

# **ENGINEERING ASSESSMENT REPORT, PROPOSED SUBDIVISION, 54 PULLEN ST , WOOLGOOLGA.**

for Peac Investments

9/06/2024 | Version 01



**de Groot & Benson Pty Ltd**  
Consulting Engineers & Planners

236 Harbour Drive Coffs Harbour NSW 2450 | 02 6652 1700 | email@dgb.com.au



## Copyright

The information in this document is Copyright. Except as permitted by the Copyright Act 1968 (Cth), no part of this document may be reproduced by any process, electronic or otherwise, without the specific written permission of the copyright owner de Groot & Benson Pty Ltd.

## Report Details

<b>Document Title:</b>	ENGINEERING ASSESSMENT REPORT, PROPOSED SUBDIVISION, 54 PULLEN ST , WOOLGOOLGA.
<b>Project Number:</b>	22157
<b>Filename:</b>	22157 2024-06-09 Engineering Assessment Report.docx
<b>Prepared For:</b>	Peac Investments
<b>Date and Version:</b>	9/06/2024   Version 01
<b>Author:</b>	Graham Knight
<b>Reviewer:</b>	Nathan Bourne
<b>Approved:</b>	Graham Knight

Rev	Date	Purpose	Author	Reviewer	Approved
01 - Draft	20/06/2024	For review	GJK	NB	GJK

## Abbreviations

Term / acronym	Definition / meaning	Term / acronym	Definition / meaning
ARI	Average Recurrence Interval		
DCP	Development Control Plan		
AHD	Australian Height Datum		

## Notes



## Executive Summary

This report provides an assessment of the civil engineering proposed for a 20 lot subdivision of lot 12 DP 1059040 (No. 54) Pullen Street, Woolgoolga. The lot covers 3.0 Ha and rises from RL 4 m AHD along Woolgoolga Creek to the north, to RL 21 m AHD along the boundary with 56 Pullen Street to the south. The proposed subdivision and dead-end internal road are shown on Drawing 22157-DA02.

With respect to civil engineering:

- **Vehicular Access.** 19 of the new 20 residential lots will be serviced via a new internal road. The remaining lot will be accessed off Pullen Street. Its driveway location meets sight distance requirements.
- **Intersections.** The new road's single Tee intersection with Pullen St is proposed not to be sign posted or line marked. Pullen Street will be the dominate through road based on road geometry. The intersection achieves Safe Intersection Sight Distance on all legs for all movements.
- **Road Design.** It is proposed to widen Pullen Street fronting the property to match that further east, being a 4.5 m wide lane with roll K&G and a 1.5 m wide footpath, similar to that of a "Collector Road". The new internal road, considered a "Local Street" under Council's Auspec 0041, is proposed to have an 8 m wide pavement with roll K&G centered within an 18 m wide road reserve (5 m wide verges) with a 1.5 m wide concrete footpath on one side.
- **Earthworks.** The site constraints of a perimeter road, steep existing slopes to the west, the need to drain No 44 Pullen St, the sewer level and the proposed near level building envelopes results in substantial earthworks and boundary retaining walls being required. A preliminary site regrading design has been completed as shown on drawing DA03 & 04. Balanced earthworks cannot be achieved and an excess of soil (VENM) in the order of 7,000 cu.m will need to be disposed of legally off site.
- **Flooding.** The predicted 1% AEP flood level in Woolgoolga Creek of a little under RL 8.0 is well below the proposed roads (low point of RL 12 m) and building pads (lowest at RL 13.2m). The subdivision works will not significantly impact the Woolgoolga Creek flood behaviour, nor will that behaviour impact the subdivision.
- **Stormwater Management.** Stormwater management is to comply with Council's Water Sensitive Urban Design (WSUD) policy via the inclusion of a combined bio-retention and detention basin within a drainage and riparian reserve to be dedicated to Council.
- **Sewer and Water.** All lots will be serviced by new gravity sewer and water reticulation. A system capacity assessment has not been undertaken.
- **Power and Telco.** Power and telco services are available and all lots can be so provisioned.

It is concluded that the proposed subdivision can be adequately constructed and serviced to Council's requirements and such works are within the economic constraints of the development.



