



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



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1 INTRODUCTION

McLaren 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 Local Strategic Planning Statement 2020* and the *Gerringong Charette 1995*, which anticipates the rezoning of the subject land. The area subject to the proposal includes Lot 2 DP1168922 and consists of approximately 13.83ha, with a potential yield of approximately 166 dwellings. The Structure Plan is provided in **Annexure A**.

The APS concept plan (**Annexure A**) is generally consistent with the map provided in the Gerringong Charette for Lot 2 and outlines that vehicle access to the subdivision will be obtained via one (1) public road connection via Campbell Street at the northern edge of the site. Further, the proposed development continues to provide vehicle access for the existing two (2) rural dwellings and associated agricultural farming on adjacent Lot 11 DP 1045242.

1.2 *State Environmental Planning Policy (Infrastructure) 2007*

If the planning proposal were approved, the subsequent development application would not 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 less than 200 allotments. Therefore, formal referral to Transport for New South Wales (TfNSW) would not be necessary.

1.3 *Site Description*

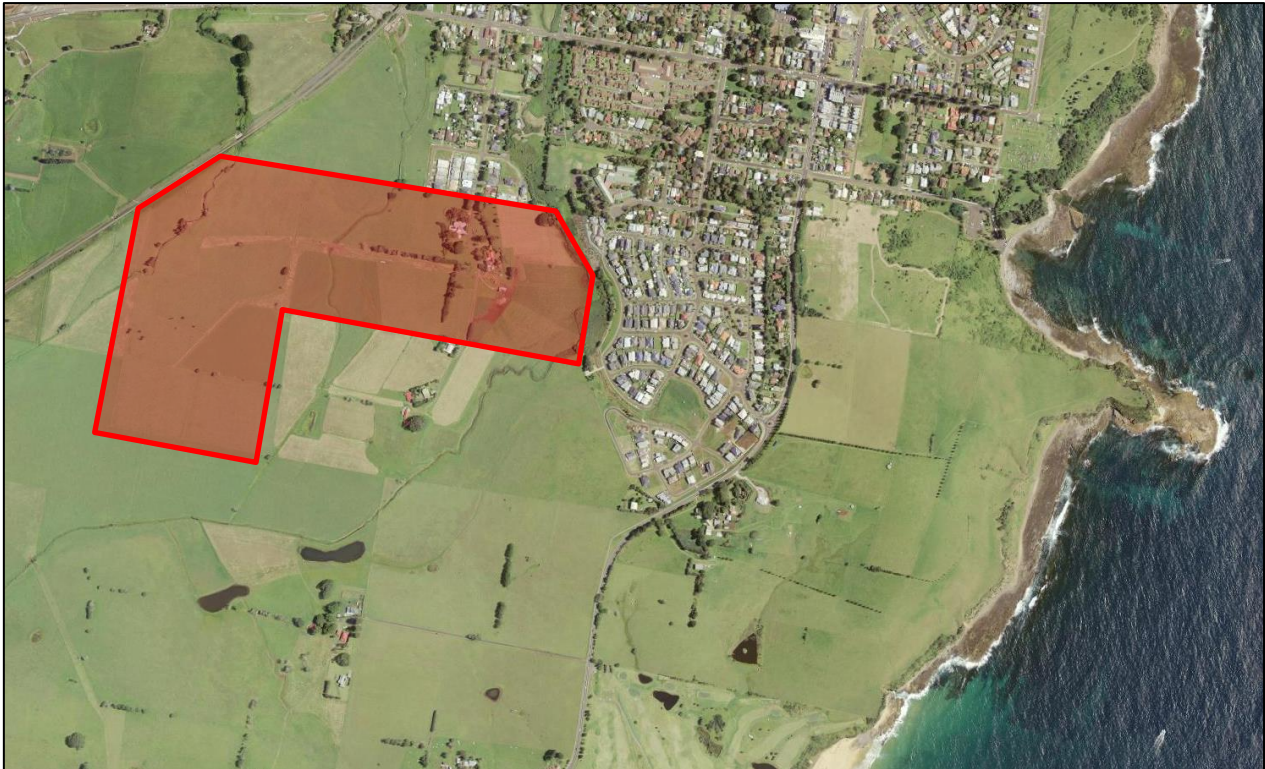
The site is Lot 2 DP1168922 and is currently zoned *RU2 – Rural Landscape*, is approximately 45.83ha in area and has approximately 13.83ha identified for rezoning to provide approximately 166 dwellings.

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 for residential development has been identified in the *Kiama Local Strategic Planning Statement 2020* and the *Gerringong Charette 1995* and is commonly referred to as the Elambra West Urban Release Area.

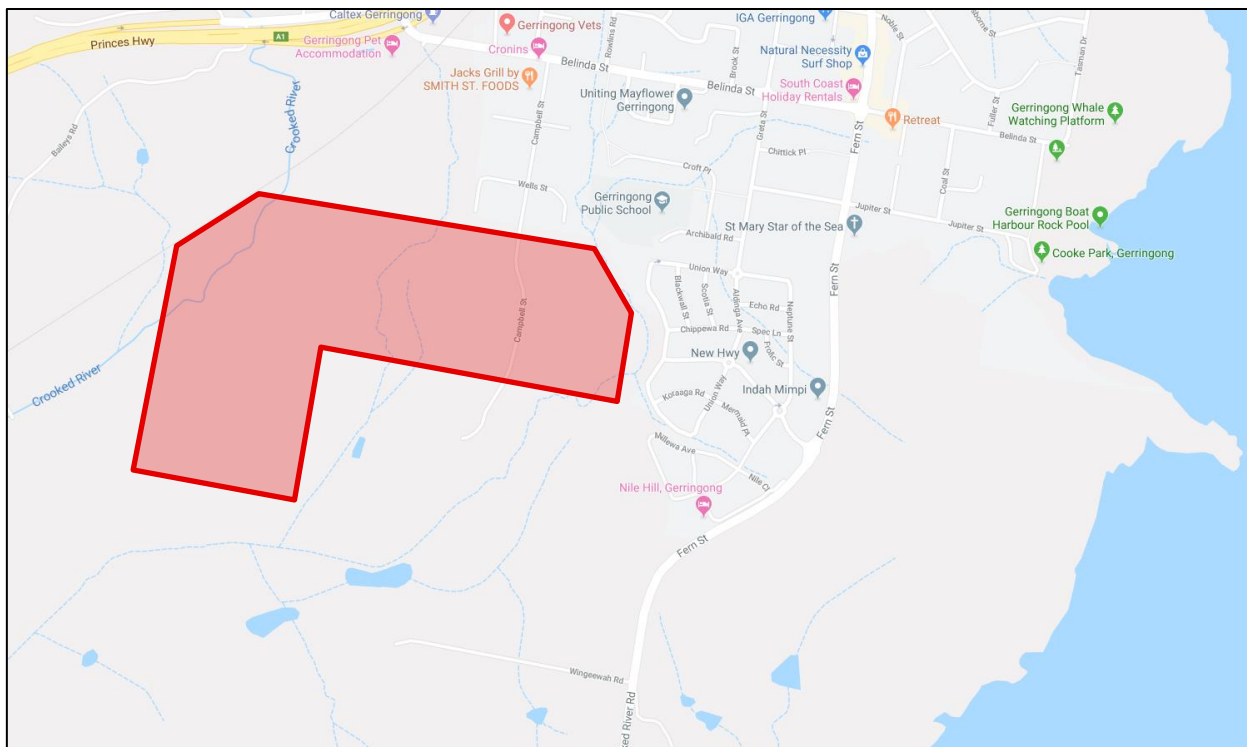
1.4 Site Context

The location of the site is shown on an aerial photo and a street map in **Figure 1** and **Figure 2** respectively.



Site Location

FIGURE 1: SITE CONTEXT – AERIAL PHOTO



Site Location

FIGURE 2: 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 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;
- Priority controlled intersection of Campbell Street/Wells Street;
- Priority controlled intersection of Campbell Street/Parkes Street.

2.3 *Existing Traffic Environment*

Turning movement count surveys were conducted at the intersection of Campbell Street/Belinda Street 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 on Campbell Street, outside 10 Campbell Street. Additionally, ATC surveys were undertaken along Belinda Street to the west of Victoria Street between the 21st April and 28th April 2020.

The 7-day tube counts in April 2020 were undertaken to determine the traffic speed characteristics of Belinda Street. Whilst these surveys were undertaken during the COVID-19 pandemic shutdown period, it is not expected that the average speed of the road would be affected. Conversely, anecdotal evidence shows that when traffic volumes along roads are reduced, average speeds can increase 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.

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 9.0. 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 road of 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 9.0)

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							
Belinda Street /Campbell Street	AM	0.17	1.2 (Worst: 11.9)	NA (Worst: A)	Stop	RT from Campbell Street	0.3 veh (2m) Campbell Street
	PM	0.18	1.1 (Worst: 13.7)	NA (Worst: A)		RT from Campbell Street	0.3 veh (2m) Campbell Street
2029 GROWTH PERFORMANCE – With No Development							
Belinda Street /Campbell Street	AM	0.20	1.1 (Worst: 13.5)	NA (Worst: A)	Stop	RT from Campbell Street	0.3 veh (2.3m) Campbell Street
	PM	0.21	1 (Worst: 15.3)	NA (Worst: B)		RT from Campbell Street	0.3 veh (2.1m) Campbell 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 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)

