of Gilliver Avenue	185	-	225	-
Gilliver Avenue				
- east of Vaucluse Road	145	+20	150	+20

3.43 Examination of Table 3.1 revealed that:

- traffic flows on New South Head Road south of Vaucluse Road would increase by some 60 vehicles per hour two-way during the morning and afternoon peak periods. Traffic flows north of Vaucluse Road would increase by some 20 vehicles per hour two-way at peak times;

- traffic flows on Vaucluse Road between New South Head Road and the new site access driveway would increase by some 80 vehicles per hour two-way during the morning and afternoon peak periods;

- traffic flows on Vaucluse Road south of Gilliver Avenue and on Gilliver Avenue east of Vaucluse Road would increase by some 20 vehicles per hour two-way during the morning and afternoon peak periods.

3.44 The surveyed intersections were reanalysed using SIDRA with additional traffic in place. The results of the SIDRA analysis are attached in Appendix B. The analysis found that the signalised intersection of New South Head Road and Vaucluse Road will continue to operate with average delays of less than 25 seconds per vehicle during morning and afternoon peak periods. This represents level of service B, a good level of intersection operation.

3.45 The unsignalised intersection of Vaucluse Road and Gilliver Avenue will continue to operate with average delays, for the movement with the highest average delay, of less than 10 seconds per vehicle during peak periods. This represents level of service A, a good level of intersection operation.

3.46 In summary the traffic analysis found that the road network in the vicinity of the site will accommodate the additional traffic generated by the school, with adjoining intersections operating at their existing levels of service.

Summary

3.47 In summary, the main points relating to the transport and accessibility implications of the proposed alterations and additions to the school are as follows:

i) the proposed alterations and additions to the school include:

- alterations and additions to the junior school and expansion of the early learning centre;
- alterations and additions to the senior school, including expansion and refurbishment of the North Wing;

- extensions and expansion of the student boarding house;
- upgrades to the main entry to the senior school building, including reconfiguration of the administration and office facilities;
- reconfiguration of the senior school forecourt to improve pedestrian facilities and relocation of the on-site bus set-down and pick-up area;
- provision of a new bus parking area, student set-down/pick-up area and car park adjacent to the senior school forecourt;
- provision of a new driveway crossing on Vaucluse Road to provide access at a new on-site student set-down and pick-up area on the northern side of the senior school;

ii) the proposed alterations and additions to the school, will result in an increase in student numbers from some 955 students to some 1,205 students. Staff numbers will increase from some 150 FTE to 185 FTE;

iii) appropriate provision for public transport is proposed at the site, including provision for buses, pedestrians and cyclists;

iv) a travel demand management approach id proposed through implementation of a Green Travel Plan;

v) appropriate on-site parking is proposed;

vi) vehicular access, internal circulation and servicing arrangements will be provided in accordance with AS2890.1-2004 and AS2890.2-2002;

vii) the school has good access to public transport services (bus services) with links to Bondi Junction, Edgecliff and CBD railway stations. The school also provide

dedicated mini bus services to various areas and staff shuttle bus services to and from Edgecliff interchange;

viii) the road network will be able to cater for the additional traffic from the proposed development; and

ix) Table 1.1 in Chapter 1 sets down the SEARs and identifies the relevant sections of the report where they are addressed.

Click: https://goo.gl/maps/L1fmZkYT9es

Location Plan

Colston Budd Rogers & Kafes Pty Ltd

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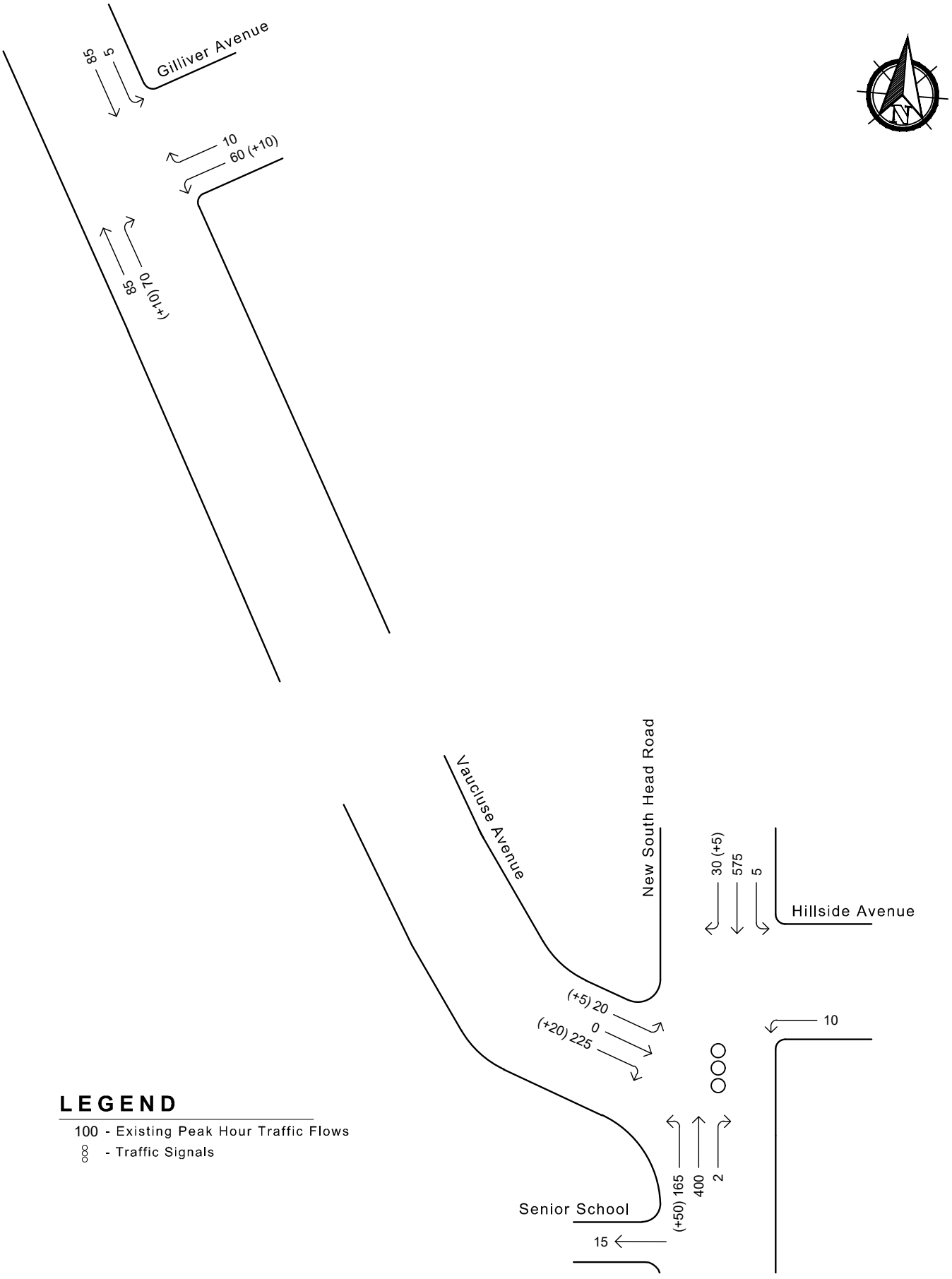
Figure 1



