DA 17/1822
Proposed Seniors Living Development

2-18 Centennial Road, Bowral

REVISED TRAFFIC AND PARKING ASSESSMENT REPORT

21 September 2018

Ref 17788

VARGA TRAFFIC PLANNING Pty Ltd
Transport, Traffic and Parking Consultants

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LIST OF ILLUSTRATIONS

1. INTRODUCTION

This revised report has been prepared on behalf of *Waterbrook* to accompany an amended development application to Council (DA 17/1822) for a seniors living development proposal to be located at 2-18 Centennial Road, Bowral (Figures 1 and 2).

The site lies within the "OLSH Precinct" of the Council's, *Bowral Town Centre DCP 2010* and is situated approximately 350m north of the pedestrian entrance to Bowral Railway Station and also Bowral Town Centre.

The proposed development involves the staged construction of a new seniors independent living development on the site, comprising free-standing villas. The proposal also involves the alterations and additions to the existing buildings on the site which will comprise a number of facilities for the exclusive use of residents and their guests, as well as the restoration and refurbishment of the existing restaurant and chapel building.

Off-street parking for the villas is to be provided is to be provided in respective internal garages in accordance with *State Environmental Planning Policy (Housing for Senior or People with a Disability) 2004* requirements. Off-street parking for the central facilities is to be provided in an outdoor at-grade parking area in accordance with expected operational requirements.

A new private internal road network is to be constructed to serve these future dwellings and central facilities, with vehicular access to be provided via two separate points off Centennial Road.

The purpose of this revised report is to assess the traffic and parking implications of the amended development proposal and to that end this report:

- describes the site and provides details of the amended development proposal

- reviews the road network in the vicinity of the site, and the traffic conditions on that road network

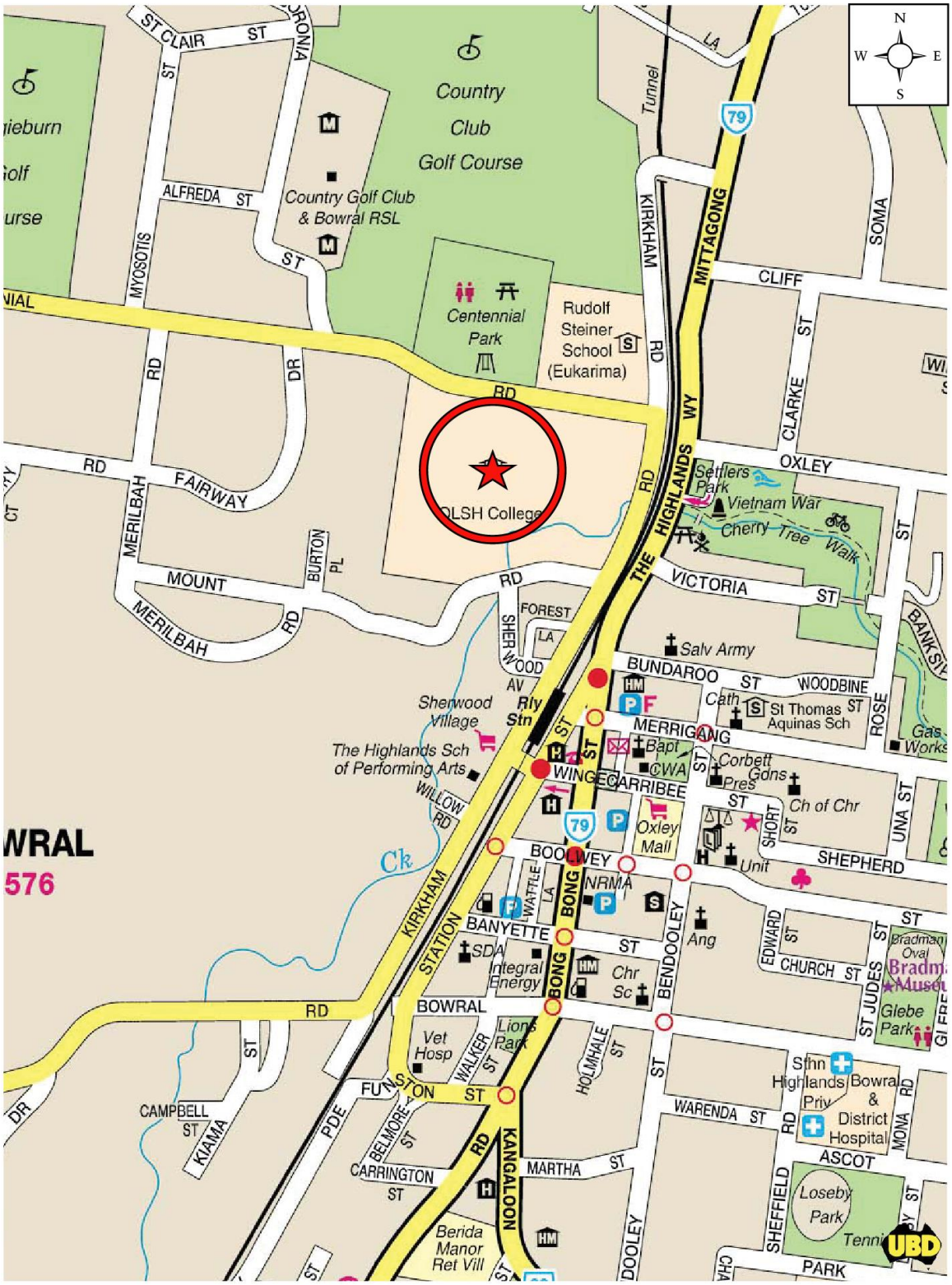
- reviews the public transport and essential services available in the vicinity of the site

- estimates the traffic generation potential of the amended development proposal, and assigns that traffic generation to the road network serving the site

- assesses the traffic implications of the amended development proposal in terms of road network capacity

- reviews the geometric design features of the proposed car parking and loading facilities for compliance with the relevant codes and standards

- assesses the adequacy and suitability of the quantum of off-street car parking and loading provided on the site.



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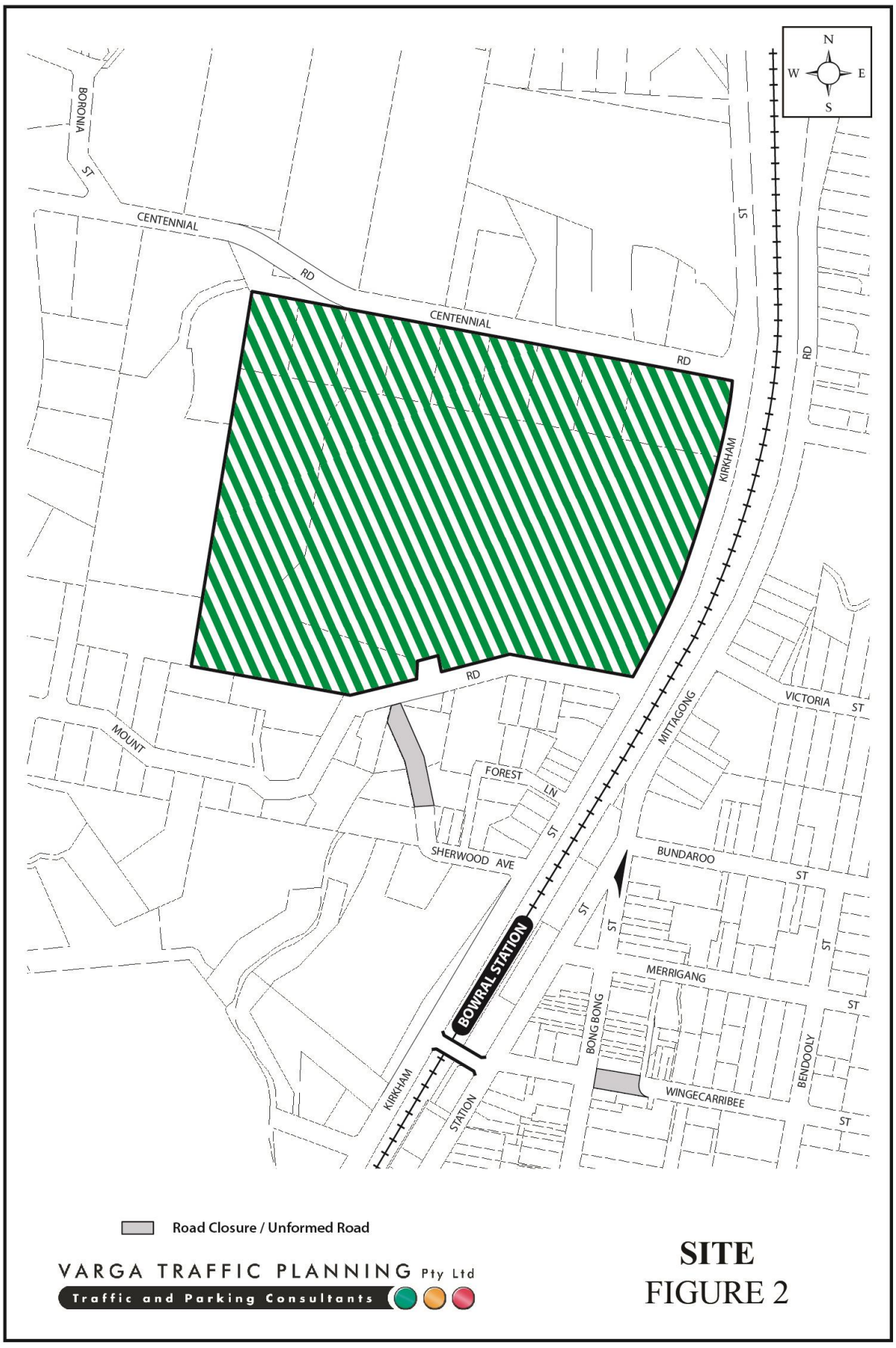
LOCATION
FIGURE 1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KIRKHAM ST
RD
MOUNT
FOREST LN
SHERWOOD AVE
MITTAGONG ST
VICTORIA ST
BUNDAROO ST
MERRIGANG ST
BOWRAL STATION
BONG BONG ST
BENDOOLY ST
WINGECARRIBEE ST
KIRKHAM STATION
Road Closure / Unformed Road
VARGA TRAFFIC PLANNING Pty Ltd
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SITE
FIGURE 2

2. PROPOSED DEVELOPMENT

Site

The subject site is located on the western side of Kirkham Road, extending between Centennial Road and Mount Road. The site has street frontages approximately 326m in length to Kirkham Road, 456m in length to Centennial Road and 295m in length to Mount Road. The site occupies an area of approximately 17.01ha.

The subject site was originally occupied by *Our Lady of Sacred Heart (OLSH)* convent, comprising a single dwelling, a number of outbuildings, an existing restaurant and a chapel. The site also comprises a mixture of established tall trees and low-level vegetation across the site, with the south-eastern portion of the site located in the vicinity of the flood plain of Mittagong Creek. A recent aerial image of the site and its surroundings is reproduced below.

OLSH Precinct

As noted in the foregoing, the site lays within the "OLSH Precinct" of the Council's, *Bowral Town Centre DCP 2010* as shown in the extract images on the following page.

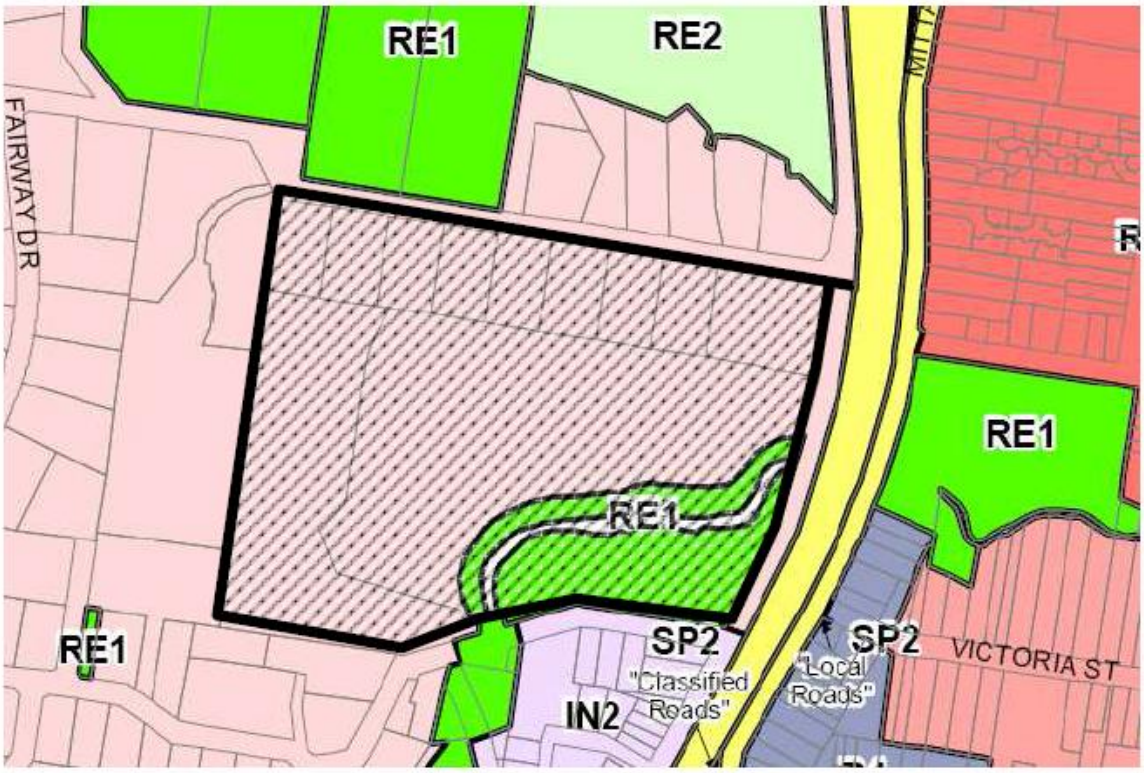


Figure C23.1 - OLSH Precinct

Figure C23.2 – Development Concepts Map

DCP 2010 notes the following with regards to any potential development on the OLSH Precinct site:

- minimise potential traffic impacts on the surrounding local roads
- no vehicular access to the site from Mount Road
- at least two vehicular access roads into the site from Centennial Road that promote the integration of the site as part of the local road network
- roads within the site can remain private roads rather than being dedicated to Council
- minimise the potential impacts to local residents during the construction stages

Proposed Development

The proposed development involves the staged construction of a new seniors independent living development on the site. A total of 135 single-storey villas are proposed in the new development as follows:

2 bedrooms dwellings:	94
3 bedrooms dwellings:	25
4 bedrooms dwellings:	16
TOTAL DWELLINGS:	**135**

The proposal also involves the alterations and additions to the existing buildings on the site which will comprise a number of facilities primarily for the exclusive use of residents and their guests, as well as the restoration and refurbishment of the existing restaurant and chapel building. The ancillary uses within the proposed development are as follows:

- ball room/auditorium
- restaurant
- lounge & bar with indoor and outdoor dining
- administration offices
- chapel
- swimming pool
- gymnasium
- library
- cinema
- day spa

Off-street car parking for the villas is to be provided for 270 cars in respective internal double garages in accordance with *State Environmental Planning Policy (Housing for Senior or People with a Disability) 2004* requirements. Off-street parking for the central facilities is to be provided for 58 cars in several outdoor, at-grade parking areas located in the vicinity, comprising 9 staff spaces and 49 visitor spaces, in accordance with expected operational requirements. A drop-off/pick-up area is also located outside the central facilities.

In order to connect the various villas and central facilities, a new private internal road network is to be constructed throughout the site. The main circulation roadways will have a typical pavement width of 6m wide with the exception of the main boulevarde which will have two separate 4m wide roadways. Access roads which serve the various "clusters" of villas will have a pavement width of between 3m-4m, widening to a minimum of 6m outside the respective double garages.

The primary vehicular access point into/out of the site is to be provided via the existing driveway located towards the eastern end of the Centennial Road site frontage, which is to be "squared up" and configured with a Rural Basic Right Turn (BAR) turning treatment. A secondary vehicular access point is to be provided via a new standard entry/exit driveway located towards the western end of the Centennial Road site frontage.

Loading/servicing for the proposed development is expected to be undertaken by a variety of commercial vehicles including the occasional mini-bus (for day trips), small rigid trucks (for deliveries) and medium rigid trucks (for garbage collection). Vehicular access for service vehicles is to be provided via the abovementioned site access driveways off Centennial Road.

Expected Operational Characteristics

As noted in the foregoing, all ancillary facilities within the development will be for the exclusive use of residents and their guests, including the ball room, restaurant, lounge/bar, day spa, swimming pool, gymnasium and cinema.

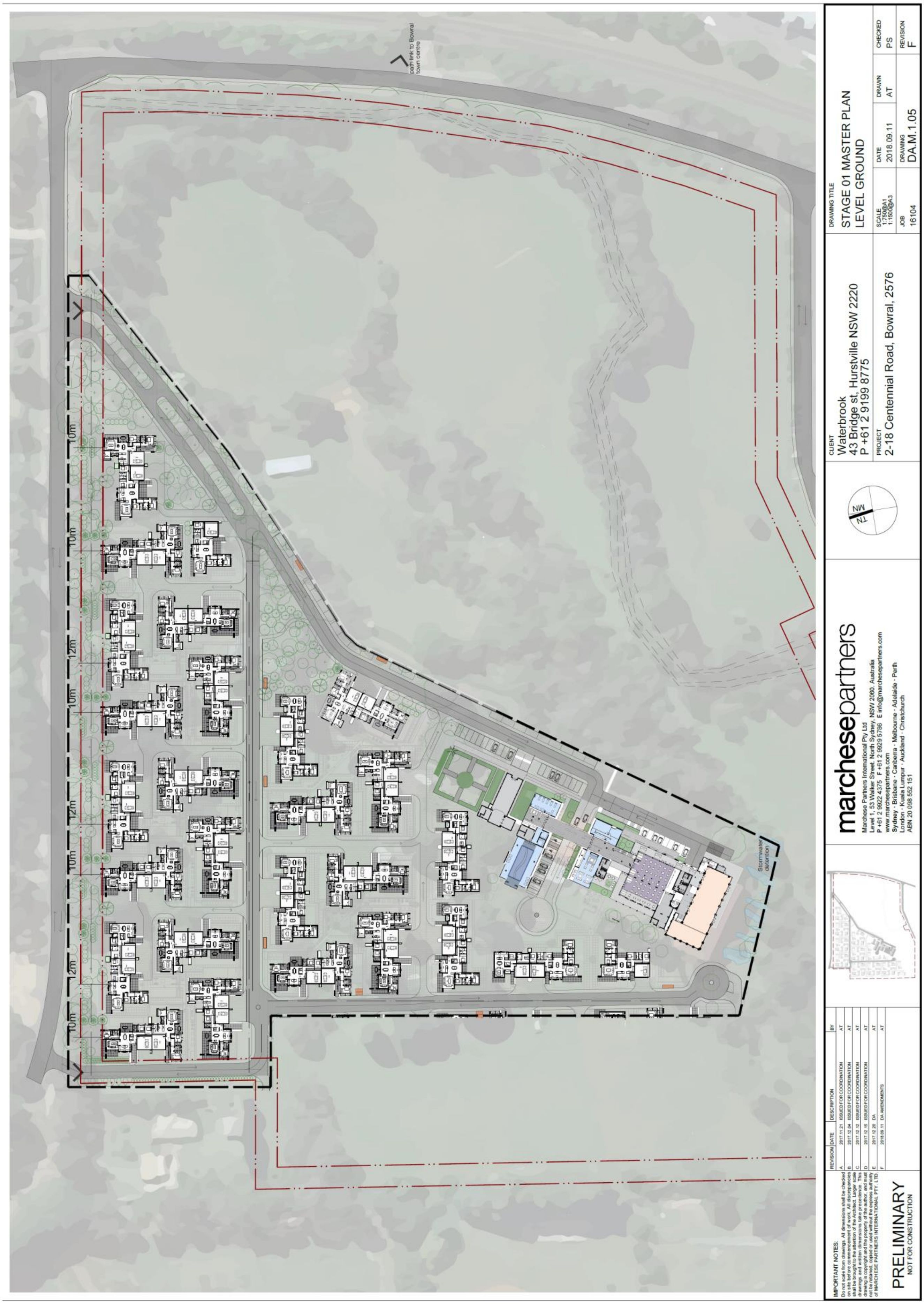
The proposed facility will provide a "golf buggy" chauffeur service for residents from their villa to the central facilities (and vice versa) and as such, are not expected to generate any additional vehicle trips or parking demand.