# Contents

1.	INTRODUCTION .....	4
2.	LOCATION AND DESCRIPTION .....	4
3.	ROAD GEOMETRY .....	5
3.1	Existing road network.....	5
3.2	Proposed Road Network and Intersections .....	5
3.3	Property Access .....	7
4.	EARTHWORKS AND GEOTECHNICAL ISSUES .....	8
4.1	Site Regrading.....	8
4.2	Geotechnical Advice .....	9
4.3	Acid Sulphate Soils.....	9
5.	FLOODING AND STORMWATER MANAGEMENT .....	10
6.	SERVICES .....	12
6.1	Sewerage .....	12
6.2	Water.....	12
6.3	Power.....	12
6.4	Telecommunications .....	12



## **1. INTRODUCTION**

This report has been prepared by de Groot and Benson P/L on engagement by Peac Investments to provide a civil engineering assessment of a proposed 20 lot residential subdivision of lot 12 DP 1059040 (No 54) Pullen Street Woolgoolga. This report is to accompany a Development Approval application for the subdivision.

The proposed development, as shown on drawing 22157 DA01 to 09, comprises 20 residential lots, an internal road and a drainage reserve to be dedicated to Council. One lot will front a widened Pullen Street. The remaining nineteen will front a new dead-end internal road with an intersection onto Pullen Street. All lots are to be serviced by sewer, water, stormwater drainage, power and telco.

This report examines the civil engineering associated with the proposed subdivision including:

- Road geometry
- Bulk earthworks
- Flood impact
- Stormwater Management
- Sewer and water supply
- Electricity and Telecommunications

Planning, environmental, bushfire, traffic and landscaping are examined in separate documents by other consultants.

## **2. LOCATION AND DESCRIPTION**

The existing property comprising the subject site is lot 12 DP 1059040 Pullen Street Woolgoolga. The subject site covers some 3.0 Ha with Pullen Street and 52 & 56 Pullen Street adjoining the southern boundary. Neighbouring private property adjoins to the west, north and east, although a portion of the northern boundary also abuts Woolgoolga Creek.

The subject site is zoned R2 Low Density Residential as is the surrounding land.

The property mostly falls to the north towards Woolgoolga creek, although the western portion falls to the west and into an un-named tributary of Woolgoolga Creek that lies just within the neighbour lot. No. 56 Pullen Street occupies the crest of a hill at RL 21 m AHD. From there the property falls moderately steeply down to RL 4 m AHD at Woolgoolga Creek and RL 6 m AHD along the western boundary. The steepest localised slopes, at greater than 1h:3v are the bank into Woolgoolga Creek and along the western boundary. Elsewhere, across the developable portion of the land, typical slopes vary from 6% to 15%.

The land is mostly cleared and until recently kept clear by domesticated animal grazing, and more recently by slashing. Some native and exotic trees occur along the western boundary and the Woolgoolga Creek bank, plus there are some isolated large native trees within the lot.



## **3. ROAD GEOMETRY**

### **3.1 Existing road network**

Pullen Street adjacent the site's southern boundary is a two-lane collector road. While it has a large catchment area west of the site, it currently only services approximately 120 dwellings. At an assumed 10 vehicle movements per day this equates to an AADT of approximately 1,200, being light for a collector road.

Adjacent the site Pullen St has:

- A suburban speed limit of 50 kmph.
- A centre crown with broken centre line marking.
- No kerb & gutter fronting the property, and only one short section on the far side of the road.
- Nominal 7.4 m wide bitumen spray seal with edge line marking to give two 3.5 m wide lanes.
- The property has two sections of frontage, that east of No 52 & 56 Pullen St, and that west.
- The road crests opposite the western boundary of No 56 Pullen.
- Fronting the property and 52 & 56 Pullen:
  - The gravel shoulder is now mostly grassed.
  - 52 & 56 Pullen is in cut with a longitudinal "table drain" draining to the east.
  - The eastern section is in embankment. The end of the table drain and the pavement sheet drains into the property.
  - The western section is in slight cut with a longitudinal "table drain" draining to the west.
- There is no concrete footpath on either side.

The property has one un-sealed driveway, immediately east of No 52, which crosses the table drain by a concrete pipe culvert. The discharge from which drains into the property as the road goes from cut to embankment.

Further to the east, the Pullen St pavement has been widened on both sides. On the northern side it includes a concrete footpath and roll kerb and gutter forming a 4.5 m wide lane. As part of the subdivision works, it is proposed that the northern side of Pullen St will be widened to match that to the east (4.5 m wide lane, roll kerb and gutter and a 1.5 m footpath) along the property frontage. This will leave gaps in the widening in front of 44, 52 and 56 Pullen St. The widening in front of those properties can only be achieved with some regrading and driveway works inside those properties. The greatest work would be required inside 44 Pullen St.

