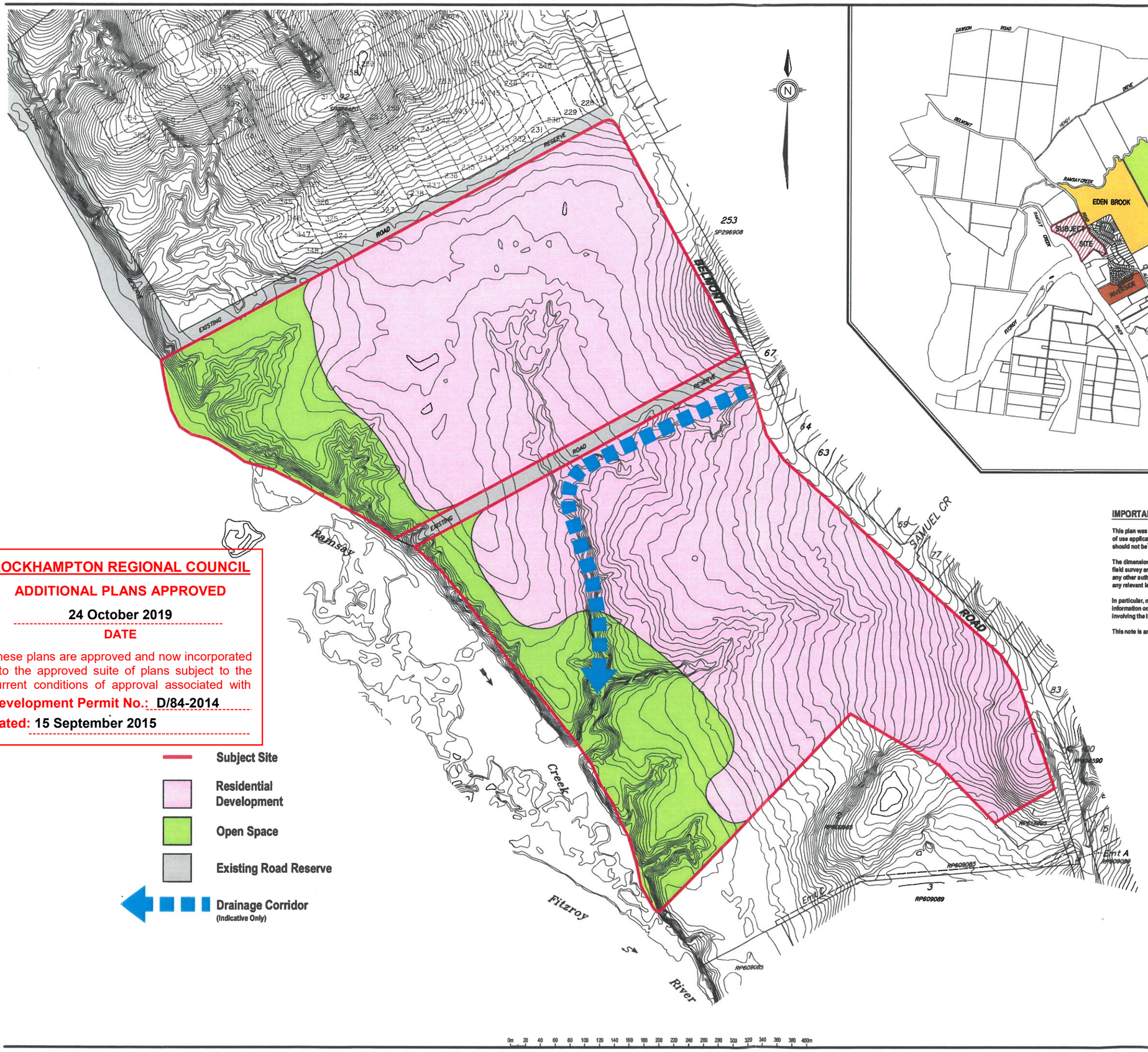
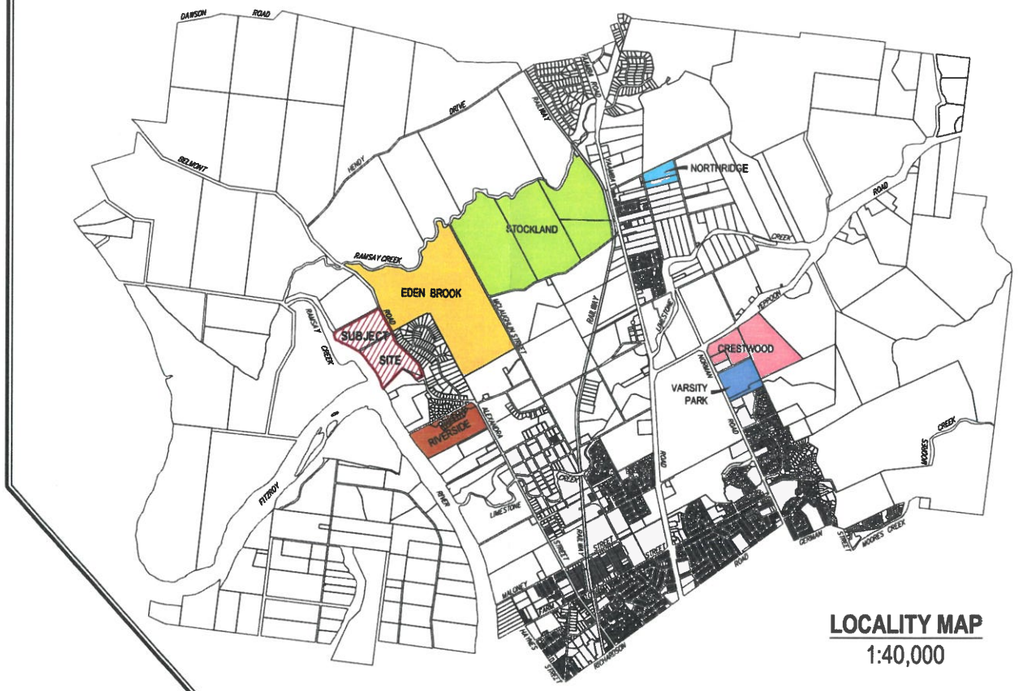




LOCALITY MAP
1:40,000

ROCKHAMPTON REGIONAL COUNCIL
ADDITIONAL PLANS APPROVED
24 October 2019
DATE
These plans are approved and now incorporated into the approved suite of plans subject to the current conditions of approval associated with
Development Permit No.: D/84-2014
Dated: 15 September 2015

- Subject Site
- Residential Development
- Open Space
- Existing Road Reserve
- Drainage Corridor (Indicative Only)

IMPORTANT NOTE

This plan was prepared to accompany a material change of use application to Rockhampton Regional Council and should not be used for any other purpose.

The dimensions and areas shown hereon are subject to field survey and also to the requirements of council and any other authority which may have requirements under any relevant legislation.

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

This note is an integral part of this plan.

client
M. Birkbeck

project
Riverside Waters Estate
Belmont Road, Parkhurst

plan of
Material Change of Use
(Residential Lots + Public Use Land)

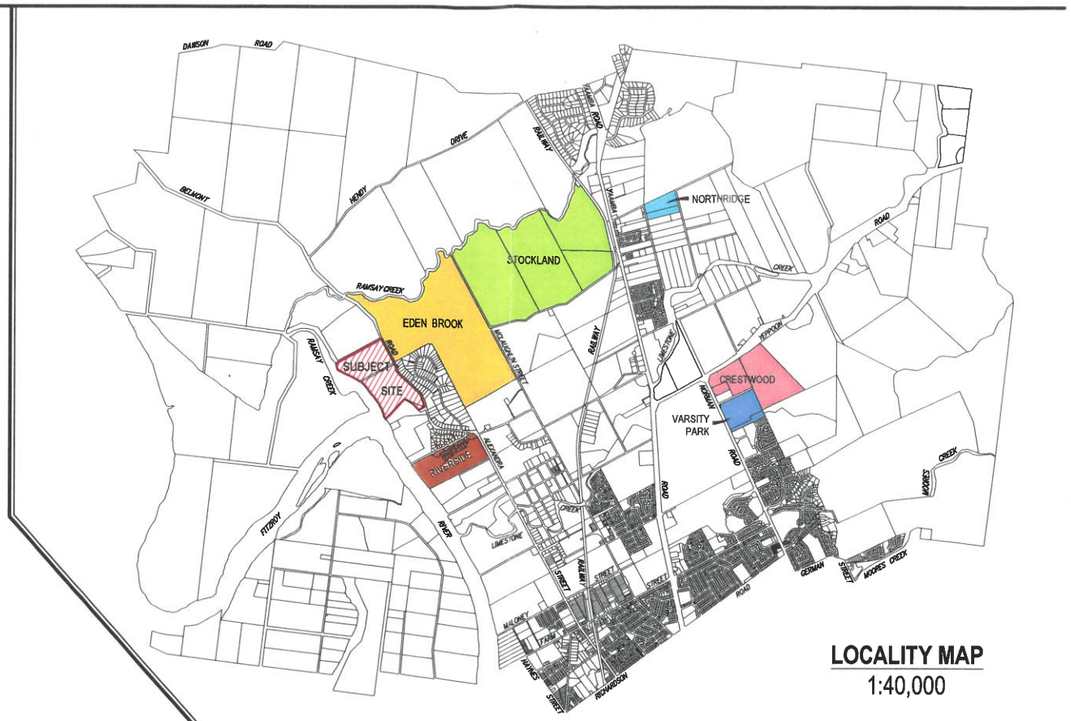
rpd
Lot 102 on RP860099
& Lot 129 on PL4021

lga
Rockhampton Regional Council

issue	date	details	authorised
A	8-02-2019	Initial issue	RJKF

created
capricornsurveygroupcq
SURVEYING & PLANNING SOLUTIONS
07 4927 5198 | reception@capcq.com.au | 132 Victoria Parade, Rockhampton QLD 4700

scale: 1:2500 @ A1
datum: RRC 0.5m Contours
sheet no.: 1 of 1
cad file: 7066-01-MCU-A
plan no.: 7066-01-MCU
issue: A



LOCALITY MAP
1:40,000

ROCKHAMPTON REGIONAL COUNCIL
ADDITIONAL PLANS APPROVED
24 October 2019
DATE
These plans are approved and now incorporated into the approved suite of plans subject to the current conditions of approval associated with
Development Permit No.: D/84-2014
Dated: 15 September 2015

Denotes Area Below Approximate Flood Level

0m 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400m

IMPORTANT NOTE

This plan was prepared to accompany a reconfiguration of a lot application to Rockhampton Regional Council and should not be used for any other purpose.

The dimensions and areas shown hereon are subject to field survey and also to the requirements of council and any other authority which may have requirements under any relevant legislation.

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

This note is an integral part of this plan.

client
M. Birkbeck

project
Riverside Waters Estate
Stages 1-12
Belmont Road, Parkhurst

plan of
Reconfiguration Plan
(222 Lots + Public Use Land)

rpd
Lot 102 on RP860099
& Lot 129 on PL4021

lga
Rockhampton Regional Council

rev	date	details	authorised
A	8-10-2018	Initial Issue	RJKF
B	4-02-2019	Layout amended, subject Lot 2 removed	RJKF

created

capricornsurveygroupcq
SURVEYING & PLANNING SOLUTIONS
07 4927 5199 | reception@csgcq.com.au | 132 Victoria Parade, Rockhampton QLD 4700

scale: **1:2500 @ A1**
datum: **RRC 0.5m Contours**
sheet no.: **1 of 1**
cad file: **7066-01-ROL-B**
plan no.: **7066-01-ROL**
revision: **B**

ROCKHAMPTON REGIONAL COUNCIL

AMENDED PLANS APPROVED

24 October 2019

DATE

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/84-2014

Dated: 15 September 2015

Contour Consulting

ABN 98 125 137 348

349 Hobler Avenue
Frenchville
Rockhampton QLD 4701
Central Queensland

Telephone: 07 4928 2898
Email: contour.consulting@bigpond.com

LANDSCAPE LEGEND

- Hydromulching coverage to proposed allotments (Refer future civil OPW approval)
- Turf & Hydroseeding areas
- Vegetated stormwater swales / channels (Refer future civil OPW approval)
- Garden areas
- Existing vegetation along natural inlets to be retained and enhanced
- Existing vegetation to be preserved
- Stormwater quality bio-retention area (Refer future civil OPW approval)
- 9.0 Existing surface contours
- 9.5 Design surface contours
- Proposed Fitzroy River Q10 flood level (To be confirmed by future civil OPW approval)
- Proposed Fitzroy River Q100 flood level (To be confirmed by future civil OPW approval)

SCALES

0 20.0 80.0m 1:4000

REVISION / ISSUE REGISTER

No.	DATE	REMARKS
A	07/19	For Review

DESIGN		DRAWN	
RS		RS	

GLENMORE HOLDINGS (AUST) PTY LTD

RIVERSIDE WATERS
STAGES 1 to 12
BELMONT RD, ROCKHAMPTON

OVERALL LANDSCAPE CONCEPT SKETCH

DWG No. 17-004/SK02 | A

DO NOT SCALE - IF IN DOUBT ASK

STREET/PARKLAND TREE LEGEND

- Accent Tree Planting (Example - Lilly Pilly Resilience)
- Evergreen Street Tree (Example - Tuckeroo)
- Evergreen Street Tree (Example - Weeping Lilly Pilly)
- Accent Tree Planting (Example - Buckinghamia)
- Feature Tree Planting (Example - Ficus Hilli)
- Feature Tree Planting (Example - Melaleuca)

LANDSCAPE LEGEND

- Hydromulching coverage to proposed allotments (Refer future civil OPW approval)
- Turf & Hydroseeding areas
- Vegetated stormwater swales / channels (Refer future civil OPW approval)
- Garden areas
- Existing vegetation along natural inlets to be retained and enhanced
- Existing vegetation to be preserved
- Stormwater quality bio-retention area (Refer future civil OPW approval)
- Existing surface contours
- Design surface contours
- Proposed Fitzroy River Q10 flood level (To be confirmed by future civil OPW approval)
- Proposed Fitzroy River Q100 flood level (To be confirmed by future civil OPW approval)

ROCKHAMPTON REGIONAL COUNCIL

AMENDED PLANS APPROVED

24 October 2019

DATE

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/84-2014

Dated: 15 September 2015

LANDSCAPE FEATURES LEGEND

1. ESTATE ENTRANCE ROUNDABOUT - Landscaping to consist of low height flowering plants.
2. ESTATE FEATURE WALL - Entrance statement to consist of a welcoming wall displaying the estate signage/logo surrounded by low height flowering plants and feature accent trees.
3. ESTATE ENTRY FEATURE GARDENS - Neatly presented accent gardens surrounding the entrance feature of the estate.
4. LANDSCAPED INTERNAL ROUNDABOUT - Consisting of feature flowering plants and a centre accent tree.
5. BOUNDARY FENCING - Allotments backing onto Belmont Rd & Open Space/Parkland to have boundary fencing in accordance with the local authority requirements.
6. VERGE GARDEN AREA - Vegetation screening along the boundary fencing of Belmont Rd.
7. CONCRETE FOOTPATH - 1.2m (min.) wide concrete footpath in accordance with the local authority requirements.
8. TIMBER BOLLARD - Hardwood timber bollard in accordance with the Capricorn Municipal Development Guidelines standard drawings.
9. OUTDOOR EXERCISE STATION - Dual outdoor exercise station mounted to concrete slab covered with approved synthetic grass.
10. VEGETATED STORMWATER MANAGEMENT CHANNEL / SWALE SYSTEM
11. PICNIC SHELTER AND TABLE/CHAIR SETTING - 4.0m x 4.0m GOSSI Park aluminum setting attached to suitable concrete slab and footings.
12. PLAY EQUIPMENT CLIMBING STRUCTURE - Mt Hotham A_SPACE climbing equipment surrounded by approved soft-fall material.
13. OUTDOOR HANDBALL SQUARE - 4.0m x 4.0m concrete handball square (4/2.0x2.0 areas) with outdoor texture & paint added to define each playing area.
14. OUTDOOR TABLE-TENNIS TABLE - Cornilleau pro outdoor table tennis table (or similar) attached to concrete slab and footing.
15. ACTIVE PARK AREA - Level kick-around and throw area for active recreation.
16. BASKET-BALL HALF COURT - 15.0 x 10.0m concrete basketball half court with outdoor texture & paint added to define playing lines.
17. BIKE/SCOOTER CIRCUIT - 2.0m wide asphalt bicycle & scooter practice/learning track with appropriate street linemarking and signage.
18. VEGETATED BATTER - 5.0m wide garden area along rear of allotments that back onto Open Space / Parkland areas.

Contour Consulting
ABN 98 125 137 348
349 Hobler Avenue
Frenchville
Rockhampton QLD 4701
Central Queensland
Telephone: 07 4928 2898
Email: contour.consulting@bigpond.com

SCALES

0 6.25 25.0m 1:1250

REVISION / ISSUE REGISTER

No.	DATE	REMARKS
A	07/19	For Review

DESIGN		DRAWN	
RS		RS	

GLENMORE HOLDINGS (AUST) PTY LTD

RIVERSIDE WATERS
STAGES 1 to 12
BELMONT RD, ROCKHAMPTON

LANDSCAPE SKETCH - 2

DWG No. 17-004/SK04 A

DO NOT SCALE - IF IN DOUBT ASK

LANDSCAPE FEATURES LEGEND

1. ESTATE ENTRANCE ROUNDABOUT - Landscaping to consist of low height flowering plants.
2. ESTATE FEATURE WALL - Entrance statement to consist of a welcoming wall displaying the estate signage/logo surrounded by low height flowering plants and feature accent trees.
3. ESTATE ENTRY FEATURE GARDENS - Neatly presented accent gardens surrounding the entrance feature of the estate.
4. LANDSCAPED INTERNAL ROUNDABOUT - Consisting of feature flowering plants and a centre accent tree.
5. BOUNDARY FENCING - Allotments backing onto Belmont Rd & Open Space/Parkland to have boundary fencing in accordance with the local authority requirements.
6. VERGE GARDEN AREA - Vegetation screening along the boundary fencing of Belmont Rd.
7. CONCRETE FOOTPATH - 1.2m (min.) wide concrete footpath in accordance with the local authority requirements.
8. TIMBER BOLLARD - Hardwood timber bollard in accordance with the Capricorn Municipal Development Guidelines standard drawings.
9. OUTDOOR EXERCISE STATION - Dual outdoor exercise station mounted to concrete slab covered with approved synthetic grass.
10. VEGETATED STORMWATER MANAGEMENT CHANNEL / SWALE SYSTEM
11. PICNIC SHELTER AND TABLE/CHAIR SETTING - 4.0m x 4.0m GOSSI Park aluminum setting attached to suitable concrete slab and footings.
12. PLAY EQUIPMENT CLIMBING STRUCTURE - Mt Hotham A_SPACE climbing equipment surrounded by approved soft-fall material.
13. OUTDOOR HANDBALL SQUARE - 4.0m x 4.0m concrete handball square (4/2.0x2.0 areas) with outdoor texture & paint added to define each playing area.
14. OUTDOOR TABLE-TENNIS TABLE - Cornilleau pro outdoor table tennis table (or similar) attached to concrete slab and footing.
15. ACTIVE PARK AREA - Level kick-around and throw area for active recreation.
16. BASKET-BALL HALF COURT - 15.0 x 10.0m concrete basketball half court with outdoor texture & paint added to define playing lines.
17. BIKE/SCOOTER CIRCUIT - 2.0m wide asphalt bicycle & scooter practice/learning track with appropriate street linemarking and signage.
18. VEGETATED BATTER - 5.0m wide garden area along rear of allotments that back onto Open Space / Parkland areas.

STREET/PARKLAND TREE LEGEND

- Accent Tree Planting (Example - Lilly Pilly Resilience)
- Evergreen Street Tree (Example - Tuckeroo)
- Evergreen Street Tree (Example - Weeping Lilly Pilly)
- Accent Tree Planting (Example - Buckinghamia)
- Feature Tree Planting (Example - Ficus Hilli)
- Feature Tree Planting (Example - Melaleuca)

LANDSCAPE LEGEND

- Hydromulching coverage to proposed allotments (Refer future civil OPW approval)
- Turf & Hydroseeding areas
- Vegetated stormwater swales / channels (Refer future civil OPW approval)
- Garden areas
- Existing vegetation along natural inlets to be retained and enhanced
- Existing vegetation to be preserved
- Stormwater quality bio-retention area (Refer future civil OPW approval)
- Existing surface contours
- Design surface contours
- Proposed Fitzroy River Q10 flood level (To be confirmed by future civil OPW approval)
- Proposed Fitzroy River Q100 flood level (To be confirmed by future civil OPW approval)

ROCKHAMPTON REGIONAL COUNCIL

AMENDED PLANS APPROVED

24 October 2019

DATE

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/84-2014

Dated: 15 September 2015

Contour Consulting

ABN 98 125 137 348

349 Hobler Avenue
Frenchville
Rockhampton QLD 4701
Central Queensland

Telephone: 07 4928 2898
Email: contour.consulting@bigpond.com

SCALES

0 6.25 25.0m 1:1250

REVISION / ISSUE REGISTER

No.	DATE	REMARKS
A	07/19	For Review

DESIGN	DRAWN
RS	RS

GLENMORE HOLDINGS (AUST) PTY LTD

RIVERSIDE WATERS
STAGES 1 to 12
BELMONT RD, ROCKHAMPTON

LANDSCAPE SKETCH - 4

DWG No. 17-004/SK06 | A

DO NOT SCALE - IF IN DOUBT ASK

LANDSCAPE FEATURES LEGEND

1. ESTATE ENTRANCE ROUNDABOUT - Landscaping to consist of low height flowering plants.
2. ESTATE FEATURE WALL - Entrance statement to consist of a welcoming wall displaying the estate signage/logo surrounded by low height flowering plants and feature accent trees.
3. ESTATE ENTRY FEATURE GARDENS - Neatly presented accent gardens surrounding the entrance feature of the estate.
4. LANDSCAPED INTERNAL ROUNDABOUT - Consisting of feature flowering plants and a centre accent tree.
5. BOUNDARY FENCING - Allotments backing onto Belmont Rd & Open Space/Parkland to have boundary fencing in accordance with the local authority requirements.
6. VERGE GARDEN AREA - Vegetation screening along the boundary fencing of Belmont Rd.
7. CONCRETE FOOTPATH - 1.2m (min.) wide concrete footpath in accordance with the local authority requirements.
8. TIMBER BOLLARD - Hardwood timber bollard in accordance with the Capricorn Municipal Development Guidelines standard drawings.
9. OUTDOOR EXERCISE STATION - Dual outdoor exercise station mounted to concrete slab covered with approved synthetic grass.
10. VEGETATED STORMWATER MANAGEMENT CHANNEL / SWALE SYSTEM
11. PICNIC SHELTER AND TABLE/CHAIR SETTING - 4.0m x 4.0m GOSSI Park aluminum setting attached to suitable concrete slab and footings.
12. PLAY EQUIPMENT CLIMBING STRUCTURE - Mt Hotham A_SPACE climbing equipment surrounded by approved soft-fall material.
13. OUTDOOR HANDBALL SQUARE - 4.0m x 4.0m concrete handball square (4/2.0x2.0 areas) with outdoor texture & paint added to define each playing area.
14. OUTDOOR TABLE-TENNIS TABLE - Cornilleau pro outdoor table tennis table (or similar) attached to concrete slab and footing.
15. ACTIVE PARK AREA - Level kick-around and throw area for active recreation.
16. BASKET-BALL HALF COURT - 15.0 x 10.0m concrete basketball half court with outdoor texture & paint added to define playing lines.
17. BIKE/SCOOTER CIRCUIT - 2.0m wide asphalt bicycle & scooter practice/learning track with appropriate street linemarking and signage.
18. VEGETATED BATTER - 5.0m wide garden area along rear of allotments that back onto Open Space / Parkland areas.

STREET/PARKLAND TREE LEGEND

- Accent Tree Planting (Example - Lilly Pilly Resilience)
- Evergreen Street Tree (Example - Tuckeroo)
- Evergreen Street Tree (Example - Weeping Lilly Pilly)
- Accent Tree Planting (Example - Buckinghamia)
- Feature Tree Planting (Example - Ficus Hilli)
- Feature Tree Planting (Example - Melaleuca)

LANDSCAPE LEGEND

- Hydromulching coverage to proposed allotments (Refer future civil OPW approval)
- Turf & Hydroseeding areas
- Vegetated stormwater swales / channels (Refer future civil OPW approval)
- Garden areas
- Existing vegetation along natural inlets to be retained and enhanced
- Existing vegetation to be preserved
- Stormwater quality bio-retention area (Refer future civil OPW approval)
- Existing surface contours
- Design surface contours
- Proposed Fitzroy River Q10 flood level (To be confirmed by future civil OPW approval)
- Proposed Fitzroy River Q100 flood level (To be confirmed by future civil OPW approval)

ROCKHAMPTON REGIONAL COUNCIL

AMENDED PLANS APPROVED

24 October 2019

DATE

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/84-2014

Dated: 15 September 2015

Contour Consulting

ABN 98 125 137 348

349 Hobler Avenue
Frenchville
Rockhampton QLD 4701
Central Queensland

Telephone: 07 4928 2898
Email: contour.consulting@bigpond.com

N

SCALES

0 6.25 25.0m 1:1250

REVISION / ISSUE REGISTER

No.	DATE	REMARKS
A	07/19	For Review

DESIGN		DRAWN	
RS		RS	

GLENMORE HOLDINGS (AUST) PTY LTD

RIVERSIDE WATERS
STAGES 1 to 12
BELMONT RD, ROCKHAMPTON

LANDSCAPE SKETCH - 7

DWG No. 17-004/SK09 A

DO NOT SCALE - IF IN DOUBT ASK

adams +sparkes
TOWN PLANNING + DEVELOPMENT

astpd.com.au

SUNSHINE COAST
p 07 5313 7705
admin@astpd.com.au
Level 1, 15 Nicklin Way
Minyama QLD 4575
PO Box 1000
Buddina QLD 4575

ROCKHAMPTON
p 07 4819 9391
rockhampton@astpd.com.au
250 Quay Street
Rockhampton Qld 4700
PO Box 455
Rockhampton Qld 4700

TOOWOOMBA
p 07 4529 0103
toowoomba@astpd.com.au
PO Box 3080
Toowoomba Qld 4350

ADAMS SPARKES PTY LTD
ATF
The AS Trust

ABN 39 290 334 500
ACN 143 963 679

RIVERSIDE ESTATE DEVELOPMENT DOCUMENT

REVISION C, AUGUST 2015

RIVERSIDE ESTATE
DEVELOPMENT DOCUMENT

PRELIMINARY APPROVAL FOR A MATERIAL CHANGE OF USE FOR RESIDENTIAL PURPOSES

46, 54 & 263 BELMONT ROAD, PARKHURST

LOT 2 ON RP609985, LOT 102 ON RP860099 & LOT 129 ON PL4021

Contents

TABLES

FIGURES

SCHEDULES

1 Introduction

1.1 Citation

1. This document should be cited as the **"Riverside Estate Development Document Revision C August 2015"** (hereafter the **"Development Document"**).

1.2 Subject Land

2. The preliminary approval applies to land described as Lot 2 on RP609985, Lot 102 on RP860099 and Lot 129 on PL4021, located at 46, 54 and 263 Belmont Road, Parkhurst. Refer to the Concept Plan (Plan No. 5892-01-CPT Rev. h) ("the subject land").

1.3 Varying effect of the Preliminary Approval: Section 242 *Sustainable Planning Act 2009*

3. For the purpose of section 242(3) and (5) of the *Sustainable Planning Act 2009*, in relation to:

- the material changes of use;
- development relating to the material changes of use; and
- the development.

4. This preliminary approval states development that is:

- exempt development;
- self-assessable development;
- compliance assessable development;
- code assessable development;
- impact assessable development;

and identifies the relevant codes for the development.

5. For the purpose of section 242(6) of the *Sustainable Planning Act 2009*, to the extent this preliminary approval states development that is:

a. exempt development;
b. self-assessable development;
c. compliance assessable development;
d. code assessable development;
e. impact assessable development;

and

identifies the relevant codes for the development.

6. In a way that the above is different from a local planning instrument, this preliminary approval prevails.

2 Using the Preliminary Approval

2.1 Assessment Levels

7. This preliminary approval identifies self assessable, code assessable and impact assessable development through:

    a) Table of Assessment Categories for Riverside Estate – Making Material Change of Use
    b) Table of Assessment Categories for Riverside Estate – Reconfiguring a lot
    c) Table of Assessment Categories for Riverside Estate – Building work
    d) Table of Assessment Categories for Riverside Estate – Operational work

8. If a development proposal is identified as having a different assessment level under any of the Tables mentioned above, the higher assessment level applies.

3 Administration

9. The Riverside Estate Development Document has been prepared in accordance with the *Sustainable Planning Act 2009* (the "Act") as a framework for managing development in a way that advances the purpose of the Act.

10. In seeking to achieve this purpose, the Development Document sets out the intention for the future development in the subject land.

11. The Development Document applies to the subject land including all premises, roads, drainage reserves, parks and internal waterways.

12. The Development Document consists of this document, including all schedules and maps:

- Assessment Categories and Relevant Assessment Criteria for Riverside Estate (Tables 1-4);
- Riverside Estate Development Code Purpose and Overall Outcomes; and,
- Performance Outcomes and Acceptable Outcomes for the Riverside Estate Development Code.

13. Where the Development Document uses terms which are defined in the *Sustainable Planning Act 2009*, they are taken to have the same meaning as defined in the *Sustainable Planning Act 2009.*

14. The use definitions listed in Schedule 1 are the definitions for the purpose of this Development Document.

15. Administrative terms used in this Development Document are to take the meaning in accordance with administrative definitions of the *Queensland Planning Provisions* (QPPs).

16. Where a term is not listed or defined by this Development Document, it has the meaning given by the Act and, where a term is not given a meaning by the Act, it has its ordinary meaning.

17. Where reference is made to the "*Rockhampton City Plan 2005*", this means the *Rockhampton City Plan 2005* (as amended May 8, 2009).

4 Riverside Estate Development Code

4.1 Compliance with the Code

18. The following rules apply in determining compliance with the Riverside Estate Development Code for self assessable development:

    (a) Development must comply with the applicable acceptable outcomes of the Riverside Estate Development Code;
    (b) Where development does not comply with the applicable acceptable outcome of the applicable code the development becomes assessable development.

19. The following rules apply in determining compliance with the Riverside Estate Development Code for code and impact assessable development:

    (a) Development complies with the code if it complies with the overall outcomes of the code;
    (b) Development, which complies with the performance criteria, complies with the code and the overall outcomes of the code;
    (c) Where acceptable outcomes are identified for a performance criteria, development which complies with the acceptable outcome complies with the performance criteria and the overall outcomes of the code; and,
    (d) Where development requiring impact assessment does not comply with the code it is inconsistent with the code.

4.2 Code Applicability

20. The provision of the code apply to “development” being any:

    (a) Material Change of Use;
    (b) Reconfiguration of a Lot;
    (c) Building Work; and/or,
    (d) Operational Work.

21. For code assessable development, the code for assessment consists of the following *Rockhampton City Plan 2005* secondary codes, which are included as Schedule 2 of this Development Document:

    - External Works and Servicing Code;
    - Filling or Excavation Code;
    - Heritage Place Code; and/or,
    - Signage Code.

4.3 Levels of assessment – Material Change of Use

22. The following tables identify the levels of assessment for development being a material change of use in the Riverside Estate and the applicable assessment criteria.

Table 1 Table of Assessment Categories for Riverside Estate – Making Material Change of Use

Note -
1. For self assessable development only the acceptable outcomes of an applicable code apply[1].
2. Development identified in this table of assessment as self assessable that does not comply with the acceptable outcomes of the applicable code is code assessable.

Use	Level of Assessment	Assessment Criteria
Residential Uses		
Community residence	**Self-assessable**	Riverside Estate Development Code
Dual occupancy	**Self-assessable** Where located on a corner lot; OR Where located on a lot with a minimum size of 900m^2. **Code assessable** if not otherwise specified.	Riverside Estate Development Code Riverside Estate Development Code
Dwelling house	**Exempt**	
All other residential uses	**Impact assessable**	*Rockhampton City Plan 2005*
Business Uses		
Home based business	**Self-assessable**	Riverside Estate Development Code
Sales office	**Self assessable**	Riverside Estate Development Code
All other business uses	**Impact assessable**	*Rockhampton City Plan 2005*
Industrial Uses		
All Industrial uses	**Impact assessable**	*Rockhampton City Plan 2005*
Community Uses		
Community use	**Self assessable** if:- (a) located on Council owned or controlled land; and (b) undertaken by or on behalf of the Council. **Impact assessable** if not otherwise specified.	Riverside Estate Development Code *Rockhampton City Plan 2005*
Emergency services	**Code assessable**	Riverside Estate Development Code
All other Community uses	**Impact assessable**	*Rockhampton City Plan 2005*
Sport and recreation uses		
Park	**Exempt**	

[1] Under section 236 of the Act, self assessable development must comply with applicable codes.

Note -
1. For self assessable development only the acceptable outcomes of an applicable code apply[1].
2. Development identified in this table of assessment as self assessable that does not comply with the acceptable outcomes of the applicable code is code assessable.

Use	Level of Assessment	Assessment Criteria
All other Sport and recreation uses	**Impact assessable**	*Rockhampton City Plan 2005*
Rural uses		
All rural uses	**Impact assessable**	*Rockhampton City Plan 2005*
Other activities		
Utility installation	**Self assessable** if undertaken by a public sector entity. **Impact assessable** if not otherwise specified.	Riverside Estate Development Code *Rockhampton City Plan 2005*
All other undefined activities	**Impact assessable**	*Rockhampton City Plan 2005*

4.4 Levels of assessment – Reconfiguring a Lot

23. The following tables identify the level of assessment for reconfiguring a lot.

Table 2 Table of Assessment Categories for Riverside Estate – Reconfiguring a lot

Development	Level of Assessment	Assessment Criteria
If the *Sustainable Planning Regulation 2009*, schedule 4, table 3 applies.	**Exempt**	
Rearrangement of lot boundaries by registering a plan of subdivision.	**Code assessable**	Riverside Estate Development Code
Reconfiguring a Lot where involving lots, which achieve the minimum lot size.	**Code assessable where:** The size of any additional lots created is: • Not more than 5% below, • Equal to, or • Greater than, the relevant specified minimum lot sizes in the Assessment Criteria	Riverside Estate Development Code
Reconfiguring a Lot if:- **(a) creating one or more additional lots in the Riverside Estate; and** **(b) not complying with the minimum lot size specified in the Riverside Estate Development Code or where circumstances for Code assessable do not apply.**	**Impact assessable**	*Rockhampton City Plan 2005*

4.5 Levels of assessment – Building Work

24. The following table identifies the level of assessment for building work regulated under the planning scheme.

Table 3 Table of Assessment Categories for Riverside Estate – Building work

Note - 1. For self assessable development only the acceptable outcomes of an applicable code apply[2]. 2. Development identified in this table of assessment as self assessable that does not comply with the acceptable outcomes of the applicable code is code assessable.		
Development	**Level of Assessment**	**Assessment Criteria**
Building work	**Exempt**[3] if involving minor building work.	
	Self assessable[4] if the applicable use code identifies acceptable outcomes applicable to self assessable development.	Riverside Estate Development Code
	Code assessable if involving work on a Heritage Place	*Rockhampton City Plan 2005* Heritage Place Code
	Code assessable if not otherwise specified above.	Riverside Estate Development Code

[2] Under section 236 of the Act, self assessable development must comply with applicable codes.
[3] Building work that is exempt under the planning scheme may be assessable development under the *Building Regulation 2006* or other State legislation.
[4] Building work that is self assessable under the Riverside Estate Development Document may be assessable development under the *Building Regulation 2006* or other State legislation.

4.6 Levels of assessment – Operational Work

25. The following table identifies the level of assessment for operational work.

Table 4 Table of Assessment Categories for Riverside Estate – Operational work

Note - 1. For self assessable development only the acceptable outcomes of an applicable code apply[5]. 2. Development identified in this table of assessment as self assessable that does not comply with the acceptable outcomes of the applicable code is code assessable.		
Development	**Level of Assessment**	**Assessment Criteria**
Advertising Sign, nominated as Group A in Schedule 1 of Planning Scheme Policy No. 9 – Signage for a Residential Area that are not a Third Party Sign, a Flashing Sign or a Free Standing Sign.	**Self assessable**	Part A of *Rockhampton City Plan 2005* Signage Code
Advertising Sign, nominated as Group A in Schedule 1 of Planning Scheme Policy No. 9 – Signage for a Residential Area that is; (a) not complying with all the relevant Acceptable Solutions listed in the Signage Code and is not a Third Party Sign or a Flashing Sign; or (b) a Freestanding Sign.	**Code assessable**	*Rockhampton City Plan 2005* Signage Code
Advertising Sign, nominated as Group B in Schedule 1 of Planning Scheme Policy No. 9 – Signage for a Residential Area that are associated with a non residential use that was existing on the site prior to the commencement of the Planning Scheme and is not a Third Party Sign or a Flashing Sign.	**Impact assessable**	*Rockhampton City Plan 2005* Signage Code
Advertising Sign, not nominated as Group A or B in Schedule 1 of Planning Scheme Policy No. 9 – Signage for a Residential Area.	**Impact assessable**	*Rockhampton City Plan 2005*
Advertising Sign, being a Third Party Sign or a Flashing Sign.	**Impact assessable**	*Rockhampton City Plan 2005*
Operational work for excavation or filling	**Code assessable**	*Rockhampton City Plan 2005* Filling or Excavation Code
Operational work for Reconfiguring a Lot	**Code assessable**	◗ Riverside Estate Development Code; and, ◗ *Rockhampton City Plan 2005* External Works and Servicing Code.

[5] Under section 236 of the Act, self assessable development must comply with applicable codes.

4.7 Purpose and Overall Outcomes

26. The purpose of the Riverside Estate Development Code is to provide predominately for dwelling houses and dual occupancies, where supported by community uses and small-scale services and facilities that cater for local residents.

27. The purpose of the code will be achieved through the following overall outcomes:

- A range of housing, predominantly detached dwelling houses, on a range of lot sizes is provided.
- Development provides for an efficient land use pattern and is well connected to other parts of the local government area.
- Development is designed to provide safe and walkable neighbourhoods.
- Development incorporates a high level of residential amenity, personal health and safety and protection for property.
- Development is designed and located in a manner which makes a positive contribution to the streetscape and is sympathetic to the existing and intended scale and character of surrounding development.
- Development is designed to incorporate sustainable practices including maximising energy efficiency, water conservation and public/active transport use.
- Development is supported by transport infrastructure that is designed to provide and promote safe and efficient public transport use, walking and cycling.
- Development is reflective and responsive to the environmental features of the land.
- Development does not impact upon the Heritage Place values of the Glenmore Homestead, which is located to the south of the Riverside Estate.
- Development is designed and sited to sensitively respond to the physical characteristics and constraints of land, including flooding and bushfire hazard where applicable.
- Development is provided with the full range of urban services to support the needs of the community, including parks, roads and transport corridors, pedestrian and cycle paths, reticulated water and sewerage where available or planned to be made available, stormwater drainage and electricity and telecommunication infrastructure.
- A network of open space and recreational areas and appropriate infrastructure to support the needs of the local community supports development.
- Non-residential uses may be supported where such uses directly support the day to day needs of the immediate residential community, do not detract from the residential amenity of the area and do not undermine the viability of nearby centres.
- Natural features such as creeks, gullies, waterways, wetlands and vegetation and bushland are retained, enhanced and buffered from the impacts of development. Any unavoidable impacts are minimised through location, design, operation and management requirements.

4.8 Assessment criteria

Table 5 Criteria for self assessable and assessable development

Performance Outcomes	Acceptable Outcomes
Development in the Riverside Estate Generally	
PO1 Development in the Riverside Estate contributes to the creation of high quality, attractive, environmentally responsible and sustainable residential neighbourhoods which:- (a) are integrated with existing and future neighbourhoods; (b) have legible and permeable local road systems; (c) provide for the coordinated provision of infrastructure; and, (d) retain, enhance and connect native vegetation areas and other ecologically important areas, and avoid development of land otherwise subject to constraints.	**A01** No acceptable outcome provided.
PO2 Development provides for buildings, structures and landscaping that are consistent with and reflect the character and setting of the Riverside Estate area.	**A02** No acceptable outcome provided.
Dual Occupancy	
Location and Site Suitability	
PO3 The dual occupancy is located on a site which is convenient to local services and public transport and has sufficient area and dimensions to accommodate the dual occupancy and associated access, parking, landscaping and setback requirements.	**A03** The dual occupancy is located on a site with a minimum lot size of 900m^2. **AND** The site has a minimum width of 20 metres.
Height	
PO4 The height of the dual occupancy is consistent with the preferred character of a local area and does not adversely impact on the amenity of adjacent premises having regard to: (a) overshadowing; (b) privacy and overlooking; (c) views and vistas; (d) building appearance; and, (e) building massing and scale as seen from neighbouring premises.	**A04** The maximum height of the dual occupancy does not exceed 8.5 metres above natural ground level.
Site Cover	

Performance Outcomes	Acceptable Outcomes
PO5 The dual occupancy: (a) is of a scale that is compatible with surrounding development; (b) does not present an appearance of bulk to adjacent premises, road or other areas in the vicinity of the site; (c) maximises opportunities for the retention of existing vegetation and allows for soft landscaping between buildings; (d) allows for adequate area at ground level for outdoor recreation, (e) entertainment, clothes drying and other site facilities; and, (f) facilitates on-site stormwater management and vehicular access.	**AO5** The site cover of the dual occupancy does not exceed: (a) 50% where a single storey dual occupancy; or, (b) 40% where the dual occupancy is 2 storeys or more in height.
Streetscape Character	
PO6 The dual occupancy is designed and constructed to: (a) provide an attractive address to all street frontages; (b) make a positive contribution to the preferred streetscape character of the locality; (c) provide shading to walls and windows of the dual occupancy; (d) minimise opportunities for residents to overlook the private (e) open space areas of neighbouring premises; and, (f) maximise the retention of existing mature trees within the frontage setback to retain streetscape character.	**AO7.1** Each dwelling has an individual design and layout that is not a mirror image of the adjoining dual occupancy unit and includes distinct external design elements (e.g. variations in roof line, facade, treatment or position of main entrances and garages, window treatments and shading devices). **AO7.2** Any garage or carport is setback a minimum of 1.5 metres from the main face of the associated dual occupancy unit, or in line with the main face of the associated dual occupancy unit, where the dual occupancy unit incorporates a front verandah or portico projecting forward of the main face and faces. **AO7.3** The dual occupancy is setback at least 4.5 metres from any street frontage with any associated garage or carport setback at least 6 metres. **AO7.4** The dual occupancy, including any garage or carport associated with the dual occupancy, is setback from any side or rear property boundary in accordance with the following: (a) 1.5 metres for any part of the building that is 4.5 metres in height or less; (b) 2 metres for any part of the building that is higher than 4.5 metres but not higher than 7.5 metres; and, (c) 2 metres plus 0.5 metres for every 3 metres of any part of the building that exceeds 7.5 metres in height.

Performance Outcomes	Acceptable Outcomes
Private Open Space	
PO8 Sufficient private open space is provided to allow for the amenity and reasonable recreation needs of the occupants of the dual occupancy.	**A08.1** Each dwelling is provided with private open space at ground level free of buildings which: (a) has an area of at least 50m²; (b) has a minimum dimension of 4 metres; and (c) comprises not more than two separate parts.
Landscaping	
PO9 The dual occupancy incorporates site landscaping that: (a) provides an attractive landscape setting for the enjoyment and appreciation of residents; (b) integrates the development into the surrounding urban landscape; (c) effectively defines and screens private open space and service areas; (d) utilises native endemic vegetation as the major planting theme; and, (e) maximises the retention of existing mature trees in order to retain the landscape character of the area.	**A09.1** The site is fully landscaped with turf and tree and shrub species. **A09.2** A minimum 1 metre wide landscape buffer strip is provided along the full length of the street frontage (excluding driveways and pathways). **A09.3** A 1.8 metre high solid screen fence is provided along the full length of all side and rear boundaries of the site. **A09.4** Fences or walls are not provided along street frontages. **OR** Fences or walls to street frontages are not more than: (a) 1.8 metres high where the site is on a major road; or, (b) 1.2 metres high where the site is not on a major road.
Safety and Security	
PO10 The dual occupancy including buildings and outdoor spaces is designed to protect the personal security and safety of residents by allowing for natural surveillance.	**AO10** Each dual occupancy unit has an entrance which is clearly identifiable and visible from the street and driveway.
Access and Car Parking	
PO11 Sufficient parking spaces are provided on the site to cater for residents and visitors.	**AO11** A minimum of two (2) car parking spaces are to be provided on-site per dual occupancy unit, one of which must be covered
PO12 The design and management of access, parking and vehicle movement on the site facilitates the safe and convenient use of the dual occupancy by residents and visitors.	**AO12** The design and construction of car parking areas and driveways complies with AS2890.1

Performance Outcomes	Acceptable Outcomes
Waste Management	
PO13 The dual occupancy is provided with adequate areas for the storage of waste and recyclable items, in appropriate containers, which are convenient to use and service.	**AO13** A separate waste storage area is provided for each dwelling to accommodate the permanent storage of waste and recyclable items in standard waste containers.
Home Based Business	
Scale	
PO14 The use is limited to a small scale operation and: (a) is located wholly or mainly within a house and associated buildings; (b) is conducted by a resident or residents of the house; and, (c) maintains a domestic scale and character.	**AO14.1** The use is conducted entirely within the house and/or any associated outbuilding on the site. **AO14.2** The use is carried out by residents of the house. **AO14.3** The use involves no more than 1 non-resident employee on site at any one time. **AO14.4** The home based business has a maximum gross floor area of 50m^2 (except for a bed and breakfast accommodation or home based child care). **AO14.5** The home based business where for bed and breakfast accommodation: (a) the combined total number of guests and permanent residents does not exceed twelve (12) persons at any one time; and (b) guests stay a maximum of fourteen (14) consecutive nights
Amenity	
PO15 The use is visually integrated with the residential use, the streetscape and adjacent premises.	**AO15.1** Equipment, goods and materials associated with the use are stored inside the house or outbuilding. **AO15.2** The use does not involve the display of goods or materials, whether or not generated by the use, to be visible from outside the house or outbuilding.
PO16	**AO16.1**

Performance Outcomes	Acceptable Outcomes
Hours of operation are suited to a residential environment.	Home based business activities generating visitors or audible noises outside the house or outbuilding are not conducted outside the hours of 7:00 am to 7:00 pm, Monday to Saturday. For all Home Based Businesses, operations are not to occur on Sundays and public holidays (except for a bed and breakfast accommodation or home based child care).
PO17 The use does not impact adversely on the amenity of the surrounding area through the production of excess noise, vibration, odour or lighting.	**AO.17.1** Noise levels generated by the Use do not exceed 5dB(A) above ambient background levels at the property boundary at anytime. **AO17.2** Any odour emissions do not extend beyond the site boundaries. **AO17.3** The use ensures that illumination levels 1.5m outside the site do not exceed 8 lux.
PO18 The operation of the use is safe for the occupants of the dwelling, the employees, visitors and neighbours.	**AO18.1** The amount of stored chemicals, gases or other hazardous materials is no more than the limits normally associated with a residential dwelling. **AO18.2** The use complies with the *Australian Standard AS1940 "The Storage and Handling of Flammable and Combustible Liquids"*, including standards for minor storage in a residential building of any type.
PO19 Use of motor vehicles associated with the home business must not impact adversely on residential amenity.	**AO19.1** The business does not include any type of vehicle service or repair on the site.
Traffic	
PO20 The use does not generate traffic more than that reasonably expected for the surrounding area.	**AO20.1** The use does not involve more than one (1) business related motor vehicle being parked on the site at any time (excluding business related vehicle/s of the permanent resident/s). **AO20.2** The use involves no more than one (1) visit per day of a delivery vehicle with a capacity of less than 2.5 tonnes. **AO20.3** The use does not involve or require the use of or visit by a vehicle with a capacity of more than 2.5 tonnes.

Performance Outcomes	Acceptable Outcomes
	AO20.4 Loading or unloading activities are undertaken within the site. **AO20.5** The use does not generate more than 10 vehicle trips per day where one (1) vehicle trip equates to arriving and departing the site. **AO20.6** The home based business contains visitor parking within the site.
Sales Office	
Operational Characteristics	
PO21 The duration of the use of premises for a sales office:- (a) in the case of a display dwelling, display village or sales office does not extend beyond a reasonable period required to construct and complete sales within the residential development or the applicable stage of the residential development; or, (b) in the case of dwelling offered as a prize, does not extend beyond a reasonable period of time to allow for promotion of the prize.	**AO21.1** Where a display dwelling, display village or sales office the use operates for a maximum period of 2 years. **OR** Where a dwelling offered as a prize, the use operates for a maximum period of 3 months. **AO21.2** Any temporary building or structure associated with the operation of the sales office is removed from the site within 14 days of the end of the period of operation and the site is left in a clean and tidy condition.
PO22 The hours of operation of the sales office does not adversely affect the amenity of nearby residential premises.	**AO22** The hours of operation of the sales office do not commence before 8.00am or extend later than 6.00pm.
PO23 The number of employees engaged in the operation of the sales office does not adversely affect the amenity of nearby residential premises.	**AO23** Where a display dwelling, dwelling offered as a prize or sales office, a maximum of 2 employees are engaged in the operation of the sales office at any one time. **OR** Where a display village, a maximum of 2 employees per display home are engaged in the operation of the sales office at any one time.
Landscaping	
PO24 The sales office incorporates site landscaping and fencing that:-	**AO24.1** Private and public open space areas are turfed and landscaped.

Performance Outcomes	Acceptable Outcomes
(a) provides an attractive landscape setting for the enjoyment and appreciation of staff and visitors; (b) integrates the development into the surrounding landscape; (c) effectively defines and screens private open space and service areas; and, (d) protects the amenity of adjoining dwellings.	**AO24.2** A 1.8 metre high solid screen fence is provided to each side and rear boundary that has residential uses adjoining. **AO24.3** Fences to street frontages are not more than 1.2 metres high or 1.8 metres high with 50% transparency.
Access and Car Parking	
PO25 Sufficient parking spaces are provided on the site to cater for staff and visitors.	**AO25** A minimum of 2 car parking spaces is provided (parking spaces may be provided in tandem).
PO26 The design and management of access, parking and vehicle movement on the site facilitates the safe and convenient use of the house by staff and visitors.	**AO26** The design and construction of car parking areas and driveways complies with AS2890.1.
Signage	
PO27 Signage associated with the sales office is small, unobtrusive and appropriate to its setting.	**AO27** Advertising devices:- (a) do not exceed a total display area of 3m²; (b) are only erected on the same lot on which the sales office is established; and (c) do not include the use of bunting.
Public Convenience Facilities	
PO28 The sales office provides appropriate public convenience facilities for users of the sales office.	**AO28** Public toilet facilities are provided where a street contains 4 or more sales offices.
Reconfiguring a Lot	
Neighbourhood / Estate Design	
PO29 Development provides for a lot layout, land use and infrastructure configuration that:- (a) provides for an efficient land use pattern; (b) effectively connects and integrates the site with existing or planned development on adjoining sites; (c) provides for the safe and efficient movement of pedestrians, cyclists, public transport and private motor vehicles in that order of priority; (d) creates legible and interconnected movement and open space networks; (e) provides defined edges to public open space and avoids direct interface between public open space and freehold lots;	**AO29** Development occurs in accordance with the Riverside Estate Concept Plan (Plan No. 5892-01-CPT Rev. H).

Performance Outcomes	Acceptable Outcomes
(f) promotes a sense of community identity and belonging; (g) provides for a high level of amenity having regard to potential noise, dust, odour and lighting nuisance sources; (h) accommodates and provides for the efficient and timely delivery of infrastructure appropriate to the site's context and setting; and, (i) avoids the use of culs-de-sac; and, avoids the sporadic or out-of sequence creation of lots.	
Lot Size and Configuration	
PO30 Development provides for the size, dimensions and orientation of lots to:- (a) be compatible with the preferred character of theRiverside Estate as specified in Code; (b) provide suitable building envelopes and safe pedestrian, bicycle and vehicular access without the need for major earthworks and retaining walls; (c) provide for the efficient use of land whilst including sufficient area for suitable and useable private open space; and, (d) take account of and respond to the natural values and site constraints.	**AO30** Newly created lots have minimum lot sizes and lot dimensions as follows: (a) 1,000m^2 minimum lot size; and, (b) 20m minimum frontage.
Services	
PO31 Development provides that each lot is provided with appropriate development infrastructure and services commensurate with the nature and location of the subdivision.	**AO31.1** New lots are connected to:- (a) the reticulated water supply infrastructure network; (b) the reticulated sewerage infrastructure networks; (c) the reticulated electricity infrastructure network; and (d) where available, a high speed telecommunications infrastructure network. **AND** **AO31.2** The location, design and proposed construction of sewerage facilities, water supply mains and fixtures, electricity, gas, communication services and street lighting are in accordance with the ***Capricorn Municipal Development Guidelines***.
Stormwater Management	
PO32 Development provides for the effective drainage of lots and roads in a manner that:-	**AO32** No acceptable outcome provided.

Performance Outcomes	Acceptable Outcomes
(a) maintains pre-existing or natural flow regime; (b) effectively manages stormwater quality and quantity; and, (c) ensures no adverse impacts on receiving waters and the surrounding land.	
Rear (Hatchet) Lots	
PO33 Development provides for rear lots to be created only where:- (a) the lots are not likely to prejudice the subsequent development of adjoining land; (b) it is not desirable nor practicable for the site to be reconfigured so that all lots have full frontage to a road; (c) the siting of buildings on the rear lot is not likely to be detrimental to the use and amenity of the surrounding area; (d) uses on surrounding land will not have a detrimental effect on the use and amenity of the rear lot; and, (e) the safety and efficiency of the road from which access is gained is not adversely affected.	**AO33** Rear lots are designed such that (a) the minimum area of the lot, exclusive of any access strip is 600m^2; (b) no more than 4 lots directly adjoin the rear lot, excluding lots that adjoin at one point; (c) no more than one rear allotment is created behind any full frontage conventional allotment; (d) no more than 20% of lots within a development are accessed from an access handle; (e) where 2 rear lots adjoin each other, a single common driveway and reciprocal access easements are provided; (f) no more than 2 rear lots and rear lot access strips directly adjoin each other; (g) rear lot access strips are located on only one side of a full frontage lot; and, (h) rear lot access strips comply with the requirements of **Table 6 (Access strip requirements for rear lots)**.
Rearrangement of Lot Boundaries	
PO34 Development provides that the rearrangement of lot boundaries:- (a) does not result in the creation, or in the potential creation of, additional lots; and, (b) is an improvement on the existing situation.	**AO34** The rearrangement of lot boundaries results in an improvement to the existing situation and at least one of the following is achieved:- (a) the rearrangement of lots remedies an existing boundary encroachment by a building or areas; (b) the rearranged lots will be made more regular in shape; (c) access is provided to a lot that previously had no access or an unsuitable access; and, (d) the rearranged lots better meet the overall outcomes of the Riverside Estate Development Document.
Landscaping	
PO35 Development provides for landscaping that contributes to and creates a high quality landscape character for the site, street and local area by:- (a) being sensitive to site conditions, natural landforms and landscape characteristics;	**AO35.1** No development must occur within fifty (50) meters of the river bank. The riverbank is to be maintained as public open space and natural riparian wetland in accordance with state development conditions.

Performance Outcomes	Acceptable Outcomes
(b) protecting and enhancing native vegetation; and, (c) being of an appropriate scale to integrate successfully with development.	**AO35.2** Mature riparian canopy species are to be retained wherever possible to assist in maintaining the scenic amenity of this residential estate **AO35.3** All allotments bordering onto Belmont Road (Lot 1 to 9, Lot 88 to 107 and Lot 116) must have a minimum two (2) metre high, double lapped and capped acoustic timber fence (having a minimum surface area density of ten (10) kilograms per square metre) along the full frontage of Belmont Road. This acoustic fence is to be installed by the developer, with ongoing maintenance the responsibility of property owners.