Existing weekday morning peak hour traffic flows

Colston Budd Rogers & Kafes Pty Ltd

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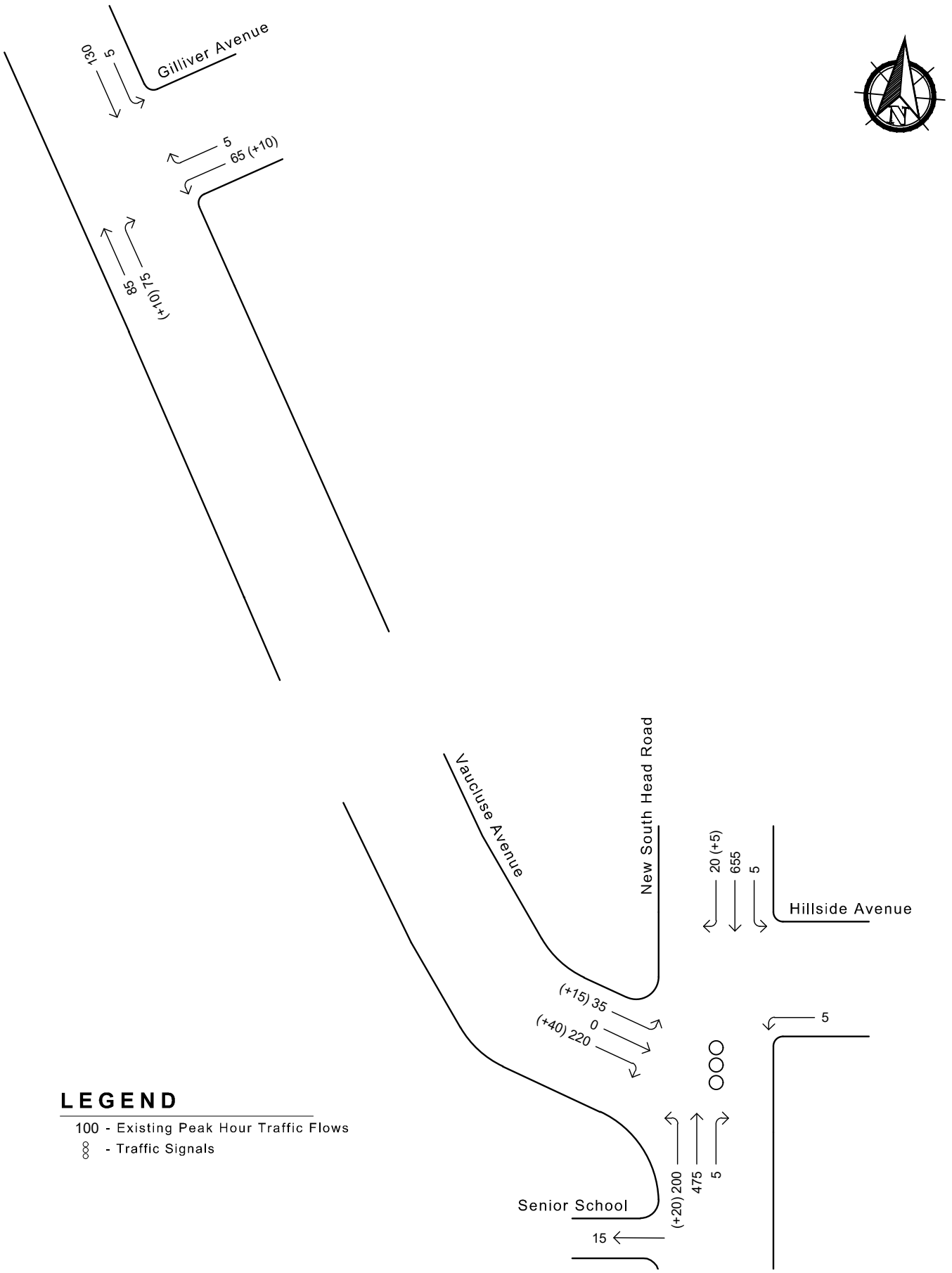
Figure 2



Existing weekday afternoon peak hour traffic flows

Colston Budd Rogers & Kafes Pty Ltd

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Figure 3

Proposed Site Plan

Colston Budd Rogers & Kafes Pty Ltd

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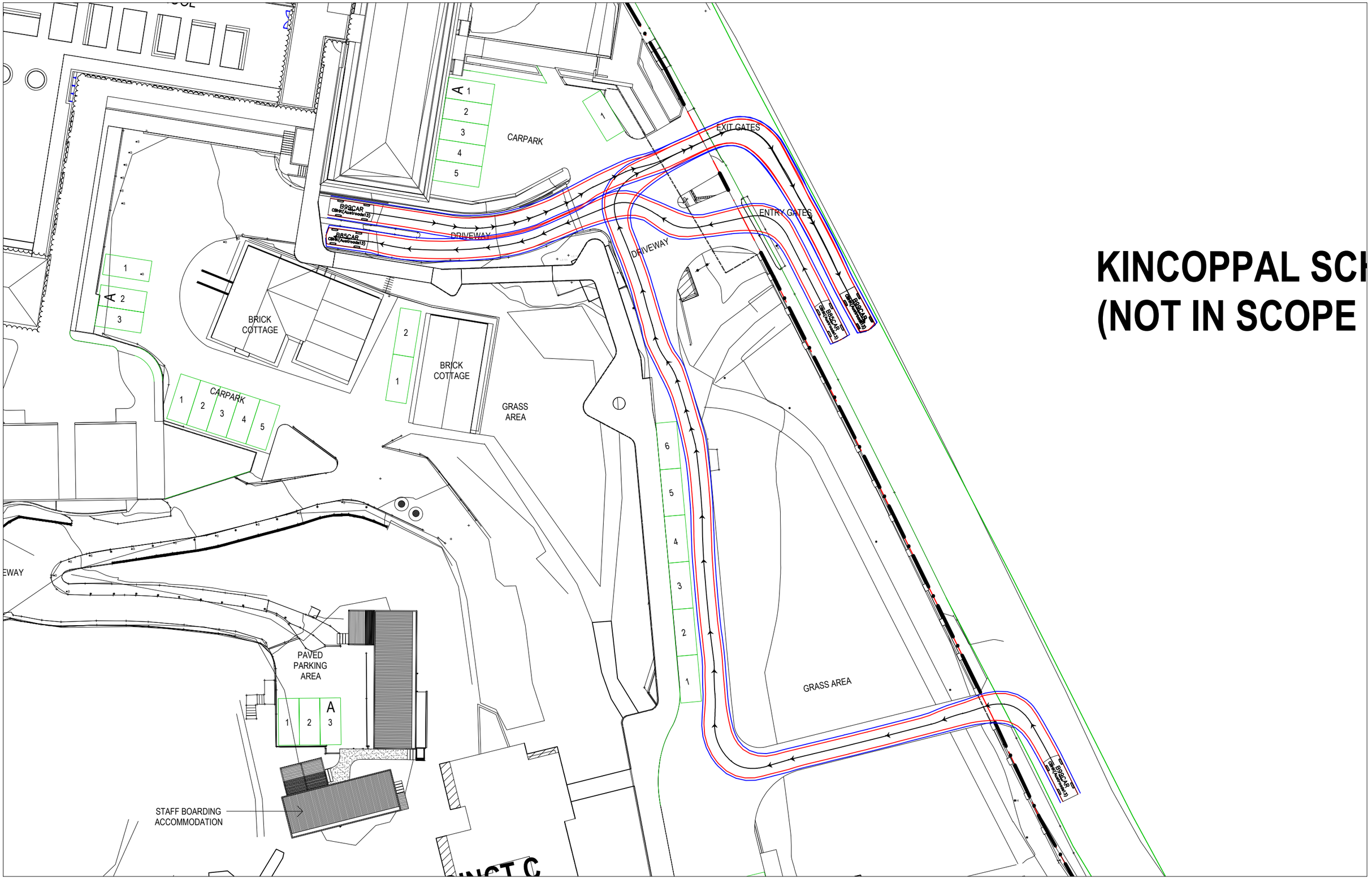
Figure 4