### **3.2 Proposed Road Network and Intersections**

The proposed road layout and geometry is shown on drawing 22157-DA2, comprising a new internal dead-end road intersecting with Pullen Street. The new internal road will provide access to 19 lots with a traffic volume of approximately 190 vpd.

In accordance with Council's Auspec 0041, the internal road is considered an Access Street. An 8.0 m wide asphalt pavement centred within an 18 m wide road reserve (5 m wide verges both sides) is proposed. The road will be centred crowned with roll kerb and gutter either side and a 1.5m wide concrete footpath on one side.



The road is to form a “perimeter road” separating the proposed residential lots from the bush fire source of riparian vegetation along Woolgoolga Creek and its tributary along the western boundary. At its eastern end it terminates in a 24 m diameter cul-de-sac head. The diameter being in accordance with the Planning For Bush Fire Guidelines.

A 55 m long combined gravel footpath, cycleway and emergency access is proposed from the Cul-de-sac head to Pullen Street. This is to have a locked gate and bollards to prevent car access but allow pedestrians and bicycle access. It can be opened in emergencies such as bush fire to improve access.

The new internal road will intersect Pullen Street by a non-line marked or sign posted Tee intersection. The through Pullen Street traffic will have right of way. On Pullen Street there is ample sight distance to the east, but a road crest limits that to the west. An assessment of sight distances was undertaken as summarised in Table 3.1.

**Table 3.1 – Sight Distances for proposed Tee intersection**

Tee Intersection Sight Distances							
Approach Leg, from the				East	West	North	
Type (P=primary, S=secondary)				P	P	S	
Design speed	V	(kmph)		50	50	40	
Approach grade (+ve is uphill)	a	(%)		3.5	-3.5	5.5	
Reaction time	Rt	(s)		2	2	2	
Decision time	Dt	(s)		5	5	5	
Gap acceptance time	ta	(s)		5	5	5	
Obstruction				Bend in road	Crest	Bend in road	
Sight Distances for Cars							
Decel	d	(m/s <sup>2</sup> )		0.36	0.36	0.36	
Stopping sight distance	SSD	(m)		52.7	58.1	37.4	Eye
Approach Sight Distance	ASD	(m)		52.7	58.1	37.4	Height
Sight Distance Available		(m)		>250	95	106	1.1
Safe Intersection Sight Distance	SISD	(m)		94.4	99.7	70.7	
Sight Distance Available		(m)		>250	104	106	1.1
Minimum Gap Sight Distance	MGSD	(m)		69.4	69.4	55.6	
Sight Distance Available		(m)		>250	100	106	1.1
Sight Distances for Trucks							
Decel	d	(m/s <sup>2</sup> )		0.29	0.29	0.29	
Stopping sight distance	SSD	(m)		58.1	66.4	40.5	Eye
Approach Sight Distance	ASD	(m)		58.1	66.4	40.5	Height
Sight Distance Available		(m)		>250	110	106	2.4
Safe Intersection Sight Distance	SISD	(m)		99.7	108.0	73.8	
Sight Distance Available		(m)		>250	121	106	2.4
Minimum Gap Sight Distance	MGSD	(m)		69.4	69.4	55.6	
Sight Distance Available		(m)		>250	116	106	2.4

*Note: For the primary through road, SISD should be provided if possible. For the terminating secondary road ASD is required.*

Table 3.1 shows that Safe Intersection Sight Distance (SISD) can be achieved for cars and trucks on all legs of the intersection.



### **3.3 Property Access**

All lots other than Lot 19 will have driveway access off the new road. The geometry of the subdivision makes providing access to lot 19 off the new road not possible as Council's DCP 2015 does not permit battle-axe driveways to cul-de-sacs.

The internal road will have roll kerb & gutter, and the dwelling pads have been designed so that grade compliant driveways can be achieved. The footpath has been located to minimise its disturbance from future driveway construction.

