

ENGINEERING SERVICES REPORT

FOR A

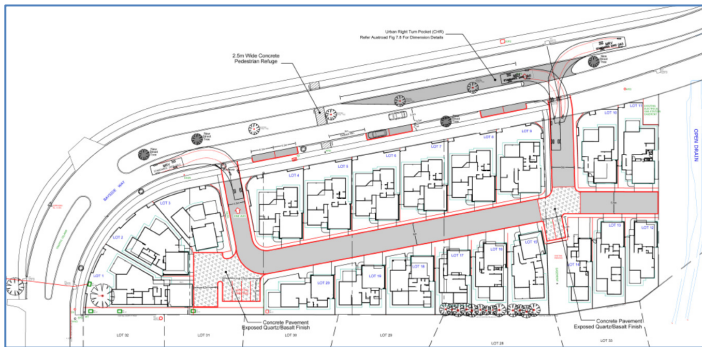
20 LOT COMMUNITY TITLE RESIDENTIAL DEVELOPMENT AND ASSOCIATED WORKS

35 Bayside Way
Brunswick Heads



At
35 Bayside Way
Brunswick Heads NSW 2483

Upon
Land Titles
Lot 1 to Lot 6 DP 1261870



Date: April 2021
(Rev -)

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1 EXECUTIVE SUMMARY

This Engineering Services Report is for a development application to create a 20 lot community title residential development at 35 Bayside Way, Brunswick Heads. The development will consist 18 x 3 bedroom and 2 x 4 bedroom dwellings.

The development proposal relates to six (6) vacant residential allotments being Lot 1 – 6 DP 1261870 being an area of 0.6582ha.

The development has a significant 187m site frontage to Bayside Way which is a local collector road.

The site would be accessed via a 140m long looped driveway. The driveway will typically be 6m wide with two way access, excepting the northern connection will be one way 'exit only' onto Bayside Way.

The development would generate an additional 130 trips per day with a peak hour demand of 16 trips per hour.

The southern driveway access into the site will require the creation of a right turn lane / pocket to enable compliant turning movements from Bayside Way. Such access design will facilitate a 8.8m Medium Rigid Vehicle to safely enter / exit the site.

Six (6) visitor parking bays are provided onsite which exceeds Council's DCP requirement of a minimum of 5 such spaces for this type of multiple dwelling development. It is proposed to construct a further six (6) on-street parallel parking spaces along the Bayside Way frontage.

Footpath connectivity to the existing network on the eastern side of Bayside Way shall be provided via the installation of a pedestrian refuge. The location of the refuge crossing point meets the Austroads requirements of being 9m clear of onstreet parking areas.

Stormwater management for the lands has been assessed to determine the treatment train required to achieve compliant quality outcomes. This assessment was undertaken using MUSIC software. The required treatment train includes: residential rainwater reuse tanks (3kL) + Ecosol GPT 4200 device + 20m² of infiltration areas. The pollutant reduction targets achieved were:

- 81% suspended solids
- 63% phosphorus
- 57% nitrogen
- 99% gross pollutants

Attenuation controls were not applicable to this locality given the sufficient capacity of the existing man made

drainage channel (circ 1992) and the tidal reach proximity of the drain to Simpsons Creek.

Water connectivity would be to the existing 200 dia mains located within Bayside Way via a 100mm new private loop main. Installation of stop valves and fire hydrants at the tee connection would be required. As the private loop main does not require internal fire hydrants, a master meter is not required as all dwelling connections would be metered (ie there would be no unmetered outlet points on the private main).

Gravity sewer connections for the development will require the installation of a maintenance shafts at the existing four (4) sewer junctions. All gravity sewer further into the site (ie from the

maintenance shafts) would be then become either a community title or private sewer asset.

The development proposal has 6ET credit entitlements. Assessment of the future contributions calculated that Section 7.11 and water/sewer development servicing fees would amount to \$421,302 as at April 2021 subject to CPI adjustment.

It is demonstrated that the 20 lot community title development proposal lands can safely and effectively comply with Byron Shire Council development policies.

2 INTRODUCTION

This Engineering Services Report has been prepared to address civil engineering matters associated with the use of existing residential lands for the purpose of a 20 lot community title development at 35 Bayside Way, Brunswick Heads. The development site occupies 6 existing residential lots identified as Lot 1 to Lot 6 in DP 1261870 which have a primary frontage of 187m to the collector road known as Bayside Way. The site also adjoins an existing open drainage reserve which ultimately discharges 400m to the east at Simpsons Creek. Refer *Figure 2.0 – Site Location*.

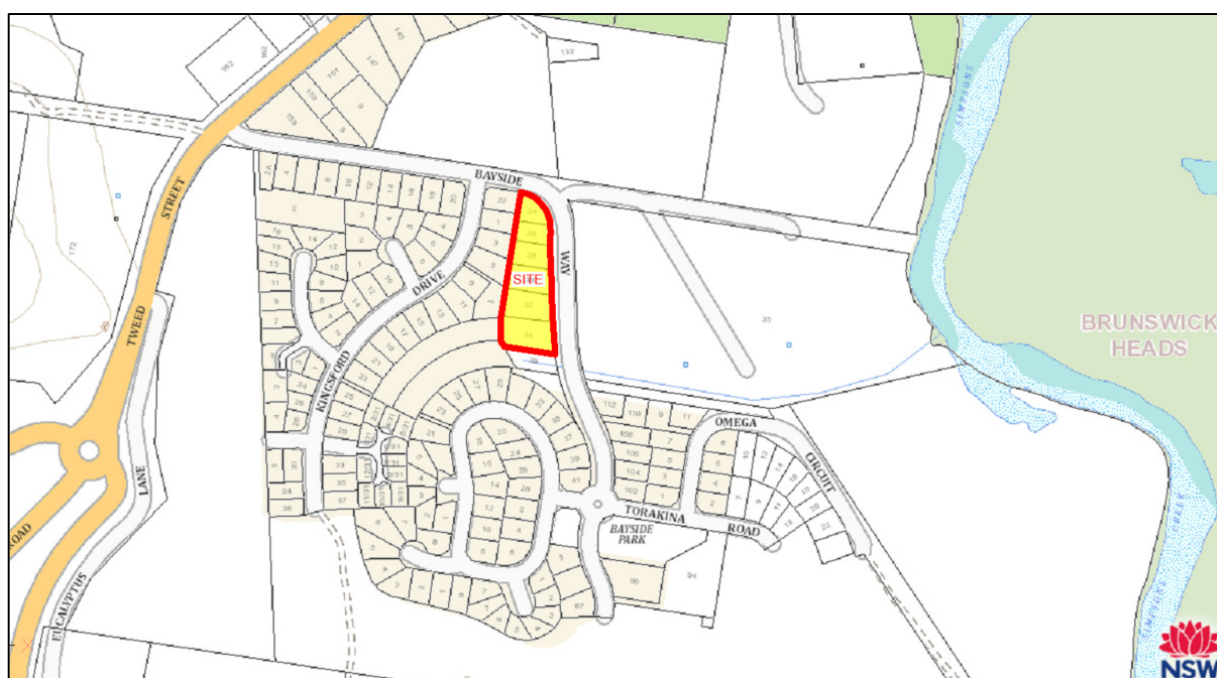


Figure 2.0 – Site Location (Source: SIXmaps.nsw.gov.au)

The subject land holding has an area of 0.6582ha, being the combination of the 6 existing residential lots. There are existing service easements (sewer / stormwater) within the development lot that were required with the creation of the original 6 lots. Excepting for the sewer infrastructure, the drainage easements will no longer be required and shall ultimately be extinguished. The layout design of the development has made allowance for retention of this sewer easement corridor.

2.1 Specific Proposal Details

The residential development pattern is centered upon the need to provide an internal driveway which will service all garage accesses. With a curve alignment affecting available driver sightlines to the northern end of the site, the driveway has been made a 4.5m wide exit only (to the north) with two-way access (6m) at the southern end of the site. Infrastructure and development matters to be considered for the subject lands is summarised as:

Existing

- 6 lots (Lot 1 to 6) upon DP 1261870	6 vacant lots
- Sewer servicing via junctions	6 sewer junctions
- Existing sewer easement	5m wide for rising main
- Stormwater IAD & infiltration pits With headwall outlet at drainage reserve	6 infiltration areas
- Water servicing via Bayside Way frontage	6 water meters
- Concrete footpath Bayside Way frontage	1.5m wide full frontage
- Electrical substation	4.2 x 8.2 easement

Proposed

- Community title residential allotments (3 bedroom dwellings 4 bedroom dwellings)	20 lots 18 dwellings) 2 dwelling)
- Visitor parking onsite	6 spaces
- New onstreet parking	6 parallel spaces Bayside Way
- New pedestrian refuge	1 refuge location Bayside Way
- Driveway access to Bayside Way (north)	1 x 4.5m wide (exit only)
- Driveway access to Bayside Way (south)	1 x 6m wide (two way)
- Right turn urban pocket Bayside Way	3m wide
- Driveway design access vehicle size	8.8m MRV
- Water reuse 3kL tank each dwelling	60kL (ie 20lot x 3kL)
- Stormwater treatment (MUSIC model) 20m ² infiltration area	Ecosol GPT 4200
- Stormwater outlet	375mm pipe to drainage reserve
- Council sewer works	Install new maintenance shafts to the 6 existing junctions
- Private gravity sewer	150mm dia gravity lines into site commencing from maintenance shafts

- | | |
|----------------------|---|
| - Council water main | Install 100dia T with hydrant and stop valve to each end to enable loop main |
| - Private water main | Install 100dia loop water main adjacent to internal driveway with individual water meters to each dwelling. No master meter required. |

New telecommunication and electrical supply is proposed to be provided via existing networks from Bayside Way. The site is not affected by any existing overhead electrical supply lines.