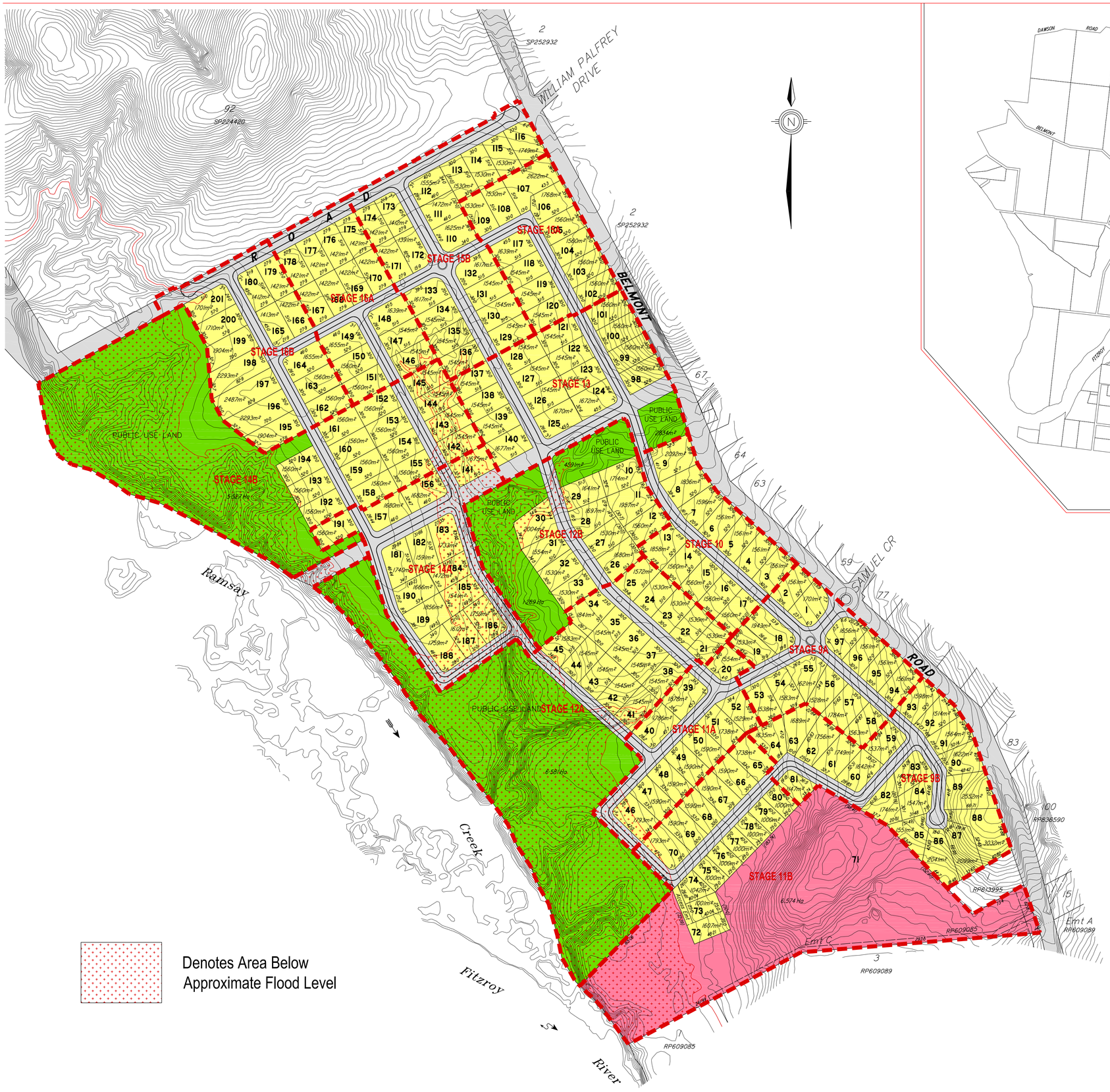
Table 6 Access strip requirements for rear lots

Column 1 Minimum width of single access strip (metres)	Column 2 Minimum width of combined access strips with reciprocal easement (metres)	Column 4 Minimum driveway width (metres)	Column 5 Maximum driveway length (metres)	Column 6 Standard of construction
5	6 (2x3)	3.5	40	Sealed or concreted pavement

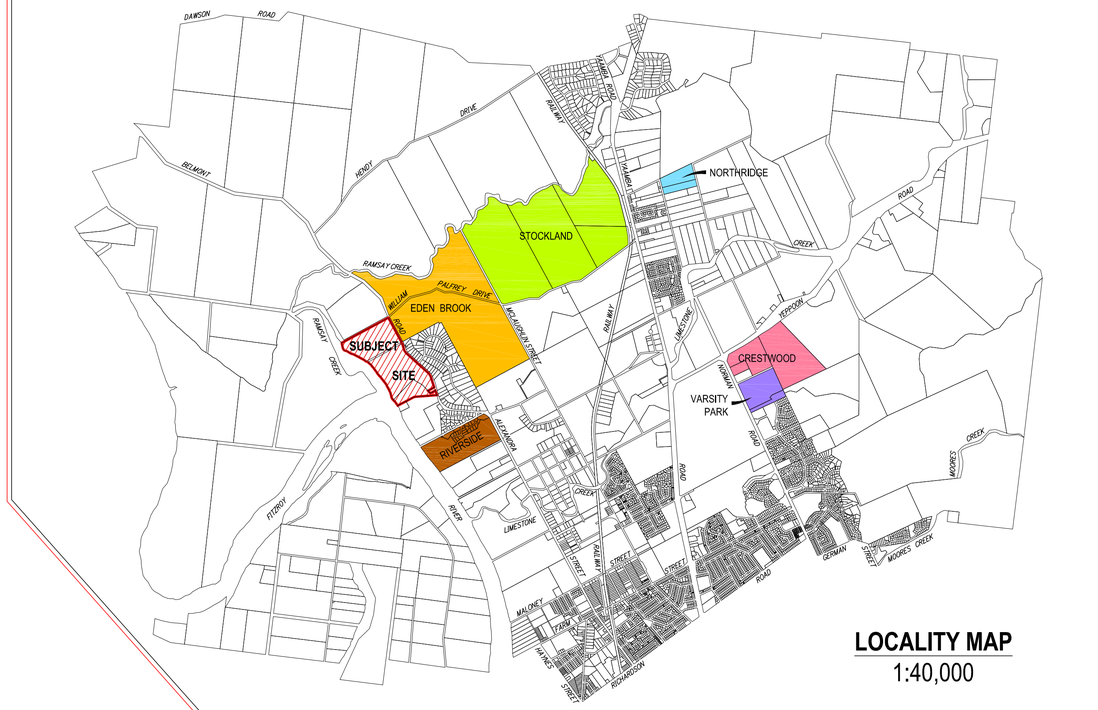
Table 7 Minimum frontage for irregular shaped lots

Column 1 Minimum width measured at the site frontage (metres)	Column 3 Minimum width measured 6 metres from site frontage (metres)
6	10

Figure 1 Concept Plan (Plan No. 5892-01-CPT Rev. H)



Denotes Area Below
Approximate Flood Level



LOCALITY MAP
1:40,000

IMPORTANT NOTE

This plan was prepared exclusively for M. Birkbeck for discussion purposes only and should not be used for any other purpose.

The areas shown hereon are subject to field survey and also to the requirements of council and any other authority which may have requirements under any relevant legislation.

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

Proposed Lot 71 is to accommodate the heritage listed Glenmore Homestead and does not form part of the Preliminary Approval.

This note is an integral part of this plan.

client
M. Birkbeck

project
Belmont Road Parkhurst Riverside Estate Stages 9-16

plan of
Concept Plan (201 Lots + Public Use Land)

rpd
Lot 102 on RP860099, Lot 129 on PL4021 & Lot 2 on RP609985 Parish of Murchison County of Livingstone

lga
Rockhampton Regional Council

rev	date	details	authorised
A	16-05-2013	Initial Issue	RJKF
B	13-08-2013	Image underlay added	RJKF
C	30-08-2013	Layout amended, underlay removed	RJKF
D	12-10-2013	Whole lot layout amended	RJKF
E	13-11-2013	Stage boundaries added	RJKF
F	6-12-2013	Layout and stage boundaries amended	RJKF
G	10-12-2013	Staging amended	RJKF
H	7-05-2014	Lot 71 no longer in original proposal	RJKF

created

CSG capricorn survey group (cq)
capricorn survey group (cq) pty ltd
250 quay street, p.o. box 1391
rockhampton qld 4700
P 07 4927 5199
F 07 4922 2716
E reception@csgcq.com.au
ABN 22 154 830 565

scale **1:2500 @ A1**
datum **RRC 0.5m Contours**
sheet no. **1 of 1**
cad file **5892-01-CPT-H**
plan no. **5892-01-CPT**
revision **H**

Schedule 1 Definitions

28. The following table lists the terms of development that are relevant to the Riverside Estate and Development Code and which differ from those in the planning scheme. The following definitions have been adopted in accordance with the *Queensland Planning Provisions* (QPPs).

29. Administrative terms used in this Development Document are to take the meaning in accordance with administrative definitions of the *Queensland Planning Provisions* (QPPs).

Use	Definition	Examples include	Does not include the following examples
Community residence	Any dwelling used for accommodation for a maximum of six persons who require assistance or support with daily living needs, share communal spaces and who may be unrelated. The use may include a resident support worker engaged or employed in the management of the residence.	Hospice	Dwelling house, dwelling unit, hostel, residential care facility, short-term accommodation
Dual occupancy	Premises containing two dwellings on one lot (whether or not attached) where the use is primarily residential.	Duplex	Dwelling house, multiple dwelling
Dwelling house	A residential use of premises for one household which contains a single dwelling. The use includes out-buildings and works normally associated with a dwelling and may include a secondary dwelling.		Caretaker's accommodation, dual occupancy, hostel, short-term accommodation, student accommodation, multiple dwelling
Home based Business	A dwelling used for a business activity where subordinate to the residential use.	Bed and breakfast, home office, home based childcare	Hobby, office, shop, warehouse transport
Minor Building Work			
Park	Premises used by the public generally for free recreation and enjoyment, and may be used for community events. Facilities may include children's playground equipment, informal sports fields and ancillary vehicle parking and other public conveniences.	Urban common	Tourist attraction, outdoor sport and recreation
Sales office	The temporary use of premises for displaying a land parcel or buildings that	Display dwelling	Bank, office

	can be built for sale or can be won as a prize. The use may include a caravan or relocatable dwelling or structure.		
Utility installation	Premises used to provide the public with the following services: • supply of water, hydraulic power, electricity or gas; • sewerage, drainage or stormwater services; • transport services including road, rail or water; • waste management facilities; • network infrastructure. The use includes maintenance and storage depots and other facilities for the operation of the use.	Sewerage treatment plant, mail depot, pumping station	Telecommunications tower, major electricity infrastructure, minor electricity infrastructure, substation, renewable energy facility, transport depot

Schedule 2 Secondary *Rockhampton City Plan 2005* Codes

- External Works and Servicing Code;
- Filling or Excavation;
- Heritage Place Code; and,
- Signage Code.

EXTERNAL WORKS AND SERVICING CODE

1 Purpose of the Code

The purpose of this Code is to:

- ensure that all development provides the necessary level of infrastructure or services that the development contributes to the demand for; and
- ensure that development does not impact on, remove or damage existing infrastructure already provided to the community; and
- ensure that development is provided with the infrastructure and services expected by the community as an appropriate standard;
- mitigate any impacts from the development onto other land, infrastructure or members of the community with the provision of appropriate design considerations or other infrastructure.

2 Application of the Code

This code outlines the general requirements applicable to development for external servicing, however the detailed requirements outlined within this code for a specific area or type of land use will take precedence over the general requirements where there are any inconsistencies.

There are no Secondary Codes to this Code.

3 Definitions

There are no definitions specific to this code.

4 Explanation

This code outlines the servicing requirements for new development. Planning Scheme Policies also contain detailed requirements for external works and contributions that are applicable for new development. Part A within this code applies to all development in any area of the city whereas Part B states additional requirements specific to development in certain locations that overrides any requirements of a lesser standard set out in Part A.

5 Performance Criteria and Acceptable Solutions

PART A – GENERAL REQUIREMENTS FOR ALL DEVELOPMENT			
Performance Criteria		**Acceptable Solutions**	
P1	Development has along all its frontages to road reserve the following items to a standard that meets or provides for their intended function or purpose. (a) an effective, high	**A1.1.1**	In all Areas except for the South Rockhampton Rural Area; the following are provided at the frontage of the site to any road reserve (or a contribution made to Council to the value of the works instead), unless a planning scheme policy has been made by the Council that any or all of these works are not required by any development along the road frontage[1]:

[1] On the commencement day, no resolutions had been made.

PART A – GENERAL REQUIREMENTS FOR ALL DEVELOPMENT	
Performance Criteria	**Acceptable Solutions**
quality paved roadway; and (b) an effective, high quality roadway kerb and channel to control stormwater, vehicle access locations to the roadway and to protect the pavement edge of the roadway; and (c) safe, high quality crossings over kerb and channel and the verge; and (d) safe, accessible, high quality; (1) bikeways linking into an existing or future bikeway network; and (2) public pedestrian pathways compatible and integrated with the surrounding environment; and (e) the provision of and alteration to public utilities required or impacted upon by the development; and (f) effective, efficient and proper control of stormwater; and (g) appropriate conduits to facilitate the provision of required street lighting systems and/or traffic	**A1.1.2** (i) concrete kerb and channel along the full frontage of the subject site to the road reserve; and (ii) a constructed bikeway where identified in **Planning Scheme Policy No. 7 - Provision of Bikeways and Bicycle Facilities**; and (iii) a constructed pedestrian pathway that has a minimum width of 1.2 metres, except when, (1) required to be a dual use pathway with bicycles, or (2) located in a Commercial Area or Precinct; it is instead 2.0 metres wide along the full frontage of the subject site to the road reserve; and (iv) reconstruction of any damaged infrastructure including public pathways, kerb and channel and the like caused as a result of the development to the standard required if it were new works; and (v) construction of the carriageway along the full frontage of the site being; (1) widening along the development side of an existing carriageway already partially constructed; and (2) if not already constructed, a half road construction along the development side extending 0.5 metres beyond the centreline of the road and having a minimum width of 4.5 metres; and (vi) alterations necessitated or caused by the development to public utility (water, sewerage, etc) mains, services or installations; and (vii) works necessary to ensure that all stormwater is drained to a lawful point of discharge and does not adversely affect any other land or have the potential to cause damage to other infrastructure items; and (viii) electrical conduits are installed wherever necessary to accommodate street lighting or traffic signals when identified as required in other approvals. **OR** In the South Rockhampton Rural Area; the following are provided at the frontage of the site to any road reserve (or a contribution made to Council to the value of the works for the works instead), unless a policy has been

PART A – GENERAL REQUIREMENTS FOR ALL DEVELOPMENT	
Performance Criteria	**Acceptable Solutions**
signals.	made by the Council that any or all of these works are not required by any development along the road frontage: (i) reconstruction of any damaged infrastructure including public pathways, kerb and channel and the like caused as a result of the development to the standard required if it were new works; and (ii) construction of the carriageway along the full frontage of the site being; (1) widening along the development side of an existing carriageway already partially constructed; and (2) if not already constructed, a half road construction along the development side extending 0.5 metres beyond the centreline of the road and having a minimum width of 4.5 metres; and **A1.2** (iii) alterations necessitated or caused by the development to public utility (water, sewerage, etc) mains, services or installations; and (iv) works necessary to ensure that all stormwater is drained to a lawful point of discharge and does not adversely affect any other land or have the potential to cause damage to other infrastructure items; and (v) electrical conduits are installed wherever necessary to accommodate street lighting when identified as required in other approvals. **AND** All works (including driveway cross overs) are designed and constructed in accordance with the Capricorn Municipal Development Guidelines.

PART B – REQUIREMENTS FOR CERTAIN TYPES OF DEVELOPMENT	
Performance Criteria	**Acceptable Solutions**
Development in a Commercial Area, Commercial Precinct or for a Commercial Use	
P2 Development in a Commercial Area, Commercial Precinct or for a Commercial Use, has along all its frontages to road reserve the following specific items to a standard that meets or provides for their intended function or purpose. (a) safe, high quality crossings over kerb and channel and the verge; and (b) safe, accessible, high quality public pedestrian pathways compatible and integrated with the surrounding environment.	**A2.1.1** The following are provided at the frontage of the site to any road reserve (or a contribution made to Council to the value of the works instead), unless a separate resolution has been made by the Council that any or all of these works are not required by any development along the road frontage: (i) where the verge is covered in part or full by a building awning or other structure, wherever shadow is cast onto the verge by the awning or structure between 9am and 3pm on the winter or summer solstice, a constructed concrete pathway covering that shaded area is provided along the full frontage of the subject site to the road reserve and shall be of type, finish and colour that matches the pavement in front of an adjoining property; and (ii) a reinforced concrete crossover from the kerb and channelling to the property alignment where vehicular access to or from the property is to occur; and (iii) vehicle barriers along the frontages of the site to a road reserve excluding the location of a vehicular access to or from the site. **A2.1.2** **OR** Works are carried out along the frontage of the site to a road reserve in accordance with any Local Area Design Guideline prepared by the Rockhampton Regional Council that applies to the subject site and its frontage. **A2.2** **AND** All works (including driveway cross overs) are designed and constructed in accordance with the Capricorn Municipal Development Guidelines.

Development in an Industrial Area or for an Industrial Use	
P3 Development in an Industrial Area of for an Industrial Use, has along all its frontages to road reserve, safe, high quality crossings over kerb and channel and the verge that meets or provides for their intended function or purpose.	**A3.1** Reinforced industrial crossings across the verge from the edge of the carriageway to the property alignment are provided on any frontage of the site to any road reserve whenever access to the road reserve is required, unless a separate resolution has been made by the Council that any or all of these works are not required by any development along the road frontage. **A3.2** **AND** All works (including driveway cross overs) are designed and constructed in accordance with the Capricorn Municipal Development Guidelines.

FILLING OR EXCAVATION CODE

1 Purpose of the Code

The purpose of this code is to ensure that excavation or filling occurs in a manner that does not:

- adversely affect the amenity of adjoining or nearby properties; or
- adversely affect the ecological values of the locality; or
- adversely affect the visual character of the locality; or
- impact on flooding of upstream, downstream or adjoining land; or
- increase the risk, or potential, for landslip to occur; or
- impact adversely on infrastructure or increase the risk of hazards; or
- divert, alter or concentrate local stormwater drainage in such a way that it causes or potentially causes a worsening of impacts onto upstream or downstream land; or
- increase the potential for environmental harm or a faster rate of corrosion of assets resulting from the disturbance of land that may host acid sulfate soils.

2 Application of the Code

This code applies to development defined as excavation or filling that may or may not be associated with other development that is code or impact assessable. It applies to:

- Excavation or filling exceeding one vertical metre in depth or height at any one point in relation to the natural ground level; or
- Excavating or otherwise removing 100m^3 or more of soil or sediment[1] from land at or below 5 metres AHD where the natural ground level is below 20 metres AHD; or
- Filling of areas situated at or below 5 metres AHD with 500m^3 or more of material with an average depth of 0.5 metres or greater; or
- Excavation or filling on Flood Prone Land or in a Waterway Corridor, other than top dressing that is less than 100mm in depth from the natural ground level and occurs infrequently over a period of years, or
- Excavation for the purpose of drainage on land at or below 5m AHD.

The 5 metre and 20 metre AHD levels are shown on Filling or Excavation Code Map 1 attached to this Code.

Filling or excavation in instances other than the above, therefore does not require an assessment against this code and is accordingly exempt from this code. Excavation or Filling exempt from this Code is instead assessed against the *Standard Building Regulation 1993* in accordance with Schedule 5 of the *Standard Building Regulation 1993*.

There are no Secondary Codes to this Code.

[1] As defined in *State Planning Policy 2/02 – Planning and Management Development involving Acid Sulfate Soils*.

3 Definitions

There are no definitions specific to this Code.

4 Explanation

This code is used for the assessment of applications for excavation or filling above the thresholds mentioned in section 2. It is necessary to be aware that even where this code does not apply, the *Environmental Protection Act 1994* binds all persons to a duty of care to ensure that activities engaged in do not cause environmental harm. In areas where there is clear evidence of the presence of acid sulfate soil requiring very high levels of treatment if disturbed, excavating or otherwise removing any acid sulfate soil will require appropriate treatment to avoid causing environmental harm.

5 Performance Criteria and Acceptable Solutions

Performance Criteria		Acceptable Solutions	
P1	Excavation or filling does not adversely impact upon the stability of land.	**A1**	Excavation or Filling does not occur on the part of a site where the works are proposed to occur that has a slope greater than or equal to 15%. *Note: On land with a slope greater 15% where excavation or filling are proposed to occur, the works do not cause or increase the risk of landslip occurring and are carried out in accordance with an approved geotechnical report prepared in accordance with **Planning Scheme Policy No. 3 - Preparation of Geotechnical Reports**.*
P2	Excavation or filling does not adversely affect the amenity of adjoining or nearby properties.	**A2.1**	Dust from excavation or filling is managed to a standard or degree sufficient to ensure that no dust goes beyond the boundaries of the site.
		A2.2	**AND** The excavation or filling does not concentrate or divert stormwater into an adjoining site more than what occurred prior to the works commencing.
		A2.3	**AND** Excavation or filling does not cause or allow the ponding of water on the site or on any other adjoining land[2].
P3	Excavation or filling does not adversely	**A3.1**	Excavation or filling does not result in the contamination of land or waterways[3].

[2] Regard is to be given to the *Guidelines To Minimise Mosquito And Biting Midge Problems In New Development Areas* produced by the Queensland Health Department, March 2002.

[3] Excavation or filling is carried out in accordance with an approved management plan that addresses the management of the excavation or filling to prevent downstream environmental impacts on waterways. A

Performance Criteria		Acceptable Solutions	
	affect the environmental values of land or receiving waterways.		**AND** **A3.2.1** The site is not on the Contaminated Land Register or the Environmental Management Register. **A3.2.2** **OR** Excavation or filling is carried out in accordance with an approval from the relevant state government agency administering the register.
P4	Excavation or Filling is carried out in a manner that ensures that in areas that may host Acid Sulphate Soils; (a) there is no worsening of water quality or reduction in the ecological health of a sensitive receiving environment; and (b) environmentally sensitive areas are not detrimentally affected; and (c) assets are not subjected to an accelerated rate of corrosion caused by changes in water quality.	**A4.1**	The ground level where excavation is proposed is at or above 20 metres AHD **OR** **A4.2** The ground level where filling is proposed is at or above 5 metres AHD **OR** **A4.3** The ground level where excavation is proposed is below 20 metres AHD and; (i) excavation does not extend below 5 metres AHD, or (ii) excavation extends below 5 metres AHD and less than 100m^3 only is to be excavated below 5 metres AHD. **OR** **A4.4** The ground level where filling is proposed is below 5 metres AHD and; (i) less than 500m^3 of filling is proposed; or (ii) the filling has an average depth less than 0.5 metres. **OR** **A4.5.1** The ground level where excavation or filling is proposed is below 20 metres AHD and; (i) excavation extends below 5 metres AHD and 100m^3 or more is to be excavated below 5 metres AHD; or (ii) filling below 5 metres AHD is equal to or greater than 500m^3 and equal to or greater than an average depth of 0.5 metres.

management plan would be expected to include an Erosion and Sediment control plan prepared in accordance with Planning Scheme Policy No. 2 - Erosion and Sediment Control Plans.

Performance Criteria		Acceptable Solutions	
		A4.5.2.1	**AND** Excavation or filling is only carried out where there is no potential for Acid Sulfate Soils to be located where the works are proposed.[4] **A4.5.2.2** **OR** Excavation or filling is to be carried out where there is potential for Acid Sulfate Soils to be located and therefore as a result the excavation or filling is carried out in accordance with an approved Acid Sulfate Soil Management Plan.[4]
P5	Any development that involves the excavation or filling of land is carried out in such a way that 'no worsening' of floodwater levels or flows results.	**A5**	No Acceptable Solution specified. *Note: No net worsening of floodwater levels or storage at any location, not otherwise approved, results from the excavation or filling. Excavation or filling on Flood Prone Land is carried out in accordance with an approved hydrology and hydraulics report, prepared by a suitably qualified person that demonstrates that any proposed excavation, filling or structure will not adversely affect flood levels or flows on the site, upstream of the site and downstream of the site i.e. no net loss in flood storage or increase in flood levels.*
P6	Any development does not adversely affect the visual character of the locality and areas of high scenic amenity and visibility. *Note: Areas of high scenic amenity and high visibility are the*	**A6**	No Acceptable Solution specified.

[4] The potential for Acid Sulfate Soils is to be determined based on the results of an Acid Sulfate Soil Investigation Report prepared in accordance with sections 6, 7 and 8 of the *State Planning Policy 2/02 Guideline for Planning and Managing Development involving Acid Sulfate Soils* and submitted with the development application. When not a referral agency, the Council will seek advice from the Department of Natural Resources and Mines under section 3.2.7 of IPA. When satisfactory and prepared in accordance with the guideline, the report will be approved by Council with the development application When an Acid Sulfate Soil Investigation Report identifies that there is potential for Acid Sulfate Soils, works can only occur if an Acid Sulfate Soil Management Plan is prepared in accordance with sections 9 and 10 of the *State Planning Policy 2/02 Guideline for Planning and Managing Development involving Acid Sulfate Soils* and submitted with the development application. When not a referral agency, the Council will seek advice from the Department of Natural Resources and Mines under section 3.2.7 of IPA. When satisfactory and prepared in accordance with the guideline, the report will be approved by Council with the development application.

Performance Criteria		Acceptable Solutions	
	Berserker Ranges, the Fitzroy River, the Botanical Gardens and other natural areas or locations.		
P7	Traffic generated by excavation or filling does not adversely impact on the amenity of the surrounding area.	**A7.1**	Haulage routes used for the transportation of fill to or from the site only use Major Streets as well as any Minor Street that is necessary to provide direct access to the site from the road network.
		A7.2	**AND** Truck movements generated by excavation or filling of a site do not exceed 20 truck movements per day.
		A7.3	**AND** Truck movements generated by excavation or filling of a site do not occur for longer than 4 weeks within any 3 month period.
P8	Excavation or Filling is carried out in a manner that will not; (a) damage, or result in damage to, existing infrastructure; or (b) compromise the safety of existing infrastructure[5].	**A8**	In respect to Electricity Works, excavation or filling does not occur within; (i) 10 metres of any tower, pole, foundation, ground anchorage or stay supporting electric lines or associated equipment; or (ii) 5 metres of a substation site boundary; or (iii) 2 metres of a padmount substation; or (iv) 1 metre of a padmount transformer or an underground cable unless an approval from the owner of the Electricity Works is granted stating otherwise.

[5] Development involving excavation or filling on Land Contiguous to Electricity Works should be referred to the relevant electricity entity (likely to be Ergon Energy Corporation Limited) to ensure there will be no electrical hazard created by the proposed development, before any application is lodged with Council. Regard should be had to maintaining the minimum safety clearances specified in the *Electrical Safety Regulation 2002*.

HERITAGE PLACE CODE

1 Purpose of the Code

The purpose of this code is to ensure that development on or adjoining a heritage place maintains the heritage significance of the place by;

- ensuring that development does not detract from the cultural heritage significance of the heritage place;
- ensuring that development respects and incorporates any relevant aspects of Indigenous cultural interests and values in the heritage place;
- ensuring that the impacts of development on the heritage place are assessed and mitigated;
- ensuring that development does not degrade, disturb or cause encroachment on the heritage place;
- conserving the biodiversity and geodiversity[1] of the heritage place; and
- protecting any ecological corridor linkages of the heritage place to other natural areas.

To do so, this code includes heritage controls with the purpose of retaining local places of cultural and natural heritage significance to ensure their ongoing survival for future generations.

2 Application of the Code

The provisions of this code apply to any building works (defined in Section 3 Definitions below), Reconfiguring a Lot and operational works, on a heritage place that is listed on the Heritage Place Register for Rockhampton in the Rockhampton City Plan. The code also applies to new buildings, including extensions to a building, and subdivision on sites adjoining heritage places.

The Heritage Place Register for Rockhampton is included in **Planning Scheme Policy No. 4 – Heritage Register**. Heritage Places entered onto the Queensland Heritage Register under the *Queensland Heritage Act 1992* are not included in the Heritage Place Register for Rockhampton as the *Queensland Heritage Act 1992* regulates the impact of development on the State listed heritage places. Therefore, this code is not applicable for the assessment of development impacts on places on the Queensland Heritage register which instead will be assessed under the provisions of the relevant State heritage legislation.

[1] The term is used so as to ensure all aspects of the abiotic environment, be they geological, geomorphological or pedological, etc are considered. Geodiversity includes the range of geological, geomorphological and soil features, assemblages, systems and processes. Many geo features have formed under conditions, climatic or geological, that are now inactive. They are essentially relict or "fossil" features that once disturbed, will never recover or will be removed forever. (*Source: Conserving Geodiversity, The Importance Of Valuing Our Geological Heritage, website for the Department of Primary Industries, Water and Environment, Tasmania*).

This code is not applicable to minor repair and maintenance works, as defined in Chapter 3 of this Planning Scheme.

There are no Secondary Codes to this Code.

3 Definitions

There are no definitions specific to this code.

4 Explanation

This code is used to assess the impact of development on the site of a heritage place. The code sets out the criteria for assessing development on or adjoining a heritage place. The assessment criteria is based on the standard for heritage reporting in Australia – The ICOMOS Charter for the Conservation of 'Burra Charter' Places of Significance 1998. This is an appropriate approach to heritage assessment given that the significance of a place could be for a range of cultural values including (but not limited to) historical, social, technological or architectural values. Accordingly, the acceptable solution is not a development standard but a report assessing the change against the criteria set out the ICOMOS Charter.

5 Performance Criteria and Acceptable Solutions

Part A - Development of or on a Heritage Place

Performance Criteria	Acceptable Solutions

P1	The proposal respects the cultural significance of the heritage place and ensures its ongoing survival.	**A1**	No Acceptable Solution specified. *Note: A report accompanying the application verifies that the proposal has been prepared in accordance with the Australia ICOMOS Charter for the Conservation of 'Burra Charter' Places of Cultural Significance 1998.*
P2	The proposal is based on, and takes account of, all aspects of the cultural significance of a place.	**A2**	No Acceptable Solution specified. *Note: A report accompanying the application verifies that the proposal has been prepared in accordance with the Guidelines to the Burra Charter: Cultural Significance.*
P3	The proposal protects the fabric and setting of the heritage place, while providing for its use, interpretation and management.	**A3**	No Acceptable Solution specified. *Note: A report accompanying the application verifies that the proposal has been prepared in accordance with the Guidelines to the Burra Charter: Conservation Policy.*
P4	The proposal is based on the issues relevant to the conservation of the heritage place, with appropriate opportunity for community comment on the findings.	**A4**	No Acceptable Solution specified. *Note: A report accompanying the application verifies that the proposal has been prepared in accordance with the Guidelines to the Burra Charter: Procedures for Undertaking Studies and Reports.*
P5	The proposal does not impair culturally significant attributes of the heritage place identified by the Indigenous people for whom the place is significant.	**A5**	No Acceptable Solution specified.

Part B - Development on land adjoining a heritage place

Performance Criteria	Acceptable Solutions
Operational works and changes to buildings	
P1 The proposal is sympathetic to and consistent with the values sought to be protected in the setting of the adjoining heritage place.	**A1.1** Views of the heritage place from public spaces are maintained where the views contribute to the community knowledge, understanding and appreciation of the heritage place and will not be damaged or reduced in quality by the proposal. **A1.2** **AND** Views from the heritage place are maintained where they contribute to the knowledge, understanding and appreciation of the heritage values of the heritage place and will not be damaged or reduced in quality by the proposal. **A1.3** **AND** The proposal will not unreasonably overshadow the adjoining heritage place (in part or in total) and includes appropriate setbacks to protect the values sought to be protected at the heritage place. **A1.4** **AND** Landscaping on the site is sympathetic to and consistent with the species composition of landscaping on the adjoining heritage place (if it exists).
Sub division	
P2 The sub division will not result in development or potential future development that will detract from or damage the setting of the adjoining heritage place and will not: (a) block or interfere with significant views, or (b) over shadow; or (c) damage the landscape/setting of the adjoining heritage place.	**A2** No Acceptable Solution specified.

SIGNAGE CODE

1 Purpose of the Code

The purpose of this code is to provide for the planning and management of signage within the City for any purpose ensuring that signage does not, or does not have the potential to, adversely impact or affect;

(a) any person, vehicle or property in respect to safety and visual amenity; and/or

(b) the visual amenity or character of the City as an important element in the City's image,

by;

- Ensuring that Advertising Signs compliment and are consistent with the character of the surrounding area;
- Ensuring that Advertising Signs do not detract from a positive and attractive City Image;
- Providing a fair, safe and consistent means of displaying Advertising Signs;
- Ensuring Advertising Signs do not obscure the view of any official traffic sign, or street name or obstruct or impede access to or from any doorway or fire escape;
- Minimising the visual impact of Advertising Signage and ensuring that Advertising Signs do not contribute to visual clutter; and
- Not encouraging contributor's to the proliferation of signage such as 'Third Party Signage'.

2 Application of the Code

This code applies to all development that is operational works for the purposes of placing an advertising device (an Advertising Sign) on premises. This code applies to the placing of an Advertising Sign on any premises, irrespective of whether it is in association with a material change of use. In accordance with the definition of premises under the *Integrated Planning Act 1997*, premises includes land and is taken to include road reserves, waterways, railway corridors, and the like.

Planning Scheme Policy No. 9 – Signage defines the different Sign Types that all Advertising Signs are divided into. For the purposes of assessing operational works for an Advertising Sign, section 5 of this code is divided into a Part A and B, whereby Part A is to be used for the assessment of self assessable development. In the instance where self assessable development is unable to comply with the stated Acceptable Solutions and therefore becomes, because of that, Code Assessable development, it is still assessed against Part A of this Code. In contrast, Sign Types that are nominated in a Level of Assessment Table for an Area as either Code or Impact Assessable development are assessed against Part B of this code. In support of Parts A and B is Part C which nominates Acceptable Solution relevant to each Sign Type.

This code also makes reference to signs that in certain instances are exempt development as specified in section 3.3 of this planning scheme.

This code will only apply in the instances when those signs are not exempt development. As an example, while bunting is referred to in this code, if it is installed for a duration that defines it as a Temporary Sign, it is exempt and not subject to the requirements of this code. However, if installed for a duration that defines it as an Advertising Sign, it is subject to the requirements of this code. Planning Scheme Policy No.9 – Signage, defines the different Sign Types that are each listed under an assessment category in Schedule 1 of that policy for the purposes of being referred to in Level of Assessment Tables for different Areas.

There are no Secondary Codes to this Code.

The manner in which this Code will apply to the different Levels of Assessment for different types and categories of Signage is as follows.

Exempt Development

Advertising Signs that are exempt development are not subject to the requirements of this code and are onlycontrolled by the Council's Local Law.

Self Assessable Development

Some Advertising Signs are nominated in the Level of Assessment Table for a particular Area as Self Assessable development and are therefore subject to the requirements of this code. These signs, while controlled by this code, do not require approval for Operational Works if they comply with the relevant Acceptable Solutions in Part A of section 5. If unable to comply with these Acceptable Solutions, these signs become Code Assessable development unless stated otherwise in the Level of Assessment Table for a particular Area.

Advertising signs that are self assessable development are also required to comply with any requirements set out in the Council's Local Law. Any advertising sign also requiring approval under the *Building Act 1975* (or as otherwise amended) must comply with the requirements of that Act.

Code Assessable Development

Some advertising signs are nominated in the Level of Assessment Table for a particular Area as code assessable development and are therefore subject to the requirements of this code. These signs require approval from Council for Operational Works under this code. Any sign nominated as Self Assessable development but unable to satisfy any of the Acceptable Solutions for Self Assessable development also becomes Code Assessable development and requires an approval for Operational Works under this Code. These advertising signs are assessed against and required to comply with section 5 Part B of this code.

Any Advertising Sign that is Code Assessable development and unable to satisfy the Performance Criteria listed in this Code, is to be taken to be development that is not preferred in the City.

Impact Assessable Development

Sign Types nominated in the Level of Assessment Table for a particular Area as Impact Assessable development are not preferred at any time due to their impacts, or contribution to impacts, on the visual amenity of a locality or the City, and accordingly the City Image.

3 *Definitions*

Advertising Sign: As defined in section 3.7 of this planning scheme.

Flashing Sign: As defined in section 3.7 of this planning scheme.

Freestanding Sign: As defined in section 3.7 of this planning scheme.

Illuminated Sign: As defined in section 3.7 of this planning scheme.

Maximum Sign Face Area: Determined in accordance with section 2 of Planning Scheme Policy No. 9 – Signage.

Moving or Variable Message Signs: Is an advertisement with a changing display, that may include a flashing sign and/or chasing bulbs. A 'Tri-vision' advertisement (where parallel segments rotate at intervals to change a display) are not a Moving or Variable Message Sign.

Sign: Means an Advertising Sign.

Sign Face Area: Is measured as either of the following;

(a) Where the sign is attached to a building/structure or is freestanding, the Sign Face Area is measured from the outside edges of the sign; or

(b) Where the sign is painted or applied directly to a surface, the Sign Face Area is measured from the outside edges of all graphics, measured in a straight line, and inclusive of all spaces and breaks between letters, words or images.

Sign Maintenance: As defined in section 3.7 of this planning scheme.

Sign Type: The definitions for the different types of Advertising Sign mentioned in this code as set out in Planning Scheme Policy No. 9 - Signage. The diagram or picture is also a part of the respective definition for each sign type as one example of the sign type.

Third Party Sign: As defined in section 3.7 of this planning scheme.

4 *Explanation*

This code sets out the requirements for Advertising Signs in Rockhampton City. Part C of Section 5 of this Code is divided in to 2 parts, Part C1 and C2. Part C1 sets out Acceptable Solutions for each Sign Type whereas Part C2 sets out Acceptable Solutions for each sign category. Any Advertising Sign nominated as Self Assessable development is only required to comply with the Acceptable Solutions listed in Part A. Advertising Signs that become Code Assessable development because they are unable to meet the Acceptable Solutions set out in Part A, are

assessed against the Performance Criteria of Part A of this code. The Performance Criteria and Acceptable Solutions in Part B of Section 5 of this code only apply to Advertising Signs stated in a Level of Assessment Table as being;

(a) Code Assessable development, or
(b) Impact Assessable development

except in those instance when an Advertising Sign becomes Code Assessable development because it does not meet the Acceptable Solutions set out in Part A for Self Assessable development.

Within Part C2 of this code is a "Sign Category List" that contains Acceptable Solutions for different categories of Advertising Signs. These Acceptable Solutions apply in addition to the Acceptable Solutions for each respective Sign Type in Part C1 and are to be treated as an extension to the list in Part C1. Part C2 of this code applies when an Advertising Sign of any Sign Type also falls within the definition of the Sign Category.

Example: A Ground Sign Type that is not illuminated needs to comply with Part C1, however if it were illuminated it would need to comply with the Acceptable Solution for the Illuminated Sign category in Part C2 also.

As stated in section 2 above and in Chapter 3 of this Planning Scheme, Temporary Signs are exempt development and therefore do not need to comply with the requirements of this code. Every type of Advertising Sign is defined in Planning Scheme Policy No. 9 – Signage.

Example: A Banner advertising a sale is displayed in a general location on a building for less than 14 days in a 3 month period. Therefore, the Banner is exempt from the requirements of this code. However, if it were displayed for a longer period of time it would be Assessable Development and unless nominated as Self Assessable development in the Level of Assessment Table for the Area where proposed, the Banner would require approval from Council.

5 Performance Criteria and Acceptable Solutions

PART A – SELF ASSESSABLE ADVERTISING SIGNS	
Performance Criteria	**Acceptable Solutions**
P1 Advertising signs are; (a) Of a size that does not adversely impact on the amenity or character of an area; and (b) Designed and located in a manner that is integrated into other development on the premises and does not dominate the visual impression of a premises; and (c) Constructed of durable materials; and (d) Located where they do not impede vehicle or pedestrian movements or reduce pre existing safety levels; and (e) Controlled in number and size to prevent a proliferation of unnecessary signage; and (f) only used as a Third Party Sign if[1]: (1) in a Commercial or Industrial Area or Precinct; and (2) on private freehold land lawfully being used for a commercial or industrial purpose.	**A1.1** The Sign complies with the Acceptable Solutions listed in Part C1 and Part C2 for the respective Sign Type or Sign Category. **AND** **A1.2** The Sign is not constructed of cardboard, paper or plastic. *Note. The intention is not to allow the use of any material that is capable of being torn by a person or damaged in a single rain event by water damage.* **A1.3** **AND** The Sign is maintained at all times on the premises by the owner of the premises to the same standard as it was when it was installed and secured to any supporting structure or device. **A1.4** **AND** The Sign is not a Third Party Sign. **A1.5** **AND** The maximum Total Sign Face Area for any premises is limited to the higher of the areas calculated using the following methods: (i) Boundary Length Method (refer to Planning Scheme Policy No. 9 – Signage) (ii) Building Elevation Method (refer to Planning Scheme Policy No. 9 - Signage)

[1] There are unlikely to be any instances when Third Party Signage is Self Assessable development, however this clause has been included in the event that it is. Third Party Signage in most instances will be either Exempt or Impact Assessable development.

PART A – SELF ASSESSABLE ADVERTISING SIGNS	
Performance Criteria	**Acceptable Solutions**
Heritage	
P2 Advertising adjacent to or located on a place of heritage significance is designed and sited so as to; (a) be compatible with the heritage significance of the heritage place and not detrimentally impact its values or its setting; and (b) not obscure the appearance or prominence of the place when viewed from adjacent public or semi-public streets or open spaces, nor intrude into that place	**A2** The Sign is not proposed; (i) on a premises; or (ii) on a premises that is adjacent to other premises; that is listed as a Heritage Place under the **Planning Scheme Policy No. 4 - Heritage Register** contained in this Planning Scheme or on the State Heritage Register.

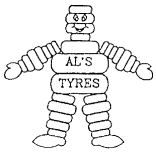
PART B – CODE [2] OR IMPACT ASSESSABLE ADVERTISING SIGNS	
Performance Criteria	**Acceptable Solutions**
P1 Advertising signage is; (a) located and is of a size that prevents any adverse impacts of Advertising Signage on; (1) the visual amenity or intent of an Area or stretch of road within its landscape, and (2) road or pedestrian user safety; and (3) the operations of the Rockhampton Airport; (b) designed and located in a manner that is integrated into other development on the premises and does not dominate the visual impression of a premises; and (c) constructed of durable materials; and (d) located where they do not impede vehicle or pedestrian movements or reduce pre existing safety levels; and (e) controlled in number and size to prevent a proliferation of unnecessary signage;	*In partial satisfaction of P1* **A1.1** The maximum Total Sign Face Area for any premises is limited to the higher of the areas calculated using the following methods: (i) Boundary Length Method (refer to Planning Scheme Policy No. 9 – Signage) (ii) Building Elevation Method (refer to Planning Scheme Policy No. 9 - Signage) **AND** **A1.2** Advertising signage along roads where the speed limit is 90km/hr or more is not located: (i) Within 200 metres of (1) an existing Advertising Sign or the approved location of any other proposed Advertising Sign, facing the one direction of travel, or (2) any constructed road intersection; AND (ii) Within 6 metres of a boundary of the parcel of land upon which it is to be erected. **A1.3.1 AND** Advertising signage is not located in a Residential Area or Residential Consolidation Area (but permitted in a commercial precinct within a Residential or Residential Consolidation Area); **A1.3.2** **OR** Advertising signage in a Residential Area or Residential Consolidation Area is only for the purposes of a Home Based Business, Home Occupation or a Bed and Breakfast and complies with the Home Based Business and Home Occupation Code or the Bed and **A1.3.3** Breakfast Code, whichever is applicable. **OR** Advertising signage in a Residential Area or Residential Consolidation Area is only for the purposes of advertising a lawful, non-residential land use on the same premises as the **A1.4** Advertising Sign that is existing or approved to be developed in the Area. **AND** Advertising Signage; (i) does not penetrate the Obstacle Limitation

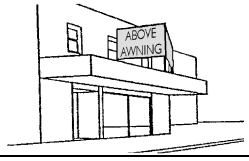
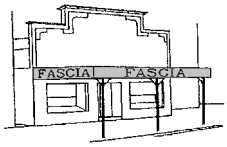
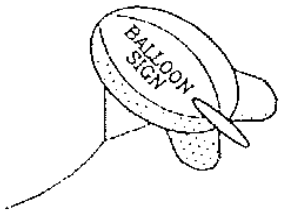
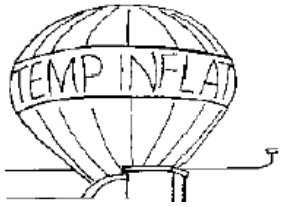
[2] Advertising Signs that are Code Assessable development because they do not meet the Acceptable Solutions in Part A are still assessed against Part A and not Part B.

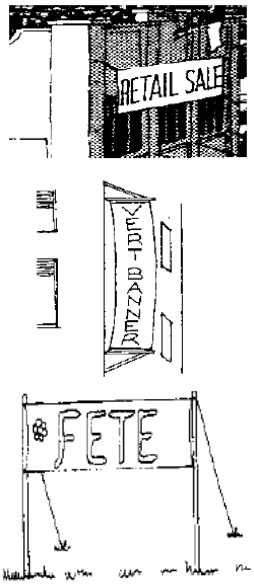
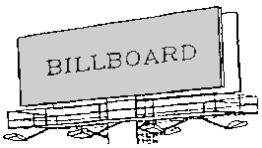
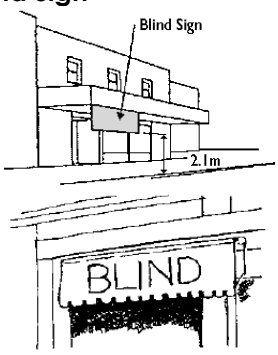
PART B – CODE 2 OR IMPACT ASSESSABLE ADVERTISING SIGNS	
Performance Criteria	**Acceptable Solutions**
	A1.5 Surface of the Rockhampton Airport as identified on Airport Code Map 2 located within the Airport Code; or (ii) is no higher than the Height Limit stated on Planning Scheme Map 3 **AND** **A1.6** The Sign complies with the Acceptable Solutions listed in Part C1 and Part C2 for the respective Sign Type or Sign Category. **AND** The Advertising Sign complies with the Design Criteria specified in **Planning Scheme Policy No. 9 – Signage** applicable to the Sign Type or Sign Category.
P2 Advertising signage is designed and constructed to avoid clutter and is compatible and consistent with, or enhances, the existing streetscape and City Image.	**A2** No Acceptable Solution provided.
P3 Advertising signage does not cause or contribute to a traffic safety hazard or a public safety hazard by way of; (a) not being constructed or located in such a way that the visibility of any traffic sign or street name is obscured to a vehicular road user; or (b) not being constructed or located in such a way that access to or from any building door, fire escape or fire hydrant is obstructed; or (c) being a distraction to the drivers of vehicles; or (d) complying with the	*In partial satisfaction of P3* **A3** Moving or variable message signs are not located: (i) adjacent to any road which has a regulated maximum traffic speed of more than 90km/hr; and (ii) within 100m of an intersection controlled by traffic signals or 50m of any other intersection. *Note:* *Advertising Signs along or adjacent to a state controlled road may require an approval from the responsible state government department and should be referred to that government department. Where there is an inconsistency between the requirements of this code and the requirements of the responsible state government department (when and where they apply), the requirements of that department will prevail because the concerns of the department are safety orientated.*

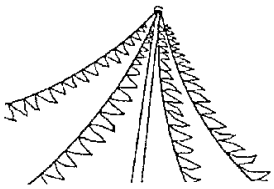
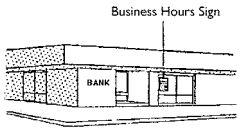
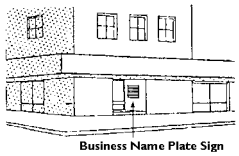
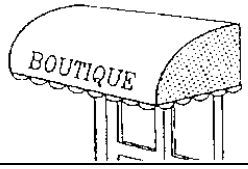
PART B – CODE [2] OR IMPACT ASSESSABLE ADVERTISING SIGNS	
Performance Criteria	**Acceptable Solutions**
minimum safety clearances in the *Electrical Safety Act 2002* and *Electrical Safety Regulation 2002*.	
P4 Signage is located to ensure that all members of the community have equitable access to advertising space in locations where it is intended, consistent and appropriate, having regard to the Intent of each Area or Precinct.	**A4.1** Advertising signs that are displayed relate exclusively to: (i) the name of the occupier of the building, or persons carrying on, conducting or practising therein any trade, business or calling; or (ii) the trade, business or calling then being so carried on, conducted or practised; or (iii) goods or commodities actually or ordinarily on sale or for hire in the normal course of business on the premises; or (iv) services actually or ordinarily available in the normal course of business on the premises; or (v) any combination of the above. **A4.2** **OR** Advertising signage is proposed for the intention of being used for the purposes of Third Party Signage only if it is located in a Commercial or Industrial Area or Precinct and on private freehold land lawfully being used for a **A4.3** commercial or industrial purpose. **OR** A maximum of one (1) advertisement for each real estate agency on each road frontage is **A4.4** displayed on any premises indicating that the same are for sale or lease. **OR** One advertisement on a parcel of land on which a building is being or is to be erected giving particulars of such buildings and the names, addresses descriptions of the owner, architect, engineer, builder and other person(s) concerned in the erection of the building;
P5 Third Party advertising signs, do not; (a) contribute to a proliferation of signage within the City; or (b) represent a duplication of other signage already existing; or (c) detrimentally affect	**A5** No Acceptable Solution specified.

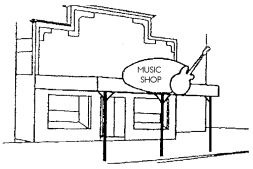
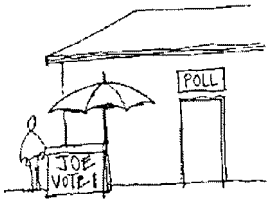
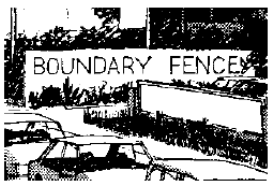
PART B – CODE [2] OR IMPACT ASSESSABLE ADVERTISING SIGNS	
Performance Criteria	**Acceptable Solutions**
the visual character or amenity of an Area, Precinct or a road including its associated landscape.	
Heritage	
P6 Advertising adjacent to or located on a place of heritage significance is designed and sited so as; (a) to be compatible with the heritage significance of the heritage place and not detrimentally impact its values or its setting; and (b) to not obscure the appearance or prominence of the place when viewed from adjacent public or semi-public streets or open spaces, nor intrude into that place	**A6** The Sign is not proposed; (i) on a premises; or (ii) on a premises that is adjacent to other premises; that is listed as a Heritage Place under the **Planning Scheme Policy No. 4 - Heritage Register** contained in this Planning Scheme or on the State Heritage Register.

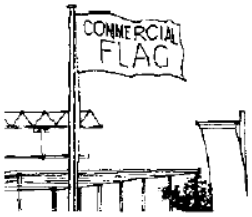
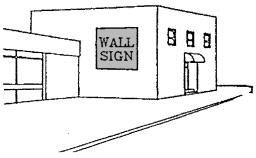
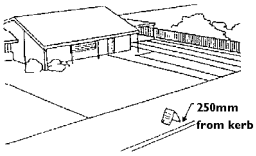
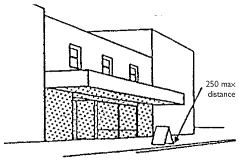
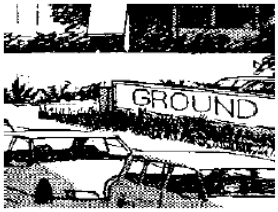
PART C1 – ACCEPTABLE SOLUTIONS FOR ALL SIGN TYPES	
SIGN TYPES LIST	
Specific Sign Type	**Acceptable Solutions**
3-Dimensional Sign 	(a) There is only 1 (one) 3-Dimensional Sign on any premises; and (b) Any sign only advertises a product or service available on the premises on which it is displayed; and (c) The sign has a maximum height that complies with the requirements for a Free Standing Sign as stated in Part C2 of this code.

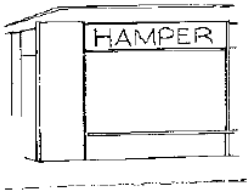
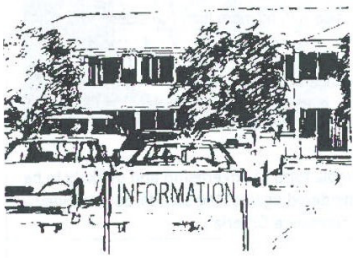
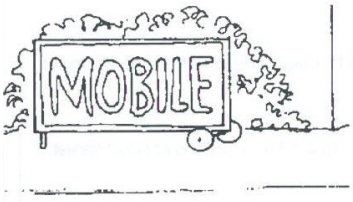
PART C1 – ACCEPTABLE SOLUTIONS FOR ALL SIGN TYPES	
SIGN TYPES LIST	
Specific Sign Type	**Acceptable Solutions**
Above Awning Sign 	**NOT PREFERRED**
Awning Fascia or Return Fascia Sign 	(a) The sign is fixed to the fascia of the awning and projects not more than 10cm from the fascia; and (b) The sign does not project above, below or to the side of the fascia outline.
Balloon/Kite Sign  	(a) the sign is only displayed for short term promotions (ie. discount sales, fetes etc) with the period of advertising not to exceed 1 month in any 3 month period; and (b) the sign is flown within the boundaries of the property and the height of the sign does not encroach into the Obstacle Limitation Surface of the Rockhampton Airport (as defined in the Airport Code); and (c) the application seeking a development approval for operational works is accompanied by a certificate from a structural engineer certifying the structural adequacy of the tie down and anchorage of the sign; and (d) a public risk policy to the value of $10,000,000 or an amount as otherwise determined by Council, is taken out against any claims for damages or injury to any person or thing caused by the flying of the sign; and (e) There is a maximum of one (1) Balloon/Kite sign per premises; and (f) A Balloon has a maximum height of 7 metres when fully inflated and any Kite has a maximum surface area of 4m^2; and (g) the sign is not secured to public property; and (h) the sign is displayed clear of any overhead power lines and in a position where if deflation occurs or the kite falls, the Balloon/Kite Sign will not fall onto adjoining properties or a road; and (i) any sign does not involve or use a non electric motor to keep it flown or inflated and any balloon used is a cold air balloon, all to reduce noise generation.

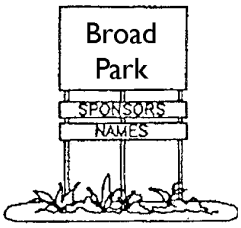
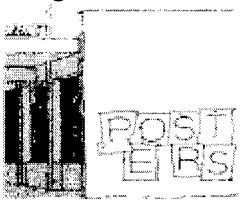
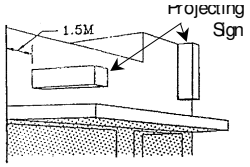
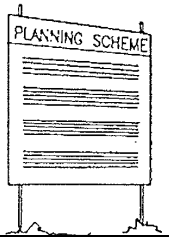
PART C1 – ACCEPTABLE SOLUTIONS FOR ALL SIGN TYPES	
SIGN TYPES LIST	
Specific Sign Type	**Acceptable Solutions**
Banner Sign 	(a) The sign face area does not exceed 8m^2; and (b) the sign is displayed for short term promotions only (ie. Discount sales, fetes, etc) with the period of advertising not exceeding 1 month in any 3 month period; and (c) only one (1) sign is displayed on any one street frontage per premises; and (d) the sign is located only on the premises being advertised; and (e) adequate air holes are provided to enable the sign to withstand normal wind conditions and to prevent unnecessary forces acting on the supporting structure.
Billboard Sign 	(a) the sign face area is a maximum of 18m^2 per side; and (b) only one (1) Billboard Sign (double or single sided) is located on any one (1) premises; and (c) the sign complies with the design criteria for a Freestanding Sign as stated in Part C2 of this code; and (d) the sign is located to ensure that the back of the sign is not exposed to, or visible from, any public place; and (e) the sign is supported on single or multiple pylons to avoid unsightly back bracing; and (f) where visible to a public place, the area below the sign is landscaped with plants that have a mature height less than the height of the bottom of the sign above ground; and (g) regardless of whether the billboard is for first party or third party signage, there is a separation distance between billboards of at least 50 metres.
Blind Sign 	(a) the sign is consistent in colour and design with the awning, verandah or building on which it is attached in order that it compliments and does not detract from, the character of the building; and (b) the sign is made of a material that flexible in nature (such as canvas) and does not contain any solid face; and (c) the bottom of the sign is a minimum of 2.1m above the surface of the ground or footpath; and (d) the sign face area does not exceed 50% of the area of the blind.