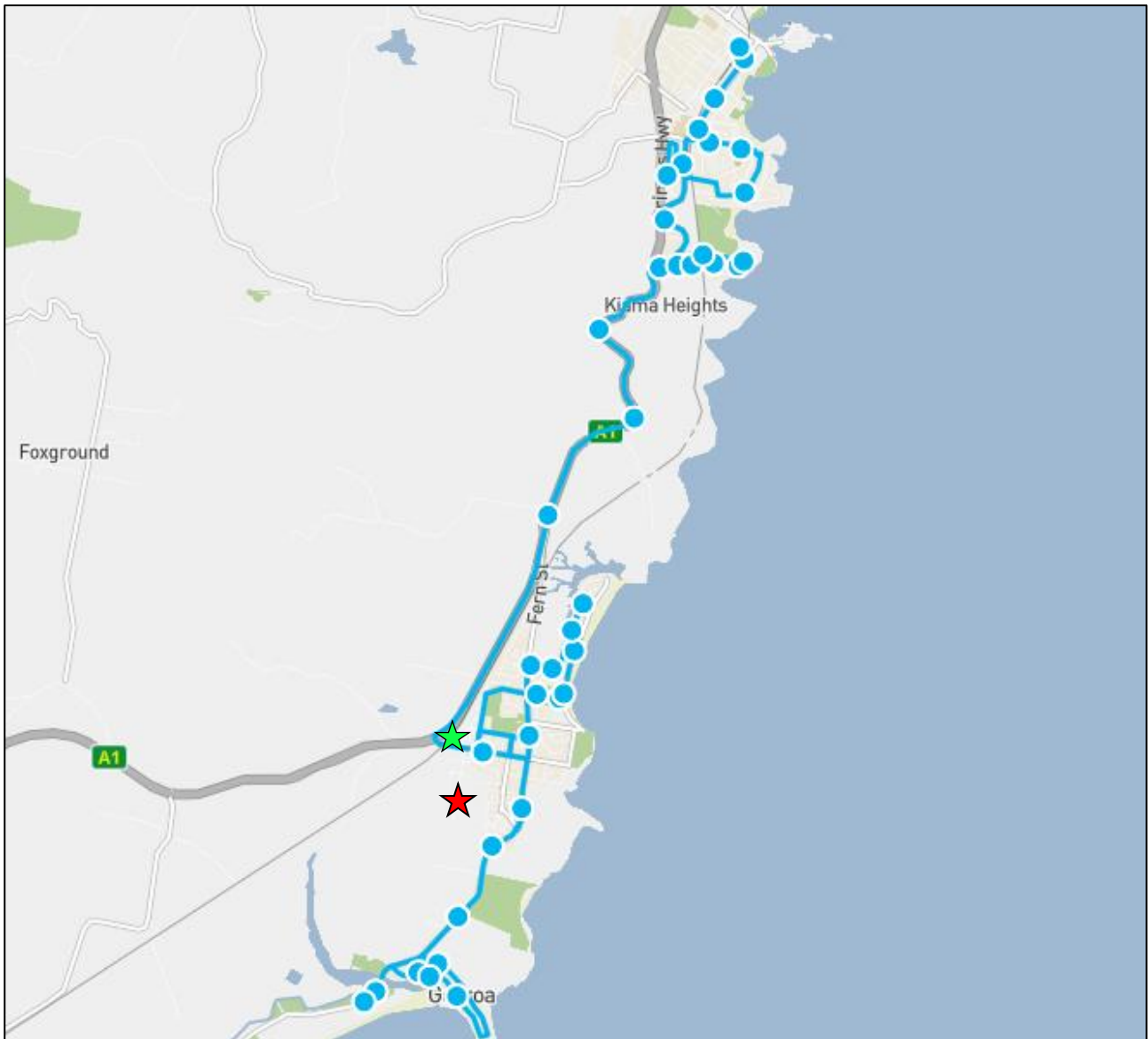
Road	Peak Hour Volume		Average Weekday Volume	85 th Percentile Speed	Heavy Vehicles
	Time	Volume			
Campbell Street	AM (8 am – 9 am)	66	822	29.4km/h	3.5%
	PM (4 pm – 5 pm)	77			
Belinda Street	AM (11 am – noon)	342	4731	54.6km/h	7.9%
	PM (3 pm – 4 pm)	418			

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.

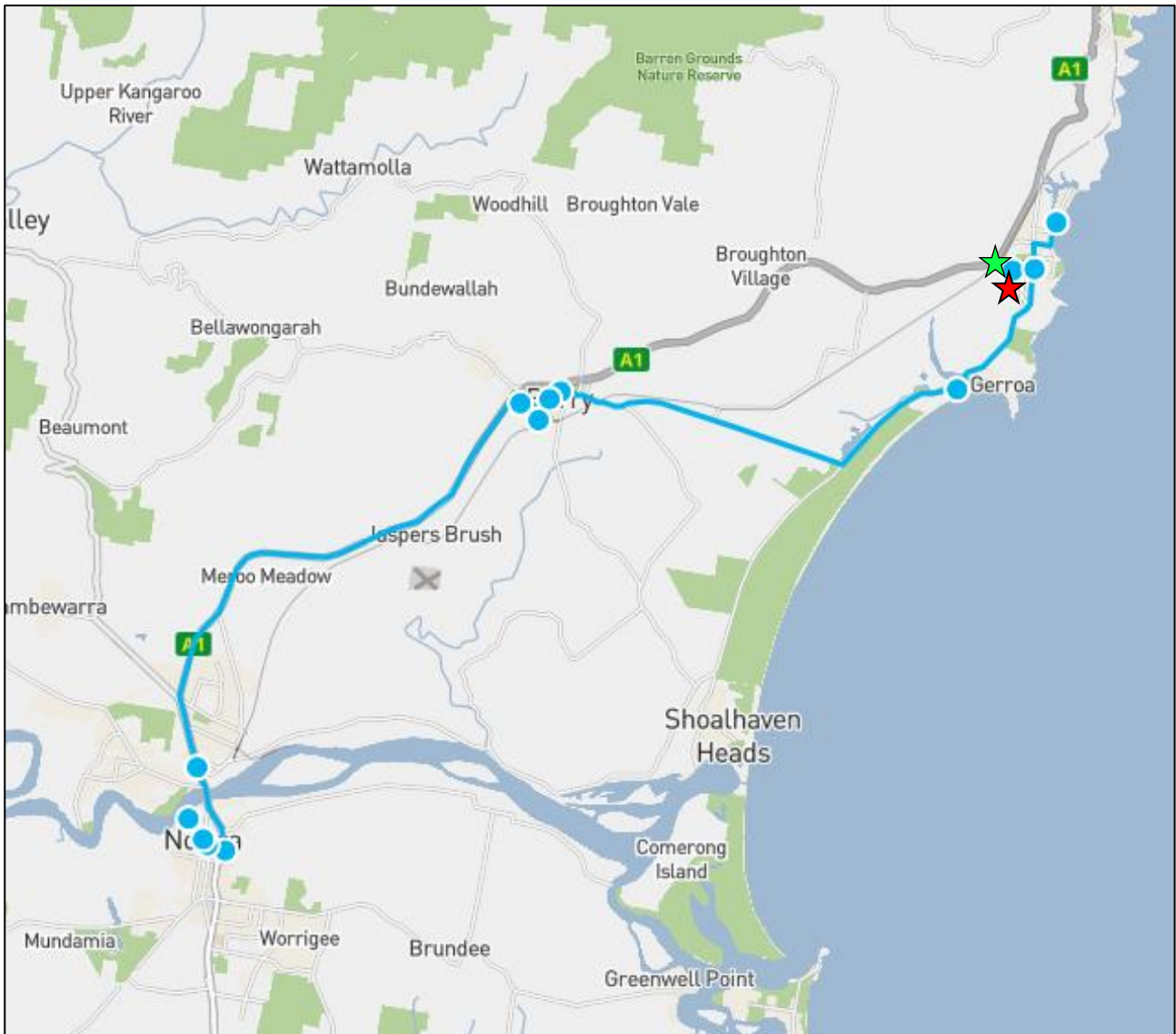
The nearest bus stop from the site (ID: 253442) is located approximately 600m walking distance to the north of the site on Belinda Street. This bus stop services existing bus routes 126 (Gerroa to Kiama via Gerringong) provided by Kiama Coachlines, and 130 (Gerringong to Nowra) provided by Shoal Bus.

The location of the site subject to the surrounding public transport network is shown in **Figure 3** and **Figure 4**.



★ Site Location ★ Gerringong Train Station

FIGURE 3: ROUTE 126 MAP



★ Site Location ★ Gerringong Train Station

FIGURE 4: 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 2020, Chapter 3 – Common Requirement – Section 3.6.67* 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.

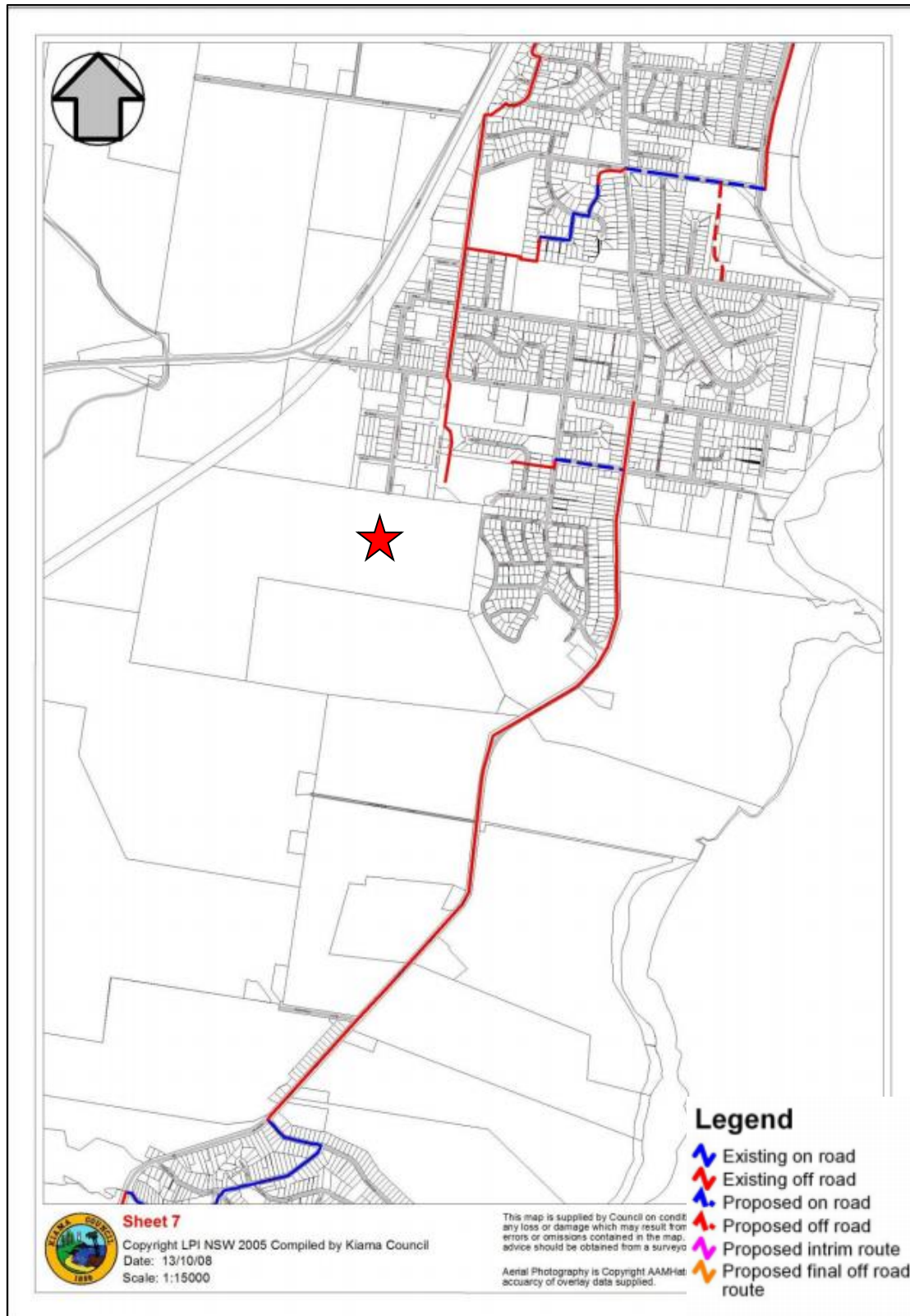
3.2 NSW RFS – “Planning for Bushfire Protection”

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 2019*.