2.2 Report Reference Documents

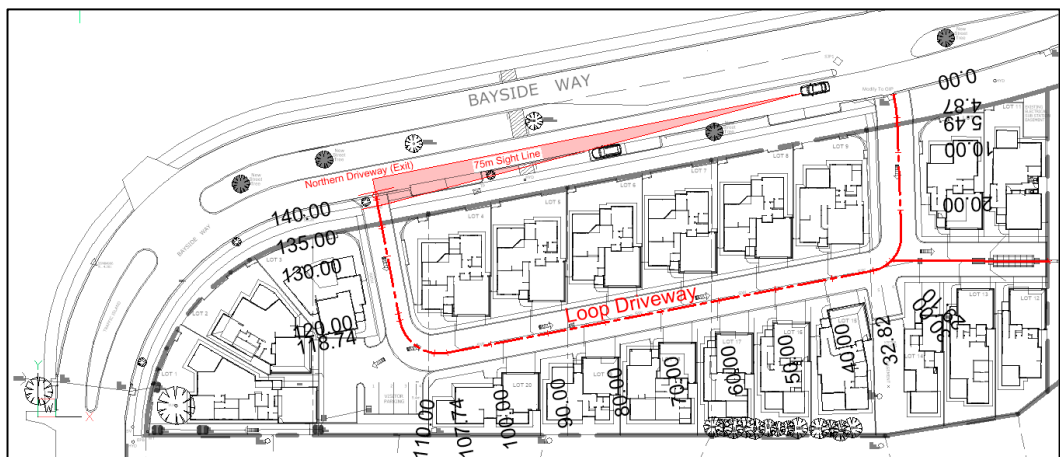
The preparation of this report has had regard to the following documents:

- Byron Shire Council *DCP 2014 – Chapter D6 Subdivision (April 2018)*
- Byron Shire Council *DCP 2014 - Chapter B4 Traffic Planning, Vehicle Parking, Circulation and Access (April 2018)*
- Byron Shire Council *NRLGM – Handbook of Stormwater Drainage Design (2013)*
- Byron Shire Council - *Comprehensive Guidelines For Stormwater Management (2014)*
- Australian Standard AS2890.1 – *Parking Facilities Part 1: Off-street Car Parking (2004)*
- Northern Rivers Local Government (NRLG) - *Development Design Specification D1 Geometric Road Design (2018)*

3 TRAFFIC AND ACCESS ASSESSMENT

Access to the development will be from the existing collector road Bayside Way via a looped 6m wide driveway. This looped driveway will be two-way access for 120m of its 140m length, whereby the last 20m shall be an exit only to the north being toward Brunswick Heads town centre.

The location of the driveway entry/exit locations achieve sightline compliance in accordance with *AS2890.1 Parking Facilities - Off Street Parking* to which a 60kph speed environment requires a minimum distance of 65m. This sightline requirement dictated that the northern exit be located immediately prior (ie south of) to the horizontal curve to ensure compliance. Refer extract below of Drg 2061-C4 for details.



Extract – Drg 2061-C4: Internal Driveway Plan Chainages (Source: Appendix A-Civil Engineering Drawings)

3.1 Trip Generation and Existing Road Capacity

The existing Bayside Way frontage is a 25m wide collector road reserve to which the 4.8m travel lanes are separated via a 4.5m wide landscaped median. Northern Rivers Design and Development guidelines nominate a collector road at 3,000vpd (or nominal 300 lots) operating capacity. Bayside Way currently services 80 dwellings plus childcare centre, hence is operating at approximately 1/3 capacity – being upward of 1000vpd. With peak hour demands typically ranging from 10% to 15% (adopt median of 12.5%),

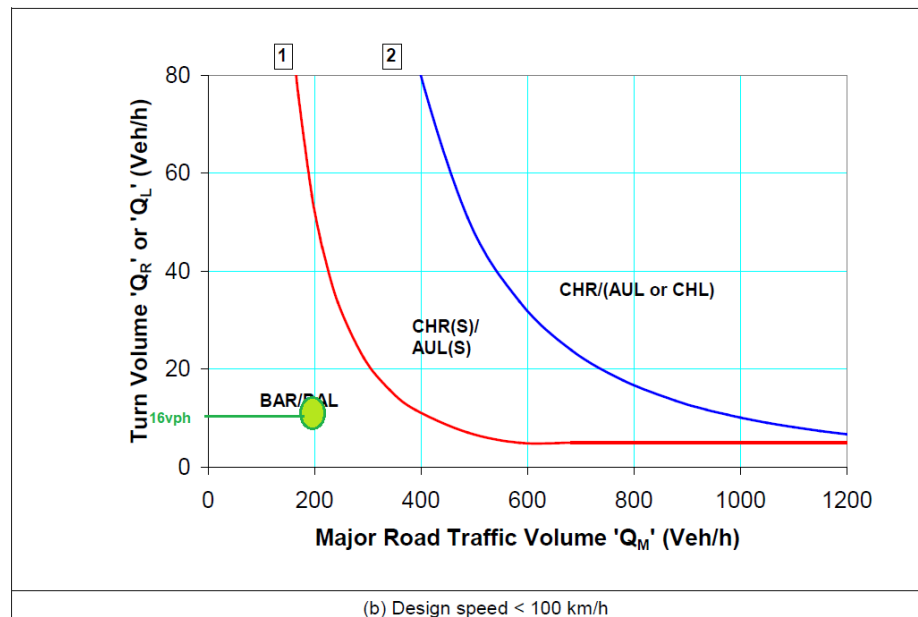
this gives a current peak traffic flow of $12.5\% \times 1000 = 125\text{vph}$. Allowing for a 5% growth over next 10yr horizon, this becomes a 200vph design demand.

The development lot layout for this proposal yields 20 dwellings. Adopting 6.5trips/dwelling, the trip generation for the site would be:

$$\text{Trips per day} = 20 \times 6.5 = 130 \text{ trips}$$

$$\text{Peak hour} = 130 \times 12.5\% = 16\text{vph}$$

To assess the need for a right turn lane / pocket, Austroads Figure 4.9 considers warrant requirements for peak hour trips. This site comfortably sits in the minimum classification type BAR (basic right turn) as shown below. As Bayside Way is of a median island construction, the 4.8m wide south bound travel lane has insufficient width to enable passing of a stationary right turn vehicle, hence a right turn pocket lane is required.



Source: Arndt and Troutbeck (2006).

Figure 4.9: Warrants for turn treatments on the major road at unsignalised intersections

It is proposed to install the right turn lane at the minimum Austroads dimensions permissible and meet the service access turning requirements for that of a 8.8m medium rigid vehicle to enter the site.

3.2 Driveway Longsection Gradients

The site is of a flat gradient ranging from RL4.90m (north) to RL3.8m (south). To facilitate stormwater drainage management, the internal loop driveway will be constructed in a V profile and have longitudinal slope principally from north to south at 1% slope.

With the internal garage setbacks being 1.5m to 3.5m from the loop driveway, the road longsection levels thereby control/set the garage finished floor levels. Refer to engineering *Drg 2061-C5 and C6* within **Appendix A - Civil Engineering Drawings** for typical details.

3.3 Other Traffic and Parking Matters

The development provides a double garage for all lots, excepting Lot 14 which has a single garage space. Six (6) onsite visitor parking spaces are provided (ie 1 per 3.3 dwellings) which exceeds *Byron Shire B4.2.12 Parking Schedule* minimum rate of 1 per 4 dwellings for multi dwelling housing landuses.

Additional 'indented' on-street parking is proposed on Bayside Way (frontage of Lot 4 to Lot 9) to which localised widening works will be undertaken to install six (6) parallel parking spaces x 2.1m wide. The construction of these parking bays will provide highly functional additional short term visitor parking options to those dwellings which have their frontage to Bayside Way.

Pedestrian connectivity to the Bayside Way footpath network will be provided by the installation of a 2.5m wide path / pedestrian refuge (ie due to the existing median island) that would connect western pathway to the eastern pathway. Location of the pedestrian refuge is greater than 9m from parking spaces so as to provide the compliant sight line 'no standing' clearance.