In addition, *Waterbrook* is expected to own and operate a mini-bus service to transfer residents to/from the nearby town centre as required, thereby further reducing associated vehicle trips.

On a typical day there are expected to be up to 9 staff on site at any given time, comprising a manager, administration staff, cleaners, kitchen hands and grounds keeping staff.

Plans of the proposed amended development have been prepared by *Marchese Partners International Pty Ltd* and are reproduced in the following pages.

100 years +500mm
100 years flood limits
outer riparian zone
EEC - TREE PROTECTION
EEC - TREE PROTECTION
PRELIMINARY
NOT FOR CONSTRUCTION
marchesepartners
CLIENT
Waterbrook
43 Bridge st, Hurstville NSW 2220
P +61 2 9199 8775
PROJECT
2-18 Centennial Road, Bowral, 2576
DRAWING TITLE
MASTER PLAN
DRAWING
DA.M.1.01
REVISION
F


path link to Bowral town centre
Stormwater detention
DRAWING TITLE
STAGE 01 MASTER PLAN
LEVEL GROUND
CLIENT
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43 Bridge st, Hurstville NSW 2220
P +61 2 9199 8775
PROJECT
2-18 Centennial Road, Bowral, 2576
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DATE
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AT
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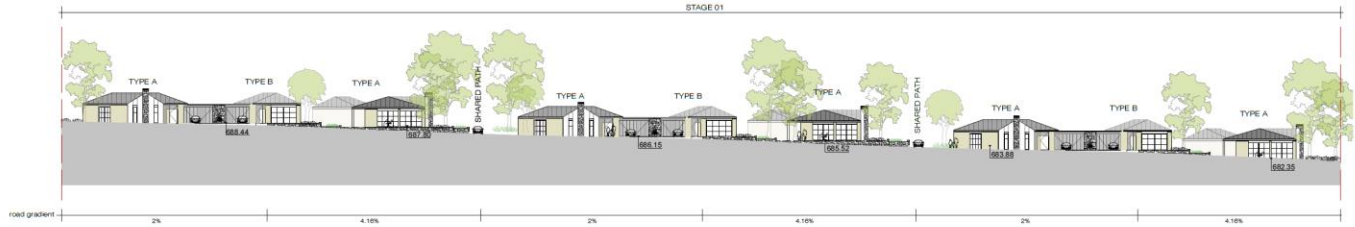

ELEVATION A - ROAD 2

ELEVATION B - ROAD 3

ELEVATION C - CENTENNIAL ROAD

IMPORTANT NOTES:
Do not scale from drawings. All dimensions shall be checked on site before commencement of work. All discrepancies shall be brought to the attention of the Architect. Larger scale drawings and written dimensions take precedence. This drawing is copyright and the property of the author, and must not be retained, copied or used without the express authority of MARCHESE PARTNERS INTERNATIONAL PTY. LTD.

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REVISION	DATE	DESCRIPTION	BY
A	2017.11.21	ISSUED FOR COORDINATION	AT
B	2017.12.04	ISSUED FOR COORDINATION	AT
C	2017.12.12	ISSUED FOR COORDINATION	AT
D	2017.12.15	ISSUED FOR COORDINATION	AT
E	2017.12.20	DA	AT
F	2018.09.11	DA AMENDMENTS	AT

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ABN 20 098 552 151

CLIENT
Waterbrook
43 Bridge st, Hurstville NSW 2220
P +61 2 9199 8775

PROJECT
2-18 Centennial Road, Bowral, 2576

DRAWING TITLE
STREET ELEVATIONS

SCALE	DATE	DRAWN	CHECKED
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JOB	DRAWING		REVISION
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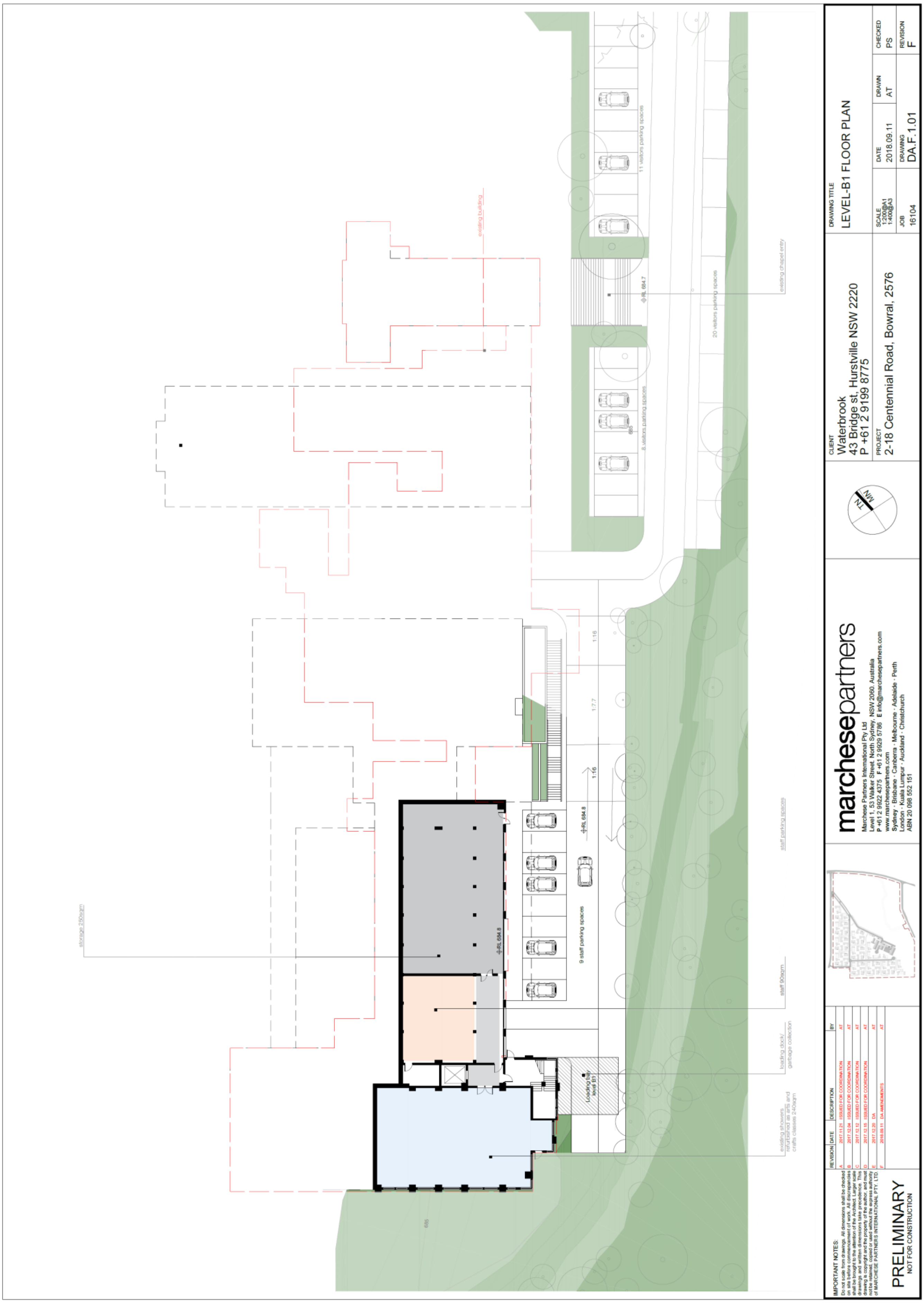
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LEVEL-B1 FLOOR PLAN
CLIENT
Waterbrook
43 Bridge st, Hurstville NSW 2220
P +61 2 9199 8775
PROJECT
2-18 Centennial Road, Bowral, 2576
DATE
2018.09.11
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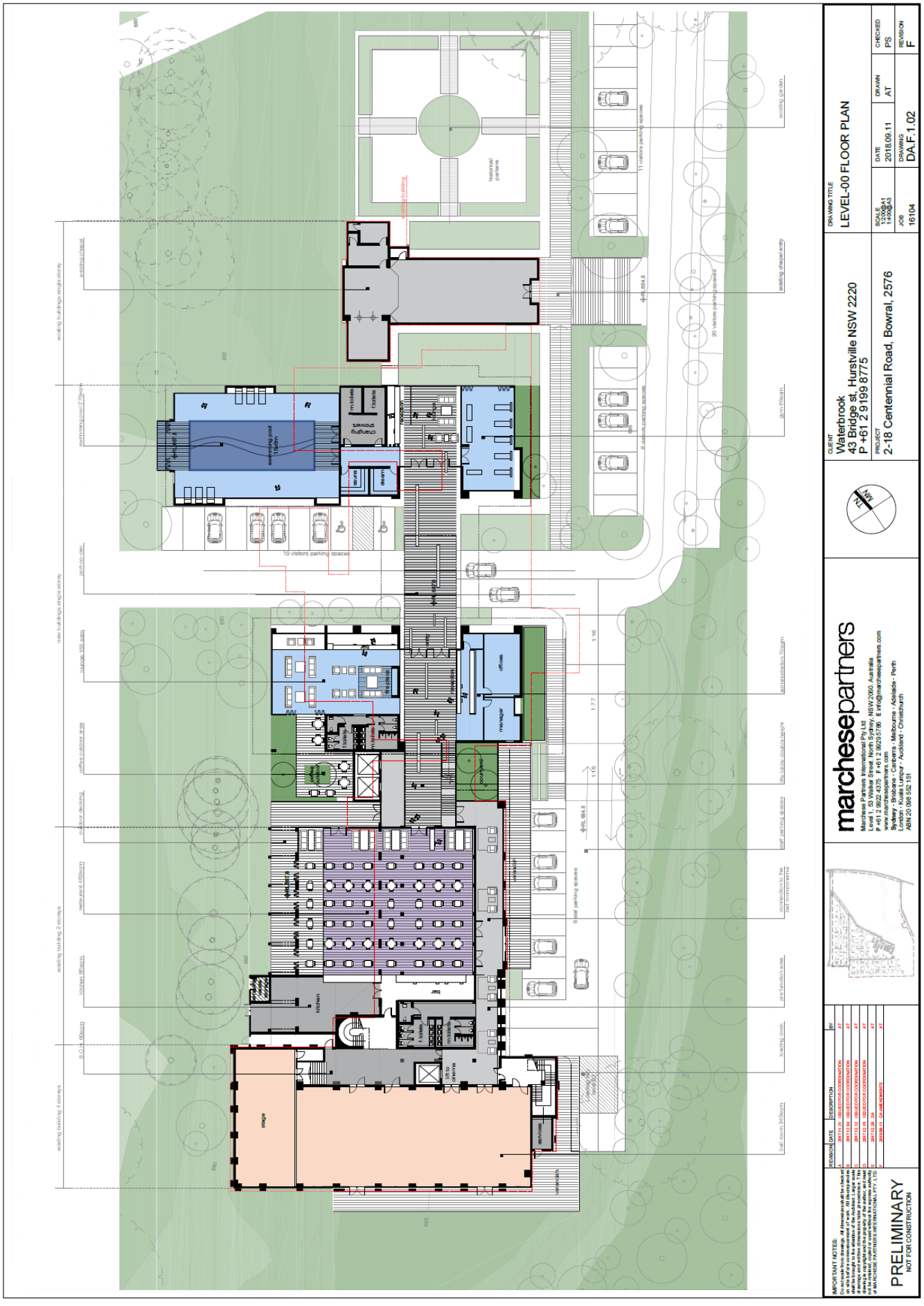
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P +61 2 9199 8775
PROJECT
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REVISION
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PRELIMINARY
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SECTION AA

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C	2017.12.12	ISSUED FOR COORDINATION	AT
D	2017.12.15	ISSUED FOR COORDINATION	AT
E	2017.12.20	DA	AT
F	2018.09.11	DA AMENDMENTS	AT

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CLIENT
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PROJECT
2-18 Centennial Road, Bowral, 2576

DRAWING TITLE
SECTION AA

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JOB	DRAWING		REVISION
16104	DA.F.2.01		F

3. TRAFFIC ASSESSMENT

Road Hierarchy

The road hierarchy allocated to the road network in the vicinity of the site by the Roads and Maritime Services is illustrated on Figure 3.

Moss Vale Road, Bong Bong Street and Mittagong Road are classified by the RMS as *Regional Roads* which provide the key north-south road link through the local Bowral area. They typically carry a single-traffic lane in each direction, with additional lanes/turning bays provided at key locations.

Kirkham Road is a local, unclassified road which performs the function of a north-south *collector route* through the area. It typically carries one traffic lane in each direction with kerbside parking generally permitted.

Centennial Road is a local, unclassified road which performs the function of a *collector route* through the area, linking the Old Hume Highway to Kirkham Road. It typically carries one traffic lane in each direction with gravel shoulders.

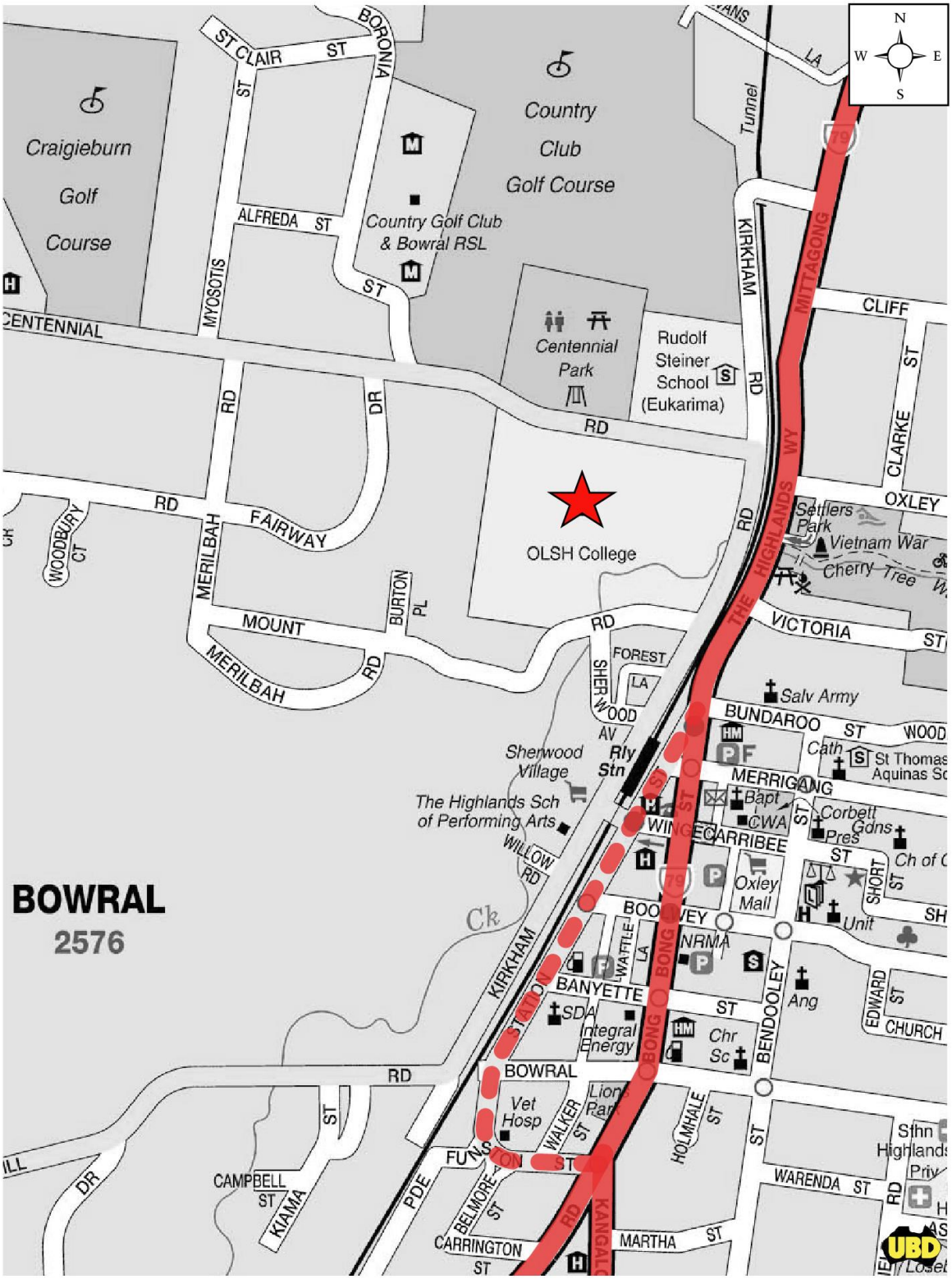
Mount Road is a local, unclassified road which is primarily used to provide vehicular and pedestrian access to frontage properties. Kerbside parking is permitted in selected locations, subject to sign posted restrictions and physical shoulder widths.