Lot 19's driveway access will be off Pullen St. The level of the proposed house pad will allow a driveway at any location along the lot's frontage. If located to the east side, it will intersect Pullen St at the road's crest. If located to the west it will be slight off the crest and offer the least sight distance. For this worst case an assessment of sight distance finds:

- For a car west bound on Pullen St intending to cross the road and enter the driveway, the driver's eye at 1.1 m can sight the top (1.25 m) of an on-coming vehicle at > 120 m which is greater than SISD of 92 m on the approach grade of 8%.
- For a car west bound on Pullen St approaching the driveway, the driver's eye at 1.1 m can sight the blinker (0.65 m) of a stopped car awaiting to turn into the driveway from > 250 m.
- For a car in the driveway with the driver's eye at 1.1 m and 3.0 m behind the kerb line, and assuming no obstruction from parked vehicles, sight distances to the 1.25 m top of an approaching car are:
  - >120 m to the west;
  - >250 m to the east.

Sight distances greater than Safe Intersection Sight Distance can be achieved for all movements.





## 4. EARTHWORKS AND GEOTECHNICAL ISSUES

### 4.1 Site Regrading

The site is moderately steep, sloping down from RL 21 m AHD where it bounds No 56 Pullen St, falling to the north towards Woolgoolga Creek, and to the west to an un-named tributary of Woolgoolga Creek. For much of the site, the slope ranges between 6 and 15%. However, that falling towards the west exceeds 1:3 (33%) as it approaches the western boundary.

Across these slopes significant site regrading is required to form roads, complaint building envelopes and driveways. Drawing DA04 shows the proposed earthworks, which involves substantial cut excavation. Balanced earthworks cannot be achieved with excess soil needing to be disposed of from the site. The reason why and principal site constraints are:

- The bushfire provisions dictate a perimeter road between the dwellings and the riparian vegetation. It is proposed that the riparian vegetation be dedicated to Council as a reserve.
- For Public lands (riparian reserve, basin and roads):
  - As a general rule, no retaining structures.
  - Where land is to be revegetated in the riparian zone, a maximum batter slopes of 1:3 (33%).
  - Elsewhere, where to be maintained by slashing, maximum slopes of 1:4 (25%).
  - Generally within 3.0 m of road kerbs, falling towards the road at less than 4%. The road itself is to be centre crowned, so essentially level across 14 m of verge and pavement.
- Within the lots:
  - Preferable provide near level building envelopes to meet the expectations of the building industry, otherwise at least 250 sq.m at less than 1:5 (20%) slope in accordance with Council's DCP.
  - Compliant driveway gradients.
  - Preferable maximum 1:4 (25%) slopes within yards.
  - Engineered retaining walls on boundaries should not be excessive, preferably below 2.0 m. Drawing DA03 shows the proposed retaining walls and level building pads.
- As the natural slope slightly exceeds 1:3 in places along the western margin, the above dictates that the road must be mostly in cut across the slope. Where the road then turns and runs east-west, the natural slopes eases and it is possible to fill and lift the road some, but still subject to its batter spill not exceeding the boundary with the neighbour or impacting the existing riparian vegetation that is to remain. These constraints dictate how high the road can be to the west and north, which is 5 - 6 m lower than the boundary around 52 & 56 Pullen St. To provide the preferred level building envelopes with complaint driveways, substantial cut excavation is then required with engineered retaining walls on boundaries.
- The proposed arrangement of lots generally provides two boundaries, and hence opportunities for retaining walls, between the road and 52 & 56 Pullen St. Except for lot 18. Here the height difference across a single lot is 5 m which is too great to provide a level pad. This lot will be finished with a sloping building envelope of approximately 12%.
- The level of the boundary with No. 44 Pullen St, and providing sewer to proposed lots 3 and 4, also greatly influences site regrading. No 44 Pullen falls steeply from Pullen St and drains to its rear and into the development site. There is no existing interlotment drainage or easements. Its drainage is by surface runoff across the development site and into the neighbouring property to the north. It shall



both be necessary to provide interlotment piped drainage from No. 44 Pullen St, and to maintain a falling overland flow path from its low point mid rear boundary. This dictates low ground levels across the rear of proposed lots 3 and 4, plus the location, arrangement and levels of the bio-retention basin. The provision of gravity sewer to the building envelopes of lots 3 and 4 requires those to be filled approximately 2.3 m higher than the drainage easement through their rear yards. This in turn dictates a substantial retaining wall with lot 4 along its northern boundary down to the proposed bio-retention basin.

- Significant retaining walls are also required along the eastern boundaries of lots 1 and 2, with these lots finished higher than the adjacent No 44 Pullen St. To keep these retaining walls as low as practical, these lots won't drain to the new street, but to their own interlotment stormwater.

It is noted that the proposed design does not involve any works within No 44 Pullen St, or the northern neighbour (lot 15 DP 1302111). Their consent is not required for the proposed subdivision. Nor is that from 52 & 56 Pullen Street.