4 STORMWATER MANAGEMENT

The development site has no external catchments which drain upon the lands and the site is self contained such as not requiring drainage upon other lands. The earlier subdivision creation

of the 6 existing allotments included the installation of stormwater infiltration treatment zones for each 6 lots which now become mostly redundant. The infiltration zone near to proposed Lot 1 and the visitor carparking area can be retained/modified and is proposed to be re-used.

The site typical drains to the south, with only 15% of the land draining to an existing culvert to the north. Refer to engineering *Drg 2061-C3: Stormwater Catchment Plan* within **Appendix A** for catchment details.

The legal points of discharge includes Bayside Way kerb, existing pipe culvert under Bayside Way (north) and existing open drainage channel to the south within a drainage reserve being lot 7 DP1261870.

4.1 Stormwater Treatment Matters

The community title dwelling/allotment layout has been modelled via MUSIC software to ensure consideration (ie sufficient size / location / quality compliance) to treatment of stormwater runoff can be effectively managed. In summary, it was found that the treatment train of using:

Residential rainwater re-use tanks (3kL x 20) + Ecosol GPT 4200 device + 20m² infiltration

would achieve a compliant stormwater quality discharge outcome. The treatment train includes reliance upon the use of infiltration into the sites sandy soils. Site testing was undertaken to determine the suitability for infiltration, with results that demonstrate an infiltration take up rate of 67mm/hr (ie 1.6m/day – refer **Appendix B** for test results) is present. Catchment details and MUSIC model configuration used were as follows:

Catchment Details (Refer Appendix A Drg: 2061-C3 Stormwater Catchment Plan)

Catchment No	Drainage Path	Description	No of Reuse Tanks (3kL ea)	Reuse Total Volume (kL)	Area (m2)			
					Roof	Road	Pervious	Total
C1 (North)	To North (Infiltration Pit)	Northern Part of Site (3 Dwellings)	3	9	598	205	62	865
C2 (Middle)	To South (GPT / Infiltration)	Middle Part of Site (17 Dwellings)	17	51	2924	890	756	4570
C3 (East & West)	To Kerb / Surface Infiltrate	Eastern Front & Western Yard Space	0	0	0	0	1087	1087
C4 (East Dway)	To Kerb	Driveway Entry To Site	0	0	0	60	0	60
Subtotals			20	60	3522	1155	1905	6582

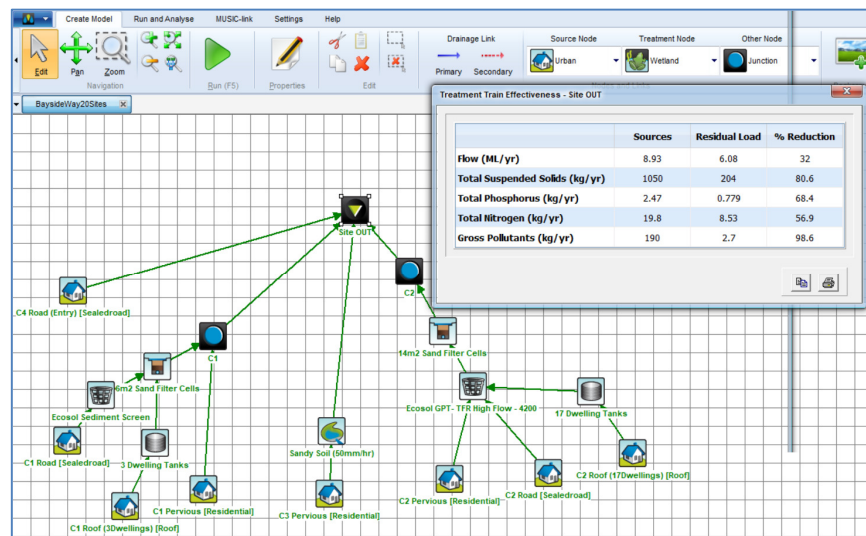


Figure 4.1 – MUSIC Model Network

The modelling demonstrated compliance with Councils pollutant reduction target as compared below and model SQZ files can be issued to Council if requested:

Pollutant	BSC Target	MUSIC Output	Complies (Yes / No)
Total Suspended Solids	80%	81%	✓ Yes
Total Phosphorus	45%	68%	✓ Yes
Total Nitrogen	45%	57%	✓ Yes
Gross Pollutants	70%	99%	✓ Yes

4.2 Stormwater Attenuation Matters

The development site is upon highly permeable sandy soils (testing to 1.6m/day) and discharges to an existing man-made drainage reserve channel. In accordance with *Byron Shire DCP 2014 – Chapter B3 – Services Section 6 c)*, onsite detention is not required for all developments. Refer part extract below.

- c) OSD is not required in the following circumstances:
- i) where the total net increase in impervious area is less than 150 m²;
 - ii) if the application is for or relates to a **dwelling house** unless a restriction on title specifies otherwise;
 - iii) if the application is for development on land zoned RU1, RU2, or R5 unless needed to provide a **lawful point of discharge**;
 - iv) where the site drains directly to a trunk drainage system within the tidal reach of a river or stream;
 - v) where the site is located within a catchment within which a regional detention structure has been provided for the ultimate development of the catchment;
 - vi) where dispersion or infiltration is used as the means of stormwater discharge from the site; or
 - vii) where a Consulting Engineer has undertaken a detailed analysis of the entire catchment and demonstrated that the provision of detention on the subject property, including consideration of the cumulative affect of detention provision across the catchment, will provide no benefit to any downstream drainage system for storm frequencies between the 5 year and 100 year **ARI**.

Extract: Byron Shire DCP 2014 – Chapter B3 – Services (Effective 11 Sept 2019)

This proposal seeks to use infiltration zones for water quality purposes to treat first flush events from impervious areas (mainly road pavement) prior to discharge from the site into the drainage channel located to the south of the site and existing pipe culvert to the north. Whilst the infiltration does assist in detention, it is assessed that on-site detention is not required for this location as:

(i) Site inspections identify that the drainage channel connects to the tidal Simpsons Creek at a point 400m to the east. A king high tide level (2.2m tide) at this location is equivalent to RL1.4m AHD which is marginally higher than the drainage culvert level of RL1.2m at Bayside Way. It is considered that whilst this man-made drainage channel is not functioning as a daily tidal waterbody, the tidal reach of Simpsons Creek can occur at peak high tide times. At present the drainage channel also has a 2ML irrigation license, to which shallow drainage channel structures are present that restrict opportunity of tidal movement up the channel and as such fresh water remains within the channel.

(ii) The man-made drainage channel was constructed circa 1992 for the purposes of providing a stormwater flow path for urban development. It varies in its profile from a broad 5m+ wide channel to a narrower 2m wide channel closer to Simpsons Creek. Refer photographs below.



Plate 1 – Constructed Drainage Channel Circ 1992 (Refer RED markup)



Plate 2 – Typical 5m+ Wide Channel



Plate 3 – Typical 2m Wide Channel

A standard flow calculation assessment for the drain was undertaken (refer **Appendix C – Mannings Drainage Calculations**) for the catchment of 37Ha for 100yr ARI event which was a flow of $10.1\text{m}^3/\text{s}$ for a 1hr time of concentration. Considering both a 'narrow' 2m wide channel and a 'broader' 5m channel it was found that sufficient capacity exists to contain the flows within the channel and no attenuation works are necessary. Refer table below.

Existing Channel Flow Capacity

Channel Type	Channel Slope	Flow Depth	Manning Flow	Required 100yr Flow	Compliance
2m Narrow	0.75%	1.5m	11.5m ³ /s	10.1m ³ /s	☒
5m Broad	0.75%	1.0m	13.8m ³ /s	10.1m ³ /s	☒

5 WATER AND SEWER CONNECTIONS

The existing six (6) torrens allotments have individual access to water services and sewer junctions. These service locations will require removal / modification to meet the new 20 lot configuration.

5.1 Water Reticulation Matters

The existing 200dia water main in Bayside Way will have a new community 100mm loop water main connected to it which will follow the internal driveway alignment. Refer to engineering *Drg 2061-C4* within **Appendix A - Civil Engineering Drawings** for alignment details. This new 100mm loop main will become a community asset watermain and there will need to be a stop valve and fire hydrant installed at both the new Tee cut in locations - such that the private community main can be isolated if required. The installation of the new fire hydrants are necessary at these locations to ensure fire fighting coverage is achieved and will be on the Council side of the stop valve connection (ie stop valve and hydrant to be Council asset).

With there being no fire hydrants on the new private 100mm loop main (ie unmetered flows), installation of a master meter is not believed necessary as each individual dwelling lot will have its on water meter.

5.2 Sewer Reticulation Matters

There are four (4) existing 150mm dia sewer gravity junctions which will be utilised to service the new 20 lot subdivision. It is proposed to install a maintenance shaft over the existing 150mm dia junction - to which this maintenance shaft would become the end of Byron Council's sewer asset network and any gravity mains from this point into the development would be a private sewer asset.