APPENDIX A

Vehicle Swept Paths



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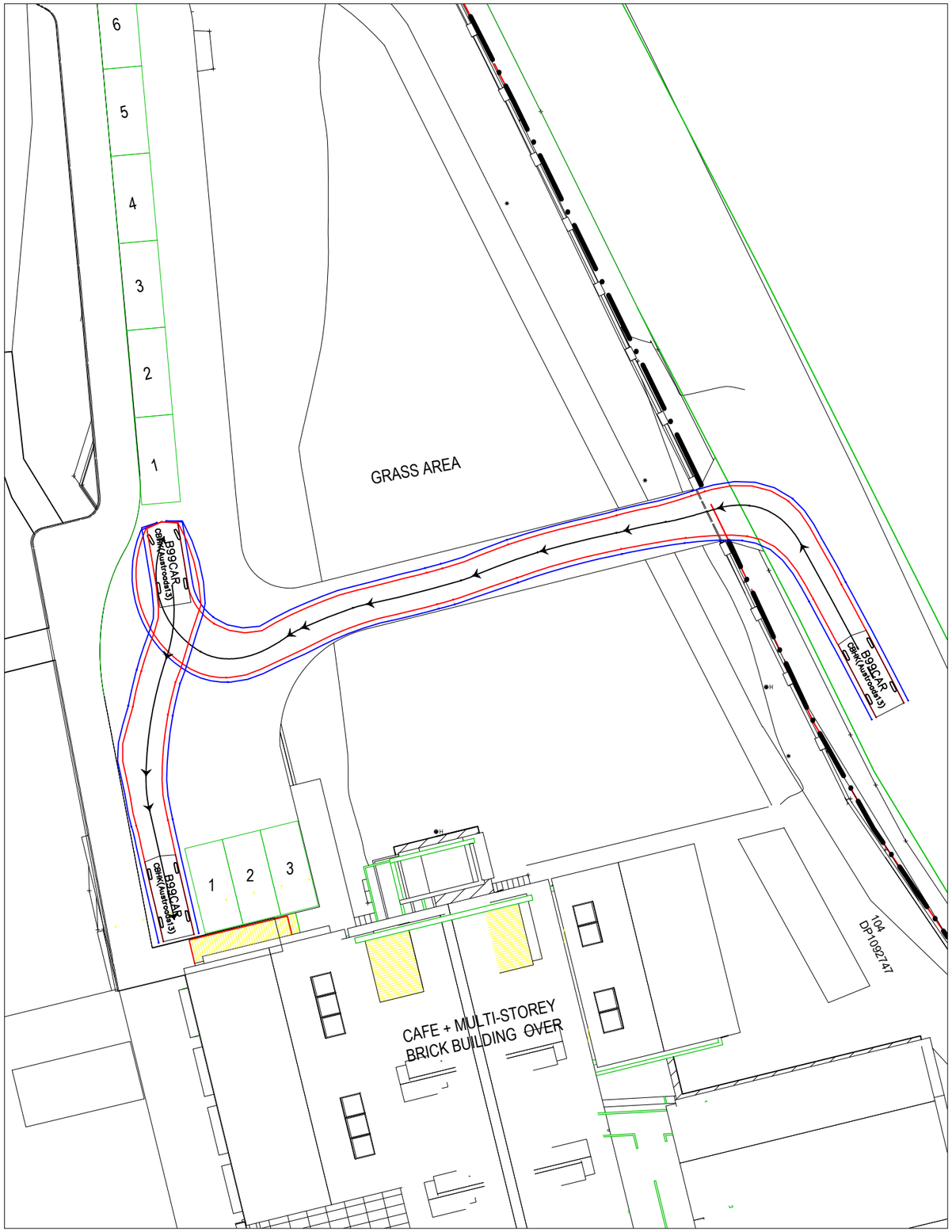
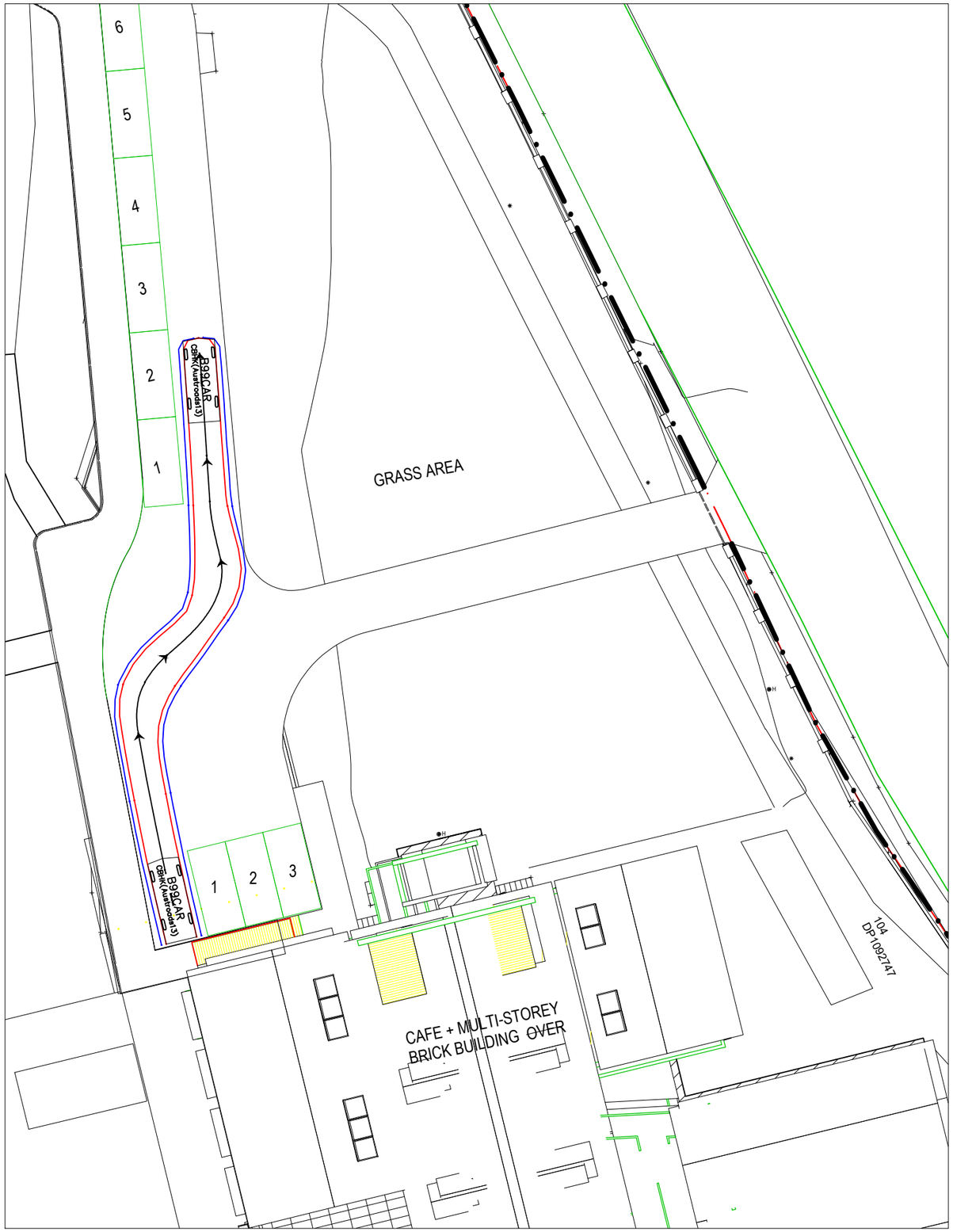
Swept Path of Vehicle Body
Swept Path of Clearance to Vehicle Body

B85 & B99 VEHICLE SWEPT PATHS

DRAWN BY CBRK Pty Ltd_mc/mr Ref: 11096 29 SEPTEMBER 2020 **A1**





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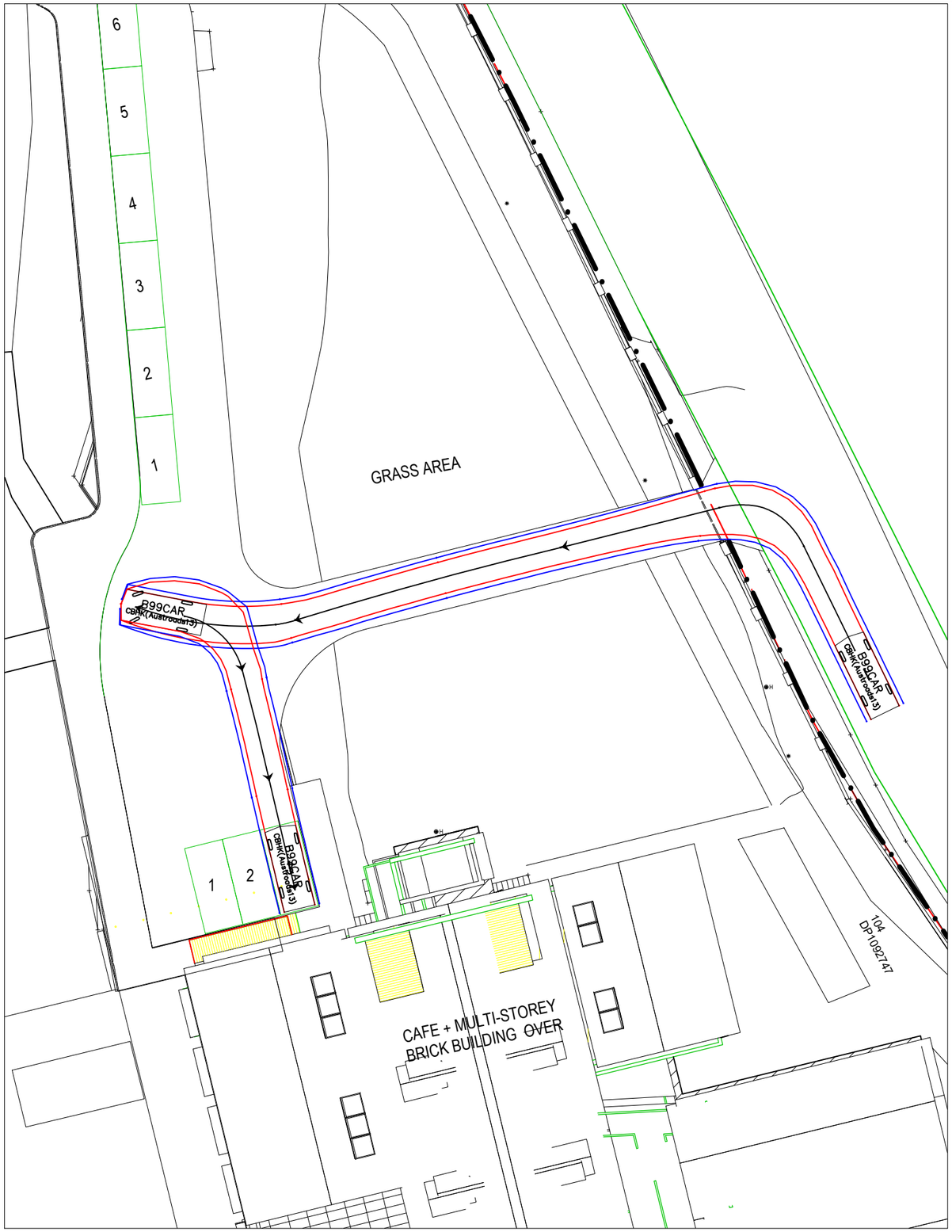
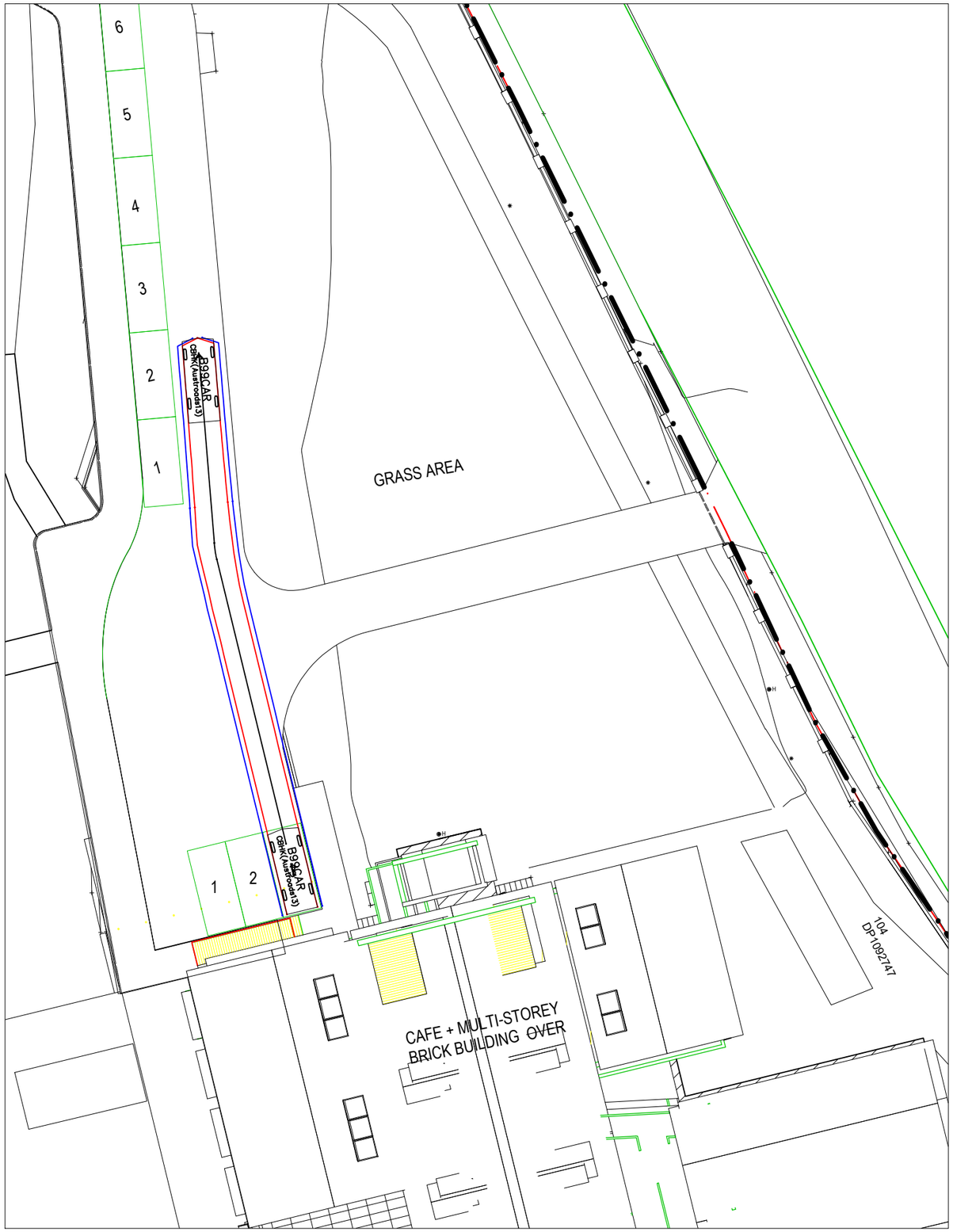
Swept Path of Vehicle Body
Swept Path of Clearance to Vehicle Body