While further optimisation will be undertaken during detailed design, aimed at reducing fill export and boundary retaining walls, the fundamental constraints outlined above remain. Significant fill export and retaining walls will be required.

## **4.2 Geotechnical Advice**

A geotechnical investigation has been undertaken by others (Regional Geotechnical Solutions) and presented under separate cover. That investigation found:

- No evidence of existing fill or soil contamination.
- Residual silty clay soils that will support the proposed earthworks and site regrading.
- Underlying hard rock is unlikely to be encountered in the excavations.

## **4.3 Acid Sulphate Soils**

The RGS geotechnical investigation included an Acid Sulphate Soil Assessment, which found that acid sulphate soils were not present, and an Acid Sulphate Soil Management Plan is not required.



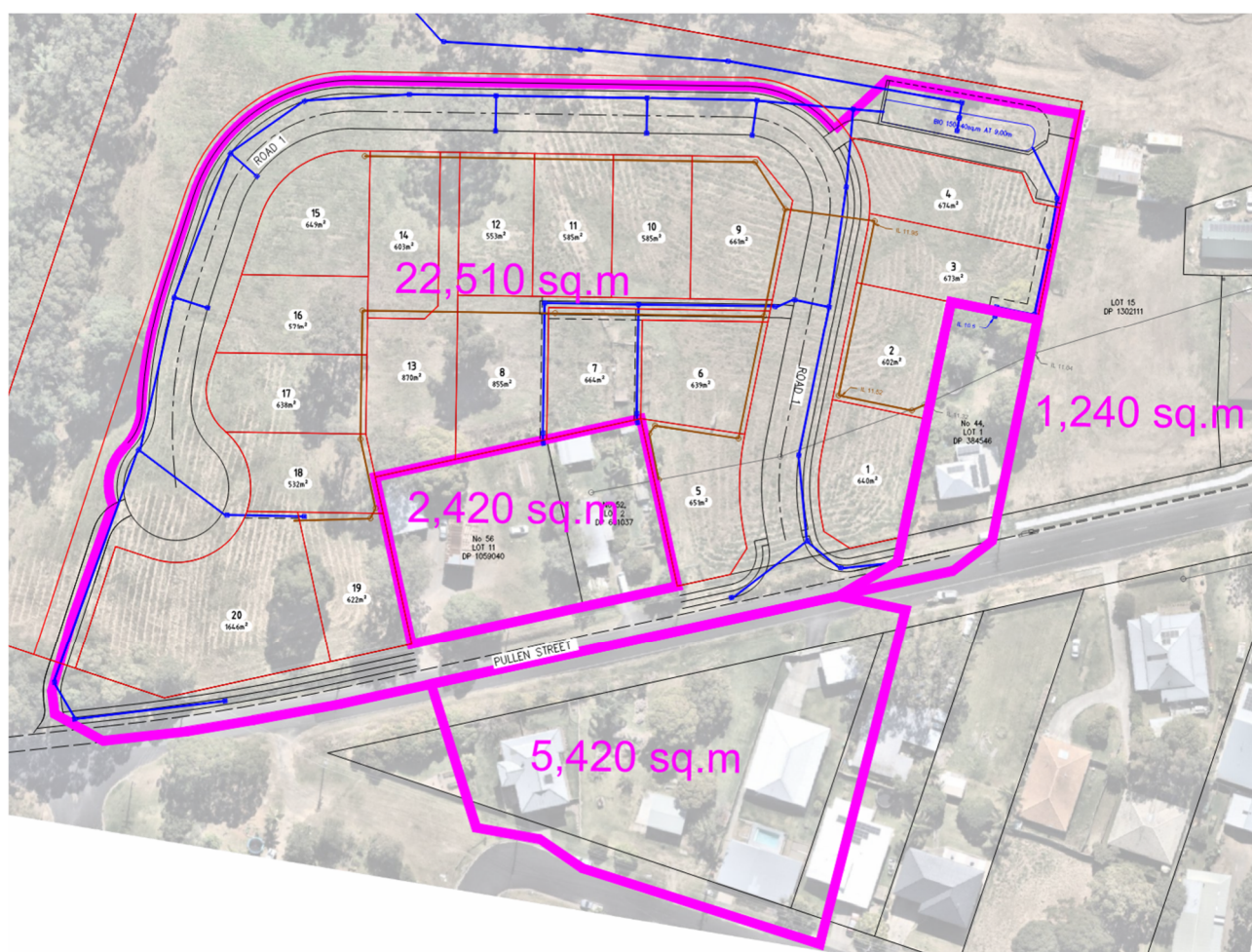
## 5. FLOODING AND STORMWATER MANAGEMENT