It is proposed to install the community sewer gravity main at 150mm diameter (ie subdivision standard) given such gravity main will become a community asset – and then provide an inspection opening (IO) junction for each dwelling which can then connect with conventional 100mm dia sewer house drainage (ie dwelling owner would be responsible for 100mm dia sewer up to the IO and then community lot responsible from the IO to the Council maintenance shaft at the existing junction. Preliminary design shows an additional manhole will also be required between Lot 14 and Lot 15 over an existing Council main to which private community service lines will connect. Refer to engineering *Drg 2061-C4* within **Appendix A - Civil Engineering Drawings** for proposed sewer network layout.

6 CONTRIBUTIONS AND DEVELOPMENT SERVICING PLAN FEES

The existing six (6) torrens allotments have existing contribution entitlements equivalent to 6 ET. The new 20 dwelling proposal consists of 18 x 3 bedroom and 2 x 4 bedroom dwellings. As at April 2021, the contribution and development servicing fees would be in the order of \$421,302 as detailed below.

Contribution and Development Servicing Plan Fees (Apr 2021)							
Development Type	Quantity	Less Credit	Per 3+ Bedroom Equivalent Tenement				Sub -Total
			S7.11 Contributions	Water DSP	Rous	Sewer DSP	
3 Bedroom	18	-6	\$9,591	\$824	\$8,872	\$10,806	\$361,116
4 Bedroom	2	0	\$9,591	\$824	\$8,872	\$10,806	\$60,186
TOTAL	20	-6	\$19,182	\$1,648	\$17,744	\$21,612	\$421,302

7 COMPLIANCE SUMMARY OF PROPOSAL

This Engineering Services Report has had regard to assessing the infrastructure services and design compliance requirements of the Byron Shire Council development standards and has found that the indicative residential planning proposal is able to demonstrate that:

- (i) *The subject lands can provide satisfactory driveway access to the existing road network and proposed dwelling sites;*
- (ii) *The subject lands can provide satisfactory pathway connections to the existing networks and provide safe road crossing locations;*
- (iii) *Stormwater management outcomes for the site can be satisfactorily catered for onsite and achieve compliant reductions in pollutant loads;*
- (iv) *The subject lands can be adequately serviced by conventional water and sewer infrastructure;*
- (v) *The subject lands can be adequately serviced by the existing electrical and telecommunications network;*

8 APPENDICES

Appendix A Civil Engineering Plan (6 Drgs x A3)

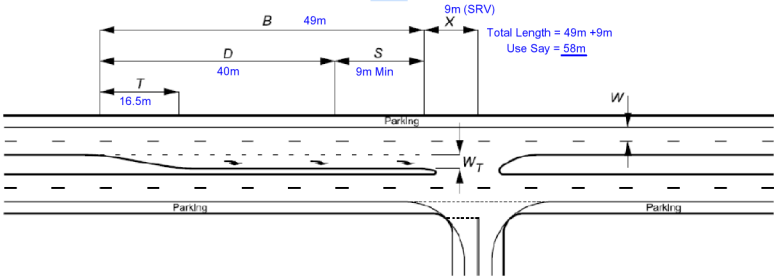
Appendix B Stormwater Infiltration Test Results (2 x A4)

Appendix C Mannings Drainage Calculations (3 x A4)

Appendix A

Civil Engineering Plans (6 x A3 Drawings by *SDS Civil*)

Figure 7.8: Urban channelised right-turn treatment (CHR) Max 60kph Design Speed



- Notes:
- This diagram does not show any specific bicycle facilities. Where required bicycle facilities should be provided in accordance with this Part.
 - A raised concrete median in the minor road may be used with this treatment.
 - The dimensions of the treatment are defined thus:
 - W = Nominal through lane width (m) (including widening for curves).
 - W_T = Nominal width of turn lane (m), including widening for curves based on the design turning vehicle. Desirable minimum = W , absolute minimum = 3.0 m.
 - B = Total length of auxiliary lane including taper, diverge/deceleration and storage (m).
 - D = Diverge/deceleration length including taper – Table 5.2 (adjust for grade using the 'correction to grade' factor in Table 5.3).
 - T = Physical taper length (m) given by Equation 5 being: $T = \frac{0.33VW_T}{3.6} = \frac{0.33 \times 60 \times 3}{3.6} = 16.5m$
 - S = Storage length (m) is the greater of:
 - 1. length of one design turning vehicle
 - 2. (calculated car spaces – 1) x 8 m or use computer program (e.g. aaSIDRA).
 - V = Design speed of major road approach (km/h).
 - X = Distance based on design vehicle turning path, refer to Design Vehicles and Turning Path Templates (Austroads 2012a).

LEGEND

- Flexible Pavement (300mm Roadbase + 40mm AC)
- Concrete Footpath 125mm 30Mpa N82
- Concrete Pavement (150mm 30Mpa + 100mm DGB20)
- New Street Tree Planting
- New On-street Parking Bays (300mm Roadbase + 40mm AC)

Urban Right Turn Pocket (CHR)
Refer Austroad Fig 7.8 For Dimension Details

2.5m Wide Concrete
Pedestrian Refuge

Concrete Pavement
Exposed Quartz/Basalt Finish

Concrete Pavement
Exposed Quartz/Basalt Finish

SDS Civil Ref: JN2061 Survey Datum: AHD / MGA Survey Source: Cantys Surveying

SDS Civil Enterprises
A.B.N. 56 656 467 255
461 Hinterland Way, Knockrow NSW
m 0438 725 414 e peterw@sdscivil.com.au

IMPORTANT NOTES
1. Verify and locate all dimensions and levels PRIOR to performing any works.
2. Ensure DBYD enquiries are made to locate current service information.
3. Pothole or service locator of any underground services before performing works.
4. Drawing may not be modified or used by others without approval of SDS Civil Enterprises.
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Rev	Date	Amendment
A		
B		
C		
D		

APPROVED

SCALE
1:500 at A3 UNO
Mr P Williams B.Eng (Civil)

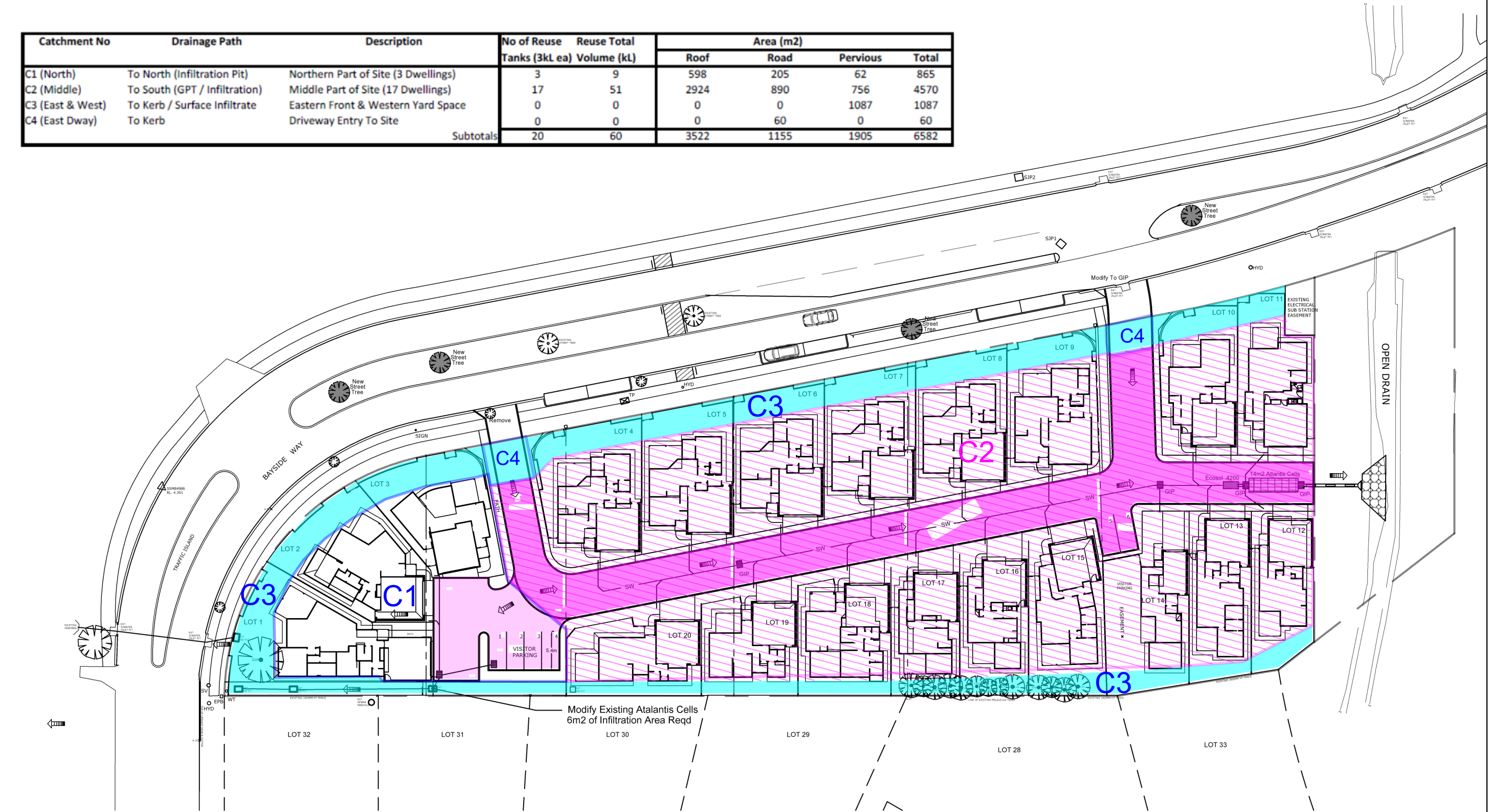
PROJECT	20 Dwelling Development	ADDRESS	35 Bayside Way Brunswick Heads	DATE	April 2021	REV
CLIENT	J & G Mills	LAND	Lot 1 - 6 DP1261870	DRAWING PURPOSE	Development Application	
DRAWING DETAILS	Roadworks Pavement Plan			DRAWING NUMBER	2061 - C1	