B99 VEHICLE SWEPT PATHS

DRAWN BY CBRK Pty Ltd_mc/mr Ref: 11096 29 SEPTEMBER 2020 **A2**





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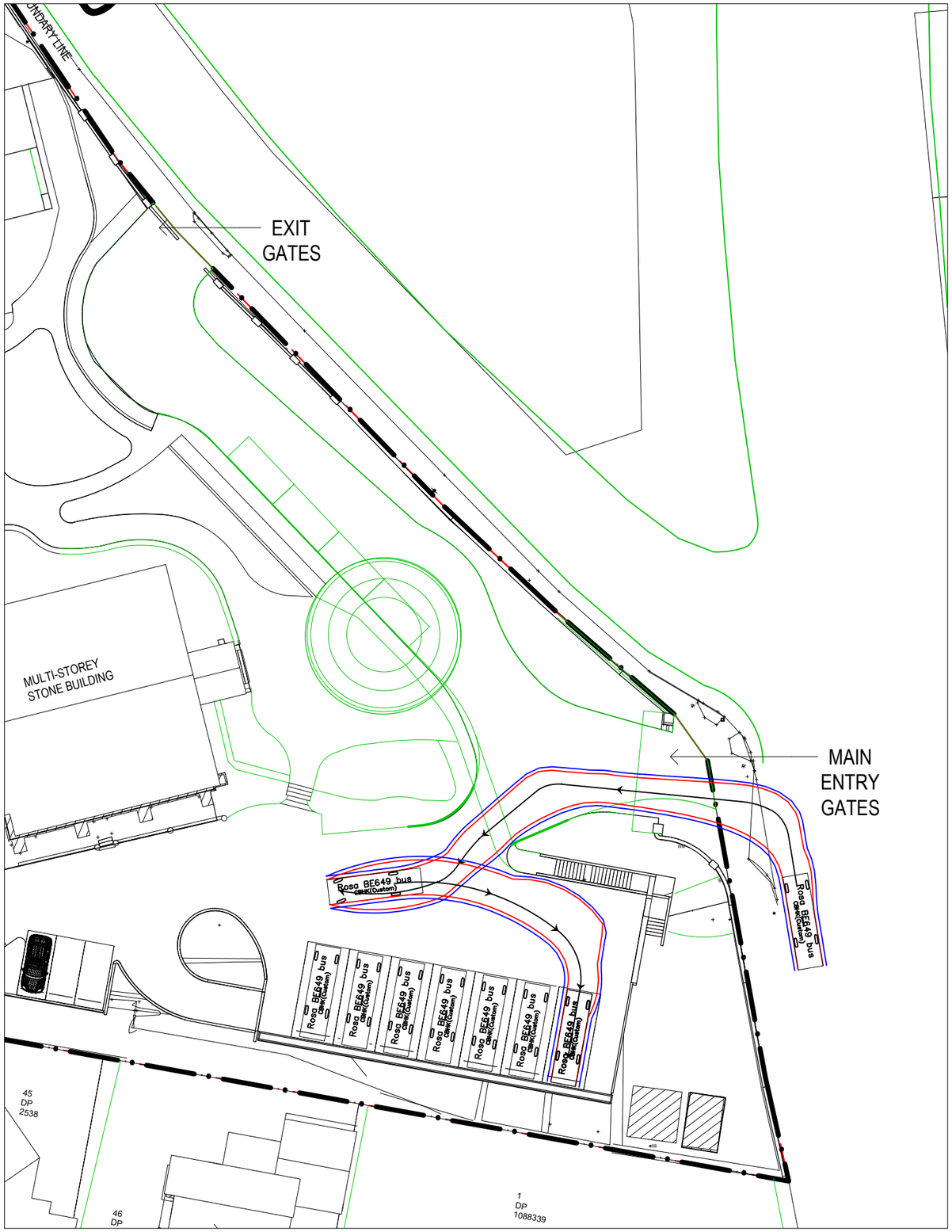
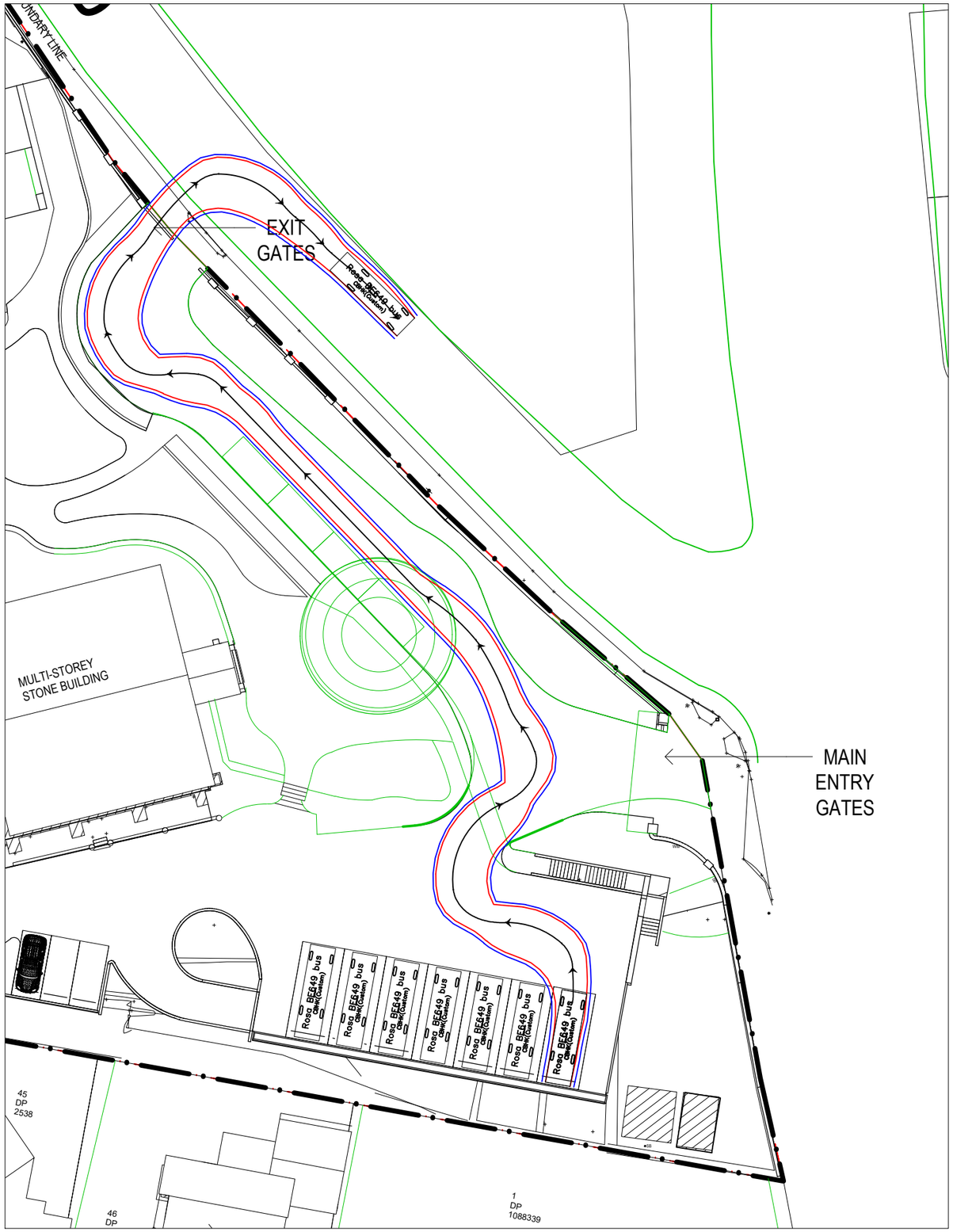
Swept Path of Vehicle Body
Swept Path of Clearance to Vehicle Body