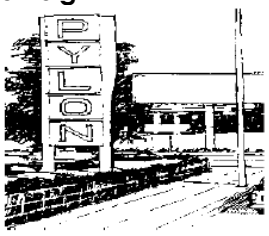
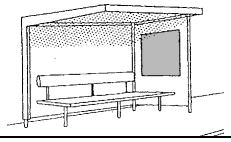
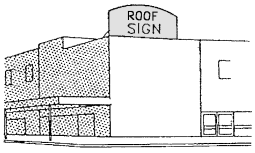
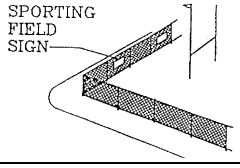
PART C1 – ACCEPTABLE SOLUTIONS FOR ALL SIGN TYPES	
SIGN TYPES LIST	
Specific Sign Type	**Acceptable Solutions**
Bunting 	(a) Bunting is not erected above a public roadway; and (b) Bunting is displayed only in association with • a Vehicle Showroom; or • an auction / sale of a premises, or • a fete, and (c) Bunting for a fete or auction / sale is only erected up to two (2) weeks prior to the event and removed the following business day; and (d) the arrangement of Bunting on a premises is in an orderly manner, without proliferation; and (e) Bunting consists of quality material and is maintained to a high standard; and (f) Bunting is securely fixed to structures capable of the wind loadings; and (g) Bunting does not hang less than 2.6 metres above the ground.
Business Hours Sign 	(a) only one (1) sign is displayed per entry point; and (b) the sign face area of each sign does not exceed 0.25m^2 (typically 900mm x 280mm); and (c) the sign is fixed to a wall or glazed panel.
Business Name Plate Sign 	(a) only two (2) signs are displayed per entry point; and (b) the sign face area of each sign does not exceed 1m^2 except for a Home Occupation, Home Based Business or Bed and Breakfast which instead has a sign face area that complies with the Performance Criteria of the respective use code; and (c) Where a Business Name Plate Sign incorporates a Business Hours Sign, the sign face area does not exceed (b) above and the sign (despite (c) for a Business Hours Sign) is not required to be fixed to a wall or glazed panel.
Canopy Sign 	The sign face area of the sign does not exceed 25% of the canopy's surface area.

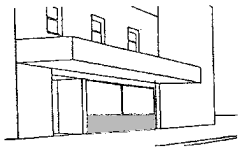
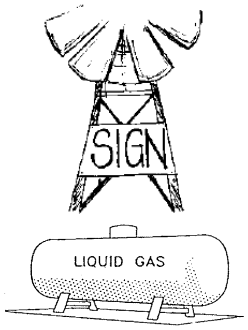
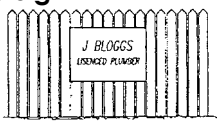
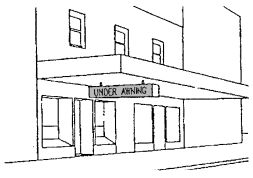
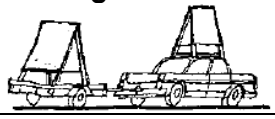
PART C1 – ACCEPTABLE SOLUTIONS FOR ALL SIGN TYPES	
SIGN TYPES LIST	
Specific Sign Type	**Acceptable Solutions**
Created Awning Sign 	(a) the sign is flush with the fascia of the awning; and (b) the sign does not detract from, or interfere with, the architectural appearance or design elements of the building; and (c) the sign does not project more than 600mm beyond the edges of the fascia to which it is attached; and (d) the sign is not longer than 50% of the length of the fascia to which it is attached and is centrally located on the fascia; and (e) the sign is not closer than 2.4 metres to the ground; and (f) the area of the sign extending beyond the fascia does not exceed 25% of the total area of the fascia.
Election Sign 	(a) the sign has a maximum sign face area of 1.2m^2 per premises with a maximum of one (1) sign per premises; and (b) the sign (other those mentioned in (f) below) is only erected in the window of a building that is the main local electoral office of any candidate, registered political party or group, or if necessary attached to the aforesaid building; and (c) the sign does not contravene any law of the State of Queensland or the Commonwealth of Australia relating to electoral advertising; and (d) the sign has clearly printed on it the name and address of the person who authorised the display; and (e) the sign is displayed for no more than six (6) weeks prior to the date of the election and no longer than one (1) week thereafter; and (f) candidates, registered political parties or groups are entitled to have one (1) additional Election Sign no more than fifty (50) metres from the entrance of each designated pre-polling and election day polling centre subject to: (i) the sign face area does not exceed 1.2m^2; and (ii) the sign is not in a position that prevents, restricts or impedes public access to the pre-polling and polling centres;
Fence Sign  	(a) the sign face area of the sign does not exceed 3m^2; and (b) the sign is no greater than 1 metre in height; and (c) the sign is flush with the fence and the top edge of the sign does not extend above the height of the fence at the location along the fence where the sign is affixed.

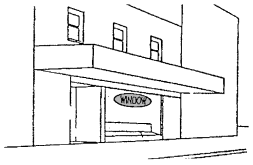
PART C1 – ACCEPTABLE SOLUTIONS FOR ALL SIGN TYPES	
SIGN TYPES LIST	
Specific Sign Type	**Acceptable Solutions**
Flag Sign 	(a) the Flag Sign has a maximum height of ten (10) metres; and (b) the pole or mast shall be structurally adequate to withstand any likely loadings, and (c) the sign is of a height that does not encroach into the Obstacle Limitation Surface of the Rockhampton Airport (as defined in the Airport Code).
Flush Wall Sign 	(a) the sign face area of the sign does not exceed 3m^2; and (b) the sign is located only on a part of a wall that is otherwise blank and the sign does not cover any opening (eg. window) or building design element (eg. finery, articulated brickwork, etc); and (c) the sign projects a maximum of 12mm from the wall; and (d) the sign does not project beyond the property boundary; and (e) the sign does not project above the eaves or parapet of the wall or the external edges of the building element to which it is applied to.
Footpath Real Estate Sign 	**No Requirements.** *Note. The* sign will need approval to be located in the road reserve by the Council in an approval issued under the Council's Local Law and will need to bein accordance with any conditions attached to an approval issued under the Local Law.
Footpath Sign 	**No Requirements.** *Note. The* sign will need approval to be located in the road reserve by the Council in an approval issued under the Council's Local Law and will need to be in accordance with any conditions attached to an approval issued under the Local Law.
Footpath Spinning Sign	**No Requirements.** *Note. The* sign will need approval to be located in the road reserve by the Council in an approval issued under the Council's Local Law and will need to be in accordance with any conditions attached to an approval issued under the Local Law.
Ground Sign 	(a) the sign face area is a maximum of 4m^2; and (b) the sign has a maximum height of 1.5m above the finished ground level; and (c) only one (1) sign is erected per premises.

PART C1 – ACCEPTABLE SOLUTIONS FOR ALL SIGN TYPES	
SIGN TYPES LIST	
Specific Sign Type	**Acceptable Solutions**
Hamper Sign 	(a) the sign does not project more than 12mm from the external surface of the building; and (b) the sign has a minimum clearance of 2m above the surface level of the ground or footpath.
Information Board Sign 	(a) the dimensions of the sign do not exceed 2 metres in height and 1.5 metres in width; and (b) for any sign not located within road reserve, the sign is located within 1.5 metres of a common boundary between the land and road reserve in order that the sign is visible from public space (unless the signage is providing directions within a site and is therefore located wherever necessary within the site), and (c) any sign located within road reserve does not obstruct pedestrian or vehicular movements as well as access to infrastructure within the road reserve;
Mobile Sign 	(a) the face area of a Mobile Sign is not to exceed 2.7m^2; and (b) for any sign not located within road reserve, the sign is not located in or on car parking spaces, site entrances or exits, landscaping areas or pedestrian pathways, and (c) any sign located within road reserve does not obstruct pedestrian or vehicular movements as well as access to infrastructure within the road reserve and is not located within 250mm of the back of the kerb line (or where there is no kerb line the edge of seal);
Newsagency Sign 	(a) the each sign has a maximum sign face area of 0.36m^2 (ie. 600mm x 600mm); and (b) (i) the sign is securely fixed to the wall of the building; or (ii) where the sign is to be located on the footpath (including tilted onto a wall, pole or the like) the sign complies with the design criteria for Footpath Signs excluding item (a).

PART C1 – ACCEPTABLE SOLUTIONS FOR ALL SIGN TYPES	
SIGN TYPES LIST	
Specific Sign Type	**Acceptable Solutions**
Park Sign 	(a) The sign is erected only within or on the boundary of any area of parkland; and (b) If the sign is proposed by a sporting club, the sporting club must carry out their activities within the area of parkland; and (c) The sign is not located within 5 metres of any part of the parkland used for an active sport or recreation purpose, and (d) Sponsor's messages on the sign do not represent more than 50% of the face area of each sign.
Poster Sign 	**Not Preferred**
Projected Image Sign 	**Not Preferred**
Projecting Sign 	(a) the sign is located at a minimum clearance of 3m above the surface level of the ground or footpath; and (b) the sign is located no closer than 1.5m to an adjoining allotment boundary; and (c) the sign; (i) is located no closer than 500mm from the kerb alignment with a maximum vertical dimension of 600mm; **or** (ii) does not exceed a vertical dimension of 7.5 metres with a maximum width of 750mm; and (d) the sign does not project above the roof line of the building. *Note. A combination of C(I) and C(ii) is not permitted as they are mutually exclusive of each other as Acceptable Solutions.*
Public Notification Sign 	**No Requirements.** *Note. The sign is still required to comply with the requirements of the relevant legislation that requires the display of the public notification sign.*

PART C1 – ACCEPTABLE SOLUTIONS FOR ALL SIGN TYPES	
SIGN TYPES LIST	
Specific Sign Type	**Acceptable Solutions**
Pylon Sign 	(a) the sign face area does not exceed 18m^2 per side; and (b) the sign complies with the design criteria for a Freestanding Sign as stated in Part C2 of this code; (c) the sign is supported on single or multiple pylons to avoid unsightly back bracing; and (d) the area below the sign is landscaped with plants that have a mature height less than the height of the bottom of the sign above ground; and (e) regardless of whether the pylon sign is for first party or third party signage, there is a separation distance between pylon signs of at least 50 metres.
Real Estate Sign 	(a) the sign face area of each sign does not exceed 1.2m^2; and (b) only one (1) sign is displayed per real estate agent, per street frontage, per premises; and (c) the sign is within the boundaries of the property being advertised or affixed to a fence located on the property boundary of the premises being advertised; and (d) the sign is removed not more than seven (7) days after; (i) the transfer of the property to its new owner, or (ii) the property is leased to a tenant.
Road Reserve Sign 	**No Requirements**
Roof Sign 	(a) The sign is not more 2.5m in height and does not extend above the maximum permissible height for development on the site; and (b) The sign is integrated with and compliments the design of the building; and (c) There is only one (1) roof sign on the premises.
Sign Written Roof Sign 	**NOT PREFERRED** in all instances, especially if the sign is greater than 10m^2 in area or greater than 50% of the area of the roof.
Sporting Field Fence Sign 	(a) the sign is a maximum of 1.2m in height; and (b) the sign faces inwards towards the sporting field and the back of the sign if exposed to the street is painted dark green or black.

PART C1 – ACCEPTABLE SOLUTIONS FOR ALL SIGN TYPES	
SIGN TYPES LIST	
Specific Sign Type	**Acceptable Solutions**
Stallboard Sign 	(a) the sign does not project more than 12mm from the external surface of the building; and (b) the sign does not project over or in front of a window glaze; and (c) the sign has a flush surface without projections of any type; and (d) the sign is made of a material or product that is water resistant.
Structure Sign 	(a) the sign face area does not exceed 3m^2; and (b) the sign does not cover more than 25% of the area of the structure. To remove any doubt, the area of a structure is measured within the boundaries of the structure (i.e. its outline) and includes any open space (eg the open space between 2 structural supports); and *Example: If the structure from one angle has an area of 4m^2, the maximum sign face area from that same angle is 1m^2. If at another angle, the same structure had an area of 8m^2, the maximum sign face area visible from that same angle is 2m^2.* (c) the sign projects no more than 12mm from the external surface of the structure and does not project beyond the edges of the structure.
Trade Sign 	(a) the sign face area is a maximum of 1.0m^2; and (b) the sign is only displayed for the duration of works carried out on the site and is removed on completion.
Under Awning Sign 	The sign; (a) is orientated at right angles to the building; and (b) has a minimum clearance of 2.5 metres between the sign and the footpath; and (c) is centrally located along the frontage of each shop or tenancy and in the case of an arcade, may also be located above the arcade entrance; and (d) is no closer than 3 metres to any other under awning sign; and (e) is no closer than 1.5 metres to the alignment of an awning or verandah return fascia or the alignment of another shop or tenancy; and (f) is not longer than 75% of the width of the awning or verandah to which it is attached with a maximum size of 0.6m high x 2.4m long x 0.2m in depth; and (g) does not project beyond the awning or verandah.
Vehicle Sign 	**NOT PREFERRED**

PART C1 – ACCEPTABLE SOLUTIONS FOR ALL SIGN TYPES	
SIGN TYPES LIST	
Specific Sign Type	**Acceptable Solutions**
Window Sign 	The sign does not result in; (a) that part of the ground floor windows between 0.8 metres and 2 metres above the floor level; or (b) any non ground floor window being more than 25% opaque

PART C2 – ACCEPTABLE SOLUTIONS FOR ALL SIGN TYPES

SIGN CATEGORY LIST

Specific Sign Category	Acceptable Solutions
Flashing Sign	(a) A minimum of 10% of the sign is illuminated at all times when the illumination of the sign is in operation and it is flashing;
Freestanding Sign	(a) the maximum height does not exceed that stated in **Planning Scheme Policy No. 9 - Signage** unless otherwise stated in this code; (b) the minimum spacing between any two Freestanding Signs on a premises is not less than the combined height of both signs multiplied by a factor of 2 (ie, a premises with two signs 6.0m and 3.0m in height will require a spacing of 18m); (c) the sign is not located closer than 3 metres to any side property boundary; (d) the sign face area of a Freestanding Sign does not exceed 35% of the Maximum Sign Face Area using the Boundary Length Method. To remove any doubt, three (3) or more signs on a premises will represent the Maximum Sign Face Area.
Illuminated Sign	(a) light does not spill beyond the site and/or create a nuisance to any adjoining property in accordance with the **Environmental Nuisance by Noise and Light Code**; (b) the advertising sign is designed and operated so as to ensure the amenity of an area is not detrimentally affected; (c) the intensity of any artificial light is maintained at a level to ensure any passing traffic is not blinded or otherwise distracted; (d) The luminance of an externally or internally illuminated sign (measured in candelas per square metre) does not exceed the levels shown below;

Location	Max Luminance
Commercial Area	500cd/m^2
Commercial Precinct within a Residential Planning Area	350cd/m^2
Industrial Planning Area	350cd/m^2
Residential Planning Area	300cd/m^2
Residential Consolidation Planning Area	300cd/m^2
Rural Planning Area	300cd/m^2
Special Use Planning Area	300cd/m^2
Environmental Protection Planning Area	300cd/m^2

CONCEPTUAL STORMWATER MANAGEMENT PLAN

Proposed Residential Subdivision
Lot 102 on RP860099 and Lot 129 on PI402
54-102 and 263 Belmont Road, Parkhurst

Glenmore Holdings (Aust) Pty Ltd

12 September 2019

File No: K4887-003-A

ROCKHAMPTON REGIONAL COUNCIL
ADDITIONAL PLANS APPROVED
24 October 2019
DATE
These plans are approved and now incorporated into the approved suite of plans subject to the current conditions of approval associated with
Development Permit No.: D/84-2014
Dated: 15 September 2015

Phone 07 5580 9777
Email eng@knobelengineers.com.au
Web knobelengineers.com.au
Address PO Box 41, Varsity Lakes Q 4227

KNOBEL ENGINEERS

DOCUMENT CONTROL SHEET

Title:	CONCEPTUAL STORMWATER MANAGEMENT PLAN
Document No:	K4887-0003
Original Date of Issue:	23 August 2019
Project Manager:	Aaron Pianta
Author:	Sarah Kirsch
Client:	Glenmore Holdings (Aust) Pty Ltd
Client Contact:	Russell Schirmer (Contour Consulting)
Client Reference:	54-102& 263 Belmont Road, Parkhurst
Synopsis:	This Conceptual Stormwater Management Plan describes the existing site characteristics, and corresponding stormwater quantity and quality management controls to be implemented during the construction and operational phase of the development.

Reviewed by RPEQ	Reg. No.	Signed	Date
Aaron Pianta	10423		23 August 2019

Revision/Checking History			
Revision No	**Date**	**Checked By**	**Issued By**
Draft	23 August 2019	Blake Stephens	Sarah Kirsch
A	12 September 2019	Blake Stephens	Sarah Kirsch

Distribution		
Recipient	**No of Copies**	**Method**
Contour Consulting – Russell Schirmer	1	PDF

The information contained within this report is provided in good faith in the belief that no information, opinions or recommendations made are misleading. All comments and opinions given in this report are based on information supplied by the client, their agent and third parties.

CONTENTS

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

1.1 Background

Knobel Engineers has been commissioned by Glenmore Holdings (Aust) Pty Ltd to prepare an amended *Conceptual Stormwater Management Plan* (CSWMP), to support a development application for the Material Change of Use and Reconfiguring of a Lot (2 Lots into 222 Lots) at 54-102 and 263 Belmont Road, Parkhurst.

The original CSWMP was prepared by Brown Consulting (Ref: R12394 – Stormwater Management Report) dated December 2014.

This CSWMP has been provided in response to an Information Request (IR) dated 26 March 2019 (Ref: D/84 -2014) which requests an updated "Stormwater Quality Report" and "Stormwater Management Report" to reflect the revised layout accompanying the current development permit. This report includes both the stormwater management and stormwater quality components requested from the IR.

In preparing this CSWMP Knobel Engineers has considered the management of quality and quantity of stormwater during both construction and operational phases, including sediment and erosion controls.

1.2 Objectives

This CSWMP details the planning, layout and design of the stormwater management infrastructure for both the construction and operational phases of this development.

This CSWMP aims to:

- Establish the required performance criteria for the proposed stormwater quantity and quality improvement systems;
- Provide a design of stormwater infrastructure including stormwater quality improvement devices;
- Ensure the quality of stormwater discharging from the proposed development does not adversely impact on the water quality and ecological values of downstream watercourses;
- Ensure stormwater runoff is conveyed through the site to a lawful point of discharge (LPOD) in accordance with QUDM; and
- Provide reporting and monitoring mechanisms whereby the performance of this system can be measured enabling identification of corrective actions/alterations required to ensure the above mentioned objectives are maintained.

This CSWMP has been prepared in accordance with the IEAust *Australian Runoff Quality: Guide to Water Sensitive Urban Design, Queensland State Planning Policy 2017*, IPWEA *Queensland Urban Drainage Manual Fourth Edition (2017),* Rockhampton Regional Council *SC6.18 City– Stormwater management planning scheme and* Design Guideline D5 –*Capricorn Municipal Development Guideline.*

1.3 Description of the Subject Site

1.3.1 Location

The subject site is located adjacent to Belmont Road in the suburb of Parkhurst and is situated along the Fitzroy River. The site has frontage to Belmont Road to the north east and backs onto the Fitzroy River, which runs along the site's western boundary. The subject site comprises of Lot 102 on RP860099 and Lot 92 on SP224420 and covers a combined area of 53.5 ha, with details as summarised in Table 1 below and as located in Figure 1.

Table 1: Site Description

Developer	Lot and Property Description	Street Address
Contour Consulting	Lot 102 on RP86009 & Lot 129 on PL4021	54-102 and 263 Belmont Road, Parkhurst

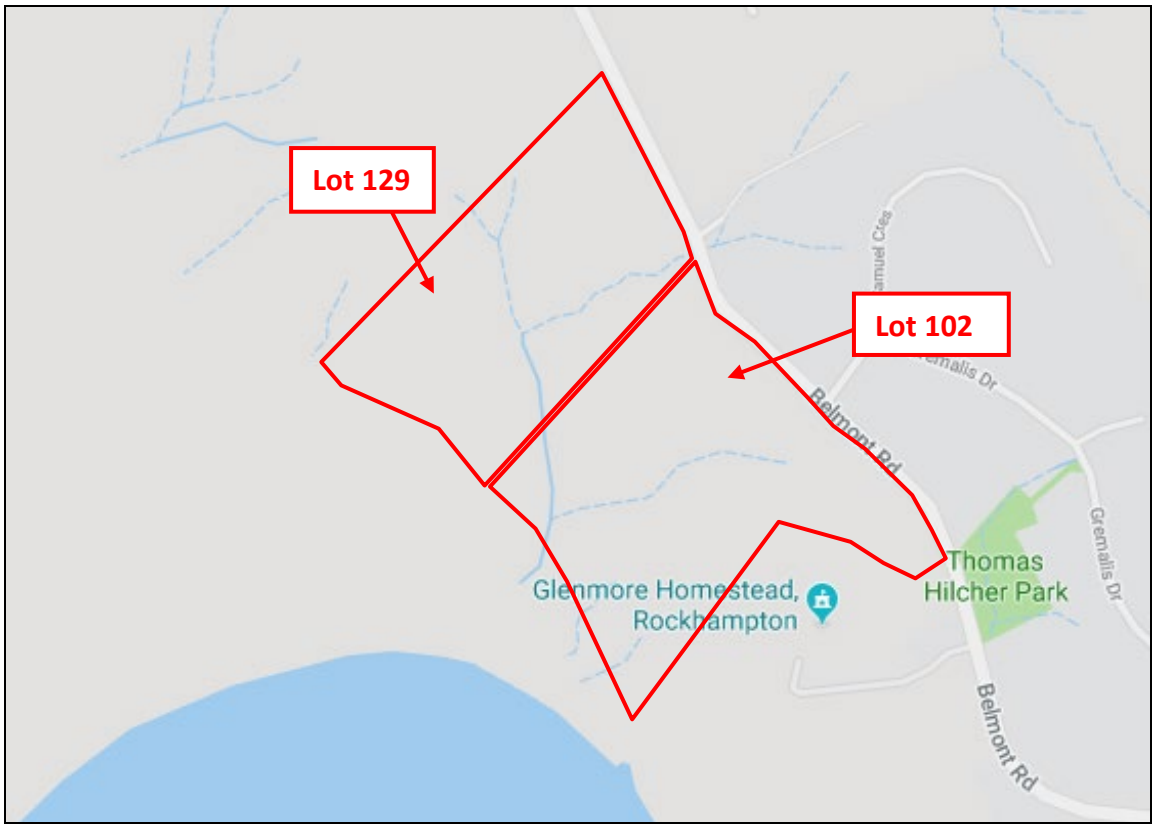


Figure 1: Site Location Plan (sourced from nearpmaps)

1.3.2 Site Topography

The subject site ultimately grades down to the southwest towards the junction of Ramsey Creek and the Fitzroy River. Spot heights on site range from RL 33 m AHD along the east boundary of the site to RL 4 m AHD along the banks of the Ramsey Creek/Fitzroy River junction with the grades varying throughout the site. There is an existing natural drainage path which runs through the middle of the subject site that discharges into the Ramsey Creek/Fitzroy River junction. Stormwater from the northeast and northwest of the subject site drain naturally into this channel which forms the major overland flow path for the pre development scenario.

1.3.3 Vegetation and Land Use

The Lots within the subject site are currently classified as being rural lots and mainly comprise of vacant land with average vegetation and grass coverage. A singular dwelling situated in the far eastern corner of the proposed development area is the only building within the subject development site. There are rural residential lots opposite to the subject site with the region to the south east being classified as special purpose land. Refer to Figure 2 for the aerial image of the subject site.

Figure 2: Aerial Photograph of the Site (sourced from CoGC City Plan Interactive mapping)

1.3.4 Description of Proposed Development

The proposed development for the site consists of a Material Change of Use for the Reconfiguration of a Lot from 2 into 222 Lots. Access to the site will be gained via Belmont Road to the north east, at the intersection of Samuel crescent and Belmont Road. There is a proposed internal road network which will connect different stages of the development. The average lot size for the proposed dwellings are greater than 1,000m^2 and as such are consistent with the surrounding land uses/zonings.

Figure 3 shows the proposed layout for the 222 Lot subdivision. For further detail refer to Contour Consulting, *Overall Landscape Concept Sketch (*Ref: 17-004/SK02) in Appendix A.

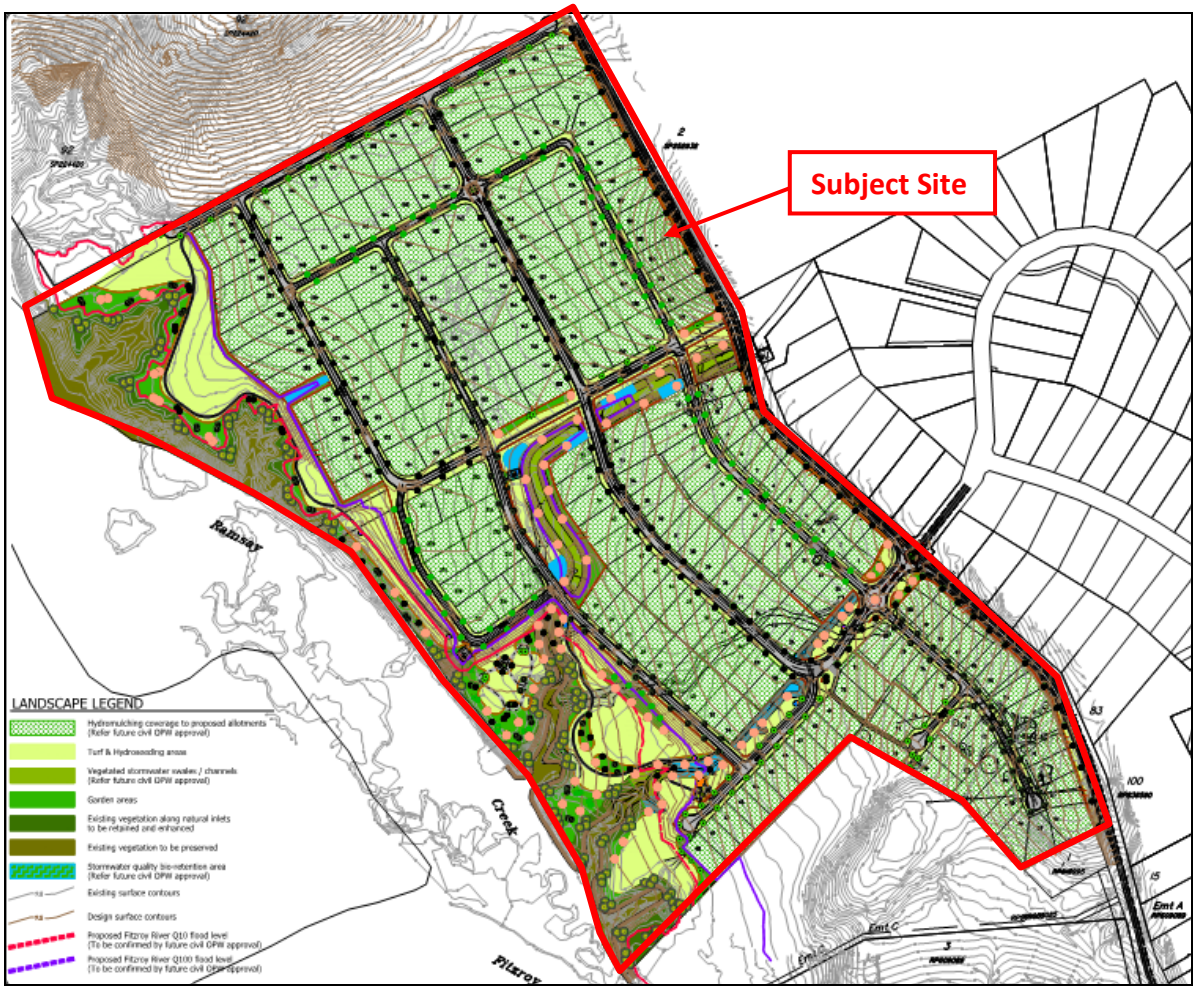


Figure 3: Proposed Layout (modified from Contour Consulting Staging Plan)

1.4 Rainfall

Rainfall intensity data has been obtained from the Australian Bureau of Meteorology's 2016 Design IFD Rainfall System. The data has been extracted for the nearest grid cell at Latitude 23.3125 (S) and Longitude 150.4875 (E). The IFD data and average rainfall intensities used in this report are in accordance with the procedures outlined in IEAust, Australian Rainfall and Runoff.

2.0 SITE HYDROLOGY AND HYDRAULICS

2.1 Background

The subject site is located along the Fitzroy River and is situated within its flood storage area. Due to the considerably large storage area of the Fitzroy River Catchment when compared to the subject site, an increase to the site runoff from the proposed development will have insignificant impact on the storage volume of the Fitzroy River Catchment. Furthermore, both its critical duration, time to peak and its peak flow rate of the subject site catchment is anticipated to be considerably less than that of the Fitzroy River Catchment and as such, the peak times of the catchments will not coincide.

As there will be no significant difference or worsening to the flood storage volume or flood levels of the Fitzroy River as a result of the increase in peak flows rates generated from the subject site, it is deemed that there is no benefit in providing a stormwater detention system for the proposed residential development.

The following section will analyse the pre and post development flow rates for the entire development and any influencing external catchments. The post development flow rates will be utilised to size the minor and major drainage infrastructure of the development.

The following sections define the parameters of the site's post development hydraulics. The Rational Method has been applied to define flow rates at and through the subject site. The Rational Method (Section 4.3 of the Queensland Urban Drainage Manual - QUDM 2017) is flexible in its data requirements and is able to produce satisfactory estimates of peak site discharges based on the following data input:

- specific intensity frequency duration (IFD) data;
- length/type of flow path;
- contributing catchment areas; and
- coefficient of discharge.

2.2 Pre Development Internal Catchments

2.2.1 Catchment Definition and Lawful Point of Discharge

In the following sections, the subject site references the combined lot area of Lot 102 and Lot 129, which covers an area of 53.5 ha.

The pre development subject site has been analysed as three (3) internal catchments for the pre development scenario based on the existing flow regime of the site. The Stormwater catchments for the pre development site have been termed Internal A, Internal B, and Internal C.

Internal Catchment A has an area of 11.73 ha and drains stormwater to the southwest into the Ramsey Creek/Fitzroy River junction. The Ramsey Creek/Fitzroy River Junction wraps around the south western site boundary and forms the Lawful Point of Discharge (LPOD) for pre development Internal Catchment A.

Internal Catchment B has an area of 40.78 ha and naturally drains towards the existing drainage channel that runs centrally through the subject site. Stormwater is conveyed from the eastern and western portions of the catchment into this channel. This channel outlets to the Ramsey Creek/Fitzroy River Junction, which represents the LPOD for pre development Internal Catchment B.

Internal Catchment C has an area of 1ha and sheds stormwater towards the south of its catchment and into a neighbouring residential lot, which represents the catchments existing point of discharge (EPOD). The ultimate LPOD for the catchment is also the Ramsey Creek/Fitzroy River Junction.

The catchment areas and LPODs for the subject site are shown on Knobel Engineers, *Pre Development Catchment Plan* (Ref: K4887/P001/A) included as Appendix B.

2.2.2 Coefficient of Runoff

The pre development coefficient of runoff (C year) for each catchment was determined based on the fraction impervious method specified in QUDM. The pre developed site is currently vacant land and as such has no impervious surfaces. In accordance with QUDM Table 4.5.4, the C_{10} value was determined by the catchment land description and the one hour ten year rainfall intensity ($^1I_{10}$) of 65.8 mm/hr for the site. Assuming good grass coverage and medium soil permeability, a C_{10} value of 0.66 has been adopted for all pre development catchments. With reference to QUDM Table 4.5.2, applying the frequency factors for the standard storms of 2, 10, 20 and 100 years results in the following post development coefficients of runoff as shown in Table 2:

Table 2: Pre Development Coefficient of Runoff

Catchment	C_2	C_{10}	C_{20}	C_{100}
Internal A/B/C	0.56	0.66	0.69	0.79

2.2.3 Time of Concentration

The time of concentration for each pre development catchment has been calculated in accordance with QUDM section 4.6.6 – Overland Flow. Friend's Equation ($t = (107n\ L^{0.333})/S^{0.2}$) has been used to calculate the initial travel time using sheet flow with the remaining travel time being concentrated natural flows

through small rills and channels. Please refer to Table 3 below for the calculated time of concentration for each pre developed catchment.

Table 3: Pre Development Time of Concentration

Catchment	Catchment Area (ha)	Catchment Properties	Time of concentration		
			Overland flow Friend's Equation	Concentrated Overland Flow Figure 4.8	Total t_c
Internal A	11.73	Average grassed surface	Horton's (n) = 0.045 L = 100 m Slope = 1% t = 22.3 mins	L = 270m Fall = 9 m Δ = 3 t = 9 mins	31.3 mins
Internal B	40.78	Average grassed surface	Horton's (n) = 0.045 L = 100m Slope = 7% t = 15.2 mins	L = 700m Fall = 19.5 m Δ = 5 t = 15 mins	30.2 mins
Internal C	1.00	Average grassed surface	Horton's (n) = 0.045 L = 120 m Slope = 8.3% t = 15.5 mins	NA	15.5 mins

2.2.4 Design Flow Rates

Design storm flow rates have been calculated for standard storms with an ARI of 2, 10, 20 and 100 years for the pre development case using design rainfall intensities from the Bureau of Meteorology. The Rational Method ($Q = 2.78 \times 10^{-3}$ CIA) has been used to calculate the required design flow rates for the subject site. The pre development peak flows for the subject site are presented in Table 4.

Table 4: Pre Development Flow Rate

Internal A					
Average Recurrence Interval	**ARI**	2	10	20	100
Coefficient of Runoff	**C**	0.56	0.66	0.69	0.79
Area of Catchment (ha)	**A**	11.73	11.73	11.73	11.73
Average Rainfall Intensity (mm/h)	**I**	62.90	98.41	113.39	150.45
Peak Flow Rate (m^3/s)	**Q**	**1.15**	**2.12**	**2.56**	**3.89**
Internal B					
Average Recurrence Interval	**ARI**	2	10	20	100
Coefficient of Runoff	**C**	0.56	0.66	0.69	0.79
Area of Catchment (ha)	**A**	40.78	40.78	40.78	40.78
Average Rainfall Intensity (mm/h)	**I**	64.3	100.63	115.94	153.81
Peak Flow Rate (m^3/s)	**Q**	**4.09**	**7.53**	**9.11**	**13.81**
Internal C					
Average Recurrence Interval	**ARI**	2	10	20	100
Coefficient of Runoff	**C**	0.56	0.66	0.69	0.79
Area of Catchment (ha)	**A**	1.00	1.00	1.00	1.00

Average Rainfall Intensity (mm/h)	**I**	90.50	141.13	162.52	215.18
Peak Flow Rate (m^3/s)	**Q**	**0.142**	**0.260**	**0.314**	**0.475**
TOTAL Peak Flow Rate (m^3/s)	**Q_t**	**5.38**	**9.91**	**11.99**	**18.17**

2.3 Pre Development External Catchments

2.3.1 Catchment Definition and Lawful Point of Discharge

The subject site and the surrounding area were examined to determine if any external catchments will contribute flows into the subject site.

Based on the existing infrastructure, contours and levels of the regions surrounding the subject site, there have been five (5) external catchments identified which discharge stormwater into the subject site. The external catchments have been termed External Catchment A-E.

External Catchment A comprises of vacant land and is situated to the west of Internal Catchment A/B and has an area of 6.15 ha. Stormwater from this catchment discharges across the western site boundary of Internal Catchment A/B, which represents the existing point of discharge for the external catchment.

External Catchment B comprises of vacant land and is situated to the north of Internal Catchment B and has an area of 6.89 ha. Stormwater from this catchment drains towards Belmont Road, where there is a sag point in the road. At present, flows from External Catchment B discharge into the subject site (internal pre development Catchment B) underneath Belmont Road, through a headwall with (1200 x 450) twin box culverts.

External Catchment C consists of rural residential lots to the northeast of the subject site and comprises of both vacant land and rural residential lots. The external catchment is situated to the east of Internal Catchment B and has an area of 12.31 ha. Stormwater from this catchment drains towards another sag point along Belmont Road where it then enters and existing stormwater pipe and drainage channel running through the subject site. The existing drainage channel represents the existing point of discharge for External Catchment C.

External Catchment D is situated to the east of Internal Catchment B and consists primarily of rural residential lots with a contributing catchment area of 12.47 ha. Stormwater collected in this catchment drains towards Samuel Crescent, which connects into Belmont Road. Major and minor flows from External Catchment D are conveyed along Belmont Road, along the natural grade of the road to the northwest and discharges into the existing central drainage channel running through the subject site.

External Catchment E is situated to the south east of Internal Catchment B and has a catchment area of 3.93ha. The catchment consists primarily of vacant land, with the exception of two (2) existing residential lots situated in the north east corner of the catchment. Stormwater collected in External Catchment E drains along the southern boundary of Internal Catchment B, where it eventually outlets into the Ramsey Creek/Fitzroy River Junction.

Refer to Knobel Engineers, Pre Development Catchment Plan (Ref: K4887/P001/A) for further information on the pre development catchment layout.

2.3.2 Coefficient of Runoff

The external catchment coefficient of runoff (C year) was determined based on fraction impervious (f_i) method as specified in QUDM and Capricorn Municipal Development Guideline - Stormwater Drainage Design D5 - Table D05.06.1 – Fraction Impervious for Development Categories.

External Catchments A, B and E consist of vacant land and as such have no impervious surfaces. In accordance with QUDM Table 4.5.4, the C_{10} value was determined by the catchment land description and the one hour ten year rainfall intensity ($^1I_{10}$) of 65.8 mm/hr for the site. Assuming good grass coverage and medium soil permeability, a C_{10} value of 0.66 has been adopted for all pre development catchments.
External Catchment C has been classified as a rural residential zone under the Rockhampton Rock-e-plan interactive mapping system. The coefficient of runoff has been determined using the Stormwater Drainage Design D5 - Table D05.06.1 – Fraction Impervious for Development Categories.

Based on rural lots of (2-5 dwelling per ha) a fraction impervious of 0.20 has been assumed for the pre development catchment. Using a one hour, ten year rainfall intensity ($^1I_{10}$) of 65.8 mm/hr, a C_{10} value of 0.71 has been adopted for each post development catchment.

External Catchment D has been classified as low residential zone under the Rockhampton Rock-e-plan interactive mapping system. The coefficient of runoff has been determined using the Stormwater Drainage Design D5 - Table D05.06.1 – Fraction Impervious for Development Categories based on a lot size of 750 m^2. Using a fraction impervious of 0.55, a one hour ten year rainfall intensity ($^1I_{10}$) of 65.8 mm/hr, a C_{10} value of 0.79 has been adopted for each post development catchment.

With reference to QUDM Table 4.5.2, applying the frequency factors for the standard storms of 2, 10, 20 and 100 years results in the following pre development coefficients of runoff as shown in Table 5.

Table 5: Pre Development External Catchment Coefficient of Runoff

Catchment	C_2	C_{10}	C_{20}	C_{100}
EXT A, B, E	0.56	0.66	0.69	0.79
EXT C	0.60	0.71	0.75	0.85
EXT D	0.67	0.79	0.83	0.95

2.3.3 Time of Concentration

The time of concentration has been calculated in accordance with QUDM section 4.6.6 – Overland Flow. Friend's Equation ($t = (107n\ L^{0.333})/S^{0.2}$) has been used to calculate the initial travel time using sheet flow and the remaining distance being calculated as concentrated natural flows using Figure 4.8. Please refer to Table 6 for the calculated time of concentration for each external catchment.

Table 6: External Catchment Time of Concentration

Catchment	Catchment Area (ha)	Catchment Properties	Time of concentration		
			Overland flow Friend's Equation	Concentrated Overland Flow Figure 4.8	Total t_c
EXT A	6.15	Average grassed surfaces	Horton's (n) = 0.045 L = 100 m Slope = 10.0% t = 14min	L = 150m Fall = 24 m Δ = 3 t = 3 mins	17 mins
EXT B	6.89	Average grassed surfaces	Horton's (n) = 0.045 L = 100 m Slope = 15.0% t = 12.8 min	L = 250m Fall = 12 m Δ = 3 t = 6 mins	18.8 mins
EXT C	12.31	Average grassed surfaces	Horton's (n) = 0.045 L = 100 m Slope = 13.0% t = 13.36 min	L = 320m Fall = 14 m Δ = 3 t = 6 mins	19.36 mins
EXT D	12.47	Developed	Standard roof to inlet time of 5 mins	L = 682 m Fall = 41 m Δ = 1 t = 3 mins	8 mins
EXT E	3.93	Average grassed surfaces	Horton's (n) = 0.045 L = 100 m Slope = 3.0% t = 17.91 min	L = 300m Fall = 12 m Δ = 3 t = 6 mins	23.91 mins

2.3.4 Design Flow Rates

Design storm flow rates have been calculated for standard storms with an ARI of 2, 10, 20 and 100 years for the external catchment case using design rainfall intensities from the Bureau of Meteorology. The Rational Method ($Q = 2.78 \times 10^{-3}$ CIA) has been used to calculate the required design flow rates for the subject site.

The calculated pre and post development peak flows for the external catchment are presented in Table 7.

Table 7: External Catchments – Pre Development Peak Flow Rates

External Catchment A					
Average Recurrence Interval	**ARI**	2	10	20	100
Coefficient of Runoff	**C**	0.56	0.66	0.69	0.79
Area of Catchment (ha)	**A**	6.15	6.15	6.15	6.15
Average Rainfall Intensity (mm/h)	**I**	86.65	135.14	155.64	206.14
Peak Flow Rate (m^3/s)	**Q**	**0.832**	**1.526**	**1.845**	**2.793**
External Catchment B					
Average Recurrence Interval	**ARI**	2	10	20	100
Coefficient of Runoff	**C**	0.56	0.66	0.69	0.79
Area of Catchment (ha)	**A**	6.89	6.89	6.89	6.89
Average Rainfall Intensity (mm/h)	**I**	82.40	128.55	148.06	196.16
Peak Flow Rate (m^3/s)	**Q**	**0.886**	**1.626**	**1.966**	**2.977**
External Catchment C					
Average Recurrence Interval	**ARI**	2	10	20	100
Coefficient of Runoff	**C**	0.60	0.71	0.75	0.85
Area of Catchment (ha)	**A**	12.31	12.31	12.31	12.31
Average Rainfall Intensity (mm/h)	**I**	81.60	127.31	146.64	194.29
Peak Flow Rate (m^3/s)	**Q**	**1.686**	**3.094**	**3.742**	**5.666**
External Catchment D					
Average Recurrence Interval	**ARI**	2	10	20	100
Coefficient of Runoff	**C**	0.67	0.79	0.83	0.95
Area of Catchment (ha)	**A**	12.47	12.47	12.47	12.47
Average Rainfall Intensity (mm/h)	**I**	115.25	179.79	206.75	272.80
Peak Flow Rate (m^3/s)	**Q**	**2.684**	**4.926**	**5.948**	**8.969**
External Catchment E					
Average Recurrence Interval	**ARI**	2	10	20	100
Coefficient of Runoff	**C**	0.56	0.66	0.69	0.79
Area of Catchment (ha)	**A**	3.93	3.93	3.93	3.93
Average Rainfall Intensity (mm/h)	**I**	73.19	144.30	131.67	174.56
Peak Flow Rate (m^3/s)	**Q**	**0.449**	**0.825**	**0.997**	**1.511**

2.4 Post Development Internal Catchments

2.4.1 Catchment Definition and Lawful Point of Discharge

The post development scenario has been analysed as six (6) internal catchments and are described as Post Development Catchments A-F. The delineation of the post development catchments have been based on the design earthworks contours, (supplied by Contour Consulting) for the site, existing overland flow paths running through the subject site and the location of the proposed bio-retention basins.

Post Development Catchment A consists of lots 60-100 to the east of the subject site and has a contributing area of 8.69 ha. This catchment will discharge stormwater towards the southwest through overland and piped flow. The overland flow will be collected and conveyed along the proposed road and discharge to the south of the lot. The minor flows will be collected in a series of pits and pipes and discharged to the proposed bio-retention basins running along the western boundary of the catchment for treatment.

Post Development Catchment B consists of lots 1-51 in the central portion of the subject site and has a contributing area of 9.845 ha. The overland flow will be collected and conveyed along the proposed road network and discharge into the existing drainage channel running through the subject site. The minor flows will be collected in a series of pits and pipes and discharged to the proposed bio-retention basins running along the west of the catchment for treatment.

Post Development Catchment C consists of lots 101-160 and 185-187 to the west of the subject site and has a contributing area of 12.3 ha. The overland flow will be collected and conveyed along the proposed road network towards the existing drainage channel running through the subject site. The minor flows will be collected in a series of pits and pipes and discharged to the proposed bio-retention basins to the east of the catchment for treatment.

Post Development Catchment D consists of lots 161,179, 181 -184, 188-196 and 201-210 to the southwest of the subject site and has a contributing area of 10.4 ha. This catchment will discharge stormwater towards the southwest through overland and piped flow. The overland flow will be collected and conveyed along the proposed road towards a drainage channel at the south of the subject site. The minor flows will be collected in a series of pits and pipes and discharged to the proposed bio-retention basins to the south of the catchment for treatment.

Post development Catchment E consists of the southern portion of the site (remaining portion thus totalling up the site area) that remains undeveloped and has a catchment area of 12.35 ha. Stormwater collected in this catchment will drain naturally as sheet flow into the junction of Ramsey Creek and the Fitzroy River. Note that Catchment E collects the stormwater from Catchments A-D.

Post Development Catchment F consists of lots 197-199 to the southwest of the subject site and has a contributing area of 0.56 ha. The major overland flow will drain naturally as sheet flow into the undeveloped land in Catchment E. The minor flows will be collected in a series of pits and pipes and discharged to the proposed bio-retention basins to the west of the catchment for treatment.

Note that the total site area has slightly increased in the post development scenario due to the acquisition of land to the west of the subject site for the development of a new access driveway.

The ultimate LPOD for all post development catchments is the junction of Ramsey Creek and the Fitzroy River. The catchment areas and LPODs for the subject site are shown on Knobel Engineers, *Post Development Catchment Plan* (Ref: K4887/P002/A) included as Appendix C.

2.4.2 Coefficient of Runoff

The coefficient of runoff (C year) for the post development catchments was determined based on the fraction impervious method specified in QUDM and the Capricorn Municipal Development Guideline - Stormwater Drainage Design D5 - Table D05.06.1 – Fraction Impervious for Development Categories.

Post Development Catchments A-D and F have been classified as low residential zones under the Rockhampton Rock-e-plan interactive mapping system. The coefficient of runoff has been determined using the Stormwater Drainage Design D5 - Table D05.06.1 – Fraction Impervious for Development Categories based on a lot size of 750 m^2. Using a fraction impervious of 0.55 and a one hour, ten year rainfall intensity ($^1I_{10}$) of 65.8 mm/hr, a C_{10} value of 0.79 has been adopted for each post development catchment.

Post Development Catchment E remains undeveloped and as such has no impervious surfaces. In accordance with QUDM Table 4.5.4, the C_{10} value was determined by the catchment land description and the one hour ten year rainfall intensity ($^1I_{10}$) of 65.8 mm/hr for the site. Assuming good grass coverage and medium soil permeability, a C_{10} value of 0.66 has been adopted for this catchment.

With reference to QUDM Table 4.5.2, applying the frequency factors for the standard storms of 2, 10, 20 and 100 years results in the following post development coefficients of runoff as shown in Table 8:

Table 8: Post Development Coefficient of Runoff

Catchment	C_2	C_{10}	C_{20}	C_{100}
Post Development A-D, F	0.67	0.79	0.83	0.95
Post Development E	0.56	0.66	0.69	0.79

2.4.3 Time of Concentration

The time of concentration for post developed catchments A-D and F has been calculated in accordance with QUDM section 4.6.6 – Overland Flow, Table 4.6.3 – Recommended roof drainage system travel times and Figure 4.8 –Flow travel time in pipes and channels.

For Post Development Catchment E the time of concentration has been calculated in accordance with QUDM section 4.6.6 – Overland Flow. Friend's Equation ($t = (107n\ L^{0.333})/S^{0.2}$) has been used to calculate the initial travel time using sheet flow with the remaining travel time being concentrated natural flows through small rills and channels. Please refer to Table 9 for the calculated time of concentration for each post developed catchment.

Table 9: Post Development Time of Concentration

Catchment	Catchment Area (ha)	Catchment Properties	Time of concentration		
			Overland flow Friend's Equation	Concentrated Overland Flow Figure 4.8	Total t_c
A	8.693	Developed	Standard roof to inlet time of 5 mins	L = 400m Fall = 9.6 m Δ = 1 t = 5 mins	10
B	9.845	Developed	Standard roof to inlet time of 5 mins	L = 350 m Fall = 6 m Δ = 1 t = 4 mins	9
C	12.328	Developed	Standard roof to inlet time of 5 mins	L = 400 m Fall = 3 m Δ = 1 t = 7 mins	12
D	10.401	Developed	Standard roof to inlet time of 5 mins	L = 220 m Fall = 2.5 m Δ = 1 t = 4 mins	9
E	12.358	Average grassed surface	Horton's (n) = 0.045 L = 100 m Slope = 3.25% t = 17.6 mins	L = 130 m Fall = 5.3 m Δ = 3 t = 3 mins	20.6 mins
F	0.560	Developed	Standard roof to inlet time of 5 mins	L = 80 m Fall = 1 m Δ = 1 t = 2 mins	7

2.4.4 Design Flow Rates

Design storm flow rates have been calculated for standard storms with an ARI of 2, 10, 20 and 100 years for the post development catchments using design rainfall intensities from the Bureau of Meteorology. The Rational Method ($Q = 2.78 \times 10^{-3}$ CIA) has been used to calculate the required design flow rates for the subject site. The post development peak flows for the subject site are presented in Table 10.

Table 10: Post Development Flow Rate

Post Development A					
Average Recurrence Interval	**ARI**	2	10	20	100
Coefficient of Runoff	**C**	0.67	0.79	0.83	0.95
Area of Catchment (ha)	**A**	8.693	8.693	8.693	8.693
Average Rainfall Intensity (mm/h)	**I**	107.49	167.62	192.87	254.87
Peak Flow Rate (m^3/s)	**Q**	**1.744**	**3.200**	**3.867**	**5.839**
Post Development B					
Average Recurrence Interval	**ARI**	2	10	20	100
Coefficient of Runoff	**C**	0.67	0.79	0.83	0.95
Area of Catchment (ha)	**A**	9.845	9.845	9.845	9.845
Average Rainfall Intensity (mm/h)	**I**	111.25	173.51	199.60	263.58
Peak Flow Rate (m^3/s)	**Q**	**2.045**	**3.751**	**4.531**	**6.839**
Post Development C					
Average Recurrence Interval	**ARI**	2	10	20	100
Coefficient of Runoff	**C**	0.67	0.79	0.83	0.95
Area of Catchment (ha)	**A**	12.328	12.328	12.328	12.328
Average Rainfall Intensity (mm/h)	**I**	100.65	156.93	180.64	238.94
Peak Flow Rate (m^3/s)	**Q**	**2.316**	**4.249**	**5.135**	**7.763**
Post Development D					
Average Recurrence Interval	**ARI**	2	10	20	100
Coefficient of Runoff	**C**	0.67	0.79	0.83	0.95
Area of Catchment (ha)	**A**	10.401	10.401	10.401	10.401
Average Rainfall Intensity (mm/h)	**I**	111.25	173.51	199.60	263.58
Peak Flow Rate (m^3/s)	**Q**	**2.160**	**3.963**	**4.787**	**7.225**
Post Development E					
Average Recurrence Interval	**ARI**	2	10	20	100
Coefficient of Runoff	**C**	0.56	0.66	0.69	0.79
Area of Catchment (ha)	**A**	12.358	12.358	12.358	12.358

Average Rainfall Intensity (mm/h)	**I**	79.11	123.45	142.20	188.44
Peak Flow Rate (m^3/s)	**Q**	**1.525**	**2.799**	**3.386**	**5.127**
Post Development F					
Average Recurrence Interval	**ARI**	2	10	20	100
Coefficient of Runoff	**C**	0.67	0.79	0.83	0.95
Area of Catchment (ha)	**A**	0.560	0.560	0.560	0.560
Average Rainfall Intensity (mm/h)	**I**	119.50	186.47	214.34	282.53
Peak Flow Rate (m^3/s)	**Q**	**0.104**	**0.192**	**0.231**	**0.348**
TOTAL Peak Flow Rate (m^3/s)	**Qt**	**9.894**	**18.154**	**21.937**	**33.141**

Note, the total peak flow is summation of all separate post development catchments and has been undertaken as a comparison only.

2.5 Post Development External Catchments

In the post development scenario, the external catchments have been analysed to account for any future development that may occur. It has been assumed that External Catchments A, B, C and E will be developed to low density residential lots, which is consistent with surrounding land classifications. Post Development Catchment D is already developed and as such the pre-existing condition for this catchment has been maintained in the following assessment. Analysing the peak flow rates under this development conditions will ensure that the proposed stormwater infrastructure for the subject site can safely convey the flows from the external catchment in the occurrence of development.

2.5.1 Catchment Definition and Lawful Point of Discharge

The location and size of the external catchments in the post development conditions are the same as described in the pre development description in section 2.3.1.

Note there are current development applications for residential subdivisions of External Catchments A, B and C. This information has been considered throughout the report and any hydraulic analysis of external catchments flows to ensure an accurate assessment of the influencing flow rates into the subject site.

The flows from External Catchment E will not enter into any of the proposed residential allotments in the developed scenario. The earthworks along the south eastern boundary adjacent to External Catchment E indicates a bund which directs stormwater along the site boundary to discharge into Ramsey Creek/Fitzroy River Junction. This arrangement maintains the pre development flow regime and causes no impact on the subject site or neighbouring lots.

2.5.2 Coefficient of Runoff

The coefficient of runoff (C year) for the post development external catchments was determined based on the Capricorn Municipal Development Guideline - Stormwater Drainage Design D5 - Table D05.06.1 – Fraction Impervious for Development Categories.

All external catchments have been classified as low residential zones under the Rockhampton Rock-e-plan interactive mapping system. The coefficient of runoff has been determined using the Stormwater Drainage Design D5 - Table D05.06.1 – Fraction Impervious for Development Categories based on a lot size of 750 m^2. Using a fraction impervious of 0.55 and a one hour, ten year rainfall intensity ($^1I_{10}$) of 65.8 mm/hr, a C_{10} value of 0.79 has been adopted for each post development catchment.

2.5.3 Time of Concentration

The time of concentration for the catchment has been determined using QUDM Table 4.6.2 – Recommended standard inlet times for urban residential catchments. This method has been adopted as the developed layout of the external catchments in unknown and therefore specific inlet times cannot be calculated accurately. Assuming an average slope of 3% to 6% for the post developed external catchment, a time of concentration of 13 mins has been adopted. Note that as External Catchment D is already developed, a time of concentration of 8 mins has been maintained for this catchment.

2.5.4 Design Flow Rates

Design storm flow rates have been calculated for standard storms with an ARI of 2, 10, 20 and 100 years for the post development catchments using design rainfall intensities from the Bureau of Meteorology. The Rational Method ($Q = 2.78 \times 10^{-3}$ CIA) has been used to calculate the required design flow rates for the subject site. The post development (unmitigated) peak flow estimates for the external catchments are presented in Table 11.