3.3 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 5** below provides an extract of the existing and proposed bicycle paths for the Gerringong area.



★ Site Location

FIGURE 5: 2008 KIAMA CYCLEWAY PLAN MAP

3.4 Servicing & Loading

3.4.1 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:

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.

3.4.2 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 2020, Chapter 3 – Common Requirement*. 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.

4 EXTERNAL ACCESS

The access to the subdivision will be through the Campbell Street/Belinda Street intersection. This connection is located within close proximity to the Princes Highway interchange which provides easy access to regional employment areas such as Nowra, Kiama, Port Kembla, Shellharbour and Wollongong.

Section 6 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 in **Section 4.1**, 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.

4.1 *Sight Distance Assessment of the Intersection of Belinda Street / Campbell Street*

The ATC survey data described in **Section 2.3.1** were used in assessing the sight distances at the intersection of Belinda Street / Campbell Street. A summary of the observed average speeds along Belinda Street (approximately 60m west of Campbell Street) is provided in **Table 4** below.

TABLE 4: 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.

4.1.1 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 5**.

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

EQUATION 1: SSD EQUATION (AGRD PART 3)

TABLE 5: 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 F**. 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.

4.1.2 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 6**.

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

EQUATION 2: SISD EQUATION (AGRD PART 3)

TABLE 6: 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 F**. 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.

4.1.3 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-second 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 F**. 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.

4.1.4 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 7** below.

TABLE 7: SUMMARY OF FINDINGS

	Sightline Requirement		Compliance achieved at		Distance Shortfall (m)
	Required Distance (m)	85 th 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.

The intersection of Campbell Street / Belinda Street is existing and that whilst the sight distances are deficient with the relevant standards and guides, there is no associated crash cluster according to publicly available crash data, being *Transport for New South Wales – Crashes Map* and website.

The increase of minor approach traffic does have the potential to increase the risk of crashes at the intersection and therefore it would be beneficial to provide for improvements to reduce this risk.

The implementation of local area traffic management (LATM) devices should be considered to lower speeds along Belinda Street on the approach to Campbell Street. Some options for LATM devices to achieve this include:

- Horizontal displacement devices;
- Vertical displacement devices (ie. speed humps or cushions);
- Warning signage (ie. w2-4_r - Side Road Intersection on Straight signage)

The implementation of one or a combination of the above LATM devices would provide for an improvement at the safety at the intersection.

5 PARKING ASSESSMENT

5.1 *DCP Car Parking Requirement*

Reference is made to Kiama Municipal Council's *Development Control Plan 2020 Chapter 3 – Common Requirement* 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.

5.2 *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.

6 TRAFFIC ASSESSMENT

6.1 *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

Daily vehicle trips = 7.4 per dwelling in regional areas

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 8**.

TABLE 8: ESTIMATED TRAFFIC GENERATION

Scale	Period	Rate	Total Volume	Direction ⁽¹⁾
166 dwellings	AM Peak	0.71 per dwelling	118	24 in; 94 out
	PM Peak	0.78 per dwelling	129	103 in; 26 out
	Daily	7.4 per dwelling	1,228	NA

NOTES:

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

As shown in **Table 8**, it is expected that the peak traffic generation of the indicative masterplan is in the order of 118 trips (24 in; 94 out) in the AM peak hourly period, and 129 trips (103 in; 26 out) in the PM peak hourly period.

6.2 *Traffic Assignment*

The traffic assignment has been based on the existing traffic assignment during the recorded peak hours. The recorded traffic assignment was:

- AM Peak Hour
 - Inbound
 - 20% from the Princes Highway interchange
 - 80% from Gerringong Town Centre
 - Outbound
 - 35% to the Princes Highway interchange

- 65% to the Gerringong Town Centre
- PM Peak Hour
 - Inbound
 - 50% from the Princes Highway interchange
 - 50% from Gerringong Town Centre
 - Outbound
 - 35% to the Princes Highway interchange
 - 65% to the Gerringong Town Centre

6.3 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 9.0 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.

TABLE 9: FUTURE INTERSECTION PERFORMANCES

Intersection	Peak Hour	Degree of Saturation ⁽¹⁾	Average Delay ⁽²⁾ (sec/veh)	Level of Service ⁽³⁾⁽⁴⁾	Control Type	Worst Movement	95th Percentile Queue
2019 EXISTING PERFORMANCE							
Belinda Street /Campbell Street	AM	0.17	1.2 (Worst: 11.9)	NA (Worst: A)	Stop	RT from Campbell Street	0.3 veh (2m) Campbell Street
	PM	0.18	1.1 (Worst: 13.7)	NA (Worst: A)		RT from Campbell Street	0.3 veh (2m) Campbell Street
2019 FUTURE PERFORMANCE – With Development							
Belinda Street /Campbell Street	AM	0.23	2.8 (Worst: 12.5)	NA (Worst: A)	Stop	RT from Campbell Street	0.9 veh (6.6m) Campbell Street
	PM	0.21	2.1 (Worst: 15.4)	NA (Worst: B)		RT from Campbell Street	0.5 veh (3.6m) Campbell Street
2029 GROWTH PERFORMANCE – With No Development							
Belinda Street /Campbell Street	AM	0.20	1.1 (Worst: 13.5)	NA (Worst: A)	Stop	RT from Campbell Street	0.3 veh (2.3m) Campbell Street
	PM	0.21	1 (Worst: 15.3)	NA (Worst: B)		RT from Campbell Street	0.3 veh (2.1m) Campbell Street
2029 GROWTH PERFORMANCE – With Development							
Belinda Street /Campbell Street	AN	0.27	2.7 (Worst: 14.6)	NA (Worst: B)	Stop	RT from Campbell Street	1.1 veh (8m) Campbell Street
	PM	0.23	2 (Worst: 17.2)	NA (Worst: B)		RT from Campbell Street	0.6 veh (3.9m) Campbell Street

Note: See **Table 1** for notes.

As can be seen in the results presented in above, the intersection maintains 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.

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

6.4 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 6** for reference.

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 6: EXTRACT FROM RMS GUIDE – TABLE 4.6

Traffic entering and leaving the proposed subdivision will utilise Campbell Street which is a residential street. Therefore, 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**.

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	118	184
	PM	77	129	206

As shown above, Campbell Street currently operates as a local road and the future two-way traffic volumes of 184 and 206 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. Consequently, the proposed subdivision development will not have a substantial impact on residential amenity.

6.5 Potential connection to Elambra Parade

Consideration was made to providing a road connection to the adjacent subdivision via the western end of Elambra Parade. However, as demonstrated in **Section 6** the single external road connection via Campbell Street can adequately cater for the expected additional traffic demand associated with 166 dwellings. The additional traffic will not have a significant impact on residential amenity along Campbell Street or level of service at the intersection of Campbell Street / Belinda Street, subject to the recommended LATM devices described in **Section 4.1.4**. Therefore, the connection to Elambra Parade is not required for the proposed residential subdivision and the proposed development is supported with a single connection via Campbell Road.

7 CONCLUSIONS

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 Structure Plan provided in **Annexure A** to this report, have been assessed.

The proposal includes an approximate total yield of 166 lots for residential use; accessed via a single connection to the existing road network via Campbell Street.

The available sight lines at the intersection of Campbell Street / Belinda Street have been assessed against the relevant requirements. The existing sight lines are non-compliant for the observed 85th percentile speed limit and as such implementation of LATM devices should be considered to lower speeds along Belinda Street on the approach to Campbell 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.