LEGEND

- Pervious Yard Space 1087m2 (Catchment C3) and Driveway Impervious 60m2 (Catchment C4)
- Impervious Parking Pavement 205m2 in Catchment C1
- Impervious Driveway Pavement 890m2 in Catchment C2

CATCHMENT SUMMARY TABLE

Catchment No	Drainage Path	Description	No of Reuse Tanks (3kL ea)	Reuse Total Volume (kL)	Area (m2)			
					Roof	Road	Pervious	Total
C1 (North)	To North (Infiltration Pit)	Northern Part of Site (3 Dwellings)	3	9	598	205	62	865
C2 (Middle)	To South (GPT / Infiltration)	Middle Part of Site (17 Dwellings)	17	51	2924	890	756	4570
C3 (East & West)	To Kerb / Surface Infiltrate	Eastern Front & Western Yard Space	0	0	0	0	1087	1087
C4 (East Dway)	To Kerb	Driveway Entry To Site	0	0	0	60	0	60
Subtotals			20	60	3522	1155	1905	6582



SDS Civil Ref: JN2061 Survey Datum: AHD / MGA Survey Source: Cantys Surveying

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Rev	Date	Amendment
A		
B		
C		
D		

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SCALE

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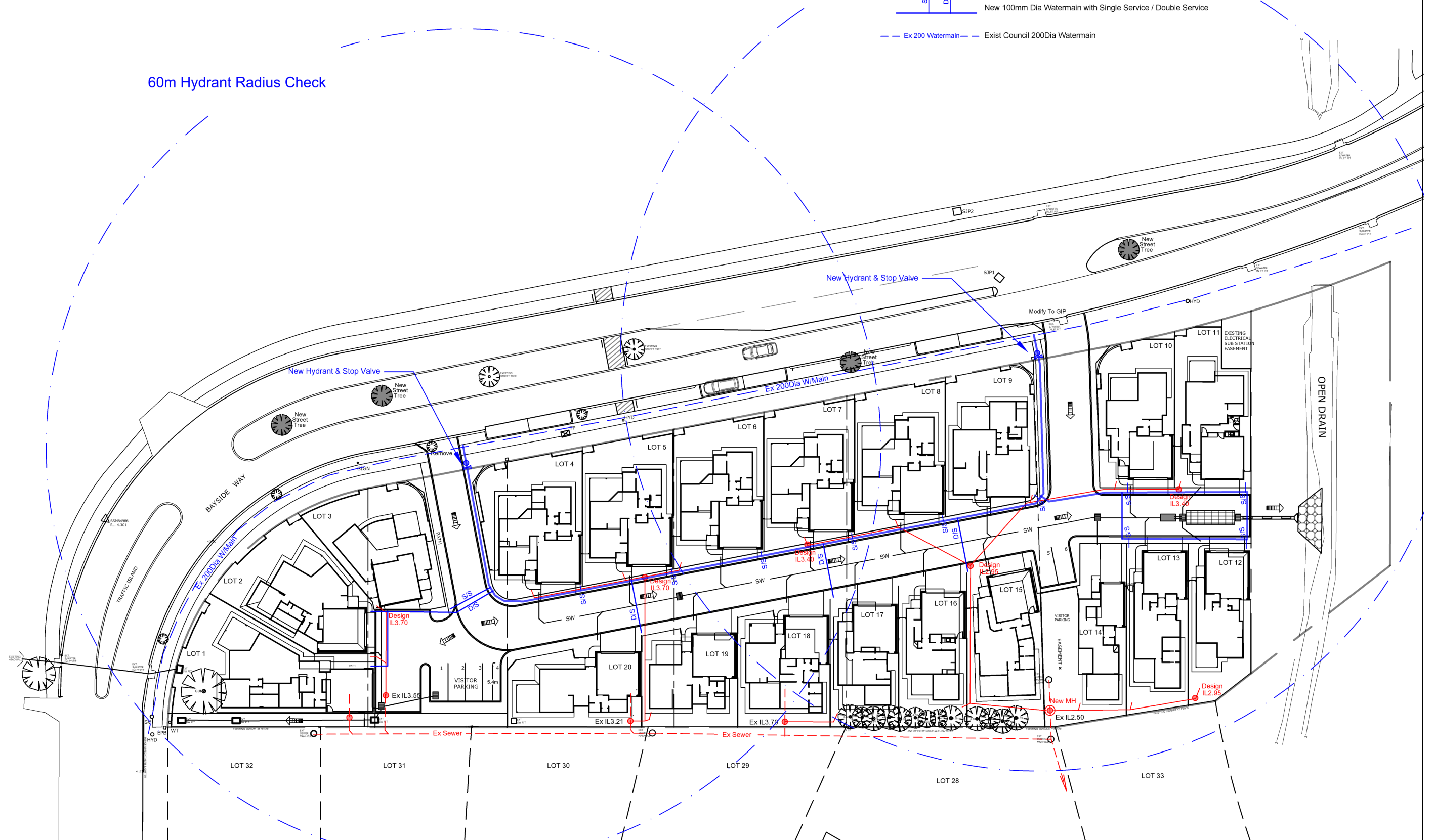
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Mr P Williams B.Eng (Civil)

PROJECT	20 Dwelling Development	ADDRESS	35 Bayside Way Brunswick Heads	DATE	April 2021	REV
CLIENT	J & G Mills	LAND	Lot 1 - 6 DP1261870	DRAWING PURPOSE	Development Application	
DRAWING DETAILS	Stormwater Catchment Plan			DRAWING NUMBER	2061 - C3	