Table 11: External Catchments – Post Development Peak Flow Rates

External Catchment A					
Average Recurrence Interval	**ARI**	2	10	20	100
Coefficient of Runoff	**C**	0.67	0.79	0.83	0.95
Area of Catchment (ha)	**A**	6.15	6.15	6.15	6.15
Average Rainfall Intensity (mm/h)	**I**	97.54	152.08	175.08	231.67
Peak Flow Rate (m^3/s)	**Q**	**1.121**	**2.055**	**2.485**	**3.757**
External Catchment B					
Average Recurrence Interval	**ARI**	2	10	20	100
Coefficient of Runoff	**C**	0.67	0.79	0.83	0.95
Area of Catchment (ha)	**A**	6.89	6.89	6.89	6.89
Average Rainfall Intensity (mm/h)	**I**	97.54	152.08	175.08	231.67
Peak Flow Rate (m^3/s)	**Q**	**1.255**	**2.302**	**2.783**	**4.208**
External Catchment C					
Average Recurrence Interval	**ARI**	2	10	20	100
Coefficient of Runoff	**C**	0.67	0.79	0.83	0.95
Area of Catchment (ha)	**A**	12.31	12.31	12.31	12.31
Average Rainfall Intensity (mm/h)	**I**	97.54	152.08	175.08	231.67
Peak Flow Rate (m^3/s)	**Q**	**2.242**	**4.112**	**4.971**	**7.517**
External Catchment D					
Average Recurrence Interval	**ARI**	2	10	20	100
Coefficient of Runoff	**C**	0.67	0.79	0.83	0.95
Area of Catchment (ha)	**A**	12.47	12.47	12.47	12.47
Average Rainfall Intensity (mm/h)	**I**	115.25	179.79	206.75	272.80
Peak Flow Rate (m^3/s)	**Q**	**2.684**	**4.926**	**5.948**	**8.969**
External Catchment E					
Average Recurrence Interval	**ARI**	2	10	20	100
Coefficient of Runoff	**C**	0.67	0.79	0.83	0.95
Area of Catchment (ha)	**A**	3.93	3.93	3.93	3.93
Average Rainfall Intensity (mm/h)	**I**	97.54	152.08	175.08	231.67
Peak Flow Rate (m^3/s)	**Q**	**0.716**	**1.313**	**1.588**	**2.401**

3.0 OVERLAND FLOW ASSESSMENT

As outlined previously, there are number of external catchments which direct flow into the subject site. These flows require appropriate management and routing through the proposed development to ensure no adverse impacts on the proposed development and surrounding properties

A combination of open conveyance channels and piped drainage has been provided in the location of major overland flows paths within the subject site to safely intercept and convey stormwater from the influencing external catchments through the development. Drainage infrastructure has been designed in accordance with Capricorn Municipal Development Guideline - *Stormwater Drainage Design D5*.

External Catchment A

A conveyance channel has been proposed to manage the flows discharging into the site from External Catchment A. The channel has been assessed for the pre development catchment scenario as there is a current development application for the sub-division and development of External Catchment. As part of this development, only pre development flow rates will be permitted to be discharged into the subject site.

In the pre development condition, the channel capacity has been designed to accommodate the Q100 flow rate from the catchment. The channel is to run from north to south along the western extent of the subject site and intercept stormwater prior to flows entering the development. Note that if the developed layout of External Catchment A directs overland flow away from the site subject, the purpose of the conveyance channel becomes redundant and the channel can be decommissioned.

External Catchment B

The overland flow from External Catchment B is to be collected in a piped drainage system and conveyed into the subject site and into the main conveyance channel running through the development. Note that there is an active development approval in place for External Catchment B which is currently under construction. As part of this development application, there is an approval condition which specifies that only pre development flows are to be discharged underneath Belmont Road into the subject site. Assuming that this development adheres to this condition, the capacity of the pipe system for External Catchment B has been sized to accommodate the pre development flows only, due to the assumption appropriate detention has been provided upstream.

At present, flows from External Catchment B discharge into the subject site (internal Catchment C) underneath Belmont Road, through a headwall with (1200 x 450) twin box culverts. These culverts are proposed to connect into the internal drainage network (designed by others) and conveyed through the development into the main conveyance channel running through the subject site. An easement is to be provided over these pipes in accordance with Capricorn Municipal Development Guideline - *Stormwater Drainage Design D5.* The easement is to provide a route for overland flows in the event of pipe blockage.

Stormwater discharging from External Catchment B has been assumed as “clean water” having undergone water quality treatment from the current development in External Catchment B. It is noted that this clean water will be mixed with the untreated runoff from internal catchments from this development and ultimately be conveyed into the bio retention basins designed for the subject site. To control this, the pipes discharging into the proposed bio-retention basins are to be sized to convey only the Q3 month flows from the internal catchments of the site. Further detail on this is provided in Section 6.0 of this report.

Internal Catchment C – D

A channel has been designed in the south west corner of the development in Internal Catchment D, to collect the Q100 flows from internal sub catchment C1 and C2. The channel is situated in between Lots 205 and 206 and will convey flows into Internal Catchment E. Refer to Knobel Engineers*, Stormwater Sub Catchment Plan* (Ref: 4887/P005/A) for further details of internal sub catchments C1 and C2.

Each channel has been designed (by Contour Consulting) with the maximum allowable batters of 1V:6H and a minimum freeboard of 300 mm. Table 12 provides details of the design parameters of conveyance channels for External Catchment A and Internal channel D. Refer to Section 4.0 for details on the proposed culverts for External Catchment B.

Table 12: Channel Parameters and Capacities

	EXTERNAL A	CHANNEL D
Type	Grass-lined	Grass-lined
Conveyance capacity	Q100 pre development flows External Catchment A	Q100 flows from Sub catchment C1, C2,
Slope (%)	1 %	1 %
Base Width (m)	7	8
Flow Depth (m)	0.65 (including 300mm freeboard)	0.75 (including 300mm freeboard)
Side Slope	1 in 6	1 in 6
Top Width (m)	15	14.6
Design Capacity (m^3/s)	**3.05**	**3.68**
Required Capacity (m^3/s)	2.095	3.31

As demonstrated in Table 12, the proposed infrastructure can safely convey the required flows from external catchments while maintaining the necessary 300mm of freeboard to surrounding roads and properties.

4.0 MAJOR CHANNEL FLOW ASSESSMENT

The capacity of the major conveyance channel running through the centre of the subject site has been assessed at critical sections to ensure that the proposed development can cater for the Q100 overland flows generated from both the external and internal catchments being drained into this channel.
The road sections along the main conveyance channel have also been assessed to ensure compliance with QUDM Table 7.4.5 – Flow limits for 'transverse' flow during MAJOR STORM during the Q100 event.

4.1 Hydraulic Model

A hydraulic computer model has been developed to assess the capacity of the main conveyance channel and critical road sections along this channel. The culvert and drainage easement for External Catchment B has also been assessment. The model assesses whether the channels and proposed culverts are adequately sized to accommodate the flows from internal and external catchments and that road sections have the required immunity to be compliant with local and state guidelines.

Modelling software XP-SWMM has been selected for the hydrologic and hydraulic analysis. Details of the model set-up, channel design and model results are summarised in the following sections for each critical section.

4.2 Model Set-up

Rainfall data for the subject site has been obtained from the Australian Bureau of Meteorology's 2016 Design IFD Rainfall System. The data has been extracted for the nearest grid cell at Latitude 23.3125 (S) and Longitude 150.4875 (E). The IFD data and average rainfall intensities used in this report are in accordance with the procedures outlined in IEAust, Australian Rainfall and Runoff. Several storm events have been included in the modelling with durations ranging from 10 min to 3hrs.

4.3 Model Validation

A single node has been designated in the hydrologic portion of the model for each catchment that contributes runoff into the main conveyance channel. The influencing catchments include, external catchments B-C and internal sub-catchments 1-3. Refer to Knobel Engineers, *Stormwater Sub catchment Plan* (Ref: K4887/P005/A) for further details on catchment details. Figure 4 details the setup for the hydraulic and hydrologic model.

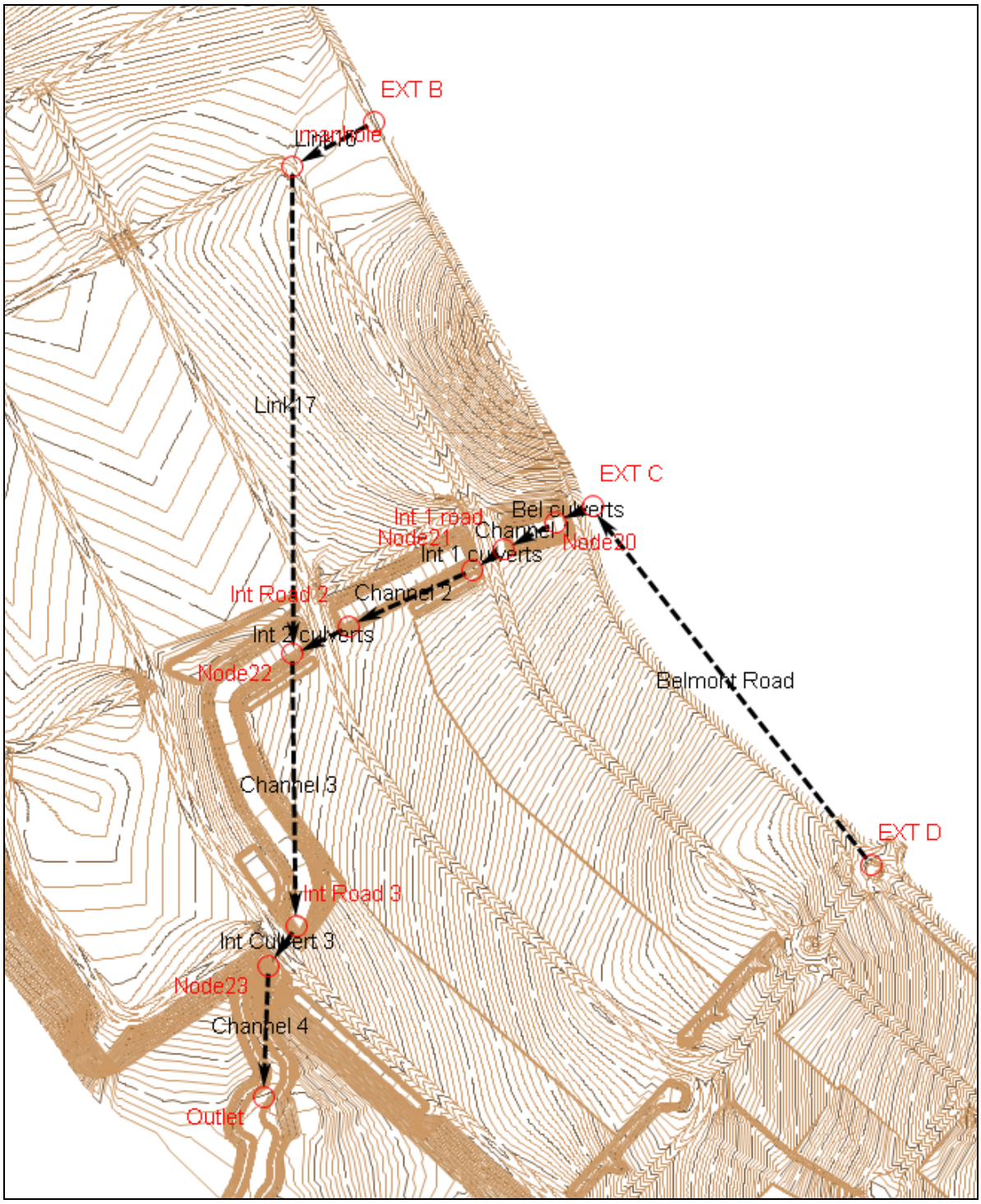


Figure 4: XPSWMM Hydraulic Model Layout

4.4 Assumptions of Hydraulic Model

Due to unavailable survey for Belmont Road and External Catchments contributing to the main conveyance channel, a range of assumptions have been made in determining the location and volume of runoff entering the channel.

External Catchment D has been modelled to drain into the upstream end of the central conveyance channel near Belmont Road. This has been assumed as there is road drainage infrastructure on the upstream side of Belmont Road and a crown in the road which would prevent stormwater from overtopping into the subject site. The culverts under Belmont Road at the upstream end of the conveyance channel have been modelled as twin 1050 mm culverts.

External Catchment B has been modelled as entering the conveyance channel as piped flow as per the stormwater strategy adopted to manage external flows for this catchment.

Pre development flows have been assumed for External Catchment B and C as per the existing development application for these catchments that stipulates that only pre development flows can be discharged into the subject site.

4.5 Hydraulic Parameters of Model

The proposed channels, culverts and weirs modelled at each critical section along the conveyance channel have been determined based off the extracted sections from the design contours provided from Contour Consulting.

The main conveyance channel has been modelled as four (4) separate links between each internal road section. The profile of the channel in each link has been assigned from the design contours provided by Contour Consulting. The average profile of the channel (channel 1-4, see Figure 4) has a general arrangement of a base width of 10m, batters of 1V;6H and total height of 1.8m. The channels have been designed so that the minor flows are contained within the section and that overtopping only occurs in a major storm.

At each road crossing along the main channel, culverts have been modelled to convey flows underneath the road. The size of the culverts have been determined such that the quantity of flows overtopping the road are in compliance with QUDM. The profile of the road has been modelled as a natural channel to simulate a spill over point in major events. Tables 13 – 16 detail the adopted infrastructure for each internal road crossing.

Table 13: Internal Road Crossing 1 Hydraulic Parameters

Location:	Internal Road Crossing 1
Culvert size:	2 x 1050mm
UPIL:	12.8m
DSIL:	12.5m
Length:	36m
Grade:	0.83%
Road surface level (spill over point):	14.7m

Table 14: Internal Road Crossing 2 Hydraulic Parameters

Location:	Internal Road Crossing 2
Culvert size:	2 x 1050 mm
UPIL:	11.3 m
DSIL:	11.1 m
Length:	34 m
Grade:	0.6%
Road surface level (spill over point):	13.2 m

Table 15: Internal Road Crossing 3 Hydraulic Parameters

Location:	Internal Road Crossing 3
Culvert size:	2 x 1200 mm
UPIL:	9.7 m
DSIL:	9.1 m
Length:	36 m
Grade:	1.6%
Road surface level (spill over point):	12 m

Table 16: External Catchment B Easement Crossing

Location:	External Catchment B Easement Crossing
Culvert size:	2 x 900 mm
UPIL:	14.45 m
DSIL:	13.85 m
Length:	60 m
Grade:	1%
Road surface level (spill over point):	15.5 m

Note that the above culvert parameters have been assigned from the design contours provided by Contour Consulting and are subject to change during the detailed design process.

4.6 Results of Hydraulic Model

For each internal road crossing, the water level, velocity and depth of flow on the road section have been analysed. In accordance with QUDM Table 7.4.5 – Flow limits for 'transverse' flows during MAJOR STORM , the flow over the road is to have a maximum depth of 250mm and have a depth*velocity product smaller than 0.4m^2/s. Table X-X detail the results at each internal Road crossing in the Q100 major event.

Table 17: Results Internal Road Crossing 1

Internal Road Crossing 1:		
Efficiency of culverts:	100%	50%
Peak Flow in culverts (m^3/s)	5.83	2.948
Peak Flow over road (m^3/s)	3.19	6.07
Q100 water level	14.79	14.83
Depth of flow over road (m)	0.09	0.130
Velocity of flow over road (m/s)	0.72	0.91
D*V	0.0648	0.12

Table 18: Results Internal Road Crossing 2

Internal Road Crossing 2:		
Efficiency of culverts:	100%	50%
Peak Flow in culverts (m^3/s)	5.62	2.86
Peak Flow over road (m^3/s)	5.503	8.527
Q100 water level	13.31	13.34
Depth of flow over road (m)	0.11	0.14
Velocity of flow over road (m/s)	0.80	0.9
D*V	0.088	0.13

Table 19: Results Internal Road Crossing 3

Internal Road Crossing 3:		
Efficiency of culverts:	100%	50%
Peak Flow in culverts (m^3/s)	8.77	4.55
Peak Flow over road (m^3/s)	6.32	12.40
Q100 water level	12.17	12.24
Depth of flow over road (m)	0.17	0.24
Velocity of flow over road (m/s)	1.01	1.29
D*V	0.17	0.31

Table 20: External Catchment B Easement

External Catchment B Easement Crossing		
Efficiency of culverts:	100%	50%
Peak Flow in culverts (m^3/s)	2.37	2.01
Peak Flow over road (m^3/s)	0	0.358
Q100 water level	15.07	15.69
Depth of flow over road (m)	0	0.19
Velocity of flow over road (m/s)	0	0.70
D*V	0	0.133

As demonstrated in the tables above, the depth and depth*velocity product for each internal road crossing is in accordance with the requirement of QUDM in the events of both full culvert efficiency and 50% blockage. The results indicate that the flow regime over the road sections is within an acceptable limit and that the channels and culverts are adequately sized to convey internal and external flows through the subject site.

It is to be noted that although the results in Table 20 show compliance with QUDM, it is crucial that the all lots are designed to have immunity from the Q100 water levels experienced in the conveyance channel during a major rainfall event. A minimum of 300mm of freeboard above the Q100 water level is to be provided to the finished floor level of surrounding lots.

5.0 WATER QUALITY ASSESSMENT

5.1 Background

The development of land has the potential to increase the pollutant loads within stormwater runoff and downstream watercourses. During the construction phase of the development disturbance to the vegetation on the site has the potential to significantly increase sediment loads entering downstream watercourses. The operational phase of the development will change the land use potentially increasing the amount of sediments and nutrients washing from the site.

The following sections describe the predicted increase in pollutant loads generated by the proposed development and treatment devices to mitigate the potential increases.

5.2 Construction Phase

A high risk of stormwater pollution will occur from the site during the construction phase due to erosion and sediment transportation off site to the receiving environment. The majority of this risk results from construction activities disturbing the site and exposing areas of soil to the direct erosive influence of the environment.

The following section outlines the procedures necessary to minimise erosion and control sediment during construction in accordance with the *International Erosion Control Association (IECA) Best Practice ESC Document.*

5.2.1 Key Pollutants

The key pollutants have been identified for the Construction Phase of this development.

Table 21: Key Pollutants, Construction Phase

Pollutant	Sources
Litter	Paper, construction packaging, food packaging, cement bags, material off cuts.
Sediment	Exposed soils and stockpiles during earthworks and building works.
Hydrocarbons	Fuel and oil spills, leaks from construction equipment and temporary car park areas.
Toxic Materials	Cement slurry, asphalt primer, solvents, cleaning agents, and wash waters (e.g., from tile works).
Acids or Alkaline substances	Acid sulphate soils, cement slurry and wash waters.

5.2.2 Performance Criteria

The following site discharge pollutant criteria have been adopted for water quality monitoring during the construction phase of the development.

Table 22: Construction Phase, Water Quality Performance Criteria

Pollutant	Criteria
Total Suspended Solids	80% hydrological effectiveness to 50mg/L
pH	6.5 – 8.5
Dissolved Oxygen	90th %ile >80% saturation or 6mg/L
Hydrocarbons	No visible sheen on receiving waters
Litter	No visible litter washed from site.
Cations and Anions	As recommended by Acid Sulphate Soil Management Plan (If Applicable to Development).
Contaminants	Dispose of waste containing contaminants at authorised facilities.

5.2.3 Sediment and Erosion Controls

Sediment and Erosion Control devices (S&EC) employed on the site shall be designed and constructed in accordance with the *International Erosion Control Association (IECA) Best Practice ESC Document as* shown on Knobel Engineers, *Sediment and Erosion Control Plan* (Ref: K4887/P004/A) included as Appendix F. The following devices and management measures are proposed:

Pre-Construction

- Stabilised site access/exit on Belmont Road;
- Sediment fences to be located along downstream contours;
- Sediment basins to be installed in accordance with Knobel Engineers, *Sediment Basin Plan* (Ref: SK01)
- Dust fencing to be installed if required; and
- Educate site personnel to the requirements of Erosion and Sediment Control Plan.

Initial Construction – Bulk Earthworks

- Maintain construction access/exit, sediment fencing, dust fences and all other existing controls as required;
- Construct diversion drains to convey disturbed site run-off to the temporary sediment traps;
- Construct clean water diversion drain to divert runoff from external catchment A; and
- Confine construction activities to stages to minimise areas of disturbance at any given time.

Second Stage Construction

- Maintain construction access/exit, sediment fencing, dust fences, diversion drain and all other existing controls as required;
- Progressively revegetate finished areas where applicable;
- Divert runoff from un-disturbed areas around disturbed areas; and
- Drainage structure protection around field inlets and gully pits.

During construction, all areas of exposed soils allowing dust generation are to be suitably treated. Treatments will include covering the soil and watering. Road accesses are to be regularly cleaned to prevent the transmission of soil on vehicle wheels and eliminate any build-up of typical road dirt and tyre dusts from delivery vehicles.

Adequate waste disposal facilities are to be provided and maintained on the site to cater for all waste materials such as litter, hydrocarbons, toxic materials, acids or alkaline substances.

5.2.4 Water Quality Monitoring and Inspections

To ensure that the water quality objectives are being met during the construction phase of the development water quality monitoring shall be conducted. Water quality monitoring shall use a calibrated probe or sampling and testing at a NATA registered laboratory.

Location: Monitoring Stations MS1 shown on Knobel Engineers, *Sediment and Erosion Control Plan* (Ref: K4887/P004/A).

Parameters: Site discharge criteria.

Frequency: Following at least 30 mm of rainfall in a 24 hour period.

The contractor shall be responsible for the inspection and maintenance of all sediment and erosion control devices. Additional controls and review of existing controls shall be undertaken in response to the results of the above-mentioned monitoring program.

5.2.5 Reporting

An inspection report shall be written by a suitably qualified and experienced scientist/engineer following each water quality monitoring episode. The report shall include at least the following information:

- Name, address and real property description for the development site;
- Council file reference number (if known);
- Monitoring locations;
- Performance criteria;
- Results for each monitoring location, identifying any breaches of performance criteria;
- Recommended corrective actions to be taken and additional sediment and erosion controls, if required; and
- Inspection reports shall be provided to the contractor for their action and compilation in an on-site register.

If the above mentioned performance criteria are exceeded and results from the downstream monitoring stations show significant deterioration from upstream results (if applicable), the contractor shall implement all recommendation of the inspection report within one (1) working day of receipt of the report.

5.3 Operational Phase

The following sections provide details of the stormwater quality improvement devices (SQID's) proposed for the operational phase of the development. Knobel Engineers, *Stormwater Management Plan* (Ref: K4887/P003/A) included as Appendix D illustrates the size and location of the proposed SQID's.

To assess the quantities of pollutants discharging from the site the water quality modelling package MUSIC v6.3 has been applied. MUSIC Modelling Parameters and delineated data have been sourced from Water by Design, *MUSIC Modelling Guidelines*. A MUSIC model has been set up using Rainfall Station 39083 for Rockhampton using a date range 1999 – 2010 with a 6 minute time step.

5.3.1 Stormwater Quality Objectives

To protect the water quality of the downstream watercourses the following water quality objective has been applied to stormwater runoff from the site in accordance with Capricorn Municipal Development Guidelines, *Stormwater Drainage Design D5 – D05.21.01.*

Best Management Practices (BMP) are required to be demonstrated for all development applications within Rockhampton Regional Council. The following load reduction targets must be achieved when assessing the post-development treatment train (comparison of unmitigated developed case versus developed mitigated case).

- 80% reduction in Total Suspended Sediment (TSS)
- 60% reduction in Total Phosphorus (TP)
- 45% reduction in Total Nitrogen (TN)
- 90% reduction in litter (sized 5 mm or greater)

5.3.2 Stormwater Quality Improvement Devices

Due to the site being located in a region that has environmental and ecological significance, a Water Sensitive Urban Design (WSUD) approach has been adopted for the site. Bio-retention systems have been proposed as the most suitable SQID's to treat runoff from the subject site as it can readily be integrated into the proposed landscaping and revegetation works. There are separate bio-retention basins proposed for Post Development Catchment A-D and F. Note that as Post Development Catchment E remains undeveloped, no bio-retention basin has been proposed for this catchment.

The MUSIC catchment areas have been based off the post development catchments described in Section 2.5 of this report. The road areas have been obtained from the proposed road network detailed in the post development layout. The roof areas have been calculated based on an assumed 350 m^2 roof area and the number of lots within the catchment. The ground surface is the remaining area and has been modelled as 15% impervious in accordance with Table 3.6 of Water by Design, *MUSIC Modelling Guidelines*.

Bio-retention basins are required to treat the Q3 month flow generated from their influencing catchments. The Q3 month flow rate for each catchment is provided in Table 23 for reference and to assist in sizing the drainage infrastructure (i.e., diversion structure) that discharges into each bio-retention basin.

Table 23: Q3 Month Runoff

Water Quality Catchment	Catchment Area (m^2)	Q3 Month Runoff (m^3/s)
A	8.693	0.737
B	9.845	0.864
C	12.328	0.979
D	10.401	0.913
F	0.560	0.044

The contributing roof, road and ground areas for each post development catchment are listed below.

Post Development Catchment A:

- Roof – 1.40 ha
- Road – 0.686 ha
- Ground – 6.608 ha

Post Development Catchment B:

- Roof – 2.065 ha
- Road – 0.248 ha
- Ground – 7.531 ha

Post Development Catchment C:

- Roof – 2.24 ha
- Road – 0.996 ha
- Ground – 9.093 ha

Post Development Catchment D:

- Roof – 1.925 ha
- Road – 1.091 ha
- Ground - 7.385 ha

Post Development Catchment F:

- Roof – 0.105 ha
- Road – 0.05 ha
- Ground – 0.4048 ha

For assessment purposes only, each post development catchment has been modelled to discharge into a singular bio-retention device for treatment. This has been carried out to allow the total required treatment area for each catchment to be determined. The layout of the proposed bio-retention basins for each catchment are depicted on Knobel Engineers, *Stormwater Management Plan* (Ref: K4887/P003/A) included as Appendix D.

The final location and arrangement of bio-retention basins within the catchments will be determined at detailed design stage.

A diagram of the operational treatment train can be seen in Figure 5.

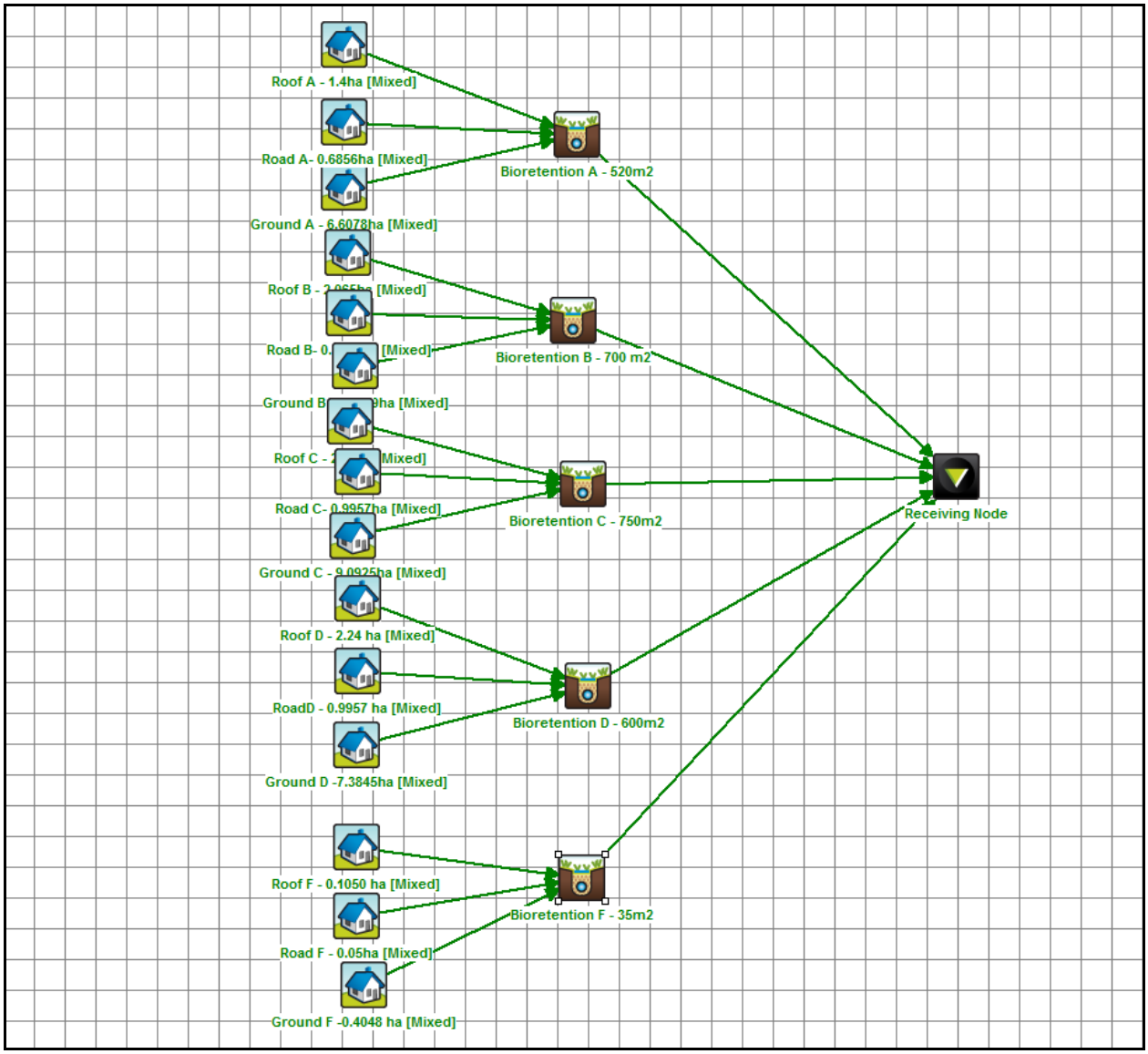


Figure 5: Operational Phase Treatment Train for Site

5.3.3 Design Parameters of the Stormwater Quality Improvement System

Detailed design of the stormwater treatment train shall be in accordance with the WSUD, Technical Design Guidelines for South East Queensland – Version 1 (June 2006).

BIO-RETENTION BASINS

A bio-retention basin is designed to pond stormwater allowing it to percolate through a layer of filter media, typically sandy loam. Runoff passing through the filter media is collected with a perforated pipe discharging to the downstream drainage infrastructure. The Bio-retention basins shall be located to treat all stormwater from the development area. The inlet of the bio-retention basin is to be equipped with a sediment forebay to allow a control point at the entrance to the bio for maintenance and removal of sediment accumulation. It will also dissipate flows reducing pipe exit velocity and limit the occurrence of potential scour of the sensitive downstream constructed bio-retention media surface.

All bio-retention basins have been modelled with the same parameters with the only change being the filter and surface area for each device. For each specific bio-retention basin, the filter area and surface area have been modelled as the same value to ensure a conservative design approach at the conceptual stage. The bio-retention basins have been modelled with the following properties:

ALL BASINS:

- Filter media — Sandy Loam;
  5 – 10% Organic Content in accordance with AS1289.4.1.1;
  Average D50 0.45 mm;
  Ksat 200 mm/hr;
  TN Content = 400 mg/kg
  Orthophosphate Content = 30 mg/kg
- Filter media depth — 0.40 m;
- Drainage layer — 0.20 m;
- Extended detention depth — 0.30 m;
- Seepage — 0 mm/hr;

BASIN A

- Filter Area — 520 m^2;
- Surface Area — 520 m^2.

BASIN B

- Filter Area — 700 m^2;
- Surface Area — 700 m^2.

BASIN C

- Filter Area — 750 m^2;
- Surface Area — 750 m^2.

BASIN D

- Filter Area — 600 m^2;
- Surface Area — 600 m^2.

BASIN F

- Filter Area — 35 m^2;
- Surface Area — 35 m^2.

5.3.4 Post Development Modelling Results - Mitigated

The stormwater quality improvement device (SQID) will reduce the amount of sediments and nutrients discharging from the proposed residential development. Table 24 illustrate the effectiveness of the SQID's in each treatment train to each of the LPODs. Note that as all stormwater from the development outlet to the one consolidated LPOD, the treatment train effectiveness shown below is for the entire site.

Table 24: Treatment Train Effectiveness

Parameter	Post	Post Mitigated	Reduction	Water Quality Objectives
Flow (ML/yr)	106	101	4.8 %	-
TSS (kg/yr)	16800	3320	80.3 %	80 %
TP (kg/yr)	35.4	9.82	72.2 %	60 %
TN (kg/yr)	221	115	48 %	45 %
Gross Pollutants (kg/yr)	3050	0	100 %	90 %

The results demonstrate that the proposed SQID meet the intended water quality objectives for suspended solids, phosphorous and nitrogen levels for the entire development.

6.0 OPERATIONAL PHASE MAINTENANCE REQUIREMENTS

The proposed stormwater management devices will require maintenance and monitoring to ensure that they function as designed. The following section provides an outline of the necessary maintenance tasks for the proposed devices.

6.1 Bio-retention Basin Maintenance

The most intensive period of maintenance is during the plant establishment period (first two years) when weed removal and replanting may be required. It is also the time when large loads of sediments could impact on plant growth particularly in developing catchments with poor building controls.

Maintenance is primarily concerned with:

- Maintenance of flow to and through the bio-retention basin;
- Maintaining vegetation;
- Preventing undesired overgrowth vegetation from taking over the bio-retention basin;
- Removal of accumulated sediments; and
- Litter and debris removal.

Vegetation maintenance will include:

- Fertilising plants;
- Removal of noxious plants or weeds; and
- Re-establishment of plants that die.

Sediments accumulated at the inlets need to be monitored. Depending on the catchment activities the deposition of sediment can tend to smother plants and reduce the ponding volume available. Should excessive sediment build-up it will impact on the plant health and require removal before it reduces the infiltration rate of the filter media. The proposed SQIDs will require regular maintenance and monitoring to ensure that they function as designed.

Table 25: Bio-retention Basin Maintenance Schedule

Bio-retention Basin Maintenance Checklist			
Inspection Frequency: 3 Monthly	**Date of Visit:**		
Location:			
Description:			
Site Visibility:			
Inspection Items	**Yes**	**No**	**Action Required (Details)**
Sediment accumulation at inflow points?			
Litter basin?			
Erosion at inlet or other key structures (e.g. crossovers)?			
Traffic damage present?			
Evidence of dumping (Building waste, oils etc)?			
Vegetation condition satisfactory (density, weeds etc)?			
Replanting required?			
Mowing required?			
Clogging of drainage points (sediment or debris)?			
Evidence of ponding?			
Damage/vandalism to structures present?			
Surface clogging visible?			
Drainage system inspected?			
Resettling of system required?			
Comments:			

7.0 FLOOD STORAGE ASSESSMENT

7.1 Flood Storage

As mentioned previously, the subject site is located alongside the Fitzroy River, with a small portion of the development being situated in the Fitzroy Rivers flood fringe area. A portion of the subject site is located within the Q100 flood event extent and must therefore be appropriately managed to ensure that any residential allotments have adequate flood immunity.

The council flood model for the subject site was obtained in order to perform a flood storage volume check for the pre and post development layout. The model contains the inundation areas and peak water surface levels from the Fitzroy River in a Q100 flood event.

The model was interrogated to extract the Q100 water level for the subject site, which was found to be 11.8 m AHD. The proposed development will maintain the existing flood storage total of 490,283 m^3 on site below the designated flood level (DFL) of 11.8 m AHD.

Flood storage compensation for the post-development case has been achieved by sculpting and increasing the volume around the southern portion of the site and within the main conveyance channel which runs through the centre of the subject site. The post development contours achieve a flood storage volume of 490,776 m^3 for the subject site, which results in a surplus of 493 m^3 below the DFL. Therefore, the proposed development will provide adequate compensatory flood storage for the site.

Refer to Knobel Engineers, *Preliminary Pre Development Flood Storage Plan* (Ref: K4887/P006/A) and Knobel Engineers, *Preliminary Post Development Flood Storage Plan* (Ref: K4887/P007/A) in Appendix H for further information.

7.2 Minimum Floor Levels

All residential allotments are to have adequate flood immunity in the Q100 event, which is to be achieved by setting finished floor levels a minimum of 300 mm above the DFL of 11.8 m AHD. In addition to this, the allotments situated along the main conveyance channel are to achieve 300 mm freeboard above the Q100 water level reached in the conveyance channel. Refer to Section 4.0 for information on the Q100 water levels reached at critical locations along the conveyance channel.

8.0 CONCLUSIONS

Knobel Engineers has been commissioned by Glenmore Holdings (Aust) Pty Ltd to prepare an amended *Conceptual Stormwater Management Plan* (CSWMP), to support a development application for the Material Change of Use and Reconfiguring of a Lot (2 Lots into 222 Lots) at 54-102 and 263 Belmont Road, Parkhurst. This CSWMP addresses the conceptual planning, layout and design of the stormwater quality and quantity management infrastructure for both the construction and operational phases of this development.

Hydraulic analysis demonstrated that the development will increase peak flow rates discharging from the site, however due to the location of the development within the Fitzroy River Catchment, stormwater detention will provide no noticeable impact to the hydraulics of the catchment and has therefore not been implemented for the development.

A hydraulic model built using the XPSWMM software program was utilised to assess the capacity of the major conveyance channel and impacted internal road sections within the developed site. Results indicated that the proposed infrastructure can safely convey the Q100 flows from contributing internal and external catchments through the subject site while adhering to QUDM transverse road flow requirements.

Knobel Engineers has adopted a water sensitive urban design (WSUD) approach to managing the stormwater runoff from the proposed development by treating stormwater runoff within separate bio-retention basins for each post development catchment. A total of 2,605 m^2 of bioretention filter area is required to treat stormwater runoff from the entire subject site and satisfy water quality objectives for Rockhampton Regional Council. A monitoring and maintenance plan for the basins has been included. A sediment and erosion control plan is provided for the construction phase of the development and shall be implemented by the contractor and developer.

APPENDIX

A

Contour Consulting

Overall Landscape Concept Sketch

(Ref: 17-004/SK02)

APPENDIX

Contour Consulting
ABN 98 125 137 348
349 Hobler Avenue
Frenchville
Rockhampton QLD 4701
Central Queensland
Telephone: 07 4928 2898
Email: contour.consulting@bigpond.com

LANDSCAPE LEGEND

- Hydromulching coverage to proposed allotments (Refer future civil OPW approval)
- Turf & Hydroseeding areas
- Vegetated stormwater swales / channels (Refer future civil OPW approval)
- Garden areas
- Existing vegetation along natural inlets to be retained and enhanced
- Existing vegetation to be preserved
- Stormwater quality bio-retention area (Refer future civil OPW approval)
- 9.0 Existing surface contours
- 9.5 Design surface contours
- Proposed Fitzroy River Q10 flood level (To be confirmed by future civil OPW approval)
- Proposed Fitzroy River Q100 flood level (To be confirmed by future civil OPW approval)

SCALES

0 20.0 80.0m 1:4000

REVISION / ISSUE REGISTER

No.	DATE	REMARKS
A	07/19	For Review

DESIGN		DRAWN	
RLS		RLS	

GLENMORE HOLDINGS (AUST) PTY LTD

RIVERSIDE WATERS
STAGES 1 to 12
BELMONT RD, ROCKHAMPTON

OVERALL LANDSCAPE CONCEPT SKETCH

DWG No. 17-004/SK02 A

DO NOT SCALE - IF IN DOUBT ASK

B

Knobel Engineers

Pre Development Catchment Plan

(Ref: K4887/P001/A)

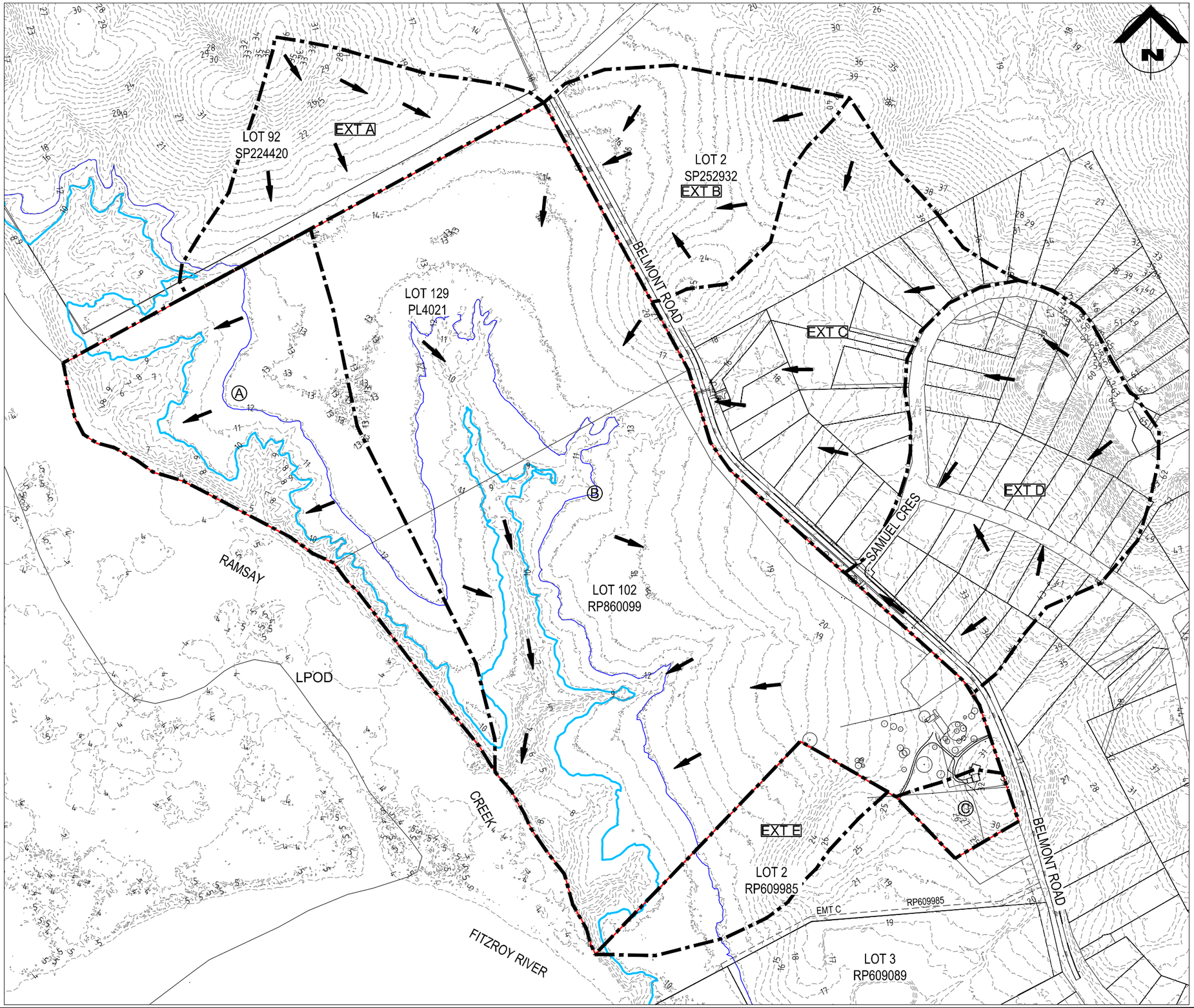
LEGEND

- SITE BOUNDARY
- STORMWATER CATCHMENT BOUNDARY
- Ⓐ STORMWATER CATCHMENT I.D.
- EXT A EXTERNAL STORMWATER CATCHMENT I.D.
- LPOD LAWFUL POINT OF DISCHARGE
- PROPOSED FLOW DIRECTION

PRE DEVELOPMENT STORMWATER CATCHMENT TABLE	
STORMWATER CATCHMENT I.D.	AREA (ha)
A	11.732
B	40.785
C	1.003
TOTAL	53.50

EXTERNAL STORMWATER CATCHMENT TABLE	
STORMWATER CATCHMENT I.D.	AREA (ha)
EXT A	6.154
EXT B	6.892
EXT C	12.312
EXT D	12.476
EXT E	3.932
TOTAL	41.766

CONTRACTOR TO DETERMINE AND LOCATE ALL EXISTING SERVICES PRIOR TO COMMENCEMENT OF WORKS



REPORT ISSUE
NOT FOR CONSTRUCTION

ISSUE No.	DATE	AMENDMENT
A	-	ISSUED FOR REPORT

KNOBEL ENGINEERS
Suite 4 - 155 Varsity Parade, Varsity Lakes Q 4227
T: 07 5580 9777 F: 07 5580 9133
E: eng@knobelengineers.com.au
PO Box 41, Varsity Lakes Q 4227
ABN: 33 071 435 202
W: knobelengineers.com.au
GOLD COAST | BRISBANE | BALLINA | ROCKHAMPTON

CLIENT: GLENMORE HOLDINGS (AUST) PTY LTD

PROJECT: RIVERSIDE WATERS ESTATE
54-102 AND 263 BELMONT ROAD
PARKHURST QLD 4702

DESIGN	DRAWN	APPROVED
SK	DKC	

TITLE: PRE DEVELOPMENT CATCHMENT PLAN

SCALE: 1:12500 AT A1, 1:25000 AT A3 (0, 500, 1000m)

PROJECT NO.: K4887

DWG NO.: P001

ISSUE: A

APPENDIX

C

Knobel Engineers

Post Development Catchment Plan

(Ref: K4887/P002/A)

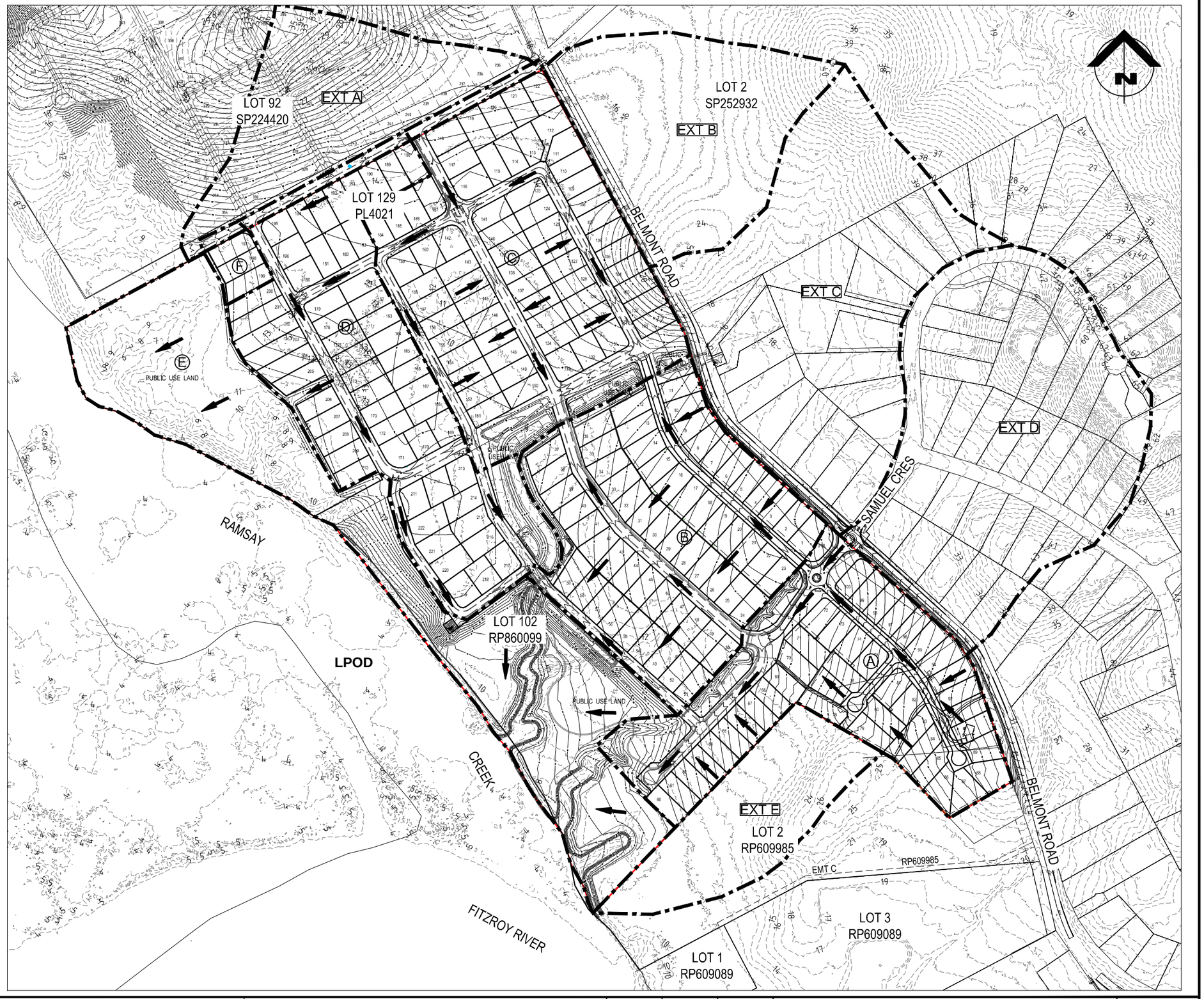
LEGEND

- SITE BOUNDARY
- STORMWATER CATCHMENT BOUNDARY
- Ⓐ STORMWATER CATCHMENT I.D.
- EXT A EXTERNAL STORMWATER CATCHMENT I.D.
- LPOD LAWFUL POINT OF DISCHARGE
- PROPOSED FLOW DIRECTION

POST DEVELOPMENT STORMWATER CATCHMENT TABLE	
STORMWATER CATCHMENT I.D.	AREA (ha)
A	8.693
B	9.845
C	12.328
D	10.401
E	12.358
F	0.560
TOTAL	54

EXTERNAL STORMWATER CATCHMENT TABLE	
STORMWATER CATCHMENT I.D.	AREA (ha)
EXT A	6.154
EXT B	6.892
EXT C	12.312
EXT D	12.476
EXT E	3.932
TOTAL	41.766

CONTRACTOR TO DETERMINE AND LOCATE ALL EXISTING SERVICES PRIOR TO COMMENCEMENT OF WORKS



REPORT ISSUE
NOT FOR CONSTRUCTION

ISSUE No.	DATE	AMENDMENT
A	-	ISSUED FOR REPORT

KNOBEL ENGINEERS
Suite 4 - 155 Varsity Parade, Varsity Lakes Q 4227
T: 07 5580 9777 F: 07 5580 9133
E: eng@knobelengineers.com.au
PO Box 41, Varsity Lakes Q 4227
ABN: 33 071 435 202
W: knobelengineers.com.au
GOLD COAST | BRISBANE | BALLINA | ROCKHAMPTON

CLIENT: GLENMORE HOLDINGS (AUST) PTY LTD

PROJECT: RIVERSIDE WATERS ESTATE
54-102 AND 263 BELMONT ROAD
PARKHURST QLD 4702

DESIGN	DRAWN	APPROVED
SK	DKC	

TITLE: POST DEVELOPMENT CATCHMENT PLAN

SCALE: 1:12500 AT A1, 1:25000 AT A3 (0 500 1000m)

PROJECT NO.: K4887

DWG NO.: P002

ISSUE: A

APPENDIX

D

Knobel Engineers

Stormwater Sub-Catchment Plan

(Ref: K4887/P005/A)

LEGEND

- SITE BOUNDARY
- STORMWATER CATCHMENT BOUNDARY
- (A) STORMWATER CATCHMENT I.D.
- INT A STORMWATER CATCHMENT I.D.
- EXT A EXTERNAL STORMWATER CATCHMENT I.D.
- LPOD LAWFUL POINT OF DISCHARGE
- PROPOSED FLOW DIRECTION

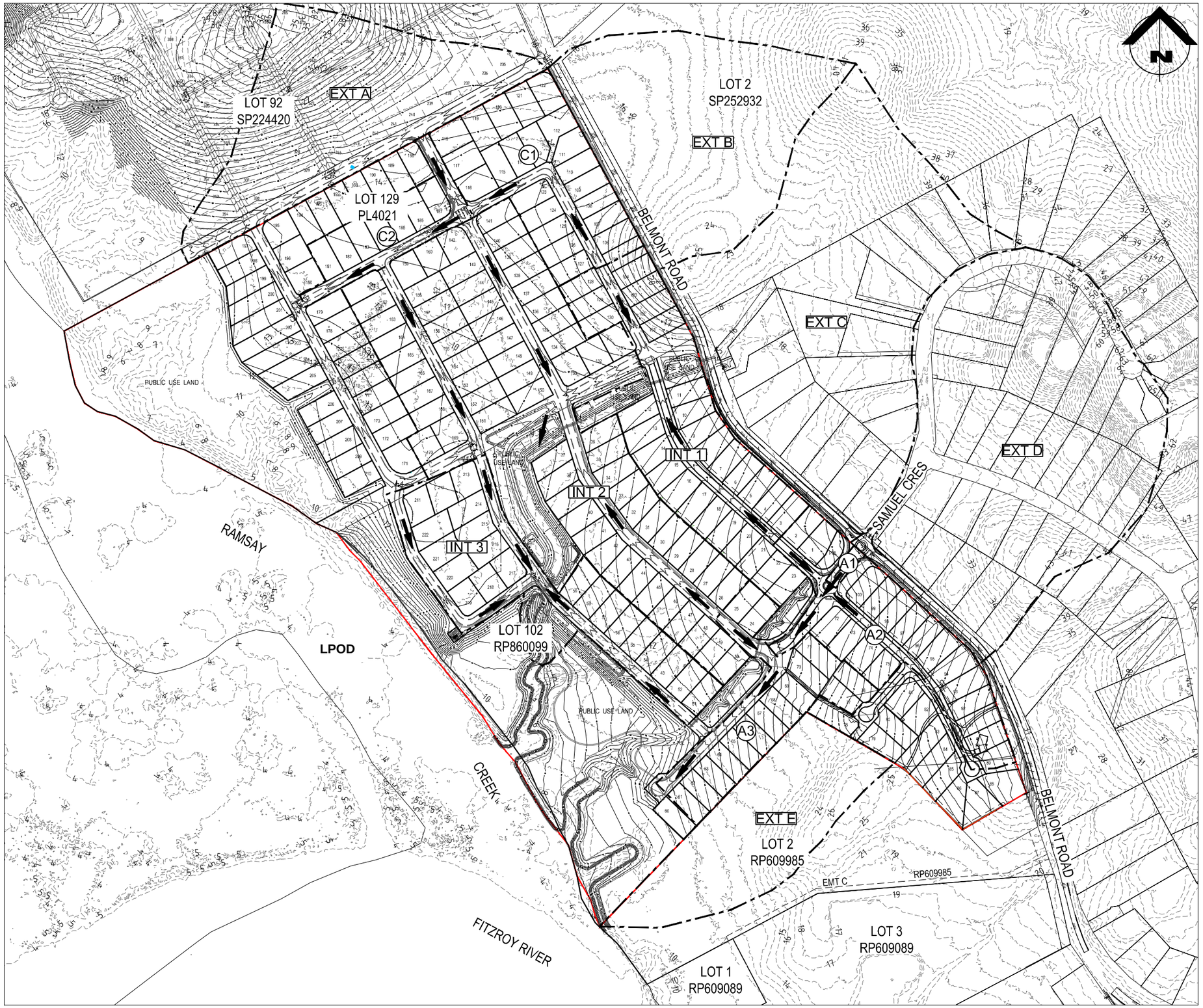
STORMWATER SUB-CATCHMENT TABLE	
STORMWATER CATCHMENT I.D.	AREA (ha)
A1	0.093
A2	3.336
A3	2.516
C1	3.581
C2	1.517
INT 1	5.105
INT 2	12.01
INT 3	4.503

EXTERNAL STORMWATER CATCHMENT TABLE	
STORMWATER CATCHMENT I.D.	AREA (ha)
EXT A	6.154
EXT B	6.892
EXT C	12.312
EXT D	12.476
EXT E	3.932
TOTAL	41.766

CONTRACTOR TO DETERMINE AND LOCATE ALL EXISTING SERVICES PRIOR TO COMMENCEMENT OF WORKS

STORMWATER SUB-CATCHMENT DISCHARGE TABLE	
STORMWATER CATCHMENT ID	DISCHARGE LOCATION
A1, A2, A3	CATCHMENT A
INT 1, INT 2, INT 3	MAIN CONVEYANCE CHANNEL
C1, C2	CHANNEL D

REPORT ISSUE
NOT FOR CONSTRUCTION



ISSUE No.	DATE	AMENDMENT
A	-	ISSUED FOR REPORT

KNOBEL ENGINEERS
Suite 4 - 155 Varsity Parade, Varsity Lakes Q 4227
PO Box 41, Varsity Lakes Q 4227
T: 07 5580 9777 F: 07 5580 9133 W: knobelengineers.com.au
E: eng@knobelengineers.com.au
ABN: 33 071 435 202
GOLD COAST | BRISBANE | BALLINA | ROCKHAMPTON

CLIENT: GLENMORE HOLDINGS (AUST) PTY LTD

PROJECT: RIVERSIDE WATERS ESTATE
54-102 AND 263 BELMONT ROAD
PARKHURST QLD 4702

DESIGN	DRAWN	APPROVED
SK	DKC	

TITLE: STORMWATER SUB CATCHMENT PLAN

SCALE: 1:12500 AT A1
1:25000 AT A3
0 500 1000m

PROJECT NO. K4887

DWG NO. P005

ISSUE A.