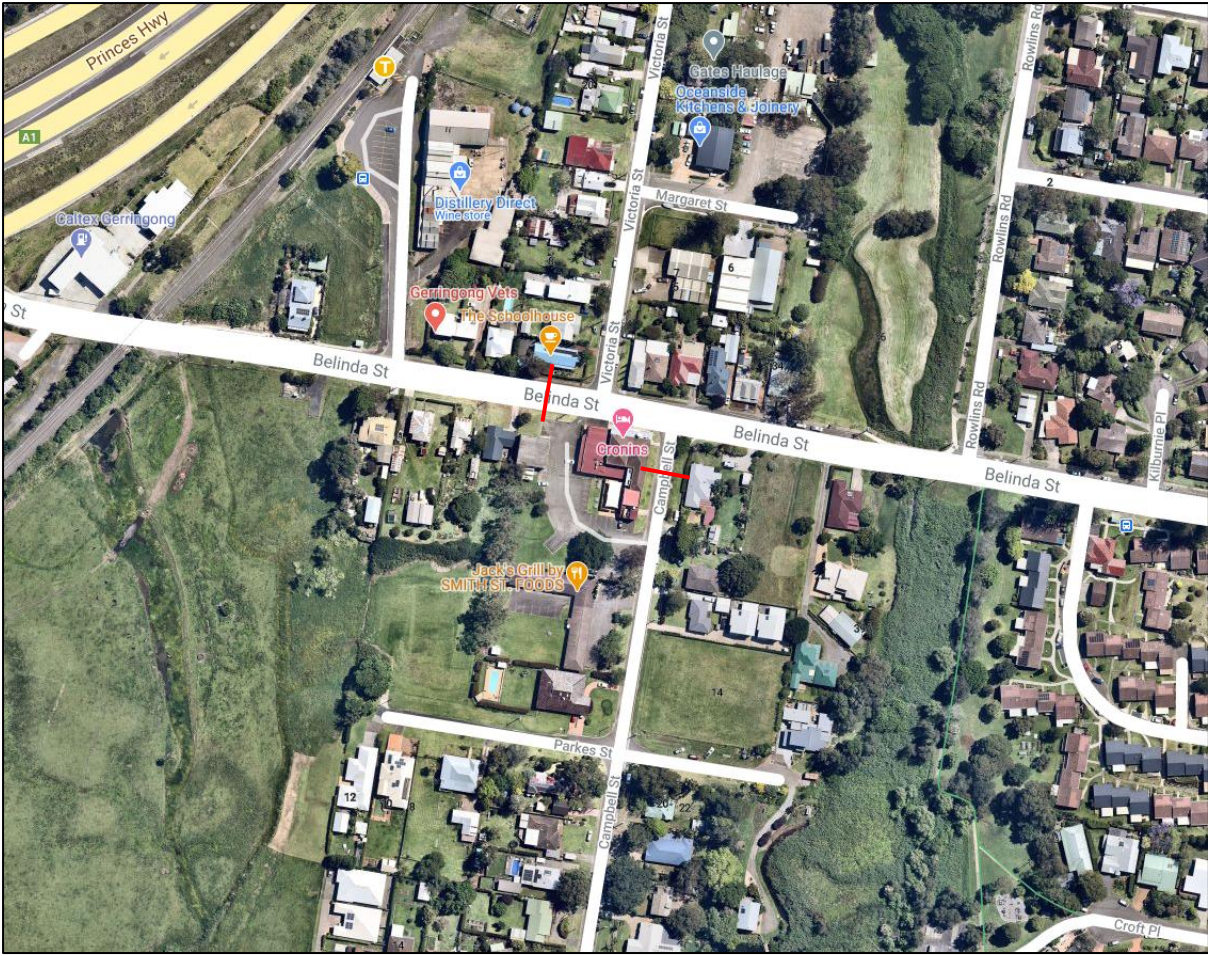
In view of the foregoing, the traffic flow and parking impacts of the Structure Plan for the Planning Proposal for the Elambra West Urban Release Area proposal is supportable.



ANNEXURE A: PROPOSED SITE CONCEPT POTENTIAL
(1 SHEET)



ANNEXURE B: TUBE SURVEY LOCATIONS
(1 SHEET)



— Tube Survey Locations



ANNEXURE C: TRAFFIC SURVEY RESULTS
(2 SHEETS)

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TURNING MOVEMENT SURVEY

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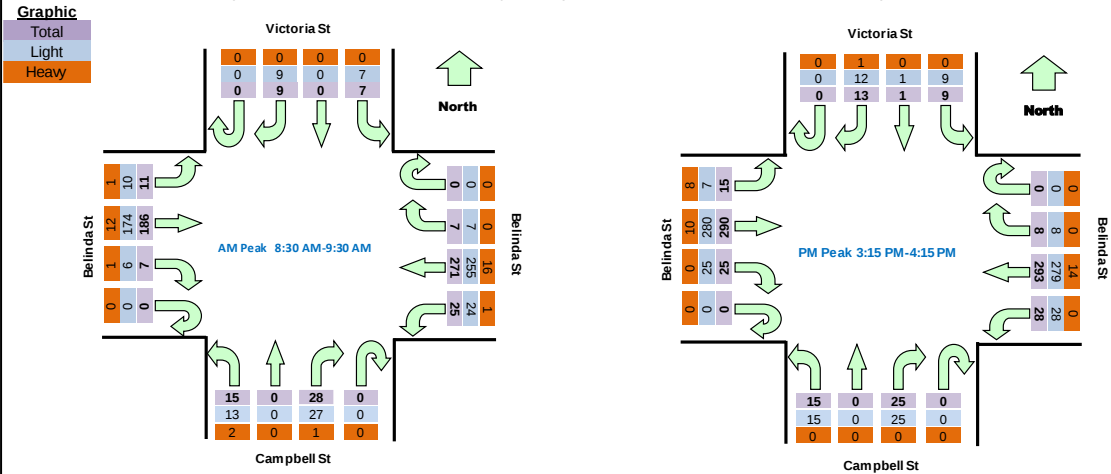
Intersection of Belinda St and Victoria St, Gerringong

GPS	-34.74615, 150.81895		
Date:	Thu 07/11/19	North:	Victoria St
Weather:	Overcast	East:	Belinda St
Suburban:	Gerringong	South:	Campbell St
Customer:	McLaren	West:	Belinda St
		Survey	AM: 7:00 AM-10:00 AM
		Period	PM: 2:30 PM-7:00 PM
		Traffic	AM: 8:30 AM-9:30 AM
		Peak	PM: 3:15 PM-4:15 PM

All Vehicles		North Approach Victoria St					East Approach Belinda St					South Approach Campbell St					West Approach Belinda St					Carpark South				Hourly Total	
Period Star	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 Star	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.



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AUTOMATIC COUNT SUMMARY

Street Name :	Campbell St	Location :	Outside Property 10
Suburb :	Gerrigong	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](#)



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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



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[Volume Data](#) [Volume Graph](#) [Classification](#)



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ANNEXURE D: SIDRA INTERSECTION RESULTS
(8 SHEETS)

MOVEMENT SUMMARY

 **Site: 001 [EXAM - Belinda Street / Campbell Street (Site Folder: General)]**

EXISTING AM
Belinda Street / Campbell Street, Gerringong NSW

Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV] veh/h	[Total veh/h]	[HV] %				[Veh. veh]	[Dist] m				
South: Campbell Street (S)														
1	L2	15	2	16	13.3	0.073	9.4	LOS A	0.3	2.0	0.50	0.93	0.50	43.5
3	R2	28	1	29	3.6	0.073	11.9	LOS A	0.3	2.0	0.50	0.93	0.50	43.3
Approach		43	3	45	7.0	0.073	11.0	LOS A	0.3	2.0	0.50	0.93	0.50	43.3
East: Belinda Street (E)														
4	L2	25	1	26	4.0	0.170	4.6	LOS A	0.0	0.0	0.00	0.04	0.00	49.1
5	T1	278	16	293	5.8	0.170	0.1	LOS A	0.0	0.0	0.00	0.04	0.00	49.7
Approach		303	17	319	5.6	0.170	0.4	NA	0.0	0.0	0.00	0.04	0.00	49.6
West: Belinda Street (W)														
11	T1	193	12	203	6.2	0.109	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
12	R2	7	1	7	14.3	0.006	5.9	LOS A	0.0	0.2	0.40	0.54	0.40	45.1
Approach		200	13	211	6.5	0.109	0.2	NA	0.0	0.2	0.01	0.02	0.01	49.8
All Vehicles		546	33	575	6.0	0.170	1.2	NA	0.3	2.0	0.04	0.10	0.04	49.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: \\mteserver\mte storage\Jobs\2020\200838\MTE SIDRA\20 03 02 - 190601 - Updated Gerringong SIDRA's - ALL Scenarios.sip9

MOVEMENT SUMMARY

 **Site: 001 [EXPM - Belinda Street / Campbell Street (Site Folder: General)]**

EXISTING PM
Belinda Street / Campbell Street, Gerringong NSW

Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] veh/h	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Campbell Street (S)														
1	L2	15	0	16	0.0	0.077	8.8	LOS A	0.3	2.0	0.54	0.94	0.54	43.2
3	R2	25	0	26	0.0	0.077	13.7	LOS A	0.3	2.0	0.54	0.94	0.54	42.8
Approach		40	0	42	0.0	0.077	11.9	LOS A	0.3	2.0	0.54	0.94	0.54	42.9
East: Belinda Street (E)														
4	L2	28	0	29	0.0	0.183	4.6	LOS A	0.0	0.0	0.00	0.05	0.00	49.2
5	T1	301	14	317	4.7	0.183	0.1	LOS A	0.0	0.0	0.00	0.05	0.00	49.6
Approach		329	14	346	4.3	0.183	0.4	NA	0.0	0.0	0.00	0.05	0.00	49.6
West: Belinda Street (W)														
11	T1	299	10	315	3.3	0.166	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
12	R2	25	0	26	0.0	0.020	5.7	LOS A	0.1	0.6	0.41	0.57	0.41	45.3
Approach		324	10	341	3.1	0.166	0.5	NA	0.1	0.6	0.03	0.04	0.03	49.5
All Vehicles		693	24	729	3.5	0.183	1.1	NA	0.3	2.0	0.05	0.10	0.05	49.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

 **Site: 001 [GROAM - Belinda Street / Campbell Street - 2029-NoDev (Site Folder: General)]**

2029 GROWTH AM - NoDev - 2% ann. growth on Belinda Street
Belinda Street / Campbell Street, Gerringong NSW

Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] veh/h	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Campbell Street (S)														
1	L2	15	2	16	13.3	0.085	9.8	LOS A	0.3	2.3	0.55	0.96	0.55	43.0
3	R2	28	1	29	3.6	0.085	13.5	LOS A	0.3	2.3	0.55	0.96	0.55	42.7
Approach		43	3	45	7.0	0.085	12.2	LOS A	0.3	2.3	0.55	0.96	0.55	42.8
East: Belinda Street (E)														
4	L2	25	1	26	4.0	0.202	4.7	LOS A	0.0	0.0	0.00	0.04	0.00	49.2
5	T1	334	19	352	5.7	0.202	0.1	LOS A	0.0	0.0	0.00	0.04	0.00	49.7
Approach		359	20	378	5.6	0.202	0.4	NA	0.0	0.0	0.00	0.04	0.00	49.7
West: Belinda Street (W)														
11	T1	232	15	244	6.5	0.132	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
12	R2	7	1	7	14.3	0.007	6.2	LOS A	0.0	0.2	0.44	0.56	0.44	45.0
Approach		239	16	252	6.7	0.132	0.2	NA	0.0	0.2	0.01	0.02	0.01	49.8
All Vehicles		641	39	675	6.1	0.202	1.1	NA	0.3	2.3	0.04	0.09	0.04	49.2

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.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

