TRAFFIC AND PARKING IMPACT ASSESSMENT FOR THE PLANNING PROPOSAL FOR THE ELAMBRA WEST URBAN RELEASE AREA AT CAMPBELL STREET, GERRINGONG

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Development Type: Planning Proposal for the Elambra West Urban Release Area

Site Address: Campbell Street, Gerringong

Prepared for: Allen Price & Scarratts Pty Ltd (APS)

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1 INTRODUCTION

M^CLaren Traffic Engineering was commissioned by *Allen Price & Scarratts Pty Ltd (APS)* to provide a Traffic and Parking Impact Assessment to accompany a detailed planning proposal for a low density residential subdivision at Campbell Street, Gerringong.

1.1 Description and Scale of Development

The subject planning proposal is being made with reference to the *Kiama Urban Strategy 2011* and the *Gerringong Charette 1995*, which anticipates the rezoning of the subject land. The area subject to the proposal consists of approximately 27.23ha, with a potential yield of approximately 326 dwellings (now revised down to 317 lots in the revised Structure Plan in **Annexure A**), as seen within **Figure 1** (initial concept plan) extracted from the Allen Price & Scarratts Pty Ltd (APS) consultant brief dated 13 September 2019, with the revised Structure Plan provided in **Annexure A**.

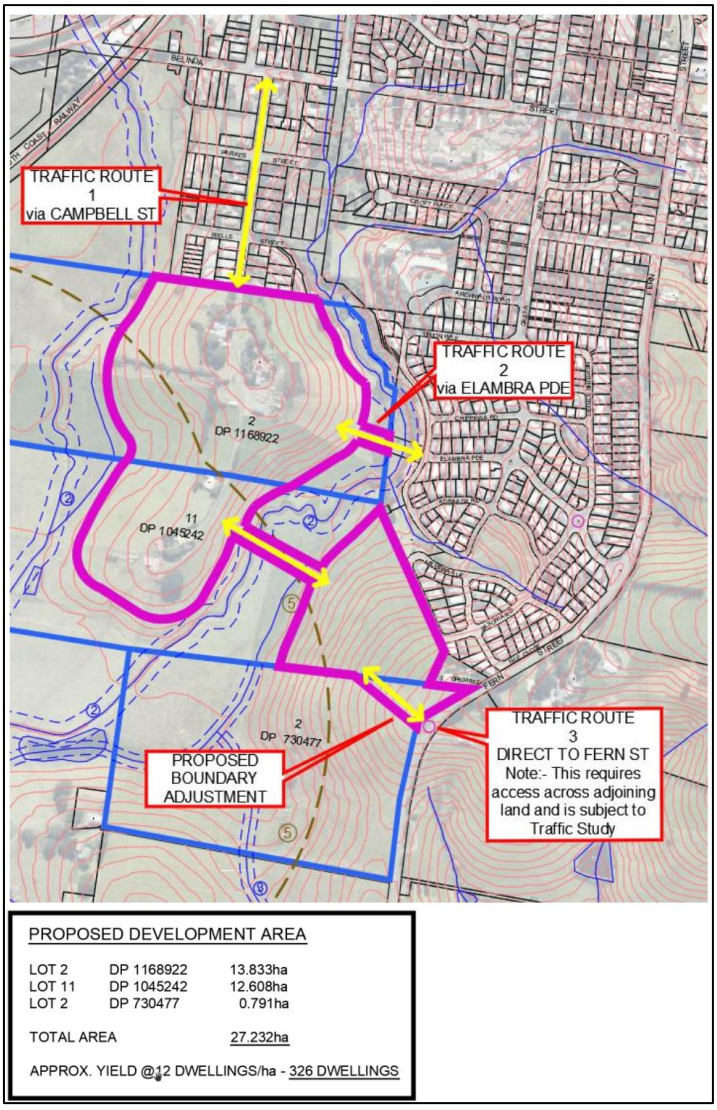


FIGURE 1: APS INITIAL CONCEPT PLAN AT COMMENCEMENT OF THIS TRAFFIC ASSESSMENT

The APS initial concept plan (**Figure 1**) is generally consistent with the map provided in the Gerringong Charette and outlines that vehicle access to the subdivision will be obtained via three (3) public road intersections/connections, which include:

- A public road connection to Campbell Street at the northern edge of the site;
- A public road connection to Elambra Parade at its intersection with Union Way, on the eastern edge of the site;
- A public road connection to Fern Street at a proposed new intersection located approximately 500m south of the existing Elambra Parade / Fern Street roundabout, at the southern edge of the site.

While these three connections were proposed by APS within their initial concept plan, additional access arrangements have been considered including a public road access to Saxonia Road at Millewa Avenue and to Short Street at the existing termination point.

1.2 State Environmental Planning Policy (Infrastructure) 2007

If the planning proposal were approved, the subsequent development application would qualify as a traffic generating development with relevant size and/or capacity under Clause 104 of the SEPP (Infrastructure) 2007 as the masterplan subdivision would be greater than 50 allotments with access to a classified road (Fern Street No. 571). Formal referral to the Roads and Maritime Services (RMS) would be necessary.

1.3 Site Description

The site is currently zoned *RU2 – Rural Landscape,* is approximately 27.2ha in area and consists of two lots being Lot 2 DP 1168922 and Lot 11 DP 1045241. In addition, part of Lot 2 DP 730477 is required in order to facilitate a proposed access to the subdivision from Fern Street at a location approximately 500m south of the existing Elambra Parade/Fern Street intersection. Although access to Fern Street via Lot 2 DP 730477 is no longer proposed as part of the revised Structure Plan as shown in **Annexure A**.

The site is currently operating as farmland and is bordered to the north and east by low-density residential dwellings in land zoned as *R2 – Low Density Residential*. The land to the south of the site is zoned *RU2 – Rural Landscape* and to the south-west *RU1 – Primary Production*. The site is bounded to the northwest by the South Coast Railway corridor.

The possible future form of this site has been identified as low-density residential development within the *Kiama Urban Strategy 2011* and the *Gerringong Charette 1995* and is commonly referred to as the Elambra West Urban Release Area. The *1995 Gerringong Charette* outlines a proposed linkage plan for this southern expansion which includes the proposed Elambra West Urban Release Area, with an extract provided below in **Figure 2.**

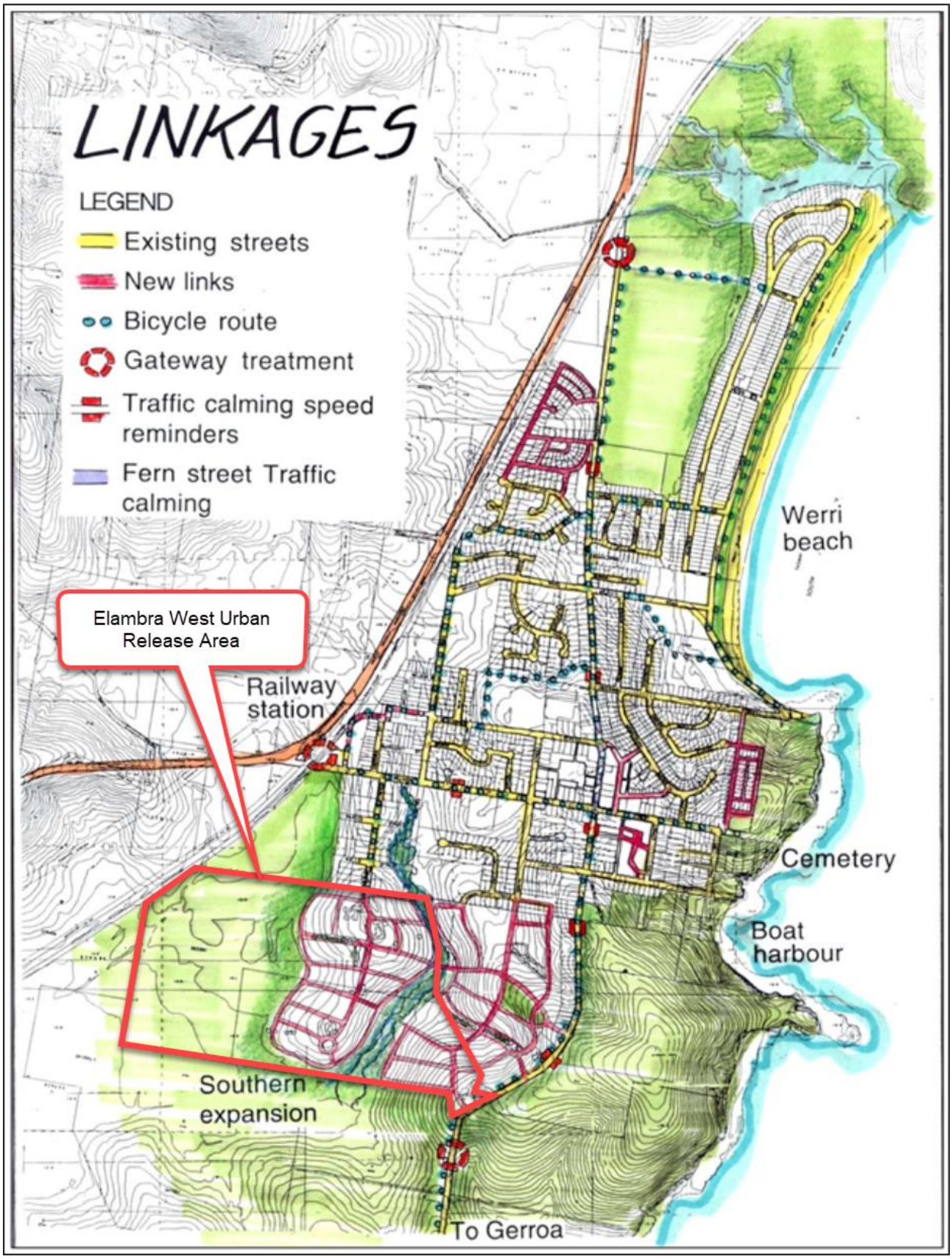
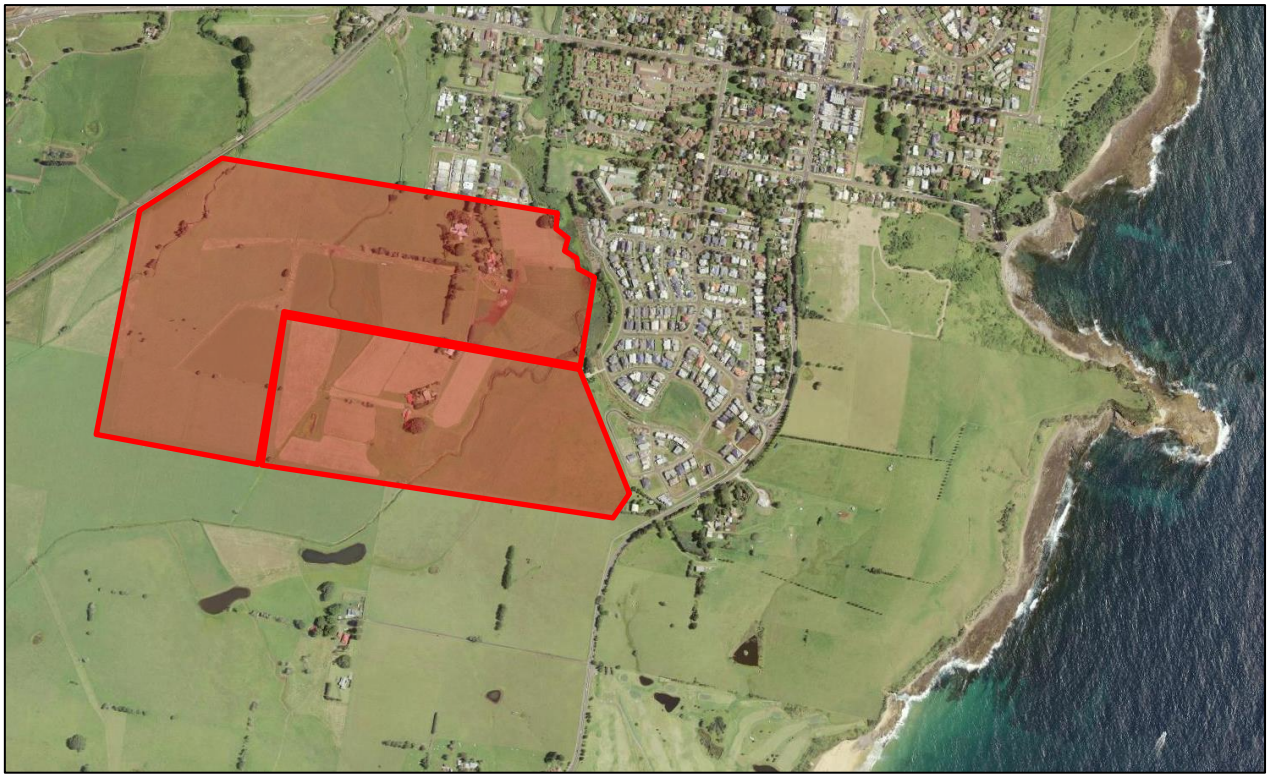


FIGURE 2: 1995 GERRINGONG CHARETTE PROPOSED LINKAGE PLAN

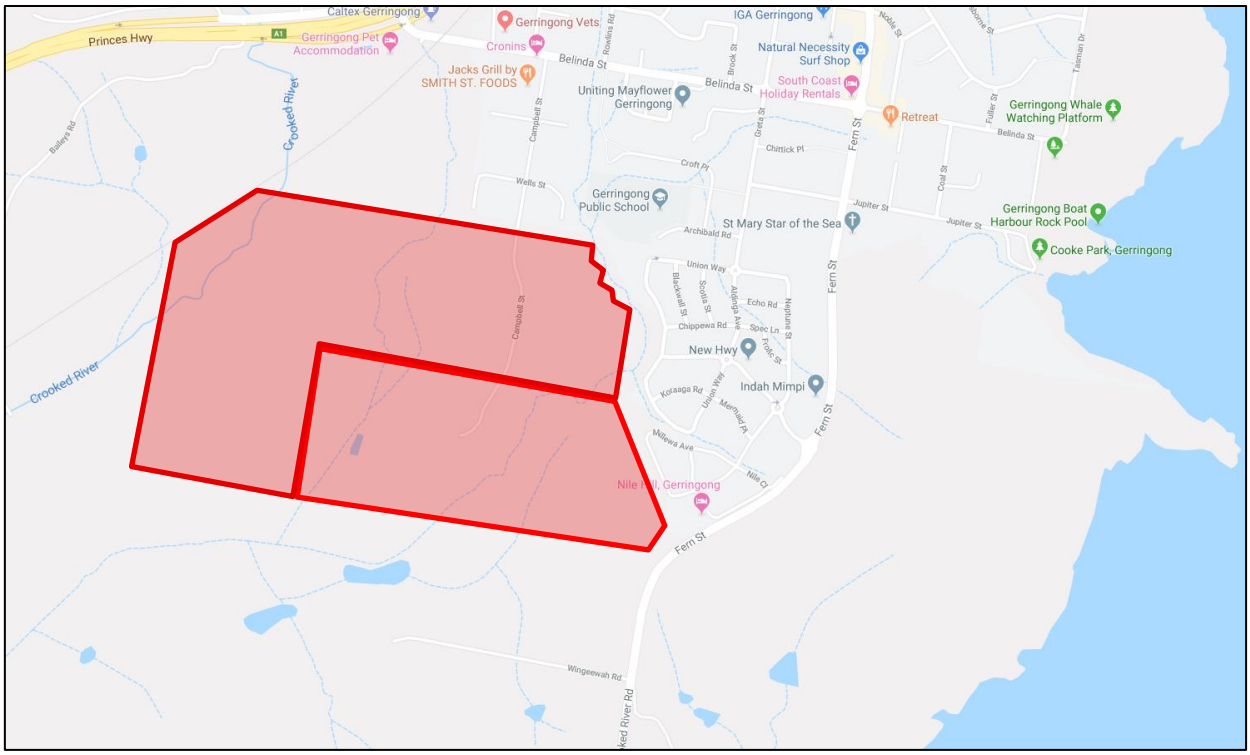
1.4 Site Context

The location of the site based upon the revised Structure Plan is shown on an aerial photo and a street map in **Figure 3** and **Figure 4** respectively.



Site Location

FIGURE 3: SITE CONTEXT – AERIAL PHOTO



Site Location

FIGURE 4: SITE CONTEXT – STREET MAP

2 EXISTING TRAFFIC AND PARKING CONDITIONS

2.1 Road Hierarchy

The road network servicing the site has characteristics as described in the following sub-sections.

2.1.1 Campbell Street

- Unclassified LOCAL Road;
- Approximately 8m wide carriageway facilitating two-way passing and kerbside parking along both sides of the road;
- Signposted 50km/h speed limit;
- Unrestricted kerbside parking available on both sides of the road.

2.1.2 Fern Street

- Classified REGIONAL Road (No. 571);
- Approximately 6.5m wide carriageway facilitating one traffic-flow lane in each direction;
- Signposted 80km/h speed limit;
- No parking available on either side of the road.

2.1.3 Elambra Parade

- Unclassified LOCAL Road;
- Approximately 8m wide carriageway facilitating two-way passing and kerbside parking along both sides of the road;
- Signposted 50km/h speed limit;
- Unrestricted kerbside parking available on both sides of the road.

2.1.4 Belinda Street

- RMS Classified REGIONAL Road (No. 571);
- Approximately 11m wide carriageway generally facilitating one traffic flow lane in each direction;
- Signposted 50km/hr speed limit;
- Intermittent lengths of kerbside parking available on either side of the road.

2.2 Existing Traffic Management

- STOP SIGN controlled intersection of Campbell Street/Belinda Street;
- Roundabout controlled intersection of Elambra Parade/Fern Street;
- Priority controlled T-junction intersection of Elambra Parade/Union Way.

2.3 Existing Traffic Environment

Turning movement count surveys were conducted at the intersections of Campbell Street/Belinda Street, Greta Street/Belinda Street and Fern Street/Elambra Parade from 7:00 AM to 10:00 AM and 2:30 PM to 7:00 PM on Thursday the 7th of November 2019 representing a typical operating weekday.

Additionally, Automatic Traffic Counters (ATCs) traffic tube surveys were undertaken from Wednesday the 6th of November 2019 to Tuesday the 12th of November 2019 inclusive across both directions of travel of the following roads:

- Fern Street, outside 259 Fern Street;
- Campbell Street, outside 10 Campbell Street;
- Greta Street, south of Belinda Street, outside Rest Park;
- Elambra Parade, outside 4 Elambra Parade;
- Saxonia Road, outside 3 Saxonia Road.

The locations of the ATCs on these roads are shown in **Annexure B**. The full survey results of both the turning movement count surveys and the traffic tube surveys are shown in **Annexure C** for reference.

2.3.1 Intersection Performance

The performance of the surrounding intersections under the existing traffic conditions has been assessed using SIDRA INTERSECTION 8.0. Additionally, the forecast 10-year growth (2029) of the surrounding region has been similarly assessed without the indicative masterplan development included with a linear 2%p.a. growth rate for through traffic volumes along the collector roads of Fern Street and Belinda Street. **Table 1** summarises the resultant intersection performance data, with full SIDRA results reproduced in **Annexure D**.

TABLE 1: EXISTING INTERSECTION PERFORMANCES (SIDRA INTERSECTION 8.0)

Intersection	Peak Hour	Degree of Saturation[1]	Average Delay[2] (sec/veh)	Level of Service[3]	Control Type	Worst Movement	95th Percentile Queue
2019 EXISTING PERFORMANCE							
Campbell Street / Belinda Street	AM	0.16	1.2 (Worst: 12.1)	**NA** (Worst: A)	Stop	RT from Campbell Street	0.2 veh (1.8m) Campbell Street
	PM	0.17	1.2 (Worst: 13.7)	**NA** (Worst: A)		RT from Campbell Street	0.3 veh (1.8m) Campbell Street
Greta Street / Belinda Street	AM	0.21	6.5 (Worst: 10)	**A** (Worst: A)	Roundabout	UT from Belinda Street	1.2 veh (8.3m) Greta Street
	PM	0.24	6.4 (Worst: 11.1)	**A** (Worst: A)		UT from Greta Street	1.4 veh (10.3m) Belinda Street
Fern Street / Elambra Parade	AM	0.14	5.1 (Worst: 11)	**A** (Worst: A)	Roundabout	UT from Elambra Parade	0.7 veh (5.3m) Fern Street
	PM	0.25	5.1 (Worst: 10.4)	**A** (Worst: A)		UT from Fern Street	1.6 veh (11.2m) Fern Street
2029 GROWTH PERFORMANCE – With No Development							
Campbell Street / Belinda Street	AM	0.19	1.1 (Worst: 13.5)	**NA** (Worst: A)	Stop	RT from Campbell Street	0.3 veh (2.1m) Campbell Street
	PM	0.21	1.1 (Worst: 15.8)	**NA** (Worst: B)		RT from Campbell Street	0.3 veh (2.1m) Campbell Street
Greta Street / Belinda Street	AM	0.22	6.5 (Worst: 10)	**A** (Worst: A)	Roundabout	UT from Belinda Street	1.3 veh (9.2m) Belinda Street
	PM	0.27	6.4 (Worst: 11.4)	**A** (Worst: A)		UT from Greta Street	1.7 veh (12m) Belinda Street
Fern Street / Elambra Parade	AM	0.16	5 (Worst: 11.2)	**A** (Worst: A)	Roundabout	UT from Elambra Parade	0.9 veh (6.3m) Fern Street
	PM	0.29	5 (Worst: 10.5)	**A** (Worst: A)		UT from Fern Street	2 veh (14m) Fern Street

NOTES:
(1) The Degree of Saturation is the ratio of demand to capacity for the most disadvantaged movement.
(2) The average delay is the delay experienced on average by all vehicles. The value in brackets represents the delay to the most disadvantaged movement.
(3) The Level of Service is a qualitative measure of performance describing operational conditions. There are six levels of service, designated from A to F, with A representing the best operational condition and level of service F the worst. The LoS of the intersection is shown in bold, and the LoS of the most disadvantaged movement is shown in brackets.
(4) No overall Level of Service is provided for Give Way and Stop controlled intersections as the low delays associated with the dominant movements skew the average delay of the intersection. The Level of Service of the worst approach is an indicator of the operation of the intersection, with a worse Level of Service corresponding to long delays and reduced safety outcomes for that approach.

As shown in **Table 1**, the intersections of Greta Street / Belinda Street and Fern Street / Elambra Parade are currently performing with a high level of efficiency, with a level of service "A" condition reflected in both the AM & PM peak hour periods in both the existing operation and operation following 10-year growth.

Similarly, the intersection of Campbell Street / Belinda Street is currently performing with a critical movement level of service "A" condition reflected in both the AM & PM peak hour periods in the existing operation. In the operation following 10-year growth, this intersection is expected to perform with critical movement level of services of "A" and "B" in the AM and PM peak hour periods respectively. The intersection or critical movement level of service "A" or "B" performance is characterised by low approach delays and spare capacity.

2.3.1 Tube Traffic Survey Results

The results from the tube traffic surveys have been summarised in **Table 2**.

TABLE 2: TUBE SURVEYS SUMMARY (TWO-WAY VOLUMES)

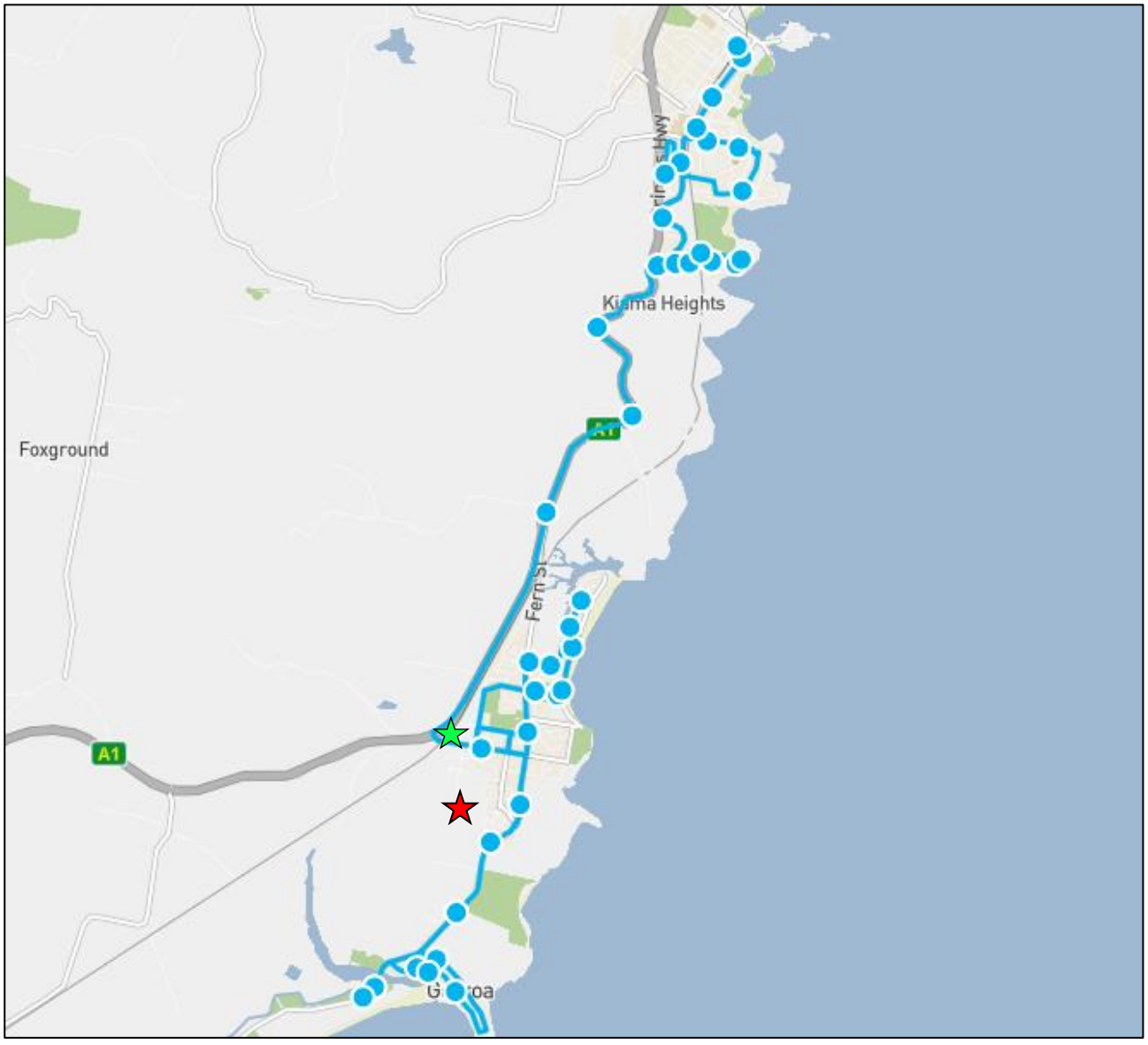
Road	Peak Hour Volume		Average Weekday Volume	85th Percentile Speed	Heavy Vehicles
	Time	Volume			
Saxonia Road	AM (8 am – 9 am)	42	509	35.6km/h	2.9%
	PM (4 pm – 5 pm)	52			
Campbell Street	AM (8 am – 9 am)	66	822	29.4km/h	3.5%
	PM (4 pm – 5 pm)	77			
Greta Street	AM (8 am – 9 am)	336	3,028	30.4km/h	2.9%
	PM (3 pm – 4 pm)	306			
Fern Street	AM (11 am – 12pm)	473	6,788	78.0km/h	3.5%
	PM (5 pm – 6 pm)	659			
Elambra Parade	AM (8 am – 9 am)	97	1,088	39.4km/h	3.0%
	PM (4 pm – 5 pm)	105			

2.4 Public Transport

The subject site is within approximately 670m walking distance of Gerringong Train Station located to the north of the site near Belinda Street, servicing the SCO - South Coast Line. A train service departs every 60-90 minutes in commuter peak periods and provides direct access between Bomaderry and Bondi Junction/Sydney CBD.

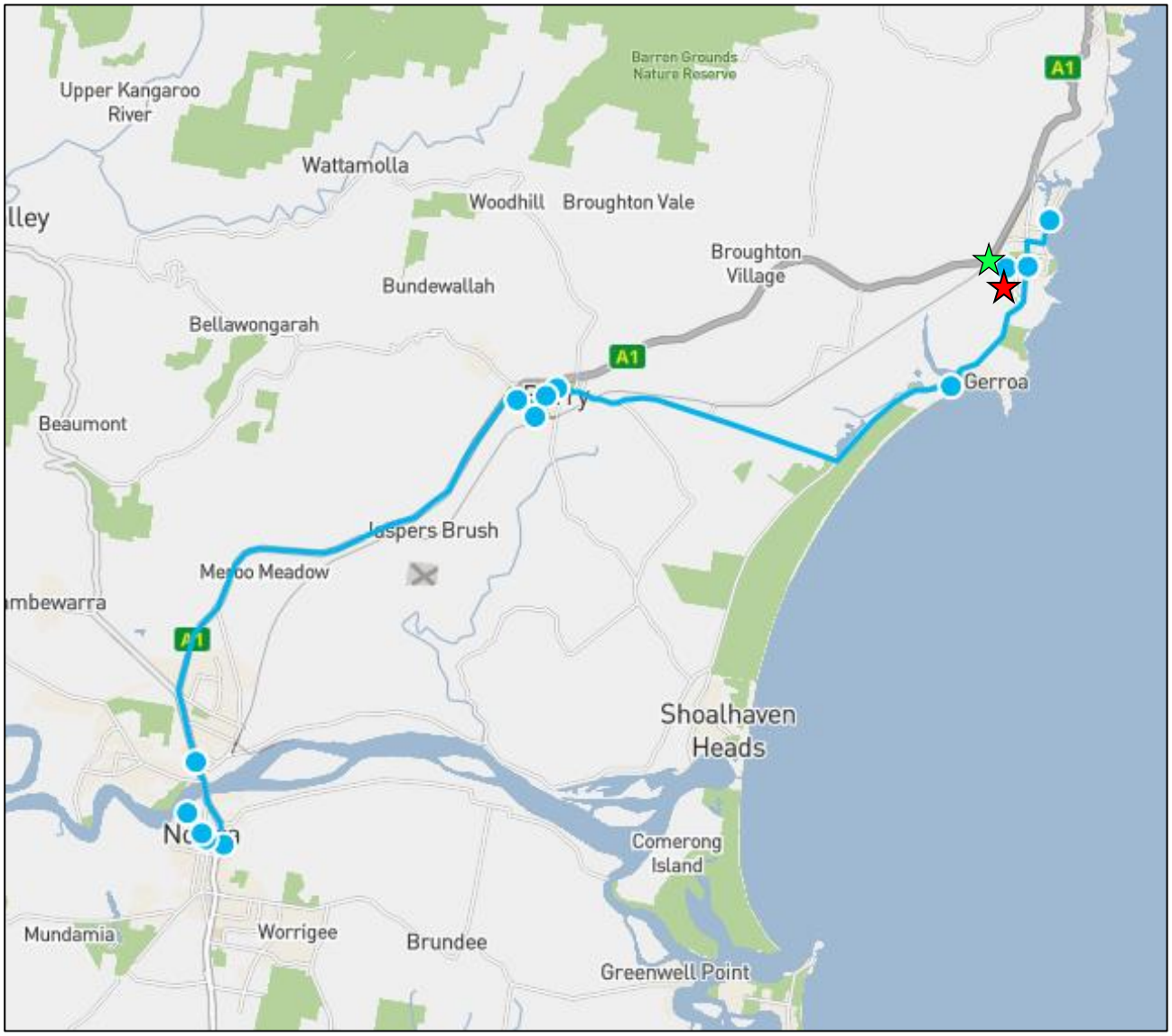
The nearest bus stop from the site (ID: 253442) is located approximately 600m walking distance to the north of the site on Belinda Street. This bus stop services existing bus routes 126 (Gerroa to Kiama via Gerringong) provided by Kiama Coachlines, and 130 (Gerringong to Nowra) provided by Shoal Bus.