Existing Traffic Controls

The existing traffic controls which apply to the road network in the vicinity of the site are illustrated on Figure 4. Key features of those traffic controls are:

- a 50 km/h SPEED LIMIT which applies to Centennial Road, Kirkham Road, Mount Road and all other local roads in the surrounding area

- a 40 km/h SCHOOL ZONE SPEED LIMIT which applies to Centennial Road and Kirkham Road in the vicinity of Aurora Southern Highlands Steiner School



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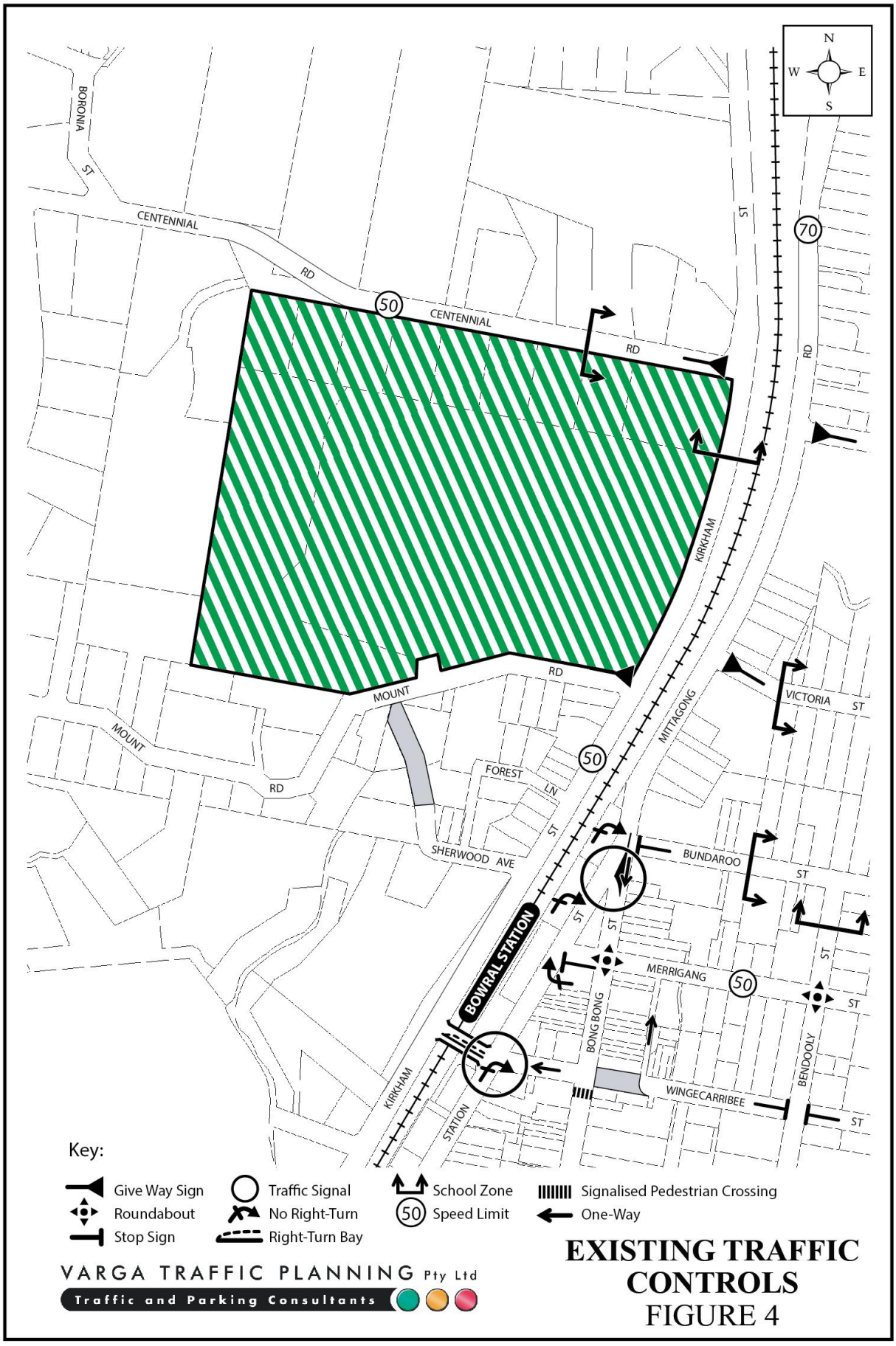
ROAD HIERARCHY
FIGURE 3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MITTAGONG
VICTORIA ST
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FOREST LN
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SHERWOOD AVE
BUNDAROO ST
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BOWRAL STATION
MERRIGANG
50
ST
ST
BONG BONG
BENDOOLY
KIRKHAM
STATION
WINGECARRIBEE ST
Key:
Give Way Sign
Roundabout
Stop Sign
Traffic Signal
No Right-Turn
Right-Turn Bay
School Zone
50 Speed Limit
Signalised Pedestrian Crossing
One-Way
VARGA TRAFFIC PLANNING Pty Ltd
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EXISTING TRAFFIC CONTROLS
FIGURE 4

- GIVE WAY restrictions in Centennial Road and Mount Road where they intersect with Kirkham Road.

It is understood Council are proposing to upgrade Kirkham Road, including constructing a new roundabout at the Centennial Road intersection. It is pertinent to note that the existing sign-controlled Kirkham Road and Centennial Road intersection operates at a *Level of Service "A"* under both the existing and "with development" scenarios – i.e. the proposed new roundabout is *not* required as a result of traffic generated by the proposed development – as detailed in the following sections of this chapter.

Existing Public Transport Services

The closest bus stops to the site are located along both sides of Mittagong Road, directly outside the Bowral Swimming Centre, which are serviced by bus routes 806, 811, and 828.

Bowral Railway Station is also located approximately 350m walking distance south of the site along Kirkham Road. Bowral Railway Station is situated on the SHL Southern Highland Line, with services operating every 60 minutes Monday to Sunday, including public holidays.

The site is also located within close proximity to Bowral Town Centre where there is an extensive range of shops (including major supermarkets), restaurants, gymnasium, cafes and services such as banks, churches, police station and the post office.

It is understood that a new 1.2m wide footpath is to be constructed along the Kirkham Road and Mount Road site frontages, as well as a new pedestrian refuge island in Kirkham Road, that will provide residents and the public easier access to the existing footpath network at the railway bridge underpass at Mittagong Creek.

In addition, new bus bays are to be constructed on Centennial Road, in between Kirkham Road and the main site access driveway. It is understood that there are no bus services which currently operate along Centennial Road at present however this may change in the future, subject to demand and a review by the local us company.

The site is therefore considered to be well served by public transport and essential services.

The new infrastructure upgrades will likely be undertaken in stages and co-ordinated with Council at the appropriate time. Design details of the proposed footpath, pedestrian refuge island and bus bays are provided in the civil package accompanying the development application.

Existing Traffic Conditions

An indication of the existing traffic conditions on the road network in the vicinity of the site is provided by peak period traffic surveys undertaken as part of this traffic study.

The traffic surveys were undertaken at the Kirkham Road and Centennial Road intersection on Monday 27th November 2017 and are reproduced in full in Appendix A, revealing that:

- two-way traffic flows in Kirkham Road, south of Centennial Road, are typically in the order of 300 vehicles per hour (vph) during weekday peak periods

- two-way traffic flows in Centennial Road and Kirkham Road, north of Centennial Road, are lower, typically in the order of 200 vph weekday during peak periods.

Projected Traffic Generation

The traffic implications of development proposals primarily concern the effects of the *additional* traffic flows generated as a result of a development and its impact on the operational performance of the adjacent road network during the morning and afternoon weekday network peak periods.

An indication of the traffic generation potential of the amended development proposal is provided by reference to the Roads and Maritime Services publication *Guide to Traffic Generating Developments, Section 3 - Landuse Traffic Generation (October 2002)* and the updated traffic generation rates in the RMS's *Technical Direction* (TDT 2013/04a) document.

The RMS *Technical Direction* is based on extensive surveys of a wide range of land uses and nominates the following traffic generation rate which is applicable to the amended development proposal:

Housing for Seniors (Regional Average)
0.22 peak hour vehicle trips per dwelling

Notwithstanding the above, one of the regional survey sites within the TDT 2013/04a was a seniors living development located in Bowral. The traffic generation rate of the Bowral survey site is as follows:

Housing for Seniors (Bowral)
0.33 peak hour vehicle trips per dwelling

It should be noted that the TDT 2013/04a notes that the morning "site" peak does not coincide with the "network" peak. Notwithstanding, for the purposes of providing a more rigorous assessment, it has been assumed that the AM peak is the same as the PM peak.

Furthermore, the above traffic generation rates *include* staff movements, however for the purpose of this assessment it has also been assumed that all of the *Waterbrook* staff will drive to/from work individually, arriving during the morning "network" peak period and leaving during the afternoon "network" peak period.

As noted in the foregoing, all ancillary facilities within the development will be for the exclusive use of residents and their guests and therefore have been *excluded* from this traffic assessment.

Application of the above traffic generation rates to the various components of the amended development proposal yields a traffic generation potential of approximately 54 vph during the weekday "network" peak periods (IN and OUT combined) as set out below:

	AM	**PM**
Residential (135 villas):	45 vph	45 vph
Staff (9 staff):	9 vph	9 vph
TOTAL TRAFFIC GENERATION POTENTIAL:	**54 vph**	**54 vph**

That projected increase in the traffic generation potential of the site as a consequence of the amended development proposal is minimal and will not have any unacceptable traffic implications in terms of road network capacity, as is demonstrated by the following section of this report.

Traffic Implications - Road Network Capacity

The traffic implications of development proposals primarily concern the effects that any *additional* traffic flows may have on the operational performance of the nearby road network. Those effects can be assessed using the SIDRA program which is widely used by the RMS and many LGAs for this purpose. Criteria for evaluating the results of SIDRA analysis are reproduced in the following pages.

Given the site's location and its most direct route to the greater road network it has been assumed that $^1/_3$ of traffic will be from the west along Centennial Road via the Old Hume Highway, $^1/_3$ of traffic will from the south along Kirkham Road to the Bowral Town Centre and beyond whilst $^1/_3$ of traffic will be from the north along Kirkham Road and onto Mittagong Road.

It is also understood that there are development approvals in place for the expansion of operations at the Bowral Brickworks which may increase traffic volumes along Kirkham Road in the future. Whilst precise details of those development approvals have not been provided, for the purposes of this assessment, the "through" traffic movements along Kirkham Road have been *doubled* in order to assess any future scenario – i.e. approximately 150 *additional* heavy vehicle movements during the morning and afternoon peak periods.

The results of the SIDRA analysis of the Kirkham Road and Centennial Road intersection are summarised on Table 3.1 below, revealing that:

- the Kirkham Road and Centennial Road intersection currently operates at *Level of Service "A"* under the existing traffic demands during the AM and PM commuter peak periods, with total average vehicle delays in the order of 2-3 seconds/vehicle

- under the projected future traffic demands expected to be generated by the amended development proposal concept, the intersection will continue to operate at *Level of Service "A"* during the peak periods, with increases in average vehicle delays of ***less than*** 1 second/vehicle.

- under the projected future traffic demands expected to be generated by the amended development proposal concept *plus* potential traffic associated with the Brickworks expansion, the intersection will also continue to operate at *Level of Service "A"* during the peak periods, with no increase in average vehicle delays.

In the circumstances, it is clear that the proposed development will not have any unacceptable traffic implications in terms of road network capacity, nor is the construction of a new roundabout required as a consequence of the proposed development.

TABLE 3.1 - RESULTS OF SIDRA ANALYSIS OF KIRKHAM ROAD & CENTENNIAL ROAD

Key Indicators		Existing Traffic Demand		Projected Development Traffic Demand		Projected Development Traffic Demand with Brickworks	
		AM	**PM**	**AM**	**PM**	**AM**	**PM**
Level of Service		A	A	A	A	A	A
Degree of Saturation		0.105	0.092	0.124	0.098	0.151	0.171
Average Vehicle Delay (secs/veh)							
Kirkham Road (south)	L	3.4	3.4	3.4	3.4	3.4	3.4
	T	0.0	0.0	0.0	0.0	0.0	0.0
Kirkham Road (north)	T	0.2	0.2	0.3	0.3	0.3	0.3
	R	4.0	4.1	4.0	4.1	4.5	4.7
Centennial Road (west)	L	3.7	3.7	3.7	3.7	4.1	4.1
	R	4.4	4.3	4.4	4.4	5.6	5.5
TOTAL AVERAGE VEHICLE DELAY		**2.4**	**2.3**	**2.5**	**2.5**	**2.2**	**2.1**

Criteria for Interpreting Results of Sidra Analysis

1. Level of Service (LOS)

LOS	Traffic Signals and Roundabouts	Give Way and Stop Signs
'A'	Good operation.	Good operation.
'B'	Good with acceptable delays and spare capacity.	Acceptable delays and spare capacity.
'C'	Satisfactory.	Satisfactory but accident study required.
'D'	Operating near capacity.	Near capacity and accident study required.
'E'	At capacity; at signals incidents will cause excessive delays. Roundabouts require other control mode.	At capacity and requires other control mode.
'F'	Unsatisfactory and requires additional capacity.	Unsatisfactory and requires other control mode.

2. Average Vehicle Delay (AVD)

The AVD provides a measure of the operational performance of an intersection as indicated on the table below which relates AVD to LOS. The AVD's listed in the table should be taken as a guide only as longer delays could be tolerated in some locations (ie inner city conditions) and on some roads (ie minor side street intersecting with a major arterial route).

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way and Stop Signs
A	less than 14	Good operation.	Good operation.
B	15 to 28	Good with acceptable delays and spare capacity.	Acceptable delays and spare capacity.
C	29 to 42	Satisfactory.	Satisfactory but accident study required.
D	43 to 56	Operating near capacity.	Near capacity and accident study required.
E	57 to 70	At capacity; at signals incidents will cause excessive delays. Roundabouts require other control mode.	At capacity and requires other control mode.

3. Degree of Saturation (DS)

The DS is another measure of the operational performance of individual intersections.

For intersections controlled by traffic signals[1] both queue length and delay increase rapidly as DS approaches 1, and it is usual to attempt to keep DS to less than 0.9. Values of DS in the order of 0.7 generally represent satisfactory intersection operation. When DS exceeds 0.9 queues can be anticipated.

For intersections controlled by a roundabout or GIVE WAY or STOP signs, satisfactory intersection operation is indicated by a DS of 0.8 or less.

1 *The values of DS for intersections under traffic signal control are only valid for cycle length of 120 secs.*

4. PARKING IMPLICATIONS

Existing Kerbside Parking Restrictions

Given the rural nature of Kirkham Road, Centennial Road, Mount Road and the surrounding area, there are generally no kerbside parking restrictions which apply in the vicinity of the site, including along the site frontage.

Off-Street Parking Provisions

The off-street parking requirements applicable to the residential component of the development proposal are specified in the *SEPP (Housing for Seniors or People with a Disability) 2004* document and are reproduced below:

> **Division 4 Self-Contained Dwellings**
>
> **50 Standards that cannot be used to refuse development consent for self-contained dwellings**
>
> A consent authority must not refuse consent to a development application made pursuant to this Chapter for the carrying out of development for the purpose of a self-contained dwelling (including in-fill self-care housing and serviced self-care housing) on any of the following grounds:
>
> (h) **parking:** if at least the following is provided:
>
> (i) 0.5 car spaces for each bedroom where the development application is made by a person other than a social housing provider, or
>
> (ii) 1 car space for each 5 dwellings where the development application is made by, or is made by a person jointly with, a social housing provider.

It should be noted that the *SEPP* does not nominate an off-street parking rate for visitors or staff. For the purposes of this assessment, a rate of *1 space per 5 dwellings* has been applied which is typical for regular medium and high density residential developments. Furthermore, a staff parking rate of *1 space per staff member* has also been applied.

As noted in the foregoing, all ancillary facilities within the development will be for the exclusive use of residents and their guests and therefore have been *excluded* from this parking assessment.

Application of the above car parking requirements to the various components of the amended development proposal yields an off-street car parking requirement of 200 spaces as set out below:

	Required	**Provided**
Residential (135 villas):	164 spaces	270 spaces
Visitor:	27 spaces	49 spaces
Staff (9 staff):	9 spaces	9 spaces
TOTAL:	**200 spaces**	**328 spaces**

As noted above, the proposed development makes provision for 270 residential spaces (i.e. 2 spaces per villa), 49 visitor spaces and 9 staff spaces, thereby *comfortably* satisfying the above requirements.

It should be noted that many of the villas only require a single parking space (using the *SEPP* parking rates) however all villas are provided with two spaces, such that their guests my park in their friend's garage. Furthermore, many of the villas are configured in such a way that parking for guests can also be provided directly outside their villa.

The geometric design layout of the car parking facilities have been designed to comply with the relevant requirements specified in the Standards Australia publication *Parking Facilities Part 1 - Off-Street Car Parking AS2890.1* and *Parking Facilities Part 6 Off-Street Parking for People with Disabilities AS2890.6 - 2009* in respect of internal roadway widths, parking bay dimensions, garage dimensions, ramp gradients and aisle widths.

Internal Road Layout

The main circulation roadways will have a minimum pavement width of approximately 6m wide with the exception of the main boulevarde which will have two separate 4m wide roadways. Access roads which serve the various "clusters" of villas will have a pavement

width of between 3m-4m, widening to a minimum of 6m outside the respective double garages.

The main circulation road has been designed to accommodate the swept turning path requirements of the largest vehicle to service the site which is expected to be a standard medium rigid truck, allowing them to enter and exit the site in a forward direction at all times.