B99 VEHICLE SWEPT PATHS

DRAWN BY CBRK Pty Ltd_mc/mr Ref: 11096 29 SEPTEMBER 2020

A3





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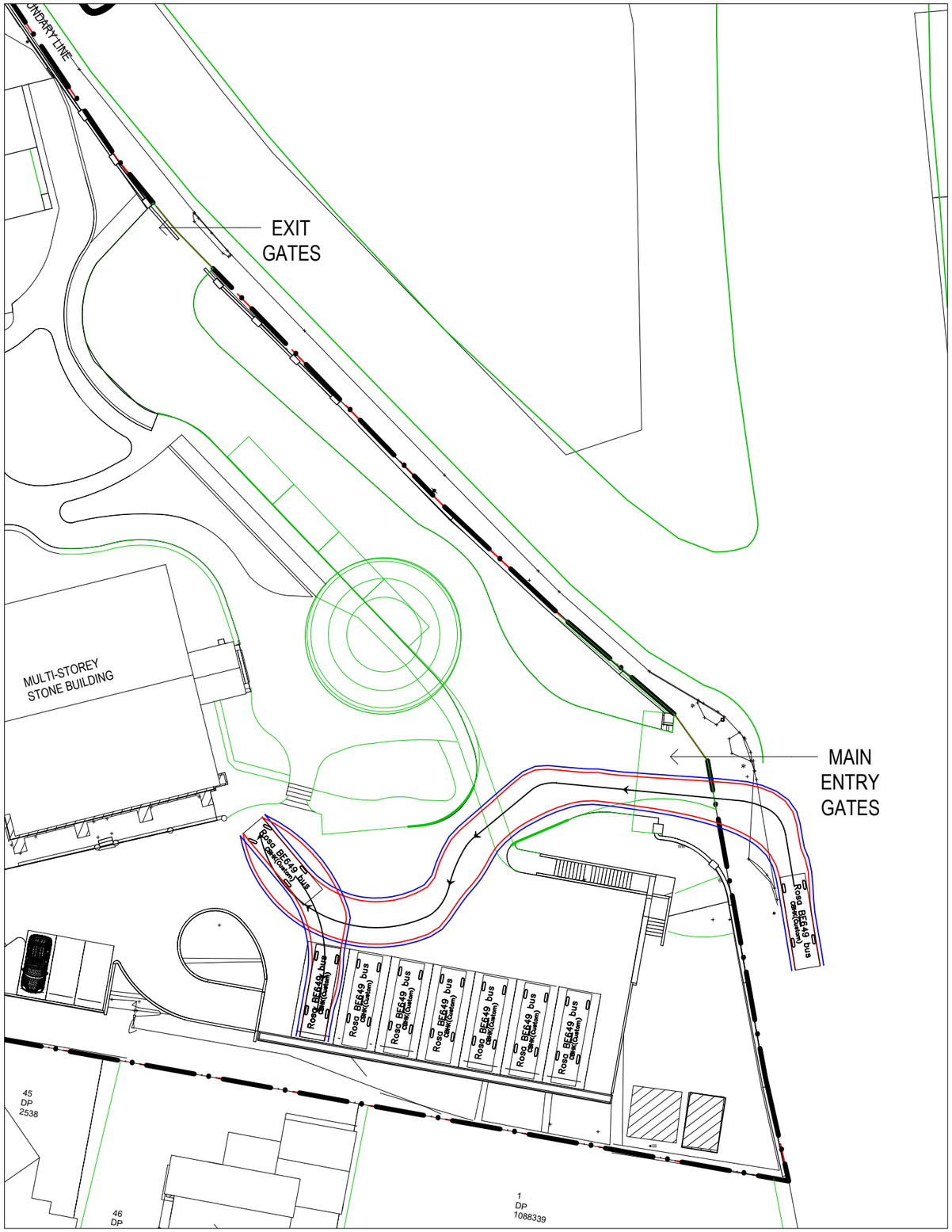
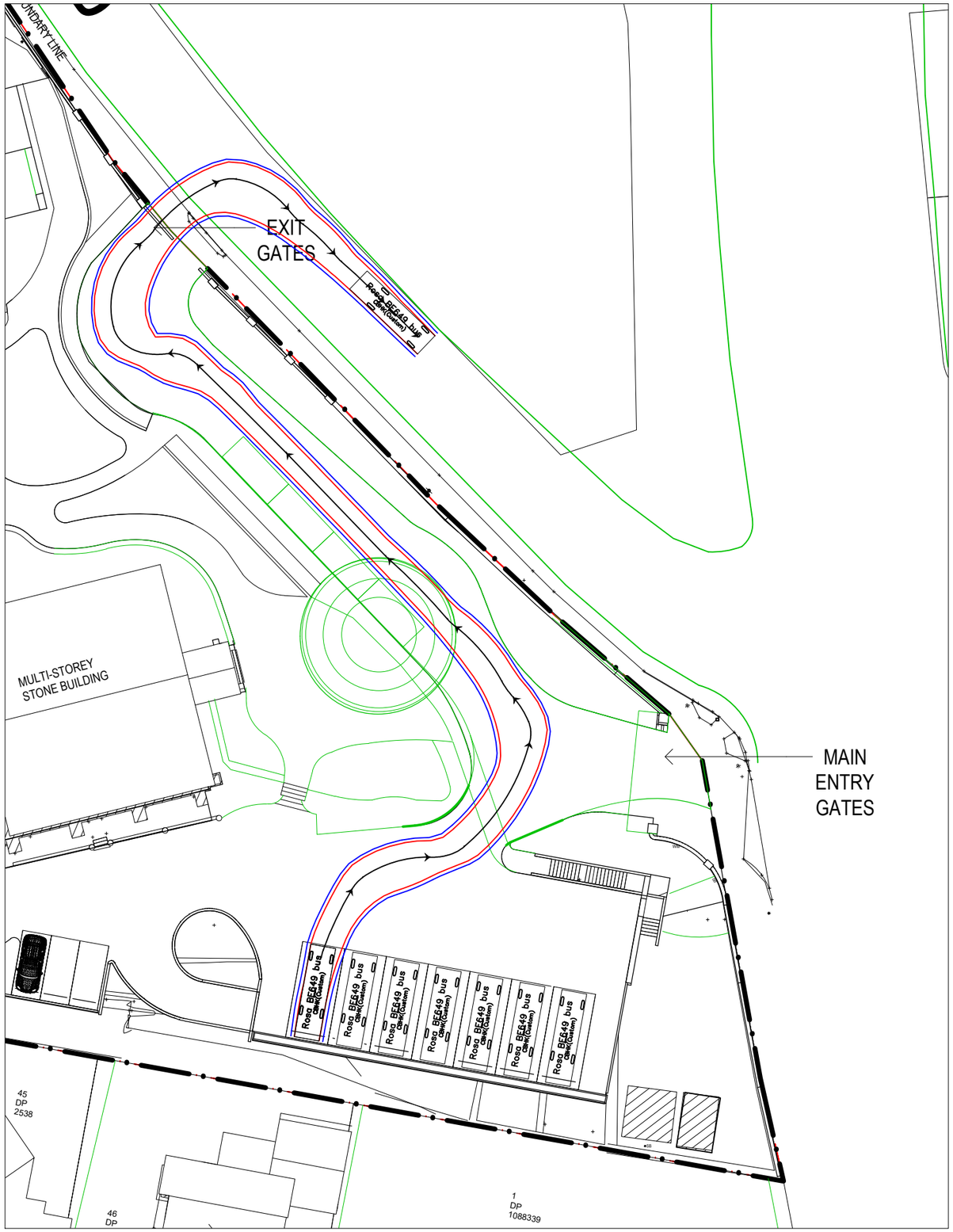
Swept Path of Vehicle Body
Swept Path of Clearance to Vehicle Body