The location of the site subject to the surrounding public transport network is shown in **Figure 5** and **Figure 6**.



Site Location Gerringong Train Station

FIGURE 5: ROUTE 126 MAP



Site Location Gerringong Train Station

FIGURE 6: ROUTE 130 MAP

2.5 Future Road and Infrastructure Upgrades

From Kiama Municipal Council's Development Application tracker and website, it appears that there are no future planned road or public transport changes that will affect traffic conditions within the immediate vicinity of the subject site.

3 SUBDIVISION DESIGN CONSIDERATIONS

3.1 Street Design Standards

Reference is made to the Kiama Municipal Council's *Development Control Plan 2012, Chapter 7- Subdivision* which provides the recommended design principles for residential subdivisions as depicted in **Table 3** below.

TABLE 3: KIAMA MUNICIPAL COUNCIL ROAD CLASSIFICATION AND STANDARDS

Road Type	Traffic Volume[1] (vpd)	Road Reserve Width[3][4] (m)	Minimum Carriageway width[4] (m)	Parking provision in Road reserve	Footpath requirement	Shared Path requirement[6]
Access Place[7]	<100	10.5m (3.5m verges[8])	3.5m	1 hardstand verge space per 2 dwellings	No	No
Access Street	<300	13.5m (3.5m verges[8])	6.5m	Carriage way[9]	No	No
Access Road	301 - 1000	15m (3.5m verges[8])	8m	Carriage way[9]	1.2m wide one side[10]	No
Minor Collector	1001 - 3000	16.5m (3.5m verges[8])	9.5m	Carriage way	1.2m wide one side away from kerb[10]	Provide within street pavement[11]
Major Collector[12]	3001-6000	Minimum 18.5m (minimum 3.5m verges)	11.5m	Carriage way	1.2m wide one side away from kerb	2.5m wide along one side
Sub-Arterial[14]	>6000	Design using road performance criteria & guides i.e. Austroads, RMS standards etc[15]				

COUNCIL NOTES:

(1) For single dwelling allotments apply a traffic generation rate of 10 vehicles per day. For multi-unit dwellings apply a traffic generation rate of 6 vpd or a rate based on local data. Peak hour traffic volume is assumed at 10% of Annual Average Daily Traffic. Where lots have the potential for re-subdivision and/or dual occupancy, such potential shall be taken into account when estimating AADT
(2) Streets are to be designed to achieve the target speed and sight distance to accord with design speed.
(3) The carriageway width must make provision for service vehicles to manoeuvre. Widening is required at bends to allow for wider vehicle paths (using AUSTROADS Turning Templates). The provision of NSW Rural Fire Service publication "Planning For Bushfire Protection" guidelines must also be met and will take precedence.
(4) Each verge must be sufficient to residential dwellings which satisfies prescribed, landscaping and to ensure a total setback to residential dwellings which satisfies prescribed traffic noise exposure levels at the façade.
(5) The minimum street reserve widths apply after satisfying the other criteria within this table and other site-specific requirements.
(6) A shared path is required if the street is part of a dedicated off road cycle route.
(7) Maximum length is 100 m. A passing bay is required if the length is greater than 80m.
(8) Where an Access Place or Access Street is adjacent to public open space on rural zoned land, the verge adjacent to the open space or rural land may be reduced to 1m.
(9) Lot layouts shall be designed to ensure staggered on-street parking in order to present a clear travel lane with passing opportunities.
(10) Footpaths are to be provided on both sides of streets serving as bus routes.
(11) Refer to AUSTROADS guidelines
(12) Painted centreline and edge lines are required to define carriageway lanes
(13) Reduced speed environments is required at designated pedestrian and shared crossing points.
(14) Direct vehicle access to lots not permitted.
(15) An acoustic assessment is required to assess the need for wider verges and/or acoustic barriers.

Whilst detailed design of the internal road network has not been developed at this planning proposal stage, the internal subdivision roads of any future subdivision on the site shall give consideration to Council's *DCP*. This can be detailed further at the Development Application stage for any subdivision on the site.

3.2 External Road Access

As part of the subject planning proposal, there are numerous locations where vehicular access to the surrounding road network is possible, which are assessed in the following subsections.

3.2.1 Southern Access to Fern Street

As outlined within *The Gerringong Charrette – A Detailed Report*, published in June 1995 an additional southern access link is proposed with Fern Street, at a location identified in Linkage Plan as extracted in **Figure 7** below.

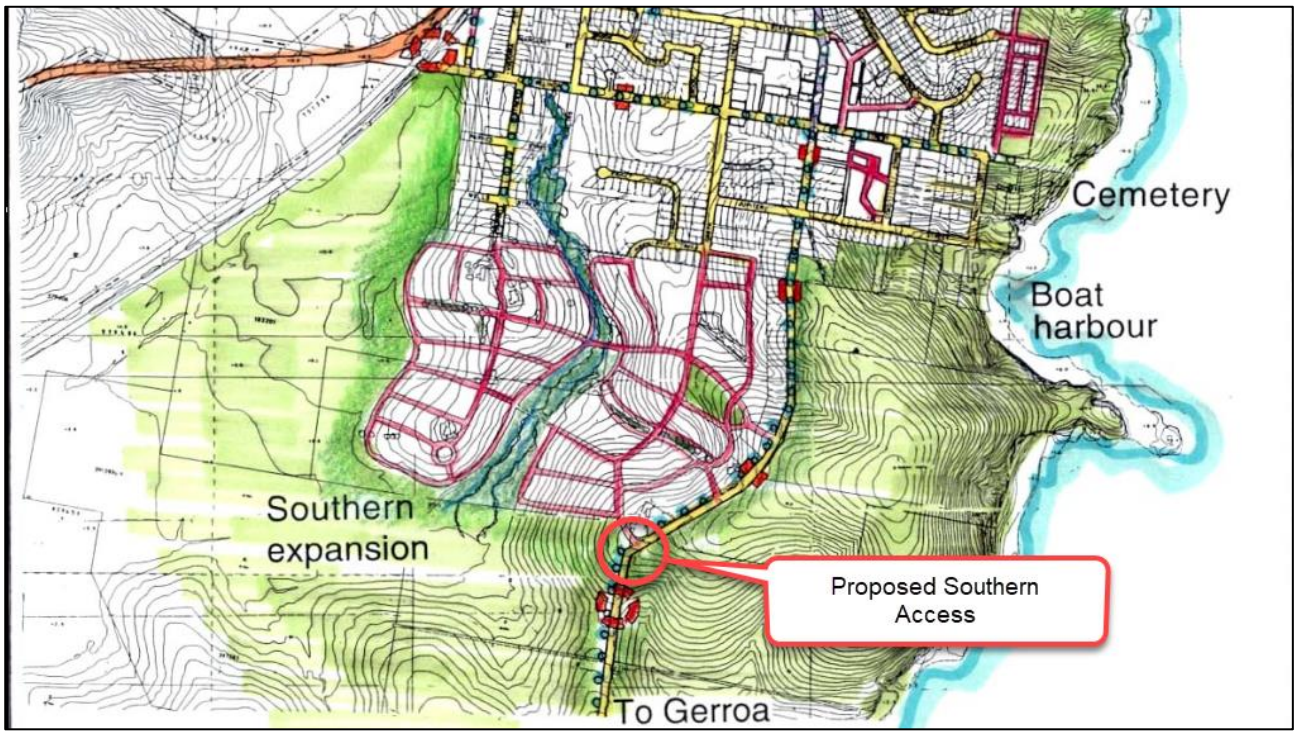


FIGURE 7: LINKAGE PLAN EXTRACT FROM GERRINGONG CHARRETTE (1995)

This southern access intersection, if needed, would take the form of a roundabout providing access to the Elambra West Urban Release Area. This possible intersection location is on a large sweeping bend with an approximately 170m radius and with grades along the curves outside edge ranging from 2.3% to 5.9%. These grades reduce in severity on approach to the current residential edge of Gerringong, adjacent to Nile Close.

The current signposted speed limit of Fern Street at this location is 80km/h, reducing to 50km/h on approach to the Elambra Parade/Fern Street intersection to the north-east. Fern Street is a Classified Regional Main Road (No. 571) and as such concurrence with the NSW Roads and Maritime Service (RMS) is required for any works within the road reserve of Fern Street.

Reference is made to Kiama Municipal Council's *Development Design Specification D1 – Geometric Road Design (Urban and Rural)* which states the following roundabout design requirements:

> *D1.17 INTERSECTIONS*
>
> *2. Intersection design for the junction of subdivision roads with existing main rural, main urban and state highways should generally be designed in accordance with the publication AUSTROADS Guide to Traffic Management Part 6 and Guide to Road Design Parts 4, 4A, 4B and 4C*
>
> *3. Intersections with main roads, tourist roads or state highways are to be designed and constructed in accordance with the requirements of the Roads and Maritime Services and Council.*
>
> *D1.18 ROUNDABOUTS*
>
> *1. Roundabouts are to be approved by the Council.*
>
> *2. Roundabouts shall be designed in accordance with the requirements of the publication AUSTROADS Guide to Traffic Management - Part 6 and Guide to Road Design - Part 4B and current RMS Guidelines. Roundabout design should generally comply with the following:*
>
> > *a. entry width to provide adequate capacity.*
> >
> > *b. adequate circulation width, compatible with the entry widths and design vehicles e.g. buses, trucks, cars.*
> >
> > *c. central islands of diameter sufficient only to give drivers guidance on the manoeuvres expected.*
> >
> > *d. deflection of the traffic to the left on entry to promote gyratory movement.*
> >
> > *e. adequate deflection of crossing movements to ensure low traffic speeds.*
> >
> > *f. a simple, clear and conspicuous layout.*
> >
> > *g. design to ensure that the speed of all vehicles approaching the intersection will be less than 50 km/h.*

At the strategic masterplan stage, it is important to consider these design requirements and consider the feasibility of any intersection facilities that a rezoned site might rely upon.

The foremost design constraint with respect to this site and the requirements of the *Austroads Guide to Road Design Part 4B – Roundabouts* is achieving both compliant and safe intersection grades, including acceptable approach grades.

With respect to roundabouts on sloping topography the Austroads Guide outlines in *Section 4.10* in *Part 4B – Roundabouts* the following requirements:

- *"For roundabouts with a central island radius less than 10m, grades and hence crossfalls on the circulating carriageway should not exceed 5%."*
- *"On circulating carriageways with varying crossfall, the superelevation should stay within the range of +/- 4. Grades on the circulating roadway greater than 4% should be avoided."*
- *"Where the general slope of the land is greater than 4%, it will be necessary to 'bench' the area for the roundabout, using a maximum grade of 3% with an absolute maximum grade of 4%."*
- *"Generally, it is desirable that the gradient on approaches to the roundabouts be limited to 3% to 4% and should not exceed 6%."*
- *"While the gradient may extend along part of the length of the entry curve it is essential that:"*
    - *"On an uphill approach a flat area (say 2-3% maximum) is provided on the immediate approach to the roundabout to accommodate the length of one design vehicle. This flat area will assist heavy vehicles to start up and move into gaps, ensure that capacity is not unduly compromised, and also assist with respect to sight distance (Section 4.10.2)."*
    - *"On a downhill approach a sag curve will be required to match the higher gradient to a 3% positive superelevation on the roundabout (Section 4.10.2)."*

The results of onsite grade measurements taken at 10m intervals along the outside edge of Fern street are provided in **Figure 8** below and in **Annexure E.** Considering the observed on-site gradients and extrapolation of those grades to the edge of the existing available road reserve, it is likely that significant earthworks would be required to facilitate a roundabout that meets the Austroads guidelines.

Additionally, the design of appropriate entry and exit radii, circulation widths and island diameters will be restricted by the limited road reserve available. This could be addressed through land acquisition, but this could potentially be a costly and difficult process.

Other intersection treatments, such as a priority give-way or stop controlled intersections are also not feasible due to limited sightlines caused by the vertical and horizontal curvature of the Fern Street at this location. The intersection would not meet the warrant requirements for a signalised intersection.

Finally, providing this southern access will provide a shorter and likely more convenient route between the Princess Highway and Crooked River Road, which provides access to the popular tourist town of Shoalhaven Heads. It is likely that such a connection at the southern side of the proposed subdivision will provide a shorter route for through traffic passing from the Princess Highway to/from Gerroa and Shoalhaven Heads, which is likely to be significant especially during school holiday periods. Connecting Fern Street at the proposed new southern connection to Campbell Street in the north, is predicted to induce passer-by through traffic within the subdivision which is undesirable for this proposal.

FIGURE 8: FERN STREET GRADE OBSERVATIONS

Considering the restrictions caused by the sloping topography and the limited existing road reserve, the construction of a new roundabout at this location would be difficult and is not considered a feasible option for the Elambra West Urban Release Area.

Additionally, as discussed in **Section 5** below, the proposed southern access is only expected to accommodate 10% of the subdivisions total traffic generation, representing only 24 movements in the AM and 25 movements in the PM peak hours. With such low intersection utilisation, this southern access is unnecessary and the traffic that would otherwise have utilised this intersection can be easily accommodated through other road access options for the Elambra West Estate.

3.2.2 Campbell Street/Belinda Street Intersection

The northern access to the subdivision will be through the Campbell Street/Belinda Street intersection and due to its proximity to the Belinda Street/Princess Highway interchange it is expected to accommodate approximately 70% of the traffic generation of the residential subdivision during the AM and PM peak hours. The Princess Highway provides easy access to regional employment areas such as Nowra, Kiama, Port Kembla, Shellharbour and Wollongong.

Section 5 of this report discusses in further detail the performance of this intersection under the proposed development in terms of traffic impact. The intersection has been found to have a good level of service, which is characterised by low approach delays and additional spare capacity, even in after 10-years of conservative growth.

The existing Campbell Street/Belinda Street intersection is situated just to the east of a crest that occurs along Belinda Street and as such a detailed sight line assessment has been undertaken, which includes speed volume surveys and detailed surveyed long sections within Belinda Street to determine if the appropriate Stopping Sight Distance (SSD), Safe Intersection Sight Distance (SISD) and Minimum Gap Sight Distance (MGSD) is achieved by the existing layout of the intersection of Campbell Street / Belinda Street. The full detailed assessment is reproduced in **Annexure F** for reference, with a summary of the results outlined below.

The available sight lines at the intersection of Campbell Street / Belinda Street have been assessed against the relevant requirements for a 54.1km/h 85th percentile speed. The SSD, SISD and MGSD are non-compliant for a 54.1km/h 85th percentile speed limit. A summary of the findings is shown in **Table 4** below.

TABLE 4: SUMMARY OF FINDINGS

	Sightline Requirement		Compliance achieved at		Distance Shortfall (m)
	Required Distance (m)	85th Percentile Speed (km/h)	Available Sightline Distance (m)	Speed (km/h)	
SSD	58.0	54.1	54.1	51.6	-3.9
SISD	102.6	54.1	85.2	46.7	-17.4
MGSD	75.1	54.1	68.3	49.2	-6.8

As shown above, compliance with SSD, SISD and MGSD requirements can be achieved through a reduction in the 85th percentile speed to at least 46.7km/h.

To strictly achieve the required SSD, SISD and MGSD road speeds would have to be reduced through the implementation of traffic calming devices such as lateral displacement devices to slow vehicle speeds. If a lateral displacement device were located in the eastbound traffic lane it could be located between the refuge and driveway of 23 Belinda Street, so to not block access to residential driveways. If both traffic lanes (eastbound and westbound) were provided with a lateral displacement device to slow vehicles (which is typically adopted), it would have to be located at the existing refuge within Belinda Street. This is required to ensure that sight lines for vehicles travelling westbound can comply with SSD to the lateral displacement device.

An alternative solution to the above would be to modify the road grades slightly to achieve the compliant sight line requirements or a combination of both traffic calming devices and modifications to road grades.

It should be noted that the standard approach taken to determining SSD, SISD and MGSD is already a conservative approach, with the 15th percentile driver height of 1.1m and the 15th percentile vehicle height of 1.45m applied to determine available sightlines, meaning that 85 percent of drivers and vehicles fall above the assessed threshold. Only a minor increase in either driver height or vehicle height (as would be experienced for the large majority of drivers and vehicles) would result in the required sightlines being achieved for the intersection of Belinda Street / Campbell Street.

These strict sight line non-compliances which are minor in their extent are typical of some existing intersections and can generally be rectified without major works being undertaken, with the installation of additional intersection signage (w2-4_r - Side Road Intersection on Straight) to inform drivers of the upcoming intersection and even implementation of "*Stop"* signage, which is currently implemented at Campbells Street connection to Belinda Street.

3.2.3 Saxonia Road Connection

An possible alternative road connection to the southern roundabout connection at Fern Street is a road connection to the existing Saxonia Road at Millewa Avenue. By providing a connection to Saxonia Road, vehicles will be able to travel to/from the Saxonia Road/Elambra Parade intersection to access the southern areas of the proposed subdivision.

Currently, a 1m wide council owned strip of land, that is legally identified as Lot 747 of DP1171578, runs directly parallel to the edge of Millewa Avenue restricting direct access to Saxonia Road. In order to gain access to Saxonia Road, arrangements must be made to purchase the required segment of this land in order to build a road connection to Saxonia Road, which will require consultation with the Kiama Municipal Council.

Including a direct connection to Saxonia Road within the subdivision would provide benefits to the convenience of residents within the southern segments of the Elambra West Estate. Despite this, it is not considered absolutely necessary from a traffic network perspective, as access to the subdivision can be accommodated through the other alternative access

options, especially considering the low traffic volumes expected to use this access connection.

3.3 NSW RFS – "Planning for Bushfire Protection"

The site has not been identified by the NSW Rural Fire Service as bushfire prone land and as such is not required to meet the objectives of the *NSW RFS Planning for Bushfire Protection.*

3.4 Cycling and Pedestrian Facility Requirements

For the internal road network, pedestrian paths and cycling facilities are to be provided within the road reserve in accordance with the Kiama Municipal Council's recommended design principles for residential subdivisions as detailed previously in **Table 3**.

The *Kiama Cycleway Plan* was adopted in 2005 by the Kiama Municipal Council and was further updated in 2008 with revised maps of the cycling network. **Figure 9** below provides an extract of the existing and proposed bicycle paths for the Gerringong area.

The 2011 *Kiama Cycleway Routes* brochure illustrates additional local cycling routes, including within the existing Elambra Estate subdivision, with an extract provided below in **Figure 10.**

The proximity of the site to these existing cycling routes will enable easy connections to be established through either formed paths or on-street cycle lanes to the existing cycling network at both Fern Street and Union Way.

3.5 Servicing & Loading

3.5.1 Public Transport

It is noted that whilst the subject site is within a reasonable walking distance of Gerringong Train Station, the closest bus stop is located approximately 600m from the northern subdivision boundary, as detailed in **Section 2.4**. Reference is made to the *Roads and Maritime Services* (RMS) *Guide to Traffic Generating Developments October 2002* (Guide)*, Section 4.6* which specifies the following requirements regarding public transport accessibility for urban residential subdivisions:

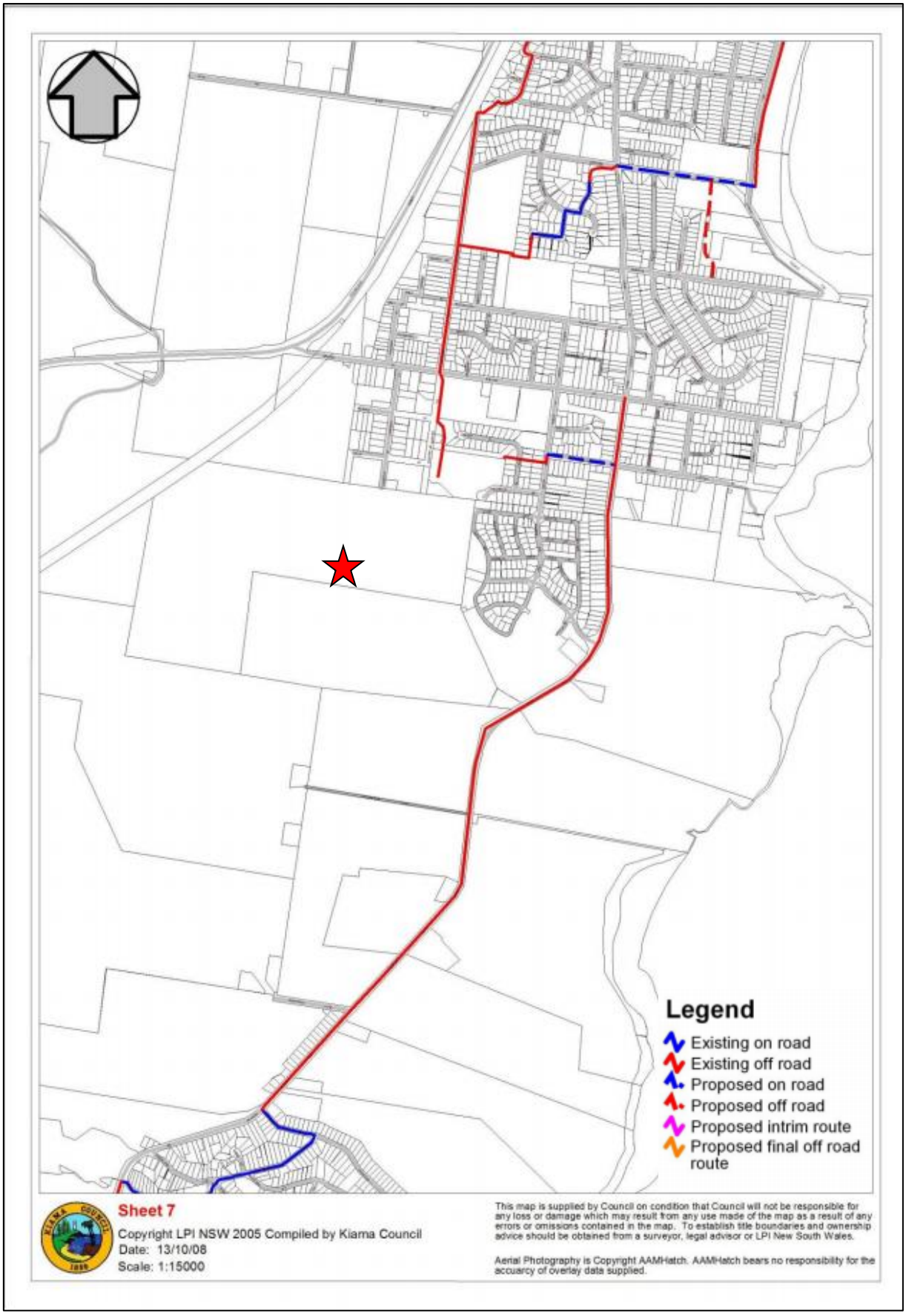
> *Subdivisions should ideally have at least two entrances to the major road network, to avoid circuitous bus routing. At least 90% of dwellings are to be within 400 metres safe walking distance from an existing or potential bus route, and not more than 500 metres from the nearest stop or potential stop.*

The proposed subdivision is residential, and it is therefore recommended that consultation with the local bus operators be undertaken to improve public transport accessibility. Bus routes 126 and 130, which service the closest bus stop to the subject site could be extended into the subdivision if supported by and arising from consultation with the local bus operators.

The increase in residents within the precinct may warrant the extension of these bus services to the area.

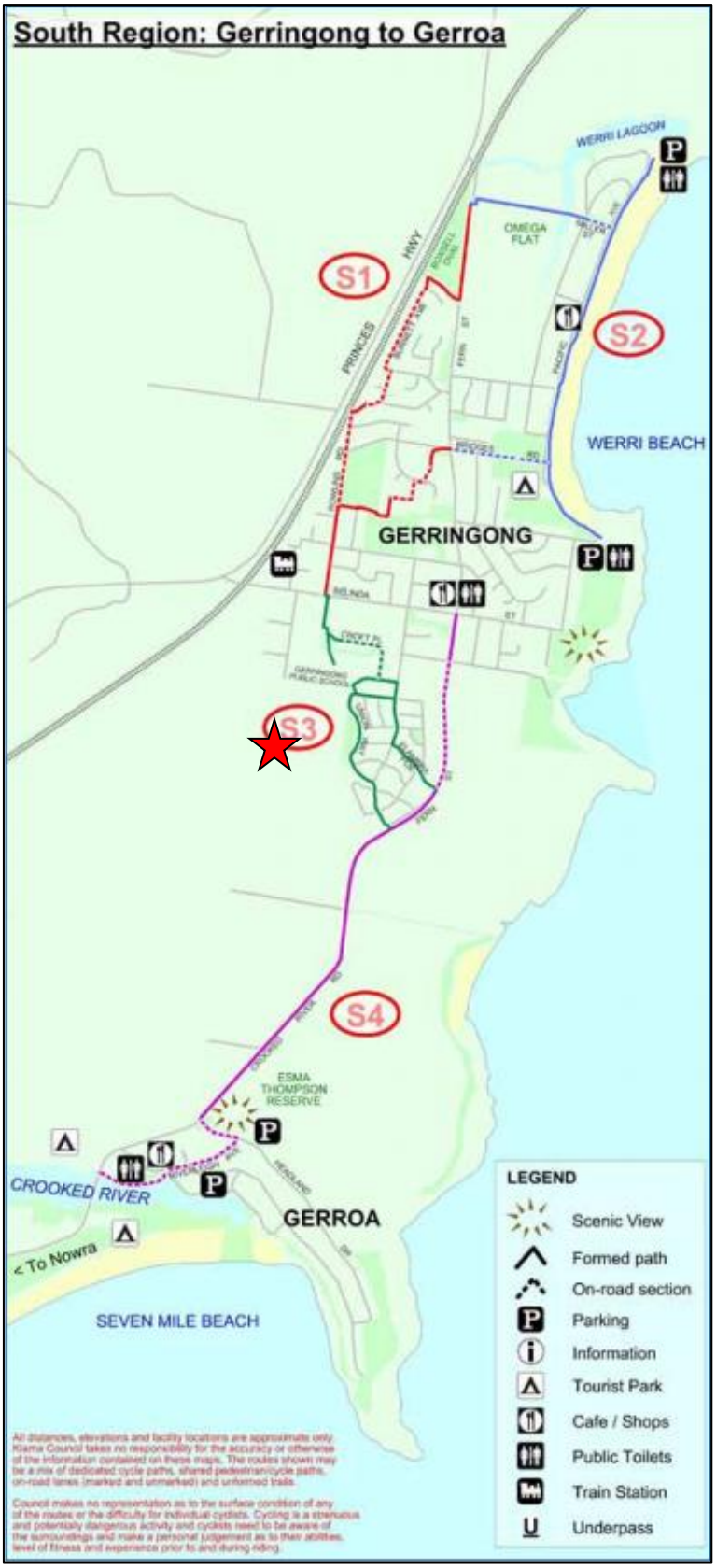
3.5.2 Servicing/ Deliveries

If the development of the indicative masterplan is approved, the detailed design of all roads in the subdivision give consideration Kiama Municipal Council's *Development Control Plan 2012, Chapter 7– Subdivision*. Road designs will include allowance for waste collection vehicles such as weekly garbage collection. It is expected that all loading and servicing (including garbage collection) will be conducted on-street.



Site Location

FIGURE 9: 2008 KIAMA CYCLEWAY PLAN MAP



Site Location

FIGURE 10: 2011 KIAMA CYCLEWAY ROUTES

4 PARKING ASSESSMENT

4.1 DCP Car Parking Requirement

Reference is made to Kiama Municipal Council's *Development Control Plan 2012 Chapter 9 – Carparking Requirements* which designates the following parking requirements applicable to the masterplan subdivision:

> *Residential*
>
> > *Dwelling house - 1 dedicated space behind the building line and 1 space behind the front boundary.*
> >
> > *Dual occupancy/attached dwelling - For each occupancy, 1 dedicated space behind the building line and 1 space behind the front boundary.*
> >
> > *Secondary dwelling - 1 space behind the front boundary for the secondary dwelling.*

The street design of any subdivision on the site shall allow for adequate sight lines to be achieved from all lots and for compliant driveway locations. It will be a requirement at DA and CC stage that each lot be checked for compliance with parking provision and driveway location requirements.

It is expected that the final masterplan design will be such that each lot is provided with a suitable location for a driveway and can meet the required car parking provision.

4.2 Car Park Design & Compliance

If the planning proposal were to be approved, the driveway access and on-site parking areas of any development on the site would be required to comply with the relevant clauses and objectives of *AS2890.1:2004*. If approved, it would be a requirement at DA and CC stage that each lot be checked for compliance with parking provision and driveway location requirements. In essence however, the masterplan lots would generally be able to accommodate suitable driveway locations and suitable car parking provision on each individual site.

5 TRAFFIC ASSESSMENT

Given the potential issues with construction of a roundabout intersection of an unnamed road with Fern Street, as outlined previously in **Section 3.2**, three different traffic scenarios for the subject planning proposal will be assessed:

- **Scenario 1:** Including the new roundabout intersection of Fern Street/Unnamed Road included, located approximately 500m south of the existing Fern Street/Elambra Parade intersection, and;
- **Scenario 2:** Without the development of the new roundabout on Fern Street (as identified in Scenario 1). No alternative southern access provided, and;
- **Scenario 3:** Without the development of the new roundabout on Fern Street (as identified in Scenario 1). In lieu of this, an alternative southern access is provided to the subdivision via Saxonia Road at the intersection of Saxonia Road/Millewa Avenue.

Figure 11, Figure 12 and **Figure 13** below outline the access points accessed under each scenario.

The impact of the expected traffic generation levels associated with the subject proposal is discussed in the following sub-sections.