The predicted flood levels along Woolgoolga Creek and its tributary are well below the proposed new road and new lots. The predicted 100-yr ARI flood level in Woolgoolga Creek is a little below RL 8.0 m AHD. The lowest filling works is of a similar level. The lowest road level is RL 12.0 m while the lowest building envelope is RL 13.2 m. The proposed development will have no impact on flood conveyance along Woolgoolga Creek, nor will flooding impact the development.

The proposed development's stormwater management is to comply with Council Water Sensitive Urban Design (WSUD) policy, specifically:

- Stormwater quality is to be treated to reach pollutant reduction targets for Total Suspended Solids, Nitrogen, Phosphorus and gross pollutants (litter).
- Peak flows are not to exceed those of the predeveloped site.

To achieve this, the new road and lots, plus some of Pullen Street's road water and a catchment to the south of Pullen Street, will be drain into a bio-retention and storm detention basin located in lot 21 to the north of Lot 4. Lot 21 is to be dedicated to Council as a drainage reserve. Figure 5.1 shows the catchments:



**Figure 5.1 – Catchments Draining to the Bio-retention Basin**

The total catchment draining to the basin is 3.16 Ha, of which 2.25 Ha is the subdivision.



The conceptual basin, as shown on drawings DA07 & 08, has been sized using MUSIC to achieve the required pollution reduction targets. The digital MUSIC model will be supplied separate to the development application, and can be provided upon request to [graham@dgb.com.au](mailto:graham@dgb.com.au). It cannot be uploaded via the NSW Planning Portal.

To fit the basin into the sloping terrain and work within the earthwork constraints as detailed in the previous section, a long narrow basin is proposed with mass retaining walls constructed of no-fines concrete blocks.

The basin is narrow enough to allow servicing from one side. A full perimeter service trail is not proposed. That proposed runs the length of the basin to a turning head sized to suit an 8.8 m Medium Rigid Vehicle.

The basin has also been modelled in DRAINS. Its outlet will be controlled by an orifice such that peak discharge from the site is not increased over the predeveloped case. Final discharge is by a new pipe outlet into Woolgoolga Creek.

The drains model will be provided in digital form, again separate to the portal application, or can be provided upon request to [graham@dgb.com.au](mailto:graham@dgb.com.au).



## **6. SERVICES**

### **6.1 Sewerage**

Drawing 22157-DA06 shows how the lots will be sewerage. New gravity sewer will be connected to the existing gravity sewer where it enters the site adjacent No 44 Pullen St. The level of this sewer dictates the filling required for lots 3, 4 and 9. Elsewhere gravity sewer can be easily reticulated through the development and does not influence the required earthworks.

It is noted that there is the potential to connect to a lower gravity sewer, that within lot 15 DP 1302111. This would allow lots 3 & 4 to be approximately 1.2 m lower than currently proposed which would reduce the boundary retaining walls required. However, that sewer currently does not extend into the property and there is no guarantee that the neighbour's consent can be obtained to undertake the necessary works.

That owners consent will be sort as it is in the developer's interest to lower lots 3 & 4. If obtained a revised sewer design will be submitted for construction approval and DA modification applied for if necessary. However, for this DA it must be assumed that the neighbour's consent cannot be obtained and the sewer design is as shown.

The subdivision will generate an additional 20 ET of sewage into Council's system. An analysis of system capacity downstream has not been undertaken.

### **6.2 Water**

A 100 mm water main runs along the southern side of Pullen St. Drawing 22157-DA06 shows how a new 100mm main can be looped through the subdivision, connecting to that in Pullen Street in two locations. This will provide water services to all the proposed new lots.

### **6.3 Power**

The property is currently serviced by existing overhead low voltage in Pullen St. There is also overhead high voltage in Pullen St. The subdivision will be reticulated with new underground low voltage. This will require a new underground high voltage connection from Pullen St to a new pad mounted sub (transformer), located within the subdivision within its own easement within a lot. Street lighting is to be provided in accordance with Council's policies.

### **6.4 Telecommunications**

NBN telecommunication cables/fibre will be installed along the new road connecting to existing in Pullen Street to service all new lots.