 **Site: 001 [GROP - Belinda Street / Campbell Street - 2029-
NoDev (Site Folder: General)]**

2029 GROWTH PM - NoDev - 2% ann. growth on Belinda Street
Belinda Street / Campbell Street, Gerringong NSW

Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist m]				
South: Campbell Street (S)														
1	L2	15	0	15	0.0	0.083	9.1	LOS A	0.3	2.1	0.58	0.95	0.58	42.6
3	R2	25	0	25	0.0	0.083	15.3	LOS B	0.3	2.1	0.58	0.95	0.58	42.3
Approach		40	0	40	0.0	0.083	13.0	LOS A	0.3	2.1	0.58	0.95	0.58	42.4
East: Belinda Street (E)														
4	L2	28	0	28	0.0	0.206	4.6	LOS A	0.0	0.0	0.00	0.04	0.00	49.2
5	T1	361	17	361	4.7	0.206	0.1	LOS A	0.0	0.0	0.00	0.04	0.00	49.7
Approach		389	17	389	4.4	0.206	0.4	NA	0.0	0.0	0.00	0.04	0.00	49.6
West: Belinda Street (W)														
11	T1	359	12	359	3.3	0.190	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
12	R2	25	0	25	0.0	0.020	5.9	LOS A	0.1	0.6	0.44	0.59	0.44	45.3
Approach		384	12	384	3.1	0.190	0.4	NA	0.1	0.6	0.03	0.04	0.03	49.6
All Vehicles		813	29	813	3.6	0.206	1.0	NA	0.3	2.1	0.04	0.08	0.04	49.2

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.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

 **Site: 001 [FUAM - Belinda Street / Campbell Street (Site Folder: General)]**

Future AM
Belinda Street / Campbell Street, Gerringong NSW

Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] veh/h	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Campbell Street (S)														
1	L2	48	2	51	4.2	0.230	9.1	LOS A	0.9	6.6	0.55	0.96	0.55	43.4
3	R2	89	1	94	1.1	0.230	12.5	LOS A	0.9	6.6	0.55	0.96	0.55	43.1
Approach		137	3	144	2.2	0.230	11.3	LOS A	0.9	6.6	0.55	0.96	0.55	43.2
East: Belinda Street (E)														
4	L2	44	1	46	2.3	0.181	4.6	LOS A	0.0	0.0	0.00	0.07	0.00	49.0
5	T1	278	16	293	5.8	0.181	0.1	LOS A	0.0	0.0	0.00	0.07	0.00	49.5
Approach		322	17	339	5.3	0.181	0.7	NA	0.0	0.0	0.00	0.07	0.00	49.4
West: Belinda Street (W)														
11	T1	193	12	203	6.2	0.109	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
12	R2	12	1	13	8.3	0.010	5.9	LOS A	0.0	0.3	0.41	0.56	0.41	45.2
Approach		205	13	216	6.3	0.109	0.4	NA	0.0	0.3	0.02	0.03	0.02	49.7
All Vehicles		664	33	699	5.0	0.230	2.8	NA	0.9	6.6	0.12	0.24	0.12	48.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

 **Site: 001 [FUPM - Belinda Street / Campbell Street (Site Folder: General)]**

FUTURE PM
Belinda Street / Campbell Street, Gerringong NSW

Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] veh/h	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Campbell Street (S)														
1	L2	24	0	25	0.0	0.142	8.9	LOS A	0.5	3.6	0.58	0.95	0.58	42.6
3	R2	42	0	44	0.0	0.142	15.4	LOS B	0.5	3.6	0.58	0.95	0.58	42.2
Approach		66	0	69	0.0	0.142	13.0	LOS A	0.5	3.6	0.58	0.95	0.58	42.4
East: Belinda Street (E)														
4	L2	79	0	83	0.0	0.212	4.6	LOS A	0.0	0.0	0.00	0.11	0.00	48.8
5	T1	301	14	317	4.7	0.212	0.1	LOS A	0.0	0.0	0.00	0.11	0.00	49.2
Approach		380	14	400	3.7	0.212	1.0	NA	0.0	0.0	0.00	0.11	0.00	49.1
West: Belinda Street (W)														
11	T1	299	10	315	3.3	0.166	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
12	R2	77	0	81	0.0	0.067	6.0	LOS A	0.3	2.0	0.45	0.63	0.45	45.2
Approach		376	10	396	2.7	0.166	1.3	NA	0.3	2.0	0.09	0.13	0.09	48.9
All Vehicles		822	24	865	2.9	0.212	2.1	NA	0.5	3.6	0.09	0.19	0.09	48.4

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.

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.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

 **Site: 001 [GROAM - Belinda Street / Campbell Street - 2029-
with DEV (Site Folder: General)]**

2029 GROWTH AM - With Dev - 2% ann. growth on Belinda Street
Belinda Street / Campbell Street, Gerringong NSW

Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV veh/h]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist m]				
South: Campbell Street (S)														
1	L2	48	2	51	4.2	0.266	9.8	LOS A	1.1	8.0	0.60	0.99	0.65	42.7
3	R2	89	1	94	1.1	0.266	14.6	LOS B	1.1	8.0	0.60	0.99	0.65	42.3
Approach		137	3	144	2.2	0.266	12.9	LOS A	1.1	8.0	0.60	0.99	0.65	42.5
East: Belinda Street (E)														
4	L2	44	1	46	2.3	0.212	4.6	LOS A	0.0	0.0	0.00	0.06	0.00	49.0
5	T1	334	19	352	5.7	0.212	0.1	LOS A	0.0	0.0	0.00	0.06	0.00	49.5
Approach		378	20	398	5.3	0.212	0.6	NA	0.0	0.0	0.00	0.06	0.00	49.5
West: Belinda Street (W)														
11	T1	232	15	244	6.5	0.131	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
12	R2	12	1	13	8.3	0.011	6.1	LOS A	0.0	0.3	0.45	0.58	0.45	45.1
Approach		244	16	257	6.6	0.131	0.3	NA	0.0	0.3	0.02	0.03	0.02	49.7
All Vehicles		759	39	799	5.1	0.266	2.7	NA	1.1	8.0	0.12	0.22	0.13	48.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

 **Site: 001 [GROP - Belinda Street / Campbell Street - 2029- with DEV (Site Folder: General)]**

2029 GROWTH PM - With Dev - 2% ann. growth on Belinda Street
Belinda Street / Campbell Street, Gerringong NSW

Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV] veh/h	[Total veh/h]	[HV] %				[Veh. veh]	[Dist] m				
South: Campbell Street (S)														
1	L2	24	0	24	0.0	0.153	9.2	LOS A	0.6	3.9	0.62	0.95	0.62	42.0
3	R2	42	0	42	0.0	0.153	17.2	LOS B	0.6	3.9	0.62	0.95	0.62	41.7
Approach		66	0	66	0.0	0.153	14.3	LOS A	0.6	3.9	0.62	0.95	0.62	41.8
East: Belinda Street (E)														
4	L2	79	0	79	0.0	0.233	4.6	LOS A	0.0	0.0	0.00	0.10	0.00	48.9
5	T1	361	17	361	4.7	0.233	0.1	LOS A	0.0	0.0	0.00	0.10	0.00	49.3
Approach		440	17	440	3.9	0.233	0.9	NA	0.0	0.0	0.00	0.10	0.00	49.2
West: Belinda Street (W)														
11	T1	359	12	359	3.3	0.189	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
12	R2	77	0	77	0.0	0.067	6.2	LOS A	0.3	2.0	0.48	0.64	0.48	45.2
Approach		436	12	436	2.8	0.189	1.2	NA	0.3	2.0	0.08	0.11	0.08	49.0
All Vehicles		942	29	942	3.1	0.233	2.0	NA	0.6	3.9	0.08	0.17	0.08	48.5

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.

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.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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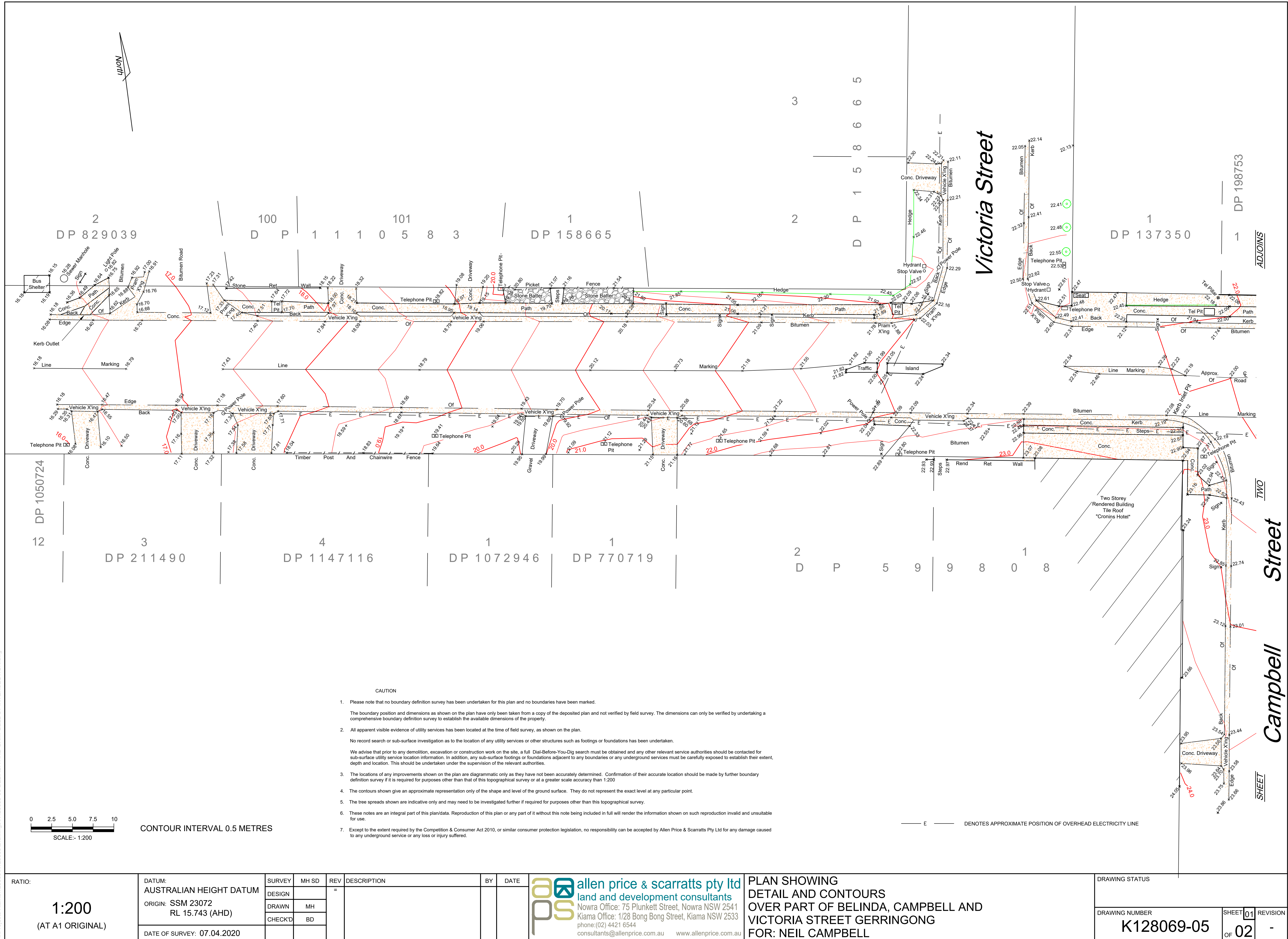
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ANNEXURE E: DETAILED INTERSECTION SURVEY
(2 SHEETS)