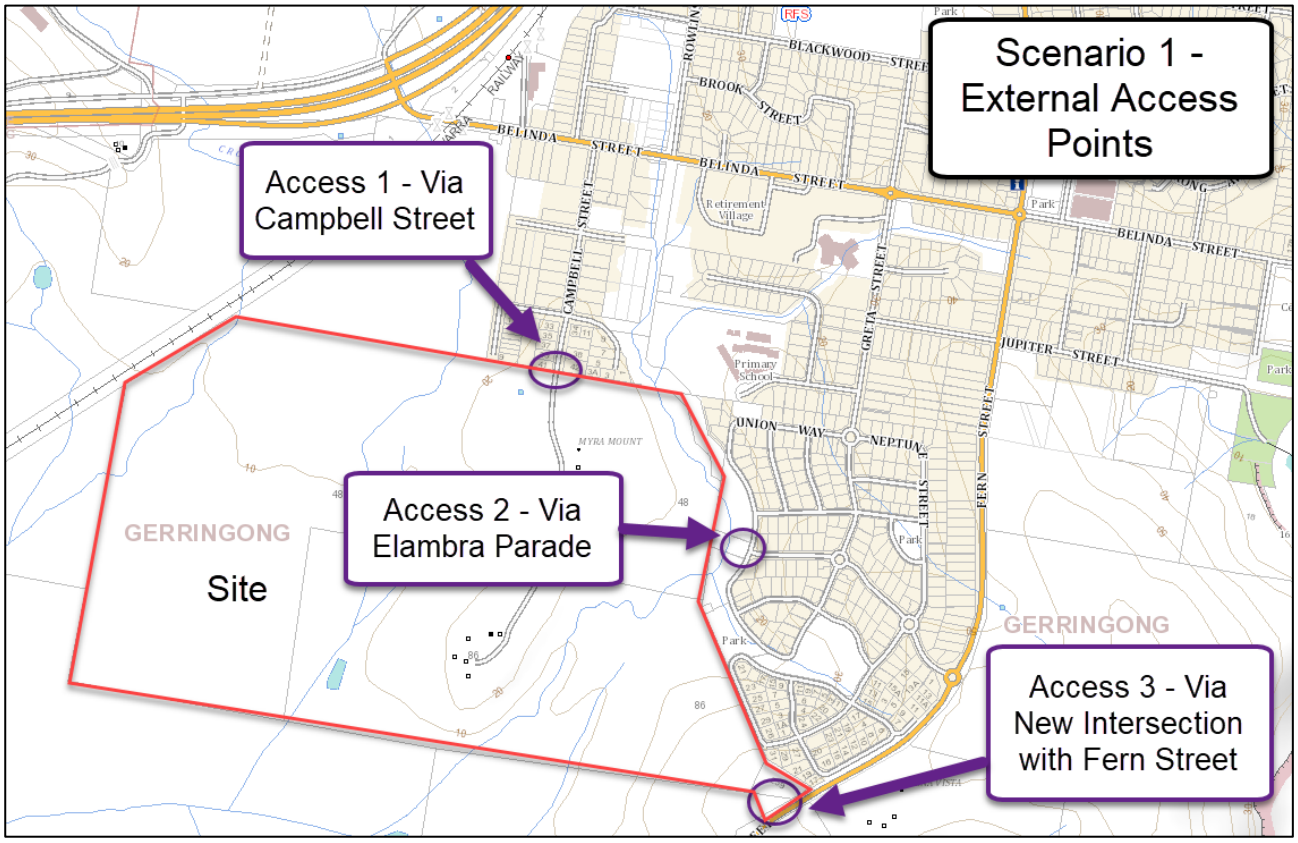


FIGURE 11: SCENARIO 1 ACCESS POINTS

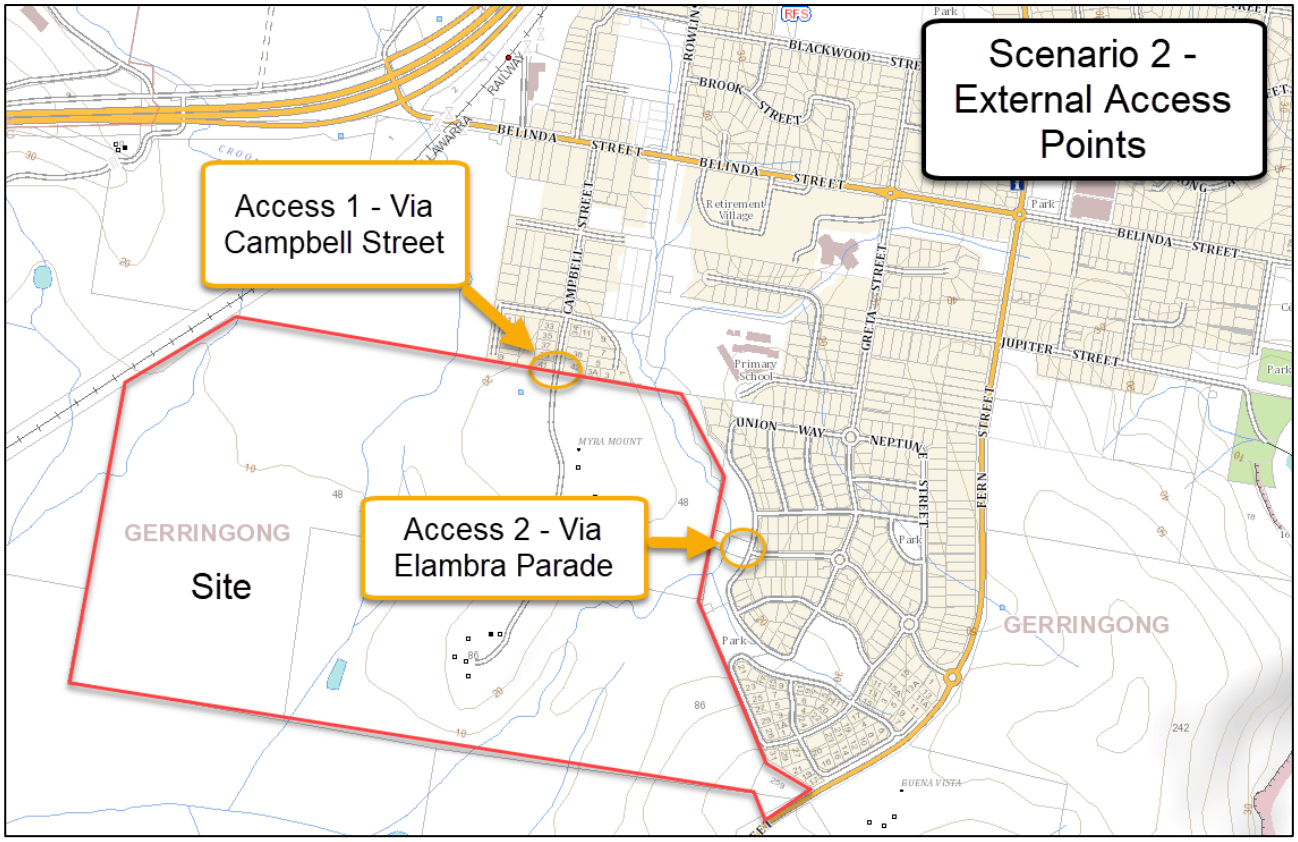


FIGURE 12: SCENARIO 2 ACCESS POINTS

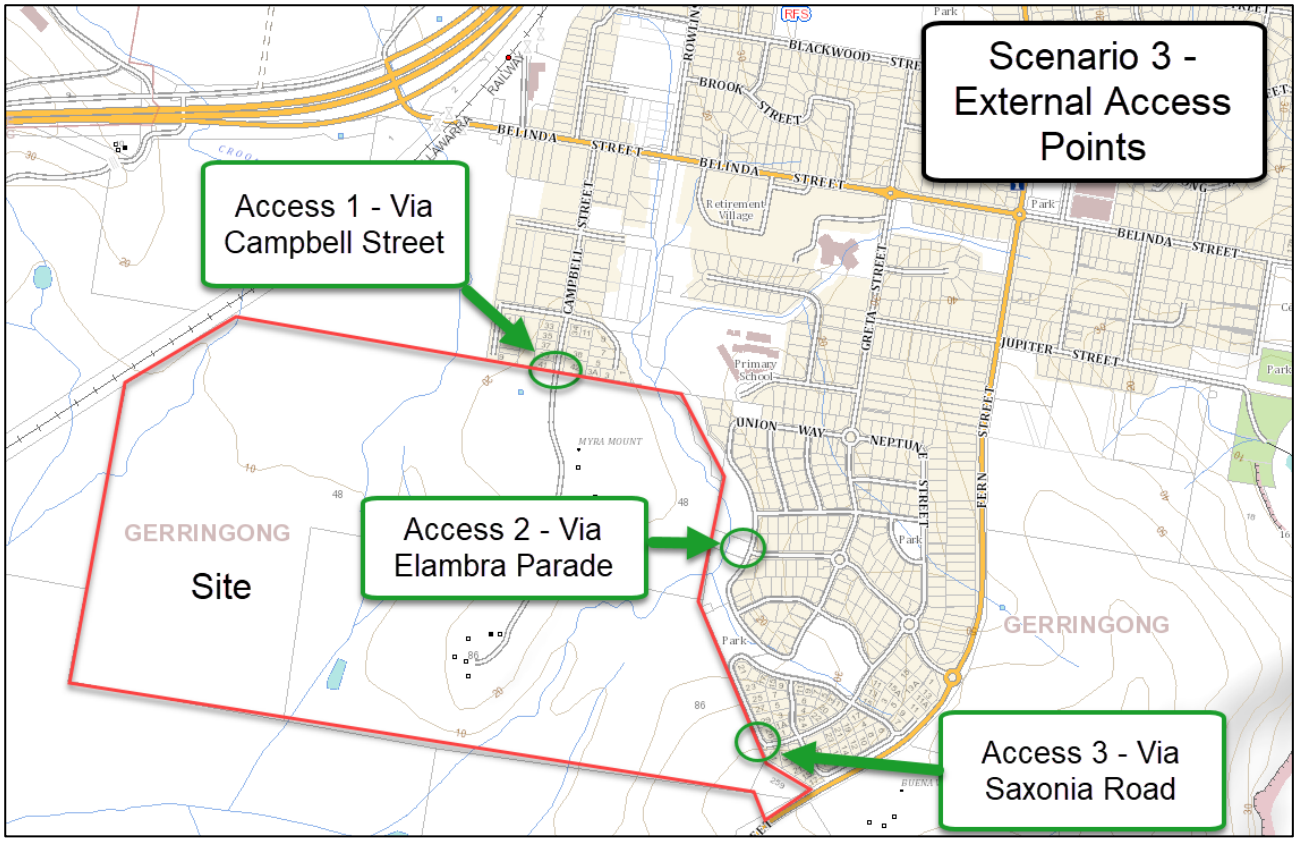


FIGURE 13: SCENARIO 3 ACCESS POINTS

5.1 Traffic Generation

The traffic generation of the indicative masterplan has been estimated based upon the most recent RMS published data for low-density residential dwellings, being the RMS *TDT 2013/04a* (an update to the *Guide to Traffic Generating Developments October 2002*), which provides the following rates:

> ***TDT 2013/04a***
>
> ***Low density residential dwellings***
>
> *Weekday average evening peak hour vehicle trips = 0.78 per dwelling in regional areas (maximum 0.90).*
>
> *Weekday average morning peak hour vehicle trips = 0.71 per dwelling in regional areas (maximum 0.85).*

The resulting traffic generation is summarised in **Table 5**.

TABLE 5: ESTIMATED TRAFFIC GENERATION

Scale	Period	Rate	Total Volume	Direction(1)
326 dwellings	AM Peak	0.71 per dwelling	231	46 in; 185 out
	PM Peak	0.78 per dwelling	254	203 in; 51 out
	Daily	7.4 per dwelling	2,412	NA

NOTES:

(1) Assumed traffic distribution of 20% inbound / 80% outbound in the AM peak period. Vice versa for PM peak

(2) Scale is based upon the initial concept plan i.e. 326 dwellings, rather than the updated structure plan in Annexure A

As shown in **Table 5**, it is expected that the peak traffic generation of the indicative masterplan is in the order of 231 trips (46 in; 185 out) in the AM peak hourly period, and 254 trips (203 in; 51 out) in the PM peak hourly period.

5.2 Traffic Assignment

The road network and the locations of residential areas and towns surrounding the site have been assessed and the following traffic assignment has been assumed for all traffic to and from the dwellings within the indicative masterplan for each scenario:

- 50% to/from the North via the Belinda Street/Princes Highway interchange
    - 50% to/from Campbell Street
- 20% to/from the North via the Fern Street/Princes Highway interchange
    - 10% to/from Greta Street
    - 5% to/from Campbell Street
    - 5% to/from Elambra Parade
- 15% to/from the South via Crooked River Road (Fern Street)
    - Scenario 1:
        - 10% to/from a new Fern Street Intersection
        - 5% to/from Elambra Parade
    - Scenario 2:
        - 15% to/from Elambra Parade
    - Scenario 3:
        - 10% to/from Elambra Parade
        - 5% to/from Elambra Parade via Saxonia Road
- 15% to/from the South via Princes Highway
    - 15% to/from Campbell Street

5.3 Traffic Impact

The traffic generation and distribution outlined in **Section 5.1 & 5.2** above has been added to the existing traffic volumes estimated in **Section 2.3**. SIDRA INTERSECTION 8.0 was used to assess the intersections performance. The purpose of this assessment is to compare the existing intersection operations to the future scenario both in 2019 and 2029 under the increased traffic load.

5.3.1 Scenario 1

The performance of each intersection in both 2019 and 2029 (following 10-year growth) with the impact of the subdivisions indicative traffic generation has been summarised in **Table 6** below.

Following the proposed development, the 2019 and the 2029 operation of the Greta Street/Belinda Street and Fern Street/Elambra Parade intersections retain their Level of Service of “A” in both the AM and PM peaks. This is the best possible performance outcome for these intersections.

For Campbell Street/Belinda Street intersection the worst movement performance of the intersection in 2019 is the right turn from Campbell Street to Belinda Street which still operates under a Level of Service “B” during the PM peak. The increase in average delay for this right turn movement, when compared to the intersections existing operation, is only 2.8 seconds, which is a relatively minor increase.

The 2029 future performance of the Campbell Street/Belinda Street intersection has a worst movement performance, again being the right turn from Campbell Street to Belinda Street operating with a Level of Service “B” during both the AM and PM peaks. The increase in average delays experienced by this movement is only 1.5 seconds in the AM and 3.5 seconds in the PM, which is a relatively minor increase in average delay from the intersections existing operation.

The new roundabout of Fern Street/Unnamed Road would operate in both 2019 and 2029 with a Level of Service “A”.

All intersections assessed under Scenario 1 operate at a Level of Service of either “A” or “B”, this level of performance indicates a good level of service, which is characterised by low approach delays and additional spare capacity.

TABLE 6: FUTURE INTERSECTION PERFORMANCES – SCENARIO 1

Intersection	Peak Hour	Degree of Saturation[1]	Average Delay[2] (sec/veh)	Level of Service[3]	Control Type	Worst Movement	95th Percentile Queue
2019 FUTURE PERFORMANCE – With Development Scenario 1							
Campbell Street / Belinda Street	AM	0.20	3.1 (Worst: 13.1)	**NA** (Worst: A)	Stop	RT from Campbell Street	0.8 veh (5.8m) Campbell Street
	PM	0.18	2.5 (Worst: 16.2)	**NA** (Worst: B)		RT from Campbell Street	0.6 veh (3.9m) Belinda Street
Greta Street / Belinda Street	AM	0.22	6.6 (Worst: 10.2)	**A** (Worst: A)	Roundabout	UT from Belinda Street	1.3 veh (9.1m) Greta Street
	PM	0.24	6.4 (Worst: 11.2)	**A** (Worst: A)		UT from Greta Street	1.5 veh (10.6m) Belinda Street
Fern Street / Elambra Parade	AM	0.14	5.2 (Worst: 11.1)	**A** (Worst: A)	Roundabout	UT from Elambra Parade	0.8 veh (5.4m) Fern Street
	PM	0.26	5.2 (Worst: 10.5)	**A** (Worst: A)		UT from Fern Street	1.6 veh (11.7m) Fern Street
Fern Street / Unnamed Street	AM	0.17	7.6 (Worst: 11.8)	**A** (Worst: A)	Roundabout	UT from Unnamed Street	1 veh (7.1m) Fern Street
	PM	0.21	7.6 (Worst: 12.2)	**A** (Worst: A)		UT from Unnamed Street	1.3 veh (9.3m) Fern Street
2029 GROWTH PERFORMANCE – With Development Scenario 1							
Campbell Street / Belinda Street	AM	0.22	2.9 (Worst: 14.8)	**NA** (Worst: B)	Stop	RT from Campbell Street	0.9 veh (6.3m) Campbell Street
	PM	0.21	2.4 (Worst: 19)	**NA** (Worst: B)		RT from Campbell Street	0.6 veh (4.1m) Belinda Street
Greta Street / Belinda Street	AM	0.23	6.6 (Worst: 10.2)	**A** (Worst: A)	Roundabout	UT from Belinda Street	1.4 veh (9.8m) Belinda Street
	PM	0.27	6.4 (Worst: 11.4)	**A** (Worst: A)		UT from Greta Street	1.7 veh (12.4m) Belinda Street
Fern Street / Elambra Parade	AM	0.17	5.2 (Worst: 11.2)	**A** (Worst: A)	Roundabout	UT from Elambra Parade	0.9 veh (6.5m) Fern Street
	PM	0.30	5.1 (Worst: 10.5)	**A** (Worst: A)		UT from Fern Street	2 veh (14.5m) Fern Street
Fern Street / Unnamed Street	AM	0.20	7.6 (Worst: 12)	**A** (Worst: A)	Roundabout	UT from Unnamed Street	1.2 veh (8.7m) Fern Street
	PM	0.25	7.7 (Worst: 12.5)	**A** (Worst: A)		UT from Unnamed Street	1.6 veh (11.6m) Fern Street

Note: For **Table 6**, please also refer to the notes also provided in association with **Table 1.** Scenario 1 has been analysed using SIDRA Intersection 8.0.

5.3.2 Scenario 2

For Scenario 2, the additional Fern Street/Unnamed Road intersection is not included within the model. Instead, all traffic looking to head south towards Crooked River Road utilises the existing Fern Street/Elambra Parade intersection, via a subdivision connection at the intersection of Union Way/Elambra Parade. The results of the Scenario 2 assessment are provided below in **Table 7.**

Due to the nature of Scenario 2, there is no change in traffic distribution of the development accessing the Campbell Street/Belinda Street and Greta Street/Belinda Street intersections. As such the performance of these two intersections under Scenario 2, is the same under Scenario 1, whereby both intersections operate at a Level of Service of either “A” or “B”. This level of performance indicates a good level of service, which is characterised by low approach delays and additional spare capacity.

The intersection of Fern Street/Elambra Parade operates under Scenario 2 at a Level of Service “A” in both 2019 and in 2029 (following 10-year growth), representing low approach delays and additional spare capacity. When compared to the 2029 operation of this intersection under Scenario 1, the only change is a minor 0.1 second increase in average delay during both the AM and PM peak hours. The Fern Street/Elambra Parade intersection under both Scenario 1 and Scenario 2 operates under a Level of Service of “A”.

5.3.3 Scenario 3

For Scenario 3, the additional Fern Street/Unnamed Road intersection is not included within the model. Instead, all traffic looking to head south towards Crooked River Road utilising the existing Fern Street/Elambra Parade intersection, via two subdivision connections at either the intersection of Union Way/Elambra Parade or a second connection at the intersection of Millewa Avenue/Saxonia Road.

As such there is no change to the traffic distribution of the proposed subdivision, when compared to Scenario 2, that will impact the critical intersections modelled within this analysis. The results of the Scenario 3 assessment are provided below in **Table 7** and are the same as the results of the Scenario 2 assessment.

The intersection of Fern Street / Elambra Parade operates at a Level of Service “A” in both 2019 and in 2029 (following 10-year growth), representing low approach delays and additional spare capacity. When compared to the 2029 operation of this intersection under Scenario 1, the only change is a minor 0.1 second increase in average delay during both the AM and PM peak hours. The Fern Street / Elambra Parade intersection under both Scenario 1 and Scenario 3 operates under a Level of Service of “A”.

TABLE 7: FUTURE INTERSECTION PERFORMANCES – SCENARIO 2 & 3

Intersection	Peak Hour	Degree of Saturation[1]	Average Delay[2] (sec/veh)	Level of Service[3]	Control Type	Worst Movement	95th Percentile Queue
2019 FUTURE PERFORMANCE – With Development Scenario 2 & Scenario 3							
Campbell Street / Belinda Street	AM	0.20	3.1 (Worst: 13.1)	**NA** (Worst: A)	Stop	RT from Campbell Street	0.8 veh (5.8m) Campbell Street
	PM	0.18	2.5 (Worst: 16.2)	**NA** (Worst: B)		RT from Campbell Street	0.6 veh (3.9m) Belinda Street
Greta Street / Belinda Street	AM	0.22	6.6 (Worst: 10.2)	**A** (Worst: A)	Roundabout	UT from Belinda Street	1.3 veh (9.1m) Greta Street
	PM	0.24	6.4 (Worst: 11.2)	**A** (Worst: A)		UT from Greta Street	1.5 veh (10.6m) Belinda Street
Fern Street / Elambra Parade	AM	0.15	5.4 (Worst: 11.1)	**A** (Worst: A)	Roundabout	UT from Elambra Parade	0.8 veh (5.6m) Fern Street
	PM	0.26	5.2 (Worst: 10.5)	**A** (Worst: A)		UT from Fern Street	1.7 veh (11.8m) Fern Street
2029 GROWTH PERFORMANCE – With Development Scenario 2 & Scenario 3							
Campbell Street / Belinda Street	AM	0.22	2.9 (Worst: 14.8)	**NA** (Worst: B)	Stop	RT from Campbell Street	0.9 veh (6.3m) Campbell Street
	PM	0.21	2.4 (Worst: 19)	**NA** (Worst: B)		RT from Campbell Street	0.6 veh (4.1m) Belinda Street
Greta Street / Belinda Street	AM	0.23	6.6 (Worst: 10.2)	**A** (Worst: A)	Roundabout	UT from Belinda Street	1.4 veh (9.8m) Belinda Street
	PM	0.27	6.4 (Worst: 11.4)	**A** (Worst: A)		UT from Greta Street	1.7 veh (12.3m) Belinda Street
Fern Street / Elambra Parade	AM	0.17	5.3 (Worst: 11.3)	**A** (Worst: A)	Roundabout	UT from Elambra Parade	0.9 veh (6.7m) Fern Street
	PM	0.31	5.2 (Worst: 10.5)	**A** (Worst: A)		UT from Fern Street	2.1 veh (14.7m) Fern Street

Note: For **Table 7**, please also refer to the notes also provided in association with **Table 1.** Scenario 2 & 3 has been analysed using SIDRA Intersection 8.0.

5.3.4 Discussion

As can be seen in the results presented in **Section 5.3.1** & **5.3.2** above, all intersections in both Scenario 1, Scenario 2 and Scenario 3 operate with a Level of Service of either "A" or "B" which indicates a good level of service, and is characterised by low approach delays and additional spare capacity. A comparison of the results under the 2019 case can be found within **Table 8** below and under the 2029 case within **Table 9** below.

TABLE 8: SUMMARY OF 2019 INTERSECTION PERFORMANCE

Intersection	Peak Hour	Existing Performance (No Development)		Future Performance (2019) Scenario 1		Future Performance (2019) Scenario 2 & 3	
		Level of Service	Average Delay (Sec)	Level of Service	Average Delay (Sec)	Level of Service	Average Delay (Sec)
Campbell Street / Belinda Street	**AM**	Worst A	1.2	Worst A	3.1	Worst A	3.1
	PM	Worst A	1.2	Worst B	2.5	Worst B	2.5
Greta Street / Belinda Street	**AM**	A	6.5	A	6.6	A	6.6
	PM	A	6.4	A	6.4	A	6.4
Fern Street / Elambra Parade	**AM**	A	5.1	A	5.2	A	5.4
	PM	A	5.1	A	5.1	A	5.2
Fern Street / Unnamed Street	**AM**	N/A	N/A	A	7.6	N/A	N/A
	PM	N/A	N/A	A	7.6	N/A	N/A

TABLE 9: SUMMARY OF 2029 INTERSECTION PERFORMANCE

Intersection	Peak Hour	2029 Growth Performance (No Development)		Growth Performance (2029) Scenario 1		Growth Performance (2029) Scenario 2 & 3	
		Level of Service	Average Delay (Sec)	Level of Service	Average Delay (Sec)	Level of Service	Average Delay (Sec)
Campbell Street / Belinda Street	**AM**	Worst A	1.1	Worst B	2.9	Worst B	2.9
	PM	Worst B	1.1	Worst B	2.4	Worst B	2.4
Greta Street / Belinda Street	**AM**	A	6.5	A	6.6	A	6.6
	PM	A	6.4	A	6.4	A	6.4
Fern Street / Elambra Parade	**AM**	A	5.0	A	5.2	A	5.3
	PM	A	5.0	A	5.1	A	5.2
Fern Street / Unnamed Street	**AM**	N/A	N/A	A	7.6	N/A	N/A
	PM	N/A	N/A	A	7.7	N/A	N/A

The impact of the development under Scenario 2 and 3, on the Fern Street/Elambra Parade intersection is minor with the existing intersection Level of Service of “A” maintained in both the 2019 and 2029 scenarios. This means that this intersection only exhibits minor increases in average delay and additional spare capacity is maintained.

With the above results under Scenario 2 and 3, it is not necessary to develop an additional southern intersection further south of the existing Fern Street / Elambra Parade intersection. The Fern Street/Elambra Parade intersection has ample capacity to accommodate all the of the additional traffic generated by the proposed Elambra West subdivision. Additionally, the introduction of an additional intersection south of Fern Street/Elambra Parade would unnecessarily impact the performance of the classified road.

Therefore, the performance of the assessed intersections inclusive of background traffic growth (which is conservatively high) remains well within acceptable limits and is supportable in terms of its traffic impacts.

5.4 Residential Amenity

The *RMS Guide to Traffic Generating Developments* provides environmental capacity criteria for local roads in Table 4.6, which is introduced in **Figure 14** for reference.

Table 4.6
Environmental capacity performance standards on residential streets

Road class	Road type	Maximum Speed (km/hr)	Maximum peak hour volume (veh/hr)
Local	Access way	25	100
	Street	40	200 environmental goal
			300 maximum
Collector	Street	50	300 environmental goal
			500 maximum

Note: Maximum speed relates to the appropriate design maximum speeds in new residential developments. In existing areas maximum speed relates to 85th percentile speed.

FIGURE 14: EXTRACT FROM RMS GUIDE – TABLE 4.6

Considering that in all three scenarios some traffic will be utilising existing residential streets, it is important to assess the impact (if any) on these streets. To undertake this assessment the proposed traffic flows have been added to the existing traffic flows observed, with the results summarised in **Table 10.**

Considering the results in **Table 10** the following results can be concluded:

- Both Elambra Parade and Saxonia Street are local streets within the network and in both Scenario 1, 2 and 3 the future two-way traffic volumes along both streets, with the development are maintained at levels below the environmental goal for residential amenity of 200 veh/h for local streets.
- Greta Street is currently a local collector road with existing traffic volumes in both the AM and PM peak periods already exceeding 300 veh/h, which is the environmental goal for collector roads. The development will have a relatively minor impact of Greta Street, with future two-way peak hour traffic volumes of 359 and 331 in the AM and PM peak hours respectively, which is still significantly below the residential amenity maximum for collector roads of 500 veh/h.
- Campbell Street currently operates as a local road and the future two-way traffic volumes of 228 and 255 in the AM and PM peak hours respectively, are both below the maximum volume of 300 veh/h for residential amenity impact along Campbell Street.

TABLE 10: EXISTING AND FUTURE TWO-WAY TRAFFIC FLOWS

Intersection	Peak Hour	Existing	Traffic Associated with Site	Total Future Traffic Volumes
Campbell Street (South of Belinda Street)	AM	66	162	228
	PM	77	178	255
Greta Street (South of Belinda Street)	AM	336	23	359
	PM	306	25	331
Scenario 1				
Saxonia Road (South of Elambra Parade)	AM	42	0	42
	PM	52	0	52
Elambra Parade (West of Fern Street)	AM	97	23	120
	PM	105	25	130
Scenario 2				
Saxonia Road (South of Elambra Parade)	AM	42	0	42
	PM	52	0	52
Elambra Parade (West of Fern Street)	AM	97	46	143
	PM	105	51	156
Scenario 3				
Saxonia Road (South of Elambra Parade)	AM	42	12	54
	PM	52	13	65
Elambra Parade (West of Fern Street)	AM	97	46	143
	PM	105	51	156

Consequently, the proposed subdivision development will not have a substantial impact on residential amenity with the future traffic volumes for all impacted streets falling below the maximum levels in all cases, and below the environmental goal for both Saxonia Road and Elambra Parade in Scenarios 1, 2 and 3.

5.5 Elambra West Structure Plan

The traffic impact assessment of the initial concept plan (**Figure 1**) has been used to inform the design of the Elambra West Structure plan which is provided in **Annexure A**.

Initial feasibility investigations have identified an additional (new) south-eastern connection to Fern Street via Saxonia Road (**Section 3.2.1**) which is not required to service the proposed Urban Release Area, with the connection to Saxonia Road not providing any significant reduction in traffic flows from other connection points. Further, a new south-eastern connection to Fern Street has significant constraints due to the sloping topography and the limited existing road reserve. As outlined within this report, a connection to Fern Street via a new roundabout would account for only 10% of the subdivisions total traffic generation. The assessed future operation of the Fern Street / Elambra Parade intersection does not necessitate an additional southern intersection with Fern Street.

6 CONCLUSION

The traffic, road safety and parking impacts of the subject Planning Proposal for the Elambra West Urban Release Area at Campbell Street, Gerringong, as shown in the revised Structure Plan provided in **Annexure A** to this report, have been assessed.

The proposal includes an approximate total yield of 317 lots (assessed in this report with a scale of 326) for residential use; accessed via three proposed connections to the existing road network, each of which has been examined in detail.

An early stage feasibility study has been conducted of the proposed new Fern Street intersection in accordance with both the design standards outlined by the Kiama Municipal Council and the relevant sections of the *Austroads Guide to Road Design*. Considering the grades that currently exist at the location of the proposed new intersection, considerable /earthworks would likely be necessary in order to achieve compliant grades with the Austroads design requirements.

The available sight lines at the intersection of Campbell Street / Belinda Street have been assessed against the relevant requirements for a 54.1km/h 85th percentile speed. The SSD, SISD and MGSD are non-compliant for a 54.1km/h 85th percentile speed limit. Compliance with SSD, SISD and MGSD requirements can be achieved through a reduction in the 85th percentile speed to at least 46.7km/h. Traffic calming devices such as lateral displacement devices to slow vehicle speeds can be implemented to reduce traffic speeds with approval from Council's Local Traffic Committee. If a lateral displacement device were in the eastbound traffic lane it could be located between the refuge and driveway of 23 Belinda Street, so to not block access to the residential driveways. If both traffic lanes (eastbound and westbound) were provided with a lateral displacement device to slow vehicles (which is typically adopted), it would have to be located at the existing refuge within Belinda Street. This is required to ensure that sight lines for vehicles travelling westbound can comply with SSD to the lateral displacement device.

An alternative solution to the above would be to modify the road grades slightly to achieve the compliant sight line requirements or a combination of both traffic calming devices and modifications to road grades.

It should be noted that the standard approach taken to determine SSD, SISD and MGSD is already a conservative approach, with the 15th percentile driver height of 1.1m and the 15th percentile vehicle height of 1.45m applied to determine available sightlines, meaning that 85 percent of drivers and vehicles fall above the assessed threshold. Only a minor increase in either driver height or vehicle height (as would be experienced for the large majority of drivers and vehicles) would result in the required sightlines being achieved for the intersection of Belinda Street / Campbell Street.

These strict sight line non-compliances, are minor in their extent are typical of some existing intersections and can generally be rectified without major works being undertaken, with the installation of additional intersection signage (w2-4_r - Side Road Intersection on Straight) to inform drivers of the upcoming intersection and even implementation of "*Stop"* signage, which is currently implemented at Campbells Street connection to Belinda Street.

The detailed design of the internal road network shall be assessed at the DA Stage. It is expected that waste collection will be completed by Council's waste collection service along the internal road network. Courier and removalist vehicles can utilise on-street parking for deliveries as these types of deliveries will be infrequent. The internal road network must be assessed against the relevant sections of Council's standard engineering drawings at the DA Stage.