APPENDIX

E

Knobel Engineers

Stormwater Management Plan

(Ref: K4887/P003/A)

LEGEND

- STORMWATER CATCHMENT BOUNDARY
- Ⓐ STORMWATER CATCHMENT I.D.
- SITE BOUNDARY
- LPOD — LAWFUL POINT OF DISCHARGE
- SWD — PROPOSED STORMWATER PIPE
- CATCHMENT FLOW DIRECTION
- PROPOSED BIORETENTION BASIN
- > > > > > > PROPOSED CHANNEL

BIORETENTION BASIN PARAMETERS TABLE

BASIN I.D	FILTER AREA	EXTENDED DETENTION DEPTH	BATTERS
A	520 m²	0.3 m	1 in 4
B	700 m²	0.3 m	1 in 4
C	750 m²	0.3 m	1 in 4
D	600 m²	0.3 m	1 in 4
F	35 m²	0.3 m	1 in 4

BIORETENTION Q3 MONTH FLOW RATE

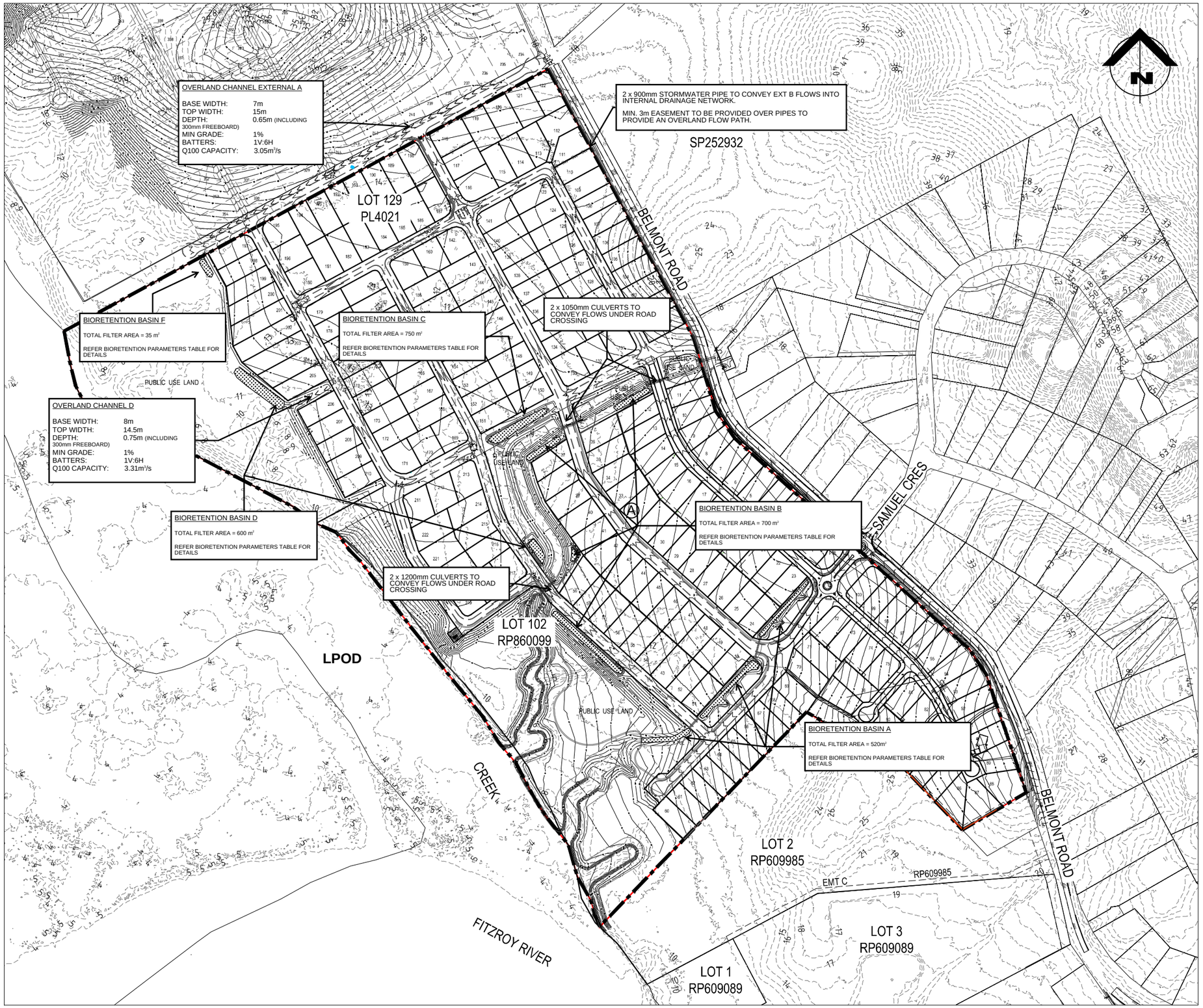
BASIN I.D	CATCHMENT AREA (ha)	Q3 MONTH FLOW RATE (m³/s)
A	8.693	0.737
B	9.845	0.864
C	12.328	0.979
D	10.401	0.913
F	0.560	0.044

STORMWATER MANAGEMENT NOTES

1. INTERNAL STORMWATER DRAINAGE DESIGNED BY OTHERS.
2. Q3 MONTH FLOWS TO BE DISCHARGED INTO BIORETENTION BASIN.
3. SEDIMENT FOREBAYS AND MAINTAINENCE TRACKS TO BE IMPLEMENTED AT EACH BIORETENTION BASIN INLET.
4. SCOUR PROTECTION TO BE PROVIDED AROUND CULVERT INLETS AND OUTLETS.
5. FINISHED FLOOR LEVELS OF ALLOTMENTS TO BE 300mm ABOVE THE Q100 WATER LEVELS.

CONTRACTOR TO DETERMINE AND LOCATE ALL EXISTING SERVICES PRIOR TO COMMENCEMENT OF WORKS

REPORT ISSUE
NOT FOR CONSTRUCTION



ISSUE No.	DATE	AMENDMENT
A	-	ISSUED FOR REPORT

KNOBEL ENGINEERS
Suite 4 - 155 Varsity Parade, Varsity Lakes Q 4227
T: 07 5580 9777 F: 07 5580 9133
E: eng@knobelengineers.com.au
PO Box 41, Varsity Lakes Q 4227
ABN: 33 071 435 202
W: knobelengineers.com.au
GOLD COAST | BRISBANE | BALLINA | ROCKHAMPTON

CLIENT	GLENMORE HOLDINGS (AUST) PTY LTD		
PROJECT	RIVERSIDE WATERS ESTATE 54-102 AND 263 BELMONT ROAD PARKHURST QLD 4702		
DESIGN	SK	DRAWN	DKC
APPROVED			
TITLE	STORMWATER MANAGEMENT PLAN		
SCALE	1:12500 AT A1 1:25000 AT A3	0 500 1000m	
PROJECT NO.	K4887		
DWG NO.	P003	ISSUE	A

APPENDIX

F

Knobel Engineers

Sediment and Erosion Control Plan

(Ref: K4887/P004/A)

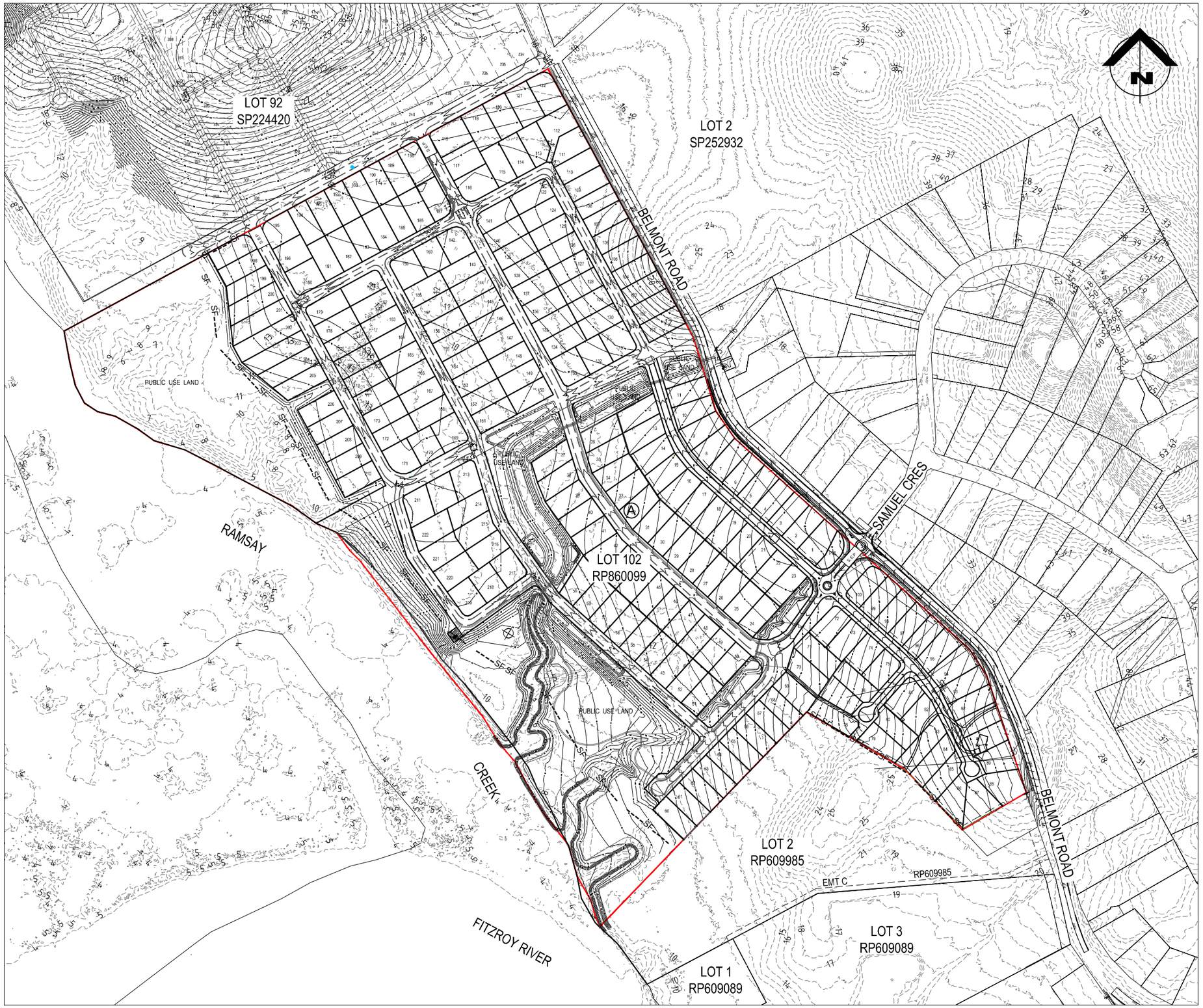
LEGEND

- SITE BOUNDARY
- SF — SEDIMENT FENCE
- SER — STABILISED ENTRY/EXIT POINT
- MS1 — WATER QUALITY MONITORING STATION
- DSP — DRAINAGE STRUCTURE PROTECTION

CONTRACTOR TO DETERMINE AND LOCATE ALL EXISTING SERVICES PRIOR TO COMMENCEMENT OF WORKS

SEDIMENT & EROSION CONTROL NOTES

1. REFER TO KNOBLE ENGINEERS SK01 FOR SEDIMENT BASIN LAYOUT.
2. DRAINAGE STRUCTURE PROTECTION TO BE IMPLEMENTED AROUND ALL CONSTRUCTED DRAINAGE INFRASTRUCTURE.



REPORT ISSUE
NOT FOR CONSTRUCTION

ISSUE No.	DATE	AMENDMENT
A	-	ISSUED FOR REPORT

KNOBEL ENGINEERS
Suite 4 - 155 Varsity Parade, Varsity Lakes Q 4227
PO Box 41, Varsity Lakes Q 4227
T: 07 5580 9777 F: 07 5580 9133 ABN: 33 071 435 202
E: eng@knobelengineers.com.au W: knobelengineers.com.au
GOLD COAST | BRISBANE | BALLINA | ROCKHAMPTON

CLIENT	GLENMORE HOLDINGS (AUST) PTY LTD		
PROJECT	RIVERSIDE WATERS ESTATE 54-102 AND 263 BELMONT ROAD PARKHURST QLD 4702		
DESIGN	SK		
DRAWN	DKC		
APPROVED			
TITLE	SEDIMENT AND EROSION CONTROL PLAN		
SCALE	1:12500 AT A1 1:25000 AT A3	0 500 1000m	
PROJECT NO.	K4887		
DWG NO.	P004	ISSUE	A

APPENDIX

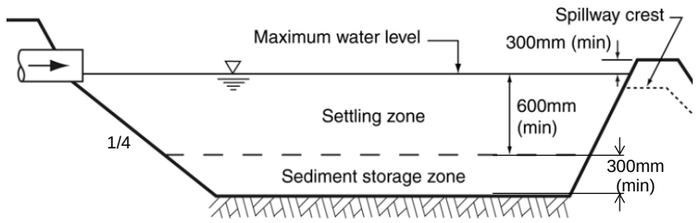
G

Knobel Engineers

Sediment Basin Plan

(Ref: SK01)

PROJECT NUMBER:	K4887
SKECTH NO:	SK01
DESCRIPTION:	SEDIMENT BASIN PLAN
DATE:	07/05/2019



SEDIMENT BASIN D TYPICAL SECTION

LEGEND

FLOW DIRECTION →

WATER QUALITY MONITORING STATION ⊕

SEDIMENT BASIN 8

Catchment Area= 1.402 ha
Surface Area (top) = 991m2
Settling Volume = 580m3 at 0.6m depth
Storage Volume = 290m3 at 0.3m depth
Basin Volume (total) = 871 m3
Emergency Spillway = 10m width at 0.9m from basin invert

SEDIMENT BASIN 7

Catchment Area= 1.562 ha
Surface Area (top) = 1,107m2
Settling Volume = 647m3 at 0.6m depth
Storage Volume = 323m3 at 0.3m depth
Total Volume = 970 m3
Emergency Spillway = 10m width at 0.9m from basin invert

SEDIMENT BASIN 6

Catchment Area= 1.259 ha
Surface Area (top) = 881m2
Settling Volume = 521m3 at 0.6m depth
Storage Volume = 261m3 at 0.3m depth
Total Volume = 781 m3
Emergency Spillway = 9m width at 0.9m from basin invert

SEDIMENT BASIN 5

Catchment Area= 0.472 ha
Surface Area (top) = 422m2
Settling Volume = 195m3 at 0.6m depth
Storage Volume = 98m3 at 0.3m depth
Total Volume = 293 m3
Emergency Spillway = 3m width at 0.9m from basin invert

SEDIMENT BASIN 4

Catchment Area= 2.517 ha
Surface Area (top) = 1,630m2
Settling Volume = 1,042m3 at 0.6m depth
Storage Volume = 521m3 at 0.3m depth
Total Volume = 1,563m3
Emergency Spillway = 15m width at 0.9m from basin invert

SEDIMENT BASIN 1

Catchment Area= 2.601ha
Surface Area (top) = 1630m2
Settling Volume = 1,077m3 at 0.6m depth
Storage Volume = 538m3 at 0.3m depth
Total Volume = 1,615m3
Emergency Spillway = 16m width at 0.9m from basin invert

SEDIMENT BASIN 3

Catchment Area= 1.739 ha
Surface Area (top) = 1,228m2
Settling Volume = 720m3 at 0.6m depth
Storage Volume = 360m3 at 0.3m depth
Total Volume (total) = 1,080 m3
Emergency Spillway = 10m width at 0.9m from basin invert

SEDIMENT BASIN 2

Catchment Area= 3.633 ha
Surface Area (top) = 2,250m2
Settling Volume = 1,504m3 at 0.6m depth
Storage Volume = 752m3 at 0.3m depth
Total Volume = 2,256m3
Emergency Spillway = 15m width at 0.9m from basin invert

1:2500 AT A1
1:5000 AT A3

0 50 100 150 200m

APPENDIX

H

Knobel Engineers

Preliminary Pre Development Flood Storage Plan

(Ref: K4887/P006/A)

Preliminary Post Development Flood Storage Plan

(Ref: K4887/P007/A)

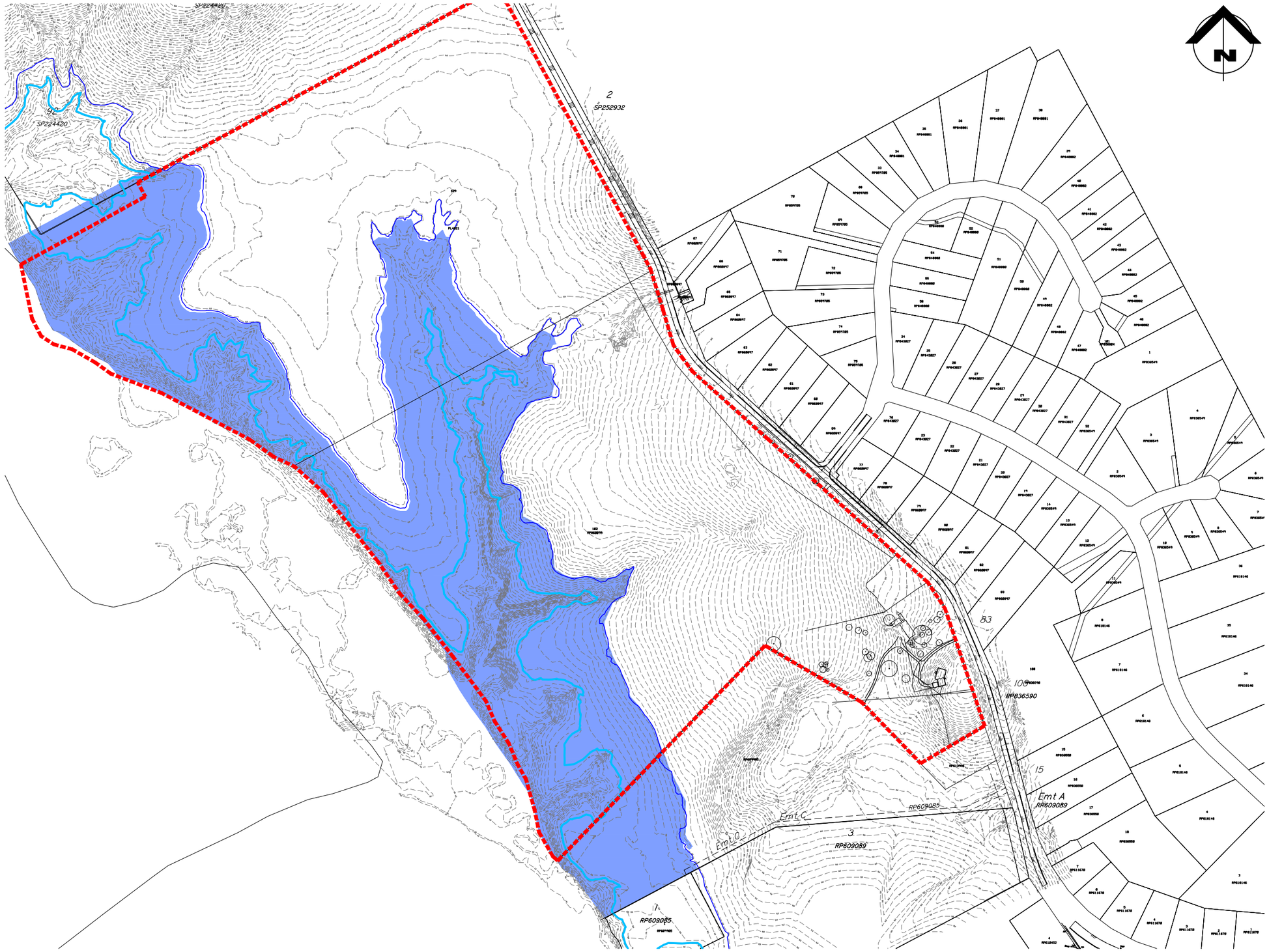
LEGEND

- FLOODED AREA
- SITE BOUNDARY
- 80.0 EXISTING SURFACE CONTOURS
- FLOW DIRECTION

PRELIMINARY FLOOD STORAGE VOLUME CALCULATIONS	
EXISTING CASE	
PRE DEVELOPMENT Q_{100} FLOOD STORAGE TO RL 11.80m A.H.D	490283m³

NOTES:

1. DESIGNATED Q_{100} FLOOD LEVEL (DFL) 11.80m A.H.D
2. FLOOD STORAGE CALCULATION HAS CONSIDERED THE EXTENT OF SITE SURVEY IN BOTH PRE/POST SCENARIOS.



PRE DEVELOPMENT

REPORT ISSUE
NOT FOR CONSTRUCTION

CONTRACTOR TO DETERMINE AND LOCATE ALL EXISTING SERVICES PRIOR TO COMMENCEMENT OF WORKS

ISSUE No.	DATE	AMENDMENT
A	12-09-19	ISSUED FOR REPORT

KNOBEL ENGINEERS
Suite 4 - 155 Varsity Parade, Varsity Lakes Q 4227
PO Box 41, Varsity Lakes Q 4227
T: 07 5580 9777 F: 07 5580 9133
ABN: 33 071 435 202
E: eng@knobelengineers.com.au
W: knobelengineers.com.au
GOLD COAST | BRISBANE | BALLINA | ROCKHAMPTON

CLIENT	DESIGN	DRAWN	APPROVED
GLENMORE HOLDINGS (AUST) PTY LTD	SK	EG	

PROJECT
RIVERSIDE WATERS ESTATE
54-102 AND 263 BELMONT ROAD
PARKHURST QLD 4702

TITLE
PRELIMINARY PRE DEVELOPMENT FLOOD STORAGE PLAN

SCALE
1:2500 AT A1
1:5000 AT A3
0 50 100 150 200m

PROJECT NO.	
K4887	
DWG NO.	ISSUE
P006	A

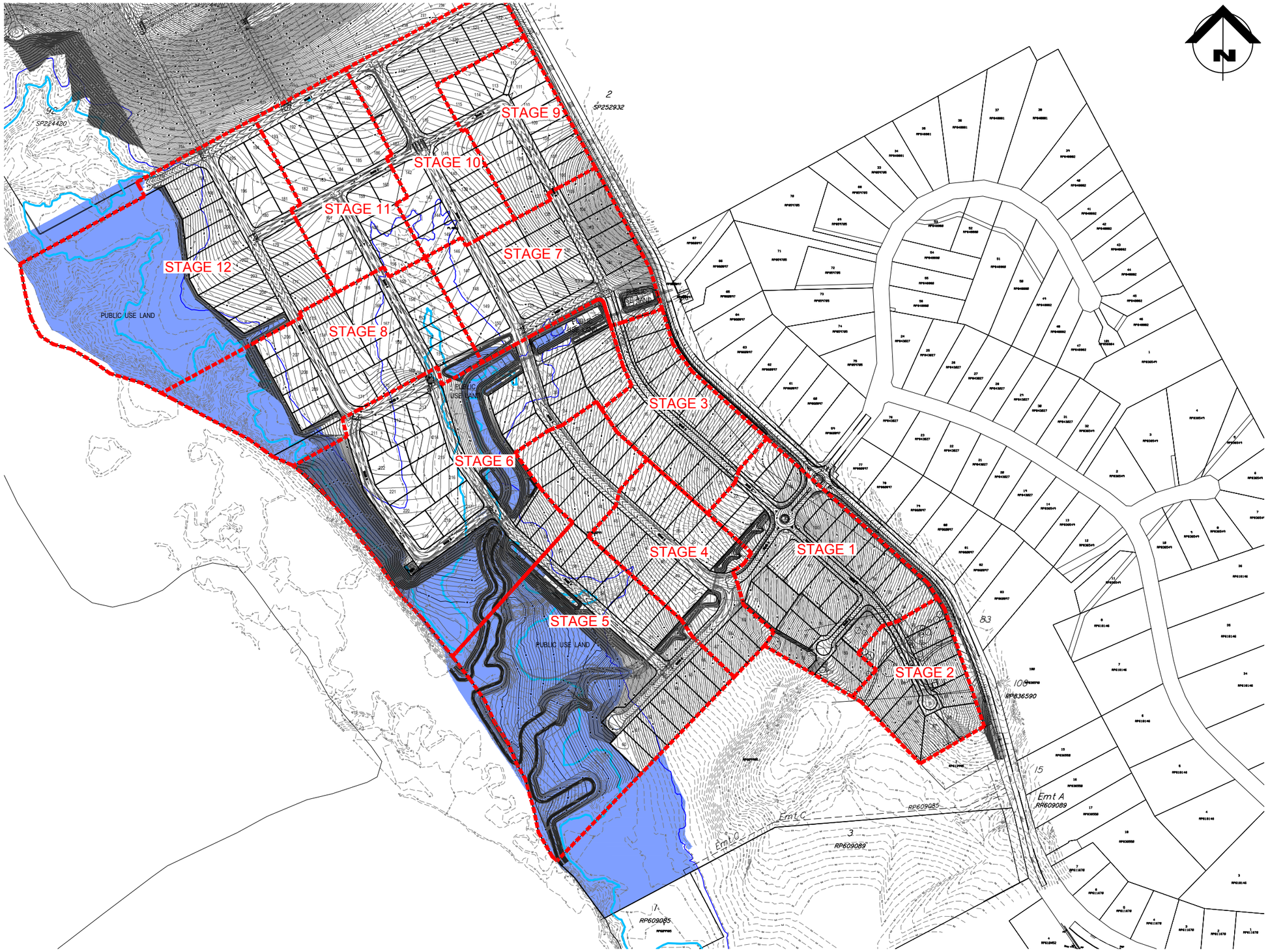
LEGEND

- FLOODED AREA
- SITE BOUNDARY
- 80.0 EXISTING SURFACE CONTOURS
- FLOW DIRECTION

PRELIMINARY FLOOD STORAGE VOLUME CALCULATIONS	
EXISTING CASE	
PRE DEVELOPMENT Q_{100} FLOOD STORAGE TO RL 11.80m A.H.D	490283m³
DEVELOPED CASE	
POST DEVELOPMENT Q_{100} FLOOD STORAGE TO RL 11.80m A.H.D	490776m³

NOTES:

1. DESIGNATED Q_{100} FLOOD LEVEL (DFL) 11.80m A.H.D
2. FLOOD STORAGE CALCULATION HAS CONSIDERED THE EXTENT OF SITE SURVEY IN BOTH PRE/POST SCENARIOS.



POST DEVELOPMENT

REPORT ISSUE
NOT FOR CONSTRUCTION

CONTRACTOR TO DETERMINE AND LOCATE ALL EXISTING SERVICES PRIOR TO COMMENCEMENT OF WORKS

ISSUE No.	DATE	AMENDMENT
A	12-09-19	ISSUED FOR REPORT

KNOBEL ENGINEERS
Suite 4 - 155 Varsity Parade, Varsity Lakes Q 4227
PO Box 41, Varsity Lakes Q 4227
T: 07 5580 9777 F: 07 5580 9133 ABN: 33 071 435 202
E: eng@knobelengineers.com.au W: knobelengineers.com.au
GOLD COAST | BRISBANE | BALLINA | ROCKHAMPTON

CLIENT: GLENMORE HOLDINGS (AUST) PTY LTD

PROJECT: RIVERSIDE WATERS ESTATE
54-102 AND 263 BELMONT ROAD
PARKHURST QLD 4702

DESIGN	DRAWN	APPROVED
SK	EG	

TITLE: PRELIMINARY POST DEVELOPMENT FLOOD STORAGE PLAN

SCALE: 1:2500 AT A1, 1:5000 AT A3 (0 50 100 150 200m)

PROJECT NO. K4887

DWG NO. P007

ISSUE A

BROWN

Infrastructure Report

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/84-2014

Dated: 15 September 2015

Riverside Estate

Belmont Road, Parkhurst

Revision C

December 2014

R12394

Prepared for Glenmore Holding (AUST) Pty Ltd

Urban Development - Rockhampton

Smart Consulting

COMMERCIAL IN CONFIDENCE

Brown Consulting (QLD) Pty Ltd
238 Quay Street
PO Box 1580
ROCKHAMPTON QLD 4700

Ph: (07) 4931 0777

2014

DOCUMENT CONTROL

Infrastructure Report – December 2014

Issue	Date	Issue Details	Author	Checked	Approved
A	11/13	Infrastructure Report	PJ	JD	Jeff Davey - RPEQ 8386
B	12/13	Infrastructure Report	PJ	JD	Jeff Davey - RPEQ 8386
C	12/14	Infrastructure Report	MD	KL	Graham Scott - RPEQ 2412

Table of Contents

APPENDICES

1. Introduction/Background

Brown Consulting (QLD) Pty Ltd has been engaged to prepare the following Infrastructure Services Report which will address the Civil Engineering Infrastructure associated with the proposed development of Lot 102 RP 860099, Lot 129 PL 4021 and Lot 2 RP 609985 known as Belmont Road, Parkhurst.

The total area of the site is approximately 59 hectares and currently exists as undeveloped parcels of land.

The existing site conditions and proposed stages are detailed on the **CSG Drawing No. 5892-01-CPT** and are included as Appendix A.

This report will present a general overview on the Infrastructure that exists in the immediate area and where any upgrading or augmenting needs to be undertaken to ensure that the development can be a logical and sequential extension of the suburban area, especially the existing developed stages of Riverside Estate, which will enhance the existing residential area of Rockhampton City, without causing any adverse effects to existing and future infrastructure.

This report will address Bulk Earthworks, Stormwater Drainage, Water Supply and Sewerage Reticulation, Proposed Road Hierarchy, Roundabout Details, Road Longsections and Cross-Section Details; as well as Electrical and Telecommunication Services.

2. Site Characteristics and Staging

The proposed development will be an extension of the existing Riverside Estate along the western side of Belmont Road and is located on the northern side of Rockhampton and abuts Ramsey Creek and the Fitzroy River. **Figure.1** below shows the approximate location of the proposed development.

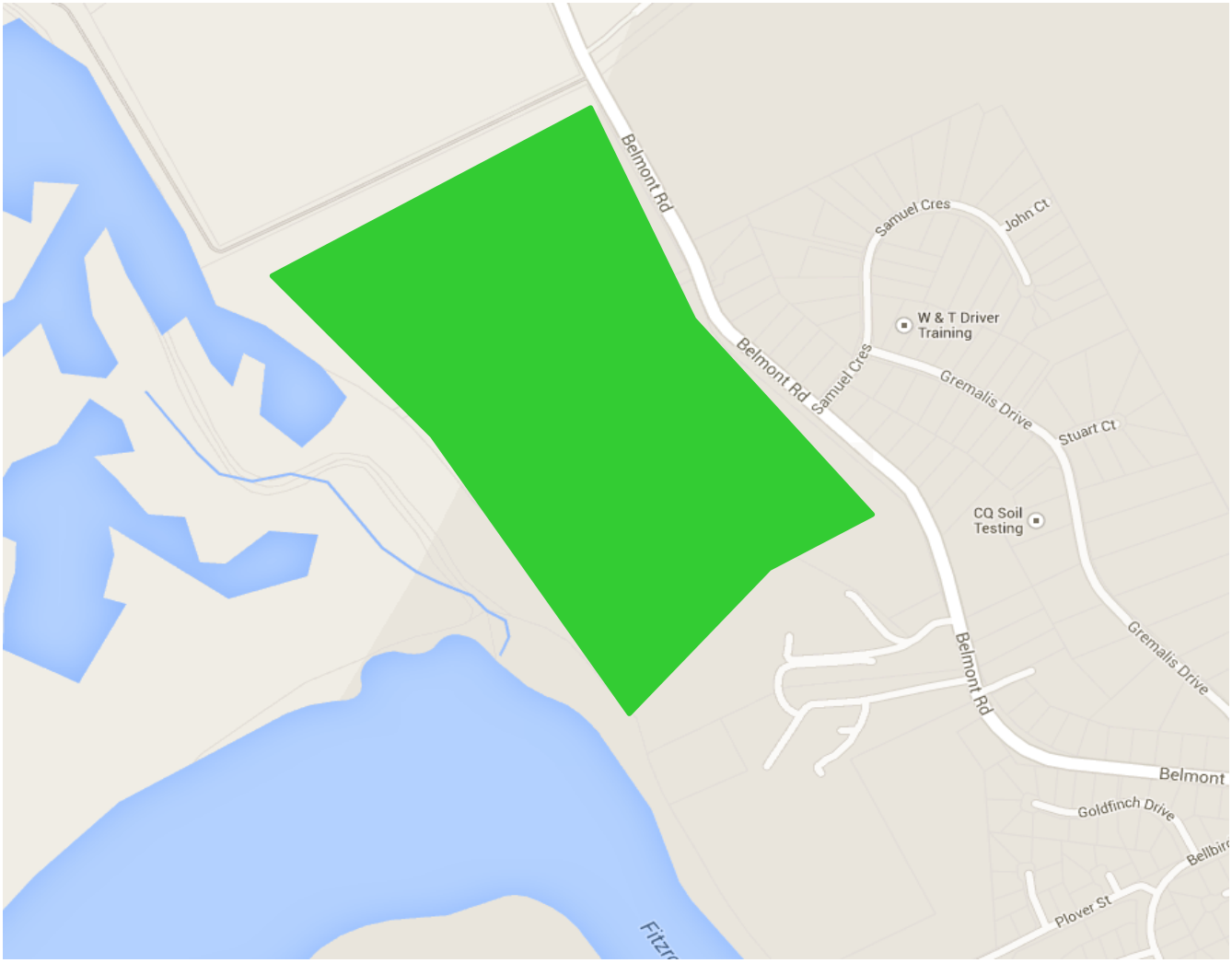


Figure.1: Approximate Site Location (Source Google Maps)

As previously discussed, the development site is best described by the Real Property Descriptions, Lot 102 RP 860099, Lot 129 PL 4021 and Lot 2 RP 609985.

The area consists of approximately 59 ha of potential urban residential development.

The proposal is for a 201 lot residential development to be over 14 stages (please refer to Appendices A and B). These stages comprise of different sized residential allotments, with an average size of 1500m^2. This reflects the

lot size of the existing Riverside Estate and will provide a community development catering for the diverse family environment.

3. Good Practice Urban Design Principles

The proposed development has been master-planned to incorporate best practices for urban developments, which are as follows:

- A mixture of gentle grade blocks, sloping allotments and elevated allotments will be incorporated into the proposed development. This ensures that the majority of the community is catered for from first home owners, to investors to luxury dwellings.

- Two accesses to Belmont Road (which will be upgraded to a Major Collector Road) for the entire development with suitable approaches and sight distances. No allotments in the proposed subdivision will gain direct access from Belmont Road.

- Loop/ring and short cul-de-sac's roads are used throughout the layout providing short, safe access and manoeuvrability around the development.

- Pedestrian links are strategically positioned throughout the development joining roadways, while providing good access to amenities within the development and also to external roadway networks.

- Stormwater drainage strategies will be incorporated and consist of natural vegetated swales and channels and bio-retention systems, providing low maintenance stormwater polishing and ensuring runoff is managed and discharged with minimal impact to the environment, whilst adding to the appearance of the development.

4. Proposed Development and Preliminary Bulk Earthwork Levels

The proposed development is to establish a combination of 201 Residential lots with a generous area of 14.12 hectares of Public Use Land (PUL).

The proposed Plan of Development (POD) has been illustrated on CSG Drawing No. 5892-01-CPT and is included as Appendix B.

In considering this POD, preliminary surface levels throughout the site have been determined to blend in, as much as possible, with the natural surface level.

Preliminary surface levels have been illustrated on Brown Consulting Sketches R12394 - Earthworks Plans (Sheets 1 and 2) and has been included as Appendix C.

Siteworks for the development will consist of the following stages:

- Clearing and grubbing
- Bulk earthworks
- Underground services installation
- Roadworks and stormwater drainage works
- Final detailed works
- Vegetation establishment and landscaping

All stockpiles are to be segregated into topsoil, construction soils, pavements and protected with appropriate silt traps and fences. All stockpiles are to be accessed from the upstream side to reduce erosion and maintain consistency throughout the project construction phase.

Erosion control measures are to be implemented during construction in accordance with the Capricorn Municipal Development Guidelines requirements. All erosion control measures are to be closely monitored by the Principal Contractor and re-established after all rain events or due to any vandalism.

5. Wastewater Treatment/Sewerage Reticulation

Following discussions with Fitzroy River Water, existing "As Constructed" information was obtained pertaining to the sewerage reticulation in the Parkhurst area.

There is an existing sewerage pump station (SP038) on the north-eastern side Belmont Road. A rising main then transfers the sewage to a receiving manhole in parkland along Belmont Road.

A Ø150mm uPVC gravity main then transfers the sewage from this manhole into Fitzroy River Water's sewerage network.

Stages 9A, 9B and 10 of the development (ie. 45 Lots) propose to generate approximately 48.6 ET. This sewage is intended to gravitate into the existing infrastructure, with no upgrading proposed. However, to minimise Bulk Earthworks and to eliminate the requirement of a lift station, or to construct the internal sewage pump station in the initial stage of development, only Stages 9A, 9B and 10 can discharge into the existing infrastructure.

To cater for Stages 11A to 16B; a Sewerage Pump Station is proposed to be constructed, within the downstream portions of the Public Use Land complemented with a rising sewerage main connecting this pump station with the "wet well".

The proposed internal sewerage network has been illustrated on Brown Consulting Sketches R12394 – Sewerage Reticulation Plans (Sheets 1 and 2). Please refer to Appendix D.

A detailed Wastewater Management Report has been prepared and is included separately, to assist with this Development Application.

Following the approval of this Development Application, a more detailed design will be undertaken in conjunction with detailed discussions with Fitzroy River Water (FRW) officers to confirm existing capacity of sewerage network required to service the staged development of Riverside Estate.

6. Water Supply

There is an existing Ø100mm AC main located in the eastern verge of Belmont Road, which services the existing residential developments, in close proximity to the subject site.

The proposed development does not intend to connect to this water main.

It is proposed to extend a Ø300mm uPVC water main from the Parkhurst water supply, which is approximately 550m downstream of the proposed entrance to the development. From there, a Ø200mm uPVC water main will service the development, generally in accordance with the proposed internal water reticulation network that has been prepared for the development of the properties. This network has been illustrated on Brown Consulting Sketches R12394 – Water Reticulation Plan Sheets 1 and 2 (please refer to Appendix E).

The ultimate building designs which will be submitted to Council, at a later date, are to comply with Council's Water Supply Policy.

All internal allotments will be serviced by new reticulation mains situated in all new road reserves and designed to provide good loop connections throughout the site. Internal fire hydrants will be installed on all new watermains at 80m centres and in accordance with the requirements of the Capricorn Municipal Development Guidelines.

In accordance with RRC policy for water supply to development's Class 1-10, the maximum water draw-off from Council's system will be in accordance with Council's policy.

Similar to the Wastewater report, a detailed Water Report has been written and is included separately.

7. Stormwater Management

The aim of the stormwater strategy is to try to maintain the natural flowpaths that flow through the development site with minimal realignment. Water quantity and quality objectives are to be met in accordance with the QUDM, CMDG & Healthy Waterways ensuring the surrounding environment, allotments and infrastructure are not adversely affected due to this residential subdivision.

Please refer to the Stormwater Management Report and Stormwater Quality Report for details regarding water quantity and quality measures to be implemented in the development works.

The Stormwater Management Report will deal with compensatory "cut and fill" measures, that are to be undertaken for the development of the site.

The sub-catchments for the management of stormwater is illustrated on Brown Consulting Sketch R12394 – Stormwater Catchments and is included as Appendix F.

8. Waste and Recycling Collection

Waste and Recycling collection for the proposed development is to occur in accordance with the Rockhampton Regional Council Planning Scheme, through a minimum of the following service frequencies:

- Weekly collections for general domestic waste, and
- Fortnightly connections for recyclable wastes.

These services are currently existing for adjacent residential allotments situated along the eastern side of Belmont Road.

9. Traffic Report, Access and Internal Road Network

A separate Traffic Report has been undertaken for this proposed development. This report, which will be included as part of the Development Application, will address background traffic conditions near the site, the likely traffic generation of the development proposal, existing and future traffic conditions, internal road configuration and proposed access arrangements.

Access into the proposed development will be via two intersections with Belmont Road. The main intersection access will be via a four leg roundabout, located at the junction of the existing Belmont Road / Samuel Crescent "T" Intersection. This upgrading to Belmont Road will provide a traffic calming device and a more efficient entry and exit from both the proposed development and existing residential dwellings within Samuel Crescent. As well as this new four leg roundabout, access into the development will be made available through a T intersection between Road I and Belmont Road, located approximately 735m North-West along Belmont Road from Samuel Crescent.

In addition, the four leg roundabout access point has suitable approaches and sight distances in both directions for the proposed development and existing residences in Samuel Crescent. These sight distances meet the requirements for a 60km/hr major collector roadway for Belmont Road. All sight distance requirements are in accordance with the Road Planning Design Manual (RPDM). The intersection of Road I and Belmont Road is be to be located in a similar location to the former William Palfrey Drive and Belmont Road intersection which had suitable sight distance which will be maintained for this new intersection.

A proposed internal road hierarchy is included as Brown Consulting Sketch R12394 – Road Hierarchy (please refer to Appendix G).

The proposed internal road network has been designed in accordance with Rockhampton Regional Council's requirements, widths specified within the Capricorn Municipal Development Guidelines (CMDG) and recommendations contained within Queensland Streets.

Belmont Road currently has a varying road reserve width, which is anticipated to be upgraded to a Major Urban Collector road as part of additional residential subdivisions being constructed north of this development site (ie. Eden Brook).

Road A of this proposed residential subdivision will be constructed as a Minor Urban Collector road from the intersection of Belmont Road to the intersection of Road I within the development. For this portion of the road, Road A will be constructed at 7.5m wide carriageway (invert to invert) in an 18.0m wide road reserve. One 1.2m pedestrian pathway will be constructed for the Minor Urban Collector section of Road A in accordance with the Capricorn Municipal Development Guidelines. To ensure good connectivity and suitable links to external road networks, Road I from chainage 0.000 to chainage 164.940 (Road A intersection) will also be constructed as a Minor Urban Collector road which links the development to Belmont Road. This portion of Road I will be 7.5m wide (invert to invert) in a 20.0m wide road reserve with a 1.2m pedestrian pathway to provide suitable amenities for pedestrian traffic.

Road B has been designed as an Urban Access Street and to a standard as per the requirements of the Capricorn Municipal Development Guidelines (CMDG). It will be constructed as a 7.5m wide (invert to invert) in a 16.0m wide road reserve. No pedestrian pathways will be constructed between these chainages in accordance with the Capricorn Municipal Development Guidelines.

As an Urban Access Street has the capacity to service up to 75 allotments, this will allow future stages to connect into the proposed road network for this development with no issues relating to traffic volumes generated from this development.

Roads C and G have been designed as both an Urban Access Street and an Urban Access, dependent upon the catchment that it serves and is compliant with the requirements of the Capricorn Municipal Development Guidelines (CMDG). Initially Road C will be constructed as a 7.5m wide (invert to invert) in a 16.0m wide road reserve. Road C will transition to an Urban Access Place until it intersects with Road A. No pedestrian pathways will be constructed in accordance with the Capricorn Municipal Development Guidelines.

Roads F and H will be constructed as an Urban Access Streets in accordance with the Capricorn Municipal Development Guidelines. Road F will be constructed at 7.5m wide (invert to invert) in a minimum 16.0m wide road reserve and Road H will be 7.5m wide (invert to invert) in a 20.0m wide road reserve. No pathway is required for these streets. Road I from chainage 164.940 (Road A intersection) to the end cul-de-sac will also be constructed as an Urban Access Street as 7.5m wide (invert to invert) within a 20.0m wide road reserve.

Roads D and E will be constructed as an Urban Access Places in accordance with the Capricorn Municipal Development Guidelines. All of these aforementioned roadways service under 25 allotments and have a traffic flow no greater than 250 AADT. Road D and E will be constructed at 5.5m wide (invert to invert) with Road D having a minimum 16.0m wide road reserve and Road E a 20.0m wide road reserve. No pathway is required for these road carriageways.

The longsections and cross-sections of these streets are also included in Appendix G.

In addition, the proposed roundabout to be constructed at the intersection of Belmont Road and Samuel Crescent, is also illustrated in Appendix G.

10. Electrical and Telecommunication

Existing overhead electrical and underground telecommunication services are currently available along the Eastern side of Belmont Road, which can provide appropriate connections for the proposed development.

The electrical services will need a new pole constructed in between the existing vegetation within the Belmont Road verge and a turret constructed near the new vehicular ingress/egress.

The telecommunication services for the entire development will be via an underground conduit, that emanates from a telecommunications pit, just outside the north east corner of the property.

Proposed connections to the units have been illustrated on Brown Consulting Sketch R12394 and included as Appendix H.

11. Conclusion

There appears to be no engineering infrastructure difficulties with the proposed extension of Riverside Estate along Belmont Road, Parkhurst. A review of the services proposed for this development and their impact on surrounding services, indicate that there is no impediment to development.

There is a workable design strategy for traffic and access, stormwater drainage, sewerage reticulation, water supply, electricity and telecommunications. Minor alterations in design may eventuate from future applications, however the fundamentals of the design strategy ensures that service provisions will not pose a serious constraint to development.

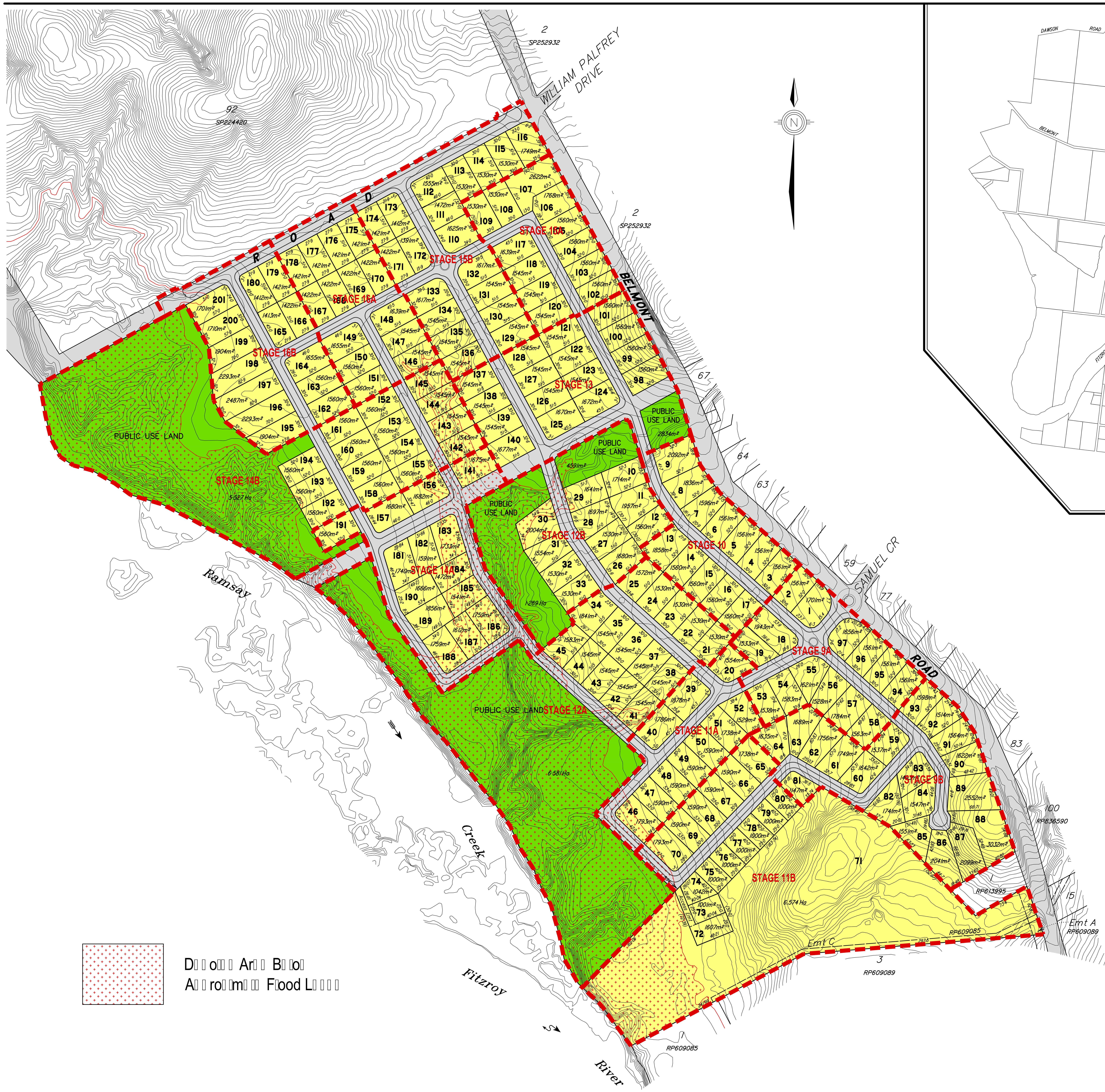
Preliminary analyses of the Water Supply confirm that they can service Stages 9A, 9B and 10 of the proposed development.

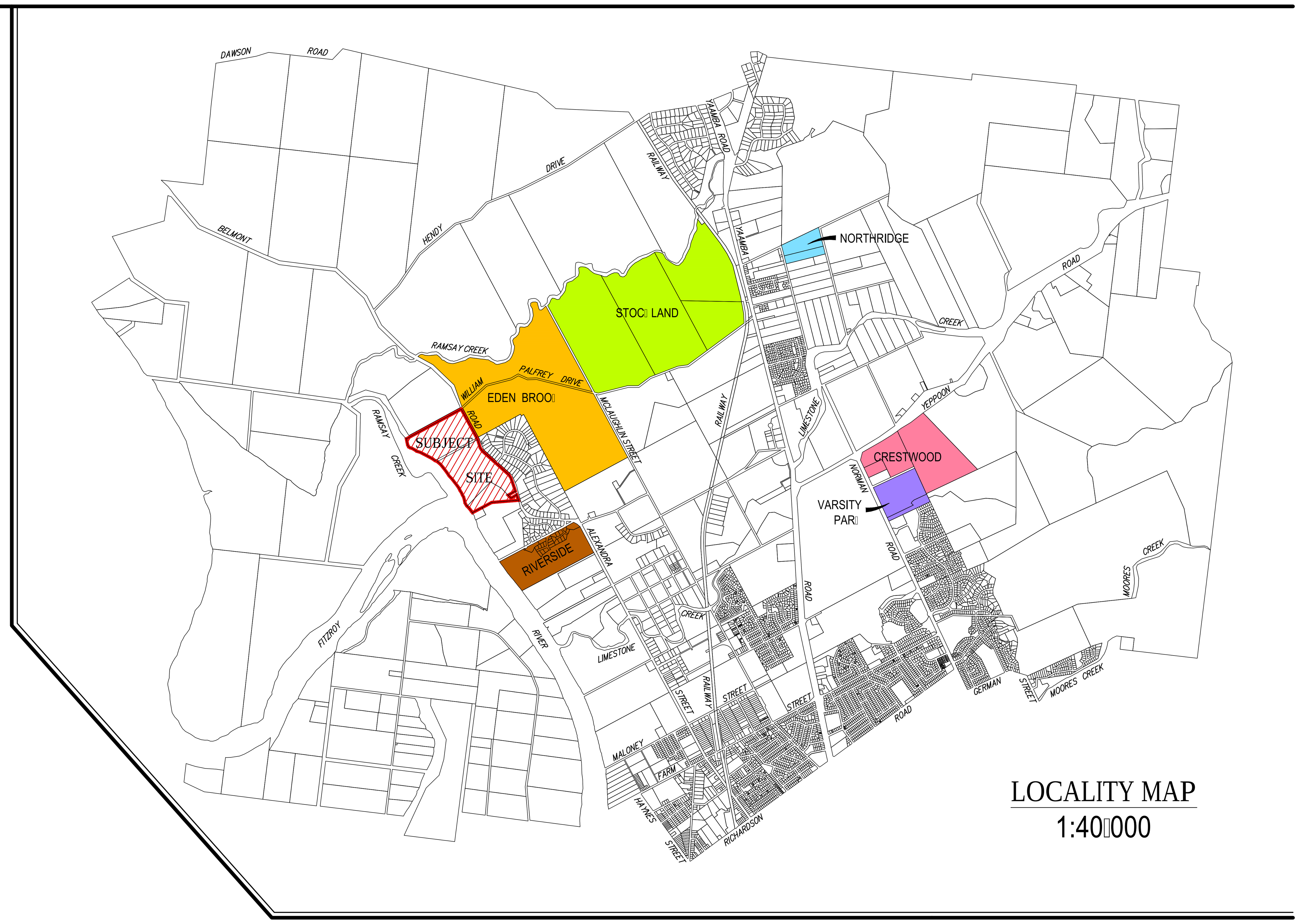
A preliminary review of the existing sewerage network confirms that they can only service Stages 9A, 9B and 10 of the proposed development; due to proposed bulk earthwork levels and grades throughout the development, without constructing an internal sewage pump station. To cater for the ultimate 201 lot development, a sewerage pump station will need to be constructed within the development, accompanied by a “wet well” for storage. A rising sewerage main will then transport the sewage to the “wet well” that was constructed as part of the initial stages of development.

BROWN

Appendices

Appendix A Existing Site Conditions and Proposed Stages





LOCALITY MAP
1:40000

IMPORTANT NOTE

This plan was prepared exclusively for M. Birkbeck for discussion purposes only and should not be used for any other purpose.

The areas shown hereon are subject to field survey and also to the requirements of council and any other authority which may have requirements under any relevant legislation.

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

This note is an integral part of this plan.