60m Hydrant Radius Check



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IMPORTANT NOTES

- IMPORTANT NOTES**
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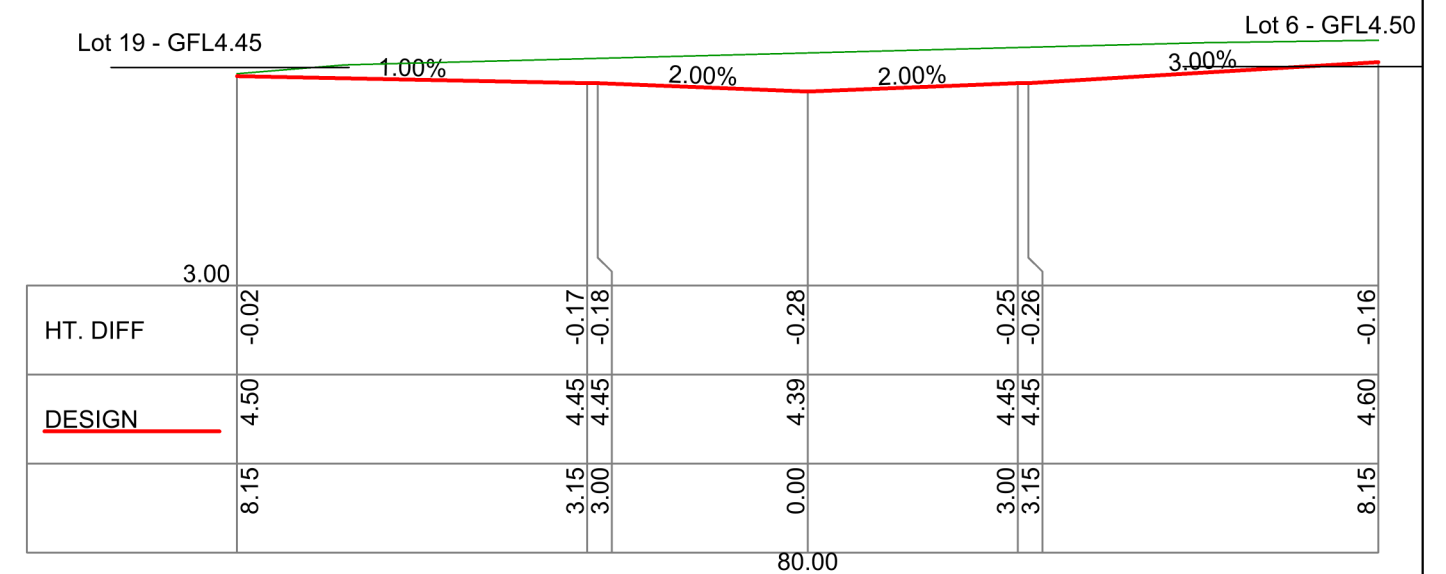
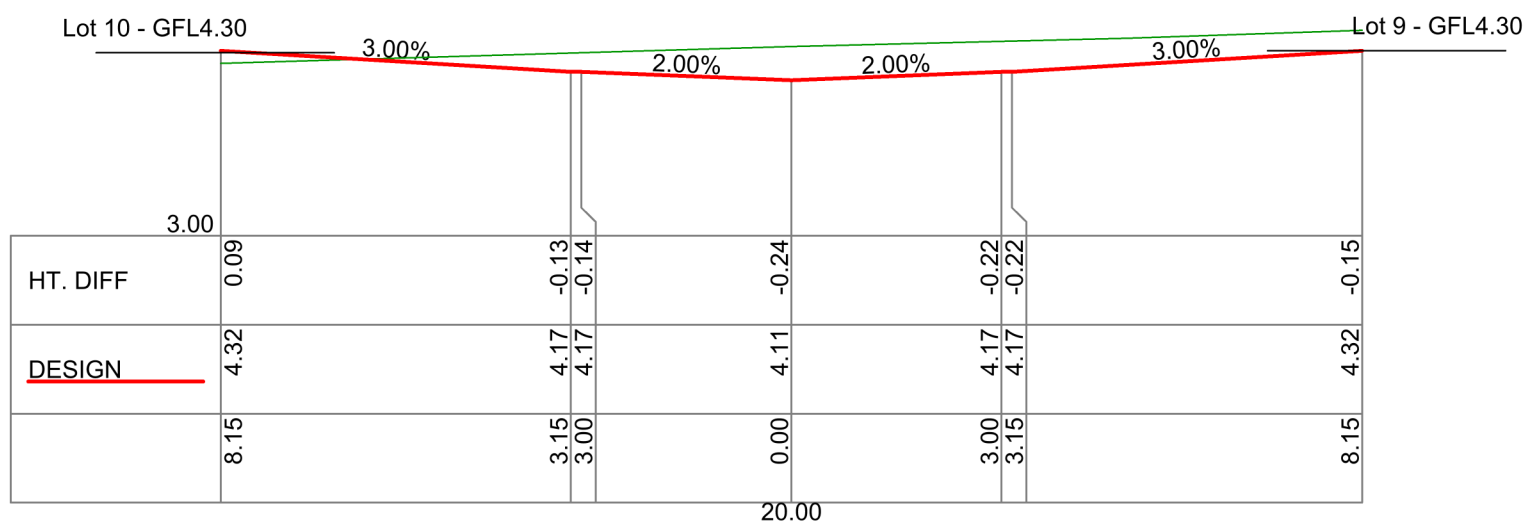
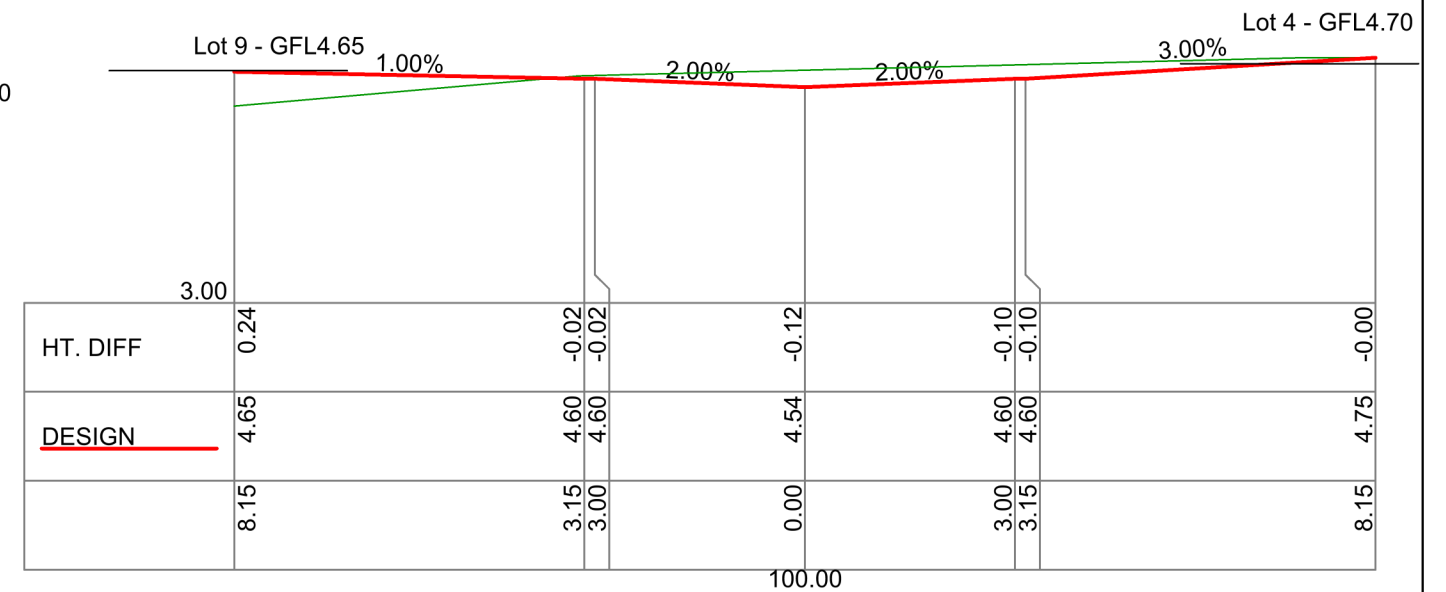
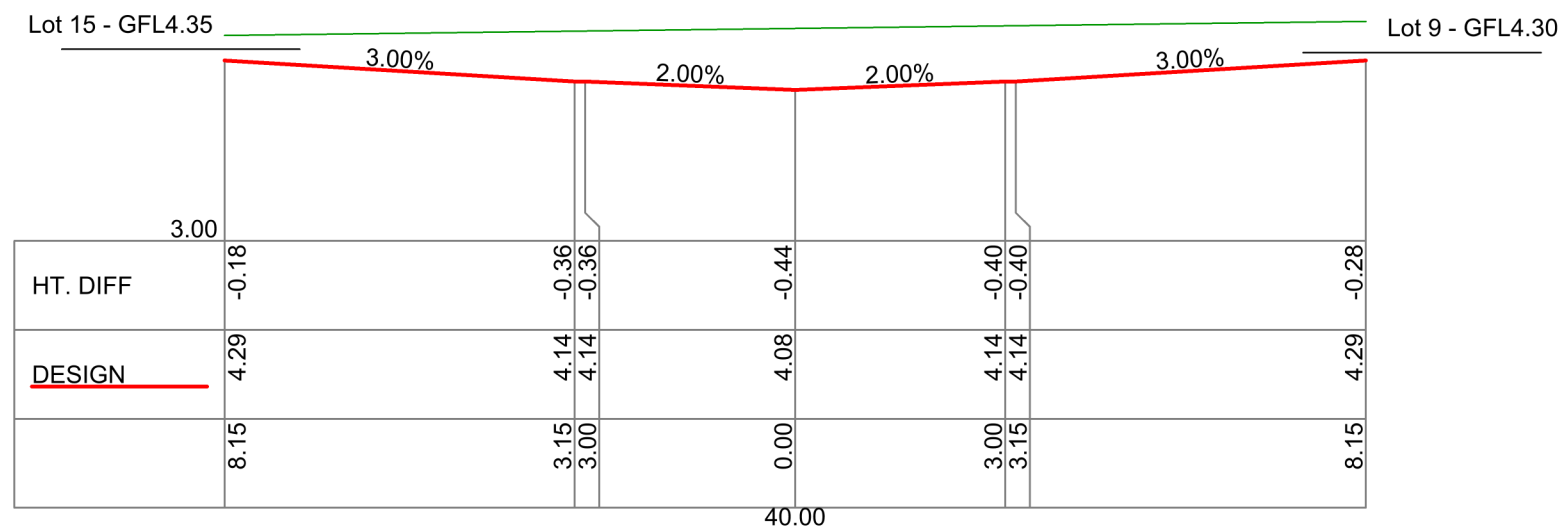
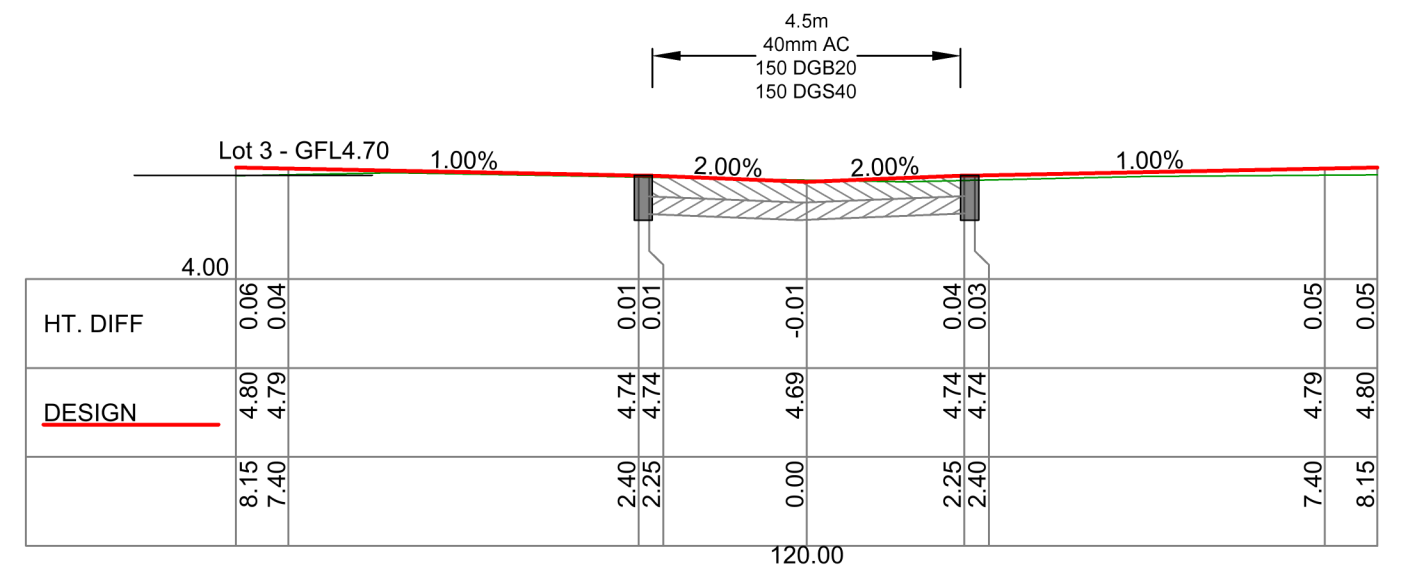
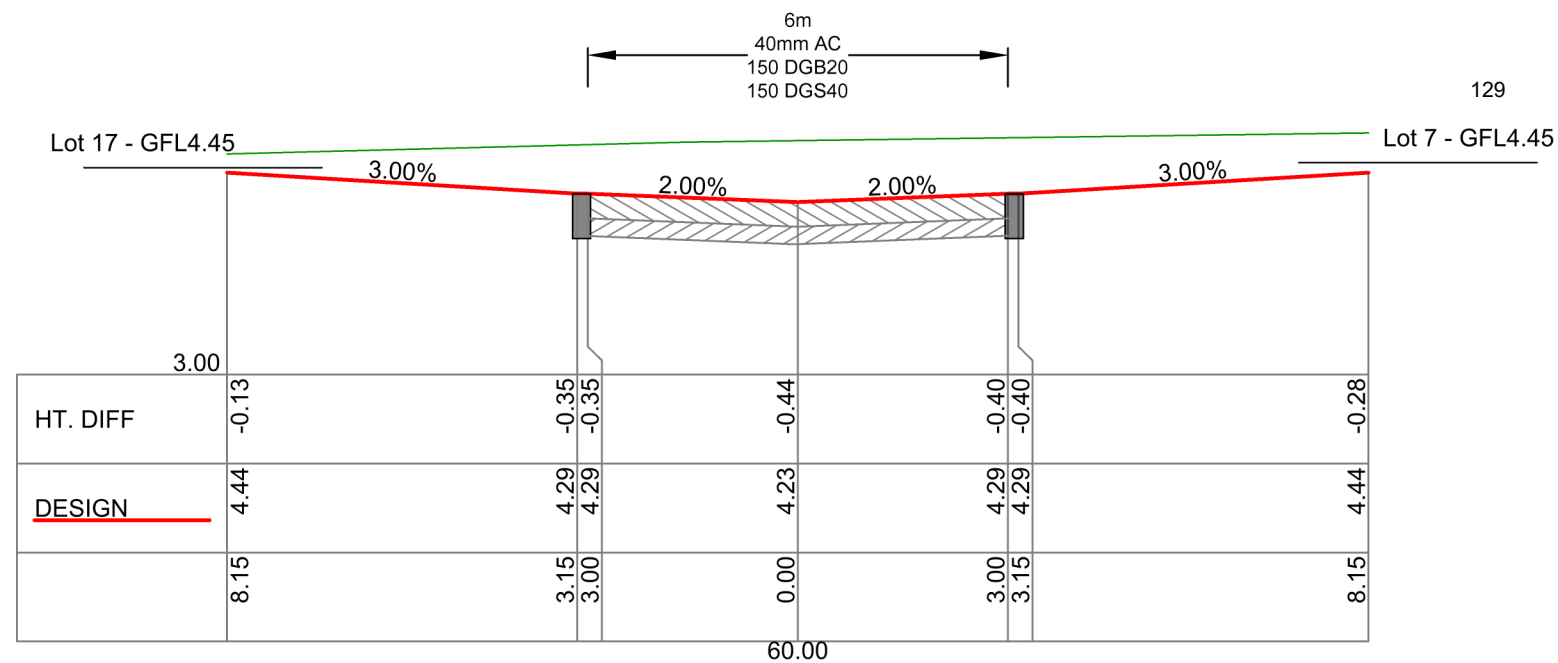
Rev	Date	Amendment	
A			APPROVED
B			
C			
D			