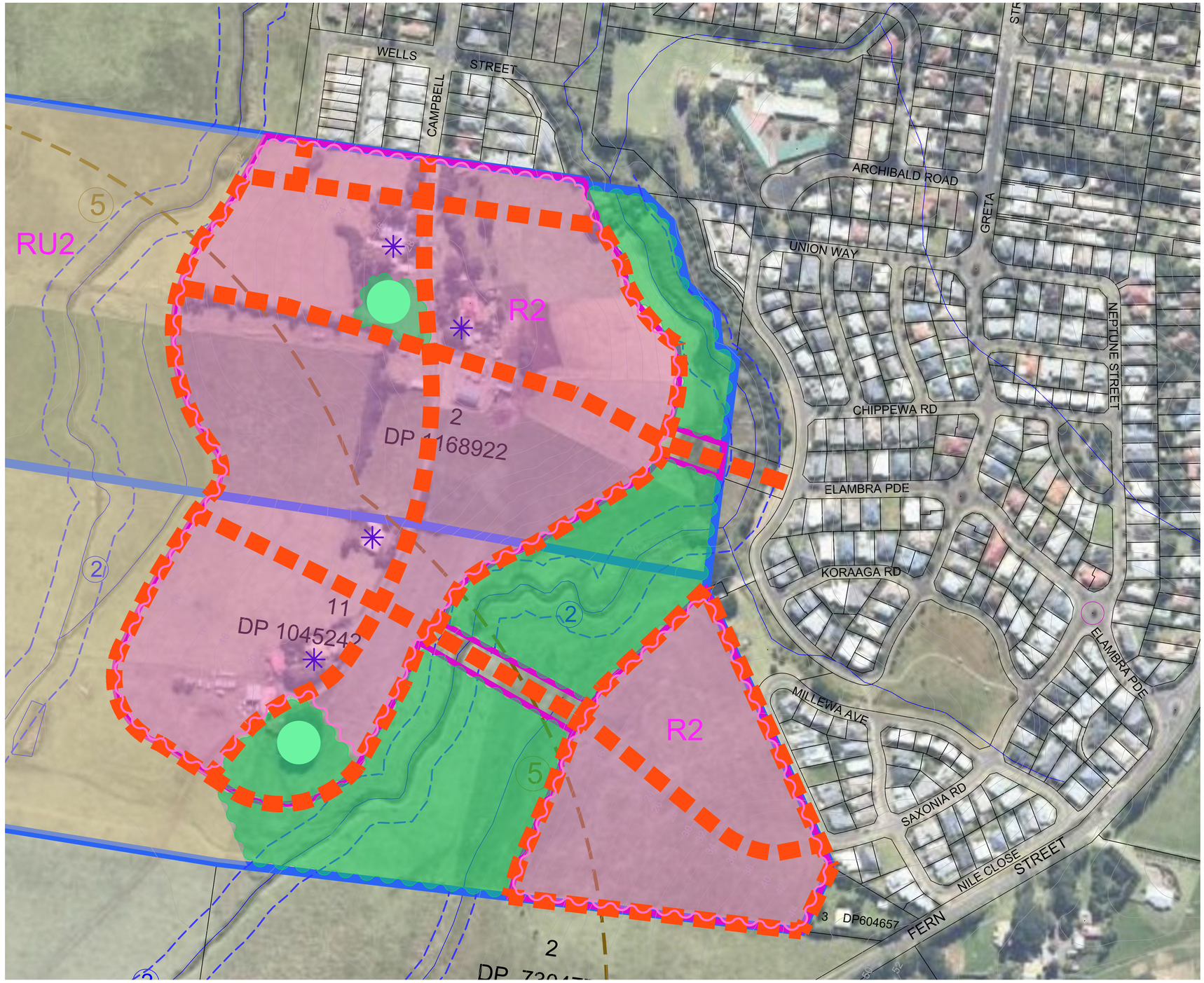
The traffic generated by the development is not expected to adversely affect the traffic flow efficiency and performance of nearby critical intersections or the existing road network either in the existing conditions or in the 10-year growth scenarios. The assessment conducted is conservative with respect to the included background traffic growth. Traffic impact is assessed particularly in terms of Level of Service, traffic flow efficiency, residential amenity and road safety considerations.

Considering the expected traffic distribution of the site and the existing and potential future operation of the Fern Street/Elambra Parade intersection, it is not necessary to introduce an additional southern intersection with Fern Street. Access to the development to/from Fern Street via Elambra Parade would be sufficient and a preferred outcome in terms of road safety and maintaining the efficiency of the classified road.

In view of the foregoing, the traffic flow and parking impacts of the revised Structure Plan for the Planning Proposal for the Elambra West Urban Release Area proposal is supportable.

ANNEXURE A: REVISED PROPOSED SITE CONCEPT POTENTIAL

(1 SHEET)



NOTE:

This plan was prepared for the client as an indicative structure plan to accompany a planning application to Kiama Municipal Council.

The information shown on this plan is not suitable for any other purpose.

The property dimensions, contours and other physical features have been compiled from existing information and have not been verified by field survey.

The dimensions, areas etc shown on this plan are subject to field survey and also to the requirements of Council and any other authority which may have requirements under any relevant legislation.

In particular, no reliance should be placed on the information on this plan for detailed subdivision design or for any financial dealings involving the land.

Allen Price & Scarratts Pty Ltd therefore disclaims any liability for any loss or damage whatsoever or howsoever incurred, arising from any party using or relying upon this plan for any purpose other than as a document prepared for the sole purpose of accompanying an application to council for planning purposes and which may be subject to alteration for reasons beyond the control of Allen Price & Scarratts Pty Ltd.

Unless stamped by Council, this plan is not a plan of an approved subdivision.

This note is an integral part of this plan.

PROPOSED DEVELOPMENT AREA

LOT 2	DP 1168922	13.833ha
LOT 11	DP 1045242	12.608ha
TOTAL AREA		26.441ha

APPROX. YIELD @12 DWELLINGS/ha - 317 DWELLINGS

LEGEND

- EXISTING DWELLING
- PRINCIPAL ROADS
- R2 — RESIDENTIAL AREA
- PUBLIC RESERVE
- FIG TREE / PUBLIC RESERVE
- SUBJECT LOTS
- INDICATIVE DEVELOPMENT AREA
- WATERCOURSE DERIVED FROM DCDB
- RIPARIAN OFFSET - APPROX 5m CHANNEL +20m EACH SIDE (CAT 2) +10m EACH SIDE (CAT 3)

KIAMA LEP MAPPING

- (2) WATERCOURSE CATEGORY
- (5) ACID SULFATE SOILS

NOTE:
CADASTRAL INFORMATION HAS BEEN OBTAINED FROM NSW LAND & PROPERTY INFORMATION (LPI) DIGITAL CADASTRAL DATA BASE (DCDB) AND IS SUBJECT TO SURVEY. IT SHOULD BE VIEWED AS APPROXIMATE ONLY.

CONTOURS ARE AT 2m INTERVALS AND HAVE ALSO BEEN DERIVED FROM DCDB MAPPING.

RATIO:	DATUM:							
1:2000 (AT A1 ORIGINAL)	AUSTRALIAN HEIGHT DATUM	SURVEY	DCDB	REV	DESCRIPTION	BY	DATE
	ORIGIN: DCDB	DESIGN					
		DRAWN	DS				
		CHECK'D	MJP				
	DATE OF PLAN: 08.04.2020						

allen price & scarratts pty ltd
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consultants@allenprice.com.au www.allenprice.com.au

PROPOSED STRUCTURE PLAN
OVER LOTS 2 DP 1168922 & LOT 11 DP1045242
ELAMBRA WEST URA
CAMPBELL ST GERRINGONG
FOR CAMPBELL & WATERFORD FARMS P/L

DRAWING STATUS: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

DRAWING NUMBER: K128069-04
SHEET 1 OF 1
REVISION: PO

K:\Projects-Kiama\128000\K128069\Drawings\K128069-04 ELAMBRA WEST- STRUCTURE PLAN.dwg

ANNEXURE B: TUBE SURVEY LOCATIONS

(1 SHEET)

Tube Survey Locations

ANNEXURE C: TRAFFIC SURVEY RESULTS

(6 SHEETS)

TRANS TRAFFIC SURVEY

trafficsurvey.com.au

TURNING MOVEMENT SURVEY

Intersection of Belinda St and Greta St, Gerringong

GPS	-34.74691, 150.82475
Date:	Thu 07/11/19
Weather:	Overcast
Suburban:	Gerringong
Customer:	McLaren

North:	Greta St
East:	Belinda St
South:	Greta St
West:	Belinda St

Survey Period	AM:	7:00 AM-10:00 AM
	PM:	2:30 PM-7:00 PM
Traffic Peak	AM:	8:30 AM-9:30 AM
	PM:	3:00 PM-4:00 PM

All Vehicles

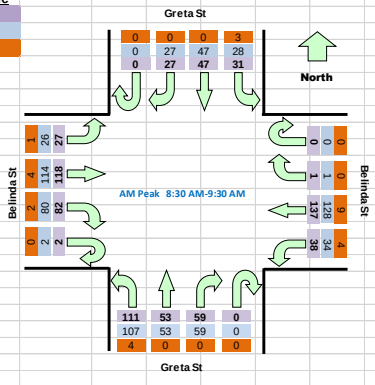
Time		North Approach Greta St				East Approach Belinda St				South Approach Greta St				West Approach Belinda St				Hourly Total	
Period Start	Period End	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	Hour	Peak
7:00	7:15	0	6	2	0	0	0	21	6	0	5	4	23	0	12	24	2	440	
7:15	7:30	0	1	4	1	0	0	33	4	1	3	1	24	0	3	23	5	466	
7:30	7:45	1	1	3	1	0	1	38	2	1	4	3	14	1	9	27	3	489	
7:45	8:00	0	3	2	4	0	0	32	2	0	3	4	29	1	15	24	4	535	
8:00	8:15	0	8	6	3	0	1	32	3	0	2	2	27	0	15	25	7	634	
8:15	8:30	0	4	6	3	0	0	31	4	0	6	6	15	1	14	25	11	720	
8:30	8:45	0	4	9	5	0	1	27	9	0	12	8	31	0	16	28	5	733	Peak
8:45	9:00	0	9	12	9	0	0	53	13	0	18	15	27	0	23	32	11	731	
9:00	9:15	0	6	18	7	0	0	30	11	0	20	22	34	2	26	31	10	658	
9:15	9:30	0	8	8	10	0	0	27	5	0	9	8	19	0	17	27	1		
9:30	9:45	0	8	12	3	0	1	26	12	0	5	6	21	1	19	31	8		
9:45	10:00	0	9	5	7	0	1	48	2	0	2	3	15	1	15	37	4		
14:30	14:45	0	9	9	11	0	0	35	4	0	3	2	11	1	22	28	4	730	
14:45	15:00	0	8	8	8	0	0	41	7	0	5	5	22	0	20	46	10	773	
15:00	15:15	0	12	17	17	0	0	32	15	0	4	5	10	1	35	42	5	792	Peak
15:15	15:30	1	11	10	6	0	0	39	2	0	14	26	39	0	20	40	8	792	Peak
15:30	15:45	0	13	9	13	0	0	34	6	0	2	6	30	0	21	45	3	766	
15:45	16:00	0	7	9	10	0	0	42	6	0	2	11	30	0	19	55	8	765	
16:00	16:15	1	12	12	16	0	0	39	6	0	6	11	13	0	24	45	10	725	
16:15	16:30	0	11	19	8	0	0	33	9	0	9	7	17	0	22	46	9	709	
16:30	16:45	0	7	13	13	0	0	44	2	0	3	2	15	1	21	52	8	706	
16:45	17:00	0	13	7	11	0	0	38	7	0	3	7	13	0	21	33	6	747	
17:00	17:15	0	5	11	14	0	0	28	6	0	5	4	21	1	17	55	12	779	
17:15	17:30	0	16	10	18	0	2	33	8	0	4	13	10	2	30	38	3	747	
17:30	17:45	0	7	20	15	0	0	36	13	0	7	17	15	1	37	43	11	707	
17:45	18:00	0	11	26	13	0	0	31	10	1	11	21	16	0	20	29	2	588	
18:00	18:15	0	8	16	19	0	0	17	6	0	5	9	10	0	10	43	4	521	
18:15	18:30	0	10	14	16	0	2	21	6	0	6	2	7	0	22	34	7		
18:30	18:45	0	5	4	13	0	1	12	3	0	3	6	10	0	17	25	4		
18:45	19:00	0	2	10	10	0	0	19	7	0	3	9	10	0	19	30	5		

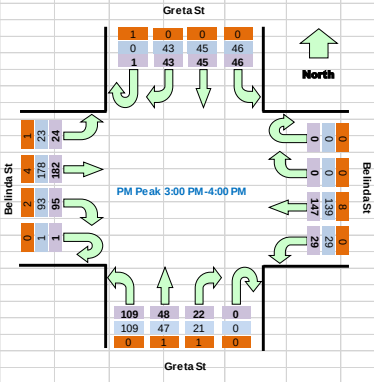
Peak Time		North Approach Greta St				East Approach Belinda St				South Approach Greta St				West Approach Belinda St				Peak
Period Start	Period End	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	total
8:30	9:30	0	27	47	31	0	1	137	38	0	59	53	111	2	82	118	27	733
15:00	16:00	1	43	45	46	0	0	147	29	0	22	48	109	1	95	182	24	792

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.

Graphic

Total
Light
Heavy





TRANS TRAFFIC SURVEY

trafficsurvey.com.au

TURNING MOVEMENT SURVEY

Intersection of Belinda St and Victoria St, Gerringong

GPS	-34.74615, 150.81895
Date:	Thu 07/11/19
Weather:	Overcast
Suburban:	Gerringong
Customer:	McLaren

North:	Victoria St
East:	Belinda St
South:	Campbell St
West:	Belinda St

Survey Period	AM:	7:00 AM-10:00 AM
	PM:	2:30 PM-7:00 PM
Traffic Peak	AM:	8:30 AM-9:30 AM
	PM:	3:15 PM-4:15 PM

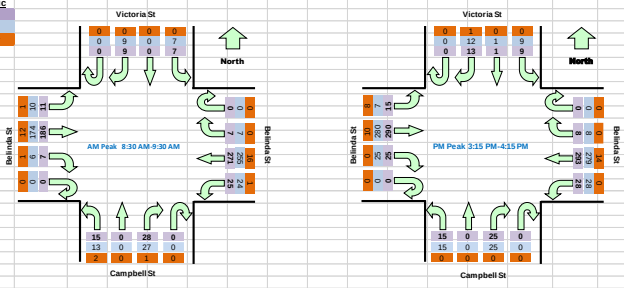
All Vehicles

Time		North Approach Victoria St					East Approach Belinda St					South Approach Campbell St					West Approach Belinda St					Carpark South				Hourly Total	
Period Start	Period End	U	R	SB	L	to Carpark	U	R	WB	L	to Carpark	U	R	NB	L	to Carpark	U	R	EB	L	to Carpark	to North	to East	to South	to West	Hour	Peak
7:00	7:15	0	1	0	0	1	0	1	68	1	0	0	3	0	4	0	0	0	39	3	0	0	0	0	0	497	
7:15	7:30	0	3	0	0	0	0	1	58	1	0	0	5	0	3	0	0	1	36	2	0	0	0	0	0	506	
7:30	7:45	0	1	0	2	0	0	1	65	6	0	0	4	0	2	0	1	0	35	3	0	0	0	0	0	516	
7:45	8:00	0	2	0	1	0	0	0	81	5	0	0	2	0	9	0	0	3	43	0	0	0	0	0	0	544	
8:00	8:15	0	1	0	1	0	0	0	64	5	0	0	3	0	4	0	0	3	46	3	0	0	0	0	0	566	
8:15	8:30	0	1	0	1	0	0	1	59	2	0	0	7	0	6	0	0	3	40	0	0	0	0	0	0	571	
8:30	8:45	0	3	0	4	0	0	3	70	5	2	0	3	0	6	0	0	1	49	2	0	0	0	0	0	575	Peak
8:45	9:00	0	2	0	3	0	0	2	76	8	2	0	12	0	4	0	0	4	52	2	1	0	0	0	0	565	
9:00	9:15	0	1	0	0	0	0	1	63	10	3	0	9	0	2	0	0	1	41	4	0	0	0	0	0	526	
9:15	9:30	0	3	0	0	0	0	1	62	2	0	0	4	0	3	0	0	1	44	3	1	0	0	0	0		
9:30	9:45	0	2	0	2	0	0	1	69	2	0	0	2	0	2	0	0	1	55	2	0	0	0	0	0		
9:45	10:00	0	1	0	3	0	0	2	62	3	0	0	5	0	3	0	0	0	45	5	0	0	0	0	0		
14:30	14:45	0	1	0	0	0	0	2	58	8	1	0	2	0	2	0	0	1	66	2	0	0	0	0	0	650	
14:45	15:00	0	2	0	3	0	0	2	64	7	1	0	7	0	1	0	0	3	73	2	0	0	0	0	0	686	
15:00	15:15	0	5	0	2	0	0	2	62	2	1	0	7	0	4	0	0	5	72	2	0	0	0	0	0	712	
15:15	15:30	0	2	0	1	0	0	1	79	11	0	0	5	0	2	0	0	3	67	7	0	0	0	0	0	729	Peak
15:30	15:45	0	4	0	3	0	0	0	70	5	5	0	3	0	0	0	0	5	79	5	0	0	0	0	0	703	
15:45	16:00	0	3	1	3	0	0	4	79	7	0	0	9	0	6	0	0	9	69	1	0	0	0	0	0	677	
16:00	16:15	0	4	0	2	0	0	3	65	5	2	0	8	0	7	0	0	8	75	2	0	0	0	0	0	676	
16:15	16:30	0	4	0	3	0	0	2	58	3	1	0	8	0	0	0	0	3	67	2	1	0	0	0	0	647	
16:30	16:45	0	3	0	0	0	1	0	62	5	2	0	9	0	4	0	0	2	61	4	0	0	0	0	0	668	
16:45	17:00	0	1	0	1	0	0	0	69	8	1	0	10	0	3	0	0	9	85	3	0	0	0	0	0	662	
17:00	17:15	0	2	0	2	1	0	0	53	10	2	0	9	0	0	0	0	4	67	1	0	0	0	0	1	601	
17:15	17:30	0	0	0	1	0	0	2	60	7	4	0	5	2	3	0	0	7	79	3	0	0	0	0	0	554	
17:30	17:45	0	4	0	0	0	0	1	55	8	2	0	8	0	3	0	0	3	60	3	0	0	0	0	0	484	
17:45	18:00	0	0	0	2	1	0	2	43	5	4	0	9	0	0	0	0	4	56	2	1	0	0	0	0	435	
18:00	18:15	0	0	0	2	1	0	1	30	10	0	0	5	0	0	0	0	1	55	0	0	0	0	0	0	393	
18:15	18:30	0	1	0	0	0	0	1	27	10	1	0	5	0	1	0	0	5	52	0	0	0	0	0	0		
18:30	18:45	0	0	0	0	0	0	1	31	3	1	0	6	0	1	0	0	3	52	0	0	0	0	0	0		
18:45	19:00	0	2	0	0	0	0	2	27	5	1	0	12	0	0	0	0	1	36	0	0	0	1	0	0		

Peak Time		North Approach 2					East Approach 2					South Approach 0					West Approach 0					Carpark South				Peak total
Period Start	Period End	U	R	SB	L	to Carpark	U	R	WB	L	to Carpark	U	R	NB	L	to Carpark	U	R	EB	L	to Carpark	to North	to East	to South	to West	
8:30	9:30	0	9	0	7	0	0	7	271	25	7	0	28	0	15	0	0	7	186	11	2	0	0	0	0	575
15:15	16:15	0	13	1	9	0	0	8	293	28	7	0	25	0	15	0	0	25	290	15	0	0	0	0	0	729

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.

Graphic
Total
Light
Heavy



TRANS TRAFFIC SURVEY

trafficsurvey.com.au

TURNING MOVEMENT SURVEY

Intersection of Elambra Pde and Fern St, Gerringong

GPS	*-34.75445, 150.8259*						
Date:	Thu 07/11/19	***North:***	Fern St	***Survey Period***	AM:	7:00 AM-10:00 AM
Weather:	Overcast	***East:***	N/A		PM:	2:30 PM-7:00 PM
Suburban:	Gerringong	***South:***	Fern St	***Traffic Peak***	AM:	8:45 AM-9:45 AM
Customer:	McLaren	***West:***	Elambra Pde		PM:	3:45 PM-4:45 PM

All Vehicles

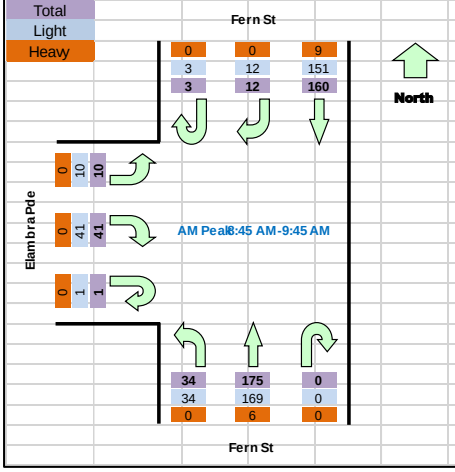
Time		North Approach Fern St			South Approach Fern St			West Approach Elambra Pd			Hourly Total	
Period Start	Period End	U	R	SB	U	NB	L	U	R	L	Hour	Peak
7:00	7:15	0	2	24	0	37	10	0	3	2	292	
7:15	7:30	0	2	26	0	28	1	0	3	2	319	
7:30	7:45	0	4	28	0	32	4	0	9	1	362	
7:45	8:00	2	1	35	0	27	1	0	8	0	381	
8:00	8:15	0	4	34	0	45	8	0	9	5	407	
8:15	8:30	1	4	42	0	40	4	0	10	4	414	
8:30	8:45	0	3	43	0	32	7	0	8	4	402	
8:45	9:00	1	3	38	0	38	7	0	10	3	436	Peak
9:00	9:15	2	5	32	0	43	9	1	15	5	431	
9:15	9:30	0	2	37	0	35	7	0	10	2		
9:30	9:45	0	2	53	0	59	11	0	6	0		
9:45	10:00	0	4	43	0	43	4	0	1	0		
14:30	14:45	0	1	63	0	56	7	0	6	4	557	
14:45	15:00	1	2	66	0	37	10	0	5	1	574	
15:00	15:15	1	1	64	0	51	7	0	11	3	635	
15:15	15:30	0	2	84	1	53	0	0	16	4	665	
15:30	15:45	1	7	77	0	53	5	0	8	3	685	
15:45	16:00	2	4	82	0	67	10	0	12	6	696	Peak
16:00	16:15	1	7	73	0	60	8	0	11	8	646	
16:15	16:30	0	2	93	0	56	10	0	17	2	627	
16:30	16:45	1	6	78	0	61	4	0	12	3	585	
16:45	17:00	1	4	68	0	39	3	0	14	4	580	
17:00	17:15	0	5	80	0	43	8	0	11	2	589	
17:15	17:30	1	6	71	1	35	9	0	11	4	570	
17:30	17:45	0	5	81	0	49	6	1	15	3	547	
17:45	18:00	0	3	77	0	32	8	0	17	5	468	
18:00	18:15	2	4	78	0	29	1	0	14	2	424	
18:15	18:30	0	1	64	0	29	6	0	8	7		
18:30	18:45	2	1	41	0	24	7	0	5	1		
18:45	19:00	0	5	51	0	25	6	0	7	4		

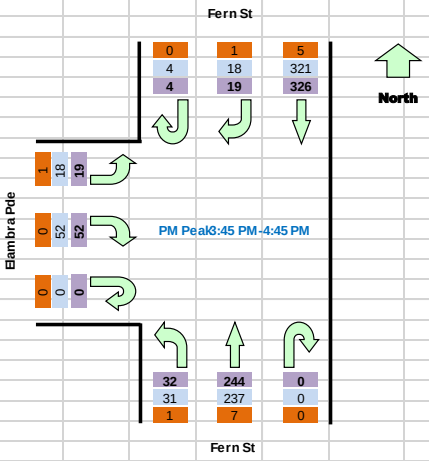
Peak Time		North Approach Fern St			South Approach Fern St			West Approach Elambra Pd			Peak total
Period Start	Period End	U	R	SB	U	NB	L	U	R	L	
8:45	9:45	3	12	160	0	175	34	1	41	10	436
15:45	16:45	4	19	326	0	244	32	0	52	19	696

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.

Graphic

Total
Light
Heavy





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AUTOMATIC COUNT SUMMARY

Street Name :	Fern St	**Location :**	Outside Property 259
Suburb :	Gerroa	**Start Date :**	00:00 Wed 06/November/2019
Metrocount ID	MF01499C/P	**Finish Date :**	00:00 Wed 13/November/2019
Site ID Number :	1374	**Speed Zone :**	80 km/h
Prepared By :	Vo Son Binh	**Email:**	binh@trafficsurvey.com.au

GPS information	Lat 34° 45' 24.03 South Long 150° 49' 21.15 East		Direction of Travel		
			Both directions	**Northbound**	**Southbound**
Traffic Volume :		Weekdays Average	6,788	3,446	3,342
(Vehicles/Day)		7 Day Average	6,028	3,069	2,959
Weekday	**AM**	11:00	473	225	247
Peak hour starts	**PM**	17:00	659	321	338
Speeds :		85th Percentile	78.0	77.8	77.3
(Km/Hr)		Average	67.7	68.0	66.6
Classification % :		Light Vehicles up to 5.5m	96.5%	96.5%	96.4%

Location

GPS Information Load Google Map (internet required)

(Latitude, Longitude) -34.756674, 150.822541

Speed Data | Speed Graph | Speed Bin
Volume Data | Volume Graph | Classification

QUALITY ASSURED COMPANY BY ISO 9001:2015
OH&S SYSTEM CERTIFIED TO ISO 4801:2001
ENVIRONMENT MANAGEMENT SYSTEM CERTIFIED TO ISO14001:2015

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AUTOMATIC COUNT SUMMARY

Street Name :	Campbell St	**Location :**	Outside Property 10
Suburb :	Gerringong	**Start Date :**	00:00 Wed 06/November/2019
Metrocount ID	Y618E7AF/P	**Finish Date :**	00:00 Wed 13/November/2019
Site ID Number :	1373	**Speed Zone :**	50 km/h
Prepared By :	Vo Son Binh	**Email:**	binh@trafficsurvey.com.au

GPS information	Lat 34° 44' 47.89 South Long 150° 49' 8.71 East		Direction of Travel		
			Both directions	**Northbound**	**Southbound**
Traffic Volume :		Weekdays Average	822	428	394
(Vehicles/Day)		7 Day Average	799	418	381
Weekday	**AM**	08:00	66	44	23
Peak hour starts	**PM**	16:00	77	34	44
Speeds :		85th Percentile	29.4	29.1	29.4
(Km/Hr)		Average	25.7	25.4	25.7
Classification % :		Light Vehicles up to 5.5m	96.5%	96.4%	96.6%

Location

GPS Information Load Google Map (internet required)

(Latitude, Longitude) -34.746636, 150.819086

Speed Data | Speed Graph | Speed Bin
Volume Data | Volume Graph | Classification

QUALITY ASSURED COMPANY BY ISO 9001:2015
OH&S SYSTEM CERTIFIED TO ISO 4801:2001
ENVIRONMENT MANAGEMENT SYSTEM CERTIFIED TO ISO14001:2015

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AUTOMATIC COUNT SUMMARY

Street Name :	Greta St	**Location :**	South of Belinda St
Suburb :	Gerringong	**Start Date :**	00:00 Wed 06/November/2019
Metrocount ID	U358YHJE/P	**Finish Date :**	00:00 Wed 13/November/2019
Site ID Number :	1375	**Speed Zone :**	50 km/h
Prepared By :	Vo Son Binh	**Email:**	binh@trafficsurvey.com.au

GPS information	Lat 34° 44' 50.00 South Long 150° 49' 28.50 East		Direction of Travel	
			Both directions	**Northbound**	**Southbound**
Traffic Volume :		Weekdays Average	3,028	1,483	1,545
(Vehicles/Day)		7 Day Average	2,808	1,373	1,435
Weekday	**AM**	08:00	336	194	142
Peak hour starts	**PM**	15:00	306	173	133
Speeds :		85th Percentile	30.4	28.9	32.0
(Km/Hr)		Average	26.3	24.6	28.1
Classification % :		Light Vehicles up to 5.5m	97.1%	97.0%	97.1%

Location

GPS Information Load Google Map (internet required)

(Latitude, Longitude) -34.747221, 150.824582

Speed Data | Speed Graph | Speed Bin
Volume Data | Volume Graph | Classification

QUALITY ASSURED COMPANY BY ISO 9001:2015
OH&S SYSTEM CERTIFIED TO ISO 4801:2001
ENVIRONMENT MANAGEMENT SYSTEM CERTIFIED TO ISO14001:2015

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AUTOMATIC COUNT SUMMARY

Street Name :	Elambra Parade	**Location :**	Outside Property 4
Suburb :	Gerringong	**Start Date :**	00:00 Wed 06/November/2019
Metrocount ID	MF09QZ37/P	**Finish Date :**	00:00 Wed 13/November/2019
Site ID Number :	1376	**Speed Zone :**	50 km/h
Prepared By :	Vo Son Binh	**Email:**	binh@trafficsurvey.com.au

GPS information	Lat 34° 45' 15.17 South Long 150° 49' 32.10 East		Direction of Travel		
			Both directions	**Westbound**	**Eastbound**
Traffic Volume :		Weekdays Average	1,088	610	478
(Vehicles/Day)		7 Day Average	1,063	592	471
Weekday	**AM**	08:00	97	50	48
Peak hour starts	**PM**	16:00	105	55	49
Speeds :		85th Percentile	39.4	38.2	40.5
(Km/Hr)		Average	34.4	33.6	35.3
Classification % :		Light Vehicles up to 5.5m	97.0%	96.9%	97.0%

Location

GPS Information Load Google Map (internet required)

(Latitude, Longitude) -34.754215, 150.825583

Speed Data | Speed Graph | Speed Bin
Volume Data | Volume Graph | Classification

QUALITY ASSURED COMPANY BY ISO 9001:2015
OH&S SYSTEM CERTIFIED TO ISO 4801:2001
ENVIRONMENT MANAGEMENT SYSTEM CERTIFIED TO ISO14001:2015

TRANS TRAFFIC SURVEY

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AUTOMATIC COUNT SUMMARY

Street Name :	Saxonia Rd	**Location :**	Outside Property 3
Suburb :	Gerringong	**Start Date :**	00:00 Wed 06/November/2019
Metrocount ID	Y629DPQ5/P	**Finish Date :**	00:00 Wed 13/November/2019
Site ID Number :	1377	**Speed Zone :**	50 km/h
Prepared By :	Vo Son Binh	**Email:**	binh@trafficsurvey.com.au

GPS information		Lat 34° 45' 14.10 South Long 150° 49' 29.60 East	Direction of Travel		
			Both directions	**Northbound**	**Southbound**
Traffic Volume :		Weekdays Average	509	252	257
(Vehicles/Day)		7 Day Average	484	241	243
Weekday	**AM**	08:00	42	29	13
Peak hour starts	**PM**	16:00	52	21	31
Speeds :		85th Percentile	35.6	36.0	35.4
(Km/Hr)		Average	31.3	31.7	31.0
Classification % :		Light Vehicles up to 5.5m	97.1%	97.1%	97.1%

Location

GPS Information Load Google Map (internet required)

(Latitude, Longitude) -34.753916, 150.824888

Speed Data | Speed Graph | Speed Bin
Volume Data | Volume Graph | Classification

QUALITY SYSTEM CERTIFICATION DNV·GL ISO 9001
SAFETY SYSTEM CERTIFICATION DNV·GL AS/NZS 4801
ENVIRONMENTAL SYSTEM CERTIFICATION DNV·GL ISO 14001