M. Birkbeck

Belmont Road
Parkhurst
Riverside Estate
Stages 9-16

Concept Plan
(201 Lots + Public Use Land)

Lot 102 on RP860099,
Lot 129 on PL4021 & Lot 2 on RP609985
Parish of Murchison
County of Livingstone

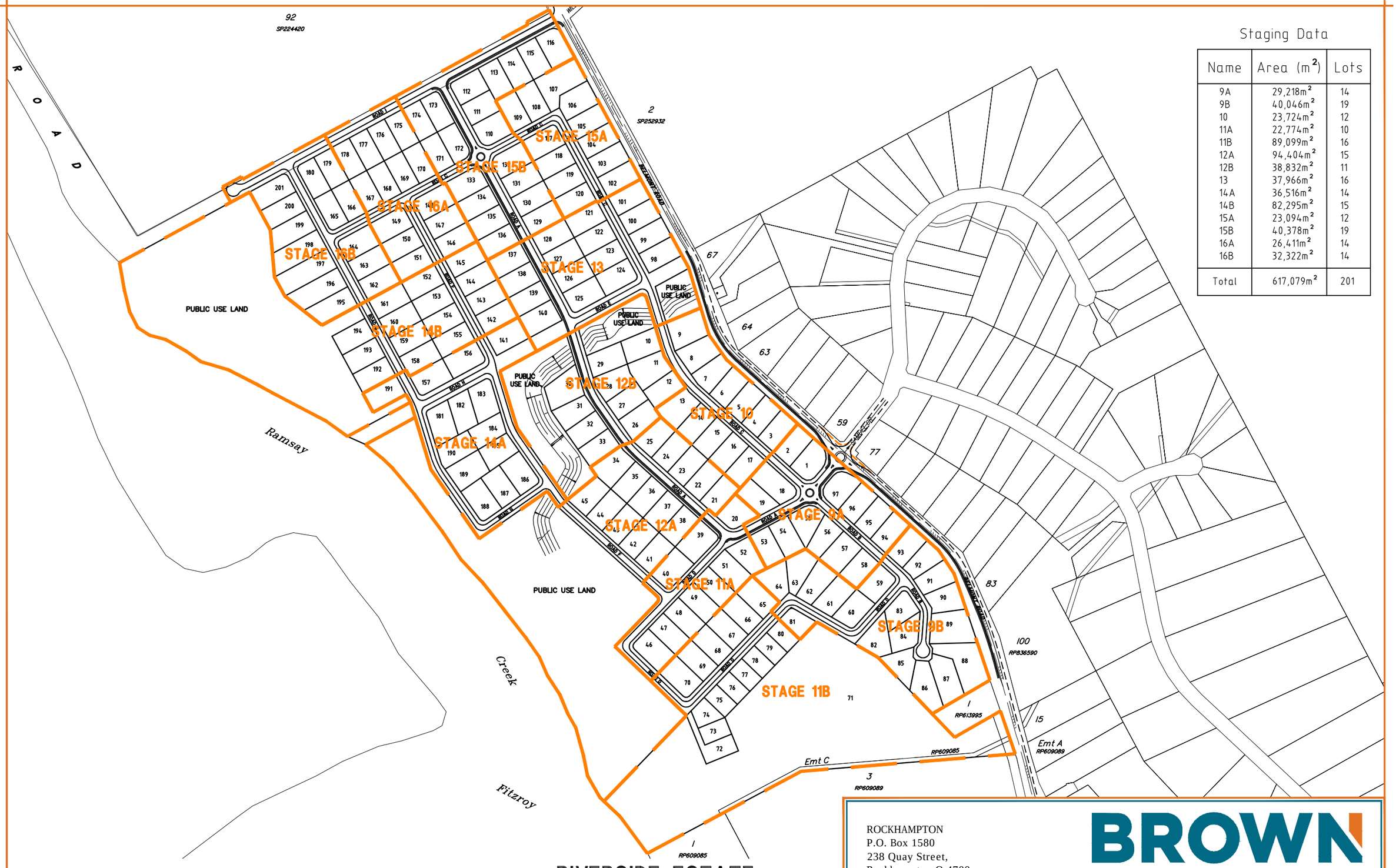
Rockhampton Regional Council

[illegible]	[illegible]	[illegible]	[illegible]
A	16-05-2013	[illegible]	R F
B	13-08-2013	[illegible]	R F
C	30-08-2013	[illegible]	R F
D	12-10-2013	[illegible]	R F
E	13-11-2013	[illegible]	R F
F	6-12-2013	[illegible]	R F
G	10-12-2013	[illegible]	R F

capricorn survey group (cq) pty ltd
250 quay street, p.o. box 1391
rockhampton qld 4700
P 07 4927 5199
F 07 4922 2716
E reception csgcq.com.au
ABN 22 154 830 565

1:2500 @ A1 RRC 0.5m Contours
1 of 1 5892-01-CPT-G
5892-01-CPT G

Appendix B Proposed Plan of Development with Stages



Staging Data

Name	Area (m^2)	Lots
9A	29,218m^2	14
9B	40,046m^2	19
10	23,724m^2	12
11A	22,774m^2	10
11B	89,099m^2	16
12A	94,404m^2	15
12B	38,832m^2	11
13	37,966m^2	16
14A	36,516m^2	14
14B	82,295m^2	15
15A	23,094m^2	12
15B	40,378m^2	19
16A	26,411m^2	14
16B	32,322m^2	14
Total	617,079m^2	201

LEGEND

Stage Boundary

0 25.0 100.0m
0 50.0 200.0m

1:2500 (A1)
1:5000 (A3)

RIVERSIDE ESTATE

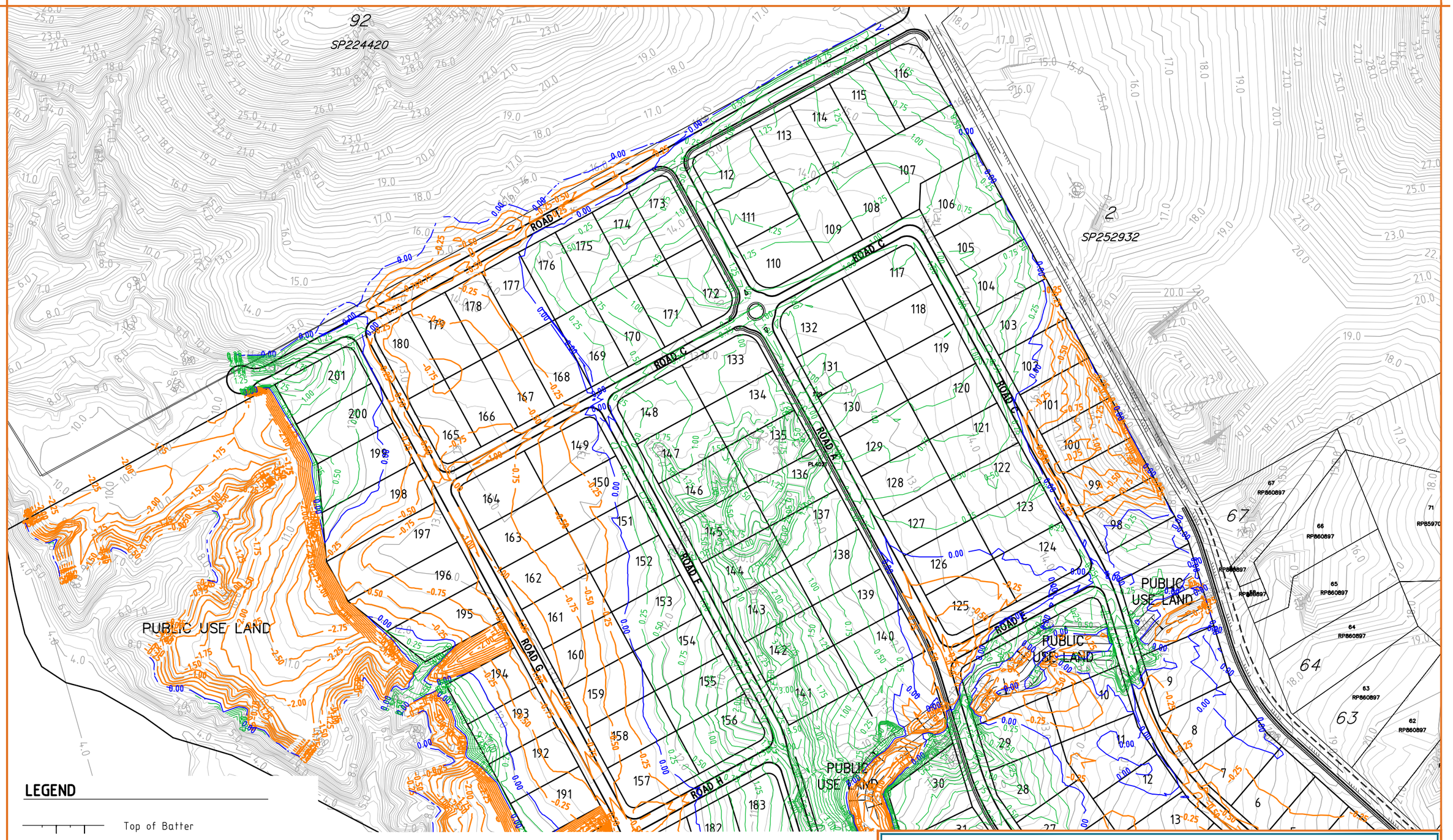
PROPOSED STAGING PLAN
R12394 - STAGING

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES

Appendix C Preliminary Bulk Earthworks Surface Levels



LEGEND

- Top of Batter
- Toe of Batter
- 0.0 Balance contours
- 1.0 Fill contours
- -1.0 Cut contours
- 12.0 Existing Contours

RIVERSIDE ESTATE

EARTHWORKS PLAN SHEET 1 OF 2
R12394 - EARTHWORKS

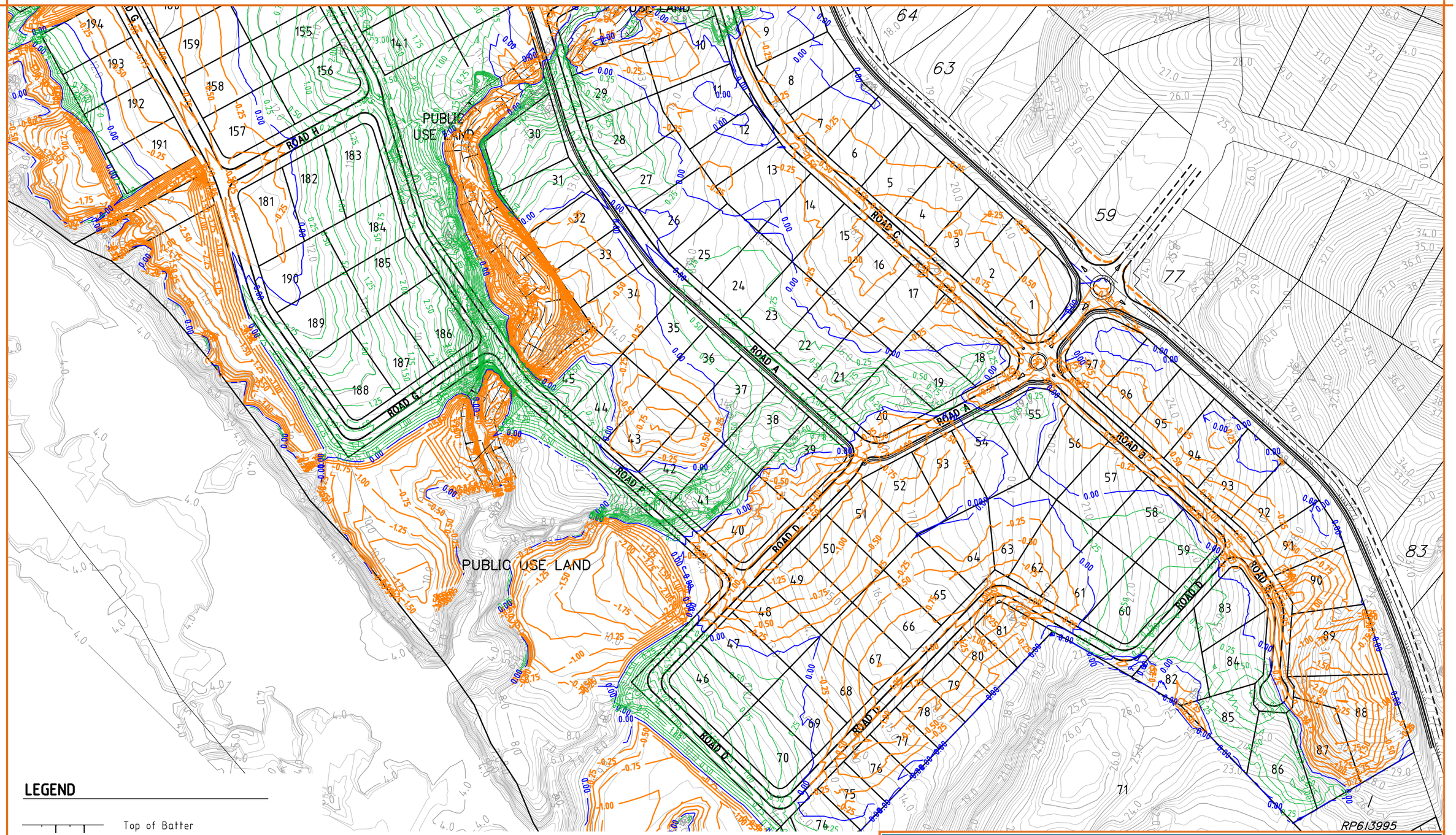
0 6.25 25.0m
0 12.5 50.0m

1:1250 (A1)
1:2500 (A3)

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



LEGEND

- Top of Batter
- Toe of Batter
- 0.0 — Balance contours
- 1.0 — Fill contours
- -1.0 — Cut contours
- 12.0 — Existing Contours

RIVERSIDE ESTATE

EARTHWORKS PLAN SHEET 2 OF 2
R12394 - EARTHWORKS

0 6.25 25.0m
0 12.5 50.0m

1:1250 (A1)
1:2500 (A3)

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES

Appendix D Existing and Proposed Sewerage Reticulation Plan

N

SP038

SP041

SP050

150 uPVC

225 uPVC

225 AC

300 uPVC

375 Concrete

450 Concrete

150 Concrete

SP017

SP032

SP016

SP052

SP009

SP029 STP

SP030

Yeppoon Rd

Yeppoon Rd

Norman Rd

Yaamba Rd

Yaamba Rd

Edmistone Rd

Six Mile Rd

Von Allmen Rd

Dargel Rd

Milner Rd

Ridgelands Rd

Farm St

Yewdale Dr

Feez St

Hinchliff St

Hollingsworth St

Richardson Rd

Alexandra St

Haynes St

Main St

Moores Creek Rd

Moores Creek Rd

High St

High St

Musgrave St

Glenmore Rd

675 Concrete

Bridge St

Lion Creek Rd

Wandal Rd

North St

North St

Albert St

Legend

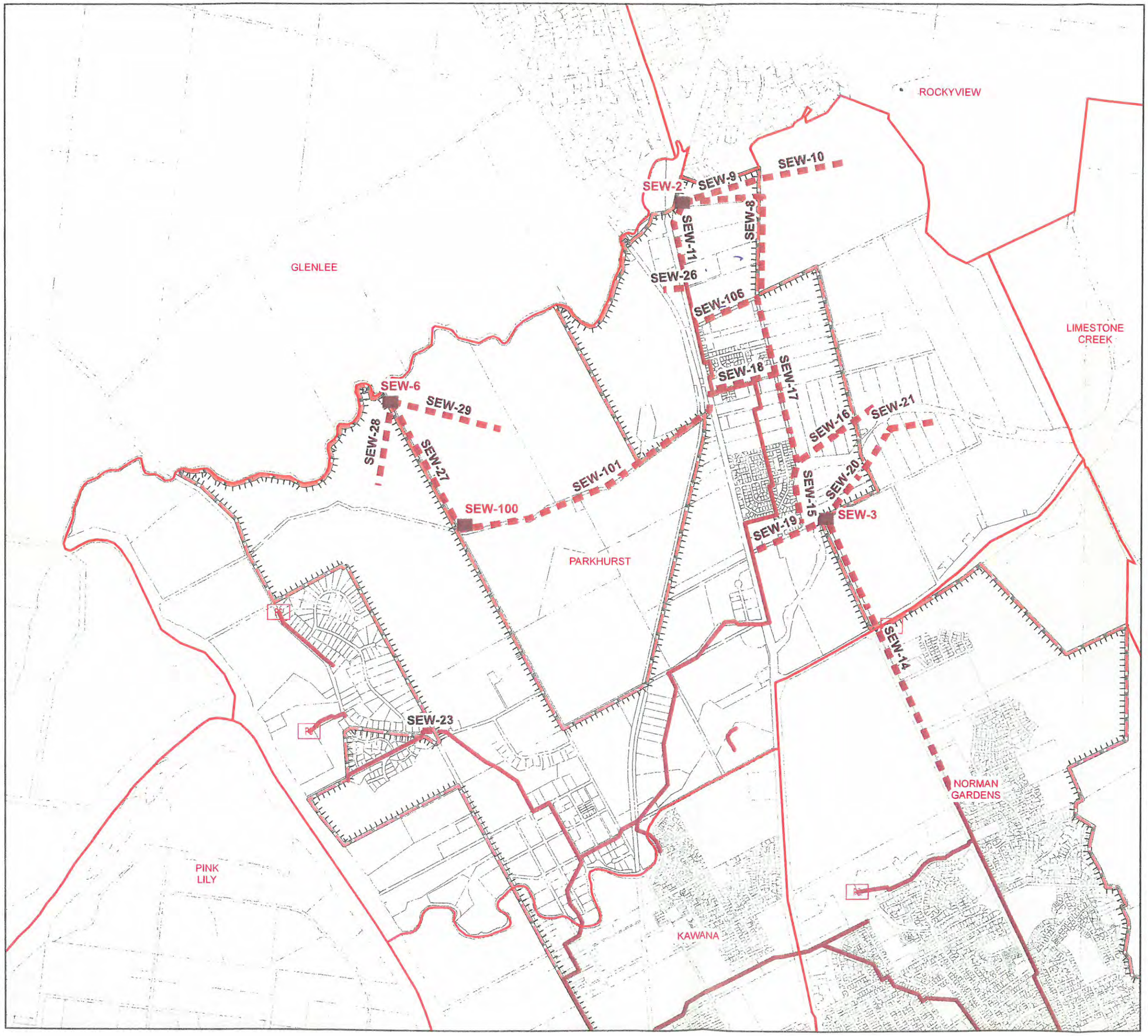
- Lot 129 on PL4021
- STP Sewer Treatment Plant
- Sewer Pump Stations
- Rising Mains
- Reticulation Main
- Trunk Main

0 170 340 680 M 1:20 000 at A3

Sewer

Rockhampton Regional Council

Date: 26/07/2013



Trunk Infrastructure - Sewerage

- Locality Boundaries

Future Sewerage Trunk Infrastructure

- Future Pump Station
- Future Treatment Plant
- Future Sewerage Main

Existing Sewerage Trunk Infrastructure

- PS — Existing Pump Station
- STP — Existing Treatment Plant
- Existing Sewerage Trunk Main
- Cadastral Parcels
- Priority Infrastructure Area

Note: Priority Infrastructure Area located inside hashed boundary.

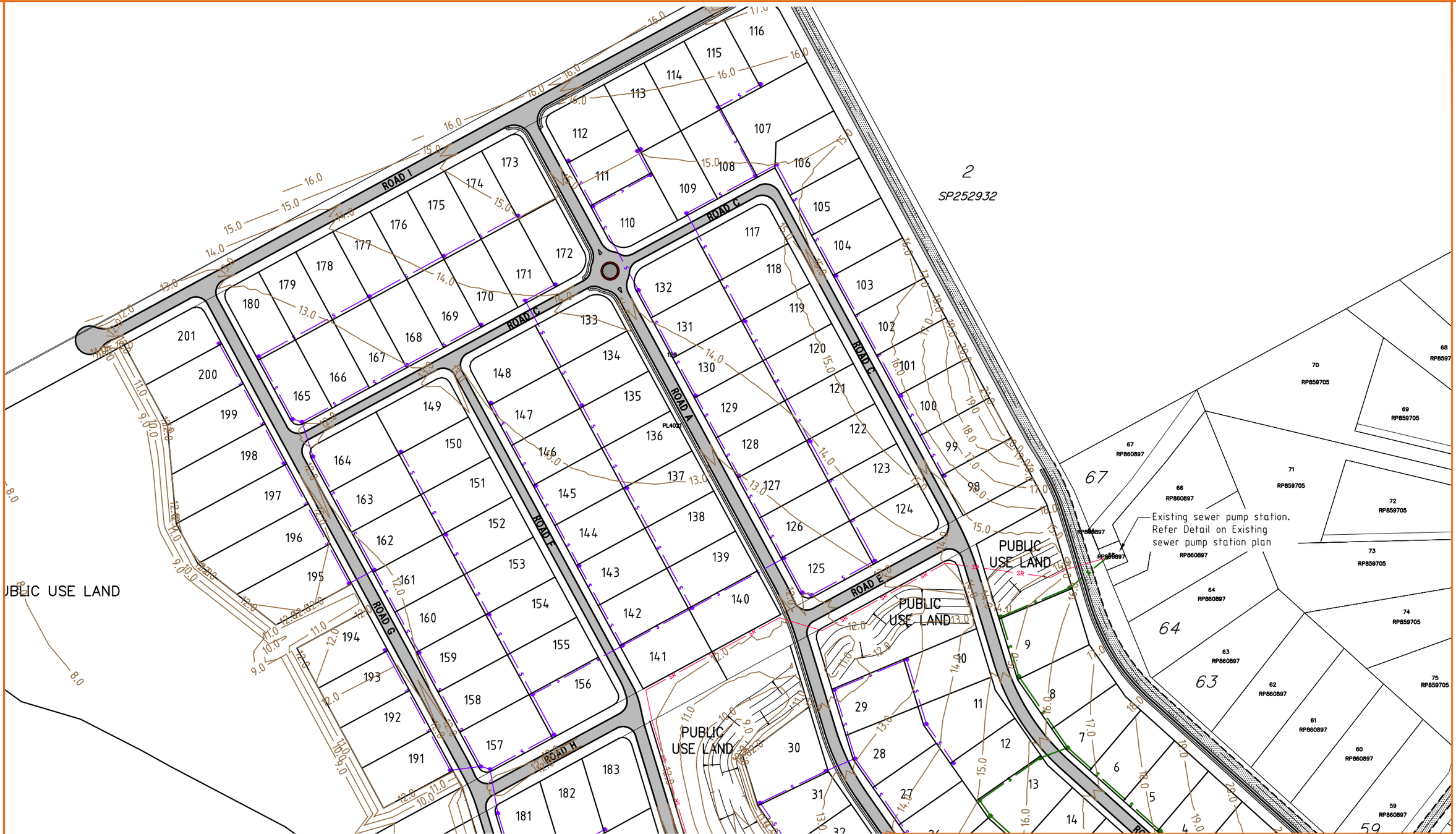
Approx Scale @A3 1:25,000

0 380 760 1,520 Metres

Map 86-2
PARKHURST
Sewerage Network Infrastructure Map

December 2012

Rockhampton Regional Council



LEGEND

- Proposed Sewer & Manhole (Gravity to Existing Pump Station)
- Proposed Sewer & Manhole (Gravity to Proposed Pump Station)
- Proposed Rising Sewer Main
- Proposed Ultimate Sewer Pump Station

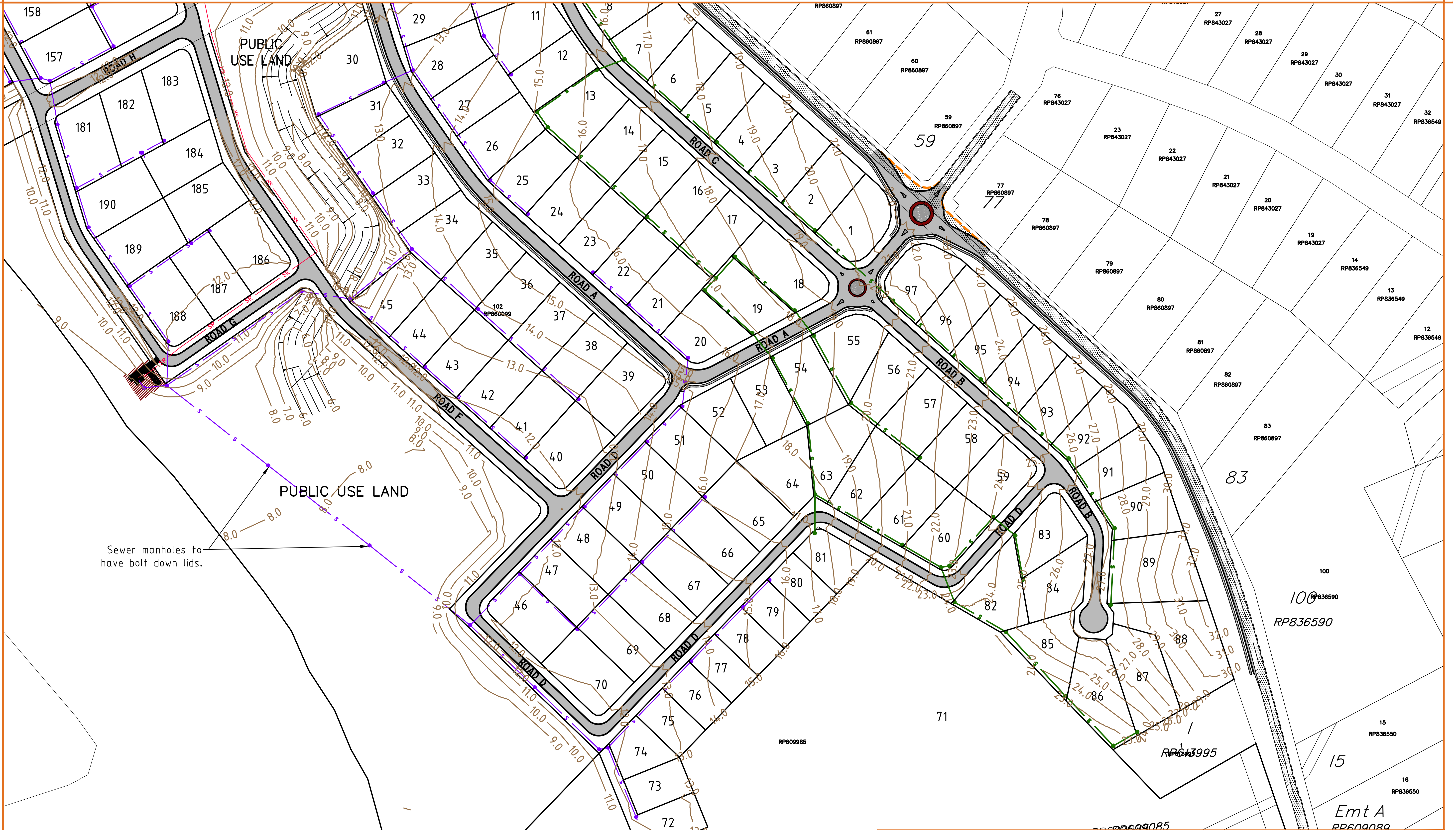
RIVERSIDE ESTATE

SEWER RETICULATION PLAN - SHEET 1 OF 2
R12394 - SEWER

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



LEGEND

- Proposed Sewer & Manhole (Gravity to Existing Pump Station)
- Proposed Sewer & Manhole (Gravity to Proposed Pump Station)
- Proposed Rising Sewer Main
- Proposed Ultimate Sewer Pump Station

RIVERSIDE ESTATE

SEWER RETICULATION PLAN - SHEET 2 OF 2

R12394 - SEWER 2

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES

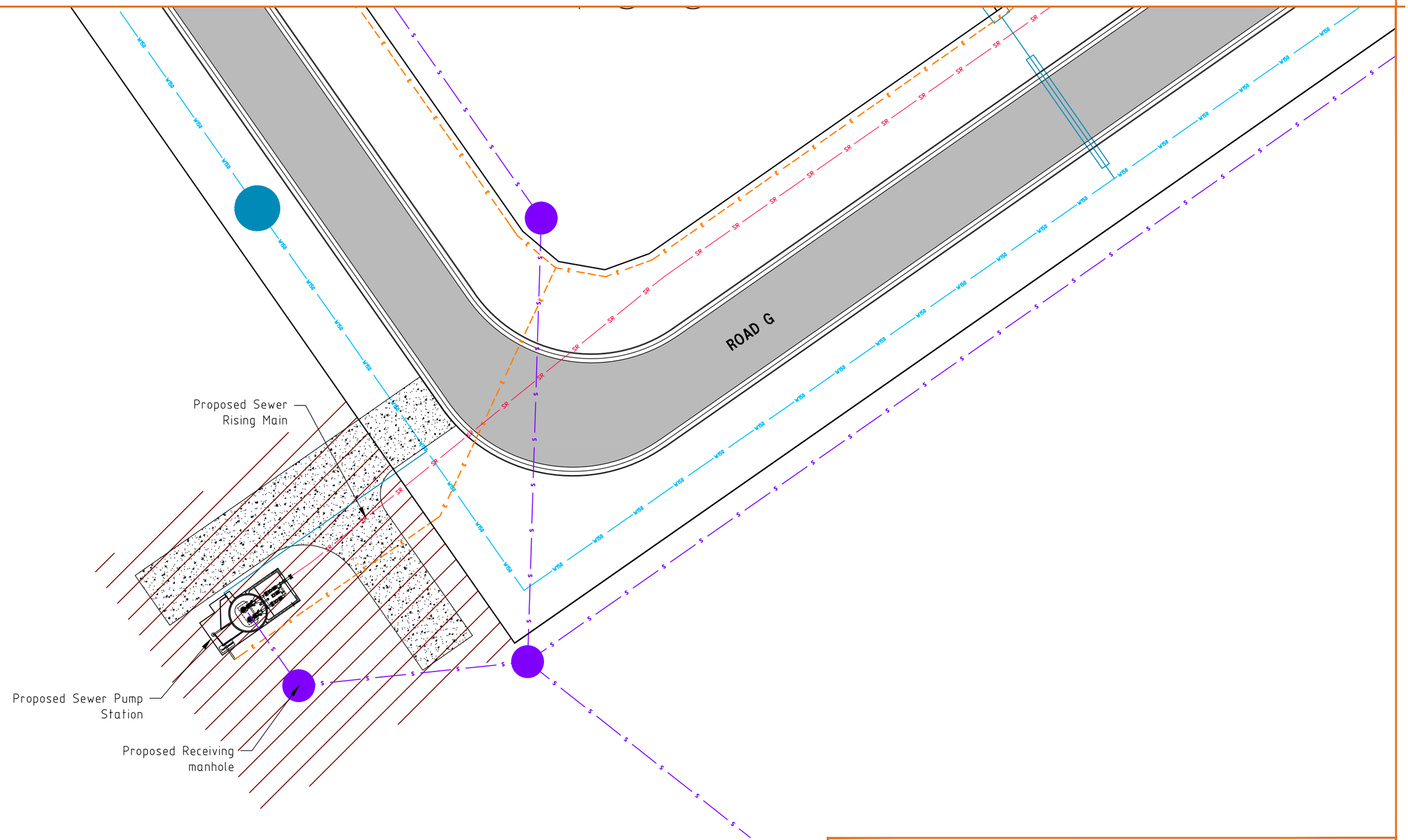
RIVERSIDE ESTATE

SEWERAGE PUMP STATION PLAN
R12394 - EXISTING SEWERAGE PUMP STATION

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



RIVERSIDE ESTATE

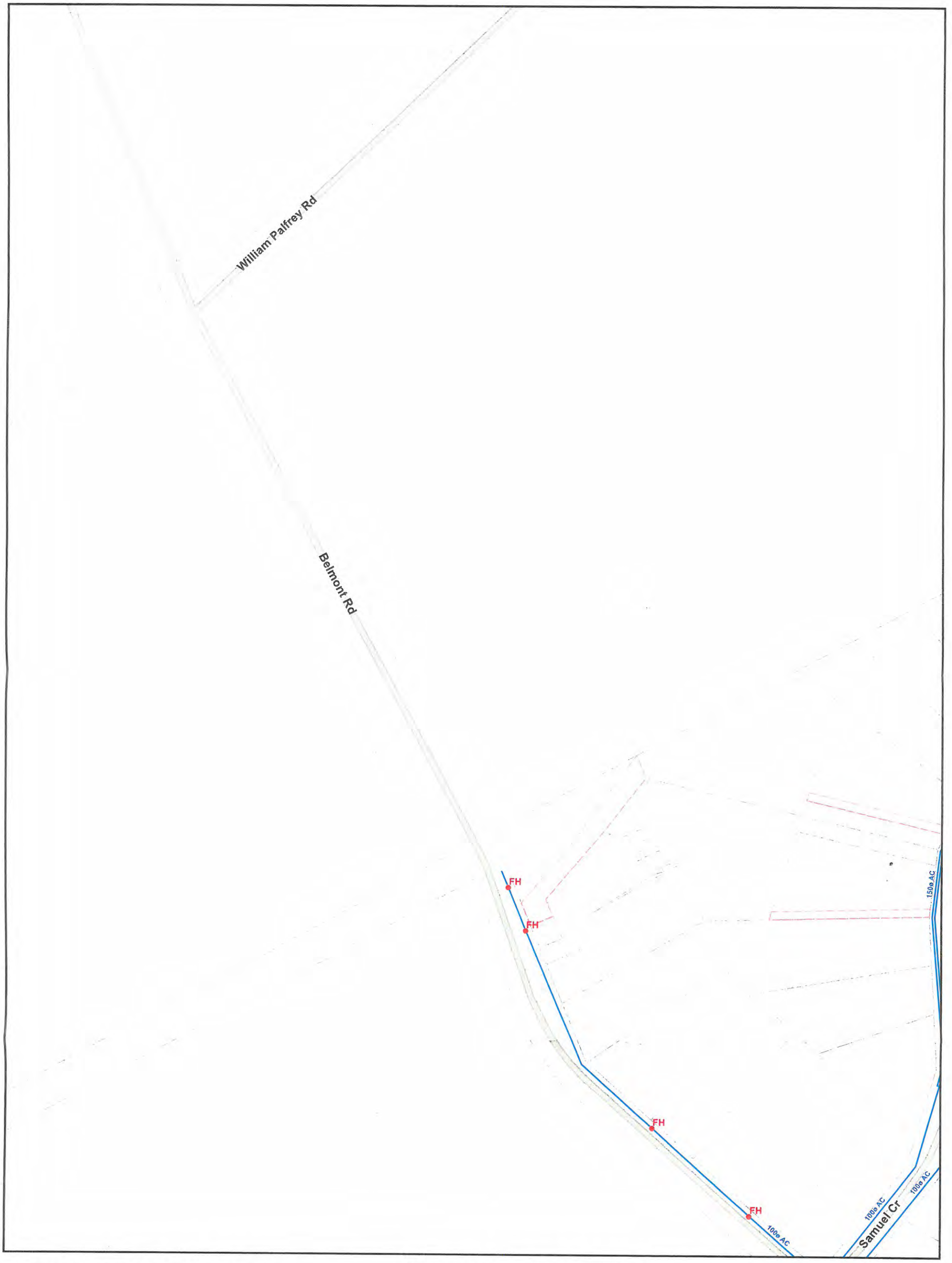
SEWERAGE PUMP STATION PLAN
R12394 - SEWERAGE PUMP STATION

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES

Appendix E Existing and Proposed Water Supply Plan



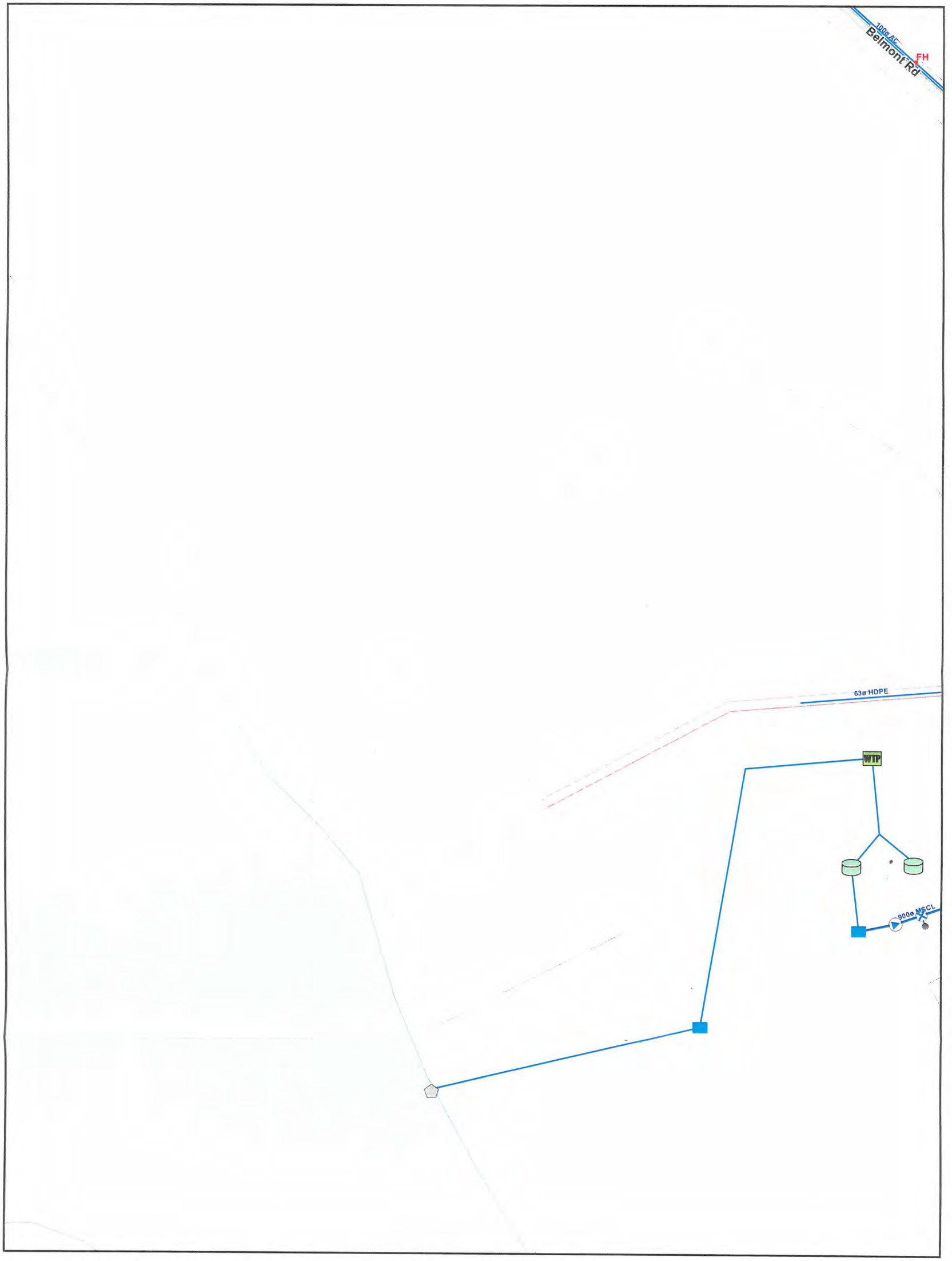
Water Network Map 8

0 15 30 60 M

1:2,100 at A3

Rockhampton Regional Council

Date: 3/09/2013



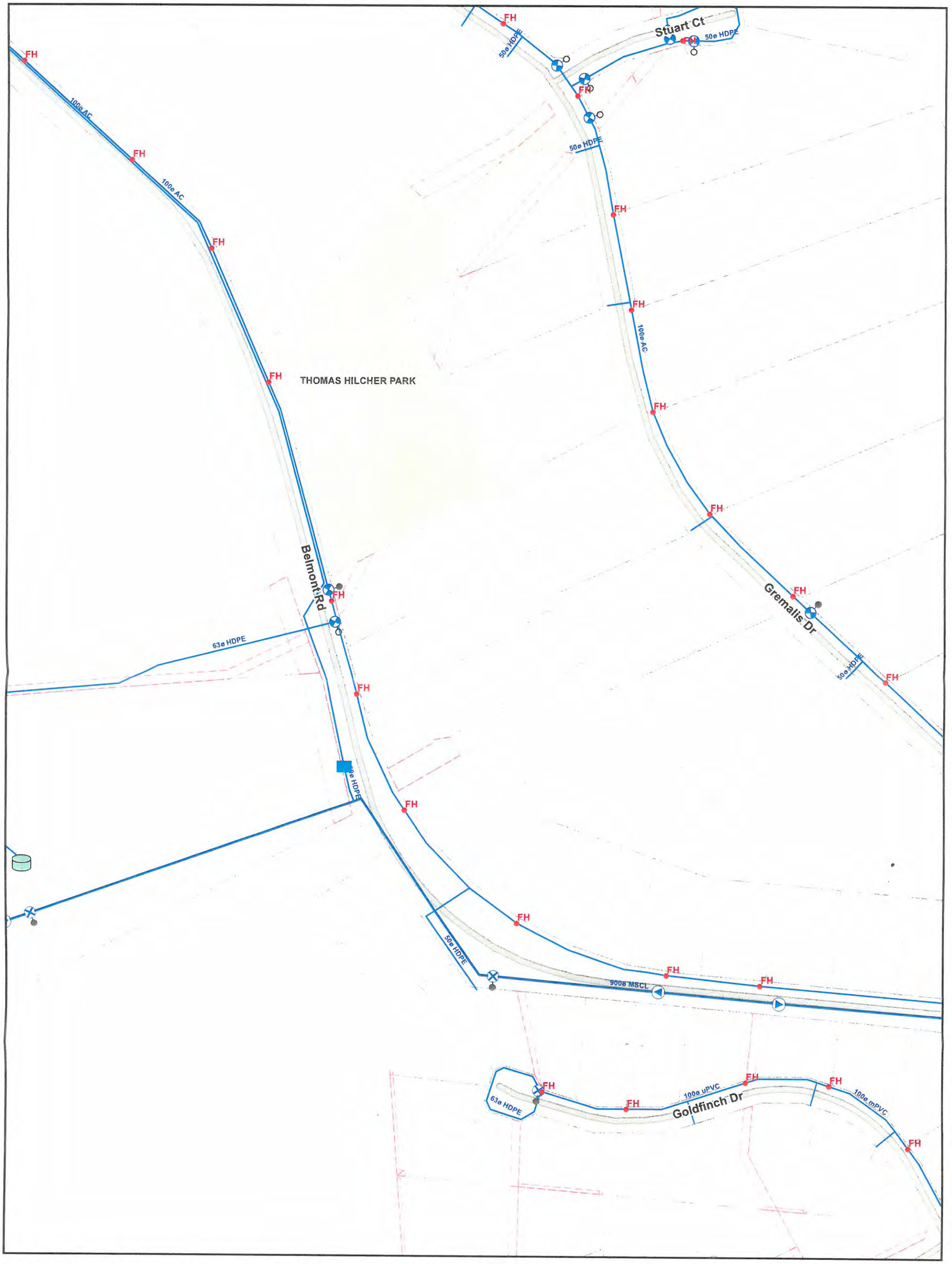
Water Network Map 11

0 15 30 60 M

1:2,100 at A3

Rockhampton Regional Council

Date: 3/09/2013



Water Network Map 12

0 15 30 60 M

1:2,100 at A3

Rockhampton Regional Council

Date: 3/09/2013

GLENLEE

ROCKYVIEW

LIMESTONE CREEK

PARKHURST

PINK LILY

KAWANA

NORMAN GARDENS

WAT-40

WAT-41

WAT-42

WAT-45

WAT-44

WAT-38

WAT-39

WAT-43

Trunk Infrastructure - Water

Locality Boundaries

Future Water Trunk Infrastructure

- Future Pump Station
- Future Treatment Plant
- Future Water Reservoir
- Future Water Trunk Main

Existing Water Trunk Infrastructure

- Existing Pump Station
- Existing Treatment Plant
- Existing Water Reservoir
- Existing Water Trunk Main
- Existing Dams or Bores
- Cadastral Parcels
- Priority Infrastructure Area

Note: Priority Infrastructure Area located inside hashed boundary.

Approx Scale @A3 1:25,000

0 380 760 1,520 Metres

Map 86-1
PARKHURST
Water Network
Infrastructure Map

December 2012

Rockhampton Regional Council

LEGEND

- New 300Ø mPVC Class 16 Watermain
- New 200Ø mPVC Class 16 Watermain
- New 150Ø mPVC Class 16 Watermain
- New 100Ø mPVC Class 16 Watermain
- Water Service Conduit
- Fire Hydrant – Sluice Valve/Gate Valve (FH SV)

RIVERSIDE ESTATE

WATER RETICULATION PLAN - SHEET 1 OF 2

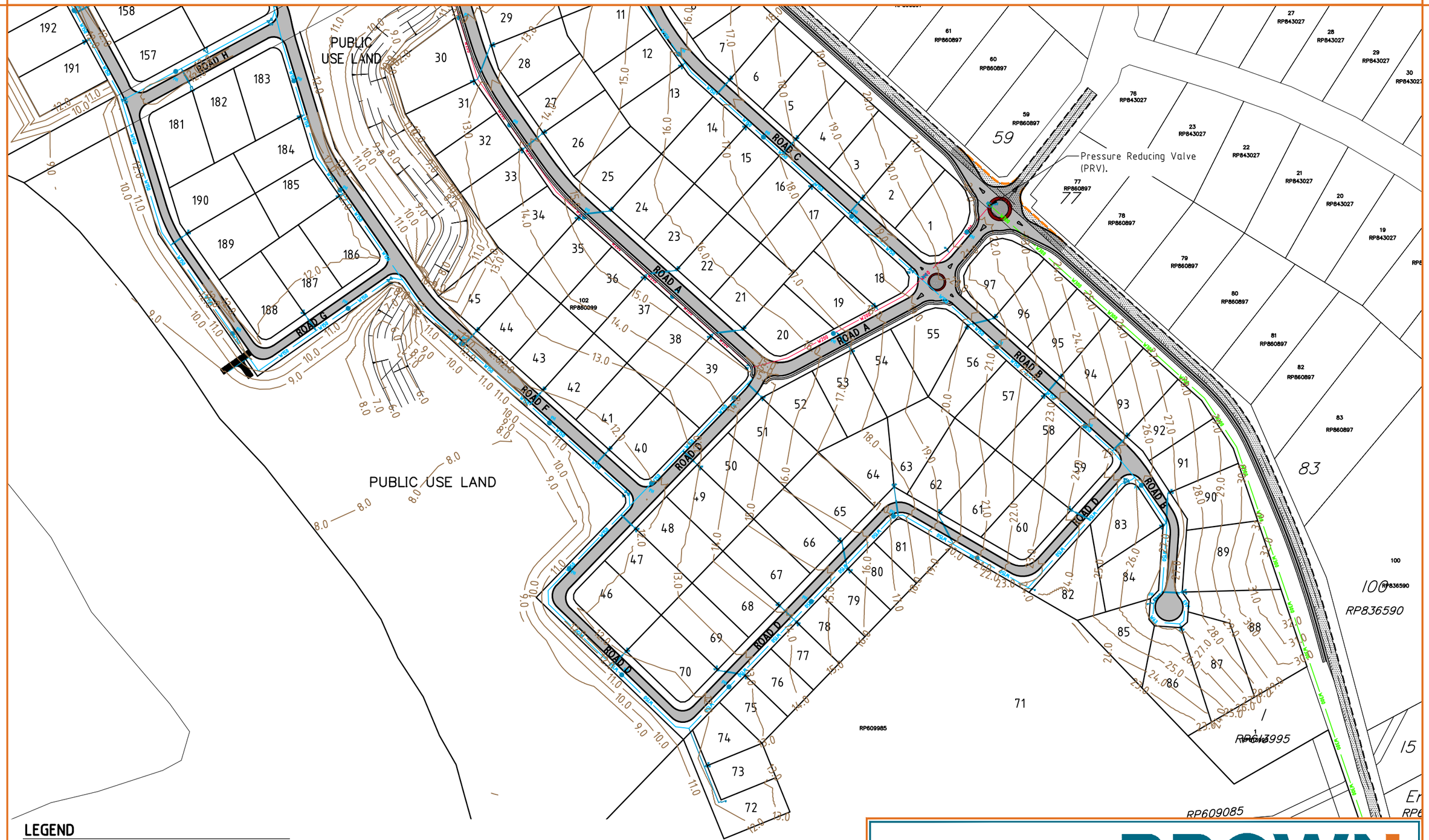
R12394 - WATER

0 25.0 100.0m
0 50.0 200.0m
1:2500 (A1)
1:5000 (A3)

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



LEGEND

- New 300Ø mPVC Class 16 Watermain
- New 200Ø mPVC Class 16 Watermain
- New 150Ø mPVC Class 16 Watermain
- New 100Ø mPVC Class 16 Watermain
- Water Service Conduit
- Fire Hydrant - Sluice Valve/Gate Valve

RIVERSIDE ESTATE

WATER RETICULATION PLAN - SHEET 2 OF 2
R12394 - WATER 2

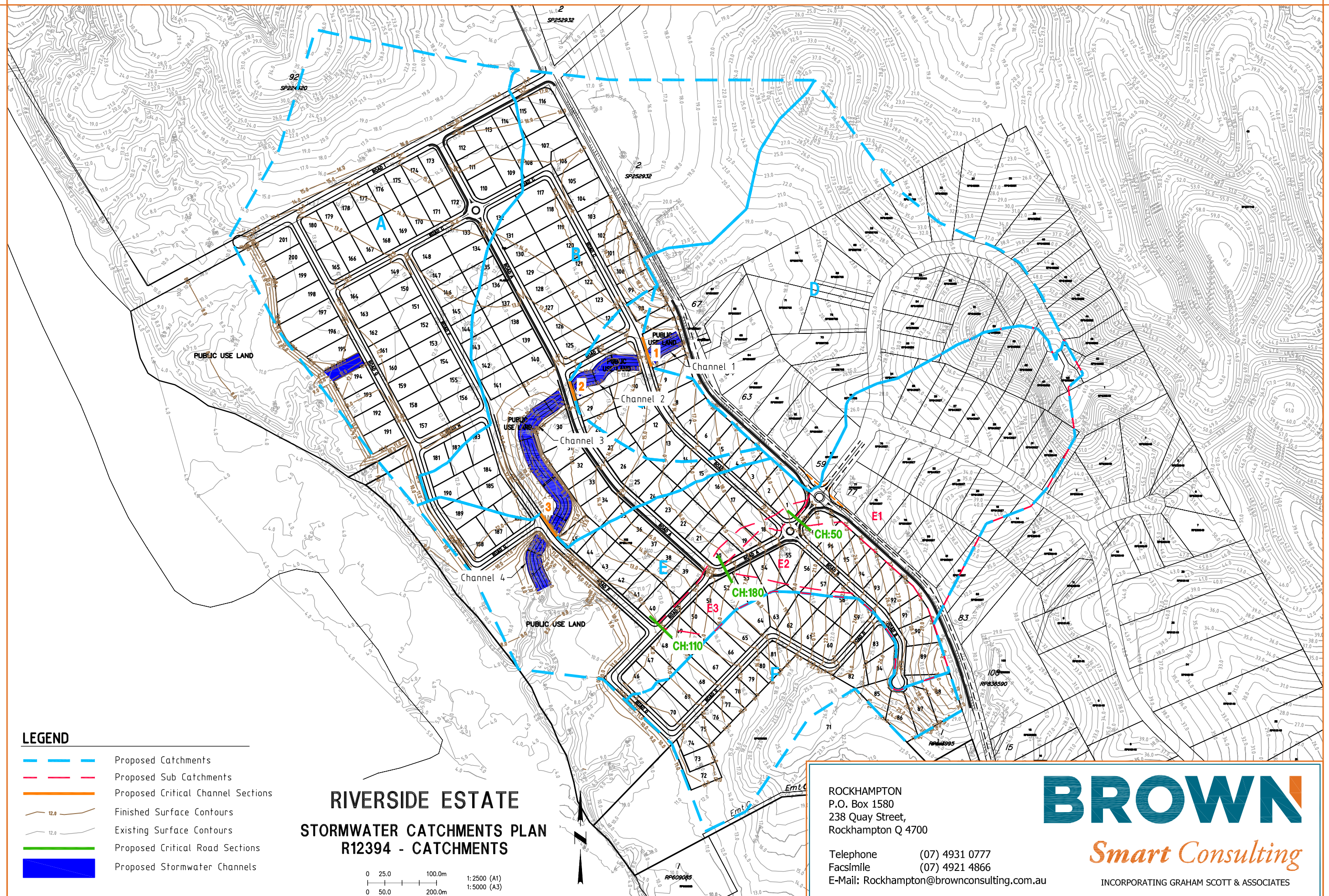
0 25.0 100.0m
0 50.0 200.0m
1:2500 (A1)
1:5000 (A3)

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES

Appendix F Proposed Stormwater Catchments



LEGEND

- Proposed Catchments
- Proposed Sub Catchments
- Proposed Critical Channel Sections
- Finished Surface Contours
- Existing Surface Contours
- Proposed Critical Road Sections
- Proposed Stormwater Channels

RIVERSIDE ESTATE

STORMWATER CATCHMENTS PLAN
R12394 - CATCHMENTS

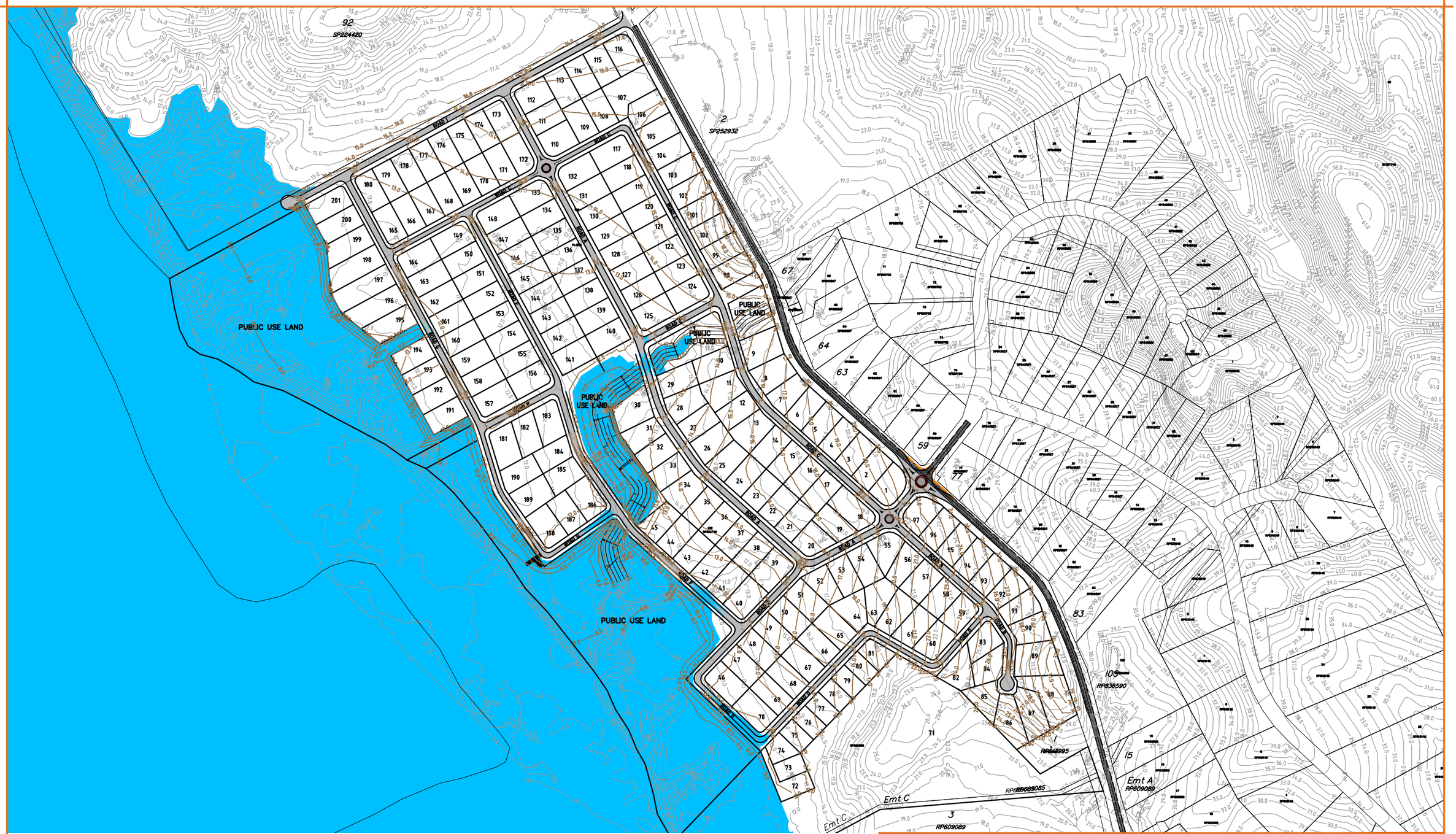
0 25.0 100.0m
0 50.0 200.0m

1:2500 (A1)
1:5000 (A3)

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



RIVERSIDE ESTATE

POST DEVELOPMENT INUNDATION PLAN
R12394 - POST INUNDATION

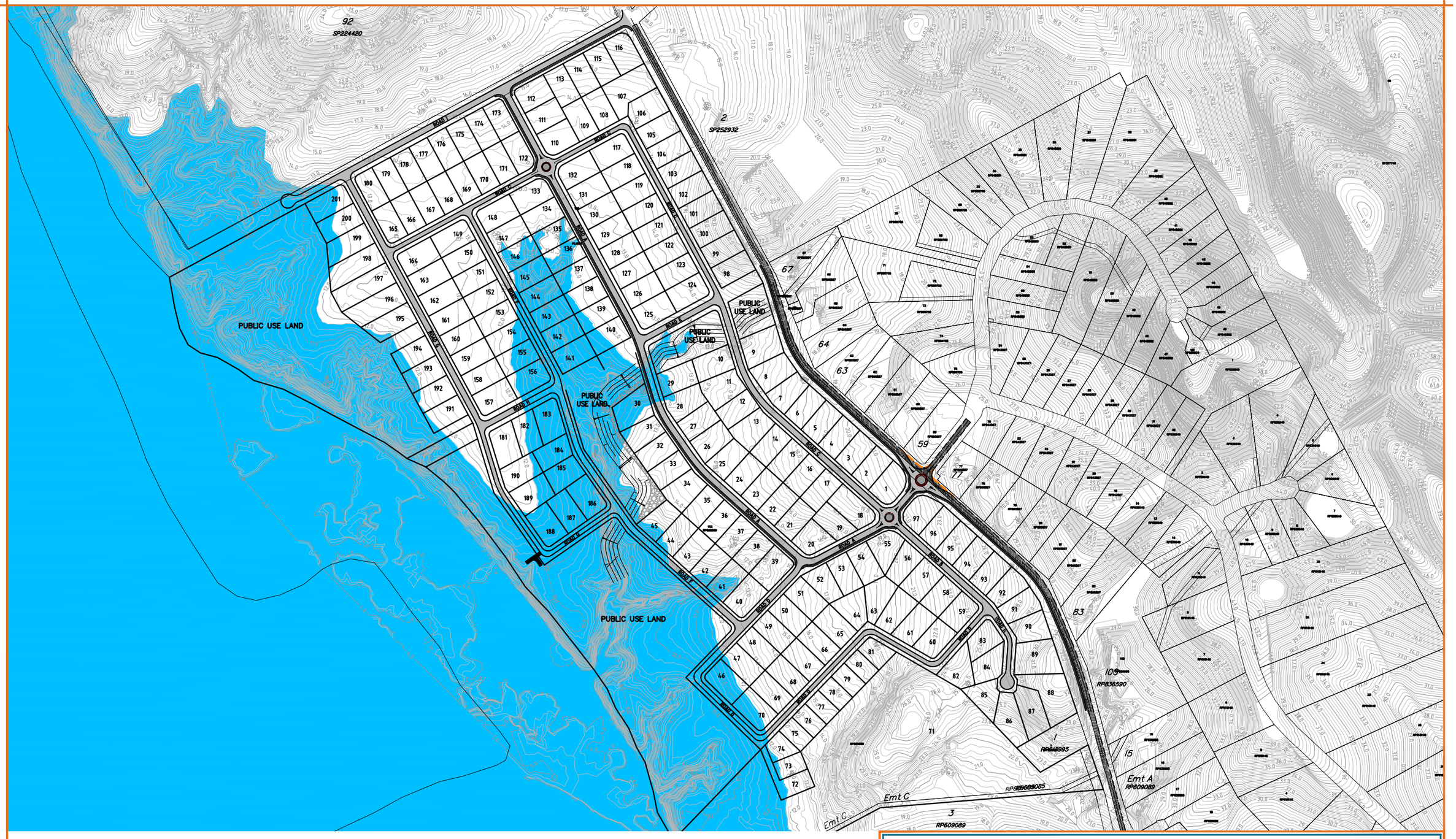
0 25.0 100.0m
0 50.0 200.0m

1:2500 (A1)
1:5000 (A3)

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



RIVERSIDE ESTATE

PRE DEVELOPMENT INUNDATION PLAN
R12394 - PRE INUNDATION

0 25.0 100.0m
0 50.0 200.0m

1:2500 (A1)
1:5000 (A3)

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES

Basin 3
400sqm of
Bio-filtration media

Basin 2
700sqm of
Bio-filtration media.