7.73m ROSA BUS SWEPT PATHS

DRAWN BY CBRK Pty Ltd_mc/mr Ref: 11096 29 SEPTEMBER 2020 **A4**





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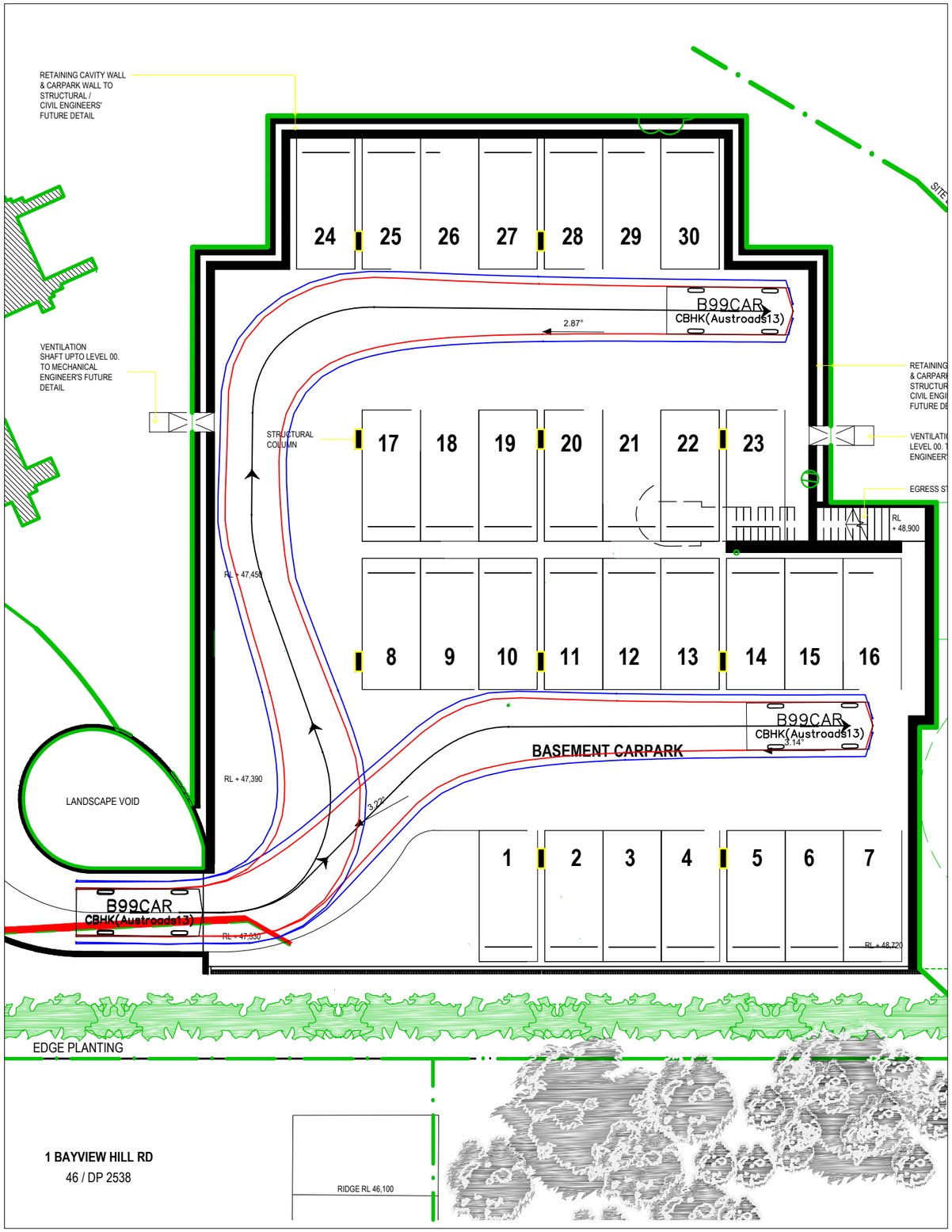
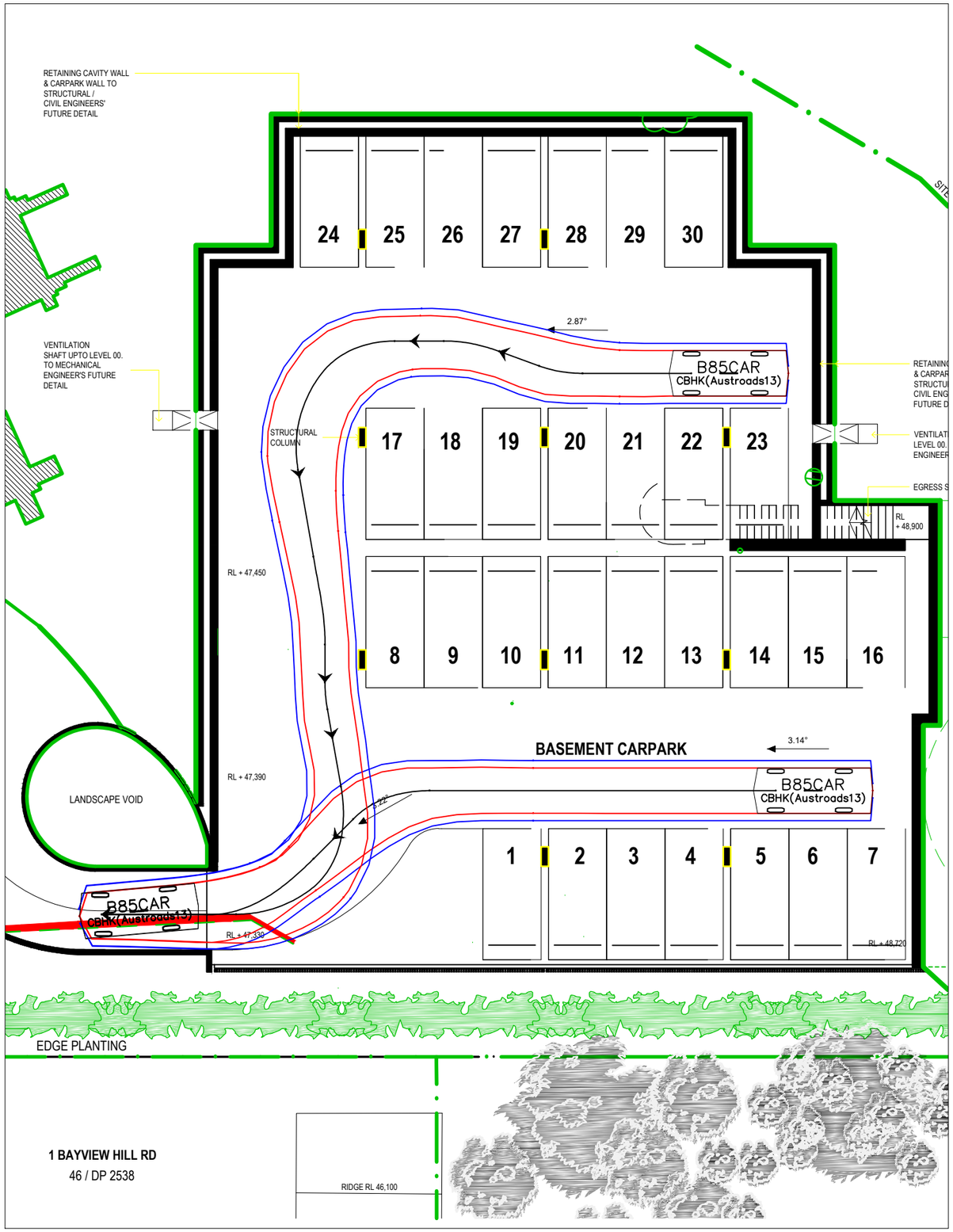
Swept Path of Vehicle Body
Swept Path of Clearance to Vehicle Body