QUALITY ASSURED COMPANY BY ISO 9001:2015
OH&S SYSTEM CERTIFIED TO ISO 4801:2001
ENVIRONMENT MANAGEMENT SYSTEM CERTIFIED TO ISO14001:2015

ANNEXURE D: SIDRA INTERSECTION RESULTS

(40 SHEETS)

MOVEMENT SUMMARY

Site: 001 [001EXAM - Belinda Street / Campbell Street]

001 - EXISITING AM
Belinda Street / Campbell Street, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Stop (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: Campbell Street (S)												
1	L2	15	13.3	0.067	10.0	LOS A	0.2	1.8	0.49	0.92	0.49	49.7
3	R2	28	3.6	0.067	12.1	LOS A	0.2	1.8	0.49	0.92	0.49	49.6
Approach		43	7.0	0.067	11.3	LOS A	0.2	1.8	0.49	0.92	0.49	49.7
East: Belinda Street (E)												
4	L2	25	4.0	0.162	5.6	LOS A	0.0	0.0	0.00	0.05	0.00	57.7
5	T1	278	5.8	0.162	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	59.5
Approach		303	5.6	0.162	0.5	NA	0.0	0.0	0.00	0.05	0.00	59.4
West: Belinda Street (W)												
11	T1	193	6.2	0.104	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	7	14.3	0.006	6.7	LOS A	0.0	0.2	0.39	0.57	0.39	51.4
Approach		200	6.5	0.104	0.2	NA	0.0	0.2	0.01	0.02	0.01	59.6
All Vehicles		546	6.0	0.162	1.2	NA	0.2	1.8	0.04	0.11	0.04	58.6

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: 001 [001EXPM - Belinda Street / Campbell Street]

001 - EXISITING PM
Belinda Street / Campbell Street, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Stop (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: Campbell Street (S)												
1	L2	15	0.0	0.070	9.3	LOS A	0.3	1.8	0.53	0.92	0.53	49.6
3	R2	25	0.0	0.070	13.7	LOS A	0.3	1.8	0.53	0.92	0.53	49.2
Approach		40	0.0	0.070	12.0	LOS A	0.3	1.8	0.53	0.92	0.53	49.3
East: Belinda Street (E)												
4	L2	28	0.0	0.174	5.6	LOS A	0.0	0.0	0.00	0.05	0.00	57.9
5	T1	301	4.7	0.174	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	59.5
Approach		329	4.3	0.174	0.5	NA	0.0	0.0	0.00	0.05	0.00	59.3
West: Belinda Street (W)												
11	T1	299	3.3	0.158	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	25	0.0	0.019	6.5	LOS A	0.1	0.6	0.40	0.59	0.40	52.0
Approach		324	3.1	0.158	0.5	NA	0.1	0.6	0.03	0.05	0.03	59.3
All Vehicles		693	3.5	0.174	1.2	NA	0.3	1.8	0.04	0.10	0.04	58.6

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: 002 [002EXAM - Belinda Street / Greta Street]

002 - EXISITING AM
Belinda Street / Greta Street, Gerringong, NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Greta Street (S)												
1	L2	111	3.6	0.207	5.9	LOS A	1.2	8.3	0.39	0.60	0.39	52.1
2	T1	53	0.0	0.207	5.7	LOS A	1.2	8.3	0.39	0.60	0.39	53.1
3	R2	59	0.0	0.207	8.9	LOS A	1.2	8.3	0.39	0.60	0.39	52.7
Approach		223	1.8	0.207	6.6	LOS A	1.2	8.3	0.39	0.60	0.39	52.5
East: Belinda Street (E)												
4	L2	38	10.5	0.167	5.9	LOS A	0.9	6.6	0.36	0.54	0.36	52.4
5	T1	137	6.6	0.167	5.7	LOS A	0.9	6.6	0.36	0.54	0.36	53.4
6	R2	1	0.0	0.167	8.7	LOS A	0.9	6.6	0.36	0.54	0.36	53.3
Approach		176	7.4	0.167	5.8	LOS A	0.9	6.6	0.36	0.54	0.36	53.2
North: Greta Street (N)												
7	L2	31	9.7	0.107	6.5	LOS A	0.5	3.9	0.44	0.61	0.44	51.7
8	T1	47	0.0	0.107	6.1	LOS A	0.5	3.9	0.44	0.61	0.44	52.9
9	R2	27	0.0	0.107	9.3	LOS A	0.5	3.9	0.44	0.61	0.44	52.5
Approach		105	2.9	0.107	7.1	LOS A	0.5	3.9	0.44	0.61	0.44	52.4
West: Belinda Street (W)												
10	L2	27	3.7	0.197	5.5	LOS A	1.1	8.1	0.32	0.57	0.32	52.1
11	T1	118	3.4	0.197	5.4	LOS A	1.1	8.1	0.32	0.57	0.32	52.9
12	R2	82	2.4	0.197	8.5	LOS A	1.1	8.1	0.32	0.57	0.32	52.6
12u	U	2	0.0	0.197	10.0	LOS A	1.1	8.1	0.32	0.57	0.32	53.2
Approach		229	3.1	0.197	6.5	LOS A	1.1	8.1	0.32	0.57	0.32	52.7
All Vehicles		733	3.7	0.207	6.5	LOS A	1.2	8.3	0.37	0.58	0.37	52.7

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

MOVEMENT SUMMARY

Site: 002 [002EXPM - Belinda Street / Greta Street]

002 - EXISITING PM
Belinda Street / Greta Street, Gerringong, NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Greta Street (S)												
1	L2	109	0.0	0.170	5.9	LOS A	0.9	6.6	0.41	0.59	0.41	52.5
2	T1	48	2.1	0.170	5.9	LOS A	0.9	6.6	0.41	0.59	0.41	53.3
3	R2	22	4.5	0.170	9.1	LOS A	0.9	6.6	0.41	0.59	0.41	52.8
Approach		179	1.1	0.170	6.3	LOS A	0.9	6.6	0.41	0.59	0.41	52.8
East: Belinda Street (E)												
4	L2	29	0.0	0.170	5.9	LOS A	0.9	6.6	0.39	0.55	0.39	52.7
5	T1	147	5.4	0.170	5.9	LOS A	0.9	6.6	0.39	0.55	0.39	53.3
6	R2	1	0.0	0.170	8.9	LOS A	0.9	6.6	0.39	0.55	0.39	53.2
Approach		177	4.5	0.170	5.9	LOS A	0.9	6.6	0.39	0.55	0.39	53.2
North: Greta Street (N)												
7	L2	46	0.0	0.139	6.5	LOS A	0.7	5.1	0.48	0.64	0.48	51.8
8	T1	45	0.0	0.139	6.4	LOS A	0.7	5.1	0.48	0.64	0.48	52.6
9	R2	43	0.0	0.139	9.6	LOS A	0.7	5.1	0.48	0.64	0.48	52.3
9u	U	1	0.0	0.139	11.1	LOS A	0.7	5.1	0.48	0.64	0.48	52.7
Approach		135	0.0	0.139	7.5	LOS A	0.7	5.1	0.48	0.64	0.48	52.2
West: Belinda Street (W)												
10	L2	24	4.2	0.238	5.2	LOS A	1.4	10.3	0.26	0.54	0.26	52.4
11	T1	182	2.2	0.238	5.1	LOS A	1.4	10.3	0.26	0.54	0.26	53.3
12	R2	95	2.1	0.238	8.2	LOS A	1.4	10.3	0.26	0.54	0.26	52.9
12u	U	1	0.0	0.238	9.8	LOS A	1.4	10.3	0.26	0.54	0.26	53.5
Approach		302	2.3	0.238	6.1	LOS A	1.4	10.3	0.26	0.54	0.26	53.1
All Vehicles		793	2.1	0.238	6.4	LOS A	1.4	10.3	0.36	0.57	0.36	52.9

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

MOVEMENT SUMMARY

Site: 003 [003EXAM - Fern Street / Elambra Parade]

003 - EXISITING AM
Fern Street / Elambra Parade, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Fern Street (S)												
1	L2	34	0.0	0.140	4.2	LOS A	0.7	5.3	0.09	0.44	0.09	54.5
2	T1	175	3.4	0.140	4.4	LOS A	0.7	5.3	0.09	0.44	0.09	55.5
Approach		209	2.9	0.140	4.4	LOS A	0.7	5.3	0.09	0.44	0.09	55.4
North: Fern Street (N)												
8	T1	160	5.6	0.130	4.6	LOS A	0.7	5.2	0.17	0.45	0.17	54.8
9	R2	12	0.0	0.130	8.5	LOS A	0.7	5.2	0.17	0.45	0.17	54.8
9u	U	3	0.0	0.130	10.4	LOS A	0.7	5.2	0.17	0.45	0.17	55.5
Approach		175	5.1	0.130	5.0	LOS A	0.7	5.2	0.17	0.45	0.17	54.8
West: Elambra Parade (W)												
10	L2	10	0.0	0.046	5.0	LOS A	0.2	1.5	0.33	0.61	0.33	51.5
12	R2	41	0.0	0.046	9.2	LOS A	0.2	1.5	0.33	0.61	0.33	52.3
12u	U	1	0.0	0.046	11.0	LOS A	0.2	1.5	0.33	0.61	0.33	53.0
Approach		52	0.0	0.046	8.4	LOS A	0.2	1.5	0.33	0.61	0.33	52.2
All Vehicles		436	3.4	0.140	5.1	LOS A	0.7	5.3	0.15	0.47	0.15	54.7

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

MOVEMENT SUMMARY

Site: 003 [003EXPM - Fern Street / Elambra Parade]

003 - EXISITING PM
Fern Street / Elambra Parade, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Fern Street (S)												
1	L2	32	3.1	0.187	4.3	LOS A	1.0	7.5	0.12	0.43	0.12	54.3
2	T1	244	2.9	0.187	4.5	LOS A	1.0	7.5	0.12	0.43	0.12	55.4
Approach		276	2.9	0.187	4.4	LOS A	1.0	7.5	0.12	0.43	0.12	55.3
North: Fern Street (N)												
8	T1	326	1.5	0.251	4.6	LOS A	1.6	11.2	0.21	0.45	0.21	54.8
9	R2	19	5.3	0.251	8.7	LOS A	1.6	11.2	0.21	0.45	0.21	54.4
9u	U	4	0.0	0.251	10.4	LOS A	1.6	11.2	0.21	0.45	0.21	55.4
Approach		349	1.7	0.251	4.9	LOS A	1.6	11.2	0.21	0.45	0.21	54.8
West: Elambra Parade (W)												
10	L2	19	5.3	0.067	5.5	LOS A	0.3	2.3	0.40	0.63	0.40	51.4
12	R2	52	0.0	0.067	9.6	LOS A	0.3	2.3	0.40	0.63	0.40	52.3
Approach		71	1.4	0.067	8.5	LOS A	0.3	2.3	0.40	0.63	0.40	52.1
All Vehicles		696	2.2	0.251	5.1	LOS A	1.6	11.2	0.19	0.46	0.19	54.7

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

MOVEMENT SUMMARY

Site: 001 [001GROAM - Belinda Street / Campbell Street - 2029-NoDev]

001 - 2029 GROWTH AM - NoDev - 2% ann. growth on Belinda Street
Belinda Street / Campbell Street, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Stop (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: Campbell Street (S)												
1	L2	15	13.3	0.077	10.3	LOS A	0.3	2.1	0.54	0.94	0.54	49.1
3	R2	28	3.6	0.077	13.5	LOS A	0.3	2.1	0.54	0.94	0.54	49.0
Approach		43	7.0	0.077	12.4	LOS A	0.3	2.1	0.54	0.94	0.54	49.0
East: Belinda Street (E)												
4	L2	25	4.0	0.191	5.6	LOS A	0.0	0.0	0.00	0.04	0.00	57.8
5	T1	334	5.7	0.191	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	59.6
Approach		359	5.6	0.191	0.4	NA	0.0	0.0	0.00	0.04	0.00	59.4
West: Belinda Street (W)												
11	T1	232	6.5	0.125	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	7	14.3	0.006	7.0	LOS A	0.0	0.2	0.43	0.58	0.43	51.3
Approach		239	6.7	0.125	0.2	NA	0.0	0.2	0.01	0.02	0.01	59.7
All Vehicles		641	6.1	0.191	1.1	NA	0.3	2.1	0.04	0.09	0.04	58.7

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: 001 [001GROPM - Belinda Street / Campbell Street - 2029-NoDev]

001 - 2029 GROWTH PM - NoDev - 2% ann. growth on Belinda Street
Belinda Street / Campbell Street, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Stop (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: Campbell Street (S)												
1	L2	15	0.0	0.083	9.7	LOS A	0.3	2.1	0.58	0.95	0.58	48.7
3	R2	25	0.0	0.083	15.8	LOS B	0.3	2.1	0.58	0.95	0.58	48.3
Approach		40	0.0	0.083	13.5	LOS A	0.3	2.1	0.58	0.95	0.58	48.4
East: Belinda Street (E)												
4	L2	28	0.0	0.206	5.6	LOS A	0.0	0.0	0.00	0.04	0.00	57.9
5	T1	361	4.7	0.206	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	59.5
Approach		389	4.4	0.206	0.4	NA	0.0	0.0	0.00	0.04	0.00	59.4
West: Belinda Street (W)												
11	T1	359	3.3	0.190	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	25	0.0	0.020	6.8	LOS A	0.1	0.6	0.44	0.61	0.44	51.9
Approach		384	3.1	0.190	0.5	NA	0.1	0.6	0.03	0.04	0.03	59.4
All Vehicles		813	3.6	0.206	1.1	NA	0.3	2.1	0.04	0.09	0.04	58.7

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: 002 [002GROAM - Belinda Street / Greta Street - 2029-NoDev]

002 - 2029 GROWTH AM - NoDev - 2% ann. growth on Belinda Street
Belinda Street / Greta Street , Gerringong, NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Greta Street (S)												
1	L2	111	3.6	0.213	6.1	LOS A	1.2	8.6	0.42	0.61	0.42	52.1
2	T1	53	0.0	0.213	5.9	LOS A	1.2	8.6	0.42	0.61	0.42	53.0
3	R2	59	0.0	0.213	9.1	LOS A	1.2	8.6	0.42	0.61	0.42	52.6
Approach		223	1.8	0.213	6.8	LOS A	1.2	8.6	0.42	0.61	0.42	52.4
East: Belinda Street (E)												
4	L2	38	10.5	0.192	5.9	LOS A	1.0	7.8	0.37	0.54	0.37	52.4
5	T1	165	6.7	0.192	5.8	LOS A	1.0	7.8	0.37	0.54	0.37	53.4
6	R2	1	0.0	0.192	8.8	LOS A	1.0	7.8	0.37	0.54	0.37	53.2
Approach		204	7.4	0.192	5.8	LOS A	1.0	7.8	0.37	0.54	0.37	53.2
North: Greta Street (N)												
7	L2	31	9.7	0.109	6.7	LOS A	0.6	4.0	0.46	0.62	0.46	51.6
8	T1	47	0.0	0.109	6.3	LOS A	0.6	4.0	0.46	0.62	0.46	52.8
9	R2	27	0.0	0.109	9.4	LOS A	0.6	4.0	0.46	0.62	0.46	52.4
Approach		105	2.9	0.109	7.2	LOS A	0.6	4.0	0.46	0.62	0.46	52.3
West: Belinda Street (W)												
10	L2	27	3.7	0.216	5.5	LOS A	1.3	9.2	0.33	0.56	0.33	52.2
11	T1	142	3.5	0.216	5.4	LOS A	1.3	9.2	0.33	0.56	0.33	53.0
12	R2	82	2.4	0.216	8.5	LOS A	1.3	9.2	0.33	0.56	0.33	52.6
12u	U	2	0.0	0.216	10.0	LOS A	1.3	9.2	0.33	0.56	0.33	53.2
Approach		253	3.2	0.216	6.4	LOS A	1.3	9.2	0.33	0.56	0.33	52.8
All Vehicles		785	3.8	0.216	6.5	LOS A	1.3	9.2	0.38	0.58	0.38	52.7

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

MOVEMENT SUMMARY

Site: 002 [002GROPM - Belinda Street / Greta Street - 2029-NoDev]

002 - 2029 GROWTH PM - NoDev - 2% ann. growth on Belinda Street
Belinda Street / Greta Street, Gerringong, NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Greta Street (S)												
1	L2	109	0.0	0.175	6.1	LOS A	1.0	6.8	0.44	0.61	0.44	52.4
2	T1	48	2.1	0.175	6.1	LOS A	1.0	6.8	0.44	0.61	0.44	53.2
3	R2	22	4.5	0.175	9.3	LOS A	1.0	6.8	0.44	0.61	0.44	52.7
Approach		179	1.1	0.175	6.5	LOS A	1.0	6.8	0.44	0.61	0.44	52.7
East: Belinda Street (E)												
4	L2	29	0.0	0.199	5.9	LOS A	1.1	8.0	0.40	0.56	0.40	52.7
5	T1	177	5.6	0.199	5.9	LOS A	1.1	8.0	0.40	0.56	0.40	53.3
6	R2	1	0.0	0.199	8.9	LOS A	1.1	8.0	0.40	0.56	0.40	53.1
Approach		207	4.8	0.199	5.9	LOS A	1.1	8.0	0.40	0.56	0.40	53.2
North: Greta Street (N)												
7	L2	46	0.0	0.143	6.8	LOS A	0.8	5.3	0.50	0.66	0.50	51.7
8	T1	45	0.0	0.143	6.7	LOS A	0.8	5.3	0.50	0.66	0.50	52.5
9	R2	43	0.0	0.143	9.8	LOS A	0.8	5.3	0.50	0.66	0.50	52.1
9u	U	1	0.0	0.143	11.4	LOS A	0.8	5.3	0.50	0.66	0.50	52.6
Approach		135	0.0	0.143	7.7	LOS A	0.8	5.3	0.50	0.66	0.50	52.1
West: Belinda Street (W)												
10	L2	24	4.2	0.265	5.3	LOS A	1.7	12.0	0.27	0.54	0.27	52.4
11	T1	219	2.3	0.265	5.1	LOS A	1.7	12.0	0.27	0.54	0.27	53.3
12	R2	95	2.1	0.265	8.3	LOS A	1.7	12.0	0.27	0.54	0.27	52.9
12u	U	1	0.0	0.265	9.8	LOS A	1.7	12.0	0.27	0.54	0.27	53.5
Approach		339	2.4	0.265	6.0	LOS A	1.7	12.0	0.27	0.54	0.27	53.1
All Vehicles		860	2.3	0.265	6.4	LOS A	1.7	12.0	0.37	0.58	0.37	52.9

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

MOVEMENT SUMMARY

Site: 003 [003GROAM - Fern Street / Elambra Parade - 2029-NoDev]

003 - 2029 GROWTH AM - NoDev - 2% ann. growth on Fern Street
Fern Street / Elambra Parade, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Fern Street (S)												
1	L2	34	0.0	0.162	4.2	LOS A	0.9	6.2	0.09	0.44	0.09	54.5
2	T1	210	3.3	0.162	4.4	LOS A	0.9	6.2	0.09	0.44	0.09	55.5
Approach		244	2.9	0.162	4.4	LOS A	0.9	6.2	0.09	0.44	0.09	55.4
North: Fern Street (N)												
8	T1	192	5.7	0.153	4.6	LOS A	0.9	6.3	0.17	0.45	0.17	54.8
9	R2	12	0.0	0.153	8.5	LOS A	0.9	6.3	0.17	0.45	0.17	54.8
9u	U	3	0.0	0.153	10.4	LOS A	0.9	6.3	0.17	0.45	0.17	55.5
Approach		207	5.3	0.153	4.9	LOS A	0.9	6.3	0.17	0.45	0.17	54.8
West: Elambra Parade (W)												
10	L2	10	0.0	0.047	5.2	LOS A	0.2	1.6	0.36	0.62	0.36	51.4
12	R2	41	0.0	0.047	9.4	LOS A	0.2	1.6	0.36	0.62	0.36	52.2
12u	U	1	0.0	0.047	11.2	LOS A	0.2	1.6	0.36	0.62	0.36	52.9
Approach		52	0.0	0.047	8.6	LOS A	0.2	1.6	0.36	0.62	0.36	52.1
All Vehicles		503	3.6	0.162	5.0	LOS A	0.9	6.3	0.15	0.46	0.15	54.8

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.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 003 [003GROPM - Fern Street / Elambra Parade - 2029-NoDev]

003 - 2029 GROWTH PM - NoDev - 2% ann. growth on Fern Street
Fern Street / Elambra Parade, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Fern Street (S)												
1	L2	32	3.1	0.219	4.3	LOS A	1.3	9.1	0.12	0.43	0.12	54.2
2	T1	293	3.1	0.219	4.5	LOS A	1.3	9.1	0.12	0.43	0.12	55.4
Approach		325	3.1	0.219	4.5	LOS A	1.3	9.1	0.12	0.43	0.12	55.3
North: Fern Street (N)												
8	T1	391	1.5	0.294	4.6	LOS A	2.0	14.0	0.22	0.45	0.22	54.8
9	R2	19	5.3	0.294	8.7	LOS A	2.0	14.0	0.22	0.45	0.22	54.4
9u	U	4	0.0	0.294	10.5	LOS A	2.0	14.0	0.22	0.45	0.22	55.4
Approach		414	1.7	0.294	4.9	LOS A	2.0	14.0	0.22	0.45	0.22	54.8
West: Elambra Parade (W)												
10	L2	19	5.3	0.069	5.8	LOS A	0.3	2.4	0.44	0.64	0.44	51.3
12	R2	52	0.0	0.069	9.8	LOS A	0.3	2.4	0.44	0.64	0.44	52.2
Approach		71	1.4	0.069	8.7	LOS A	0.3	2.4	0.44	0.64	0.44	52.0
All Vehicles		810	2.2	0.294	5.0	LOS A	2.0	14.0	0.20	0.46	0.20	54.7

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

MOVEMENT SUMMARY

Site: 101 [101FUAM - Belinda Street / Campbell Street - WithDev1]

101 - 2019 FUTURE AM - WITH DEVELOPMENT SCENARIO 1
Belinda Street / Campbell Street, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Stop (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: Campbell Street (S)												
1	L2	135	1.5	0.197	9.5	LOS A	0.8	5.8	0.45	0.91	0.45	50.8
3	R2	37	2.7	0.197	13.1	LOS A	0.8	5.8	0.45	0.91	0.45	50.3
Approach		172	1.7	0.197	10.3	LOS A	0.8	5.8	0.45	0.91	0.45	50.7
East: Belinda Street (E)												
4	L2	27	3.7	0.163	5.6	LOS A	0.0	0.0	0.00	0.05	0.00	57.7
5	T1	278	5.8	0.163	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	59.5
Approach		305	5.6	0.163	0.5	NA	0.0	0.0	0.00	0.05	0.00	59.3
West: Belinda Street (W)												
11	T1	193	6.2	0.104	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	37	2.7	0.028	6.5	LOS A	0.1	0.9	0.39	0.60	0.39	52.0
Approach		230	5.7	0.104	1.1	NA	0.1	0.9	0.06	0.10	0.06	58.5
All Vehicles		707	4.7	0.197	3.1	NA	0.8	5.8	0.13	0.28	0.13	56.7

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 [101FUPM - Belinda Street / Campbell Street - WithDev1]

101 - 2019 FUTURE PM - WITH DEVELOPMENT SCENARIO 1
Belinda Street / Campbell Street, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Stop (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: Campbell Street (S)												
1	L2	48	0.0	0.122	9.4	LOS A	0.5	3.2	0.51	0.91	0.51	49.7
3	R2	28	0.0	0.122	16.2	LOS B	0.5	3.2	0.51	0.91	0.51	49.3
Approach		76	0.0	0.122	11.9	LOS A	0.5	3.2	0.51	0.91	0.51	49.5
East: Belinda Street (E)												
4	L2	38	0.0	0.179	5.6	LOS A	0.0	0.0	0.00	0.07	0.00	57.7
5	T1	301	4.7	0.179	0.0	LOS A	0.0	0.0	0.00	0.07	0.00	59.3
Approach		339	4.1	0.179	0.6	NA	0.0	0.0	0.00	0.07	0.00	59.1
West: Belinda Street (W)												
11	T1	299	3.3	0.158	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	158	0.0	0.122	6.7	LOS A	0.6	3.9	0.43	0.65	0.43	52.0
Approach		457	2.2	0.158	2.3	NA	0.6	3.9	0.15	0.22	0.15	56.9
All Vehicles		872	2.8	0.179	2.5	NA	0.6	3.9	0.12	0.22	0.12	57.0

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.
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: 102 [102FUAM - Belinda Street / Greta Street - WithDev1]

102 - 2019 FUTURE AM - WITH DEVELOPMENT SCENARIO 1
Belinda Street / Greta Street, Gerringong, NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Greta Street (S)												
1	L2	111	3.6	0.223	5.9	LOS A	1.3	9.1	0.40	0.61	0.40	52.0
2	T1	53	0.0	0.223	5.7	LOS A	1.3	9.1	0.40	0.61	0.40	52.9
3	R2	78	0.0	0.223	8.9	LOS A	1.3	9.1	0.40	0.61	0.40	52.6
Approach		242	1.7	0.223	6.8	LOS A	1.3	9.1	0.40	0.61	0.40	52.4
East: Belinda Street (E)												
4	L2	43	9.3	0.173	5.9	LOS A	0.9	6.9	0.36	0.54	0.36	52.4
5	T1	139	6.5	0.173	5.7	LOS A	0.9	6.9	0.36	0.54	0.36	53.4
6	R2	1	0.0	0.173	8.8	LOS A	0.9	6.9	0.36	0.54	0.36	53.3
Approach		183	7.1	0.173	5.8	LOS A	0.9	6.9	0.36	0.54	0.36	53.2
North: Greta Street (N)												
7	L2	31	9.7	0.109	6.7	LOS A	0.6	4.0	0.46	0.62	0.46	51.6
8	T1	47	0.0	0.109	6.3	LOS A	0.6	4.0	0.46	0.62	0.46	52.8
9	R2	27	0.0	0.109	9.5	LOS A	0.6	4.0	0.46	0.62	0.46	52.4
Approach		105	2.9	0.109	7.2	LOS A	0.6	4.0	0.46	0.62	0.46	52.3
West: Belinda Street (W)												
10	L2	27	3.7	0.210	5.6	LOS A	1.2	8.7	0.35	0.58	0.35	52.1
11	T1	127	3.1	0.210	5.5	LOS A	1.2	8.7	0.35	0.58	0.35	52.9
12	R2	82	2.4	0.210	8.6	LOS A	1.2	8.7	0.35	0.58	0.35	52.5
12u	U	2	0.0	0.210	10.2	LOS A	1.2	8.7	0.35	0.58	0.35	53.1
Approach		238	2.9	0.210	6.6	LOS A	1.2	8.7	0.35	0.58	0.35	52.7
All Vehicles		768	3.5	0.223	6.6	LOS A	1.3	9.1	0.38	0.58	0.38	52.7

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

MOVEMENT SUMMARY

Site: 102 [102FUPM - Belinda Street / Greta Street - WithDev1]

102 - 2019 FUTURE PM - WITH DEVELOPMENT SCENARIO 1
Belinda Street / Greta Street, Gerringong, NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Greta Street (S)												
1	L2	109	0.0	0.177	6.0	LOS A	1.0	6.8	0.42	0.60	0.42	52.5
2	T1	48	2.1	0.177	6.0	LOS A	1.0	6.8	0.42	0.60	0.42	53.2
3	R2	27	3.7	0.177	9.1	LOS A	1.0	6.8	0.42	0.60	0.42	52.7
Approach		184	1.1	0.177	6.5	LOS A	1.0	6.8	0.42	0.60	0.42	52.7
East: Belinda Street (E)												
4	L2	49	0.0	0.198	5.9	LOS A	1.1	7.8	0.40	0.56	0.40	52.7
5	T1	157	5.1	0.198	5.9	LOS A	1.1	7.8	0.40	0.56	0.40	53.3
6	R2	1	0.0	0.198	8.9	LOS A	1.1	7.8	0.40	0.56	0.40	53.1
Approach		207	3.9	0.198	5.9	LOS A	1.1	7.8	0.40	0.56	0.40	53.2
North: Greta Street (N)												
7	L2	46	0.0	0.140	6.6	LOS A	0.7	5.2	0.48	0.65	0.48	51.8
8	T1	45	0.0	0.140	6.5	LOS A	0.7	5.2	0.48	0.65	0.48	52.6
9	R2	43	0.0	0.140	9.6	LOS A	0.7	5.2	0.48	0.65	0.48	52.2
9u	U	1	0.0	0.140	11.2	LOS A	0.7	5.2	0.48	0.65	0.48	52.7
Approach		135	0.0	0.140	7.6	LOS A	0.7	5.2	0.48	0.65	0.48	52.2
West: Belinda Street (W)												
10	L2	24	4.2	0.242	5.3	LOS A	1.5	10.6	0.27	0.55	0.27	52.4
11	T1	185	2.2	0.242	5.1	LOS A	1.5	10.6	0.27	0.55	0.27	53.2
12	R2	95	2.1	0.242	8.3	LOS A	1.5	10.6	0.27	0.55	0.27	52.9
12u	U	1	0.0	0.242	9.8	LOS A	1.5	10.6	0.27	0.55	0.27	53.4
Approach		305	2.3	0.242	6.1	LOS A	1.5	10.6	0.27	0.55	0.27	53.1
All Vehicles		831	2.0	0.242	6.4	LOS A	1.5	10.6	0.37	0.58	0.37	52.9

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

MOVEMENT SUMMARY

Site: 103 [103FUAM - Fern Street / Elambra Parade - WithDev1]

103 - 2019 FUTURE AM - WITH DEVELOPMENT SCENARIO 1
Fern Street / Elambra Parade, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Fern Street (S)												
1	L2	36	0.0	0.143	4.2	LOS A	0.8	5.4	0.10	0.44	0.10	54.5
2	T1	175	3.4	0.143	4.4	LOS A	0.8	5.4	0.10	0.44	0.10	55.5
Approach		211	2.8	0.143	4.4	LOS A	0.8	5.4	0.10	0.44	0.10	55.3
North: Fern Street (N)												
8	T1	160	5.6	0.134	4.6	LOS A	0.7	5.4	0.19	0.46	0.19	54.7
9	R2	14	0.0	0.134	8.6	LOS A	0.7	5.4	0.19	0.46	0.19	54.6
9u	U	3	0.0	0.134	10.4	LOS A	0.7	5.4	0.19	0.46	0.19	55.4
Approach		177	5.1	0.134	5.0	LOS A	0.7	5.4	0.19	0.46	0.19	54.7
West: Elambra Parade (W)												
10	L2	19	0.0	0.062	5.0	LOS A	0.3	2.1	0.33	0.61	0.33	51.7
12	R2	50	0.0	0.062	9.2	LOS A	0.3	2.1	0.33	0.61	0.33	52.5
12u	U	1	0.0	0.062	11.1	LOS A	0.3	2.1	0.33	0.61	0.33	53.2
Approach		70	0.0	0.062	8.1	LOS A	0.3	2.1	0.33	0.61	0.33	52.3
All Vehicles		458	3.3	0.143	5.2	LOS A	0.8	5.4	0.17	0.47	0.17	54.6

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

MOVEMENT SUMMARY

Site: 103 [103FUPM - Fern Street / Elambra Parade - WithDev1]