Basin 1
800sqm of
Bio-filtration
media

PUBLIC USE LAND

Channel 1

Channel 2

Channel 3

Emt C

Emt A
RP609089

LEGEND

- Existing Overland Flowpath
- Proposed Overland Flowpath
- Existing Contours (185.0)
- Proposed Culvert System
- Proposed Bio-retention Basins
- Proposed Rock Protection / Rock Retaining wall

RIVERSIDE ESTATE

STORMWATER QUALITY PLAN
R12394 - STORMWATER QUALITY

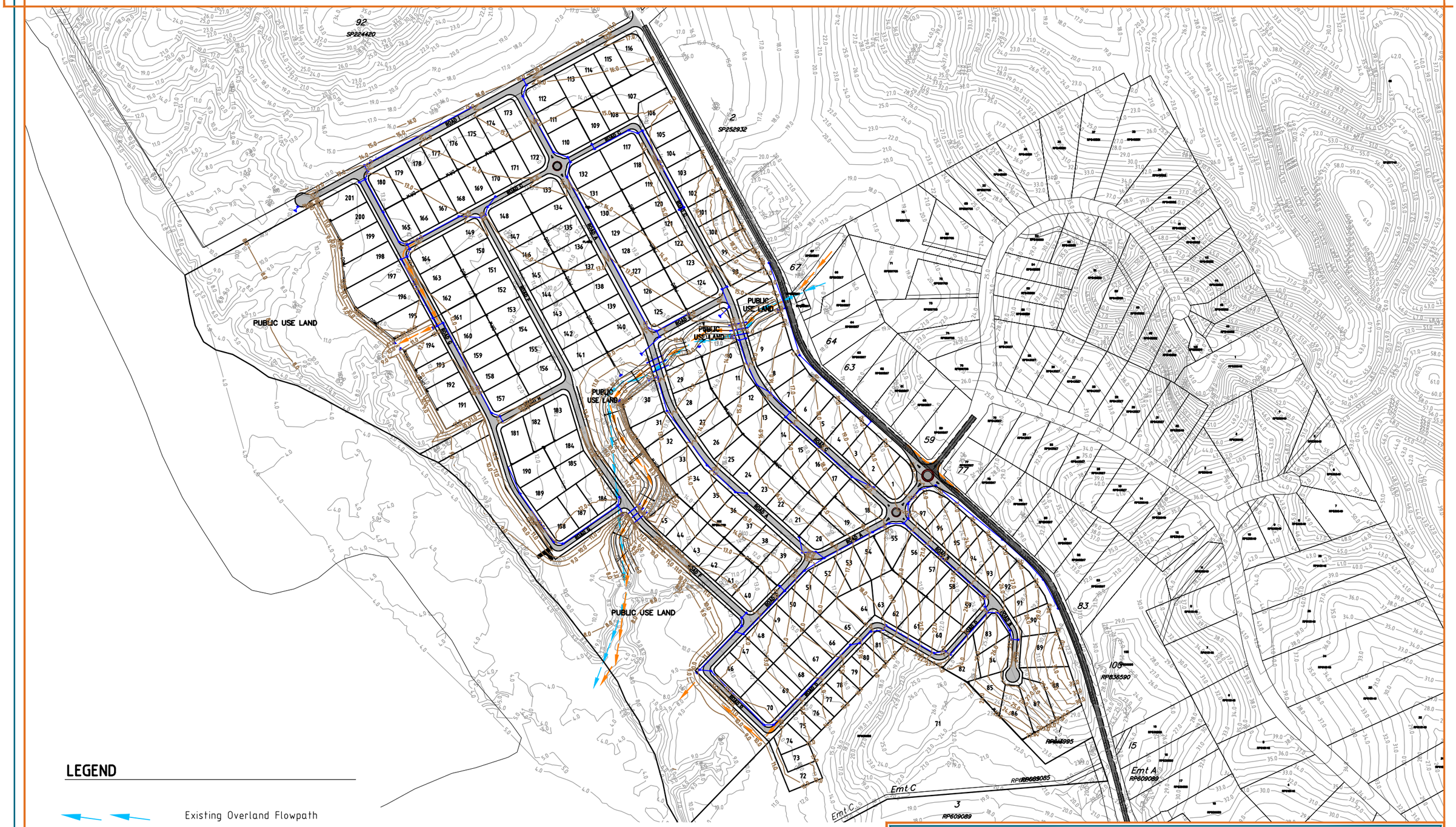
0 25.0 100.0m
0 50.0 200.0m

1:2500 (A1)
1:5000 (A3)

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



LEGEND

- Existing Overland Flowpath
- Proposed Overland Flowpath
- Existing Contours (185.0)
- Proposed Culvert System
- Proposed Bio-retention Basins
- Proposed Rock Protection / Rock Retaining wall

RIVERSIDE ESTATE

STORMWATER
R12394 - STORMWATER

0 25.0 100.0m
0 50.0 200.0m

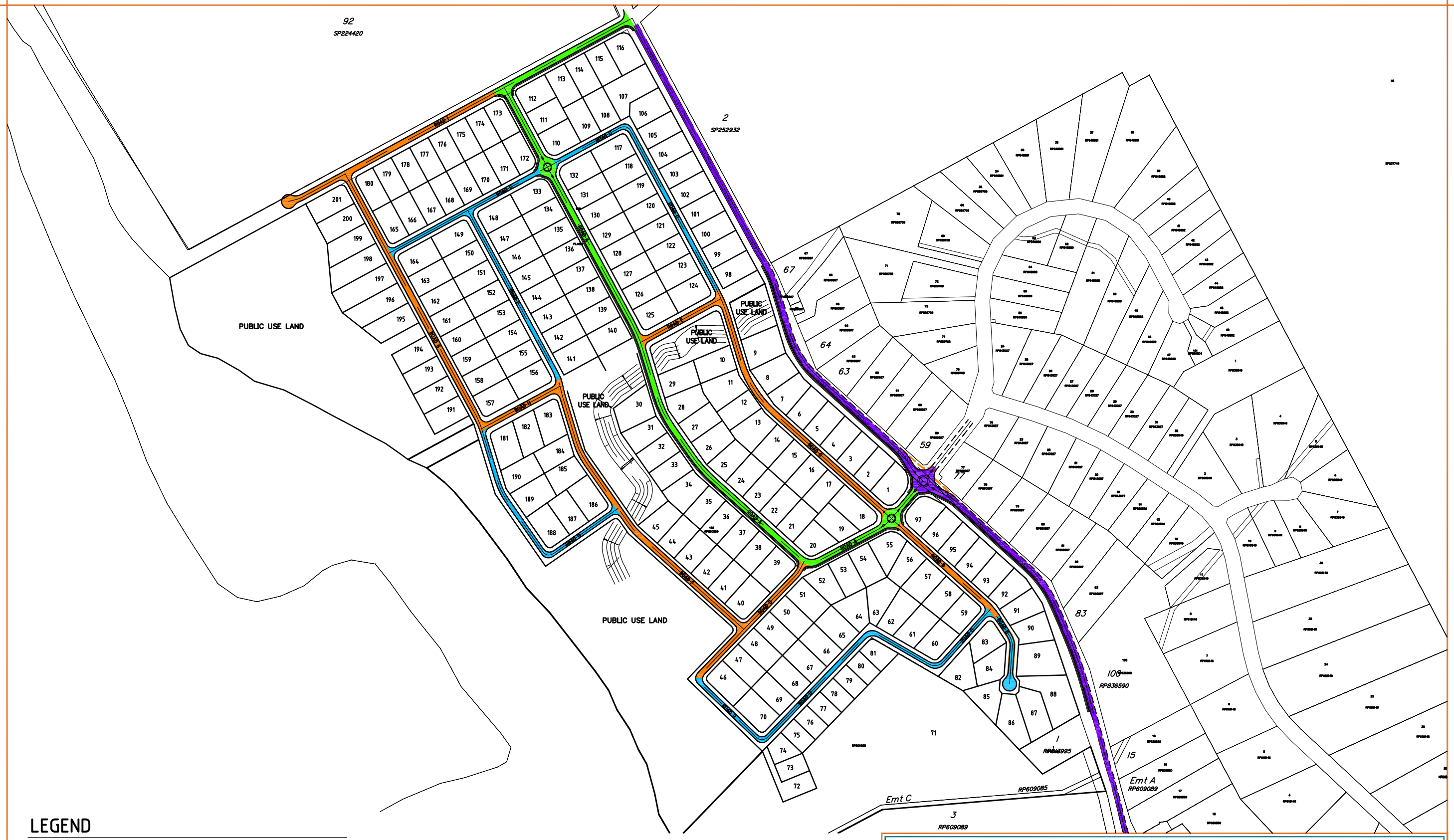
1:2500 (A1)
1:5000 (A3)

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES

Appendix G Proposed Road Hierarchy Plan, Roundabout Details, Road Longsections and Cross-section Details



LEGEND

- Minor Urban Collector
- Urban Access Street
- Urban Access Place
- Half Width Major Collector (Belmont Road)

RIVERSIDE ESTATE

ROAD HIERARCHY PLAN
R12394 - ROAD HEIRARCHY

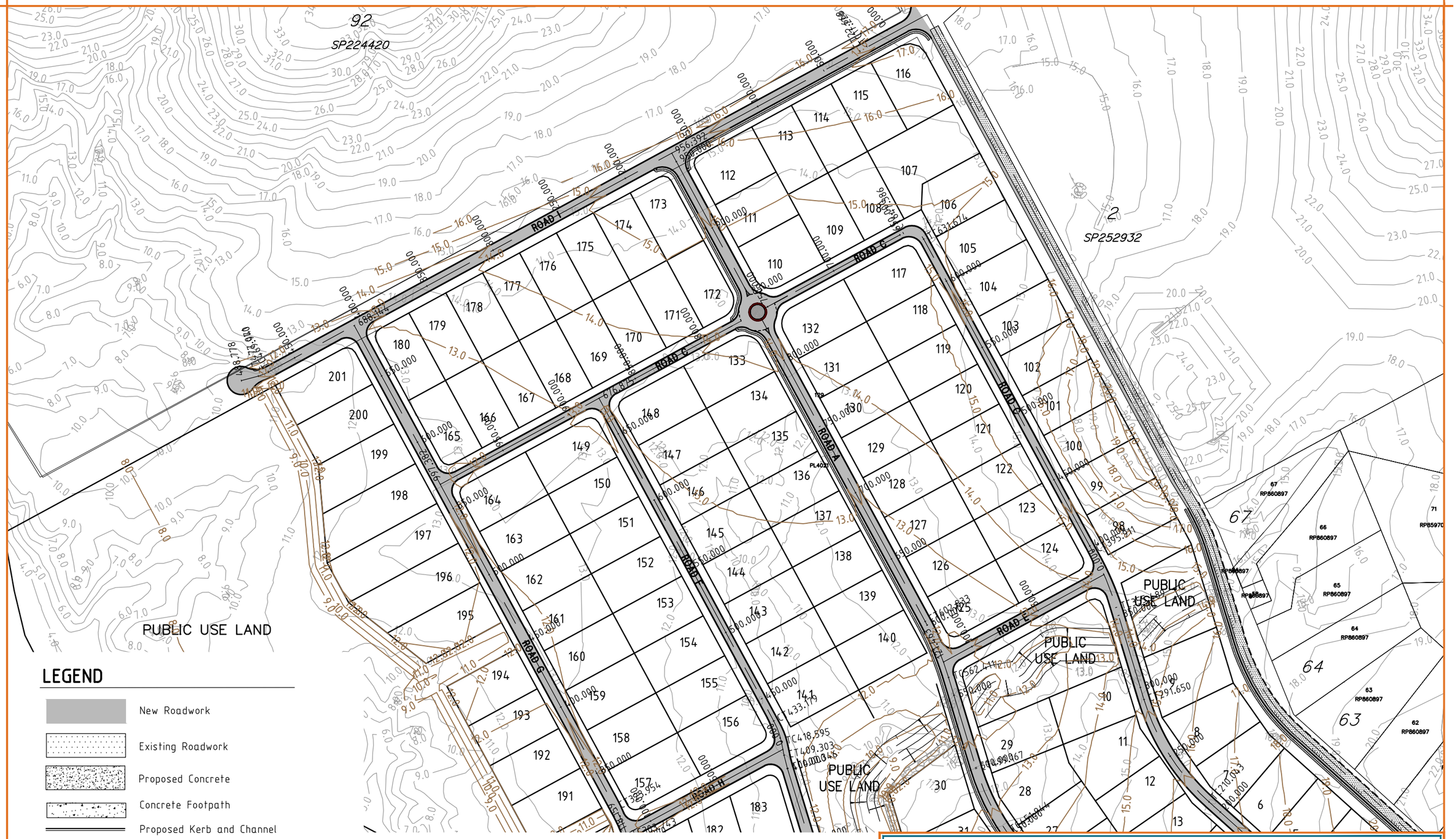
0 25.0 100.0m
0 50.0 200.0m

1:2500 (A1)
1:5000 (A3)

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



LEGEND

- New Roadwork
- Existing Roadwork
- Proposed Concrete
- Concrete Footpath
- Proposed Kerb and Channel
- Existing Kerb and Channel
- 12.0 Existing Contours
- 12.0 Finished Surface Contours

RIVERSIDE ESTATE

ROADWORKS PLAN SHEET 1 OF 2
R12394 - ROADWORKS

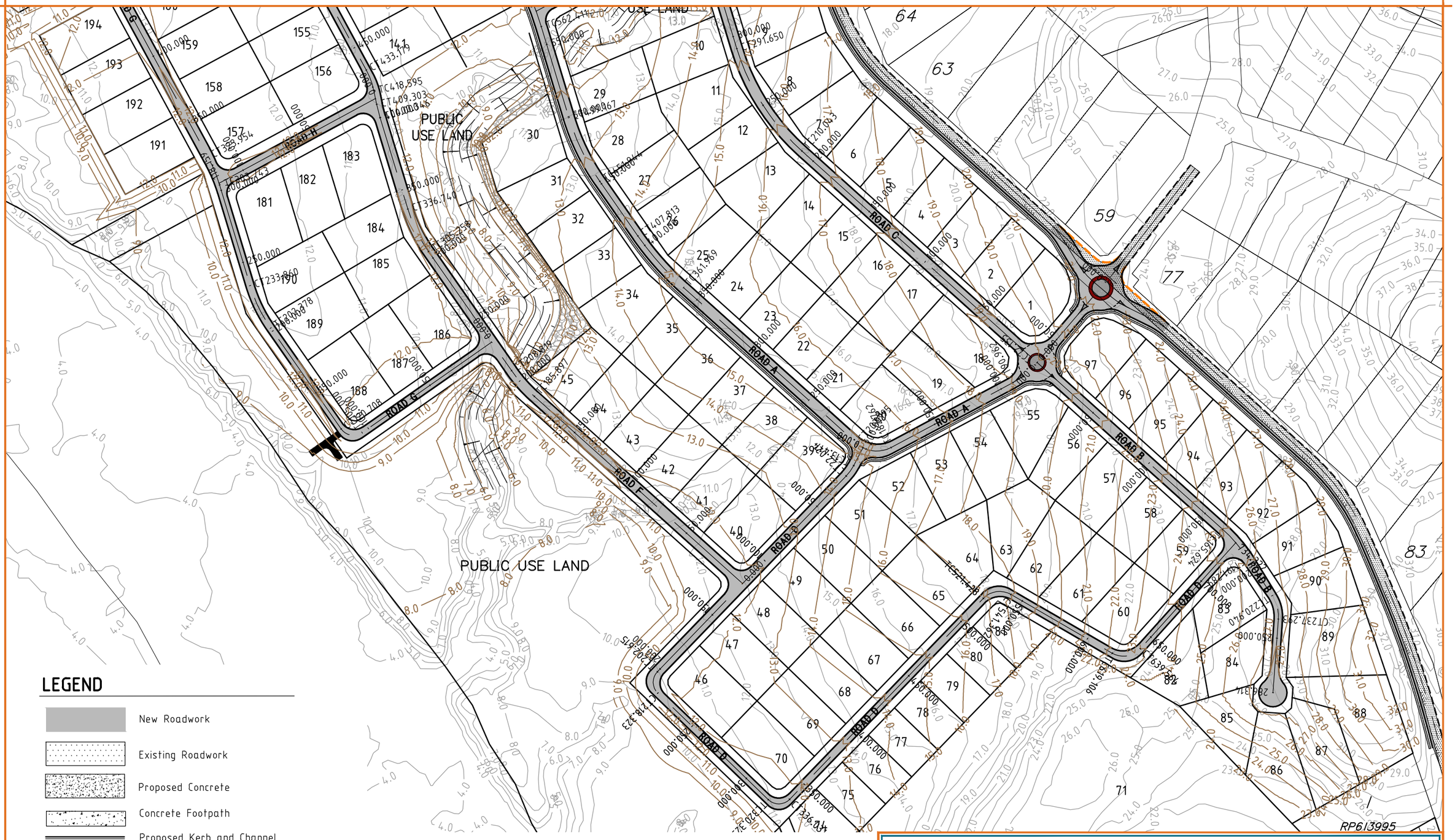
0 6.25 25.0m
0 12.5 50.0m

1:1250 (A1)
1:2500 (A3)

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



LEGEND

- New Roadwork
- Existing Roadwork
- Proposed Concrete
- Concrete Footpath
- Proposed Kerb and Channel
- Existing Kerb and Channel
- 12.0 Existing Contours
- 12.0 Finished Surface Contours

RIVERSIDE ESTATE

ROADWORKS PLAN SHEET 2 OF 2
R12394 - ROADWORKS

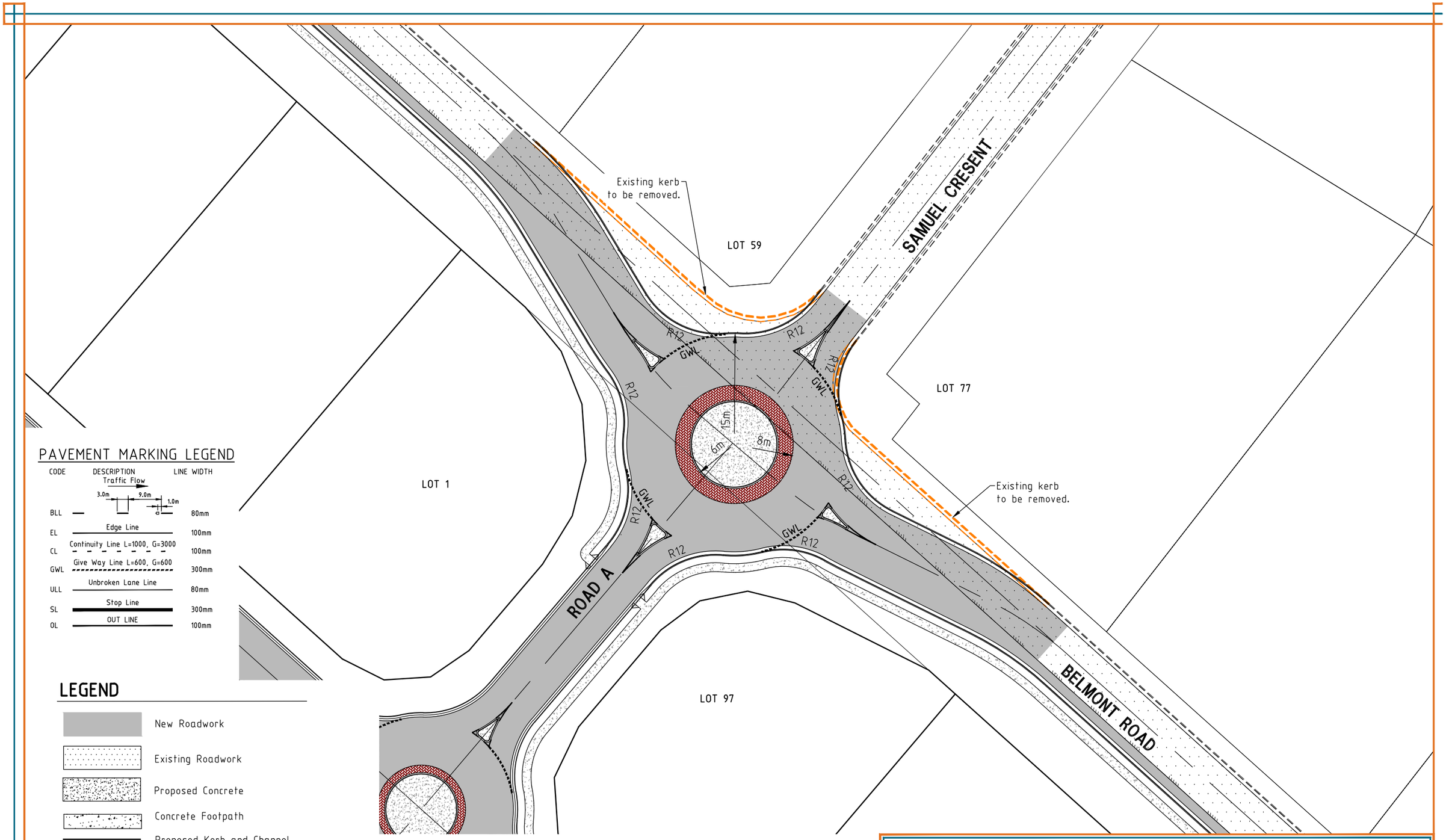
0 6.25 25.0m
0 12.5 50.0m

1:1250 (A1)
1:2500 (A3)

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



PAVEMENT MARKING LEGEND

CODE	DESCRIPTION	LINE WIDTH
	Traffic Flow (3.0m, 9.0m, 1.0m)	
BLL		80mm
EL	Edge Line	100mm
CL	Continuity Line L=1000, G=3000	100mm
GWL	Give Way Line L=600, G=600	300mm
ULL	Unbroken Lane Line	80mm
SL	Stop Line	300mm
OL	OUT LINE	100mm

LEGEND

- New Roadwork
- Existing Roadwork
- Proposed Concrete
- Concrete Footpath
- Proposed Kerb and Channel
- Existing Kerb and Channel
- 12.0 Existing Contours
- 12.0 Finished Surface Contours

RIVERSIDE ESTATE

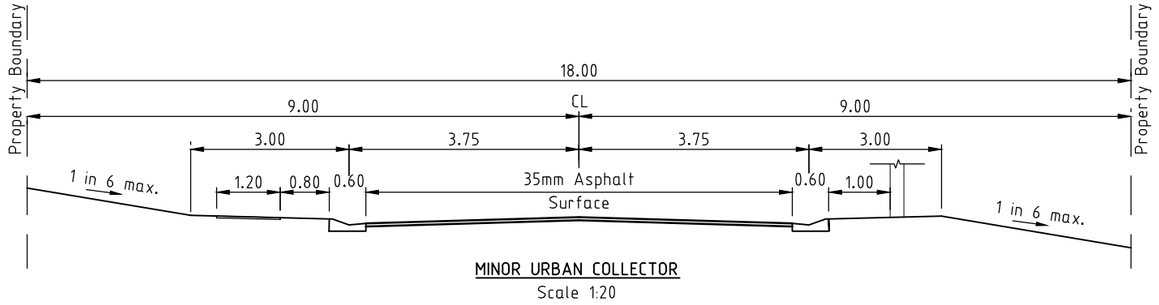
BELMONT ROAD INTERSECTION LAYOUT PLAN
R12394 - INTERSECTION LAYOUT

0 1.25 5.0m
0 2.5 10.0m
1:250 (A1)
1:500 (A3)

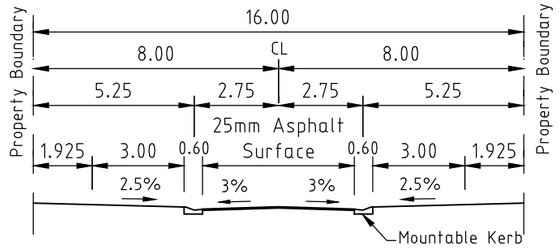
ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

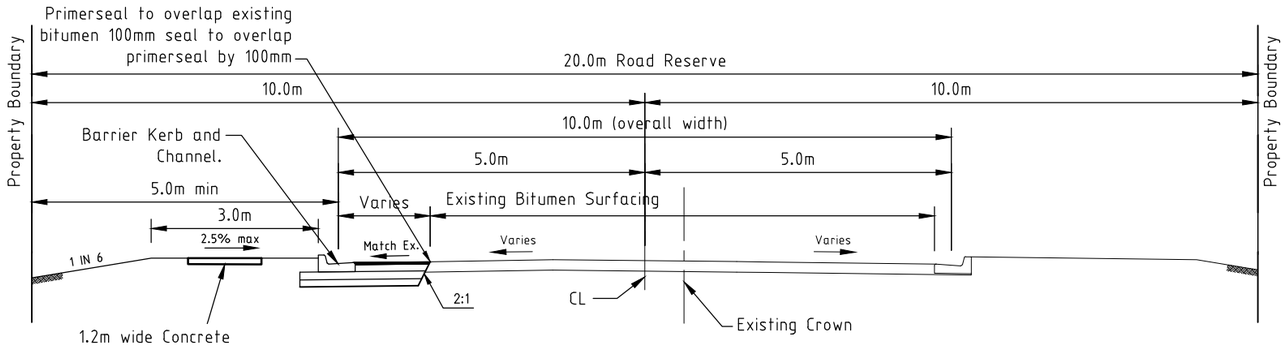
BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



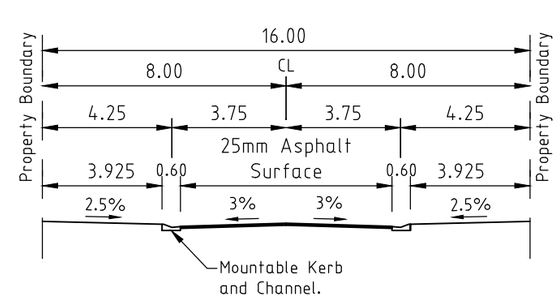
MINOR URBAN COLLECTOR
Scale 1:20



URBAN ACCESS PLACE
Scale 1:50



TYPICAL WIDENING - MAJOR URBAN COLLECTOR BELMONT ROAD



URBAN ACCESS STREET
Scale 1:50

NOTE: Please refer to Riverside Estate road hierarchy plan.

RIVERSIDE ESTATE

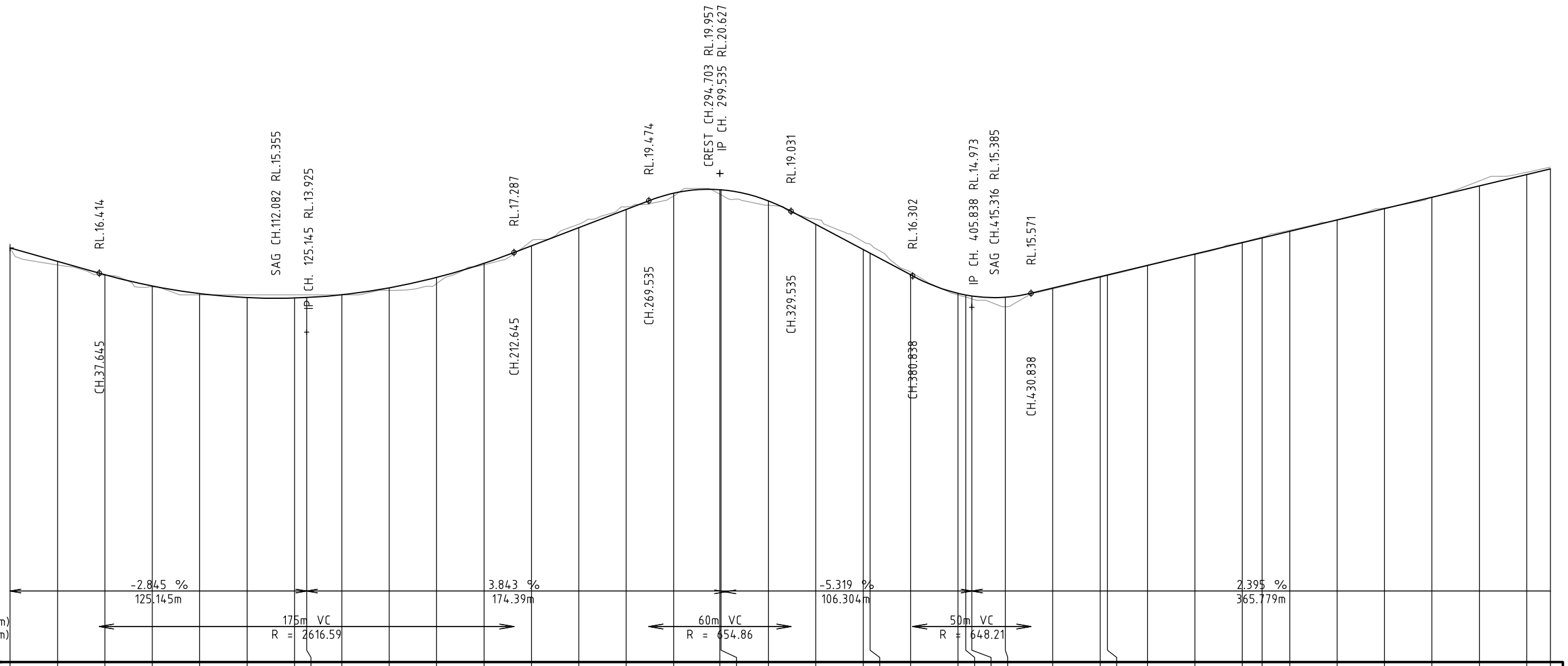
ROADWORKS DETAILS PLAN
R12394 - ROADWORKS DETAILS

0 6.25 25.0m
0 12.5 50.0m
1:1250 (A1)
1:2500 (A3)

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



CUT / FILL DEPTH	0	0.153	0.016	0.036	0.052	-0.117	-0.133	-0.112	0.004	0.103	0.257
DESIGN LEVELS ON ROAD CENTRELINE	17.485	16.916	16.348	15.873	15.552	15.383	15.367	15.388	15.504	15.794	16.236
NAT. SURFACE ON ROAD CENTRELINE	17.485	16.763	16.332	15.837	15.500	15.500	15.500	15.500	15.500	15.691	15.979
CHAINAGE	0.000	20.000	40.000	60.000	80.000	100.000	120.000	125.145	140.000	160.000	180.000

CUT / FILL DEPTH	0.058	-0.208	-0.143	-0.107	0.126	0.192	0.214	0.186	-0.221	-0.337
DESIGN LEVELS ON ROAD CENTRELINE	16.832	17.570	18.339	19.107	19.792	19.940	19.936	19.469	18.474	17.411
NAT. SURFACE ON ROAD CENTRELINE	16.774	17.778	18.482	19.214	19.666	19.748	19.722	19.283	18.695	17.748
CHAINAGE	200.000	220.000	240.000	260.000	280.000	299.535	300.000	320.000	340.000	360.000

CUT / FILL DEPTH	-0.382	-0.117	0.069	0.088	0.121	0.402	0.037	0.031	0.031	0.021
DESIGN LEVELS ON ROAD CENTRELINE	17.257	16.347	15.566	15.497	15.455	15.402	15.791	16.270	16.343	16.748
NAT. SURFACE ON ROAD CENTRELINE	17.639	16.464	15.497	15.409	15.334	15.000	15.754	16.238	16.313	16.727
CHAINAGE	362.884	380.000	400.000	403.308	405.838	420.000	440.000	460.000	463.087	480.000

CUT / FILL DEPTH	0.024	-0.02	-0.034	-0.045	-0.009	-0.023	0.006	-0.206	-0.098	-0.074
DESIGN LEVELS ON ROAD CENTRELINE	17.227	17.706	17.907	18.185	18.664	19.143	19.622	20.101	20.580	20.819
NAT. SURFACE ON ROAD CENTRELINE	17.204	17.726	17.941	18.230	18.673	19.166	19.616	20.306	20.677	20.893
CHAINAGE	500.000	520.000	528.372	540.000	560.000	580.000	600.000	620.000	640.000	650.000

LONGITUDINAL SECTION Belmont Road

0 10.0 40.0m
0 20.0 80.0m
HORIZONTAL
1:1000 (A1)
1:2000 (A3)

0 1.0 4.0m
0 2.0 8.0m
VERTICAL
1:100 (A1)
1:200 (A3)

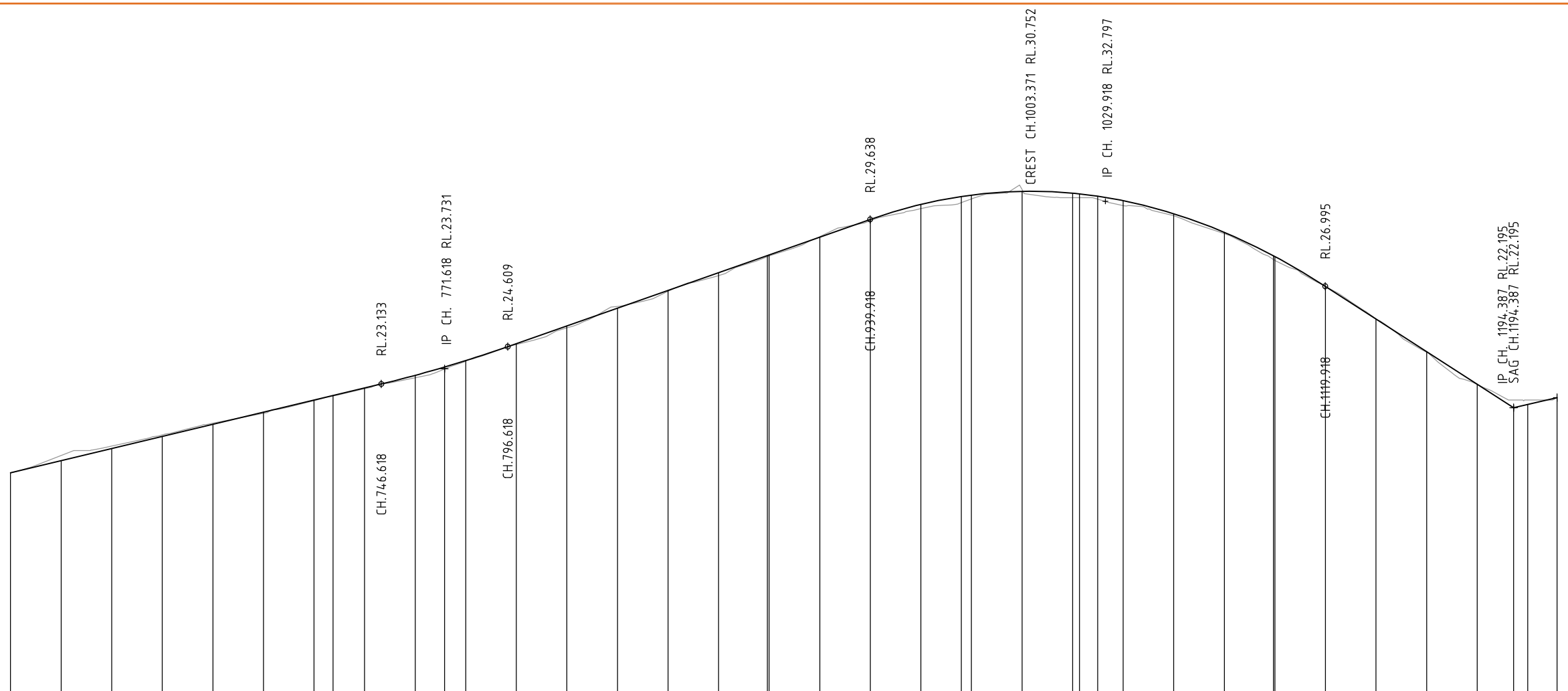
RIVERSIDE ESTATE

ROAD LONGSECTIONS PLAN SHEET 1 OF 14
R12394 - ROAD LONGSECTIONS

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



CUT / FILL DEPTH	0.006	-0.206	-0.098	-0.059	-0.043	0.044	0.021	0.017	0.032	0.092	0.077	0.021	0.037
DESIGN LEVELS ON ROAD CENTRELINE	19.622	20.101	20.580	21.059	21.538	22.016	22.495	22.676	22.974	23.473	23.801	24.056	24.727
NAT. SURFACE ON ROAD CENTRELINE	19.616	20.306	20.677	21.117	21.581	21.972	22.474	22.659	22.943	23.381	23.724	24.035	24.690
CHAINAGE	600.000	620.000	640.000	660.000	680.000	700.000	720.000	727.531	740.000	760.000	771.618	780.000	800.000

CUT / FILL DEPTH	0.079	-0.069	0.038	0.117	0.045	0.046	-0.013	0.053	0.164	0.244	0.153	-0.066	0.175
DESIGN LEVELS ON ROAD CENTRELINE	25.429	26.131	26.833	27.535	28.211	28.237	28.939	29.641	30.231	30.545	30.601	30.748	30.675
NAT. SURFACE ON ROAD CENTRELINE	25.350	26.200	26.795	27.418	28.166	28.191	28.952	29.588	30.067	30.300	30.447	30.815	30.500
CHAINAGE	820.000	840.000	860.000	880.000	899.256	900.000	920.000	940.000	960.000	976.010	980.000	1000.000	1020.000

CUT / FILL DEPTH	0.148	0.119	0.197	0.08	0.054	0.146	0.154	0.001	-0.002	0.025	0.006	-0.305	-0.177
DESIGN LEVELS ON ROAD CENTRELINE	30.648	30.557	30.381	29.865	29.128	28.199	28.169	26.990	25.701	24.411	23.122	22.195	22.323
NAT. SURFACE ON ROAD CENTRELINE	30.500	30.438	30.183	29.785	29.074	28.053	28.016	26.989	25.702	24.386	23.116	22.500	22.500
CHAINAGE	1022.683	1029.918	1040.000	1060.000	1080.000	1099.442	1100.000	1120.000	1140.000	1160.000	1180.000	1194.387	1200.000

CUT / FILL DEPTH	0
DESIGN LEVELS ON ROAD CENTRELINE	22.590
NAT. SURFACE ON ROAD CENTRELINE	22.590
CHAINAGE	1211.611

LONGITUDINAL SECTION Belmont Road

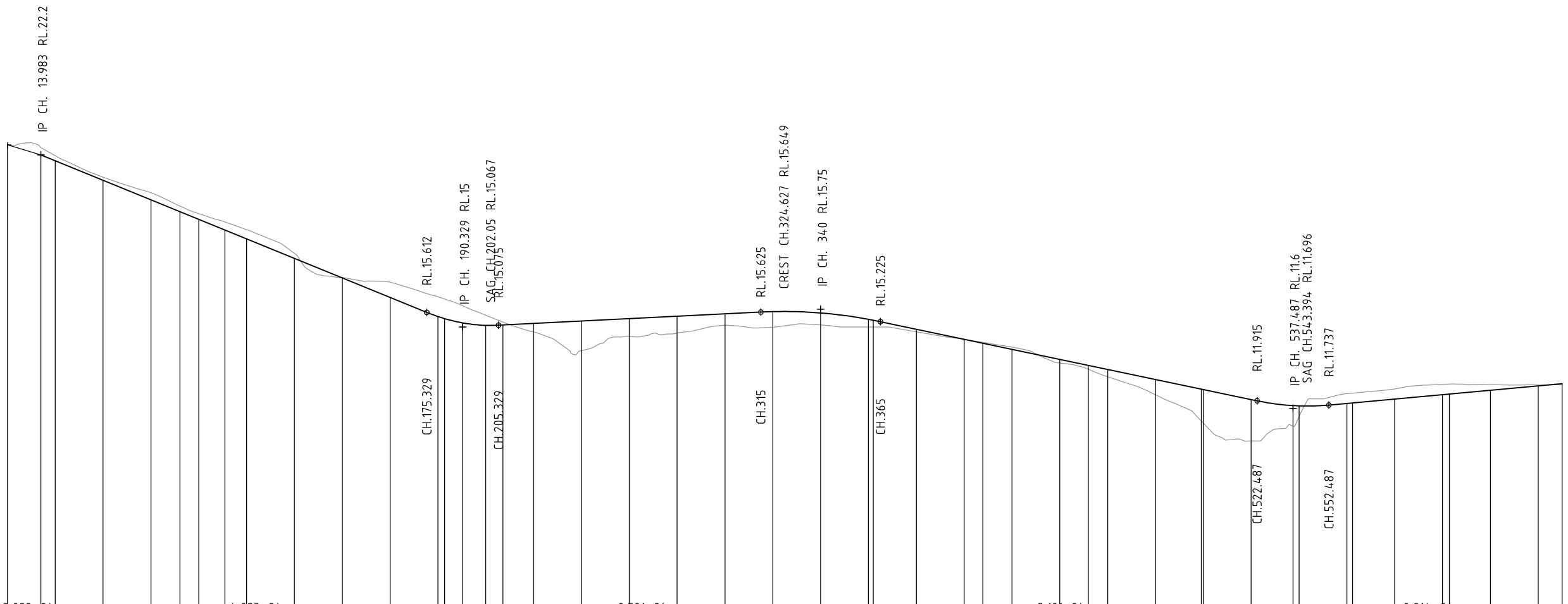
RIVERSIDE ESTATE

ROAD LONGSECTIONS PLAN SHEET 2 OF 14
R12394 - ROAD LONGSECTIONS

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



Vertical Geometry Grade (%) -3.029 % | -4.083 % | 0.501 % | -2.101 % | 0.914 %
Vertical Grade Length 13.983m | 176.346m | 149.671m | 197.487m | 298.905m

Vertical Curve Length (m) | 30m VC | 50m VC | 30m VC
Vertical Curve Radius (m) | R = 654.45 | R = 1921.23 | R = 994.89

DATUM R.L.0.000

CHAINAGE	CUT / FILL DEPTH	DESIGN LEVELS ON ROAD CENTRELINE	NAT. SURFACE ON ROAD CENTRELINE
0.000	0.008	22.624	22.615
13.983	-0.3	22.200	22.500
20.000	-0.207	21.954	22.161
40.000	-0.131	21.138	21.269
60.000	-0.29	20.321	20.611
72.135	-0.23	19.826	20.056
80.000	-0.234	19.505	19.739
90.962	-0.335	19.057	19.392
100.000	-0.386	18.688	19.074
120.000	-0.209	17.871	18.080
140.000	-0.017	17.055	17.072
160.000	-0.636	16.238	16.874
180.000	-0.822	15.438	16.261
182.762	-0.823	15.351	16.174
190.329	-0.717	15.172	15.889
200.000	-0.426	15.070	15.496
207.195	-0.124	15.085	15.208
220.000	0.358	15.149	14.791
240.000	1.234	15.249	14.015
260.000	0.74	15.349	14.610
280.000	0.706	15.449	14.744
300.000	0.472	15.550	15.078
320.000	0.652	15.643	14.991
340.000	0.501	15.587	15.086
360.000	0.323	15.323	15.000
361.969	0.286	15.286	15.000
380.000	0.108	14.909	14.801
400.000	0.002	14.489	14.487
407.813	-0.036	14.325	14.361
420.000	-0.093	14.069	14.162
440.000	0.157	13.649	13.492
451.944	0.167	13.398	13.230
460.000	0.31	13.228	12.919
480.000	0.64	12.808	12.168
499.167	1.341	12.405	11.064
500.000	1.409	12.388	10.979
520.000	1.736	11.967	10.231
537.487	0.867	11.713	10.846
540.000	0.453	11.701	11.248
560.000	-0.406	11.806	12.212
562.411	-0.409	11.828	12.237
580.000	-0.423	11.989	12.412
600.000	-0.433	12.171	12.604
602.833	-0.418	12.197	12.615
620.000	-0.238	12.354	12.592
640.000	-0.039	12.537	12.576
650.000	0.031	12.628	12.597

LONGITUDINAL SECTION Road A

0 10.0 40.0m
0 20.0 80.0m
HORIZONTAL
1:1000 (A1)
1:2000 (A3)

0 1.0 4.0m
0 2.0 8.0m
VERTICAL
1:100 (A1)
1:200 (A3)

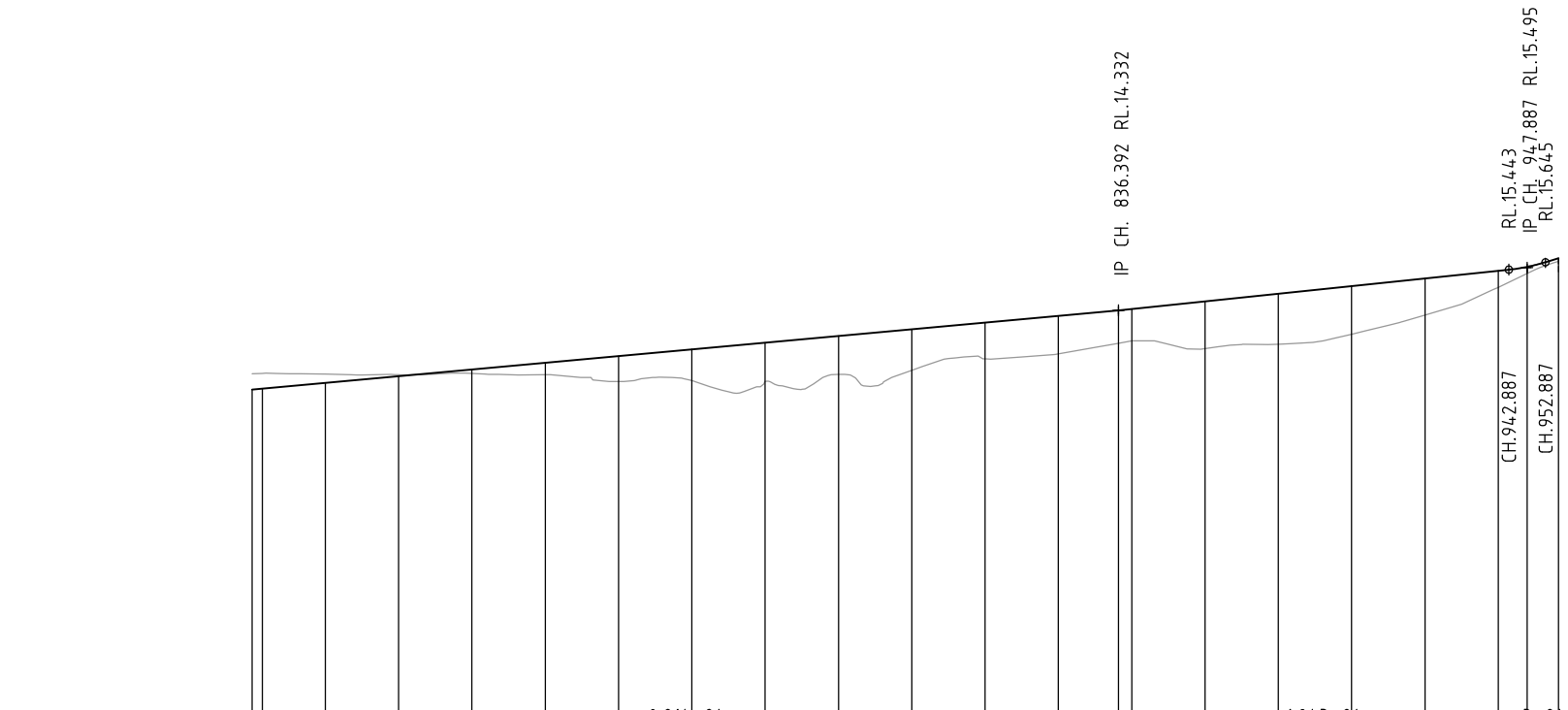
RIVERSIDE ESTATE

ROAD LONGSECTIONS PLAN SHEET 3 OF 14
R12394 - ROAD LONGSECTIONS

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



CUT / FILL DEPTH	-0.433	-0.418	-0.238	-0.039	0.109	0.326	0.694	0.851	1.06	1.051	1.12	0.992	1.035	0.897	0.872	1.29	1.376	1.314	1	0.452	0.181	0.08	
DESIGN LEVELS ON ROAD CENTRELINE	12.171	12.197	12.354	12.537	12.720	12.903	13.085	13.268	13.451	13.634	13.817	13.999	14.182	14.332	14.370	14.578	14.787	14.995	15.204	15.412	15.519	15.750	
NAT. SURFACE ON ROAD CENTRELINE	12.604	12.615	12.592	12.576	12.610	12.577	12.391	12.418	12.391	12.583	12.696	13.008	13.147	13.435	13.498	13.288	13.410	13.681	14.204	14.961	15.338	15.670	
CHAINAGE	600.000	602.833	620.000	640.000	660.000	680.000	700.000	720.000	740.000	760.000	780.000	800.000	820.000	836.392	840.000	860.000	880.000	900.000	920.000	940.000	947.887	956.392	

LONGITUDINAL SECTION Road A

0 10.0 40.0m
0 20.0 80.0m
HORIZONTAL
1:1000 (A1)
1:2000 (A3)

0 1.0 4.0m
0 2.0 8.0m
VERTICAL
1:100 (A1)
1:200 (A3)

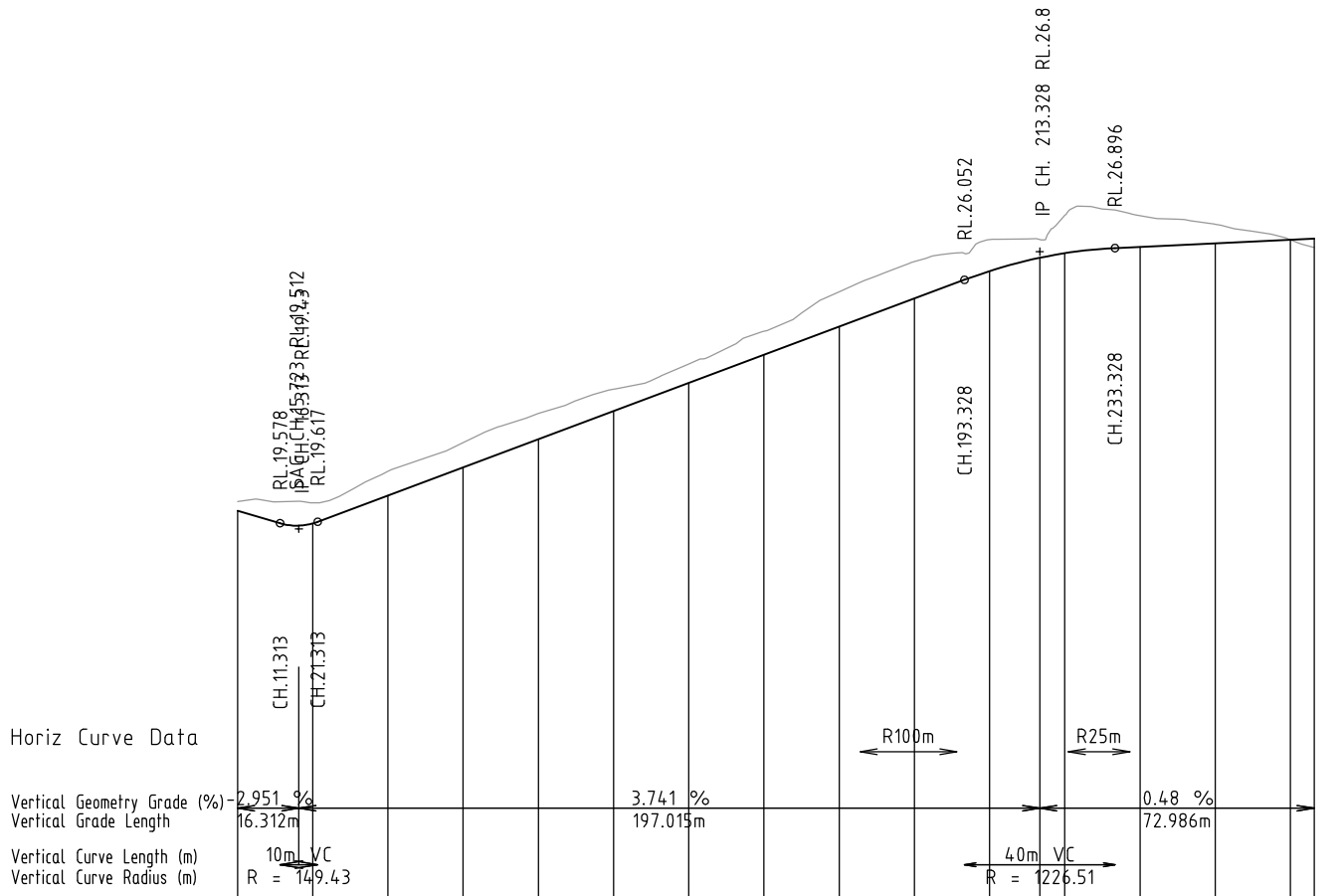
RIVERSIDE ESTATE

ROAD LONGSECTIONS PLAN SHEET 4 OF 14
R12394 - ROAD LONGSECTIONS

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



VOLUMES																				
	CUT		106		163	194	202	188	151	159	213	272	240	168		250	166	48		
	FILL		0		0	0	0	0	0	0	0	0	0	0		0	0	2		
KERB LEVELS RHS			19.411	19.469	20.212	20.96	21.708	22.456	23.205	23.953	24.701	25.449	26.188	26.555	26.684	26.854	26.95			
KERB LEVELS LHS			19.411	19.469	20.212	20.96	21.708	22.456	23.205	23.953	24.701	25.449	26.188	26.555	26.684	26.854	26.95			
CUT / FILL DEPTH	-0.246	-0.646	-0.551	-0.646	-0.656	-0.688	-0.58	-0.507	-0.626	-0.932	-0.981	-0.838	-0.485	-1.002	-0.831	-0.508	0.009	0.242		
DESIGN LEVELS ON ROAD CENTRELINE	19.911	19.514	19.574	20.316	21.064	21.812	22.561	23.309	24.057	24.805	25.553	26.283	26.637	26.760	26.928	27.024	27.120	27.150		
NAT. SURFACE ON ROAD CENTRELINE	20.158	20.159	20.124	20.962	21.720	22.500	23.140	23.815	24.683	25.737	26.534	27.122	27.122	27.762	27.759	27.532	27.111	26.908		
CHAINAGE	0.000	16.313	20.000	40.000	60.000	80.000	100.000	120.000	140.000	160.000	180.000	200.000	213.328	220.000	240.000	260.000	280.000	286.314		

LONGITUDINAL SECTION Road B

0 10.0 40.0m
0 20.0 80.0m
HORIZONTAL
1:1000 (A1)
1:2000 (A3)

0 1.0 4.0m
0 2.0 8.0m
VERTICAL
1:100 (A1)
1:200 (A3)