Site Access Driveway

As noted in the foregoing, the primary access driveway of Centennial Road is to be configured with a Rural Basic Right Turn (BAR) turning treatment on a two-way rural road as shown on the Austroads extract below (Figure 7.5 from the *Guide to Road Design Part 4A: Unsignalised and Signalised Intersections).*

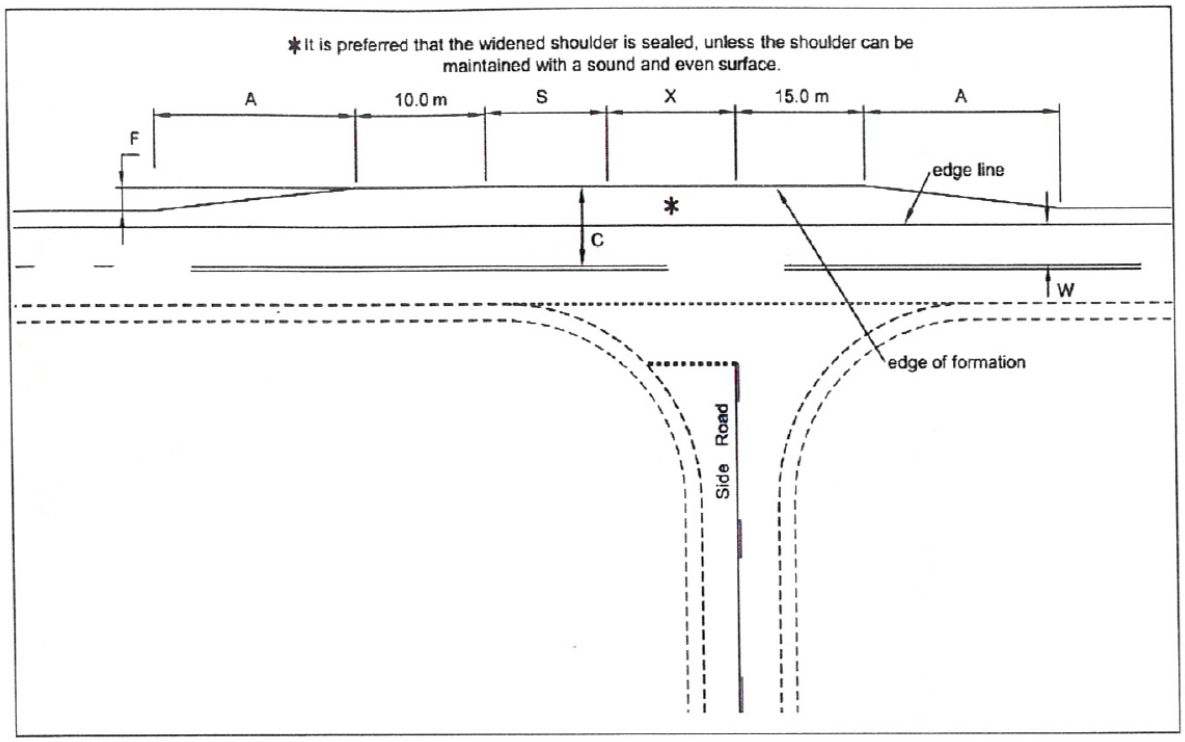
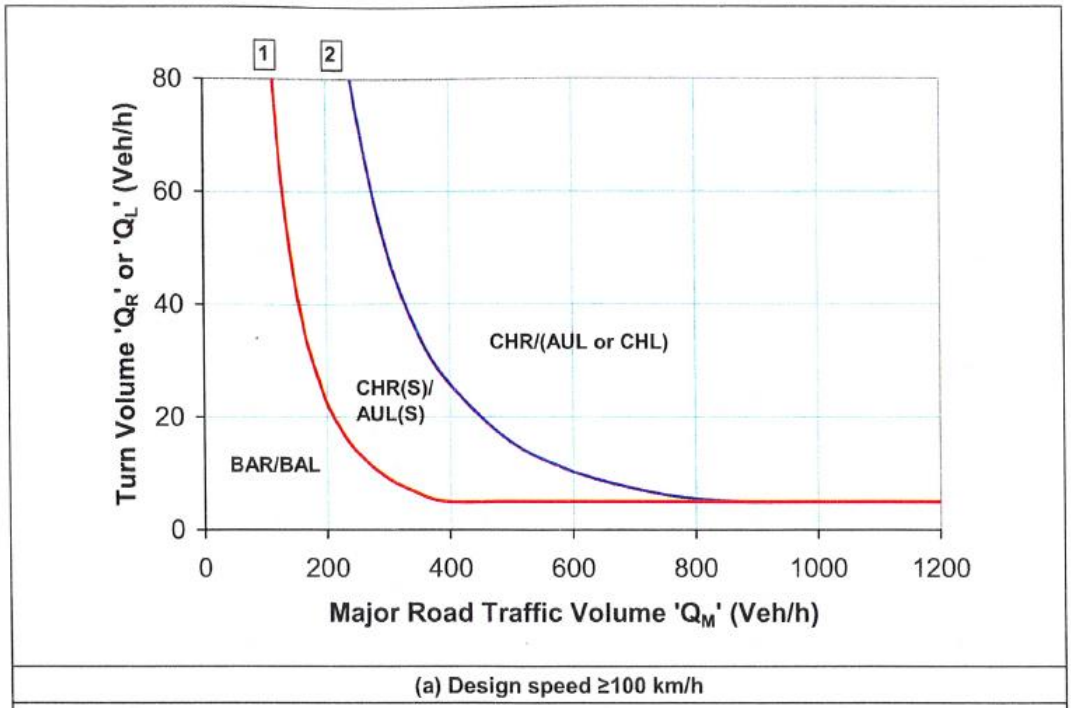


Figure 7.5: Basic right (BAR) turn treatment on a two-lane rural road

In order to determine whether the proposed main access driveway with BAR turning treatments is sufficient to accommodate the proposed turning movements, reference is made

to Figure 4.9(a) of the Austroads publication, *Guide to Road Design Part 4A: Unsignalised and Signalised Intersections*.



As noted in the foregoing, eastbound traffic volumes along Centennial Road in the vicinity of the site are typically in the order of 124 vph during the *morning* peak period and approximately 101 vph during the *afternoon* peak period. Westbound traffic volumes along Centennial Road in the vicinity of the site are typically in the order of 97 vph during the *morning* peak period and approximately 109 vph during the *afternoon* peak period.

When the above parameters are considered in the context of Figure 4.9(a), the proposed BAR turning treatment at the main site access driveway will be sufficient to accommodate the proposed turn movements into the site as a consequence of the development.

Driver Sight Distance/Visibility

The driver site distance/visibility requirements at site access driveways are specified in *Figure 3.2 Site Distance Requirements at Access Driveways* of *AS2890.1 - 2004* published by *Standards Australia* and also in *Chapter 3.4 Site Distance at Property Entrances* (*Austroads 2009).*

The driver sight distance/visibility requirements in both publications are based on a minimum gap sight distance of 5 seconds.

The relevant extract from *AS2890.1 – 2004* is reproduced below:

FIGURE 3.2 SIGHT DISTANCE REQUIREMENTS AT ACCESS DRIVEWAYS

Frontage road speed (Note 4) Km/h	**Distance (Y) along frontage road m**	
	Access driveways other than domestic (Note 5)	
	Desirable 5 s gap	**Minimum SSD**
40	55	35
50	69	45
60	83	65
70	97	85
80	111	105
90	125	130
100	139	160
110	153	190

The *Standards Australia* and *Austroads* publications both specify a desirable driver sight distance/visibility of 69m for a frontage road speed of 50 km/h.

The primary site access driveway in Centennial Road achieves a driver sight distance/visibility *in excess* of 300m to the west and approximately 100m to the east back to the Kirkham Road intersection. Furthermore, the secondary site access driveway in Centennial Road achieves a driver sight distance/visibility of approximately 150m to the west and *in excess* of 300m to the east.

Accordingly, the driver sight distance/visibility available at the two proposed access driveways *satisfies* Standards Australia and *Austroads* requirements.

Loading/Servicing Provisions

Loading/servicing for the proposed development is expected to be undertaken by a variety of commercial vehicles including the occasional mini-bus (for day trips), small rigid trucks (for

deliveries) and medium rigid trucks (for garbage collection). Vehicular access for service vehicles is to be provided via the abovementioned site access driveways off Centennial Road.

Conclusion

In summary, the foregoing assessment has found that:

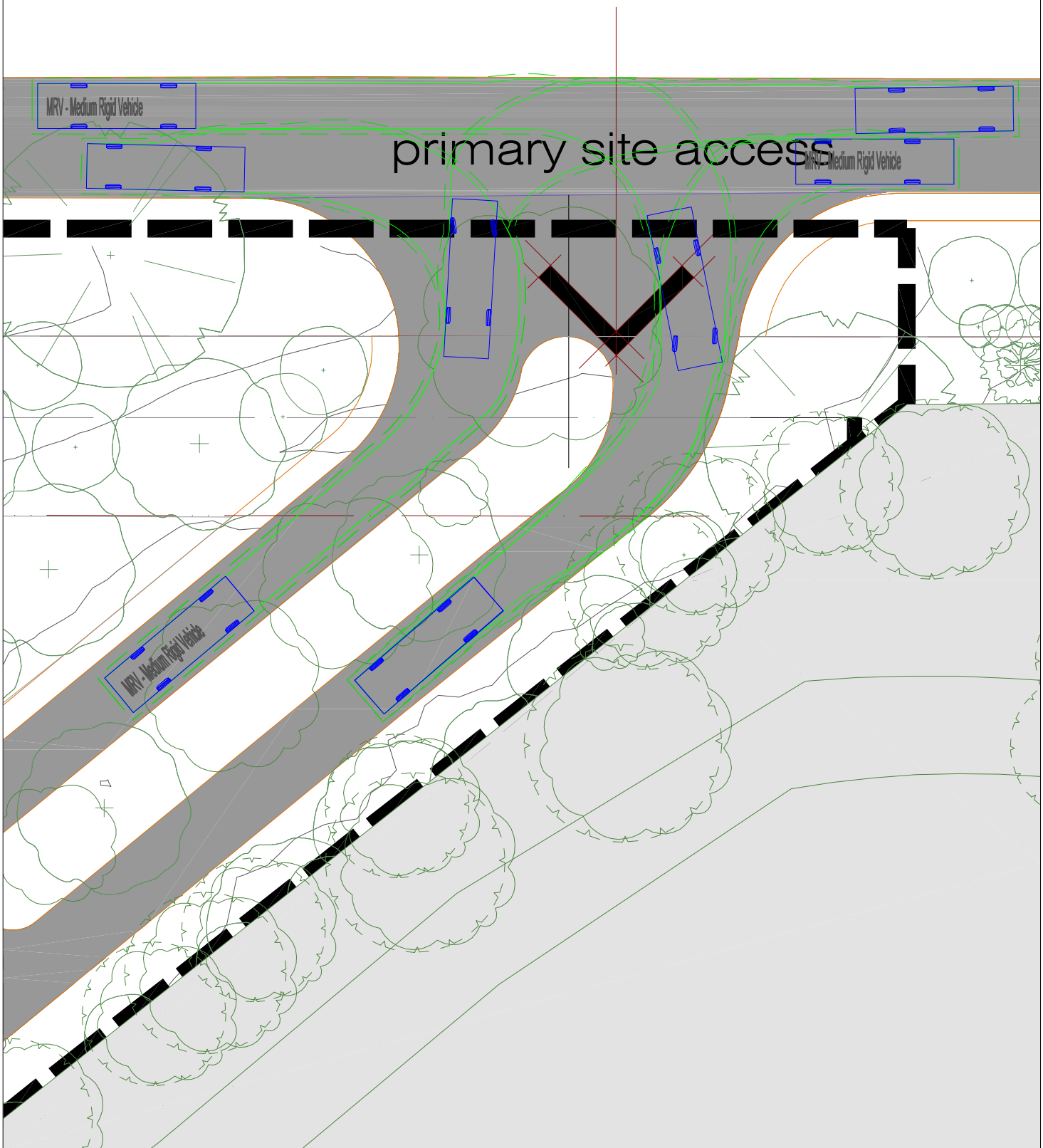
- the projected additional traffic flows associated with the proposed seniors living development will not result in any appreciable increases in delays, nor will any road upgrades/improvements/widening be required, other than the proposed BAR turning treatment at the main site access driveway

- all parking requirements associated with the proposed development will be accommodated *within* the site.

- the servicing requirements of the proposed development can also be accommodated *within* the site

- all vehicles can enter and exit the site in a forward direction

In summary, the proposed parking, loading and access arrangements satisfy the relevant requirements specified in the *SEPP*, Council's *DCP 2010*, *Austroads* as well as the Australian Standards and it is therefore concluded that the proposed development will not have any unacceptable traffic, parking, access or servicing implications.



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www.vargatraffic.com.au
Sydney, Australia

PROJECT
RESIDENTIAL DEVELOPMENT

N

DRAWING TITLE
8.8M MRV TRUCK TURNING PATH
Entering / Exiting Eastern Driveway

1:300 @ A4

ADDRESS
2-18 Centennial Road, Bowral

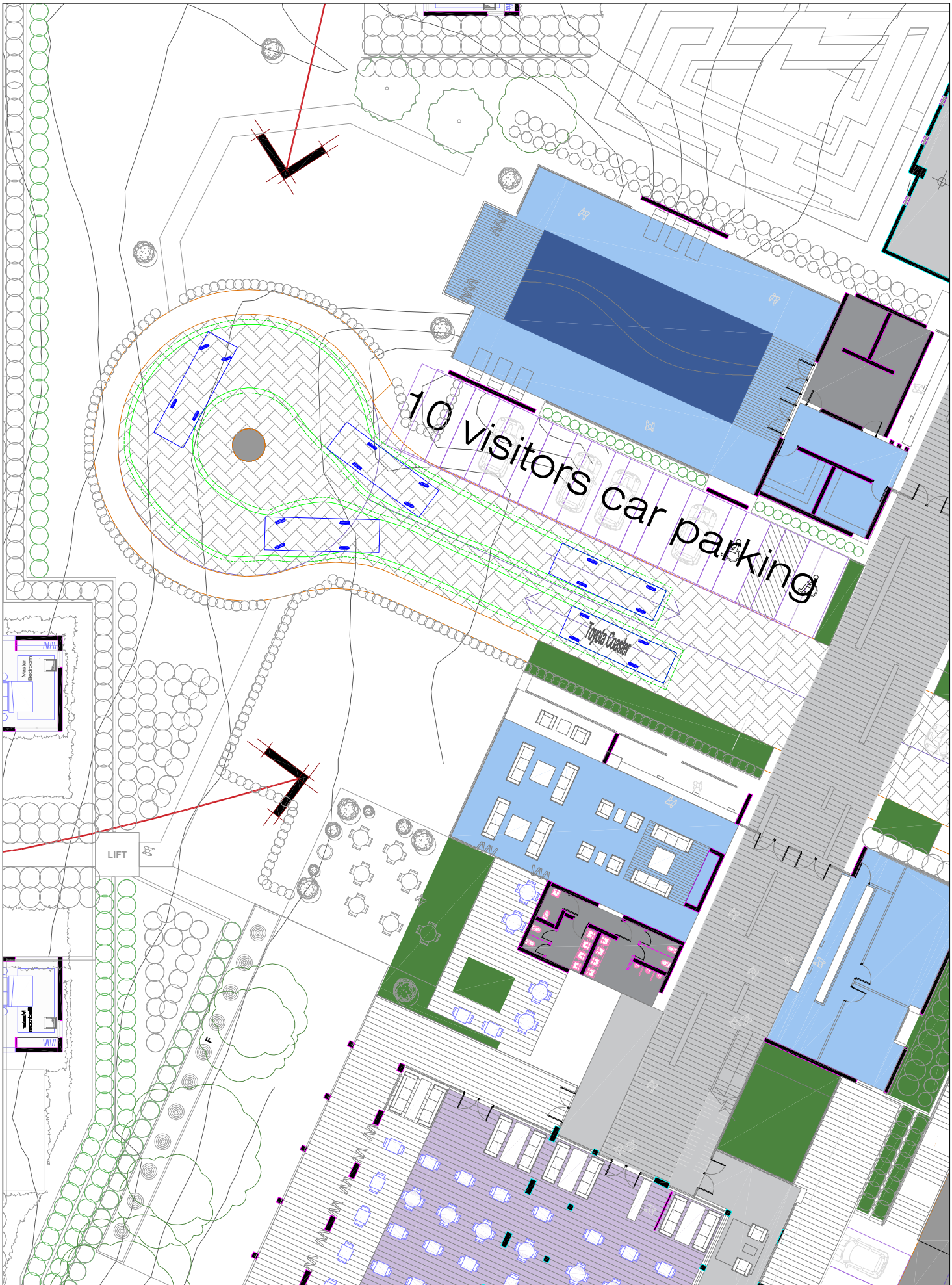
PROJECT NO.
17788

DATE DRAWN
2018-9-20

REVIEWED
CHRIS PALMER

PREPARED
DONALD LEE

VARGA TRAFFIC PLANNING Pty Ltd
Transport, Traffic and Parking Consultants



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Sydney, Australia

PROJECT
RESIDENTIAL DEVELOPMENT

N

DRAWING TITLE
7.0M TOYOTA COASTER TURNING PATH
U-Turning out of Community Facility Area

1:300 @ A4

ADDRESS
2-18 Centennial Road, Bowral

PROJECT NO.
17788

DATE DRAWN
2018-9-20

REVIEWED
CHRIS PALMER

PREPARED
DONALD LEE

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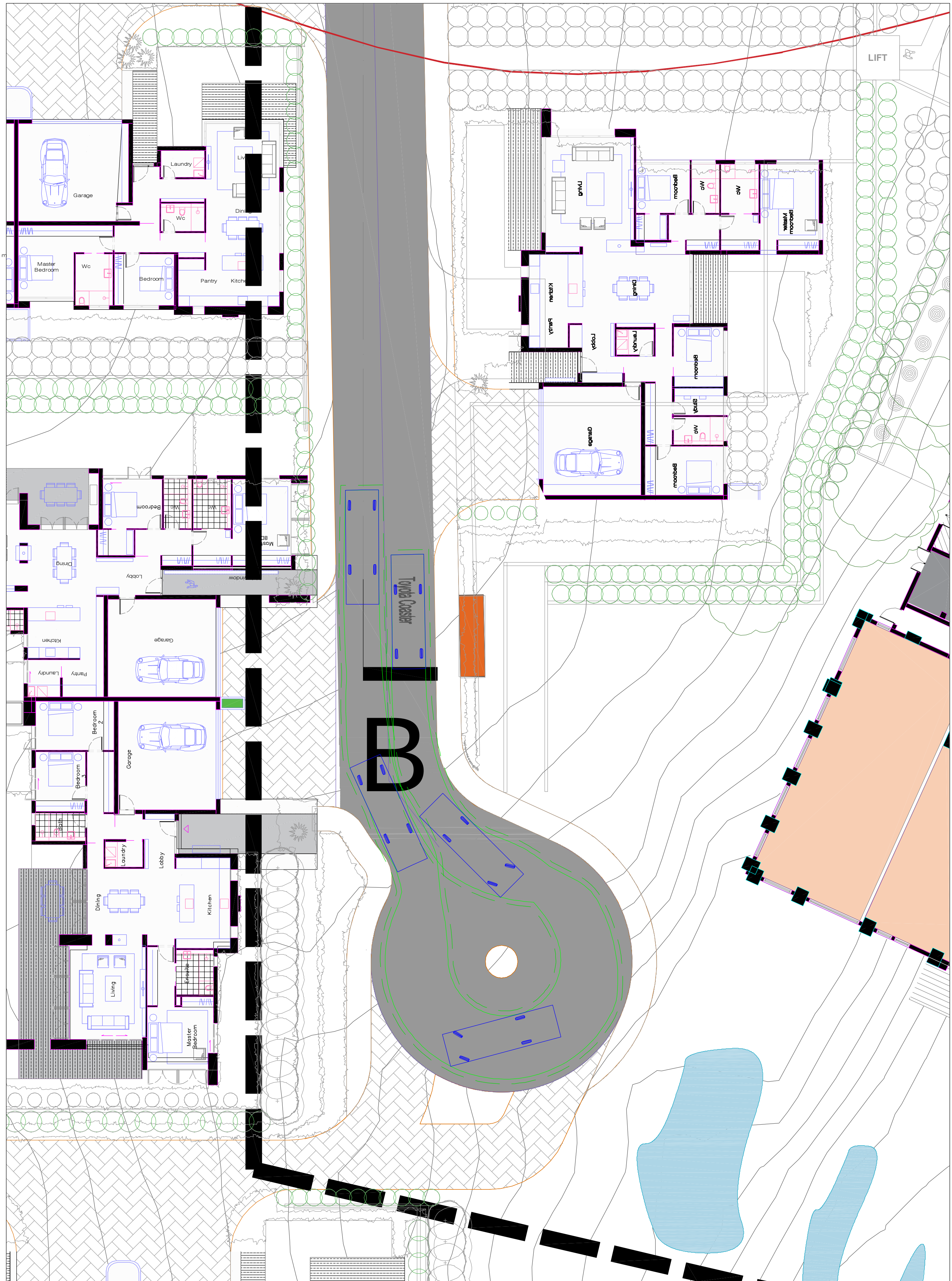

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PROJECT

RESIDENTIAL DEVELOPMENT

N

DRAWING TITLE

7.0M TOYOTA COASTER TURNING PATH
U-Turning out of Site (South-western Corner)