103 - 2019 FUTURE PM - WITH DEVELOPMENT SCENARIO 1
Fern Street / Elambra Parade, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Fern Street (S)												
1	L2	42	2.4	0.200	4.3	LOS A	1.1	8.1	0.15	0.44	0.15	54.2
2	T1	244	2.9	0.200	4.5	LOS A	1.1	8.1	0.15	0.44	0.15	55.3
Approach		286	2.8	0.200	4.5	LOS A	1.1	8.1	0.15	0.44	0.15	55.1
North: Fern Street (N)												
8	T1	326	1.5	0.259	4.6	LOS A	1.6	11.7	0.22	0.46	0.22	54.7
9	R2	29	3.4	0.259	8.7	LOS A	1.6	11.7	0.22	0.46	0.22	54.4
9u	U	4	0.0	0.259	10.5	LOS A	1.6	11.7	0.22	0.46	0.22	55.3
Approach		359	1.7	0.259	5.0	LOS A	1.6	11.7	0.22	0.46	0.22	54.7
West: Elambra Parade (W)												
10	L2	22	4.5	0.072	5.5	LOS A	0.4	2.5	0.40	0.63	0.40	51.4
12	R2	55	0.0	0.072	9.6	LOS A	0.4	2.5	0.40	0.63	0.40	52.4
Approach		77	1.3	0.072	8.4	LOS A	0.4	2.5	0.40	0.63	0.40	52.1
All Vehicles		722	2.1	0.259	5.2	LOS A	1.6	11.7	0.21	0.47	0.21	54.6

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

MOVEMENT SUMMARY

Site: 104 [104FUAM - Fern Street / Unnamed Street - WithDev1]

104 - 2019 FUTURE AM - WITH DEVELOPMENT SCENARIO 1
Fern Street / Unnamed Street, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Fern Street (S)												
1a	L1	5	0.0	0.140	5.7	LOS A	0.7	5.2	0.04	0.66	0.04	54.4
3a	R1	227	3.5	0.140	9.7	LOS A	0.7	5.2	0.04	0.66	0.04	63.0
3u	U	1	0.0	0.140	10.8	LOS A	0.7	5.2	0.04	0.66	0.04	60.4
Approach		233	3.4	0.140	9.6	LOS A	0.7	5.2	0.04	0.66	0.04	62.7
NorthEast: Fern Street (N)												
24a	L1	256	3.5	0.169	5.8	LOS A	1.0	7.1	0.11	0.50	0.11	67.1
26	R2	2	0.0	0.169	8.8	LOS A	1.0	7.1	0.11	0.50	0.11	62.2
26u	U	1	0.0	0.169	10.9	LOS A	1.0	7.1	0.11	0.50	0.11	63.5
Approach		259	3.5	0.169	5.9	LOS A	1.0	7.1	0.11	0.50	0.11	67.1
NorthWest: Unnamed Street (W)												
27	L2	2	0.0	0.019	4.8	LOS A	0.1	0.6	0.36	0.56	0.36	48.8
29a	R1	19	0.0	0.019	7.3	LOS A	0.1	0.6	0.36	0.56	0.36	53.2
29u	U	1	0.0	0.019	11.8	LOS A	0.1	0.6	0.36	0.56	0.36	50.7
Approach		22	0.0	0.019	7.3	LOS A	0.1	0.6	0.36	0.56	0.36	52.7
All Vehicles		514	3.3	0.169	7.6	LOS A	1.0	7.1	0.09	0.57	0.09	64.3

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

MOVEMENT SUMMARY

Site: 104 [104FUPM - Fern Street / Unnamed Street - WithDev1]

104 - 2019 FUTURE PM - WITH DEVELOPMENT SCENARIO 1
Fern Street / Unnamed Street, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Fern Street (S)												
1a	L1	20	0.0	0.209	5.7	LOS A	1.2	8.4	0.04	0.66	0.04	54.6
3a	R1	331	3.3	0.209	9.7	LOS A	1.2	8.4	0.04	0.66	0.04	63.2
3u	U	1	0.0	0.209	10.8	LOS A	1.2	8.4	0.04	0.66	0.04	60.5
Approach		352	3.1	0.209	9.4	LOS A	1.2	8.4	0.04	0.66	0.04	62.6
NorthEast: Fern Street (N)												
24a	L1	341	3.5	0.209	5.8	LOS A	1.3	9.3	0.06	0.50	0.06	67.5
26	R2	2	0.0	0.209	8.7	LOS A	1.3	9.3	0.06	0.50	0.06	62.5
26u	U	1	0.0	0.209	10.8	LOS A	1.3	9.3	0.06	0.50	0.06	63.9
Approach		344	3.5	0.209	5.8	LOS A	1.3	9.3	0.06	0.50	0.06	67.5
NorthWest: Unnamed Street (W)												
27	L2	2	0.0	0.007	5.3	LOS A	0.0	0.2	0.43	0.56	0.43	49.7
29a	R1	5	0.0	0.007	7.8	LOS A	0.0	0.2	0.43	0.56	0.43	54.3
29u	U	1	0.0	0.007	12.2	LOS A	0.0	0.2	0.43	0.56	0.43	51.6
Approach		8	0.0	0.007	7.7	LOS A	0.0	0.2	0.43	0.56	0.43	52.7
All Vehicles		704	3.3	0.209	7.6	LOS A	1.3	9.3	0.05	0.58	0.05	64.7

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

MOVEMENT SUMMARY

Site: 101 [101GROAM - Belinda Street / Campbell Street - 2029-WithDev1]

101 - 2029 GROWTH AM - WITH DEVELOPMENT SCENARIO 1 & 2% ann. growth on Belinda Street
Belinda Street / Campbell Street, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Stop (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: Campbell Street (S)												
1	L2	135	1.5	0.218	9.8	LOS A	0.9	6.3	0.50	0.92	0.50	50.4
3	R2	37	2.7	0.218	14.8	LOS B	0.9	6.3	0.50	0.92	0.50	49.9
Approach		172	1.7	0.218	10.9	LOS A	0.9	6.3	0.50	0.92	0.50	50.3
East: Belinda Street (E)												
4	L2	30	3.3	0.194	5.6	LOS A	0.0	0.0	0.00	0.05	0.00	57.7
5	T1	334	5.7	0.194	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	59.5
Approach		364	5.5	0.194	0.5	NA	0.0	0.0	0.00	0.05	0.00	59.4
West: Belinda Street (W)												
11	T1	232	6.5	0.125	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	37	2.7	0.030	6.8	LOS A	0.1	0.9	0.43	0.62	0.43	51.9
Approach		269	5.9	0.125	0.9	NA	0.1	0.9	0.06	0.08	0.06	58.7
All Vehicles		805	4.8	0.218	2.9	NA	0.9	6.3	0.13	0.25	0.13	56.9

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 [101GROPM - Belinda Street / Campbell Street - 2029-WithDev1]

101 - 2029 GROWTH PM - WITH DEVELOPMENT SCENARIO 1 & 2% ann. growth on Belinda Street
Belinda Street / Campbell Street, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Stop (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: Campbell Street (S)												
1	L2	48	0.0	0.143	9.8	LOS A	0.5	3.6	0.56	0.93	0.56	49.0
3	R2	28	0.0	0.143	19.0	LOS B	0.5	3.6	0.56	0.93	0.56	48.5
Approach		76	0.0	0.143	13.2	LOS A	0.5	3.6	0.56	0.93	0.56	48.8
East: Belinda Street (E)												
4	L2	38	0.0	0.211	5.6	LOS A	0.0	0.0	0.00	0.06	0.00	57.8
5	T1	361	4.7	0.211	0.0	LOS A	0.0	0.0	0.00	0.06	0.00	59.4
Approach		399	4.3	0.211	0.6	NA	0.0	0.0	0.00	0.06	0.00	59.3
West: Belinda Street (W)												
11	T1	359	3.3	0.190	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	158	0.0	0.131	7.0	LOS A	0.6	4.1	0.47	0.68	0.47	51.9
Approach		517	2.3	0.190	2.2	NA	0.6	4.1	0.14	0.21	0.14	57.2
All Vehicles		992	2.9	0.211	2.4	NA	0.6	4.1	0.12	0.20	0.12	57.3

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

MOVEMENT SUMMARY

Site: 102 [102GROAM - Belinda Street / Greta Street - 2029-WithDev1]

102 - 2029 GROWTH AM - WITH DEVELOPMENT SCENARIO 1 & 2% ann. growth on Belinda Street
Belinda Street / Greta Street, Gerringong, NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Greta Street (S)												
1	L2	111	3.6	0.231	6.1	LOS A	1.3	9.4	0.43	0.62	0.43	51.9
2	T1	53	0.0	0.231	5.9	LOS A	1.3	9.4	0.43	0.62	0.43	52.8
3	R2	78	0.0	0.231	9.1	LOS A	1.3	9.4	0.43	0.62	0.43	52.5
Approach		242	1.7	0.231	7.0	LOS A	1.3	9.4	0.43	0.62	0.43	52.3
East: Belinda Street (E)												
4	L2	43	9.3	0.197	5.9	LOS A	1.1	8.0	0.37	0.54	0.37	52.4
5	T1	166	6.6	0.197	5.8	LOS A	1.1	8.0	0.37	0.54	0.37	53.4
6	R2	1	0.0	0.197	8.8	LOS A	1.1	8.0	0.37	0.54	0.37	53.2
Approach		210	7.1	0.197	5.8	LOS A	1.1	8.0	0.37	0.54	0.37	53.2
North: Greta Street (N)												
7	L2	31	9.7	0.111	6.8	LOS A	0.6	4.1	0.48	0.63	0.48	51.5
8	T1	47	0.0	0.111	6.5	LOS A	0.6	4.1	0.48	0.63	0.48	52.7
9	R2	27	0.0	0.111	9.6	LOS A	0.6	4.1	0.48	0.63	0.48	52.3
Approach		105	2.9	0.111	7.4	LOS A	0.6	4.1	0.48	0.63	0.48	52.2
West: Belinda Street (W)												
10	L2	27	3.7	0.230	5.6	LOS A	1.4	9.8	0.36	0.57	0.36	52.1
11	T1	151	3.3	0.230	5.5	LOS A	1.4	9.8	0.36	0.57	0.36	52.9
12	R2	82	2.4	0.230	8.6	LOS A	1.4	9.8	0.36	0.57	0.36	52.6
12u	U	2	0.0	0.230	10.2	LOS A	1.4	9.8	0.36	0.57	0.36	53.2
Approach		262	3.1	0.230	6.5	LOS A	1.4	9.8	0.36	0.57	0.36	52.7
All Vehicles		819	3.7	0.231	6.6	LOS A	1.4	9.8	0.40	0.59	0.40	52.6

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

MOVEMENT SUMMARY

Site: 102 [102GROPM - Belinda Street / Greta Street - 2029-WithDev1]

102 - 2029 GROWTH PM - WITH DEVELOPMENT SCENARIO 1 & 2% ann. growth on Belinda Street
Belinda Street / Greta Street, Gerringong, NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Greta Street (S)												
1	L2	109	0.0	0.182	6.2	LOS A	1.0	7.1	0.45	0.61	0.45	52.4
2	T1	48	2.1	0.182	6.1	LOS A	1.0	7.1	0.45	0.61	0.45	53.1
3	R2	27	3.7	0.182	9.3	LOS A	1.0	7.1	0.45	0.61	0.45	52.6
Approach		184	1.1	0.182	6.6	LOS A	1.0	7.1	0.45	0.61	0.45	52.6
East: Belinda Street (E)												
4	L2	49	0.0	0.225	5.9	LOS A	1.3	9.2	0.41	0.56	0.41	52.7
5	T1	186	5.4	0.225	5.9	LOS A	1.3	9.2	0.41	0.56	0.41	53.3
6	R2	1	0.0	0.225	9.0	LOS A	1.3	9.2	0.41	0.56	0.41	53.1
Approach		236	4.2	0.225	6.0	LOS A	1.3	9.2	0.41	0.56	0.41	53.1
North: Greta Street (N)												
7	L2	46	0.0	0.145	6.8	LOS A	0.8	5.4	0.51	0.66	0.51	51.6
8	T1	45	0.0	0.145	6.7	LOS A	0.8	5.4	0.51	0.66	0.51	52.4
9	R2	43	0.0	0.145	9.9	LOS A	0.8	5.4	0.51	0.66	0.51	52.1
9u	U	1	0.0	0.145	11.4	LOS A	0.8	5.4	0.51	0.66	0.51	52.5
Approach		135	0.0	0.145	7.8	LOS A	0.8	5.4	0.51	0.66	0.51	52.0
West: Belinda Street (W)												
10	L2	24	4.2	0.270	5.3	LOS A	1.7	12.4	0.28	0.54	0.28	52.4
11	T1	222	2.3	0.270	5.1	LOS A	1.7	12.4	0.28	0.54	0.28	53.3
12	R2	95	2.1	0.270	8.3	LOS A	1.7	12.4	0.28	0.54	0.28	52.9
12u	U	1	0.0	0.270	9.8	LOS A	1.7	12.4	0.28	0.54	0.28	53.5
Approach		342	2.3	0.270	6.0	LOS A	1.7	12.4	0.28	0.54	0.28	53.1
All Vehicles		897	2.2	0.270	6.4	LOS A	1.7	12.4	0.38	0.58	0.38	52.8

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.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 103 [103GROAM - Fern Street / Elambra Parade - 2029-WithDev1]

103 - 2029 GROWTH AM - WITH DEVELOPMENT SCENARIO 1 & 2% ann. growth on Fern Street
Fern Street / Elambra Parade, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Fern Street (S)												
1	L2	36	0.0	0.165	4.2	LOS A	0.9	6.4	0.10	0.44	0.10	54.5
2	T1	210	3.3	0.165	4.4	LOS A	0.9	6.4	0.10	0.44	0.10	55.5
Approach		246	2.8	0.165	4.4	LOS A	0.9	6.4	0.10	0.44	0.10	55.4
North: Fern Street (N)												
8	T1	192	5.7	0.157	4.6	LOS A	0.9	6.5	0.19	0.45	0.19	54.7
9	R2	14	0.0	0.157	8.6	LOS A	0.9	6.5	0.19	0.45	0.19	54.7
9u	U	3	0.0	0.157	10.4	LOS A	0.9	6.5	0.19	0.45	0.19	55.4
Approach		209	5.3	0.157	5.0	LOS A	0.9	6.5	0.19	0.45	0.19	54.7
West: Elambra Parade (W)												
10	L2	19	0.0	0.063	5.2	LOS A	0.3	2.1	0.37	0.62	0.37	51.6
12	R2	50	0.0	0.063	9.4	LOS A	0.3	2.1	0.37	0.62	0.37	52.5
12u	U	1	0.0	0.063	11.2	LOS A	0.3	2.1	0.37	0.62	0.37	53.2
Approach		70	0.0	0.063	8.3	LOS A	0.3	2.1	0.37	0.62	0.37	52.2
All Vehicles		525	3.4	0.165	5.2	LOS A	0.9	6.5	0.17	0.47	0.17	54.7

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

MOVEMENT SUMMARY

Site: 103 [103 GROPM - Fern Street / Elambra Parade - 2029-WithDev1]

103 - 2029 GROWTH PM - WITH DEVELOPMENT SCENARIO 1 & 2% ann. growth on Fern Street
Fern Street / Elambra Parade, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Fern Street (S)												
1	L2	42	2.4	0.232	4.3	LOS A	1.4	9.8	0.15	0.44	0.15	54.1
2	T1	293	3.1	0.232	4.5	LOS A	1.4	9.8	0.15	0.44	0.15	55.3
Approach		335	3.0	0.232	4.5	LOS A	1.4	9.8	0.15	0.44	0.15	55.1
North: Fern Street (N)												
8	T1	391	1.5	0.303	4.7	LOS A	2.0	14.5	0.23	0.46	0.23	54.7
9	R2	29	3.4	0.303	8.7	LOS A	2.0	14.5	0.23	0.46	0.23	54.4
9u	U	4	0.0	0.303	10.5	LOS A	2.0	14.5	0.23	0.46	0.23	55.3
Approach		424	1.7	0.303	5.0	LOS A	2.0	14.5	0.23	0.46	0.23	54.7
West: Elambra Parade (W)												
10	L2	21	4.8	0.074	5.8	LOS A	0.4	2.6	0.44	0.65	0.44	51.3
12	R2	55	0.0	0.074	9.8	LOS A	0.4	2.6	0.44	0.65	0.44	52.3
Approach		76	1.3	0.074	8.7	LOS A	0.4	2.6	0.44	0.65	0.44	52.0
All Vehicles		835	2.2	0.303	5.1	LOS A	2.0	14.5	0.22	0.46	0.22	54.6

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

MOVEMENT SUMMARY

Site: 104 [104GROPM - Fern Street / Unnamed Street - 2029-WithDev1]

104 - 2029 GROWTH PM - WITH DEVELOPMENT SCENARIO 1 & 2% ann. growth on Fern Street
Fern Street / Unnamed Street, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Fern Street (S)												
1a	L1	20	0.0	0.246	5.7	LOS A	1.4	10.3	0.04	0.66	0.04	54.5
3a	R1	395	3.3	0.246	9.7	LOS A	1.4	10.3	0.04	0.66	0.04	63.1
3u	U	1	0.0	0.246	10.8	LOS A	1.4	10.3	0.04	0.66	0.04	60.5
Approach		416	3.1	0.246	9.5	LOS A	1.4	10.3	0.04	0.66	0.04	62.7
NorthEast: Fern Street (N)												
24a	L1	409	3.4	0.248	5.8	LOS A	1.6	11.6	0.06	0.50	0.06	67.5
26	R2	2	0.0	0.248	8.7	LOS A	1.6	11.6	0.06	0.50	0.06	62.5
26u	U	1	0.0	0.248	10.8	LOS A	1.6	11.6	0.06	0.50	0.06	63.9
Approach		412	3.4	0.248	5.8	LOS A	1.6	11.6	0.06	0.50	0.06	67.5
NorthWest: Unnamed Street (W)												
27	L2	2	0.0	0.008	5.6	LOS A	0.0	0.3	0.47	0.57	0.47	49.6
29a	R1	5	0.0	0.008	8.1	LOS A	0.0	0.3	0.47	0.57	0.47	54.1
29u	U	1	0.0	0.008	12.5	LOS A	0.0	0.3	0.47	0.57	0.47	51.5
Approach		8	0.0	0.008	8.0	LOS A	0.0	0.3	0.47	0.57	0.47	52.6
All Vehicles		836	3.2	0.248	7.7	LOS A	1.6	11.6	0.06	0.58	0.06	64.8

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.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 104 [104GROAM - Fern Street / Unnamed Street - 2029-WithDev1]

104 - 2029 GROWTH AM - WITH DEVELOPMENT SCENARIO 1 & 2% ann. growth on Fern Street
Fern Street / Unnamed Street, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Fern Street (S)												
1a	L1	5	0.0	0.166	5.7	LOS A	0.9	6.4	0.04	0.66	0.04	54.4
3a	R1	272	3.7	0.166	9.7	LOS A	0.9	6.4	0.04	0.66	0.04	62.9
3u	U	1	0.0	0.166	10.8	LOS A	0.9	6.4	0.04	0.66	0.04	60.4
Approach		278	3.6	0.166	9.6	LOS A	0.9	6.4	0.04	0.66	0.04	62.7
NorthEast: Fern Street (N)												
24a	L1	305	3.6	0.200	5.8	LOS A	1.2	8.7	0.12	0.49	0.12	67.1
26	R2	2	0.0	0.200	8.8	LOS A	1.2	8.7	0.12	0.49	0.12	62.2
26u	U	1	0.0	0.200	10.9	LOS A	1.2	8.7	0.12	0.49	0.12	63.5
Approach		308	3.6	0.200	5.9	LOS A	1.2	8.7	0.12	0.49	0.12	67.1
NorthWest: Unnamed Street (W)												
27	L2	2	0.0	0.020	5.1	LOS A	0.1	0.6	0.39	0.57	0.39	48.7
29a	R1	19	0.0	0.020	7.5	LOS A	0.1	0.6	0.39	0.57	0.39	53.1
29u	U	1	0.0	0.020	12.0	LOS A	0.1	0.6	0.39	0.57	0.39	50.6
Approach		22	0.0	0.020	7.5	LOS A	0.1	0.6	0.39	0.57	0.39	52.6
All Vehicles		608	3.5	0.200	7.6	LOS A	1.2	8.7	0.09	0.57	0.09	64.4

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

MOVEMENT SUMMARY

Site: 201 [201FUAM - Belinda Street / Campbell Street - WithDev2/3]

201 - 2019 FUTURE AM - WITH DEVELOPMENT SCENARIO 2/3
Belinda Street / Campbell Street, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Stop (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: Campbell Street (S)												
1	L2	135	1.5	0.197	9.5	LOS A	0.8	5.8	0.45	0.91	0.45	50.8
3	R2	37	2.7	0.197	13.1	LOS A	0.8	5.8	0.45	0.91	0.45	50.3
Approach		172	1.7	0.197	10.3	LOS A	0.8	5.8	0.45	0.91	0.45	50.7
East: Belinda Street (E)												
4	L2	27	3.7	0.163	5.6	LOS A	0.0	0.0	0.00	0.05	0.00	57.7
5	T1	278	5.8	0.163	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	59.5
Approach		305	5.6	0.163	0.5	NA	0.0	0.0	0.00	0.05	0.00	59.3
West: Belinda Street (W)												
11	T1	193	6.2	0.104	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	37	2.7	0.028	6.5	LOS A	0.1	0.9	0.39	0.60	0.39	52.0
Approach		230	5.7	0.104	1.1	NA	0.1	0.9	0.06	0.10	0.06	58.5
All Vehicles		707	4.7	0.197	3.1	NA	0.8	5.8	0.13	0.28	0.13	56.7

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: 201 [201FUPM - Belinda Street / Campbell Street - WithDev2/3]

201 - 2019 FUTURE PM - WITH DEVELOPMENT SCENARIO 2/3
Belinda Street / Campbell Street, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Stop (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: Campbell Street (S)												
1	L2	48	0.0	0.122	9.4	LOS A	0.5	3.2	0.51	0.91	0.51	49.7
3	R2	28	0.0	0.122	16.2	LOS B	0.5	3.2	0.51	0.91	0.51	49.3
Approach		76	0.0	0.122	11.9	LOS A	0.5	3.2	0.51	0.91	0.51	49.5
East: Belinda Street (E)												
4	L2	38	0.0	0.179	5.6	LOS A	0.0	0.0	0.00	0.07	0.00	57.7
5	T1	301	4.7	0.179	0.0	LOS A	0.0	0.0	0.00	0.07	0.00	59.3
Approach		339	4.1	0.179	0.6	NA	0.0	0.0	0.00	0.07	0.00	59.1
West: Belinda Street (W)												
11	T1	299	3.3	0.158	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	158	0.0	0.122	6.7	LOS A	0.6	3.9	0.43	0.65	0.43	52.0
Approach		457	2.2	0.158	2.3	NA	0.6	3.9	0.15	0.22	0.15	56.9
All Vehicles		872	2.8	0.179	2.5	NA	0.6	3.9	0.12	0.22	0.12	57.0

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.
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: 202 [202FUAM - Belinda Street / Greta Street - WithDev2/3]

202 - 2019 FUTURE AM - WITH DEVELOPMENT SCENARIO 2/3
Belinda Street / Greta Street, Gerringong, NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Greta Street (S)												
1	L2	111	3.6	0.223	5.9	LOS A	1.3	9.1	0.40	0.61	0.40	52.0
2	T1	53	0.0	0.223	5.7	LOS A	1.3	9.1	0.40	0.61	0.40	52.9
3	R2	78	0.0	0.223	8.9	LOS A	1.3	9.1	0.40	0.61	0.40	52.6
Approach		242	1.7	0.223	6.8	LOS A	1.3	9.1	0.40	0.61	0.40	52.4
East: Belinda Street (E)												
4	L2	43	9.3	0.173	5.9	LOS A	0.9	6.9	0.36	0.54	0.36	52.4
5	T1	139	6.5	0.173	5.7	LOS A	0.9	6.9	0.36	0.54	0.36	53.4
6	R2	1	0.0	0.173	8.8	LOS A	0.9	6.9	0.36	0.54	0.36	53.3
Approach		183	7.1	0.173	5.8	LOS A	0.9	6.9	0.36	0.54	0.36	53.2
North: Greta Street (N)												
7	L2	31	9.7	0.109	6.7	LOS A	0.6	4.0	0.46	0.62	0.46	51.6
8	T1	47	0.0	0.109	6.3	LOS A	0.6	4.0	0.46	0.62	0.46	52.8
9	R2	27	0.0	0.109	9.5	LOS A	0.6	4.0	0.46	0.62	0.46	52.4
Approach		105	2.9	0.109	7.2	LOS A	0.6	4.0	0.46	0.62	0.46	52.3
West: Belinda Street (W)												
10	L2	27	3.7	0.210	5.6	LOS A	1.2	8.7	0.35	0.58	0.35	52.1
11	T1	127	3.1	0.210	5.5	LOS A	1.2	8.7	0.35	0.58	0.35	52.9
12	R2	82	2.4	0.210	8.6	LOS A	1.2	8.7	0.35	0.58	0.35	52.5
12u	U	2	0.0	0.210	10.2	LOS A	1.2	8.7	0.35	0.58	0.35	53.1
Approach		238	2.9	0.210	6.6	LOS A	1.2	8.7	0.35	0.58	0.35	52.7
All Vehicles		768	3.5	0.223	6.6	LOS A	1.3	9.1	0.38	0.58	0.38	52.7

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

MOVEMENT SUMMARY

Site: 202 [202FUPM - Belinda Street / Greta Street - WithDev2/3]

202 - 2019 FUTURE PM - WITH DEVELOPMENT SCENARIO 2/3
Belinda Street / Greta Street, Gerringong, NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Greta Street (S)												
1	L2	109	0.0	0.177	6.0	LOS A	1.0	6.8	0.42	0.60	0.42	52.5
2	T1	48	2.1	0.177	6.0	LOS A	1.0	6.8	0.42	0.60	0.42	53.2
3	R2	27	3.7	0.177	9.1	LOS A	1.0	6.8	0.42	0.60	0.42	52.7
Approach		184	1.1	0.177	6.5	LOS A	1.0	6.8	0.42	0.60	0.42	52.7
East: Belinda Street (E)												
4	L2	49	0.0	0.198	5.9	LOS A	1.1	7.8	0.40	0.56	0.40	52.7
5	T1	157	5.1	0.198	5.9	LOS A	1.1	7.8	0.40	0.56	0.40	53.3
6	R2	1	0.0	0.198	8.9	LOS A	1.1	7.8	0.40	0.56	0.40	53.1
Approach		207	3.9	0.198	5.9	LOS A	1.1	7.8	0.40	0.56	0.40	53.2
North: Greta Street (N)												
7	L2	46	0.0	0.140	6.6	LOS A	0.7	5.2	0.48	0.65	0.48	51.8
8	T1	45	0.0	0.140	6.5	LOS A	0.7	5.2	0.48	0.65	0.48	52.6
9	R2	43	0.0	0.140	9.6	LOS A	0.7	5.2	0.48	0.65	0.48	52.2
9u	U	1	0.0	0.140	11.2	LOS A	0.7	5.2	0.48	0.65	0.48	52.7
Approach		135	0.0	0.140	7.6	LOS A	0.7	5.2	0.48	0.65	0.48	52.2
West: Belinda Street (W)												
10	L2	24	4.2	0.242	5.3	LOS A	1.5	10.6	0.27	0.55	0.27	52.4
11	T1	185	2.2	0.242	5.1	LOS A	1.5	10.6	0.27	0.55	0.27	53.2
12	R2	95	2.1	0.242	8.3	LOS A	1.5	10.6	0.27	0.55	0.27	52.9
12u	U	1	0.0	0.242	9.8	LOS A	1.5	10.6	0.27	0.55	0.27	53.4
Approach		305	2.3	0.242	6.1	LOS A	1.5	10.6	0.27	0.55	0.27	53.1
All Vehicles		831	2.0	0.242	6.4	LOS A	1.5	10.6	0.37	0.58	0.37	52.9

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

MOVEMENT SUMMARY

Site: 203 [203FUAM - Fern Street / Elambra Parade - WithDev2/3]

203 - 2019 FUTURE AM - WITH DEVELOPMENT SCENARIO 2/3
Fern Street / Elambra Parade, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Fern Street (S)												
1	L2	41	0.0	0.146	4.2	LOS A	0.8	5.6	0.10	0.44	0.10	54.5
2	T1	175	3.4	0.146	4.4	LOS A	0.8	5.6	0.10	0.44	0.10	55.5
Approach		216	2.8	0.146	4.4	LOS A	0.8	5.6	0.10	0.44	0.10	55.3
North: Fern Street (N)												
8	T1	160	5.6	0.139	4.7	LOS A	0.8	5.6	0.23	0.47	0.23	54.5
9	R2	14	0.0	0.139	8.7	LOS A	0.8	5.6	0.23	0.47	0.23	54.5
9u	U	3	0.0	0.139	10.5	LOS A	0.8	5.6	0.23	0.47	0.23	55.2
Approach		177	5.1	0.139	5.2	LOS A	0.8	5.6	0.23	0.47	0.23	54.5
West: Elambra Parade (W)												
10	L2	19	0.0	0.078	5.0	LOS A	0.4	2.7	0.34	0.62	0.34	51.5
12	R2	69	0.0	0.078	9.2	LOS A	0.4	2.7	0.34	0.62	0.34	52.4
12u	U	1	0.0	0.078	11.1	LOS A	0.4	2.7	0.34	0.62	0.34	53.1
Approach		89	0.0	0.078	8.3	LOS A	0.4	2.7	0.34	0.62	0.34	52.2
All Vehicles		482	3.1	0.146	5.4	LOS A	0.8	5.6	0.19	0.48	0.19	54.4

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

MOVEMENT SUMMARY

Site: 203 [203FUPM - Fern Street / Elambra Parade - WithDev2/3]

203 - 2019 FUTURE PM - WITH DEVELOPMENT SCENARIO 2/3
Fern Street / Elambra Parade, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Fern Street (S)												
1	L2	63	1.6	0.213	4.3	LOS A	1.2	8.8	0.15	0.44	0.15	54.2
2	T1	244	2.9	0.213	4.5	LOS A	1.2	8.8	0.15	0.44	0.15	55.3
Approach		307	2.6	0.213	4.5	LOS A	1.2	8.8	0.15	0.44	0.15	55.1
North: Fern Street (N)												
8	T1	326	1.5	0.261	4.7	LOS A	1.7	11.8	0.23	0.46	0.23	54.7
9	R2	29	3.4	0.261	8.7	LOS A	1.7	11.8	0.23	0.46	0.23	54.3
9u	U	4	0.0	0.261	10.5	LOS A	1.7	11.8	0.23	0.46	0.23	55.3
Approach		359	1.7	0.261	5.1	LOS A	1.7	11.8	0.23	0.46	0.23	54.6
West: Elambra Parade (W)												
10	L2	21	4.8	0.076	5.5	LOS A	0.4	2.7	0.40	0.63	0.40	51.3
12	R2	60	0.0	0.076	9.6	LOS A	0.4	2.7	0.40	0.63	0.40	52.3
Approach		81	1.2	0.076	8.5	LOS A	0.4	2.7	0.40	0.63	0.40	52.1
All Vehicles		747	2.0	0.261	5.2	LOS A	1.7	11.8	0.22	0.47	0.22	54.5

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

MOVEMENT SUMMARY

Site: 201 [201GROAM - Belinda Street / Campbell Street - 2029-WithDev2/3]