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

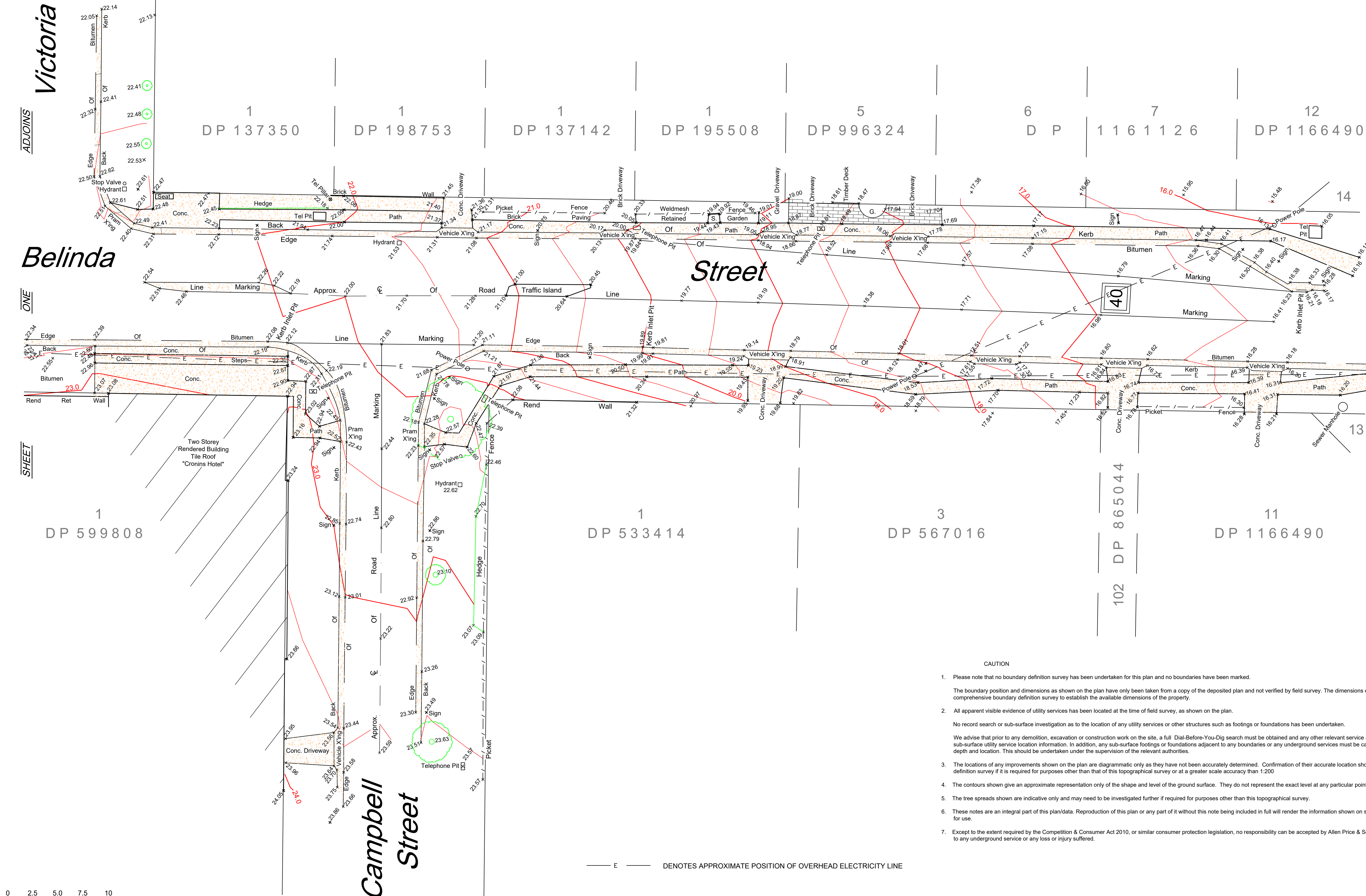


K:\Projects-Kiama\128000\K128069\Drawings\K128069-05 BELINDA AND CAMPBELL ST INTERSECTION.dwg

ADJOINS
Victoria Street

Belinda Street

SHEET



0 2.5 5.0 7.5 10
SCALE:- 1:200

CONTOUR INTERVAL 0.5 METRES

— E — DENOTES APPROXIMATE POSITION OF OVERHEAD ELECTRICITY LINE

CAUTION

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

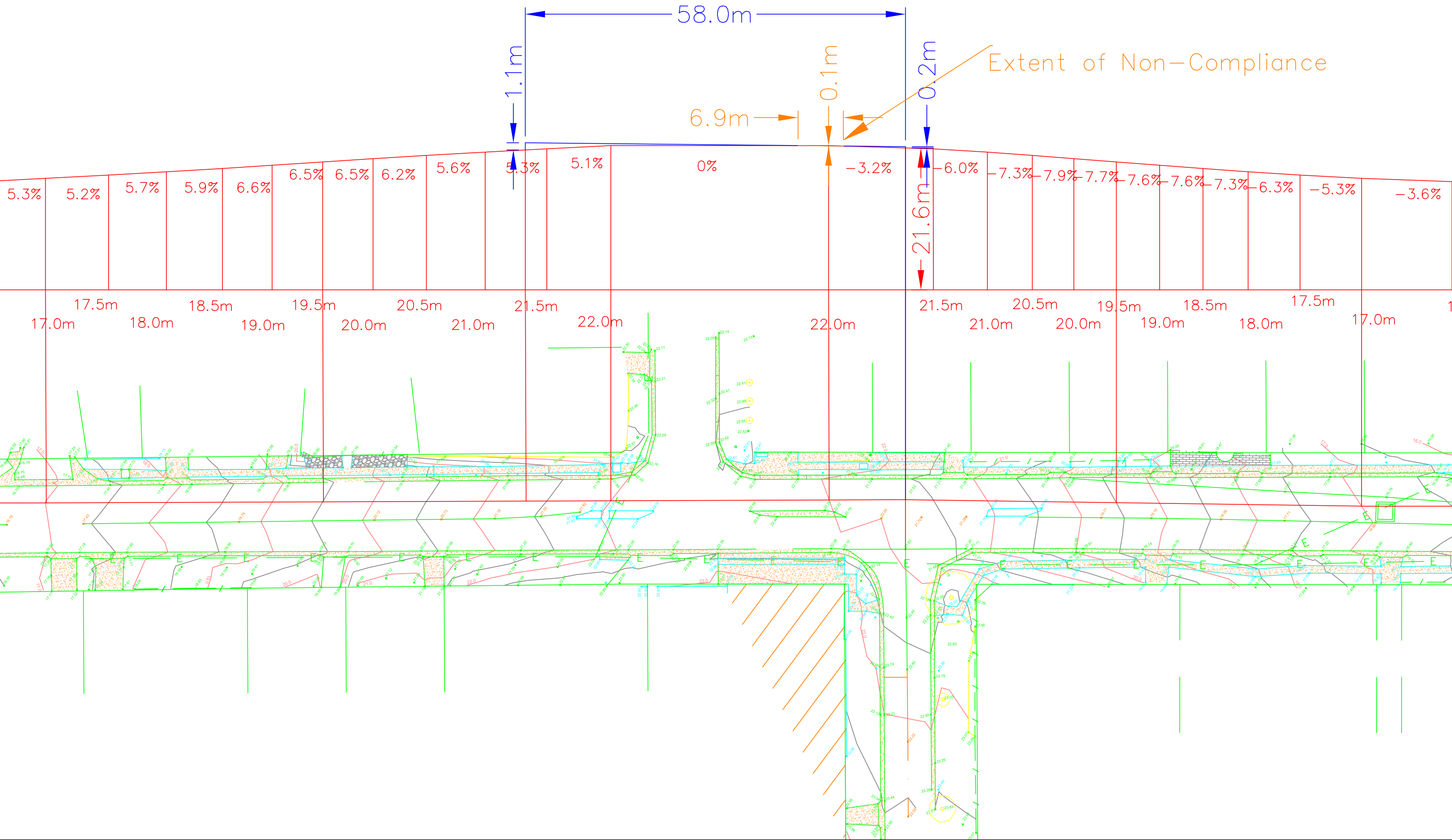
RATIO: 1:200 (AT A1 ORIGINAL)	DATUM: AUSTRALIAN HEIGHT DATUM	SURVEY	MH SD	REV	DESCRIPTION	BY	DATE	PLAN SHOWING DETAIL AND CONTOURS OVER PART OF BELINDA, CAMPBELL AND VICTORIA STREET, GERRINGONG FOR: NEIL CAMPBELL	DRAWING STATUS		
	ORIGIN: SSM 23072 RL 15.743 (AHD)	DESIGN							DRAWING NUMBER K128069-05	SHEET 02 OF 02	REVISION -
	DATE OF SURVEY: 07.04.2020	DRAWN	MH								
		CHECK'D	BD								

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phone: (02) 4421 6544
consultants@allenprice.com.au www.allenprice.com.au



ANNEXURE F: MTE SIGHT DISTANCE ASSESSMENTS
(6 SHEETS)

Eastbound – SSD – 54.1km/h – 58.0m



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www.mcclarentraffic.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