1:300 @ A4

ADDRESS

2-18 Centennial Road, Bowral

PROJECT NO.
17788

DATE DRAWN
2018-9-20

REVIEWED
CHRIS PALMER

PREPARED
DONALD LEE

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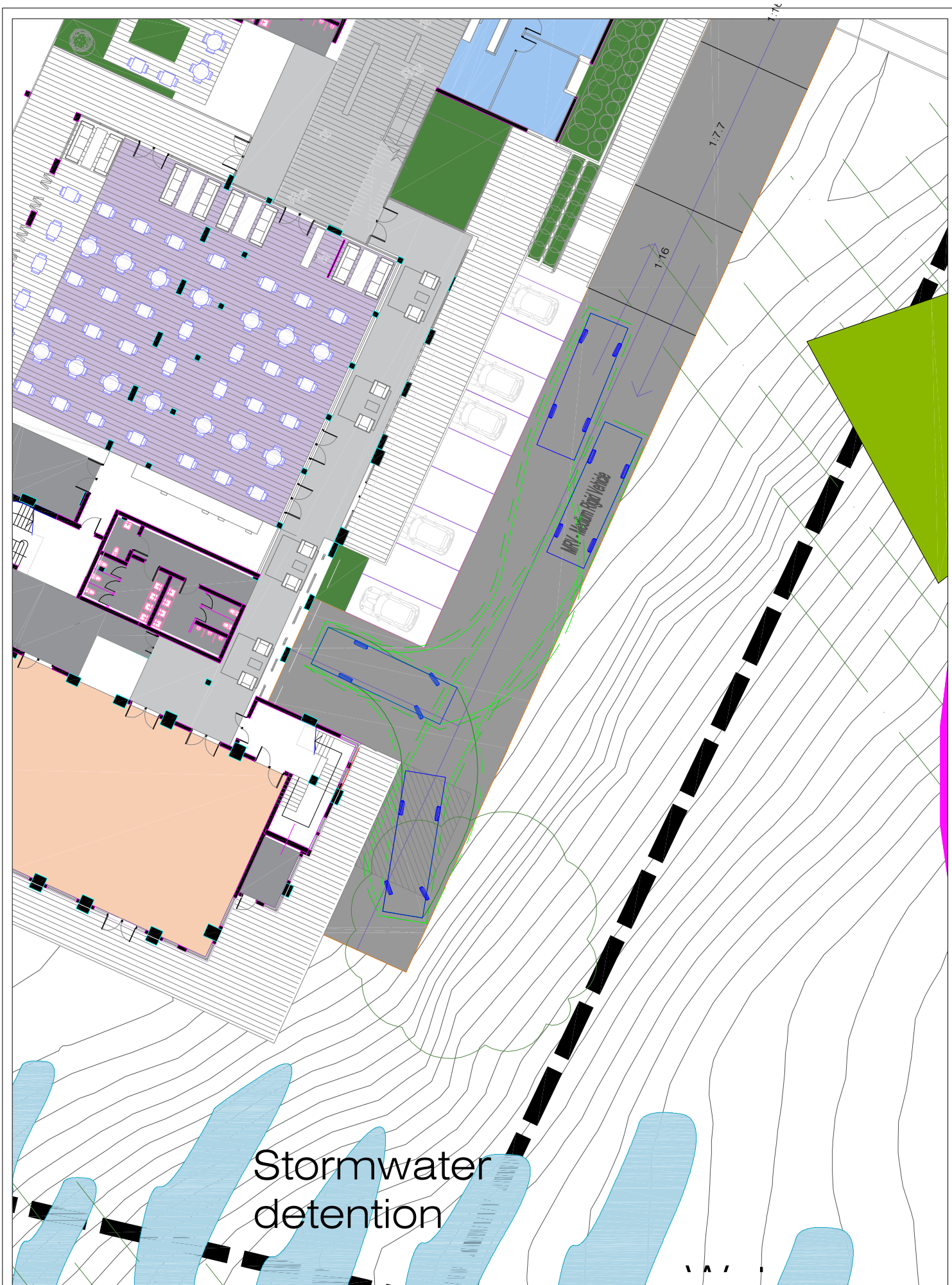

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Sydney, Australia

PROJECT
RESIDENTIAL DEVELOPMENT

N

DRAWING TITLE
8.8M MRV TRUCK TURNING PATH
U-Turning Out of Site

1:300 @ A4

ADDRESS
2-18 Centennial Road, Bowral

PROJECT NO.
17788

DATE DRAWN
2018-9-20

REVIEWED
CHRIS PALMER

PREPARED
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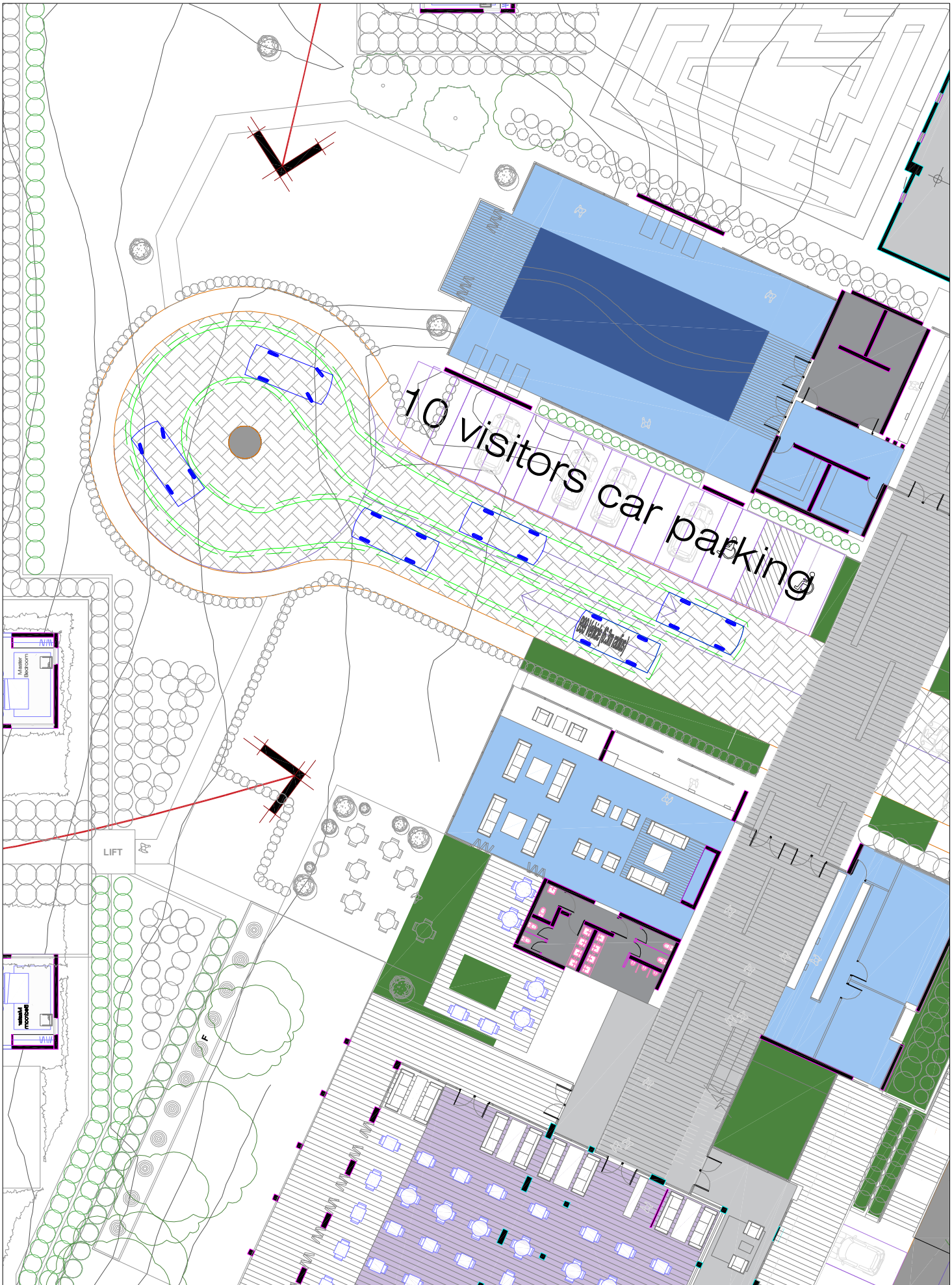

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Sydney, Australia

PROJECT
RESIDENTIAL DEVELOPMENT

N

DRAWING TITLE
B99 VEHICLE TURNING PATH
U-Turning out of Community Facility Area

1:300 @ A4

ADDRESS
2-18 Centennial Road, Bowral

PROJECT NO.
17788

DATE DRAWN
2018-9-20

REVIEWED
CHRIS PALMER

PREPARED
DONALD LEE

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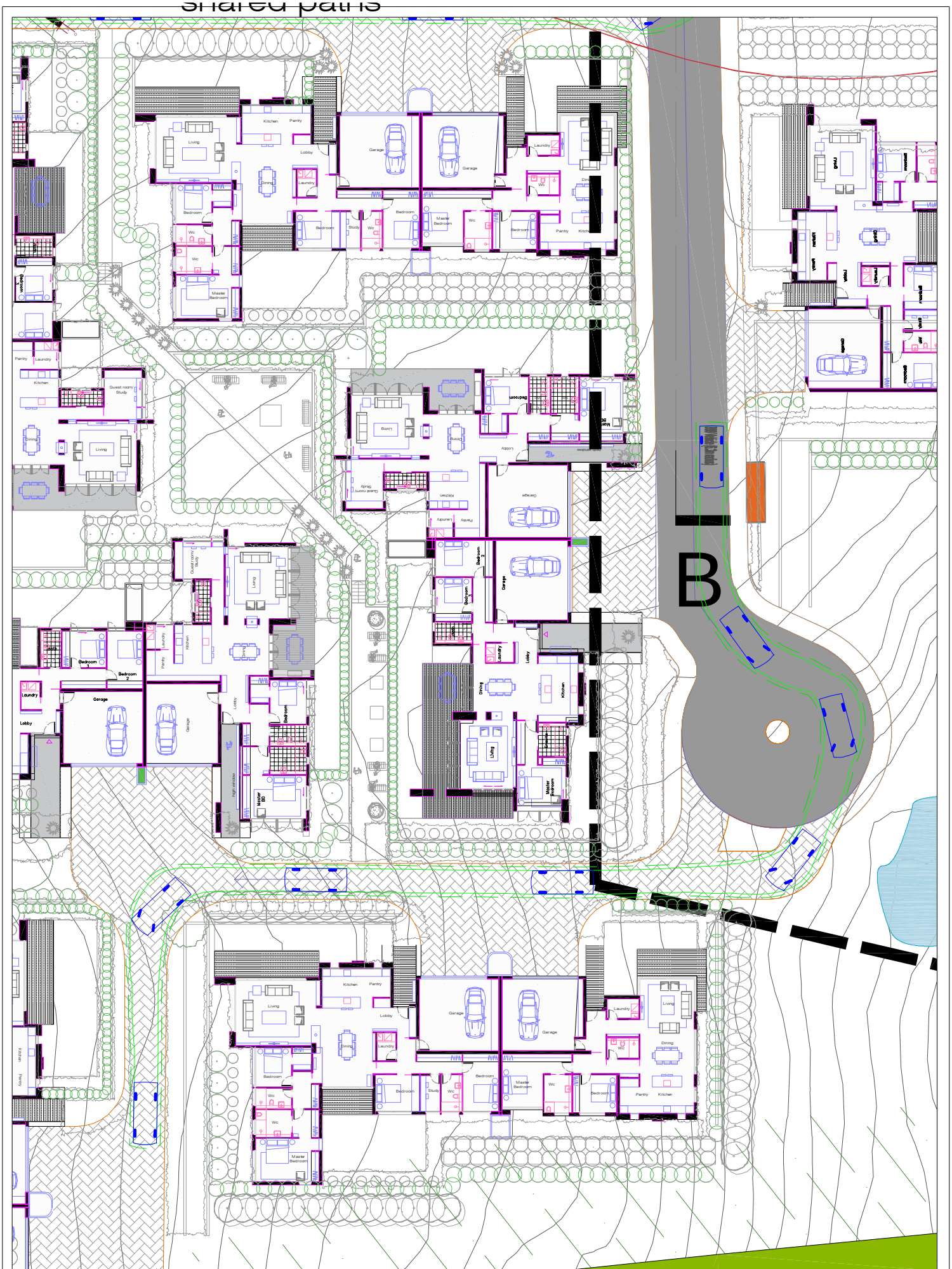

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Sydney, Australia

PROJECT
RESIDENTIAL DEVELOPMENT

N

DRAWING TITLE
B99 VEHICLE TURNING PATH
Entering South-Western Corner Area

1:400 @ A4

ADDRESS
2-18 Centennial Road, Bowral

PROJECT NO.
17788

DATE DRAWN
2018-9-20

REVIEWED
CHRIS PALMER

PREPARED
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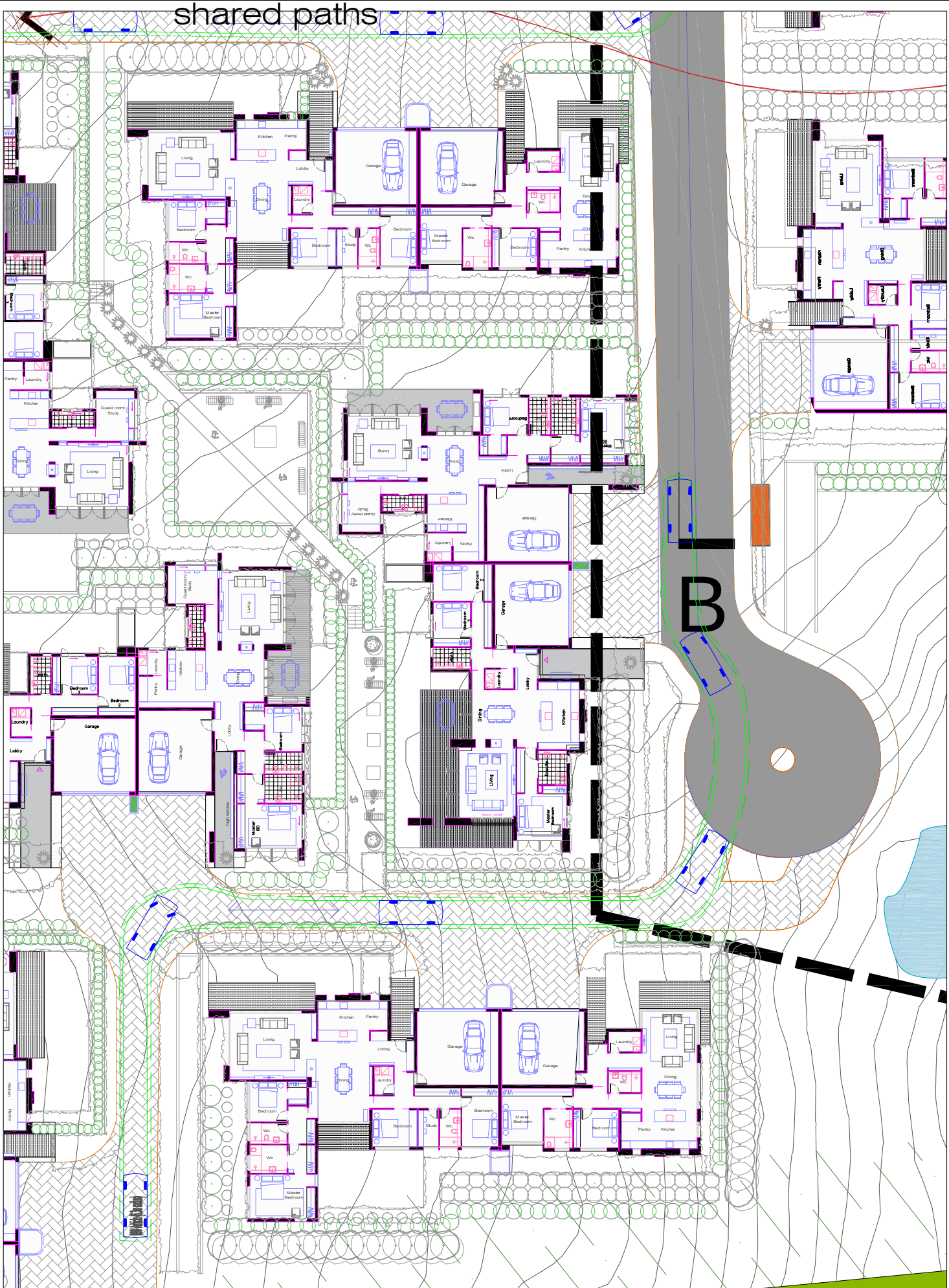

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PROJECT
RESIDENTIAL DEVELOPMENT

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DRAWING TITLE
B99 VEHICLE TURNING PATH
Exiting South-Western Corner

1:400 @ A4

ADDRESS
2-18 Centennial Road, Bowral

PROJECT NO.
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DATE DRAWN
2018-9-20

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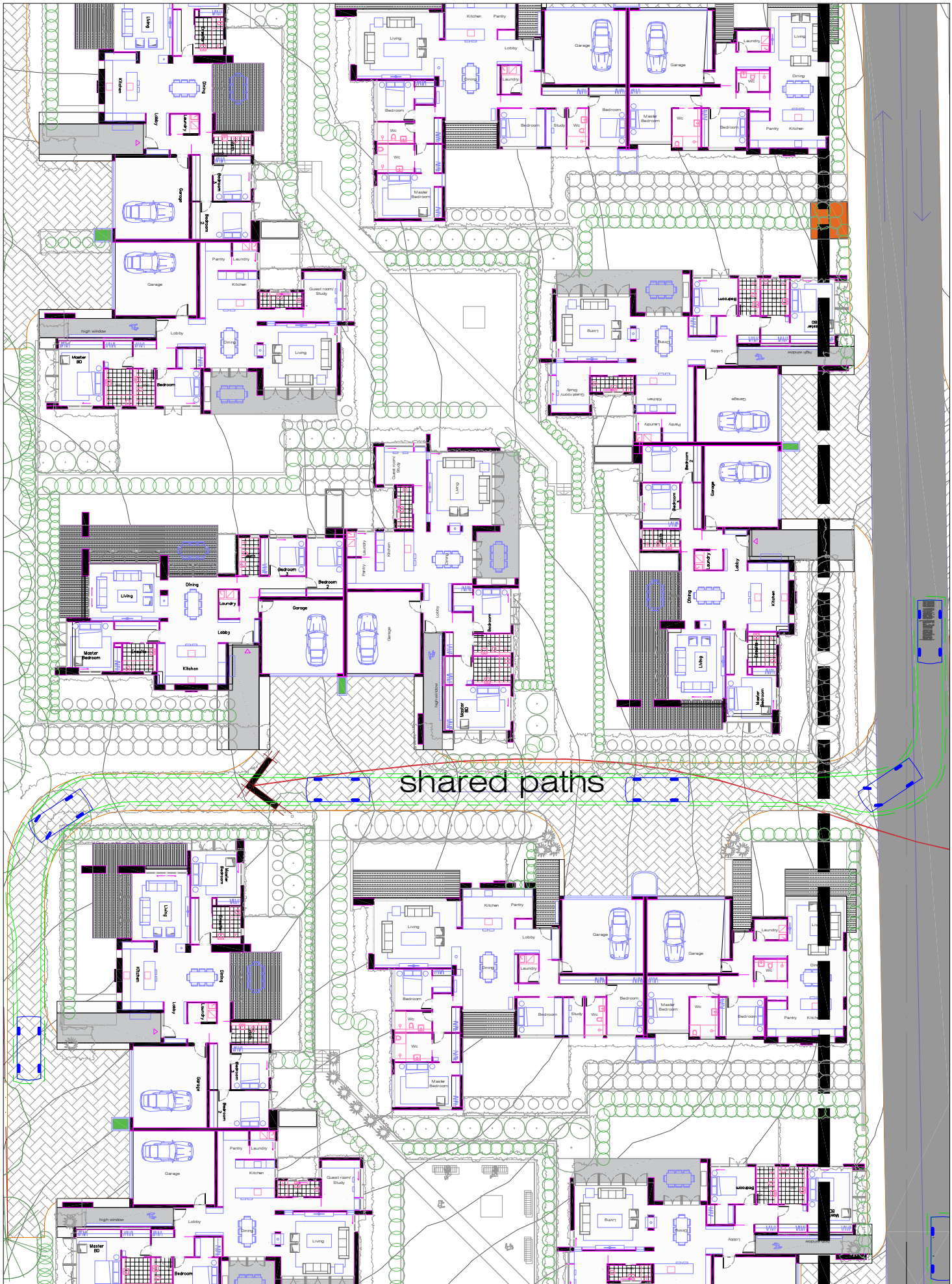