SCALE

1:500 at A3 UNO

PRWilliams

PROJECT	20 Dwelling Development	ADDRESS	35 Bayside Way Brunswick Heads	DATE	April 2021	REV
CLIENT	J & G Mills	LAND	Lot 1 - 6 DP1261870	DRAWING PURPOSE	Development Application	
DRAWING DETAILS	Water and Sewer Reticulation			DRAWING NUMBER	2061 - C4	-



SDS Civil Ref: JN2061 Survey Datum: AHD / MGA Survey Source: Cantys Surveying

LEGEND: GFL = Garaged Floor Level

SDS Civil Enterprises A.B.N. 56 656 467 255 461 Hinterland Way, Knockrow NSW m 0438 725 414 e peterw@sdscivil.com.au	IMPORTANT NOTES 1. Verify and locate all dimensions and levels PRIOR to performing any works. 2. Ensure DBYD enquiries are made to locate current service information. 3. Pothole or service locator of any underground services before performing works. 4. Drawing may not be modified or used by others without approval of SDS Civil Enterprises. © Copyright SDS Civil Enterprises	Rev	Date	Amendment	SCALE As per dimensions  Mr P Williams B.Eng (Civil)	PROJECT	20 Dwelling Development	ADDRESS	35 Bayside Way Brunswick Heads	DATE	April 2021	REV			
		A				CLIENT	J & G Mills	LAND	Lot 1 - 6 DP1261870	DRAWING PURPOSE	Development Application				
		B				APPROVED	DRAWING DETAILS	Internal Driveway Cross Section Profiles					DRAWING NUMBER	2061 - C6	-
		C													
		D													

Appendix B

Stormwater Infiltration Test Results (2 x A4 by *Australian Soil & Concrete Testing*)

Report on Field Permeability Testing

Client:	SDS Civil	Report No:	1
Client Address:	461 Hinterland Way, Knockrow, NSW 2479	Report Date:	8/03/2021
Project:	Bayside Way, Brunswick Heads	Report Page:	Page 1 of 1
Works Component:	Site Material Assessment	Project No:	2205
Material Used:	Existing	Request/Order:	NA
Material Description:	Silty Sand	Lot Number:	NA
Lot Boundaries:	Chainage NA to NA. Offsets NA to NA.	ITP/PCP Number:	-
Lot Comments:	-	Control Line:	NA

Sample Number	Sample Date	Chainage/Location	Offset	Level of Test	Test Depth
13692	2/03/2021	Lot 6	NA	Subgrade	0.6m

Parameters			Units	Test Results
Diameter of Test Hole			cm	10.0
Depth of Test Hole			cm	60.0
Depth of Water in Test Hole			cm	50.0
Depth to impermeable layer (if any)			cm	0.0
Source of Test Water			--	Potable
Test Commenced			--	08/03/21 - 10:50
Adopted Stable Flow Rate			cm ³ /min	359.100000
Saturated Hydraulic Conductivity			cm/min	1.12E-01
Saturated Hydraulic Conductivity			m/day	1.61E+00
Saturated Hydraulic Conductivity			mm/hr	6.73E+01
Vegetation at the Test Site				
Short Grass				
Field Comments & Observations				
Fine				

Sampling & Test Methods (Results relate only to the items sampled/tested)	Report Remarks & Endorsement
Client: Test Locations nominated by client. AS 1547: Field Permeability (Constant Head)	 Always Test With The Best. Issued By:  D. Kennedy Approved Signatory