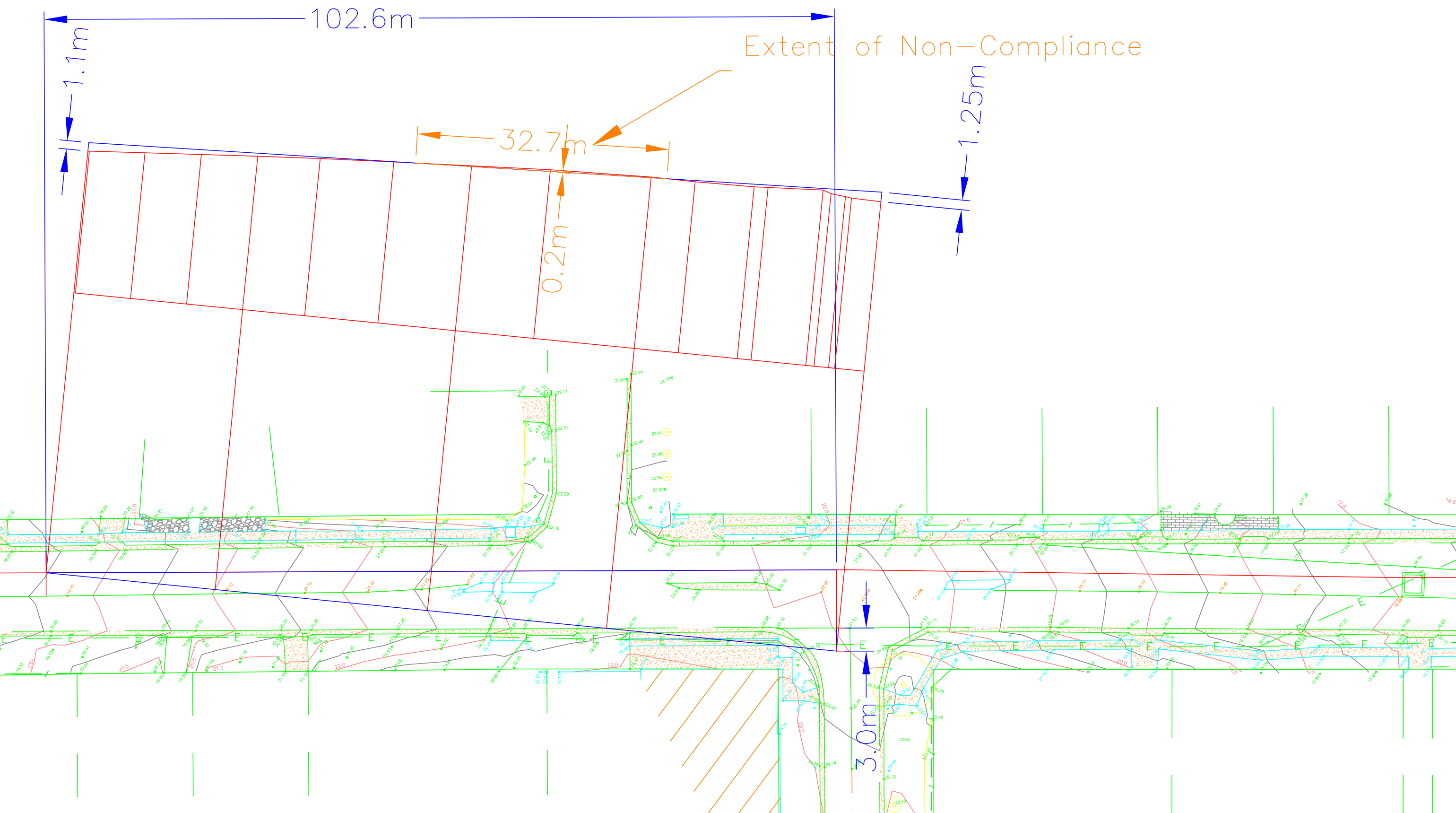
Project No: 2020/0238

Drawing No: 2020-0238-01A

Revision	Date	Details
A	15/05/2020	SSD Assessment



Eastbound – SISD – 54.1km/h – 102.6m



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CLIENT / Project:
Allen Price & Scarratts Pty Ltd

Project Address:
Belinda Street / Campbell Street, Gerringong

Notes:
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NOT FOR CONSTRUCTION.

Tested Using:
*AutoTURN 10
*ZWCAD 2019

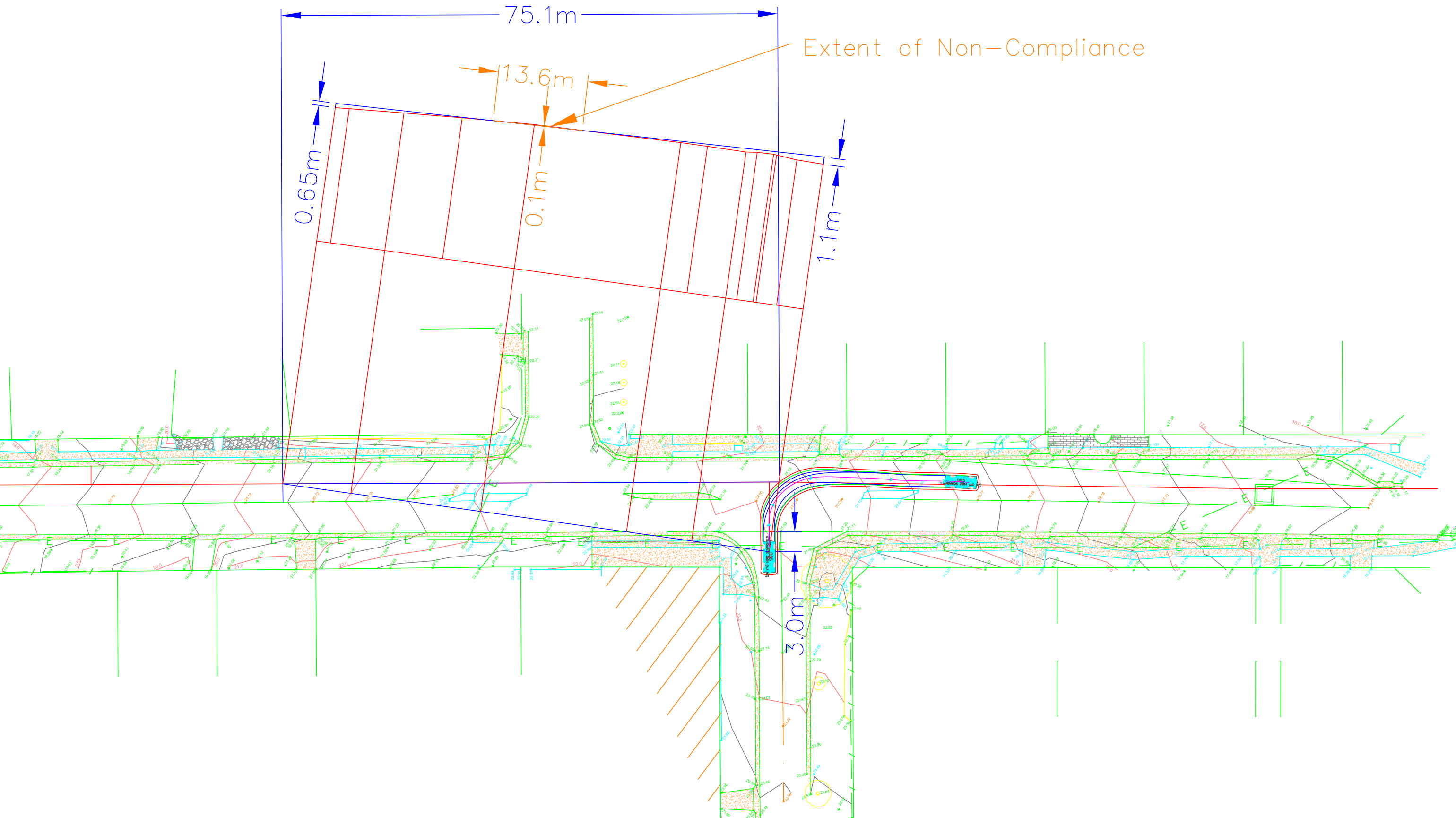
Drawing Title:
SISD Assessment

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





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CLIENT / Project:
Allen Price & Scarratts Pty Ltd

Project Address:
Belinda Street / Campbell Street, Gerringong

Notes:
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Tested Using:
*AutoTURN 10
*ZWCAD 2019