201 - 2029 GROWTH AM - WITH DEVELOPMENT SCENARIO 2/3 & 2% ann. growth on Belinda Street
Belinda Street / Campbell Street, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Stop (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: Campbell Street (S)												
1	L2	135	1.5	0.218	9.8	LOS A	0.9	6.3	0.50	0.92	0.50	50.4
3	R2	37	2.7	0.218	14.8	LOS B	0.9	6.3	0.50	0.92	0.50	49.9
Approach		172	1.7	0.218	10.9	LOS A	0.9	6.3	0.50	0.92	0.50	50.3
East: Belinda Street (E)												
4	L2	30	3.3	0.194	5.6	LOS A	0.0	0.0	0.00	0.05	0.00	57.7
5	T1	334	5.7	0.194	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	59.5
Approach		364	5.5	0.194	0.5	NA	0.0	0.0	0.00	0.05	0.00	59.4
West: Belinda Street (W)												
11	T1	232	6.5	0.125	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	37	2.7	0.030	6.8	LOS A	0.1	0.9	0.43	0.62	0.43	51.9
Approach		269	5.9	0.125	0.9	NA	0.1	0.9	0.06	0.08	0.06	58.7
All Vehicles		805	4.8	0.218	2.9	NA	0.9	6.3	0.13	0.25	0.13	56.9

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: 201 [201GROPM - Belinda Street / Campbell Street - 2029-WithDev2/3]

201 - 2029 GROWTH PM - WITH DEVELOPMENT SCENARIO 2/3 & 2% ann. growth on Belinda Street
Belinda Street / Campbell Street, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Stop (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: Campbell Street (S)												
1	L2	48	0.0	0.143	9.8	LOS A	0.5	3.6	0.56	0.93	0.56	49.0
3	R2	28	0.0	0.143	19.0	LOS B	0.5	3.6	0.56	0.93	0.56	48.5
Approach		76	0.0	0.143	13.2	LOS A	0.5	3.6	0.56	0.93	0.56	48.8
East: Belinda Street (E)												
4	L2	38	0.0	0.211	5.6	LOS A	0.0	0.0	0.00	0.06	0.00	57.8
5	T1	361	4.7	0.211	0.0	LOS A	0.0	0.0	0.00	0.06	0.00	59.4
Approach		399	4.3	0.211	0.6	NA	0.0	0.0	0.00	0.06	0.00	59.3
West: Belinda Street (W)												
11	T1	359	3.3	0.190	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	158	0.0	0.131	7.0	LOS A	0.6	4.1	0.47	0.68	0.47	51.9
Approach		517	2.3	0.190	2.2	NA	0.6	4.1	0.14	0.21	0.14	57.2
All Vehicles		992	2.9	0.211	2.4	NA	0.6	4.1	0.12	0.20	0.12	57.3

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

MOVEMENT SUMMARY

Site: 202 [202GROAM - Belinda Street / Greta Street - 2029-WithDev2/3]

202 - 2029 GROWTH AM - WITH DEVELOPMENT SCENARIO 2/3 & 2% ann. growth on Belinda Street
Belinda Street / Greta Street, Gerringong, NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Greta Street (S)												
1	L2	111	3.6	0.231	6.1	LOS A	1.3	9.4	0.43	0.62	0.43	51.9
2	T1	53	0.0	0.231	5.9	LOS A	1.3	9.4	0.43	0.62	0.43	52.8
3	R2	78	0.0	0.231	9.1	LOS A	1.3	9.4	0.43	0.62	0.43	52.5
Approach		242	1.7	0.231	7.0	LOS A	1.3	9.4	0.43	0.62	0.43	52.3
East: Belinda Street (E)												
4	L2	43	9.3	0.197	5.9	LOS A	1.1	8.0	0.37	0.54	0.37	52.4
5	T1	166	6.6	0.197	5.8	LOS A	1.1	8.0	0.37	0.54	0.37	53.4
6	R2	1	0.0	0.197	8.8	LOS A	1.1	8.0	0.37	0.54	0.37	53.2
Approach		210	7.1	0.197	5.8	LOS A	1.1	8.0	0.37	0.54	0.37	53.2
North: Greta Street (N)												
7	L2	31	9.7	0.111	6.8	LOS A	0.6	4.1	0.48	0.63	0.48	51.5
8	T1	47	0.0	0.111	6.5	LOS A	0.6	4.1	0.48	0.63	0.48	52.7
9	R2	27	0.0	0.111	9.6	LOS A	0.6	4.1	0.48	0.63	0.48	52.3
Approach		105	2.9	0.111	7.4	LOS A	0.6	4.1	0.48	0.63	0.48	52.2
West: Belinda Street (W)												
10	L2	27	3.7	0.230	5.6	LOS A	1.4	9.8	0.36	0.57	0.36	52.1
11	T1	151	3.3	0.230	5.5	LOS A	1.4	9.8	0.36	0.57	0.36	52.9
12	R2	82	2.4	0.230	8.6	LOS A	1.4	9.8	0.36	0.57	0.36	52.6
12u	U	2	0.0	0.230	10.2	LOS A	1.4	9.8	0.36	0.57	0.36	53.2
Approach		262	3.1	0.230	6.5	LOS A	1.4	9.8	0.36	0.57	0.36	52.7
All Vehicles		819	3.7	0.231	6.6	LOS A	1.4	9.8	0.40	0.59	0.40	52.6

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

MOVEMENT SUMMARY

Site: 202 [202GROPM - Belinda Street / Greta Street - 2029-WithDev2/3]

202 - 2029 GROWTH PM - WITH DEVELOPMENT SCENARIO 2/3 & 2% ann. growth on Belinda Street
Belinda Street / Greta Street, Gerringong, NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Greta Street (S)												
1	L2	109	0.0	0.181	6.2	LOS A	1.0	7.1	0.45	0.61	0.45	52.4
2	T1	48	2.1	0.181	6.1	LOS A	1.0	7.1	0.45	0.61	0.45	53.1
3	R2	27	3.7	0.181	9.3	LOS A	1.0	7.1	0.45	0.61	0.45	52.6
Approach		184	1.1	0.181	6.6	LOS A	1.0	7.1	0.45	0.61	0.45	52.6
East: Belinda Street (E)												
4	L2	49	0.0	0.224	5.9	LOS A	1.3	9.1	0.41	0.56	0.41	52.7
5	T1	186	5.4	0.224	5.9	LOS A	1.3	9.1	0.41	0.56	0.41	53.3
Approach		235	4.3	0.224	5.9	LOS A	1.3	9.1	0.41	0.56	0.41	53.2
North: Greta Street (N)												
7	L2	46	0.0	0.144	6.8	LOS A	0.8	5.4	0.51	0.66	0.51	51.7
8	T1	45	0.0	0.144	6.7	LOS A	0.8	5.4	0.51	0.66	0.51	52.4
9	R2	43	0.0	0.144	9.9	LOS A	0.8	5.4	0.51	0.66	0.51	52.1
9u	U	1	0.0	0.144	11.4	LOS A	0.8	5.4	0.51	0.66	0.51	52.5
Approach		135	0.0	0.144	7.8	LOS A	0.8	5.4	0.51	0.66	0.51	52.0
West: Belinda Street (W)												
10	L2	24	4.2	0.268	5.3	LOS A	1.7	12.2	0.28	0.54	0.28	52.4
11	T1	221	2.3	0.268	5.1	LOS A	1.7	12.2	0.28	0.54	0.28	53.3
12	R2	95	2.1	0.268	8.3	LOS A	1.7	12.2	0.28	0.54	0.28	52.9
12u	U	1	0.0	0.268	9.8	LOS A	1.7	12.2	0.28	0.54	0.28	53.5
Approach		341	2.3	0.268	6.0	LOS A	1.7	12.2	0.28	0.54	0.28	53.1
All Vehicles		895	2.2	0.268	6.4	LOS A	1.7	12.2	0.38	0.58	0.38	52.9

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

MOVEMENT SUMMARY

Site: 203 [203GROAM - Fern Street / Elambra Parade - 2029-WithDev2/3]

203 - 2029 GROWTH AM - WITH DEVELOPMENT SCENARIO 2/3 & 2% ann. growth on Fern Street
Fern Street / Elambra Parade, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Fern Street (S)												
1	L2	41	0.0	0.168	4.2	LOS A	0.9	6.6	0.10	0.44	0.10	54.5
2	T1	210	3.3	0.168	4.4	LOS A	0.9	6.6	0.10	0.44	0.10	55.5
Approach		251	2.8	0.168	4.4	LOS A	0.9	6.6	0.10	0.44	0.10	55.3
North: Fern Street (N)												
8	T1	192	5.7	0.163	4.8	LOS A	0.9	6.7	0.23	0.46	0.23	54.5
9	R2	14	0.0	0.163	8.7	LOS A	0.9	6.7	0.23	0.46	0.23	54.5
9u	U	3	0.0	0.163	10.5	LOS A	0.9	6.7	0.23	0.46	0.23	55.3
Approach		209	5.3	0.163	5.1	LOS A	0.9	6.7	0.23	0.46	0.23	54.6
West: Elambra Parade (W)												
10	L2	19	0.0	0.081	5.2	LOS A	0.4	2.8	0.37	0.63	0.37	51.5
12	R2	69	0.0	0.081	9.4	LOS A	0.4	2.8	0.37	0.63	0.37	52.3
12u	U	1	0.0	0.081	11.3	LOS A	0.4	2.8	0.37	0.63	0.37	53.0
Approach		89	0.0	0.081	8.5	LOS A	0.4	2.8	0.37	0.63	0.37	52.1
All Vehicles		549	3.3	0.168	5.3	LOS A	0.9	6.7	0.19	0.48	0.19	54.5

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

MOVEMENT SUMMARY

Site: 203 [203 GROPM - Fern Street / Elambra Parade - 2029-WithDev2/3]

203 - 2029 GROWTH PM - WITH DEVELOPMENT SCENARIO 2/3 & 2% ann. growth on Fern Street
Fern Street / Elambra Parade, Gerringong NSW
Job Ref: 190601
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Fern Street (S)												
1	L2	63	1.6	0.245	4.3	LOS A	1.5	10.5	0.16	0.44	0.16	54.2
2	T1	293	3.1	0.245	4.5	LOS A	1.5	10.5	0.16	0.44	0.16	55.3
Approach		356	2.8	0.245	4.5	LOS A	1.5	10.5	0.16	0.44	0.16	55.1
North: Fern Street (N)												
8	T1	391	1.5	0.306	4.7	LOS A	2.1	14.7	0.25	0.46	0.25	54.6
9	R2	29	3.4	0.306	8.7	LOS A	2.1	14.7	0.25	0.46	0.25	54.3
9u	U	4	0.0	0.306	10.5	LOS A	2.1	14.7	0.25	0.46	0.25	55.2
Approach		424	1.7	0.306	5.0	LOS A	2.1	14.7	0.25	0.46	0.25	54.6
West: Elambra Parade (W)												
10	L2	21	4.8	0.079	5.8	LOS A	0.4	2.8	0.44	0.65	0.44	51.2
12	R2	60	0.0	0.079	9.8	LOS A	0.4	2.8	0.44	0.65	0.44	52.2
Approach		81	1.2	0.079	8.8	LOS A	0.4	2.8	0.44	0.65	0.44	51.9
All Vehicles		861	2.1	0.306	5.2	LOS A	2.1	14.7	0.23	0.47	0.23	54.5

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

ANNEXURE E: ONSITE GRADE OBSERVATIONS

(1 SHEETS)

Fern Street Grade Observations

Chainage	Grade (%)
0	5.65
10	5.75
20	5.85
30	5.75
40	5.85
50	5.65
60	5.2
70	4.9
80	4.8
90	5.05
100	5.00
110	4.35
120	4.5
130	4.25
140	3.75
150	3.15
160	3.15
170	2.8
180	2.25

ANNEXURE F: DETAILED SIGHT LINE ASSESSMENT FOR THE INTERSECTION OF BELINDA STREET / CAMPBELL STREET

(17 SHEETS)

M^CLAREN TRAFFIC ENGINEERING

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Postal: P.O Box 66 Sutherland NSW 1499

Telephone: +61 2 8355 2440
Fax: +61 2 9521 7199
Web: www.mclarentraffic.com.au
Email: admin@mclarentraffic.com.au

Division of RAMTRANS Australia ABN: 45067491678 RPEQ: 19457

Transport Planning, Traffic Impact Assessments, Road Safety Audits, Expert Witness

28th May 2020 Reference: 200238.01FA

Pearce & Campbell and Waterford Farms Pty Ltd
c/- Allen Price & Scarratts Pty Ltd
P.O Box 2541
Nowra NSW 2541
Attention: James Harris

LETTER OF ADVICE REGARDING
THE SIGHT DISTANCE ASSESSMENT OF THE INTERSECTION
OF BELINDA STREET / CAMPBELL STREET, GERRINGONG

Dear James,

Reference is made to your request to provide a Letter of Advice regarding the Sight Distance Assessment of the Intersection at Belinda Street / Campbell Street, Gerringong. This letter provides a detailed assessment of the existing sight lines available at the intersection of Belinda Street / Campbell Street, Gerringong.

Assessment of the appropriate sight distance parameters has been undertaken in accordance with the *Austroads Guide to Road Design Part 3: Geometric Design (2016)* and the *Austroads Guide to Road Design Part 4A: Unsignalized and Signalised Intersections (2017)*.

1 Site Data

The intersection of Campbell Street / Belinda Street has the following characteristics relevant to this sight distance assessment:

- STOP Controlled intersection with Belinda Street as the priority road
- Campbell Street has a signposted 50km/h speed limit
- Belinda Street has a signposted 50km/h speed limit
- At the intersection location Belinda Street has a width of 10.7m
- Victoria Street is offset from Campbell Street by 33.7m (centre-to-centre), to the west

Figure 1 below provides the latest aerial imagery of the intersection.

FIGURE 1: BELINDA STREET / CAMPBELL STREET INTERSECTION

Surveys were undertaken along Belinda Street and Campbell Street to form the basis of this sight distance analysis. The surveys are attached in **Annexure A**.

Further to this 7-day tube counts were undertaken between the 21st April and 28th April 2020 with the results presented in **Annexure B**.

It should be noted that the 7-day tube counts were undertaken during the COVID-19 pandemic in Australia, while the purpose of these 7-day tube counts was to determine average speeds rather that outline typical traffic volumes along Belinda Street, anecdotal evidence and professional experience that during periods of lower traffic volumes (such as those experienced during the COVID-19 pandemic) can sometimes lead to higher through road speeds such as along Belinda Street due to reduced traffic flow friction. This being said the results of the 7-day tube counts still indicate an average speed profile that would be expected for this type of 50km/h collector road. A summary of the observed average speeds along Belinda Street (approximately 60m west of Campbell Street) are provided in **Table 1** below.

TABLE 1: SPEED SUMMARY FOR BELINDA STREET

Speed	Both Directions	Westbound Only	Eastbound Only
85th Percentile	54.6 km/h	55.0 km/h	54.1 km/h
Average	47.0 km/h	47.4 km/h	46.7 km/h

Based on the results of the 7-day tube count speed survey the sight distance requirements for this intersection have been determined by applying the 85th percentile speed of 54.1km/h for the eastbound direction.

2 Stopping Sight Distance (SSD) Assessment

The Stopping Sight Distance (SSD), *"is the distance required for a normally alert driver, travelling at the design speed on wet pavement, to perceive, react and brake to a stop before reaching a hazard on the road"* as stated in *Section 5.3, Austroads Guide to Road Design Part 3: Geometric Design (2016)*, and determined through **Equation 1** below with the input parameters specific to this site as outlined in **Table 2**.

$$SSD = \frac{R_T V}{3.6} + \frac{V^2}{254(d + 0.01a)}$$

EQUATION 1:SSD EQUATION (AGRD PART 3)

TABLE 2: SSD INPUT PARAMTERS

Equation Parameter	Applied Value
R_T	2.0 Seconds
$V^{(1)}$	54.1 km/h
D	0.36
$a^{(2)}$	5.3%

Notes:

1) 85th Percentile eastbound speed applied as design speed
2) Grade adjustment determined through on-site surveys of Belinda Street, based on grades within the 70m to the west of Campbell Street

Based on the application of the SSD equation the required stopping site distance is **58.0m**.

Assessment of the sightlines for an approaching driver on Belinda Street, indicate that the required 58.0m SSD is not strictly achieved, as demonstrated in **Annexure C**. The available sight line is 54.1m, a shortfall of 3.9m from strict compliance. The available sight line of 54.1m achieves a compliance for a speed limit of 51.6km/h.

3 Safe Intersection Site Distance (SISD) Assessments

The Safe Intersection Sight Distance (SISD), *"provides sufficient distance for a driver of a vehicle on the major road to observe a vehicle on a minor road approach moving into a collision (e.g. in the worst case, stalling across the traffic lanes), and to decelerate to a stop before reaching the collision"*. as per *Section 3.2.2* of the *Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections (2017),* and determined through **Equation 2** below with the input parameters specific to this site as outlined in **Table 3**.

$$SISD = \frac{D_T \times V}{3.6} + \frac{V^2}{254 \times (d + 0.01 \times a)}$$

EQUATION 2:SISD EQUATION (AGRD PART 3)

TABLE 3: SISD INPUT PARAMTERS

Equation Parameter	Applied Value
D_T	5.0 Seconds
$V^{(1)}$	54.1 km/h
D	0.36
$a^{(2)}$	6.0%

Notes:
1) 85th Percentile westbound speed applied as design speed
2) Grade adjustment determined through on-site surveys of Belinda Street, based on grades within the 100m to the west of Campbell Street.

Based on the application of the SISD equation the required safe intersection site distance is **102.6m**

Assessment of the sightlines for an approaching driver on Belinda Street (major road) at an eye height of 1.1m, to a vehicle on Campbell Street (minor road), which is setback 3m from the stop line, indicate that the required 102.6m SISD is not strictly achieved, as demonstrated in **Annexure C**. The available sight line is 85.2m, a shortfall of 17.4m from strict compliance. The available sight line of 85.2m achieves compliance for a speed limit of 46.7km/h.

4 Minimum Gap Sight Distance (MGSD) Assessment

The Minimum Gap Sight Distance (MGSD) is the distance *"required for the driver of an entering vehicle to see a vehicle in the conflicting streams in order to safely commence the desired manoeuvre"* as stated in *Section 3.2.3, Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections (2017)*.

The MGSD requirement for a 5-second critical gap acceptance required for a right turn from Campbell Street (minor road) is calculated by the distance travelled at the 85th percentile speed within that 5-sceond period. Application of a 54.1km/h speed for 5 seconds, equates to minimum gap sight distance of **75.1m**.

Assessment of the sightlines for a right turning vehicle from Campbell Street (minor road) at a driver eye height of 1.1m, to an approaching vehicle on Belinda Street (major road), with an indicator height of 0.65m, indicate that the required 75.1m is not strictly achieved, as demonstrated in **Annexure C**. The available sight line is 68.3m, a shortfall of 6.8m from strict compliance. The available sight line of 68.3m achieves compliance for a speed limit of 49.2km/h.

5 Summary of Sight Line Assessment

The available sight lines at the intersection of Campbell Street / Belinda Street have been assessed against the relevant requirements for a 54.1km/h 85th percentile speed. The SSD, SISD and MGSD are non-compliant for a 54.1km/h 85th percentile speed limit. A summary of the findings are shown in **Table 4** below.

TABLE 4: SUMMARY OF FINDINGS

	Sightline Requirement		Compliance achieved at		Distance Shortfall (m)
	Required Distance (m)	85th Percentile Speed (km/h)	Available Sightline Distance (m)	Speed (km/h)	
SSD	58.0	54.1	54.1	51.6	-3.9
SISD	102.6	54.1	85.2	46.7	-17.4
MGSD	75.1	54.1	68.3	49.2	-6.8

As shown above, compliance with SSD, SISD and MGSD requirements can be achieved through a reduction in the 85th percentile speed to at least 46.7km/h. It is recommended that speed calming devices be installed to reduce vehicle speed to ensure compliance with sight line requirements.

An alternative solution to traffic calming devices would be to modify the road grades slightly to achieve the compliant sight line requirements or a combination of both traffic calming devices and modifications to road grades.

It should be noted that the standard approach taken to determine SSD, SISD and MGSD is already a conservative approach, with the 15th percentile driver height of 1.1m and the 15th percentile vehicle height of 1.45m applied to determine available sightlines, meaning that 85 percent of drivers and vehicles fall above the assessed threshold. Only a minor increase in either driver height or vehicle height (as would be experienced for the large majority of drivers and vehicles) would result in the required sightlines being achieved for the intersection of Belinda Street / Campbell Street.

These strict sight line non-compliances, are minor in their extent are typical of some existing intersections and can generally be rectified without major works being undertaken, with the installation of additional intersection signage (w2-4_r - Side Road Intersection on Straight) to inform drivers of the upcoming intersection and even implementation of "*Stop"* signage, which is currently implemented at Campbells Street connection to Belinda Street.

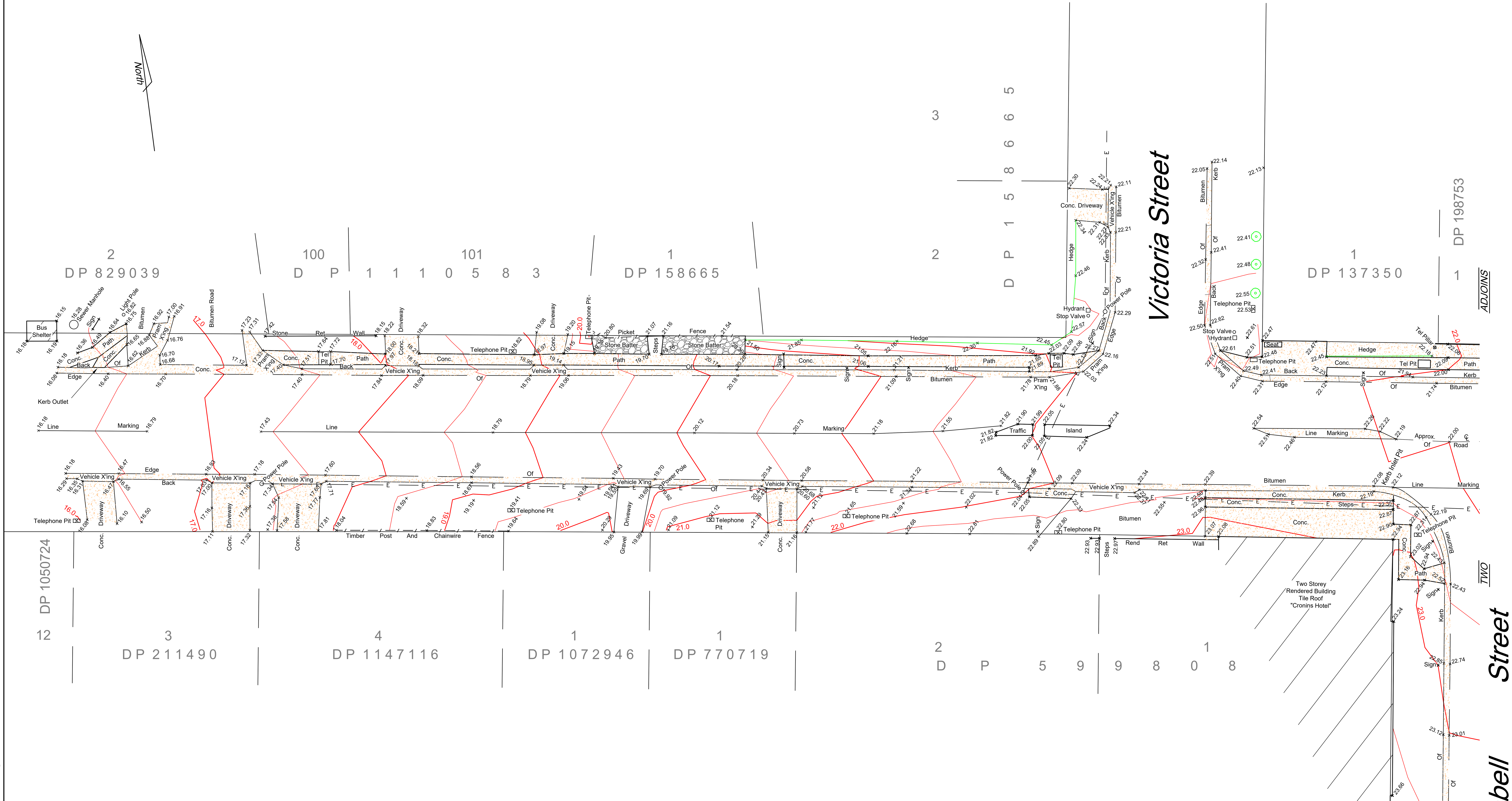
Please contact Mr Aaron Tomlins or the undersigned on 8355 2440 should you require further information or assistance.

M^{c}Laren Traffic Engineering

Matthew M^{c}Carthy
Senior Traffic Engineer
BE Civil Engineering
Masters of Engineering Science
RMS Accredited Level 1 Road Safety Auditor
RMS Accredited Work Zone Traffic Management Plan Designer and Inspector

ANNEXURE A: DETAILED INTERSECTION SURVEY

(2 SHEETS)



0 2.5 5.0 7.5 10

SCALE:- 1:200

CONTOUR INTERVAL 0.5 METRES

CAUTION

1. Please note that no boundary definition survey has been undertaken for this plan and no boundaries have been marked.

   The boundary position and dimensions as shown on the plan have only been taken from a copy of the deposited plan and not verified by field survey. The dimensions can only be verified by undertaking a comprehensive boundary definition survey to establish the available dimensions of the property.

2. All apparent visible evidence of utility services has been located at the time of field survey, as shown on the plan.

   No record search or sub-surface investigation as to the location of any utility services or other structures such as footings or foundations has been undertaken.

   We advise that prior to any demolition, excavation or construction work on the site, a full Dial-Before-You-Dig search must be obtained and any other relevant service authorities should be contacted for sub-surface utility service location information. In addition, any sub-surface footings or foundations adjacent to any boundaries or any underground services must be carefully exposed to establish their extent, depth and location. This should be undertaken under the supervision of the relevant authorities.

3. The locations of any improvements shown on the plan are diagrammatic only as they have not been accurately determined. Confirmation of their accurate location should be made by further boundary definition survey if it is required for purposes other than that of this topographical survey or at a greater scale accuracy than 1:200

4. The contours shown give an approximate representation only of the shape and level of the ground surface. They do not represent the exact level at any particular point.

5. The tree spreads shown are indicative only and may need to be investigated further if required for purposes other than this topographical survey.

6. These notes are an integral part of this plan/data. Reproduction of this plan or any part of it without this note being included in full will render the information shown on such reproduction invalid and unsuitable for use.

7. Except to the extent required by the Competition & Consumer Act 2010, or similar consumer protection legislation, no responsibility can be accepted by Allen Price & Scarratts Pty Ltd for any damage caused to any underground service or any loss or injury suffered.

E DENOTES APPROXIMATE POSITION OF OVERHEAD ELECTRICITY LINE

RATIO:	DATUM:			REV	DESCRIPTION	BY	DATE
1:200 (AT A1 ORIGINAL)	AUSTRALIAN HEIGHT DATUM	SURVEY	MH SD	=			
	ORIGIN: SSM 23072 RL 15.743 (AHD)	DESIGN					
		DRAWN	MH				
	DATE OF SURVEY: 07.04.2020	CHECK'D	BD				

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land and development consultants
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consultants@allenprice.com.au www.allenprice.com.au

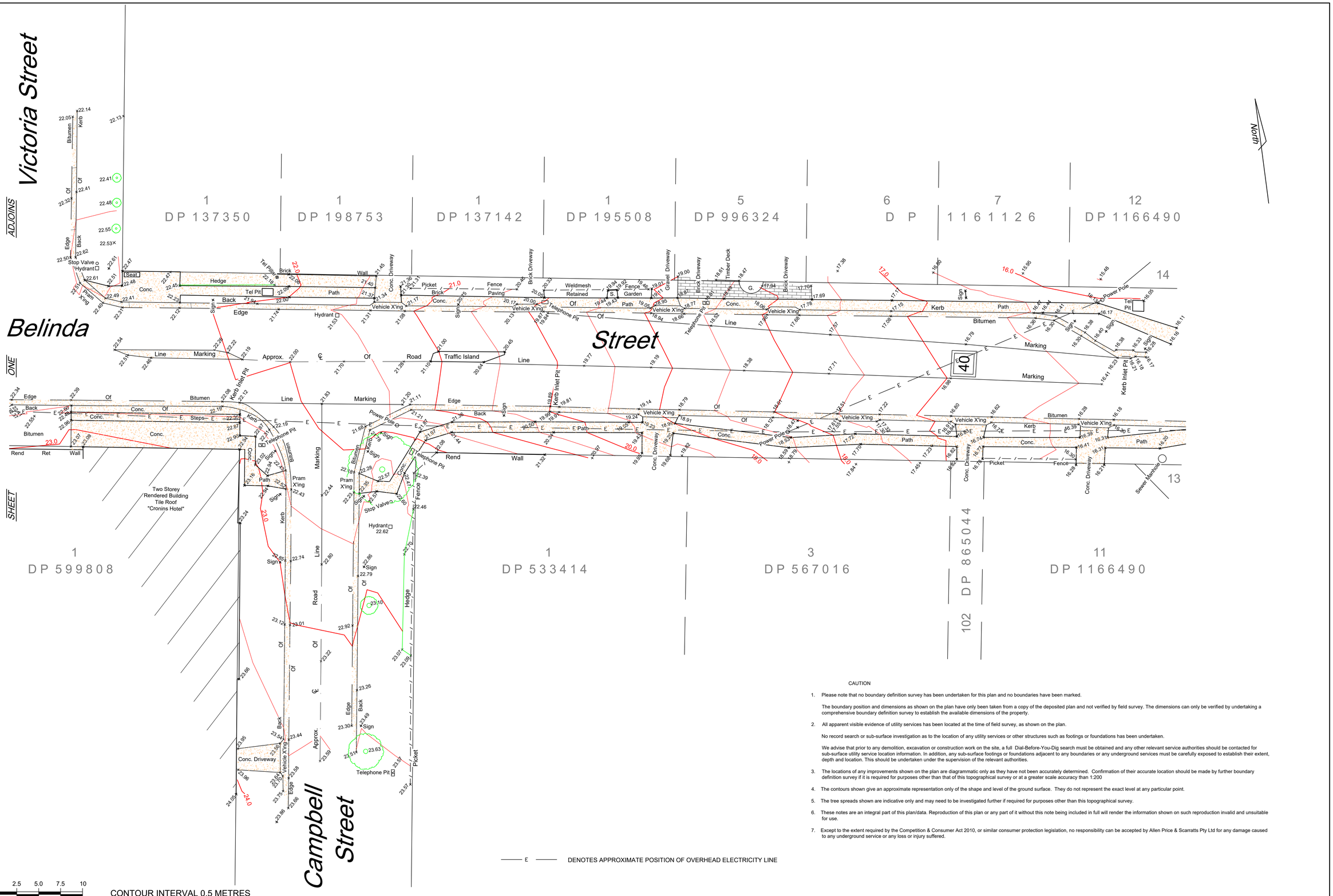
PLAN SHOWING
DETAIL AND CONTOURS
OVER PART OF BELINDA, CAMPBELL AND
VICTORIA STREET GERRINGONG
FOR: NEIL CAMPBELL

DRAWING STATUS

DRAWING NUMBER K128069-05

SHEET 01 OF 02

REVISION -



——— E ——— DENOTES APPROXIMATE POSITION OF OVERHEAD ELECTRICITY LINE

CAUTION

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   The boundary position and dimensions as shown on the plan have only been taken from a copy of the deposited plan and not verified by field survey. The dimensions can only be verified by undertaking a comprehensive boundary definition survey to establish the available dimensions of the property.