Report on Field Permeability Testing

Client:	SDS Civil	Report No:	2
Client Address:	461 Hinterland Way, Knockrow, NSW 2479	Report Date:	8/03/2021
Project:	Bayside Way, Brunswick Heads	Report Page:	Page 1 of 1
Works Component:	Site Material Assessment	Project No:	2205
Material Used:	Existing	Request/Order:	NA
Material Description:	Silty Sand	Lot Number:	NA
Lot Boundaries:	Chainage NA to NA. Offsets NA to NA.	ITP/PCP Number:	-
Lot Comments:	-	Control Line:	NA

Sample Number	Sample Date	Chainage/Location	Offset	Level of Test	Test Depth
13693	2/03/2021	Lot 3	NA	Subgrade	0.6m

Parameters			Units	Test Results
Diameter of Test Hole			cm	10.0
Depth of Test Hole			cm	60.0
Depth of Water in Test Hole			cm	50.0
Depth to impermeable layer (if any)			cm	0.0
Source of Test Water			--	Potable
Test Commenced			--	08/03/21 - 11:10
Adopted Stable Flow Rate			cm ³ /min	359.100000
Saturated Hydraulic Conductivity			cm/min	1.12E-01
Saturated Hydraulic Conductivity			m/day	1.61E+00
Saturated Hydraulic Conductivity			mm/hr	6.73E+01
Vegetation at the Test Site				
Short Grass				
Field Comments & Observations				
Fine				

Sampling & Test Methods (Results relate only to the items sampled/tested)	Report Remarks & Endorsement
Client: Test Locations nominated by client. AS 1547: Field Permeability (Constant Head)	 Always Test With The Best. Issued By:  D. Kennedy Approved Signatory

Appendix C

Mannings Drainage Calculations (3 x A4 by *SDS Civil*)

Project: Bayside Way Catchment
(Drainage Calculations and Catchment Plan)

Barnsby Williams

$t_c = 58L / (A^{0.1} \times S_e^{0.2})$	L =	1.5 km	134
	A =	38 Ha	
	$S_e =$	2 %	
$t_c =$	56.42	mins	
Say	60	mins	I Intensity at 100ry ARI
			100 mm/hr

HANDBOOK OF STORMWATER DRAINAGE DESIGN

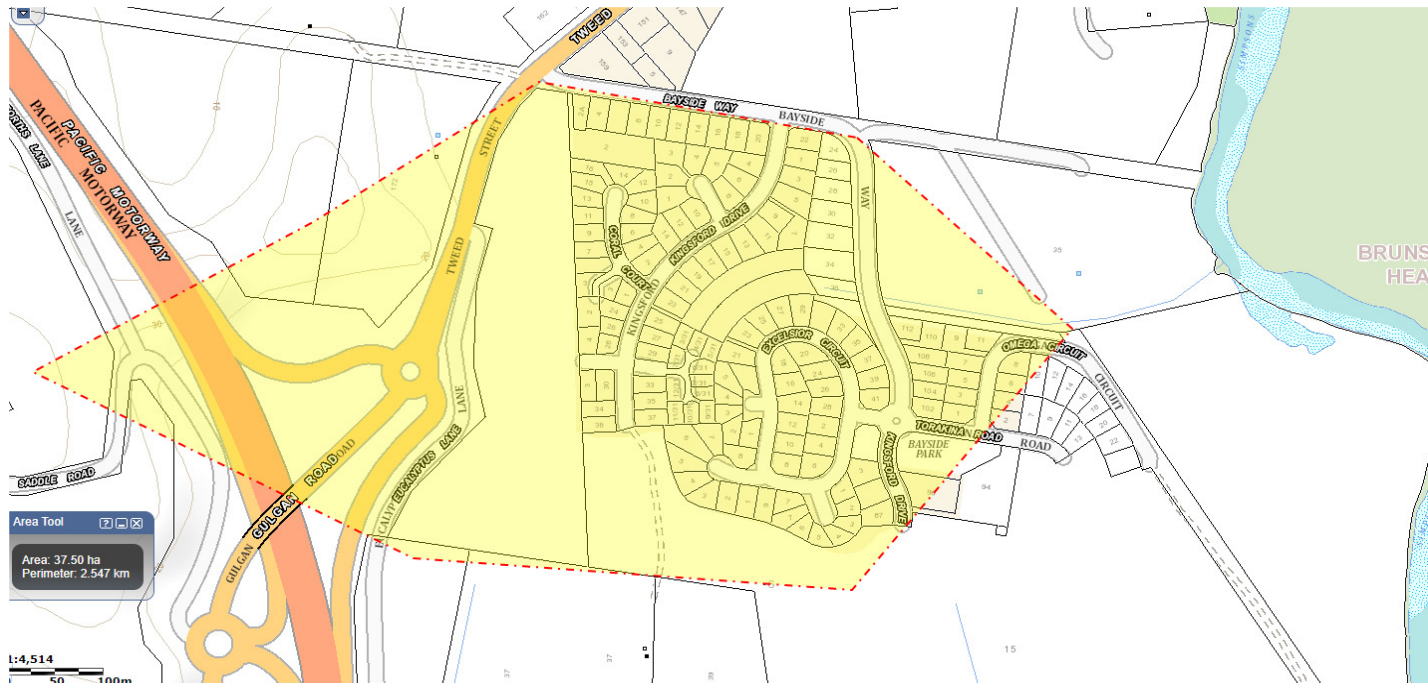
Rational Flow Formula

$$Q = C I A / 360$$

Q = m ³ /s for 100yr ARI	38 Ha
A = Ha	100 mm/hr
I = mm/hr	0.96
C = discharge coefficient = 1.2 x 0.8 =	
Q =	10.13 m³/s (100yr)
Q = m ³ /s for 5yr ARI	38
A = Ha	60 mm/hr
I = mm/hr	0.64
C = discharge coefficient = 0.8 x 0.8 =	
Q =	4.05 m³/s (1yr)

A2 Byron Shire Council (Reference BSC Development Control Plan 2002 – Part N5)
Byron Bay & Bangalow

Duration	LPIII Intensity (mm/hr) for Average Recurrence Interval (Years)						
	1	2	5	10	20	50	100
5 min	128	160	190	215	240	260	300
6 min	120	150	180	200	222	250	280
10 min	98	125	150	165	180	210	235
20 min	72	90	110	125	140	155	170
30 min	60	75	90	100	115	130	140
1 hr	40	50	63	70	80	90	100
2 hrs	26	34	42	47	54	62	78
3 hrs	20	26	34	38	43	50	54
6 hrs	12	16	21	24	28	32	34
12 hrs	8	10	14	15	18	21	22
24 hrs	5.5	7.7	9	10.5	12.5	14.5	16
48 hrs	3.5	4.6	6.5	7.5	8.7	10.8	12
72 hrs	2.7	3.6	5.1	6	7.2	9.2	10.5



Mannings Formula for Open Channel Flow

$Q = (1/n) \times A \times R^{2/3} \times S^{1/2}$

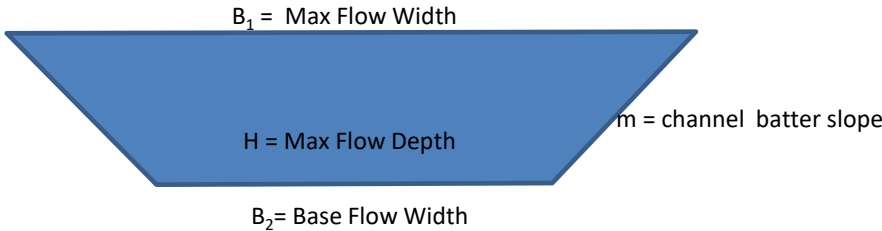
Where: Q = flow [m³/s]
 n = mannings roughness coefficient
 A = Area of flow [m²]
 P = Wetted Perimeter [m]
 R = hydraulic radius [m]
 = A/P
 S = slope

Channel Dimensions	
B ₁ =	5 m
H =	1 m
m =	3 :1
B ₂ =	11 m
A =	8.00 m²
P =	17.32
R =	0.46 m

Mannings Equation	
n =	0.03
S =	0.0075
Q =	13.80 m³/s

Velocity = 1.724624842

* not required as base width given



Project: Existing Man-made Channel (2m Narrow)

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Mannings Formula for Open Channel Flow

$$Q = (1/n) \times A \times R^{2/3} \times S^{1/2}$$

Q = flow [m^3/s]

n = mannings roughness coefficient

A = Area of flow [m^2]

P = Wetted Perimeter [m]

R = hydraulic radius [m]

$$= A/P$$

S = slope

Channel Dimensions	
B_1 =	2 m
H =	1.5 m
m =	3 :1
B_2 =	6 m
A =	6.00 m^2
P =	11.00
R =	0.55 m

*

Mannings Equation	
n =	0.03
S =	0.0075
Q =	11.56 m^3/s

Velocity = 1.927148082

* not required as base width given