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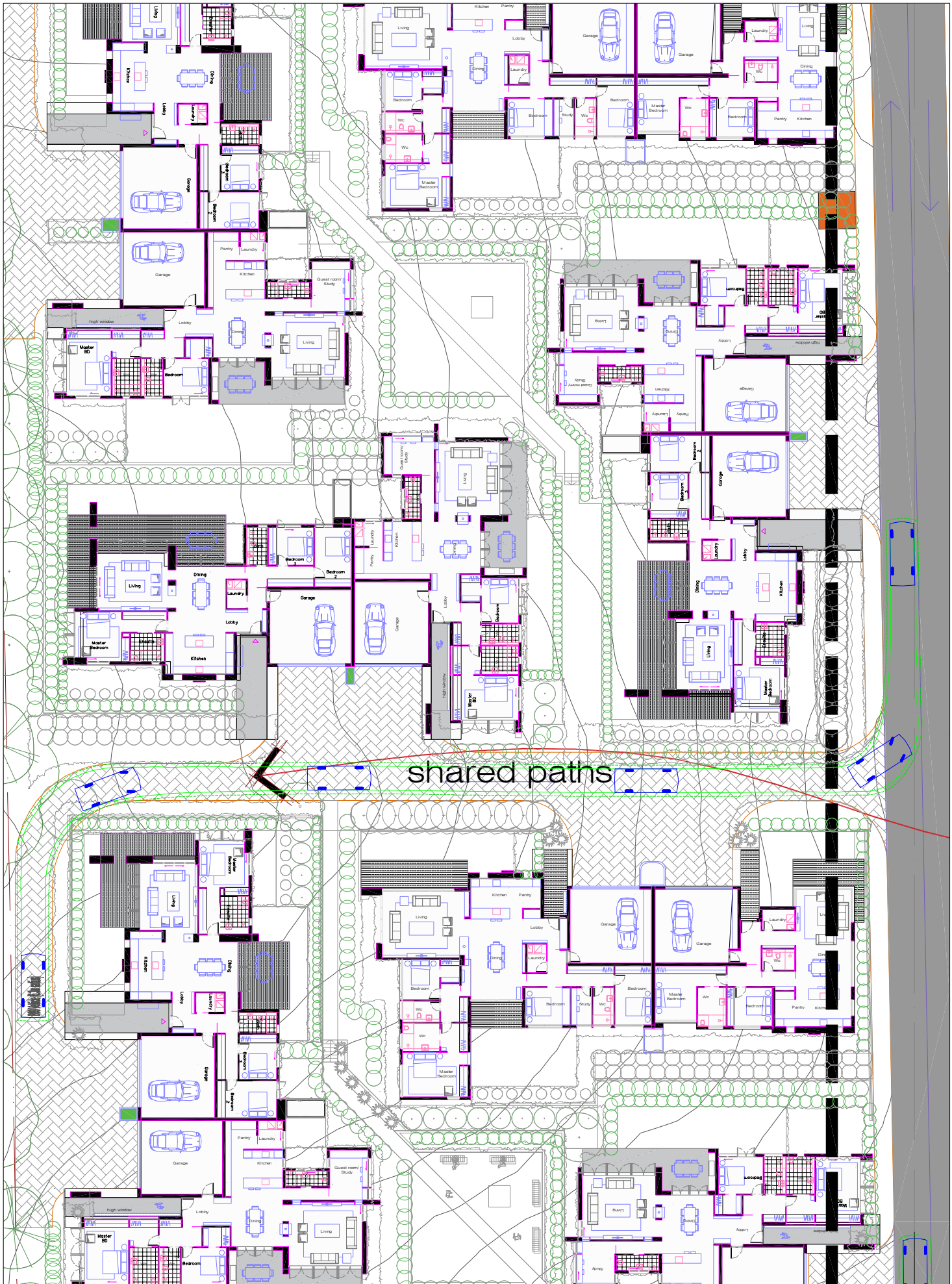

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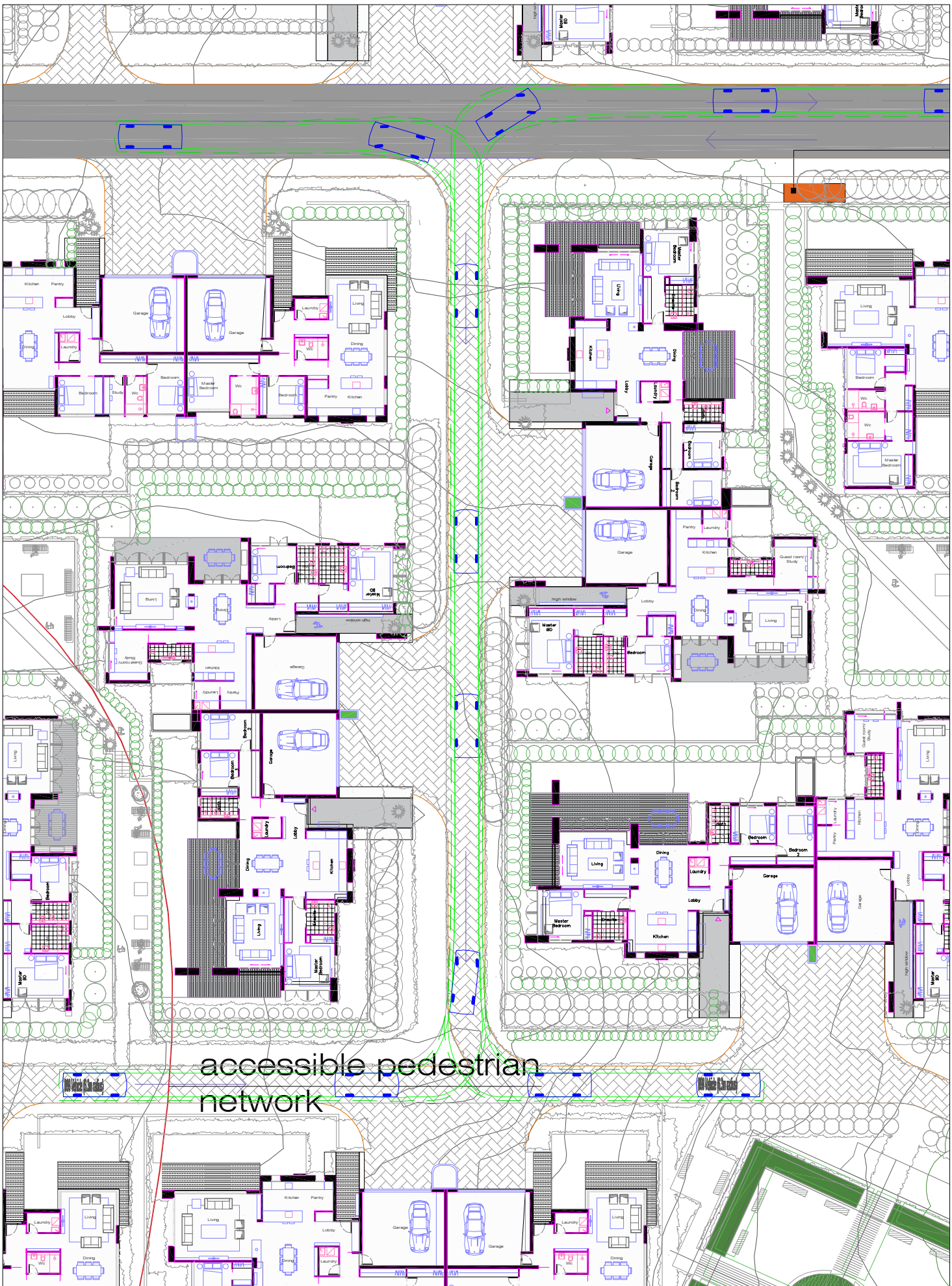

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Exiting / Exiting Central Site Area

1:400 @ A4

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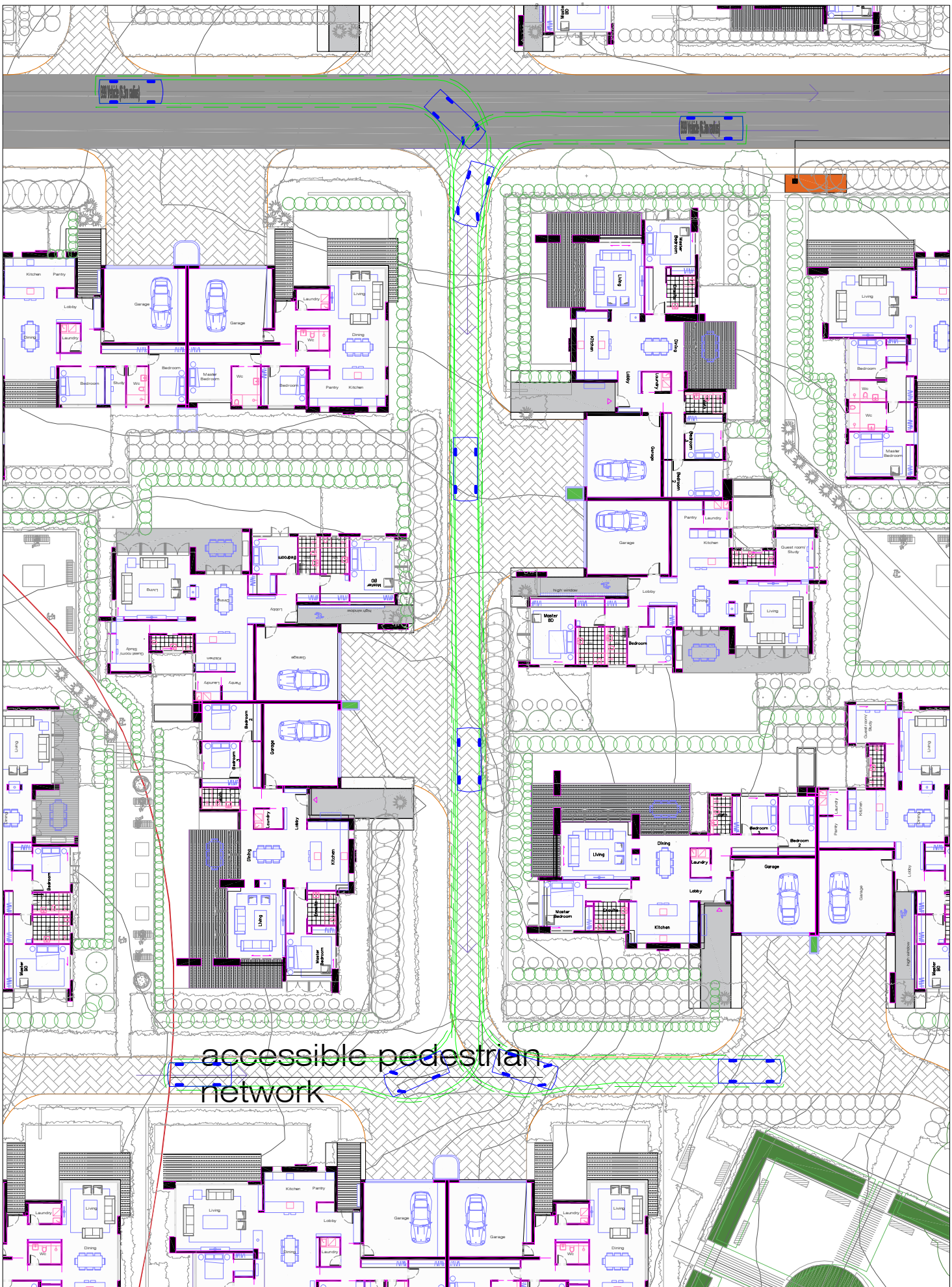

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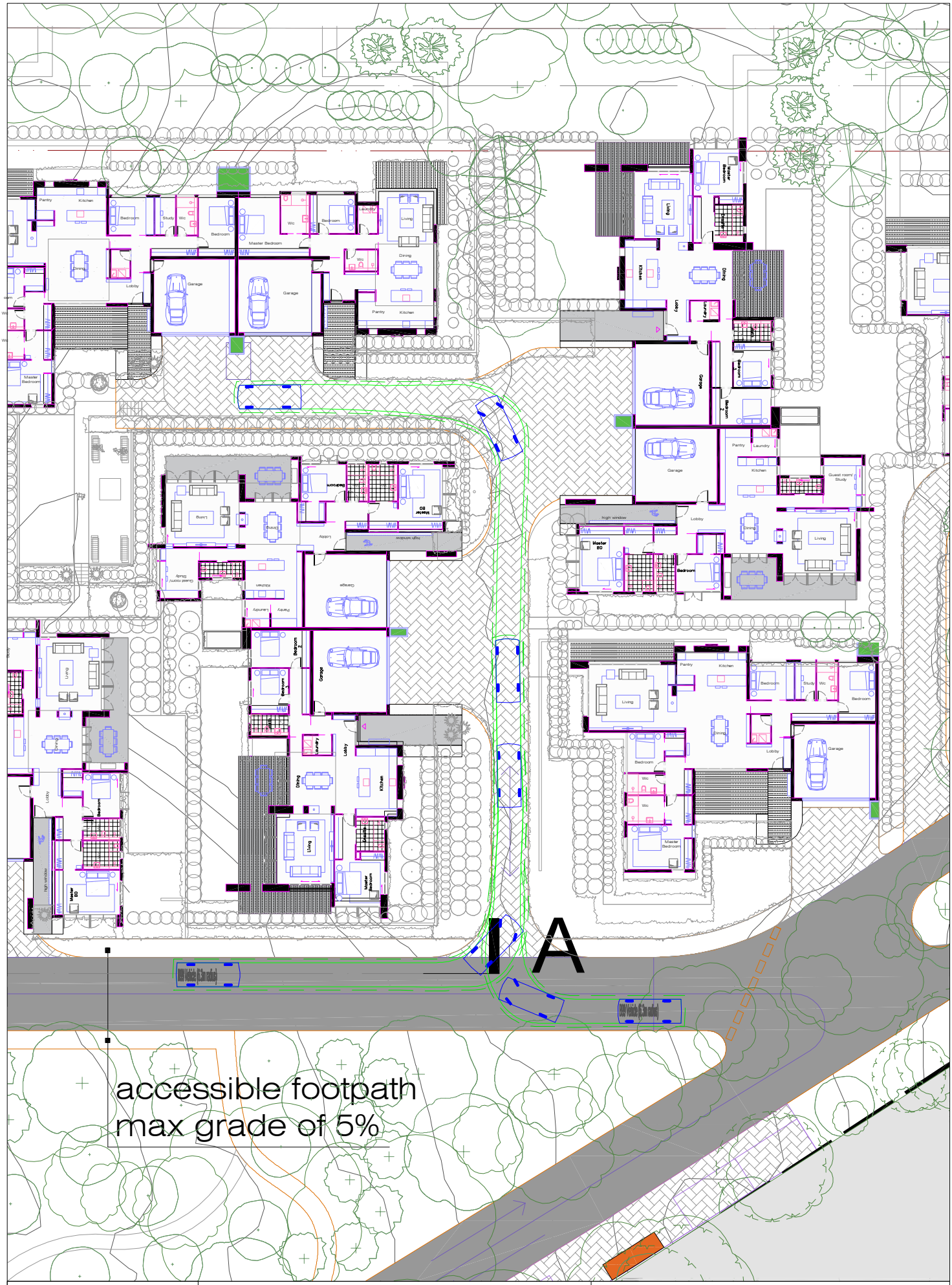

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Entering Northern Site Area

1:400 @ A4

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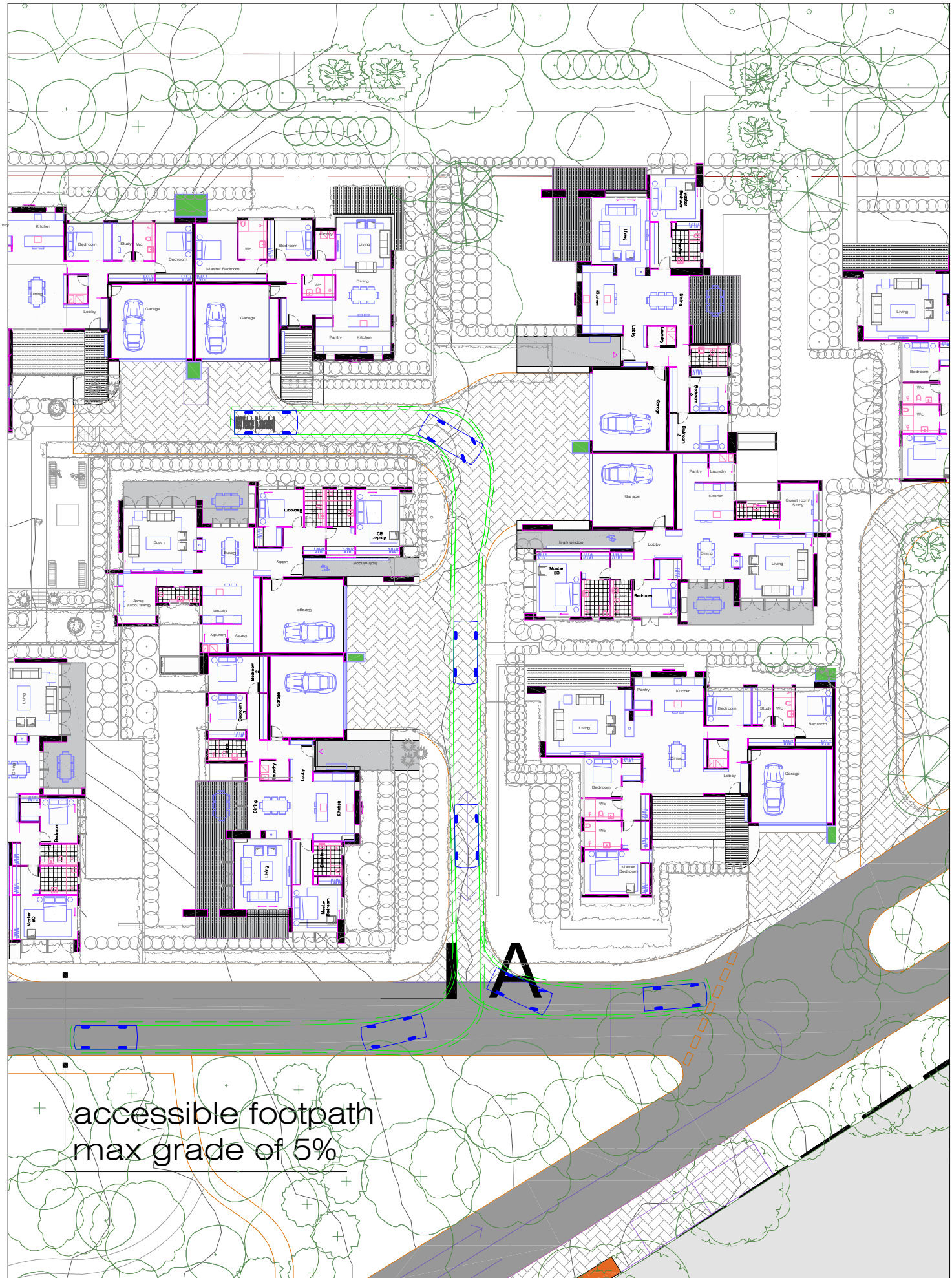