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   We advise that prior to any demolition, excavation or construction work on the site, a full Dial-Before-You-Dig search must be obtained and any other relevant service authorities should be contacted for sub-surface utility service location information. In addition, any sub-surface footings or foundations adjacent to any boundaries or any underground services must be carefully exposed to establish their extent, depth and location. This should be undertaken under the supervision of the relevant authorities.

3. The locations of any improvements shown on the plan are diagrammatic only as they have not been accurately determined. Confirmation of their accurate location should be made by further boundary definition survey if it is required for purposes other than that of this topographical survey or at a greater scale accuracy than 1:200

4. The contours shown give an approximate representation only of the shape and level of the ground surface. They do not represent the exact level at any particular point.

5. The tree spreads shown are indicative only and may need to be investigated further if required for purposes other than this topographical survey.

6. These notes are an integral part of this plan/data. Reproduction of this plan or any part of it without this note being included in full will render the information shown on such reproduction invalid and unsuitable for use.

7. Except to the extent required by the Competition & Consumer Act 2010, or similar consumer protection legislation, no responsibility can be accepted by Allen Price & Scarratts Pty Ltd for any damage caused to any underground service or any loss or injury suffered.

RATIO: 1:200 (AT A1 ORIGINAL)

DATUM: AUSTRALIAN HEIGHT DATUM
ORIGIN: SSM 23072 RL 15.743 (AHD)
DATE OF SURVEY: 07.04.2020

SURVEY	MH SD	REV	DESCRIPTION	BY	DATE
DESIGN		=			
DRAWN	MH				
CHECK'D	BD				

allen price & scarratts pty ltd
land and development consultants
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PLAN SHOWING
DETAIL AND CONTOURS
OVER PART OF BELINDA, CAMPBELL AND
VICTORIA STREET, GERRINGONG
FOR: NEIL CAMPBELL

DRAWING STATUS

DRAWING NUMBER K128069-05 | SHEET 02 OF 02 | REVISION -

K:\Projects-Kiama\128000\K128069\Drawings\K128069-05 BELINDA AND CAMPBELL ST INTERSECTION.dwg

ANNEXURE B: SUMMARY OF 7-DAY TUBE COUNT RESULTS (1 SHEET)

TRANS TRAFFIC SURVEY

trafficsurvey.com.au

T. 1300 82 88 82 - F. 1300 83 88 83 - E. traffic@trafficsurvey.com.au - W. www.trafficsurvey.com.au

AUTOMATIC COUNT SUMMARY

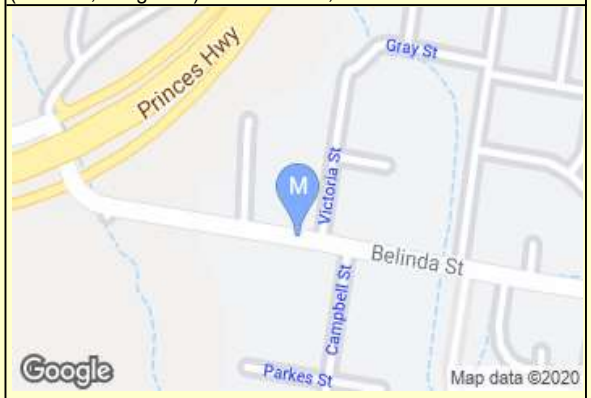
Street Name :	Belinda St	**Location :**	West of Victoria St
Suburb :	Gerragong	**Start Date :**	00:00 Tue 21-April-2020
Metrocount ID	MD79910Q	**Finish Date :**	00:00 Tue 28-April-2020
Site ID Number :	1383	**Speed Zone :**	50 km/h
Prepared By :	Vo Son Binh	**Email:**	binh@trafficsurvey.com.au

GPS information		Lat 34° 44' 45.74 South Long 150° 49' 6.40 East	Direction of Travel		
			Both directions	**Westbound**	**Eastbound**
Traffic Volume :		Weekdays Average	4,731	2,486	2,245
(Vehicles/Day)		7 Day Average	4,249	2,237	2,012
Weekday	**AM**	11:00	342	184	158
Peak hour start	**PM**	15:00	418	216	202
Speeds :		85th Percentile	54.6	55.0	54.1
(Km/Hr)		Average	47.0	47.4	46.7
Classification % :		Light Vehicles up to 5.5m	92.1%	91.8%	92.4%

Location

GPS Information Load Google Map (internet required)

(Latitude, Longitude) -34.746038,150.8184457



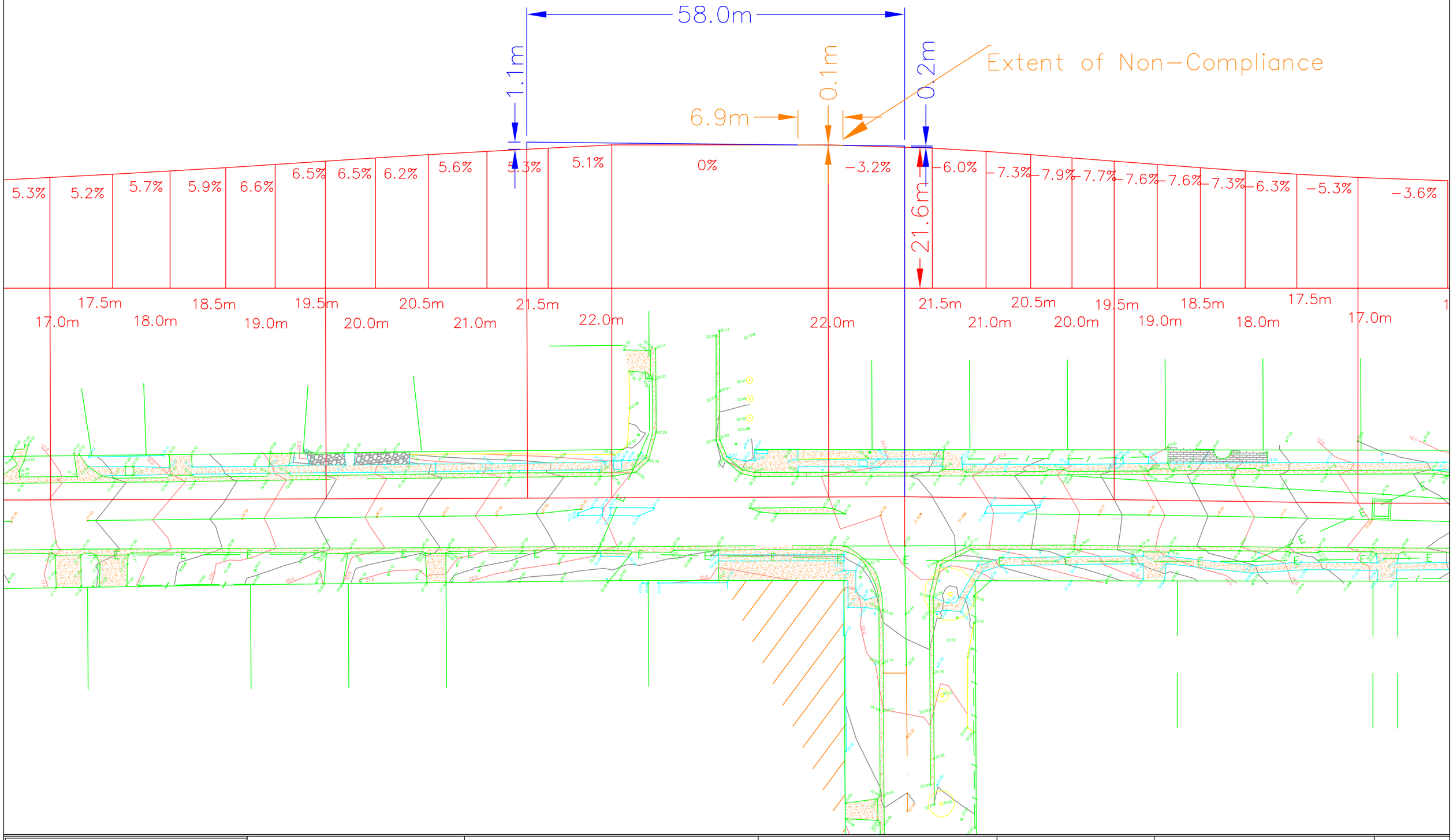
Speed Data | Speed Graph | Speed Bin
Volume Data | Volume Graph | Classification

QUALITY SYSTEM CERTIFICATION DNV·GL ISO 9001
SAFETY SYSTEM CERTIFICATION DNV·GL AS/NZS 4801
ENVIRONMENTAL SYSTEM CERTIFICATION DNV·GL ISO 14001

QUALITY ASSURED COMPANY BY ISO 9001:2015
OH&S SYSTEM CERTIFIED TO ISO 4801:2001
ENVIRONMENT MANAGEMENT SYSTEM CERTIFIED TO ISO14001:2015

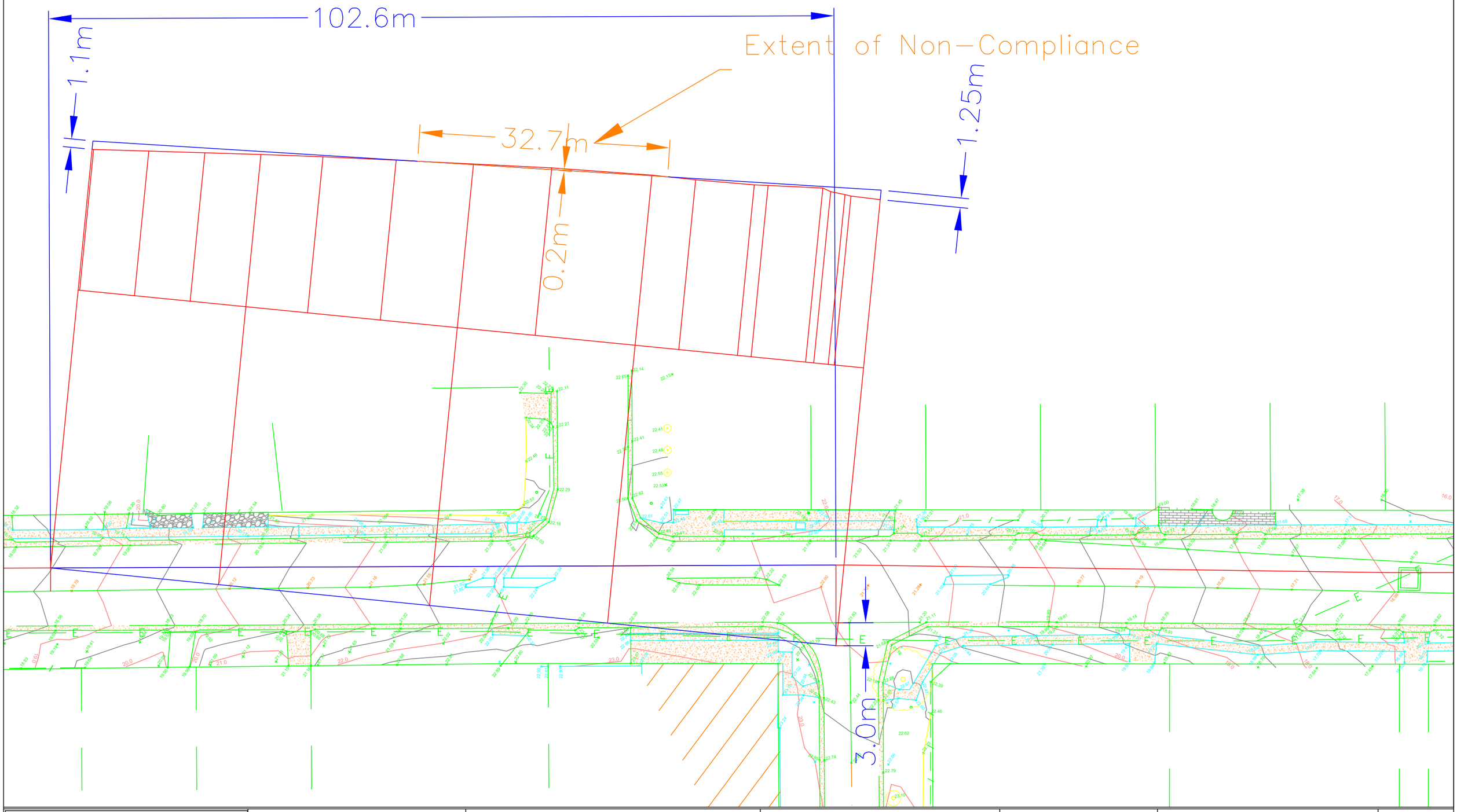
ANNEXURE C: MTE SIGHT DISTANCE ASSESSMENTS
(6 SHEETS)

Eastbound – SSD – 54.1km/h – 58.0m



McLaren Traffic Engineering	MCLAREN TRAFFIC ENGINEERING A division of RAMTRANS Australia Pty. Ltd. Shop 7, 716-720 Old Princes Hwy, Sutherland NSW 2232 P : (02) 8355 2440 M : 0412 949 578 E : admin@mclarentraffic.com.au www.mclarentraffic.com.au	**CLIENT / Project:** Allen Price & Scarratts Pty Ltd **Project Address:** Belinda Street / Campbell Street, Gerringong	**Notes:** CONCEPT PLAN ONLY. NOT FOR CONSTRUCTION. **Tested Using:** *AutoTURN 10 *ZWCAD 2019	**Drawing Title:** SSD Assessment **Project No:** 2020/0238 **Drawing No:** 2020-0238-01A	Revision / Date / Details A / 15/05/2020 / SSD Assessment

Eastbound – SISD – 54.1km/h – 102.6m



McLaren Traffic Engineering

MCLAREN TRAFFIC ENGINEERING
A division of RAMTRANS Australia Pty. Ltd.

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M : 0412 949 578
E : admin@mclarentraffic.com.au
www.mclarentraffic.com.au

CLIENT / Project:
Allen Price & Scarratts Pty Ltd

Project Address:
Belinda Street / Campbell Street, Gerringong

Notes:
CONCEPT PLAN ONLY.
NOT FOR CONSTRUCTION.

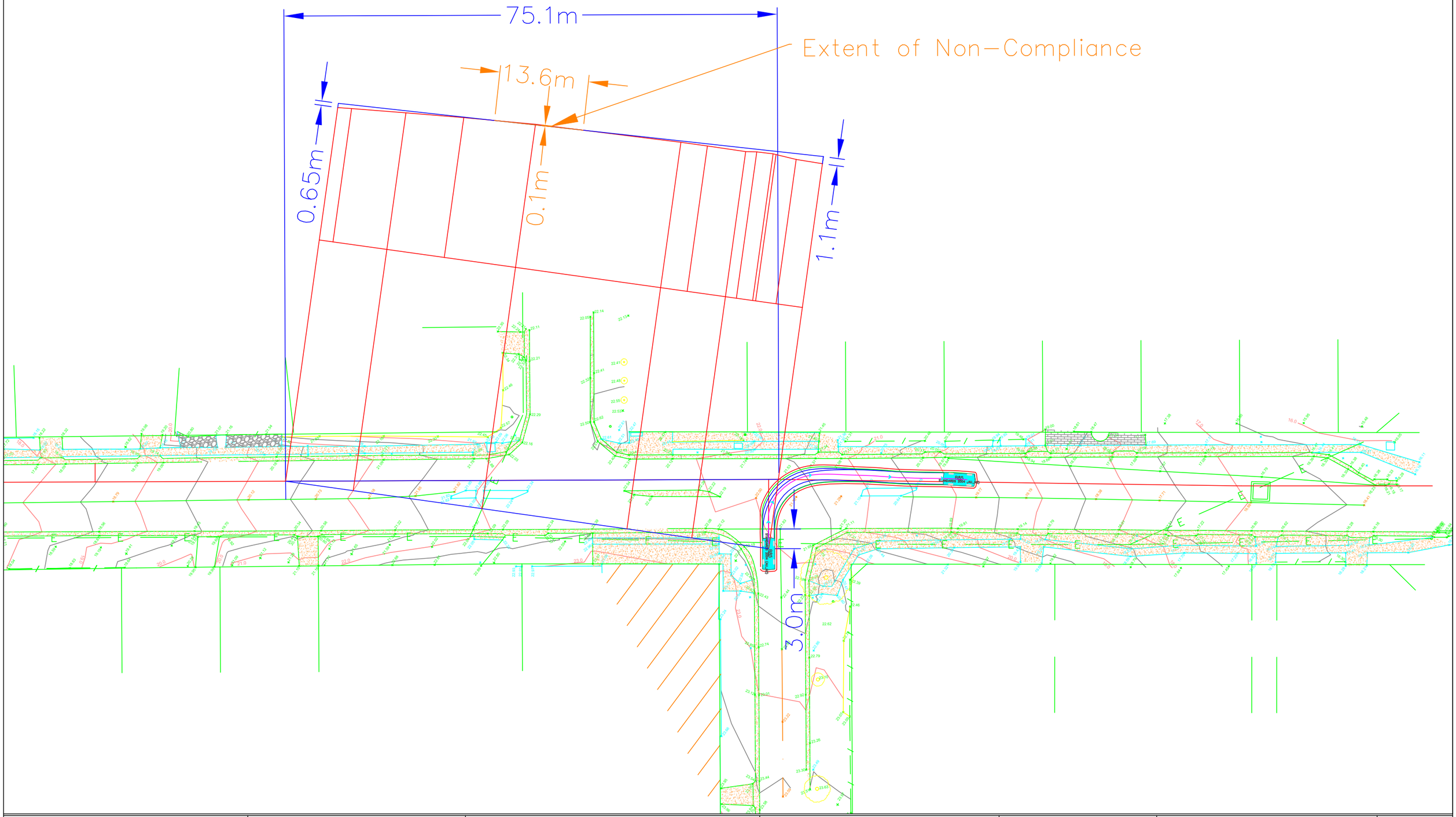
Tested Using:
*AutoTURN 10
*ZWCAD 2019

Drawing Title:
SISD Assessment

Project No:	Drawing No:
2020/0238	2020-0238-02A

Revision	Date	Details
A	15/05/2020	SISD Assessment

Eastbound – Right Turn – MGSD – 54.1km/h – 75.1m



MCLAREN TRAFFIC ENGINEERING
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CLIENT / Project:
Allen Price & Scarratts Pty Ltd

Project Address:
Belinda Street / Campbell Street, Gerringong

Notes:
CONCEPT PLAN ONLY.
NOT FOR CONSTRUCTION.

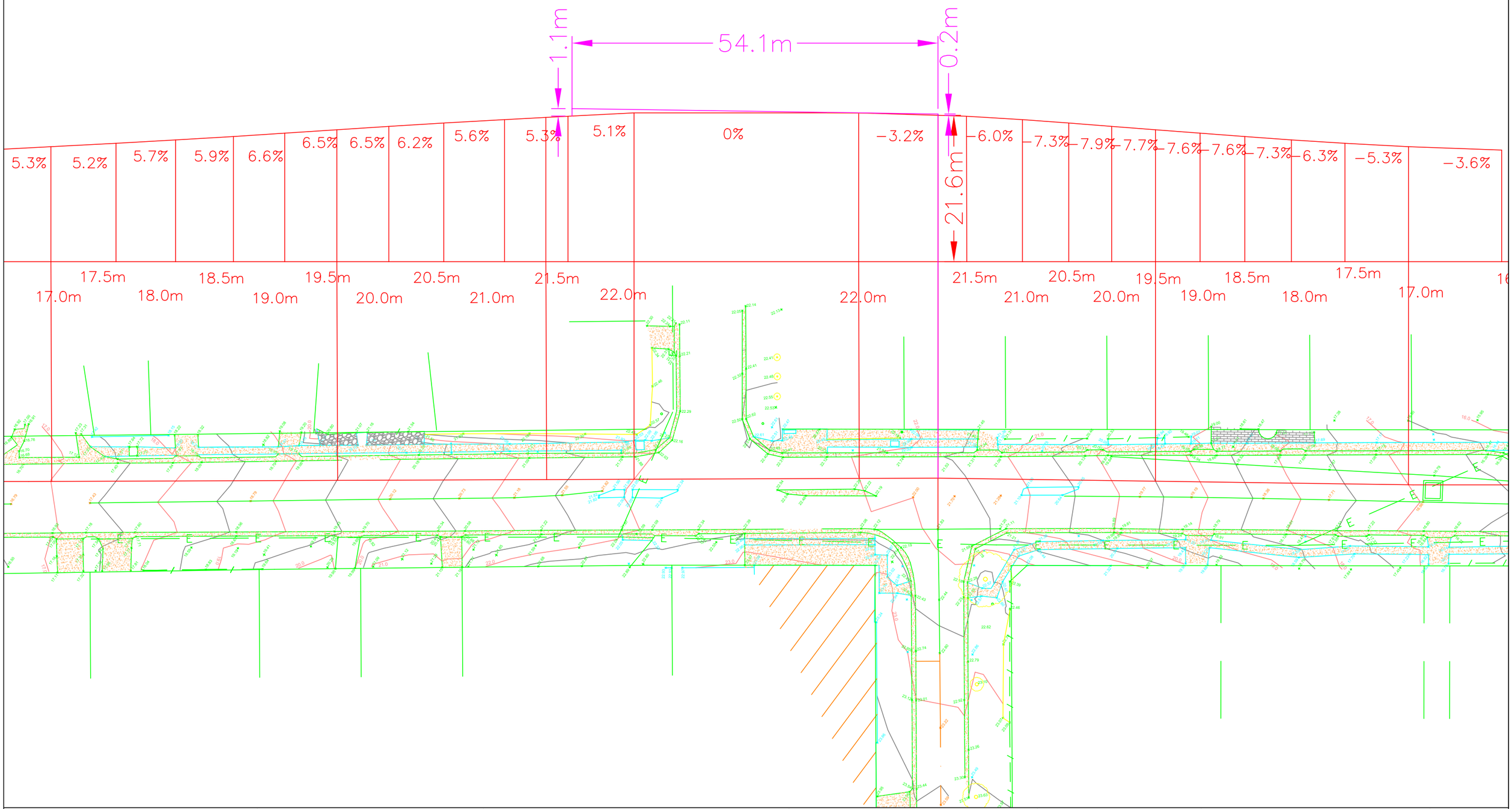
Tested Using:
*AutoTURN 10
*ZWCAD 2019

Drawing Title:
MGSD Assessment

Project No:	Drawing No:
2020/0238	2020-0238-03A

Revision	Date	Details
A	15/05/2020	MGSD Assessment

Eastbound – SSD – Sight line achieved 54.1m



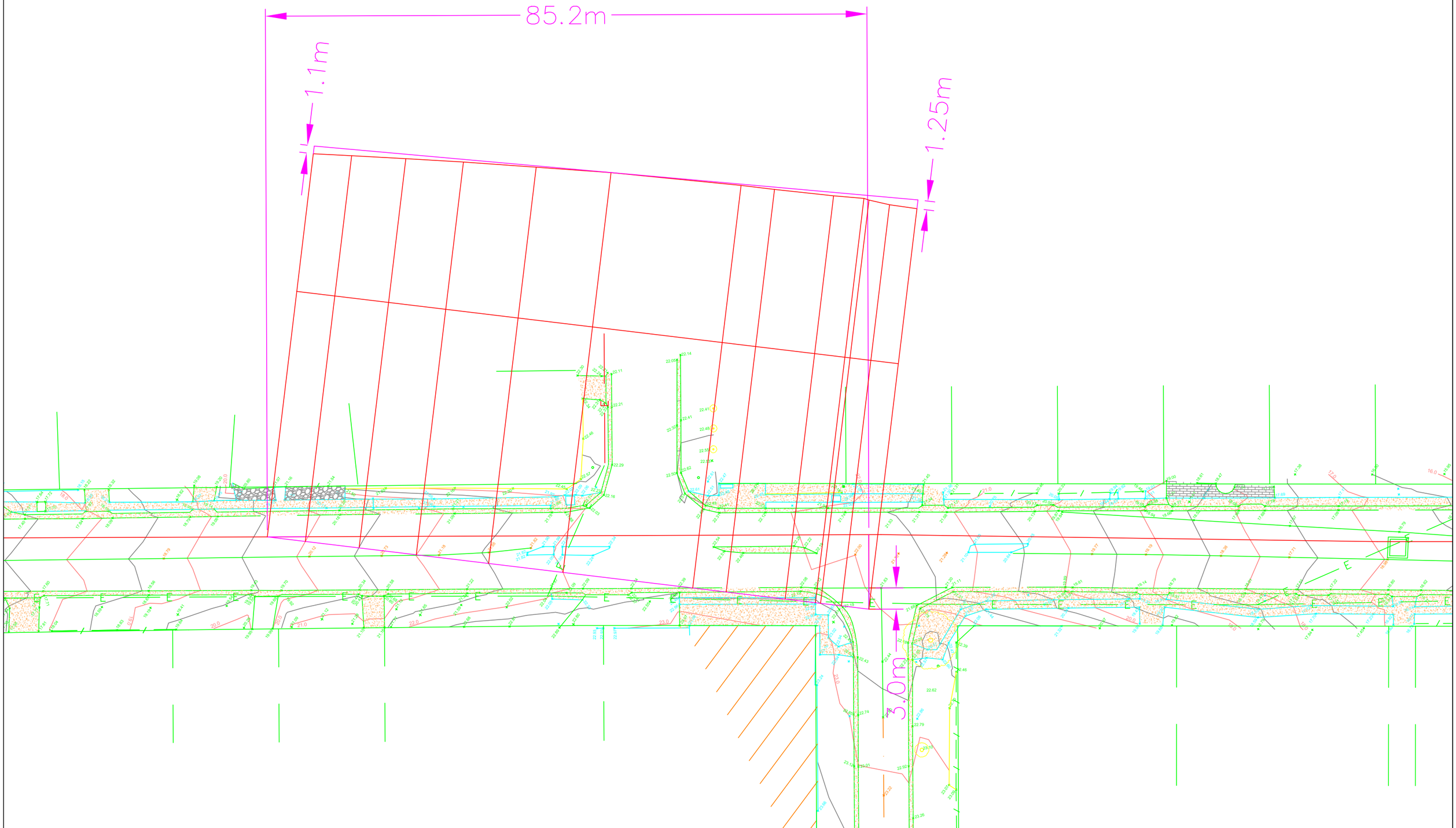
McLaren Traffic Engineering	MCLAREN TRAFFIC ENGINEERING A division of RAMTRANS Australia Pty. Ltd. Shop 7, 716-720 Old Princes Hwy, Sutherland NSW 2232 P : (02) 8355 2440 M : 0412 949 578 E : admin@mclarentraffic.com.au www.mclarentraffic.com.au	**CLIENT / Project:** Allen Price & Scarratts Pty Ltd **Project Address:** Belinda Street / Campbell Street, Gerringong	**Notes:** CONCEPT PLAN ONLY. NOT FOR CONSTRUCTION. **Tested Using:** *AutoTURN 10 *ZWCAD 2019

Drawing Title:
SSD Assessment - Achieved

Project No:	Drawing No:
2020/0238	2020-0238-04A

Revision	Date	Details
A	15/05/2020	SSD Assessment - Achieved

Eastbound – SISD – Sight line achieved 85.2m



McLaren Traffic Engineering

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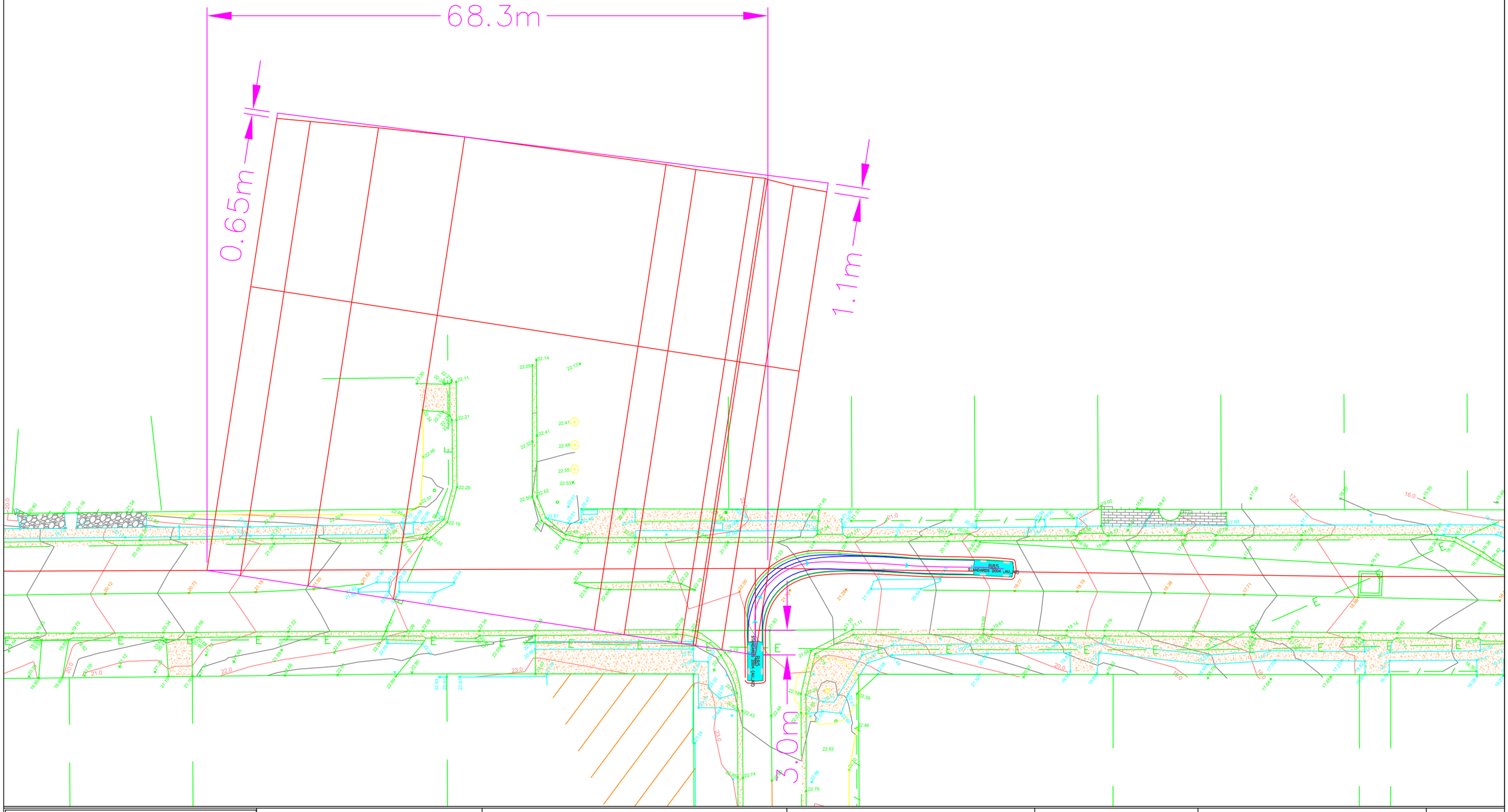
*ZWCAD 2019

Drawing Title:
SISD Assessment - Achieved

Project No:	Drawing No:
2020/0238	2020-0238-05A

Revision	Date	Details
A	15/05/2020	SISD Assessment - Achieved

Eastbound – Right Turn – MGSD – Sight line achieved 68.3m



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*ZWCAD 2019

Drawing Title:
MGSD Assessment - Achieved

Project No:	Drawing No:
2020/0238	2020-0238-06A

Revision	Date	Details
A	15/05/2020	MGSD Assessment - Achieved