7.73m ROSA BUS SWEPT PATHS

DRAWN BY CBRK Pty Ltd_mc/mr Ref: 11096 29 SEPTEMBER 2020

A5





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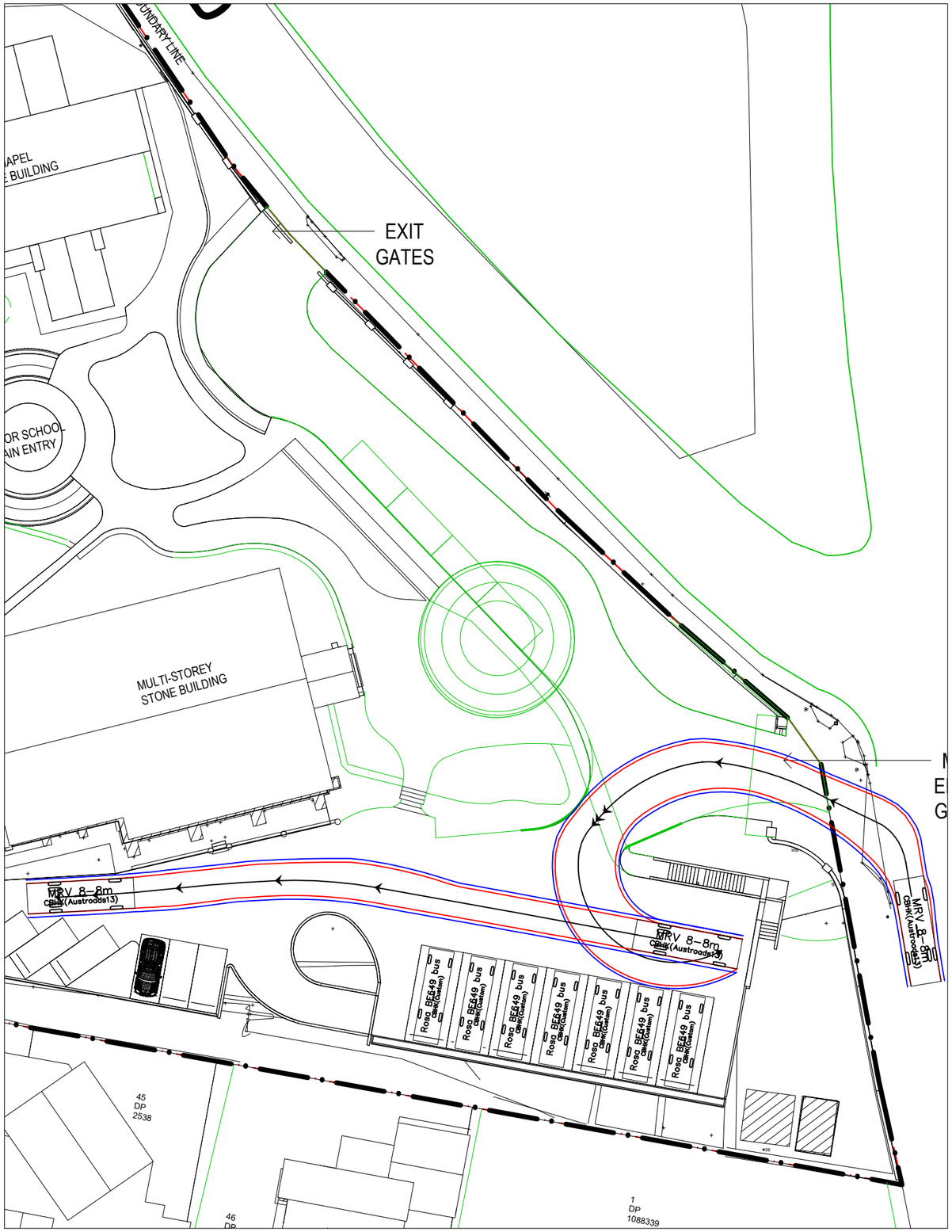
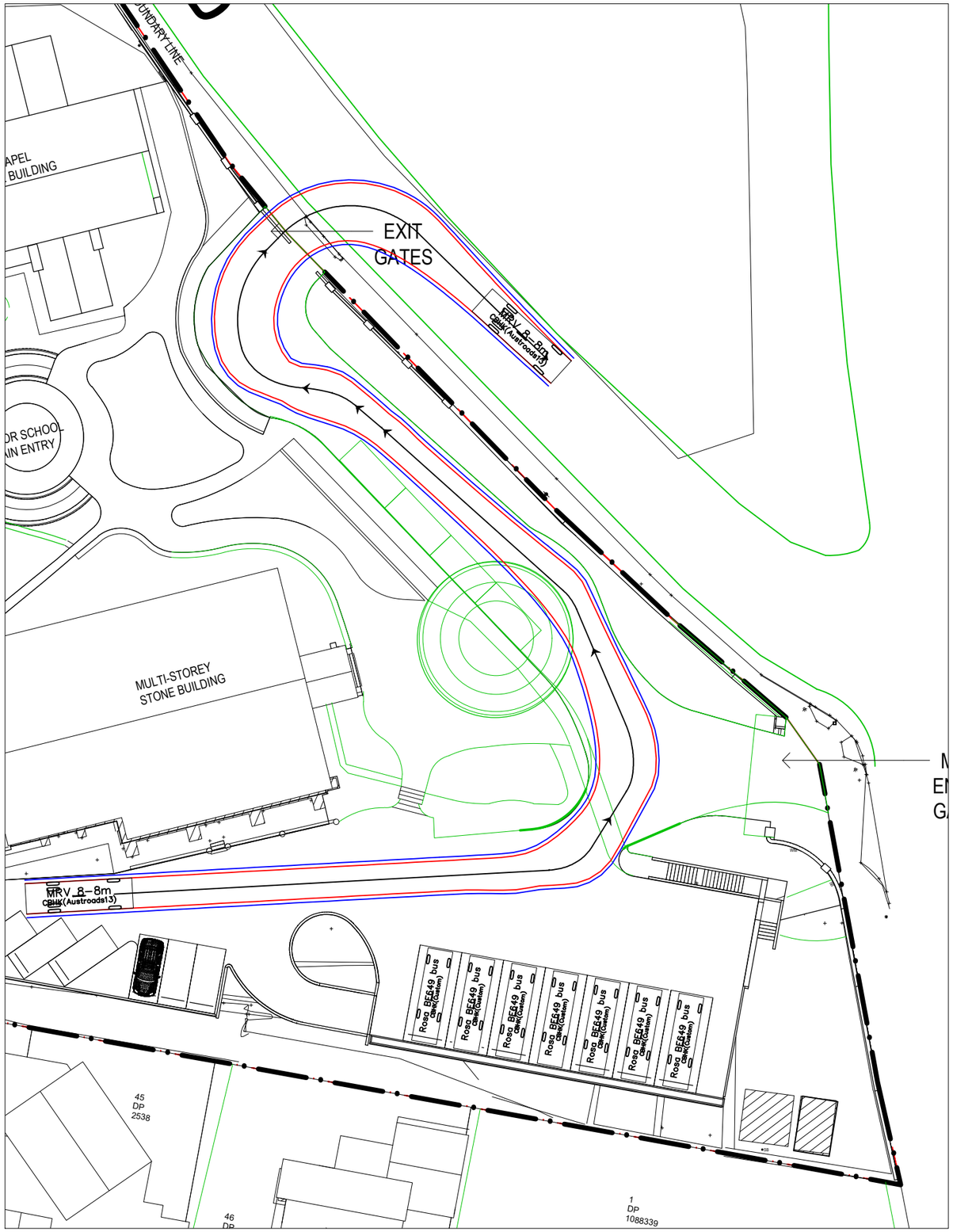
Swept Path of Vehicle Body
Swept Path of Clearance to Vehicle Body

B85 & B99 SWEPT PATHS

DRAWN BY CBRK Pty Ltd_mc/mr Ref: 11096 29 SEPTEMBER 2020

A6





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Swept Path of Vehicle Body
Swept Path of Clearance to Vehicle Body

8.8m MEDIUM RIGID VEHICLE SWEPT PATHS

DRAWN BY CBRK Pty Ltd_mc/mr Ref: 11096 29 SEPTEMBER 2020

A7

APPENDIX B

SIDRA Analysis

MOVEMENT SUMMARY

Site: 101 [AM EX - New South Head Road - Vaucluse Road]

Existing Weekday Morning Peak Hour Traffic
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 91 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: New South Head Road												
1a	L1	165	2.0	0.124	8.1	LOS A	2.3	16.6	0.35	0.60	0.35	36.6
2	T1	400	2.0	0.478	23.5	LOS B	11.4	81.5	0.80	0.68	0.80	31.8
Approach		565	2.0	0.478	19.0	LOS B	11.4	81.5	0.67	0.66	0.67	33.0
North: New South Head Road												
8	T1	580	2.0	0.413	23.8	LOS B	8.8	62.7	0.79	0.66	0.79	31.6
9b	R3	30	2.0	0.413	30.6	LOS C	7.7	54.9	0.83	0.71	0.83	30.9
Approach		610	2.0	0.413	24.2	LOS B	8.8	62.7	0.79	0.66	0.79	31.6
NorthWest: RoadName												
27b	L3	20	2.0	0.480	34.2	LOS C	9.2	65.6	0.89	0.79	0.89	29.7
29a	R1	225	2.0	0.480	32.4	LOS C	9.2	65.6	0.89	0.79	0.89	29.6
Approach		245	2.0	0.480	32.5	LOS C	9.2	65.6	0.89	0.79	0.89	29.6
All Vehicles		1420	2.0	0.480	23.6	LOS B	11.4	81.5	0.76	0.68	0.76	31.8

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	39.8	LOS D	0.1	0.1	0.94	0.94
P7	NorthWest Full Crossing	53	39.8	LOS D	0.1	0.1	0.94	0.94
All Pedestrians		105	39.8	LOS D			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [PM EX - New South Head Road - Vaucluse Road]