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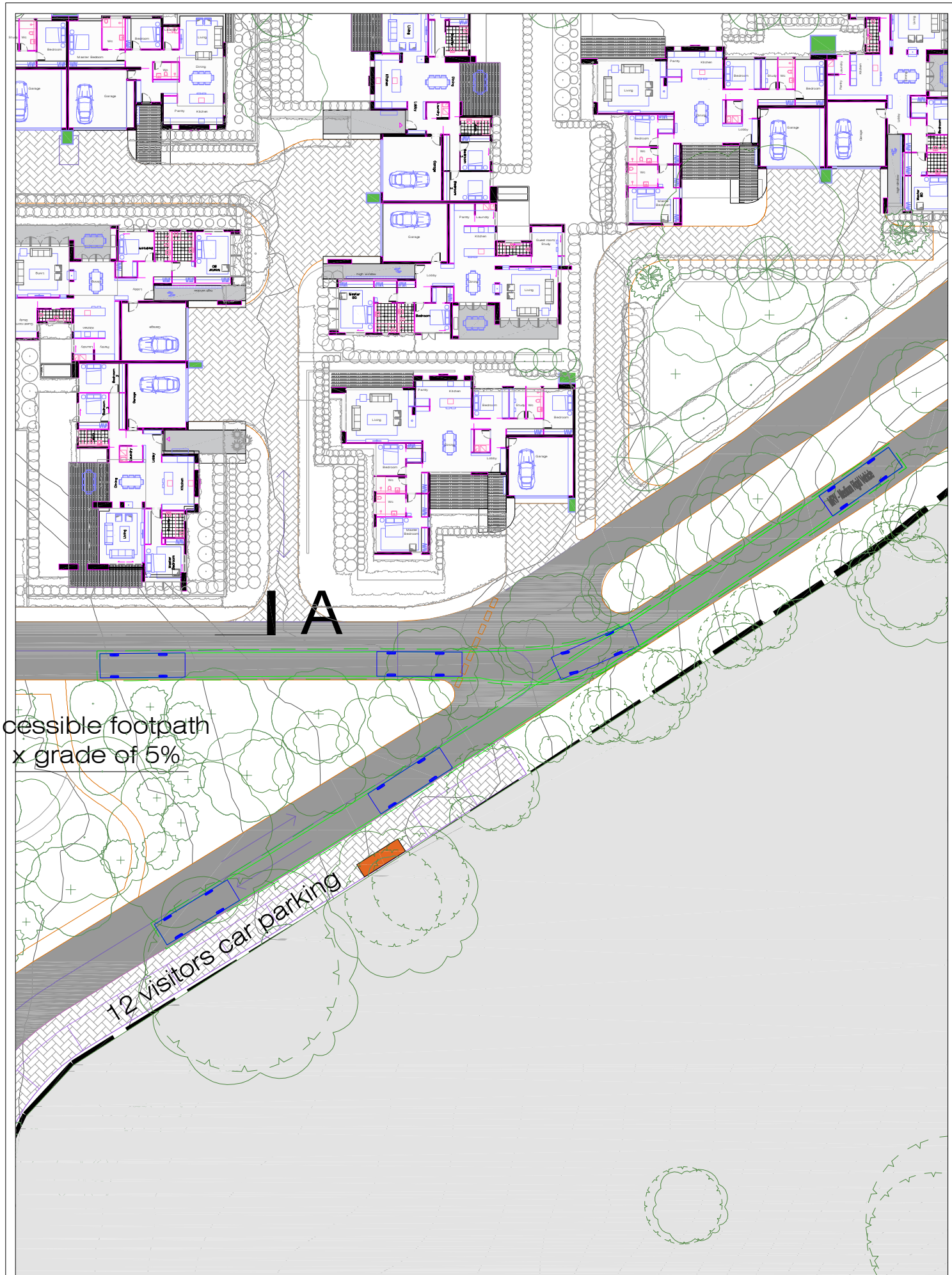

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PROJECT
RESIDENTIAL DEVELOPMENT

N

DRAWING TITLE
8.8M MRV TRUCK CIRCULATING PATHS
Entering Eastern Junction of Site

1:500 @ A4

ADDRESS
2-18 Centennial Road, Bowral

PROJECT NO.
17788

DATE DRAWN
2018-9-20

REVIEWED
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PREPARED
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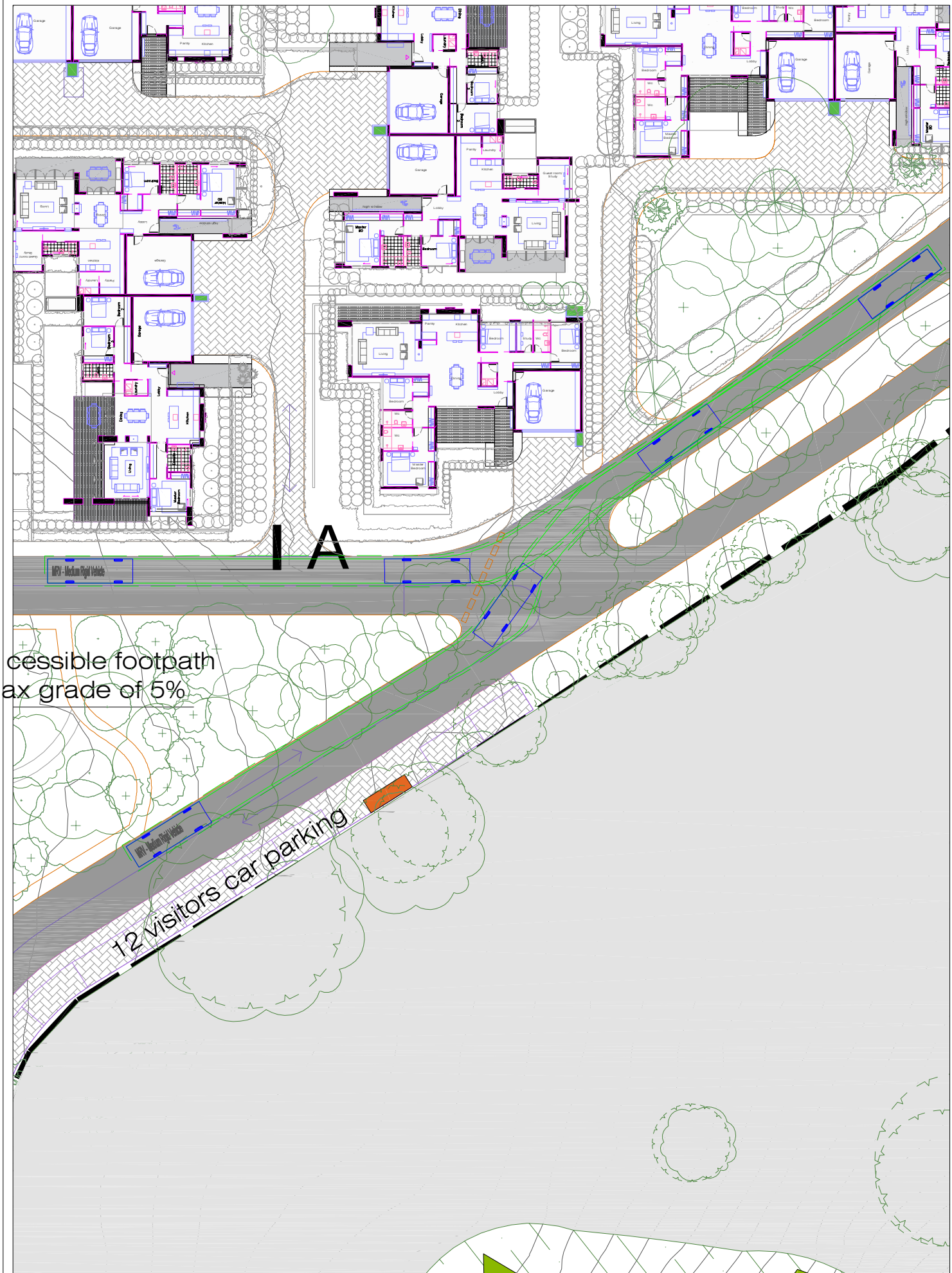

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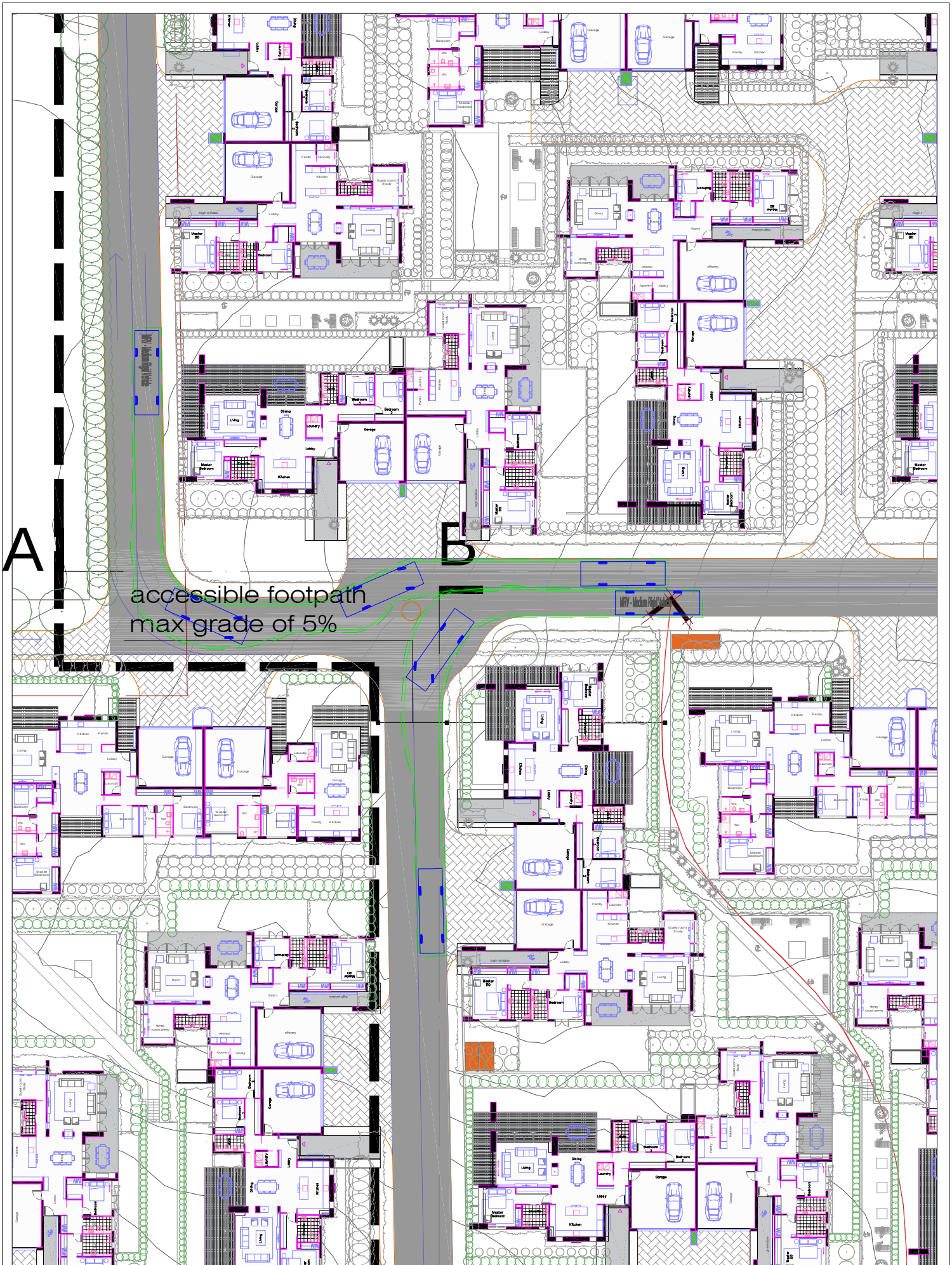

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8.8M MRV TRUCK CIRCULATING PATHS
Entering Western Junction of Site

1:500 @ A4

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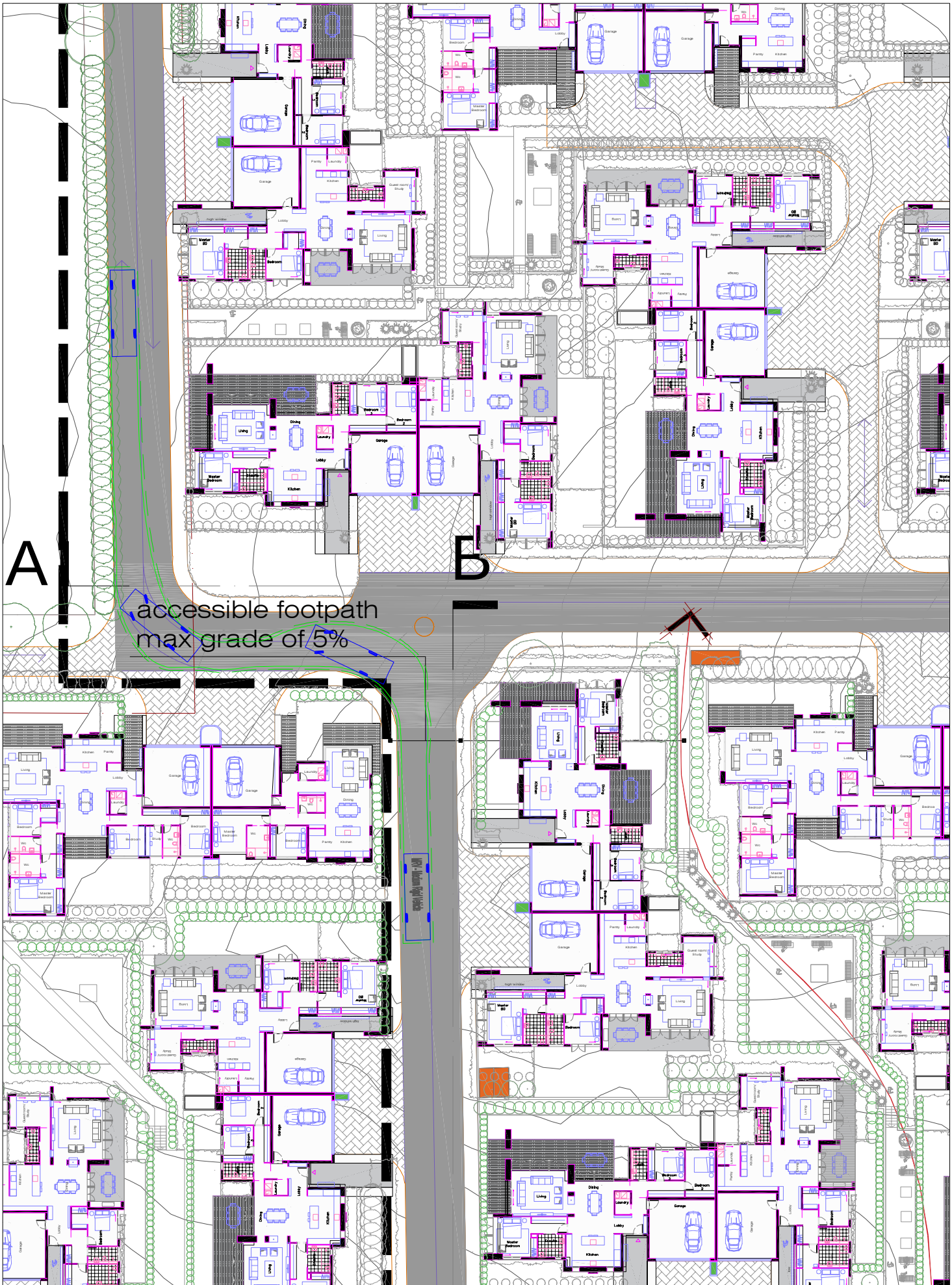

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2018-9-20

REVIEWED
CHRIS PALMER

PREPARED
DONALD LEE

VARGA TRAFFIC PLANNING Pty Ltd
Transport, Traffic and Parking Consultants

APPENDIX A

TRAFFIC SURVEY DATA

T

Reliable, Original & Authentic Results

Ph.88196847, Mob.0418-239019

Client : Varga Traffic Planning
Job No/Name : 6650 BOWRAL Kirkham Rd
Day/Date : Monday 27th November 2017

T	T Kirkham Rd	T Centennial Rd	T Kirkham Rd	T T
0700 - 0715	0	0	0	
0715 - 0730	0	0	0	
0730 - 0745	0	0	0	
0745 - 0800	0	0	0	
0800 - 0815	0	0	0	
0815 - 0830	0	0	0	
0830 - 0845	0	0	1	
0845 - 0900	2	0	0	
0900 - 0915	0	0	0	
0915 - 0930	0	0	0	
0930 - 0945	0	0	0	
0945 - 1000	0	2	1	

	T Kirkham Rd	T Centennial Rd	T Kirkham Rd	T T
0700 - 0800	0	0	0	
0715 - 0815	0	0	0	
0730 - 0830	0	0	0	
0745 - 0845	0	0	1	
0800 - 0900	2	0	1	
	2	0	1	
0830 - 0930	2	0	1	
0845 - 0945	2	0	0	
0900 - 1000	0	2	1	

L	T Kirkham Rd		T Centennial Rd		T Kirkham Rd		T T
T	T	L	L	L	L	T	
0700 - 0715	7	3	4	15	6	2	
0715 - 0730	7	3	0	16	9	8	
0730 - 0745	11	3	3	8	6	8	
0745 - 0800	18	2	3	20	13	12	
0800 - 0815	9	9	7	21	13	12	
0815 - 0830	11	7	11	19	14	14	
0830 - 0845	18	10	8	23	17	18	
0845 - 0900	16	14	13	31	16	29	
0900 - 0915	22	5	8	11	13	18	
0915 - 0930	13	4	5	14	17	8	
0930 - 0945	8	8	1	13	14	17	
0945 - 1000	18	2	8	25	17	32	