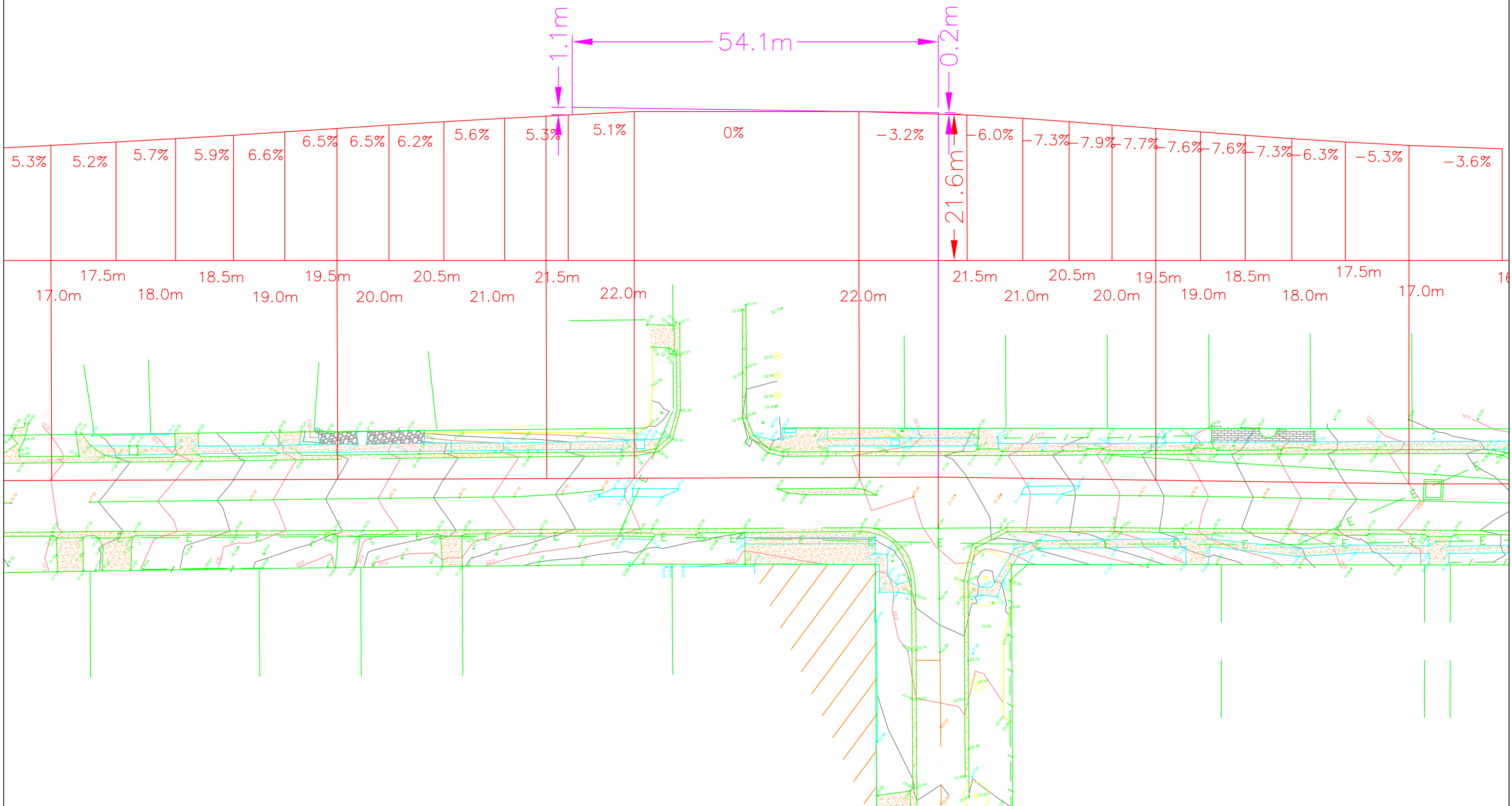
Drawing Title:
MGSD Assessment

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



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CLIENT / Project:
Allen Price & Scarratts Pty Ltd

Project Address:
Belinda Street / Campbell Street, Gerringong

Notes:
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Tested Using:
*AutoTURN 10
*ZWCAD 2019

Drawing Title:
SSD Assessment - Achieved

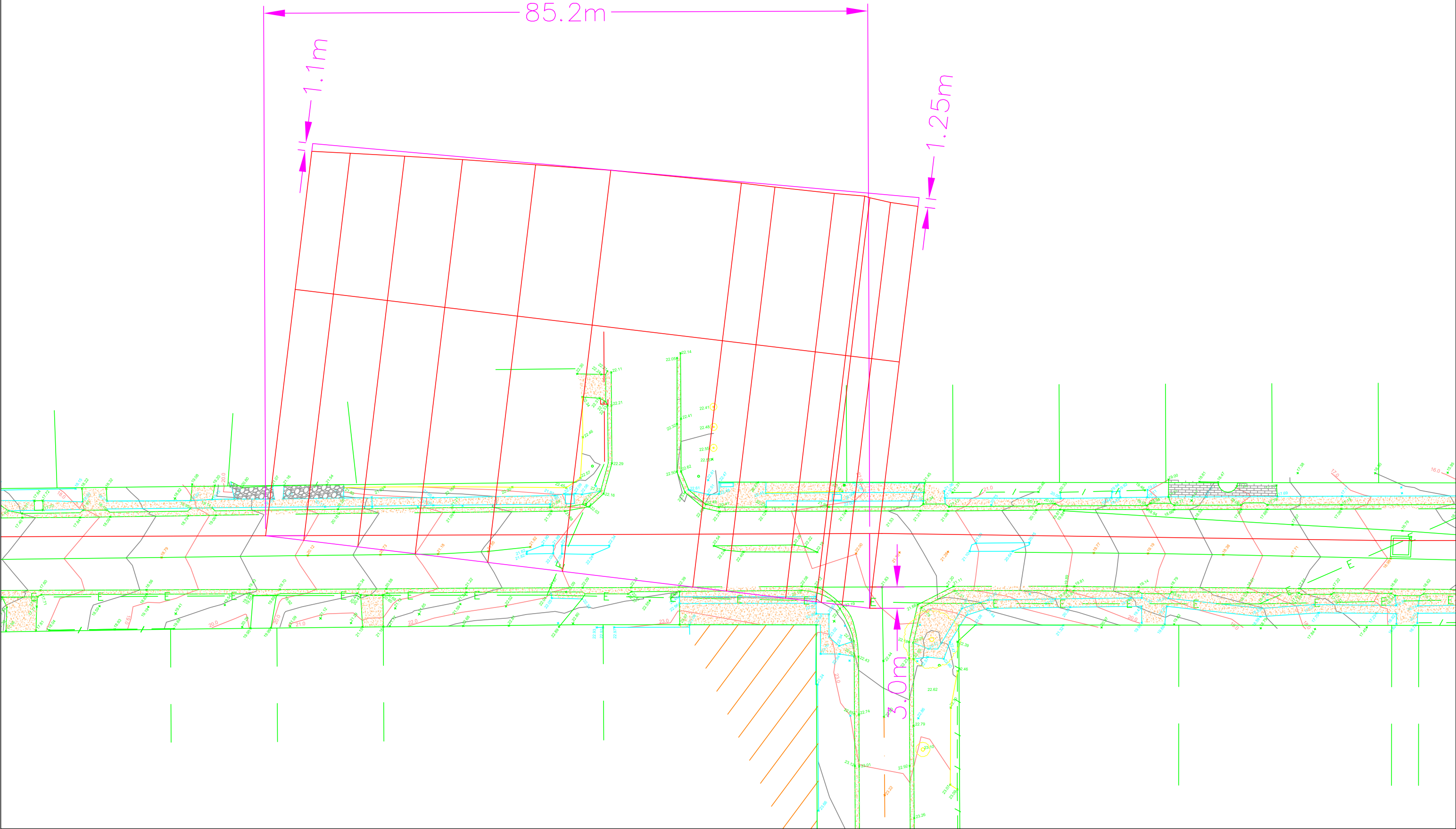
Project No: 2020/0238

Drawing No: 2020-0238-04A

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



Eastbound – SISD – Sight line achieved 85.2m



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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:
SISD Assessment - Achieved

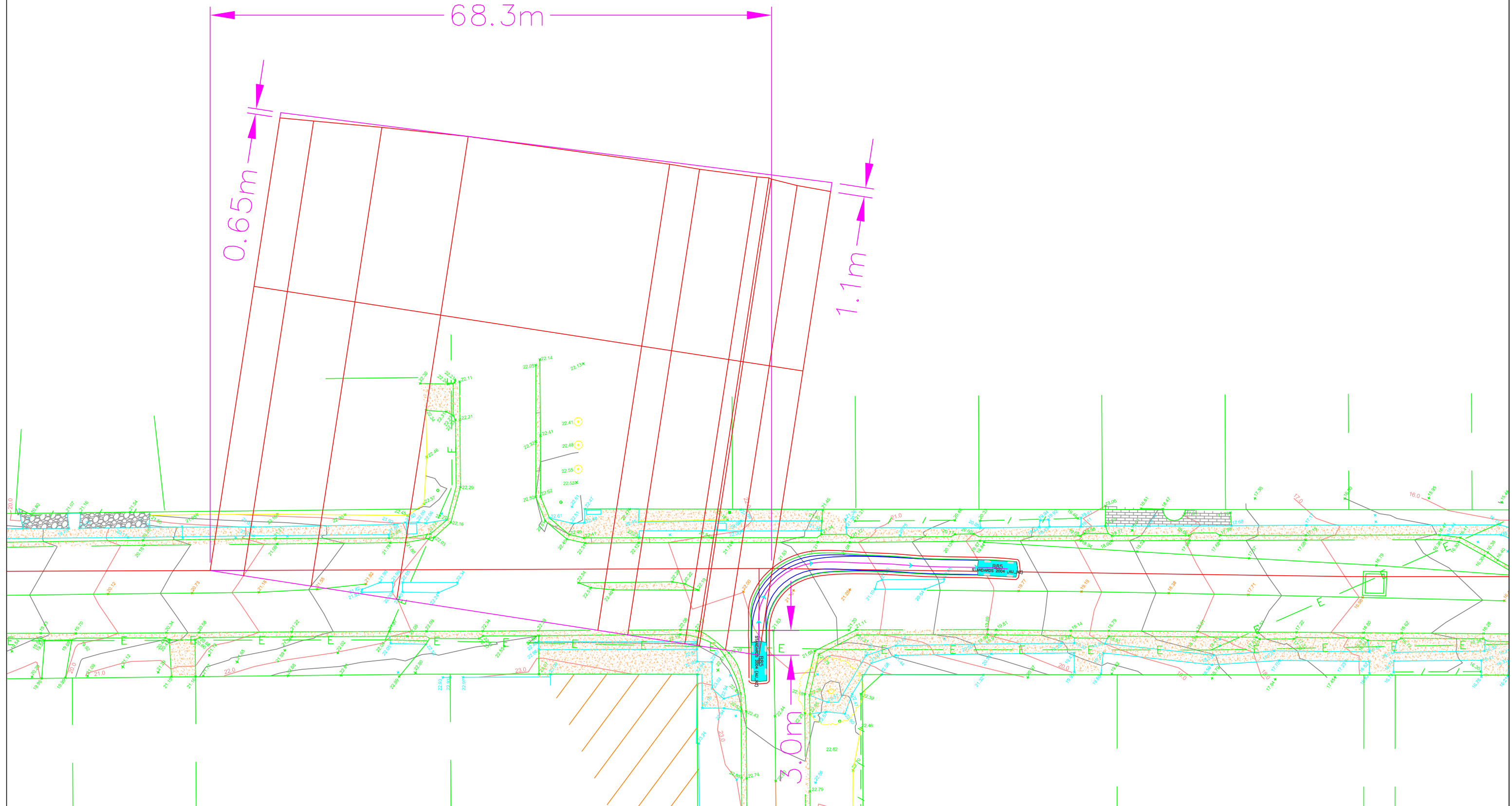
Project No:	Drawing No:
2020/0238	2020-0238-05A

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



Eastbound — Right Turn — MGSD —

Sight line achieved 68.3m



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Tested Using:
*AutoTURN 10
*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