Existing Weekday Afternoon Peak Hour Traffic
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 91 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: New South Head Road												
1a	L1	200	2.0	0.151	8.2	LOS A	2.9	20.6	0.35	0.61	0.35	36.5
2	T1	480	2.0	0.540	22.8	LOS B	13.8	98.5	0.80	0.69	0.80	32.0
Approach		680	2.0	0.540	18.5	LOS B	13.8	98.5	0.67	0.67	0.67	33.2
North: New South Head Road												
8	T1	655	2.0	0.422	22.3	LOS B	9.1	65.1	0.77	0.65	0.77	32.1
9b	R3	20	2.0	0.422	28.5	LOS C	8.7	62.1	0.81	0.69	0.81	31.6
Approach		675	2.0	0.422	22.5	LOS B	9.1	65.1	0.77	0.65	0.77	32.1
NorthWest: RoadName												
27b	L3	35	2.0	0.548	36.4	LOS C	10.0	71.2	0.92	0.80	0.92	29.2
29a	R1	220	2.0	0.548	34.6	LOS C	10.0	71.2	0.92	0.80	0.92	29.1
Approach		255	2.0	0.548	34.9	LOS C	10.0	71.2	0.92	0.80	0.92	29.1
All Vehicles		1610	2.0	0.548	22.7	LOS B	13.8	98.5	0.75	0.68	0.75	32.0

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	39.8	LOS D	0.1	0.1	0.94	0.94
P7	NorthWest Full Crossing	53	39.8	LOS D	0.1	0.1	0.94	0.94
All Pedestrians		105	39.8	LOS D			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [AM EX+Dev - New South Head Road - Vaucluse Road]

Existing Weekday Morning Peak Hour Traffic
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: New South Head Road												
1a	L1	215	2.0	0.163	8.3	LOS A	3.1	22.3	0.36	0.61	0.36	36.5
2	T1	400	2.0	0.503	24.7	LOS B	11.7	83.1	0.82	0.70	0.82	31.5
Approach		615	2.0	0.503	18.9	LOS B	11.7	83.1	0.66	0.67	0.66	33.1
North: New South Head Road												
8	T1	580	2.0	0.452	25.2	LOS B	9.2	65.5	0.81	0.68	0.81	31.3
9b	R3	35	2.0	0.452	32.8	LOS C	7.8	55.4	0.87	0.74	0.87	30.4
Approach		615	2.0	0.452	25.7	LOS B	9.2	65.5	0.82	0.69	0.82	31.2
NorthWest: RoadName												
27b	L3	25	2.0	0.504	33.1	LOS C	10.0	71.2	0.88	0.79	0.88	30.0
29a	R1	245	2.0	0.504	31.3	LOS C	10.0	71.2	0.88	0.79	0.88	29.9
Approach		270	2.0	0.504	31.5	LOS C	10.0	71.2	0.88	0.79	0.88	29.9
All Vehicles		1500	2.0	0.504	24.0	LOS B	11.7	83.1	0.76	0.70	0.76	31.7

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
P7	NorthWest Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
All Pedestrians		105	39.3	LOS D			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [PM EX+Dev - New South Head Road - Vaucluse Road]

Existing Weekday Afternoon Peak Hour Traffic
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 91 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: New South Head Road												
1a	L1	220	2.0	0.166	8.2	LOS A	3.2	22.9	0.36	0.61	0.36	36.5
2	T1	480	2.0	0.591	25.3	LOS B	14.6	104.1	0.85	0.72	0.85	31.3
Approach		700	2.0	0.591	20.0	LOS B	14.6	104.1	0.69	0.69	0.69	32.8
North: New South Head Road												
8	T1	655	2.0	0.485	25.4	LOS B	9.9	70.4	0.82	0.69	0.82	31.2
9b	R3	25	2.0	0.485	32.8	LOS C	9.2	65.5	0.87	0.74	0.87	30.4
Approach		680	2.0	0.485	25.6	LOS B	9.9	70.4	0.82	0.69	0.82	31.2
NorthWest: RoadName												
27b	L3	50	2.0	0.592	34.6	LOS C	12.0	85.5	0.91	0.81	0.91	29.6
29a	R1	260	2.0	0.592	32.8	LOS C	12.0	85.5	0.91	0.81	0.91	29.5
Approach		310	2.0	0.592	33.1	LOS C	12.0	85.5	0.91	0.81	0.91	29.5
All Vehicles		1690	2.0	0.592	24.7	LOS B	14.6	104.1	0.78	0.71	0.78	31.5

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	39.8	LOS D	0.1	0.1	0.94	0.94
P7	NorthWest Full Crossing	53	39.8	LOS D	0.1	0.1	0.94	0.94
All Pedestrians		105	39.8	LOS D			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [AM EX - Vaucluse Road - Gilliver Avenue]

Weekday Morning Peak Hour Traffic
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Vaucluse Road												
2	T1	85	2.0	0.088	0.2	LOS A	0.3	2.3	0.14	0.21	0.14	39.1
3	R2	70	2.0	0.088	3.8	LOS A	0.3	2.3	0.14	0.21	0.14	42.7
Approach		155	2.0	0.088	1.8	NA	0.3	2.3	0.14	0.21	0.14	40.6
East: Gilliver Avenue												
4	L2	60	2.0	0.041	3.7	LOS A	0.2	1.1	0.18	0.45	0.18	41.9
6	R2	10	2.0	0.041	4.4	LOS A	0.2	1.1	0.18	0.45	0.18	41.5
Approach		70	2.0	0.041	3.8	LOS A	0.2	1.1	0.18	0.45	0.18	41.8
North: Vaucluse Road												
7	L2	5	2.0	0.047	3.4	LOS A	0.0	0.0	0.00	0.03	0.00	40.1
8	T1	85	2.0	0.047	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	39.9
Approach		90	2.0	0.047	0.2	NA	0.0	0.0	0.00	0.03	0.00	39.9
All Vehicles		315	2.0	0.088	1.8	NA	0.3	2.3	0.11	0.21	0.11	40.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [PM EX - Vaucluse Road - Gilliver Avenue]

Weekday Afternoon Peak Hour Traffic
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Vaucluse Road												
2	T1	85	2.0	0.093	0.3	LOS A	0.4	2.5	0.18	0.22	0.18	39.0
3	R2	75	2.0	0.093	3.9	LOS A	0.4	2.5	0.18	0.22	0.18	42.6
Approach		160	2.0	0.093	2.0	NA	0.4	2.5	0.18	0.22	0.18	40.6
East: Gilliver Avenue												
4	L2	65	2.0	0.042	3.8	LOS A	0.2	1.2	0.23	0.45	0.23	41.8
6	R2	5	2.0	0.042	4.6	LOS A	0.2	1.2	0.23	0.46	0.23	41.4
Approach		70	2.0	0.042	3.9	LOS A	0.2	1.2	0.23	0.45	0.23	41.8
North: Vaucluse Road												
7	L2	5	2.0	0.070	3.4	LOS A	0.0	0.0	0.00	0.02	0.00	40.1
8	T1	130	2.0	0.070	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	39.9
Approach		135	2.0	0.070	0.1	NA	0.0	0.0	0.00	0.02	0.00	39.9
All Vehicles		365	2.0	0.093	1.7	NA	0.4	2.5	0.12	0.19	0.12	40.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [AM EX+Dev - Vaucluse Road - Gilliver Avenue]

Weekday Morning Peak Hour Traffic
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Vaucluse Road												
2	T1	85	2.0	0.094	0.2	LOS A	0.4	2.5	0.15	0.23	0.15	39.0
3	R2	80	2.0	0.094	3.8	LOS A	0.4	2.5	0.15	0.23	0.15	42.6
Approach		165	2.0	0.094	1.9	NA	0.4	2.5	0.15	0.23	0.15	40.7
East: Gilliver Avenue												
4	L2	70	2.0	0.047	3.7	LOS A	0.2	1.3	0.18	0.45	0.18	41.9
6	R2	10	2.0	0.047	4.5	LOS A	0.2	1.3	0.18	0.45	0.18	41.5
Approach		80	2.0	0.047	3.8	LOS A	0.2	1.3	0.18	0.45	0.18	41.8
North: Vaucluse Road												
7	L2	5	2.0	0.047	3.4	LOS A	0.0	0.0	0.00	0.03	0.00	40.1
8	T1	85	2.0	0.047	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	39.9
Approach		90	2.0	0.047	0.2	NA	0.0	0.0	0.00	0.03	0.00	39.9
All Vehicles		335	2.0	0.094	1.9	NA	0.4	2.5	0.11	0.23	0.11	40.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [PM EX+Dev - Vaucluse Road - Gilliver Avenue]

Weekday Afternoon Peak Hour Traffic
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Vaucluse Road												
2	T1	85	2.0	0.099	0.3	LOS A	0.4	2.8	0.19	0.24	0.19	38.9
3	R2	85	2.0	0.099	3.9	LOS A	0.4	2.8	0.19	0.24	0.19	42.5
Approach		170	2.0	0.099	2.1	NA	0.4	2.8	0.19	0.24	0.19	40.7
East: Gilliver Avenue												
4	L2	75	2.0	0.047	3.8	LOS A	0.2	1.3	0.23	0.46	0.23	41.8
6	R2	5	2.0	0.047	4.7	LOS A	0.2	1.3	0.23	0.46	0.23	41.4
Approach		80	2.0	0.047	3.9	LOS A	0.2	1.3	0.23	0.46	0.23	41.8
North: Vaucluse Road												
7	L2	5	2.0	0.070	3.4	LOS A	0.0	0.0	0.00	0.02	0.00	40.1
8	T1	130	2.0	0.070	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	39.9
Approach		135	2.0	0.070	0.1	NA	0.0	0.0	0.00	0.02	0.00	39.9
All Vehicles		385	2.0	0.099	1.8	NA	0.4	2.8	0.13	0.21	0.13	40.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.