	T Kirkham Rd		T Centennial Rd		T Kirkham Rd		T T
T	T	L	L	L	L	T	
0700 - 0715	0	0	0	0	0	0	
0715 - 0730	1	0	0	0	0	0	
0730 - 0745	0	0	0	1	0	0	
0745 - 0800	0	0	0	1	0	0	
0800 - 0815	0	0	0	1	1	0	
0815 - 0830	0	0	0	0	0	1	
0830 - 0845	2	0	0	0	0	1	
0845 - 0900	1	0	0	0	1	0	
0900 - 0915	0	0	0	0	0	1	
0915 - 0930	1	0	0	0	0	1	
0930 - 0945	1	0	0	0	0	0	
0945 - 1000	1	0	0	0	2	0	

	T Kirkham Rd		T Centennial Rd		T Kirkham Rd		T T
T	T	L	L	L	L	T	
0700 - 0715	7	3	4	15	6	2	
0715 - 0730	8	3	0	16	9	8	
0730 - 0745	11	3	3	9	6	8	
0745 - 0800	18	2	3	21	13	12	
0800 - 0815	9	9	7	22	14	12	
0815 - 0830	11	7	11	19	14	15	
0830 - 0845	20	10	8	23	17	19	
0845 - 0900	17	14	13	31	17	29	
0900 - 0915	22	5	8	11	13	19	
0915 - 0930	14	4	5	14	17	9	
0930 - 0945	9	8	1	13	14	17	
0945 - 1000	19	2	8	25	19	32	

L	T Kirkham Rd		T Centennial Rd		T Kirkham Rd		T T
	T	L	L	L	L	T	
0700 - 0800	43	11	10	59	34	30	
0715 - 0815	45	17	13	65	41	40	
0730 - 0830	49	21	24	68	46	46	
0745 - 0845	56	28	29	83	57	56	
0800 - 0900	54	40	39	94	60	73	
	67	36	40	84	60	79	
0830 - 0930	69	33	34	79	63	73	
0845 - 0945	59	31	27	69	60	72	
0900 - 1000	61	19	22	63	61	75	

	T Kirkham Rd		T Centennial Rd		T Kirkham Rd		T T
	T	L	L	L	L	T	
0700 - 0800	1	0	0	2	0	0	
0715 - 0815	1	0	0	3	1	0	
0730 - 0830	0	0	0	3	1	1	
0745 - 0845	2	0	0	2	1	2	
0800 - 0900	3	0	0	1	2	2	
	3	0	0	0	1	3	
0830 - 0930	4	0	0	0	1	3	
0845 - 0945	3	0	0	0	1	2	
0900 - 1000	3	0	0	0	2	2	

	T Kirkham Rd		T Centennial Rd		T Kirkham Rd		T T
	T	L	L	L	L	T	
0700 - 0800	44	11	10	61	34	30	
0715 - 0815	46	17	13	68	42	40	
0730 - 0830	49	21	24	71	47	47	
0745 - 0845	58	28	29	85	58	58	
0800 - 0900	57	40	39	95	62	75	
	70	36	40	84	61	82	
0830 - 0930	73	33	34	79	64	76	
0845 - 0945	62	31	27	69	61	74	
0900 - 1000	64	19	22	63	63	77	

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Reliable, Original & Authentic Results
Ph.88196847, Mob.0418-239019

Client	: Varga Traffic Planning
Job No/Name	: 6650 BOWRAL Kirkham Rd
Day/Date	: Monday 27th November 2017

1	2	3
4	5	6
7	8	9

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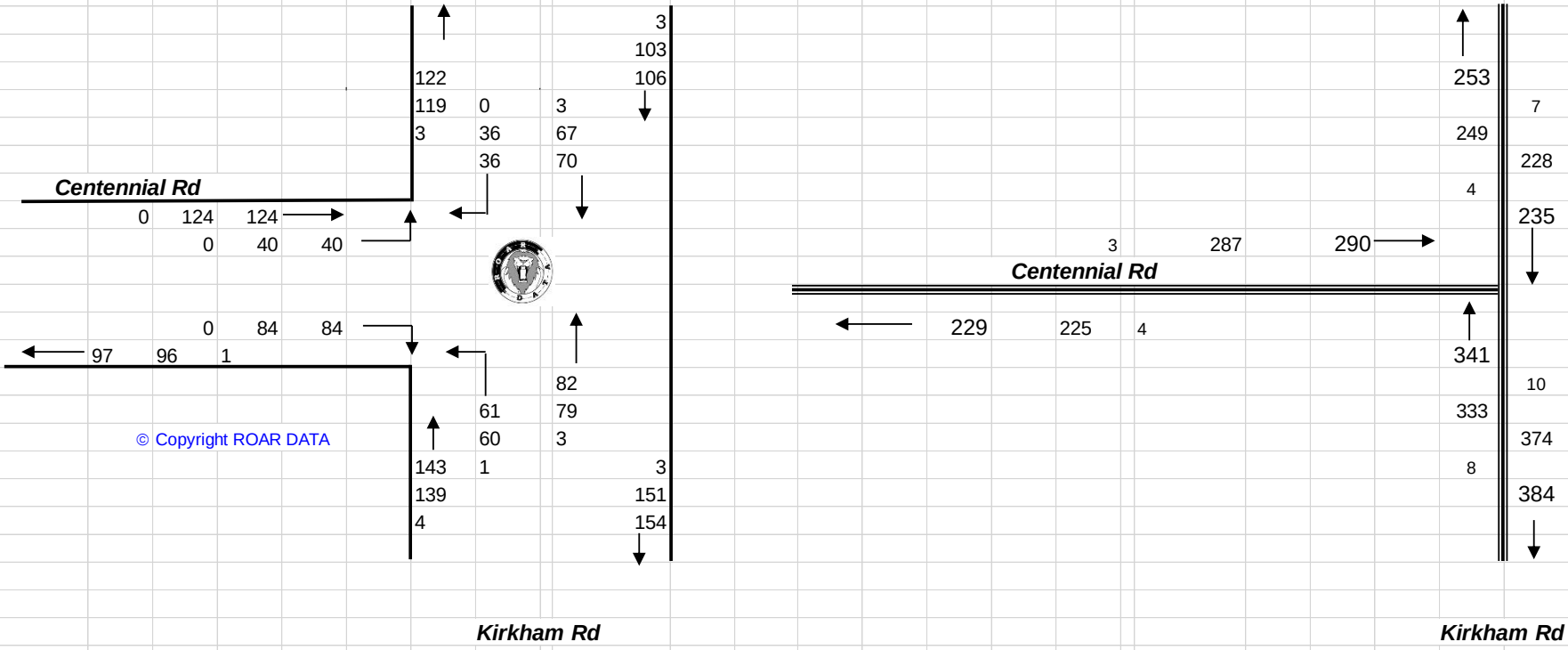
AM PEAK
0815 - 0915

N



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Reliable, Original & Authentic Results

Ph.88196847, Mob.0418-239019

Client : Varga Traffic Planning

Job No/Name : 6650 BOWRAL Kirkham Rd

Day/Date : Monday 27th November 2017

T	T Kirkham Rd	T Centennial	T Kirkham Rd	T T
1530 - 1545	0	0	0	
1545 - 1600	0	0	0	
1600 - 1615	2	0	0	
1615 - 1630	0	0	0	
1630 - 1645	0	0	0	
1645 - 1700	0	1	0	
1700 - 1715	0	0	0	
1715 - 1730	0	2	1	
1730 - 1745	0	0	0	
1745 - 1800	0	0	0	
1800 - 1815	0	0	0	
1815 - 1830	0	0	0	

	T Kirkham Rd	T Centennial	T Kirkham Rd	T T
	2	0	0	
1545 - 1645	2	0	0	
1600 - 1700	2	1	0	
1615 - 1715	0	1	0	
1630 - 1730	0	3	1	
1645 - 1745	0	3	1	
1700 - 1800	0	2	1	
1715 - 1815	0	2	1	
1730 - 1830	0	0	0	

L	T Kirkham Rd		T Centennial Rd		T Kirkham Rd		T T
T	T	_	L	_	L	T	
1530 - 1545	14	5	12	18	27	31	
1545 - 1600	17	7	9	22	28	23	
1600 - 1615	12	2	4	20	11	11	
1615 - 1630	13	9	4	12	19	18	
1630 - 1645	11	8	4	14	20	20	
1645 - 1700	14	7	5	14	22	20	
1700 - 1715	11	8	4	12	20	25	
1715 - 1730	6	7	5	9	20	9	
1730 - 1745	2	3	4	13	12	5	
1745 - 1800	6	7	4	17	8	10	
1800 - 1815	6	4	3	4	10	8	
1815 - 1830	4	10	1	9	9	5	

_____	T Kirkham Rd		T Centennial Rd		T Kirkham Rd		T T
T	T	_	L	_	L	T	
1530 - 1545	1	0	0	0	0	2	
1545 - 1600	3	0	0	0	1	0	
1600 - 1615	0	0	0	0	0	0	
1615 - 1630	0	0	0	0	0	1	
1630 - 1645	0	0	0	0	0	0	
1645 - 1700	0	0	0	0	0	0	
1700 - 1715	1	0	0	0	1	0	
1715 - 1730	0	0	0	0	0	0	
1730 - 1745	2	0	0	0	0	0	
1745 - 1800	0	0	0	0	0	0	
1800 - 1815	0	0	0	0	0	1	
1815 - 1830	0	0	0	0	0	1	

_____	T Kirkham Rd		T Centennial Rd		T Kirkham Rd		T T
T	T	_	L	_	L	T	
1530 - 1545	15	5	12	18	27	33	
1545 - 1600	20	7	9	22	29	23	
1600 - 1615	12	2	4	20	11	11	
1615 - 1630	13	9	4	12	19	19	
1630 - 1645	11	8	4	14	20	20	
1645 - 1700	14	7	5	14	22	20	
1700 - 1715	12	8	4	12	21	25	
1715 - 1730	6	7	5	9	20	9	
1730 - 1745	4	3	4	13	12	5	
1745 - 1800	6	7	4	17	8	10	
1800 - 1815	6	4	3	4	10	9	
1815 - 1830	4	10	1	9	9	6	

L	T Kirkham Rd		T Centennial Rd		T Kirkham Rd		T T
	T	_	L	_	L	T	
	56	23	29	72	85	83	
1545 - 1645	53	26	21	68	78	72	
1600 - 1700	50	26	17	60	72	69	
1615 - 1715	49	32	17	52	81	83	
1630 - 1730	42	30	18	49	82	74	
1645 - 1745	33	25	18	48	74	59	
1700 - 1800	25	25	17	51	60	49	
1715 - 1815	20	21	16	43	50	32	
1730 - 1830	18	24	12	43	39	28	

_____	T Kirkham Rd		T Centennial Rd		T Kirkham Rd		T T
	T	_	L	_	L	T	
	4	0	0	0	1	3	
1545 - 1645	3	0	0	0	1	1	
1600 - 1700	0	0	0	0	0	1	
1615 - 1715	1	0	0	0	1	1	
1630 - 1730	1	0	0	0	1	0	
1645 - 1745	3	0	0	0	1	0	
1700 - 1800	3	0	0	0	1	0	
1715 - 1815	2	0	0	0	0	1	
1730 - 1830	2	0	0	0	0	2	

_____	T Kirkham Rd		T Centennial Rd		T Kirkham Rd		T T
	T	_	L	_	L	T	
	60	23	29	72	86	86	
1545 - 1645	56	26	21	68	79	73	
1600 - 1700	50	26	17	60	72	70	
1615 - 1715	50	32	17	52	82	84	
1630 - 1730	43	30	18	49	83	74	
1645 - 1745	36	25	18	48	75	59	
1700 - 1800	28	25	17	51	61	49	
1715 - 1815	22	21	16	43	50	33	
1730 - 1830	20	24	12	43	39	30	

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Reliable, Original & Authentic Results

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Client	: Varga Traffic Planning
Job No/Name	: 6650 BOWRAL Kirkham Rd
Day/Date	: Monday 27th November 2017

1	2	3
4	5	6
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PM PEAK
1530 - 1630

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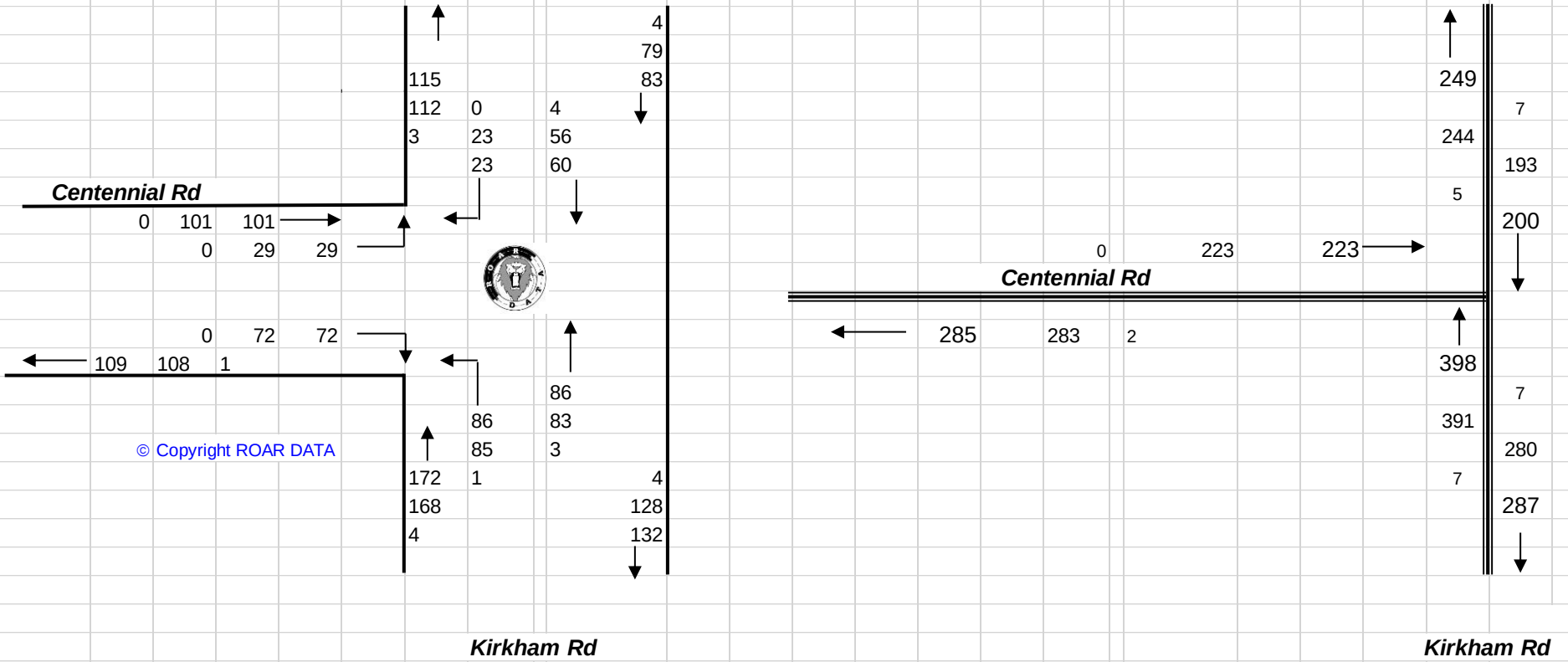

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Reliable, Original & Authentic Results

Ph.88196847, Mob.0418-239019

Client	: Varga Traffic Planning
Job No/Name	: 6650 BOWRAL Kirkham Rd
Day/Date	: Monday 27th November 2017

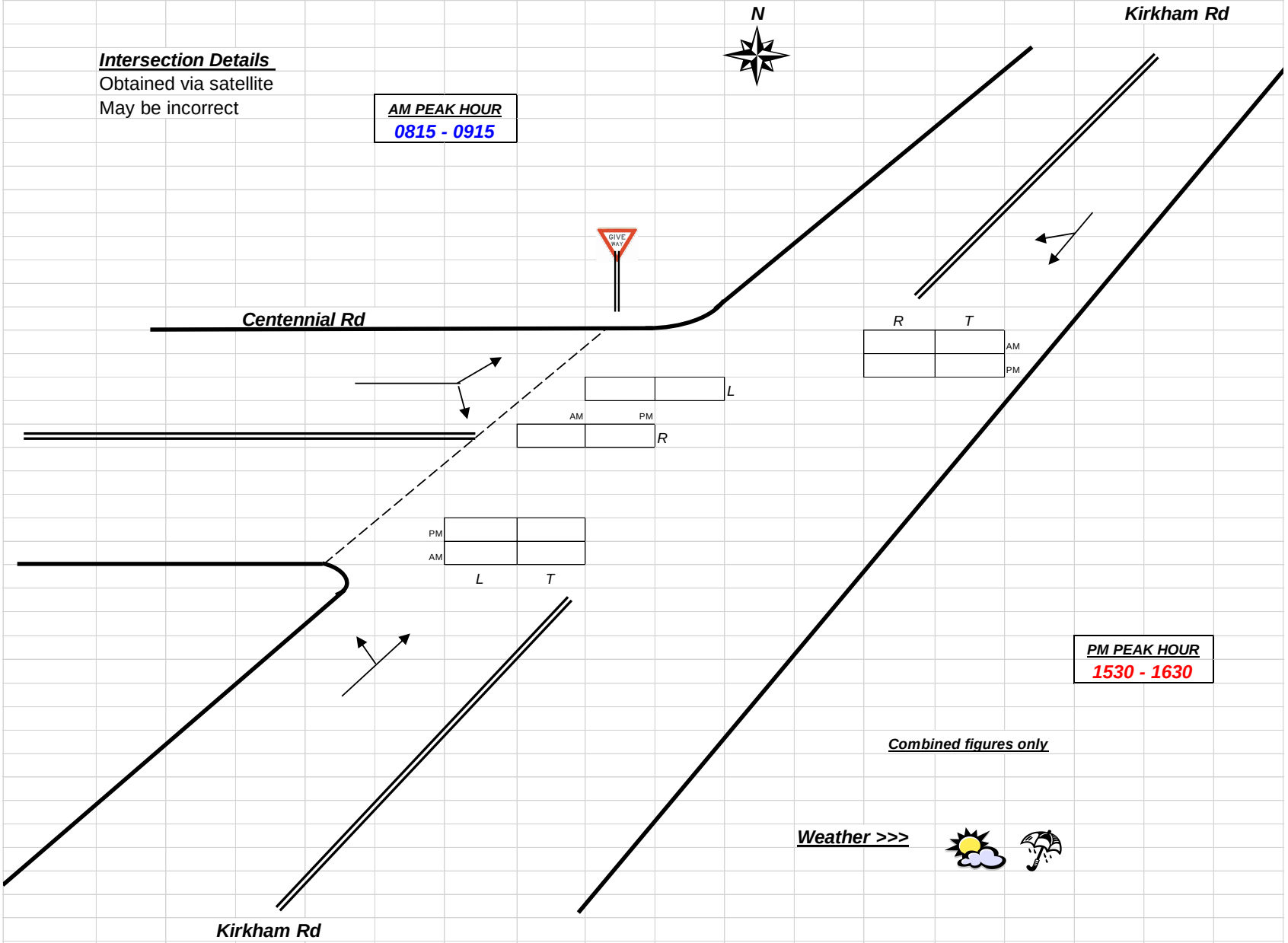
Intersection Details

Obtained via satellite

May be incorrect

AM PEAK HOUR

0815 - 0915



PM PEAK HOUR

1530 - 1630

Combined figures only

Weather >>>