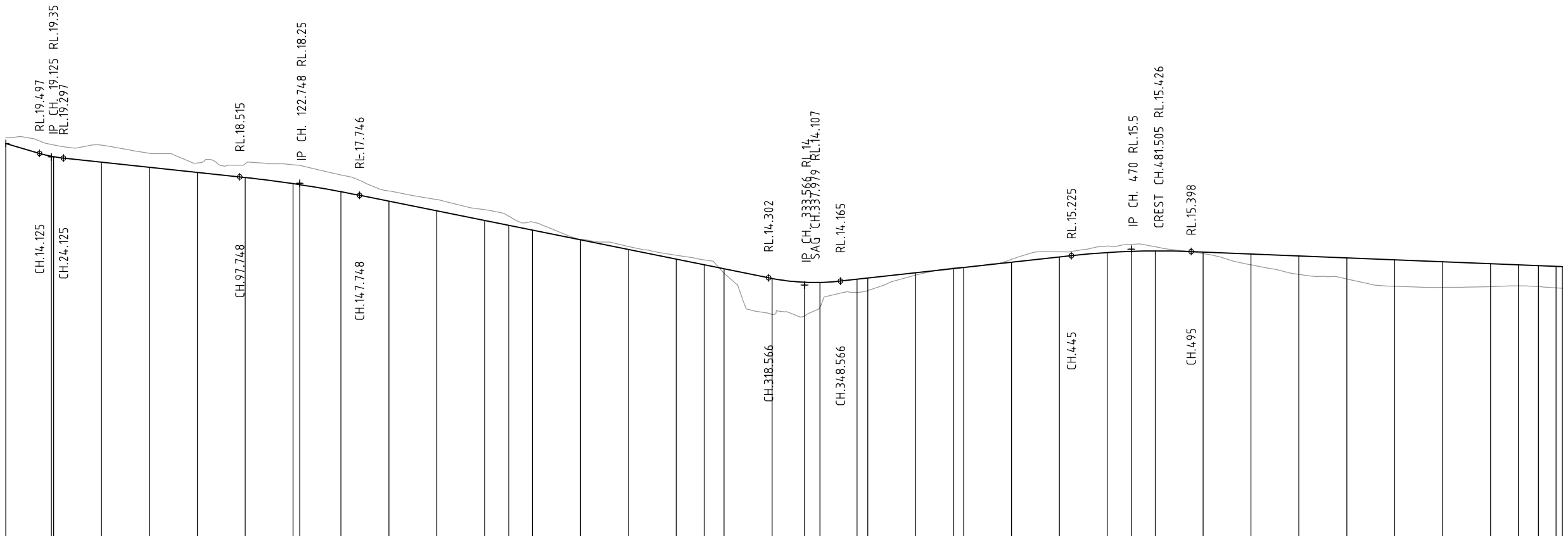
RIVERSIDE ESTATE

ROAD LONGSECTIONS PLAN SHEET 5 OF 14
R12394 - ROAD LONGSECTIONS

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



CHAINAGE	0.000	19.125	20.000	40.000	60.000	80.000	100.000	120.000	122.748	140.000	160.000	180.000	200.000	210.043	220.000
CUT / FILL DEPTH	-0.245	-0.494	-0.493	-0.711	-0.583	-0.388	-0.573	-0.789	-0.803	-0.703	-0.432	-0.48	-0.456	-0.387	-0.346
DESIGN LEVELS ON ROAD CENTRELINE	19.912	19.373	19.357	19.128	18.916	18.704	18.491	18.232	18.190	17.896	17.499	17.096	16.693	16.490	16.289
NAT. SURFACE ON ROAD CENTRELINE	20.158	19.867	19.850	19.839	19.499	19.092	19.064	19.021	18.994	18.599	17.931	17.575	17.149	16.877	16.636

CHAINAGE	240.000	260.000	280.000	291.650	300.000	320.000	333.566	340.000	355.489	360.000	380.000	395.911	400.000	420.000	440.000
CUT / FILL DEPTH	-0.02	-0.125	-0.163	-0.207	0.186	1.502	1.421	1.032	0.548	0.522	0.098	-0.033	-0.014	-0.127	-0.218
DESIGN LEVELS ON ROAD CENTRELINE	15.886	15.483	15.080	14.845	14.677	14.275	14.117	14.109	14.241	14.291	14.511	14.685	14.730	14.950	15.170
NAT. SURFACE ON ROAD CENTRELINE	15.906	15.608	15.243	15.052	14.491	12.773	12.696	13.077	13.693	13.769	14.412	14.718	14.745	15.077	15.388

CHAINAGE	460.000	470.000	480.000	500.000	520.000	540.000	560.000	580.000	600.000	620.000	631.674	640.000	647.386	650.000
CUT / FILL DEPTH	-0.273	-0.295	-0.17	0.066	0.453	0.763	0.879	1.104	1.066	0.955	0.876	0.873	0.897	0.906
DESIGN LEVELS ON ROAD CENTRELINE	15.356	15.406	15.425	15.378	15.297	15.216	15.134	15.053	14.972	14.890	14.843	14.809	14.779	14.768
NAT. SURFACE ON ROAD CENTRELINE	15.629	15.701	15.596	15.312	14.844	14.452	14.255	13.949	13.906	13.935	13.967	13.936	13.882	13.862

LONGITUDINAL SECTION Road C

0 10.0 40.0m
0 20.0 80.0m
HORIZONTAL
1:1000 (A1)
1:2000 (A3)

0 1.0 4.0m
0 2.0 8.0m
VERTICAL
1:100 (A1)
1:200 (A3)

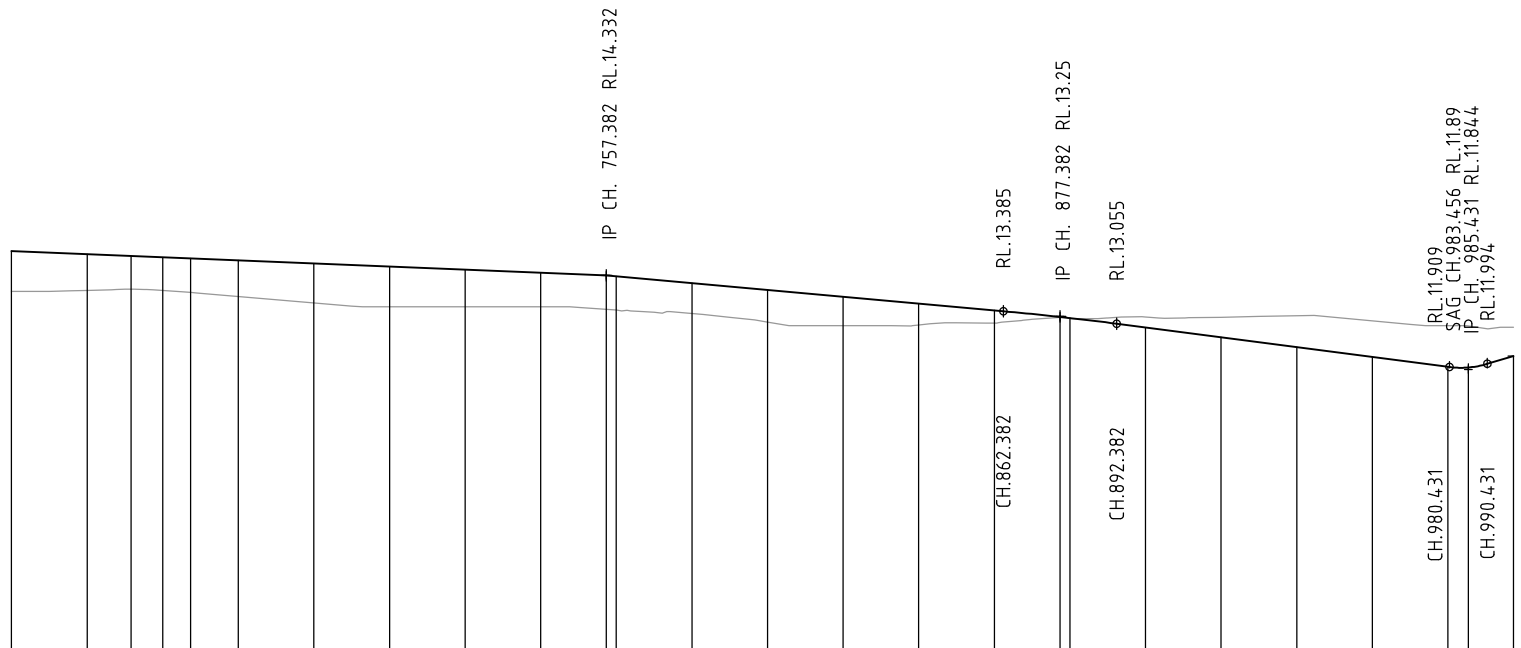
RIVERSIDE ESTATE

ROAD LONGSECTIONS PLAN SHEET 6 OF 14
R12394 - ROAD LONGSECTIONS

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



Vertical Geometry Grade (%)							-0.406 %							-0.902 %						-1.301 %					3 %						
Vertical Grade Length							287.382m							120m						108.048m					11.952m						
Vertical Curve Length (m)																	30m VC								10m VC						
Vertical Curve Radius (m)																	R = 7512.13								R = 232.51						
DATUM R.L.0.000																																
CUT / FILL DEPTH	1.066	0.955	0.876	0.873	0.897	0.95	1.038	1.065	0.984	0.903	0.897	0.891	0.804	0.85	0.767	0.567	0.339	0.01	0.011	-0.278	-0.532	-0.828	-0.955	-1.085	-1.094	-0.755						
DESIGN LEVELS ON ROAD CENTRELINE	14.972	14.890	14.843	14.809	14.779	14.728	14.647	14.565	14.484	14.403	14.332	14.308	14.128	13.948	13.767	13.587	13.407	13.235	13.206	12.956	12.696	12.435	12.175	11.915	11.898	12.203						
NAT. SURFACE ON ROAD CENTRELINE	13.906	13.935	13.967	13.936	13.882	13.778	13.608	13.500	13.500	13.500	13.435	13.417	13.324	13.098	13.000	13.020	13.068	13.225	13.195	13.234	13.227	13.264	13.130	13.000	12.992	12.958						
CHAINAGE	600.000	620.000	631.674	640.000	647.386	660.000	680.000	700.000	720.000	740.000	757.382	760.000	780.000	800.000	820.000	840.000	860.000	877.382	880.000	900.000	920.000	940.000	960.000	980.000	985.431	997.382						

LONGITUDINAL SECTION Road C

0 10.0 40.0m
0 20.0 80.0m
HORIZONTAL
1:1000 (A1)
1:2000 (A3)

0 1.0 4.0m
0 2.0 8.0m
VERTICAL
1:100 (A1)
1:200 (A3)

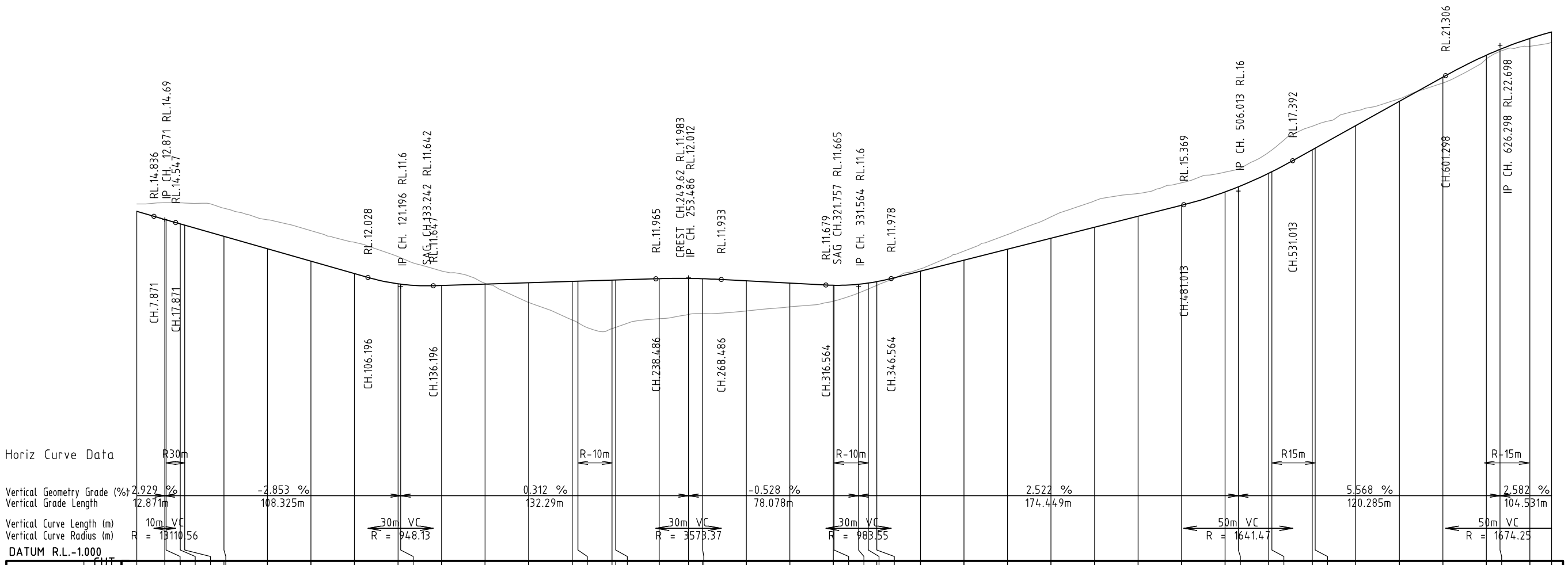
RIVERSIDE ESTATE

ROAD LONGSECTIONS PLAN SHEET 7 OF 14
R12394 - ROAD LONGSECTIONS

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



VOLUMES																	
CUT	116	288	313	338	341	336	234	99	1868	2826	1028	463	1408	1806	544	328	0
FILL	0	0	0	0	0	0	0	0	123	452	928	788	675	585	464	292	107

VOLUMES																
CUT	15	69	139	204	274	283	256	252	221	274	213	92	9	0	9	0
FILL	13	0	0	0	0	0	0	0	0	0	0	0	21	67	45	52

CHAINAGE	0.000	12.871	13.417	20.000	22.024	40.000	60.000	80.000	100.000	120.000	121.196	140.000	160.000	180.000	200.000	202.615
KERB LEVELS RHS	23.871	14.617	14.601	14.412	14.355	13.842	13.271	12.701	12.13	11.66	11.645	11.584	11.647	11.709	11.771	11.779
KERB LEVELS LHS	23.838	14.617	14.601	14.412	14.355	13.842	13.271	12.701	12.13	11.66	11.645	11.584	11.647	11.709	11.771	11.779
CUT / FILL DEPTH	-0.341	-0.773	-0.79	-0.97	-1.021	-1.29	-1.335	-1.404	-1.439	-1.25	-1.215	-0.666	-0.037	0.904	1.77	1.909
DESIGN LEVELS ON ROAD CENTRELINE	15.067	14.691	14.675	14.487	14.429	13.916	13.346	12.775	12.205	11.735	11.719	11.659	11.721	11.783	11.846	11.854
NAT. SURFACE ON ROAD CENTRELINE	15.408	15.464	15.465	15.456	15.450	15.206	14.680	14.179	13.644	12.985	12.933	12.325	11.758	10.880	10.075	9.945

CHAINAGE	218.323	220.000	240.000	253.486	260.000	280.000	300.000	320.000	320.323	331.564	336.031	340.000	360.000	380.000	400.000	420.000
KERB LEVELS RHS	11.828	11.834	11.896	11.906	11.893	11.798	11.692	11.593	11.592	11.64	11.695	11.76	12.243	12.747	13.252	13.756
KERB LEVELS LHS	11.828	11.834	11.896	11.906	11.893	11.798	11.692	11.593	11.592	11.64	11.695	11.76	12.243	12.747	13.252	13.756
CUT / FILL DEPTH	2.228	2.176	1.843	1.653	1.598	1.388	1.09	0.735	0.726	0.4	0.273	0.17	-0.105	-0.414	-0.672	-0.982
DESIGN LEVELS ON ROAD CENTRELINE	11.903	11.908	11.970	11.981	11.968	11.872	11.767	11.667	11.667	11.714	11.769	11.835	12.317	12.822	13.326	13.831
NAT. SURFACE ON ROAD CENTRELINE	9.674	9.732	10.127	10.328	10.369	10.485	10.677	10.933	10.940	11.314	11.496	11.664	12.422	13.236	13.998	14.813

CHAINAGE	440.000	460.000	480.000	500.000	506.013	520.000	521.428	540.000	541.362	560.000	580.000	600.000	620.000	626.298	640.000	650.000
KERB LEVELS RHS	14.261	14.765	15.27	15.884	16.116	16.742	16.812	17.818	17.894	18.932	20.046	21.159	22.168	22.437	22.939	23.235
KERB LEVELS LHS	14.261	14.765	15.27	15.884	16.116	16.742	16.812	17.818	17.894	18.932	20.046	21.159	22.168	22.437	22.939	23.235
CUT / FILL DEPTH	-1.21	-1.05	-1.036	-0.912	-0.81	-0.964	-0.997	-1.087	-1.057	-0.671	-0.121	0.268	0.169	0.083	0.366	0.485
DESIGN LEVELS ON ROAD CENTRELINE	14.335	14.839	15.344	15.958	16.190	16.816	16.886	17.892	17.968	19.006	20.120	21.233	22.243	22.511	23.013	23.309
NAT. SURFACE ON ROAD CENTRELINE	15.545	15.889	16.380	16.870	17.000	17.779	17.883	18.980	19.026	19.677	20.241	20.966	22.074	22.428	22.647	22.825

LONGITUDINAL SECTION Road D

0 10.0 40.0m
0 20.0 80.0m
HORIZONTAL
1:1000 (A1)
1:2000 (A3)

0 1.0 4.0m
0 2.0 8.0m
VERTICAL
1:100 (A1)
1:200 (A3)

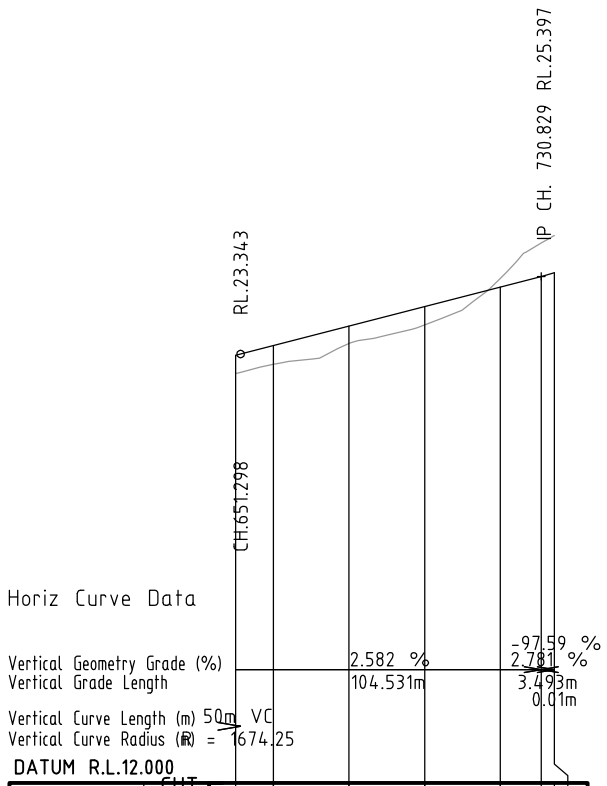
RIVERSIDE ESTATE

ROAD LONGSECTIONS PLAN SHEET 8 OF 14
R12394 - ROAD LONGSECTIONS

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

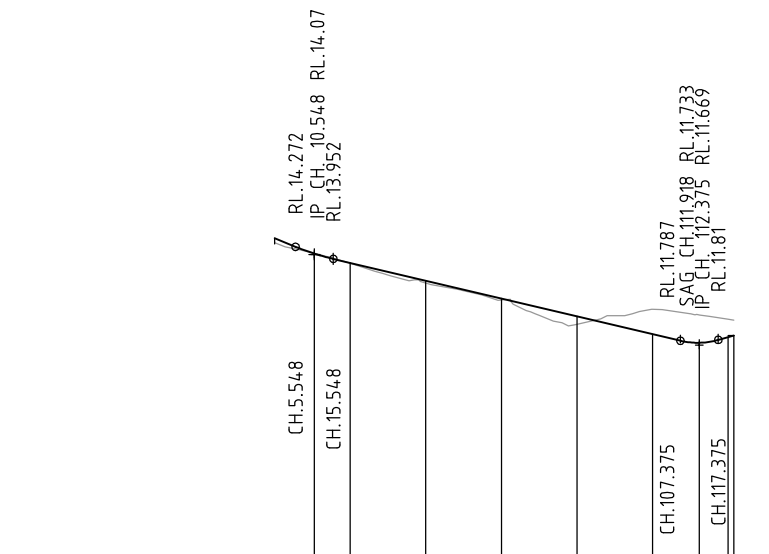
Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



VOLUMES CUT / FILL	0 / 60	0 / 135	0 / 118	9 / 63	34 / 0		
KERB LEVELS RHS	23.235	23.494	24.01	24.526	25.043		
KERB LEVELS LHS	23.235	23.494	24.01	24.526	25.043		
CUT / FILL DEPTH	0.485	0.496	0.458	0.486	-0.226	-0.882	-0.98
DESIGN LEVELS ON ROAD CENTRELINE	23.309	23.568	24.084	24.601	25.117	25.397	25.494
NAT. SURFACE ON ROAD CENTRELINE	22.825	23.072	23.627	24.114	25.343	26.279	26.474
CHAINAGE	650.000	660.000	680.000	700.000	720.000	730.829	734.322

LONGITUDINAL SECTION Road D



CUT / FILL DEPTH	-0.006	0.011	0.065	0.036	0.209	-0.657	-0.737	-0.472	-0.409
DESIGN LEVELS ON ROAD CENTRELINE	14.091	13.847	13.375	12.904	12.432	11.960	11.733	11.885	11.926
NAT. SURFACE ON ROAD CENTRELINE	14.380 / 14.097	13.836	13.311	12.868	12.223	12.617	12.471	12.356	12.335
CHAINAGE	0.000 / 10.548	20.000	40.000	60.000	80.000	100.000	112.375	120.000	121.463

LONGITUDINAL SECTION Road E

0 10.0 40.0m HORIZONTAL 1:1000 (A1) 1:2000 (A3)
0 20.0 80.0m
0 1.0 4.0m VERTICAL 1:100 (A1) 1:200 (A3)
0 2.0 8.0m

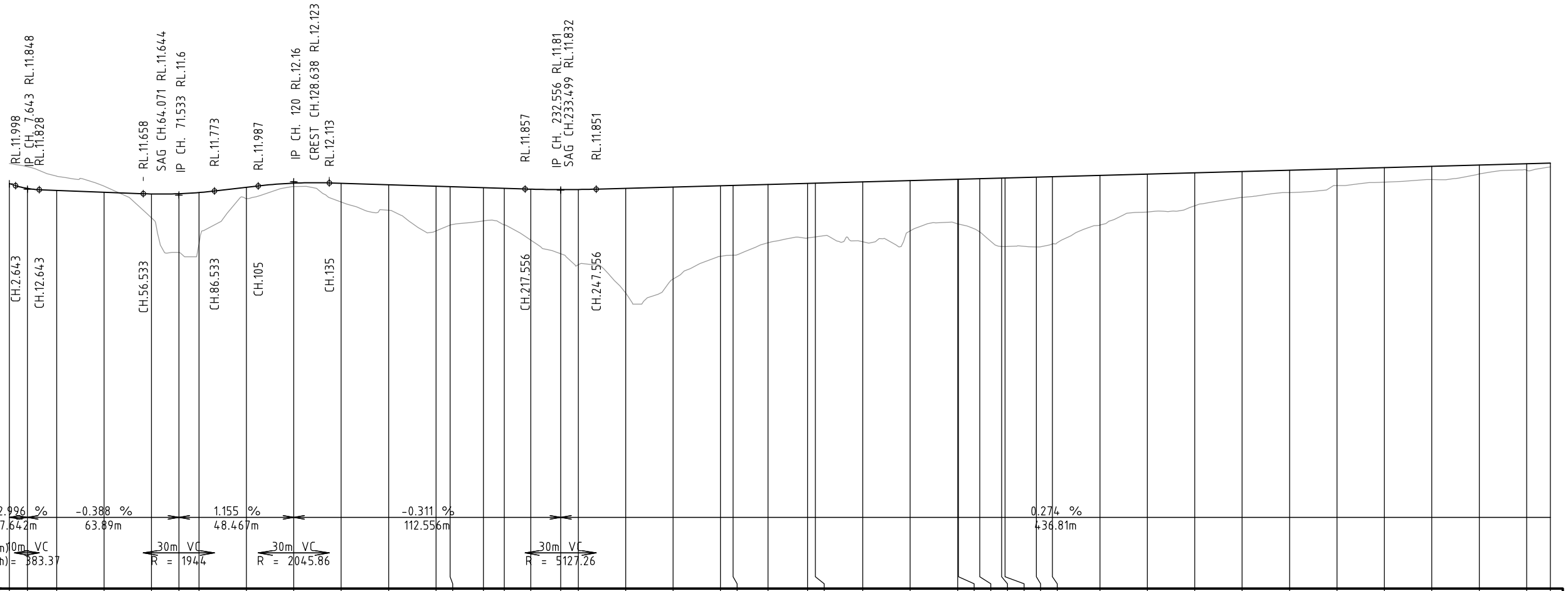
RIVERSIDE ESTATE

ROAD LONGSECTIONS PLAN SHEET 9 OF 14
R12394 - ROAD LONGSECTIONS

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



CUT / FILL DEPTH	-0.857	-0.918	-0.599	-0.252	1.004	2.477	2.194	0.473	0.146	0.789	1.077	1.887	1.62	1.4	1.539
DESIGN LEVELS ON ROAD CENTRELINE	12.077	11.880	11.800	11.722	11.648	11.658	11.709	11.929	12.105	12.098	12.036	11.973	11.955	11.911	11.884
NAT. SURFACE ON ROAD CENTRELINE	12.933	12.799	12.399	11.975	10.644	9.181	9.515	11.456	11.959	11.309	10.959	10.087	10.335	10.511	10.345
CHAINAGE	0.000	7.643	20.000	40.000	60.000	71.533	80.000	100.000	120.000	140.000	160.000	180.000	185.897	200.000	208.819

CUT / FILL DEPTH	2.15	2.704	3.172	4.421	3.882	2.977	2.947	2.461	2.306	2.269	2.529	2.123	1.884	1.895	2.251
DESIGN LEVELS ON ROAD CENTRELINE	11.850	11.832	11.836	11.885	11.940	11.995	12.009	12.050	12.096	12.105	12.159	12.214	12.269	12.270	12.295
NAT. SURFACE ON ROAD CENTRELINE	9.700	9.128	8.664	7.464	8.058	9.018	9.062	9.589	9.790	9.836	9.630	10.091	10.385	10.375	10.044
CHAINAGE	220.000	232.556	240.000	260.000	280.000	300.000	305.258	320.000	336.740	340.000	360.000	380.000	400.000	400.346	409.303

CUT / FILL DEPTH	2.894	2.898	2.948	2.84	2.096	1.599	1.394	1.094	0.945	0.708	0.616	0.565	0.383	0.278	0.168
DESIGN LEVELS ON ROAD CENTRELINE	12.320	12.324	12.360	12.379	12.434	12.488	12.543	12.598	12.653	12.708	12.763	12.817	12.872	12.927	12.954
NAT. SURFACE ON ROAD CENTRELINE	9.426	9.426	9.412	9.538	10.337	10.890	11.149	11.504	11.708	12.000	12.147	12.253	12.490	12.649	12.787
CHAINAGE	418.595	420.000	433.179	440.000	460.000	480.000	500.000	520.000	540.000	560.000	580.000	600.000	620.000	640.000	650.000

LONGITUDINAL SECTION Road F

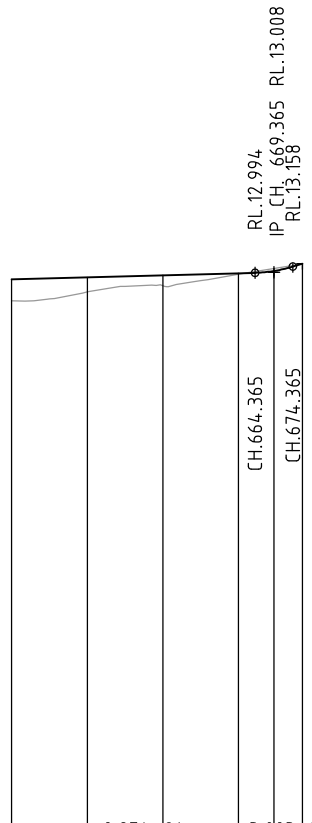
RIVERSIDE ESTATE

ROAD LONGSECTIONS PLAN SHEET 10 OF 14
R12394 - ROAD LONGSECTIONS

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



Vertical Geometry Grade (%)			0.274 %			3.003 %	
Vertical Grade Length			436.81m			7.51m	
Vertical Curve Length (m)						10m VC	
Vertical Curve Radius (m)						R = 366.46	
DATUM R.L.-5.000							
CUT / FILL DEPTH	0.565	0.383	0.278	0.026	-0.065	0.008	
DESIGN LEVELS ON ROAD CENTRELINE	12.817	12.872	12.927	12.982	13.042	13.233	
NAT. SURFACE ON ROAD CENTRELINE	12.253	12.490	12.649	12.955	13.107	13.225	
CHAINAGE	600.000	620.000	640.000	660.000	669.365	676.875	

LONGITUDINAL SECTION Road F

0 10.0 40.0m
0 20.0 80.0m
HORIZONTAL
1:1000 (A1)
1:2000 (A3)

0 1.0 4.0m
0 2.0 8.0m
VERTICAL
1:100 (A1)
1:200 (A3)

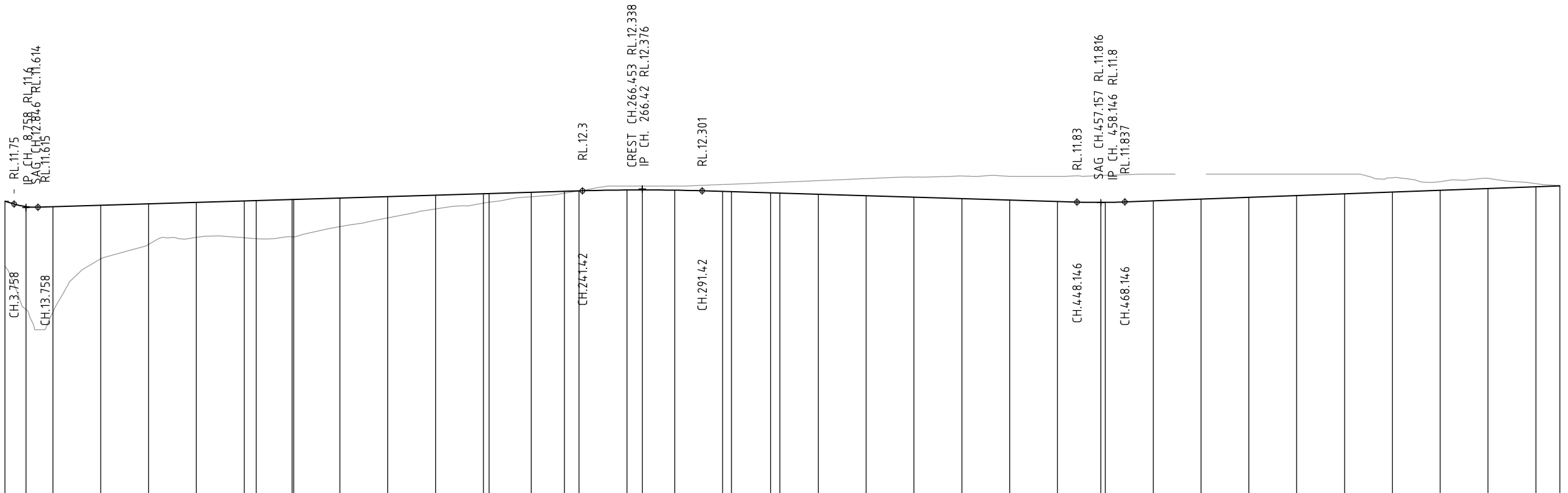
RIVERSIDE ESTATE

ROAD LONGSECTIONS PLAN SHEET 11 OF 14
R12394 - ROAD LONGSECTIONS

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



CUT / FILL DEPTH	2.709	4.297	4.394	2.239	1.698	1.461	1.536	1.59	1.558	1.562	1.194	0.884	0.572	0.389	0.358
DESIGN LEVELS ON ROAD CENTRELINE	11.863	11.641	11.634	11.694	11.754	11.814	11.875	11.890	11.935	11.937	11.995	12.055	12.116	12.176	12.183
NAT. SURFACE ON ROAD CENTRELINE	9.154	7.345	7.240	9.455	10.056	10.353	10.338	10.299	10.377	10.375	10.801	11.171	11.544	11.786	11.825
CHAINAGE	0.000	8.758	20.000	40.000	60.000	80.000	100.000	105.000	120.000	120.708	140.000	160.000	180.000	200.000	202.378

CUT / FILL DEPTH	0.183	0.074	0.012	-0.164	-0.162	-0.173	-0.287	-0.313	-0.428	-0.456	-0.571	-0.715	-0.839	-0.946
DESIGN LEVELS ON ROAD CENTRELINE	12.236	12.278	12.296	12.336	12.338	12.327	12.275	12.264	12.215	12.203	12.155	12.095	12.035	11.975
NAT. SURFACE ON ROAD CENTRELINE	12.053	12.203	12.285	12.500	12.500	12.500	12.562	12.577	12.642	12.659	12.726	12.809	12.874	12.920
CHAINAGE	220.000	233.860	240.000	260.000	266.420	280.000	300.000	303.743	320.000	323.954	340.000	360.000	380.000	400.000

CUT / FILL DEPTH	-0.994	-1.047	-1.118	-1.125	-1.12	-1.047	-0.973	-0.9	-0.827	-0.603	-0.364	-0.429	-0.134	-0.021
DESIGN LEVELS ON ROAD CENTRELINE	11.915	11.854	11.817	11.818	11.880	11.953	12.027	12.100	12.173	12.246	12.319	12.393	12.466	12.503
NAT. SURFACE ON ROAD CENTRELINE	12.908	12.902	12.935	12.942	13.000	13.000	13.000	13.000	13.000	12.849	12.683	12.822	12.600	12.524
CHAINAGE	420.000	440.000	458.146	460.000	480.000	500.000	520.000	540.000	560.000	580.000	600.000	620.000	640.000	650.000

LONGITUDINAL SECTION Road G

0 10.0 40.0m
0 20.0 80.0m
HORIZONTAL
1:1000 (A1)
1:2000 (A3)

0 1.0 4.0m
0 2.0 8.0m
VERTICAL
1:100 (A1)
1:200 (A3)

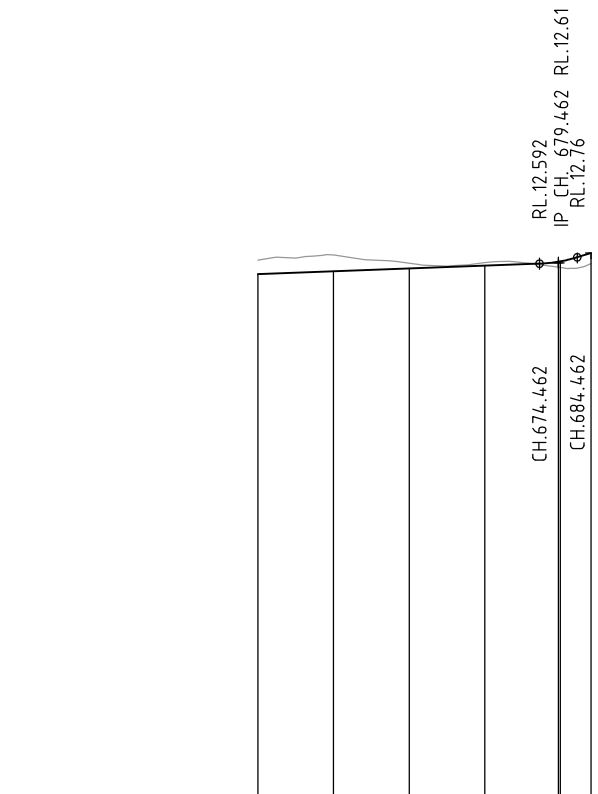
RIVERSIDE ESTATE

ROAD LONGSECTIONS PLAN SHEET 12 OF 14
R12394 - ROAD LONGSECTIONS

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

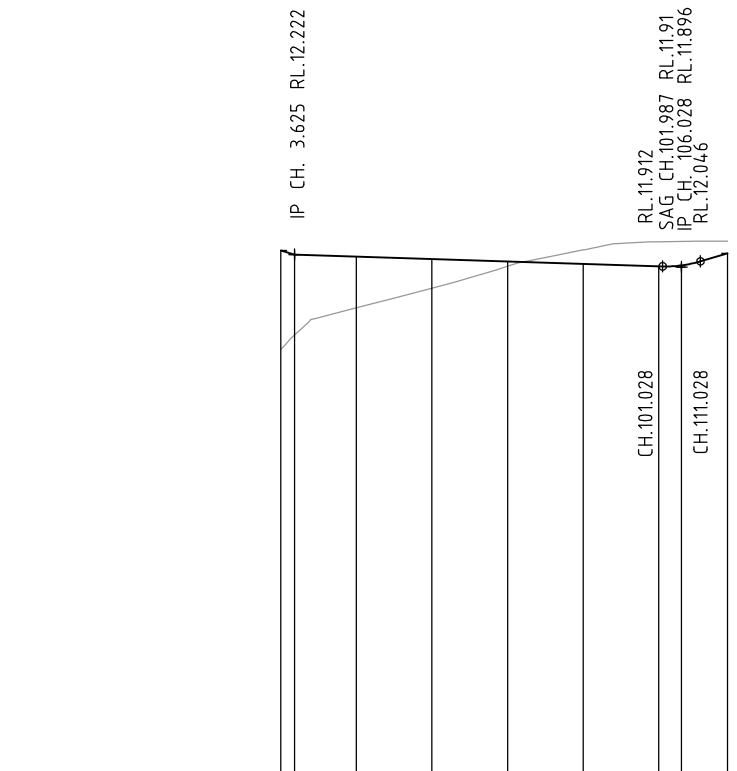
Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



Vertical Geometry Grade (%)		0.366 %			3 %		
Vertical Grade Length		221.316m			8.682m		
Vertical Curve Length (m)					10m VC		
Vertical Curve Radius (m)					R = 379.62		
DATUM R.L.-5.000							
CUT / FILL DEPTH	-0.364	-0.429	-0.134	-0.079	0.144	0.161	0.279
DESIGN LEVELS ON ROAD CENTRELINE	12.319	12.393	12.466	12.539	12.643	12.653	12.871
NAT. SURFACE ON ROAD CENTRELINE	12.683	12.822	12.600	12.618	12.499	12.492	12.592
CHAINAGE	600.000	620.000	640.000	660.000	679.462	680.000	688.144

LONGITUDINAL SECTION Road G



Vertical Geometry Grade (%)	2.95 %			-0.318 %			3.003 %		
Vertical Grade Length	3.628m			102.403m			12.133m		
Vertical Curve Length (m)							10m VC		
Vertical Curve Radius (m)							R = 301.13		
DATUM R.L.-5.000									
CUT / FILL DEPTH	2.616	2.124	1.355	0.771	0.128	-0.366	-0.65	-0.633	-0.321
DESIGN LEVELS ON ROAD CENTRELINE	12.329	12.222	12.170	12.106	12.042	11.979	11.915	11.937	12.260
NAT. SURFACE ON ROAD CENTRELINE	9.713	10.098	10.815	11.335	11.915	12.345	12.565	12.570	12.581
CHAINAGE	0.000	3.625	20.000	40.000	60.000	80.000	100.000	106.028	118.159

LONGITUDINAL SECTION Road H

0 10.0 40.0m
0 20.0 80.0m
HORIZONTAL
1:1000 (A1)
1:2000 (A3)

0 1.0 4.0m
0 2.0 8.0m
VERTICAL
1:100 (A1)
1:200 (A3)

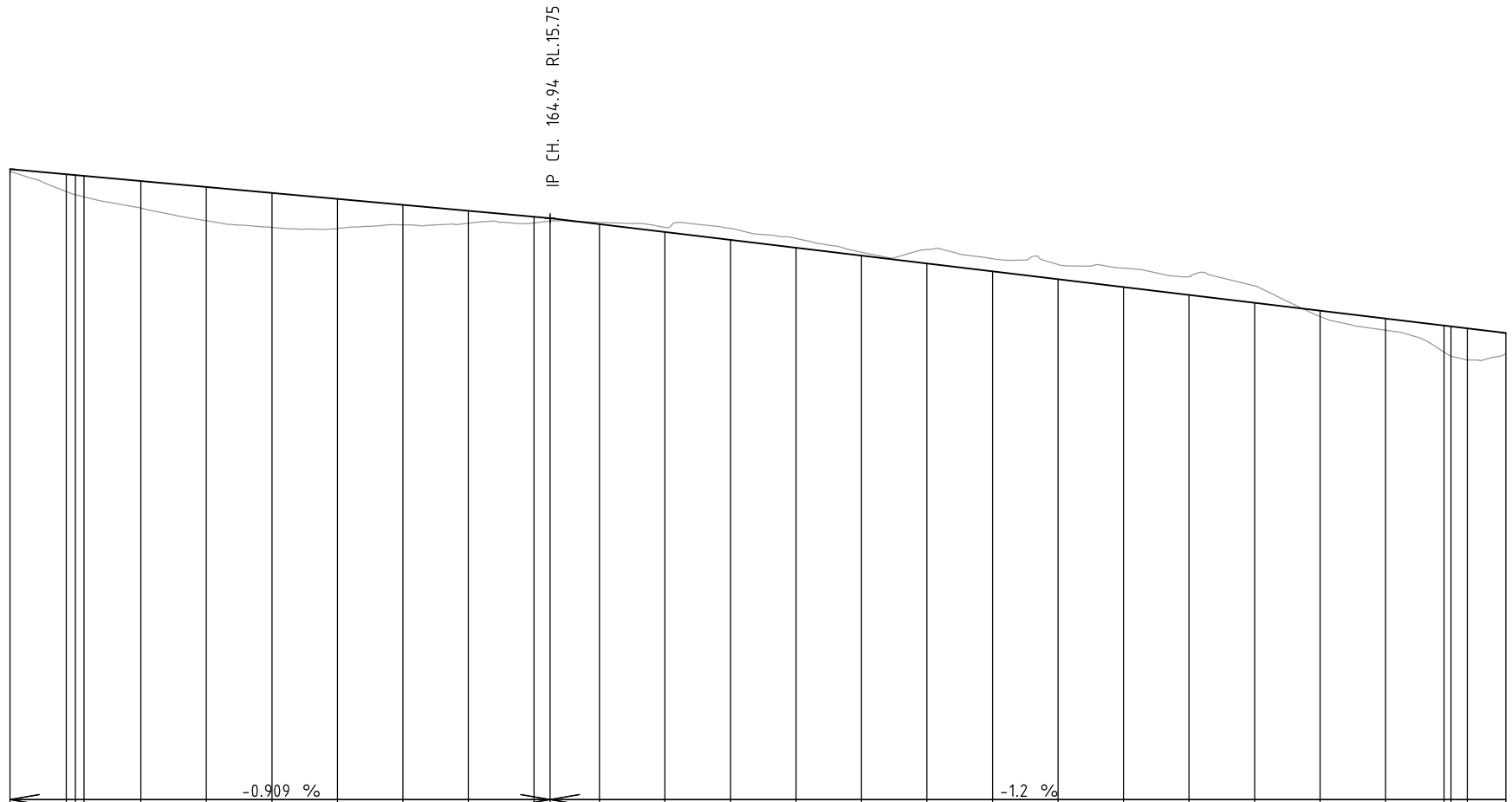
RIVERSIDE ESTATE

ROAD LONGSECTIONS PLAN SHEET 13 OF 14
R12394 - ROAD LONGSECTIONS

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



Vertical Geometry Grade (%)
Vertical Grade Length

Vertical Curve Length (m)
Vertical Curve Radius (m)

DATUM R.L.-5.000

CUT / FILL DEPTH	0.066	0.527	0.595	0.638	0.821	1.03	1.052	0.901	0.609	0.373	0.185	0.08	-0.059	-0.145	-0.352
DESIGN LEVELS ON ROAD CENTRELINE	17.250	17.093	17.068	17.044	16.886	16.704	16.522	16.341	16.159	15.977	15.795	15.750	15.569	15.329	15.090
NAT. SURFACE ON ROAD CENTRELINE	17.184	16.566	16.473	16.406	16.065	15.674	15.470	15.440	15.549	15.604	15.610	15.670	15.628	15.474	15.442
CHAINAGE	0.000	17.226	20.000	22.668	40.000	60.000	80.000	100.000	120.000	140.000	160.000	164.940	180.000	200.000	220.000

CUT / FILL DEPTH	-0.286	-0.101	-0.424	-0.386	-0.452	-0.578	-0.556	-0.517	0.176	0.355	0.808	0.916	0.959	0.64
DESIGN LEVELS ON ROAD CENTRELINE	14.850	14.610	14.370	14.130	13.890	13.650	13.410	13.170	12.930	12.690	12.476	12.451	12.391	12.250
NAT. SURFACE ON ROAD CENTRELINE	15.135	14.710	14.794	14.516	14.342	14.228	13.966	13.687	12.754	12.335	11.668	11.535	11.432	11.610
CHAINAGE	240.000	260.000	280.000	300.000	320.000	340.000	360.000	380.000	400.000	420.000	437.871	440.000	445.002	456.710

LONGITUDINAL SECTION Road I

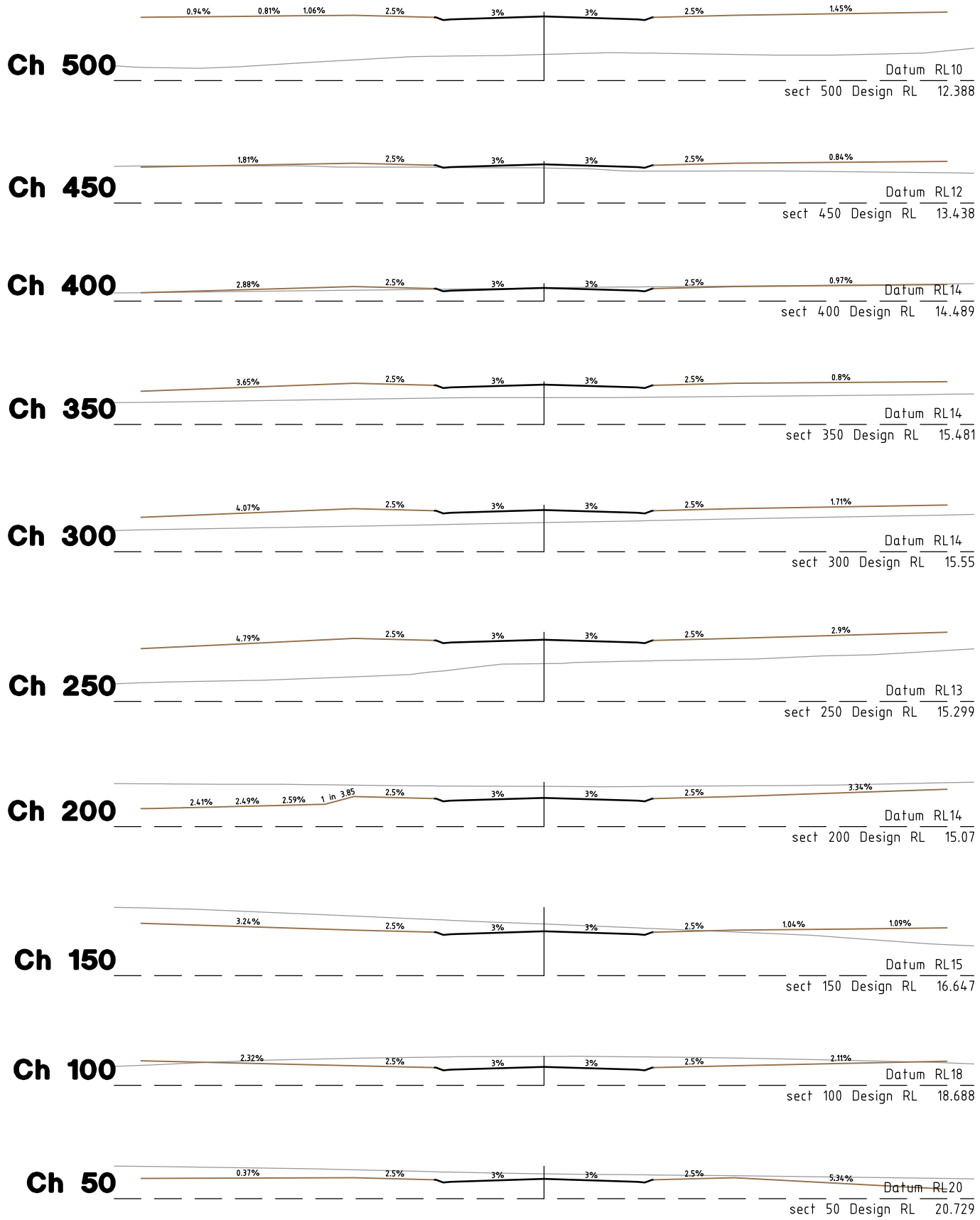
RIVERSIDE ESTATE

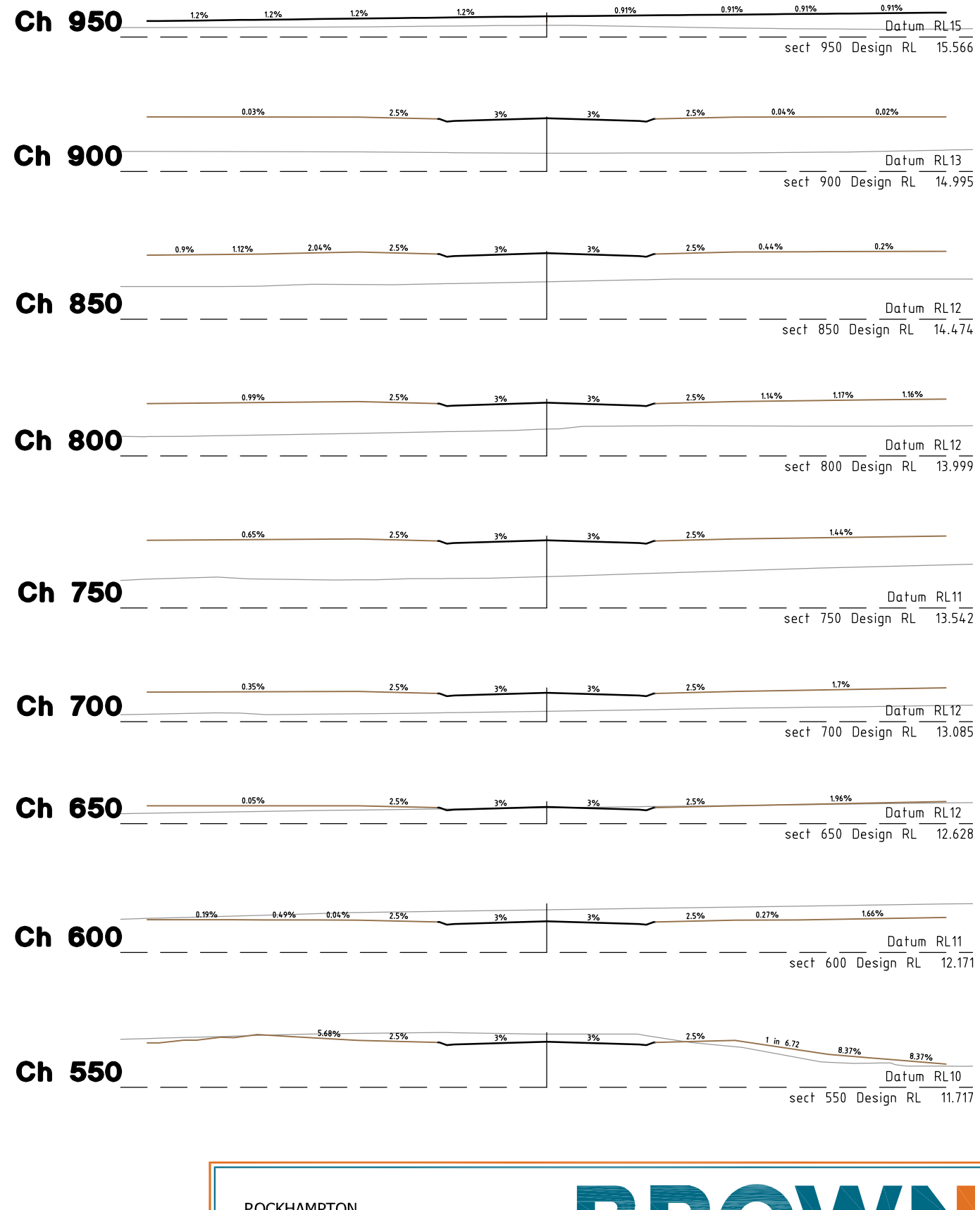
ROAD LONGSECTIONS PLAN SHEET 14 OF 14
R12394 - ROAD LONGSECTIONS

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES





0 1.0 4.0m
0 2.0 8.0m

1:100 (A1)
1:200 (A3)

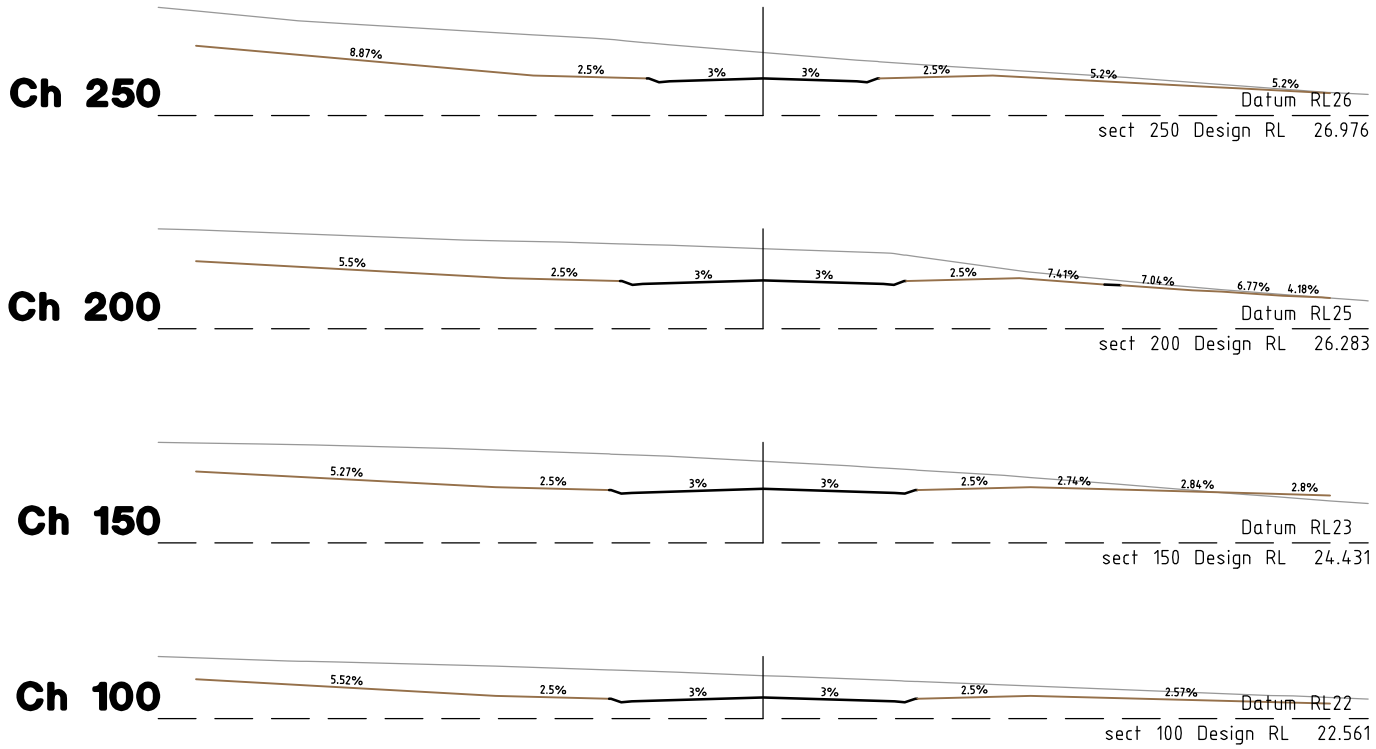
RIVERSIDE ESTATE

ROAD CROSS SECTION ROAD A
R12394 - ROAD CROSS SECTION 1

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



0 1.0 4.0m
0 2.0 8.0m

1:100 (A1)
1:200 (A3)

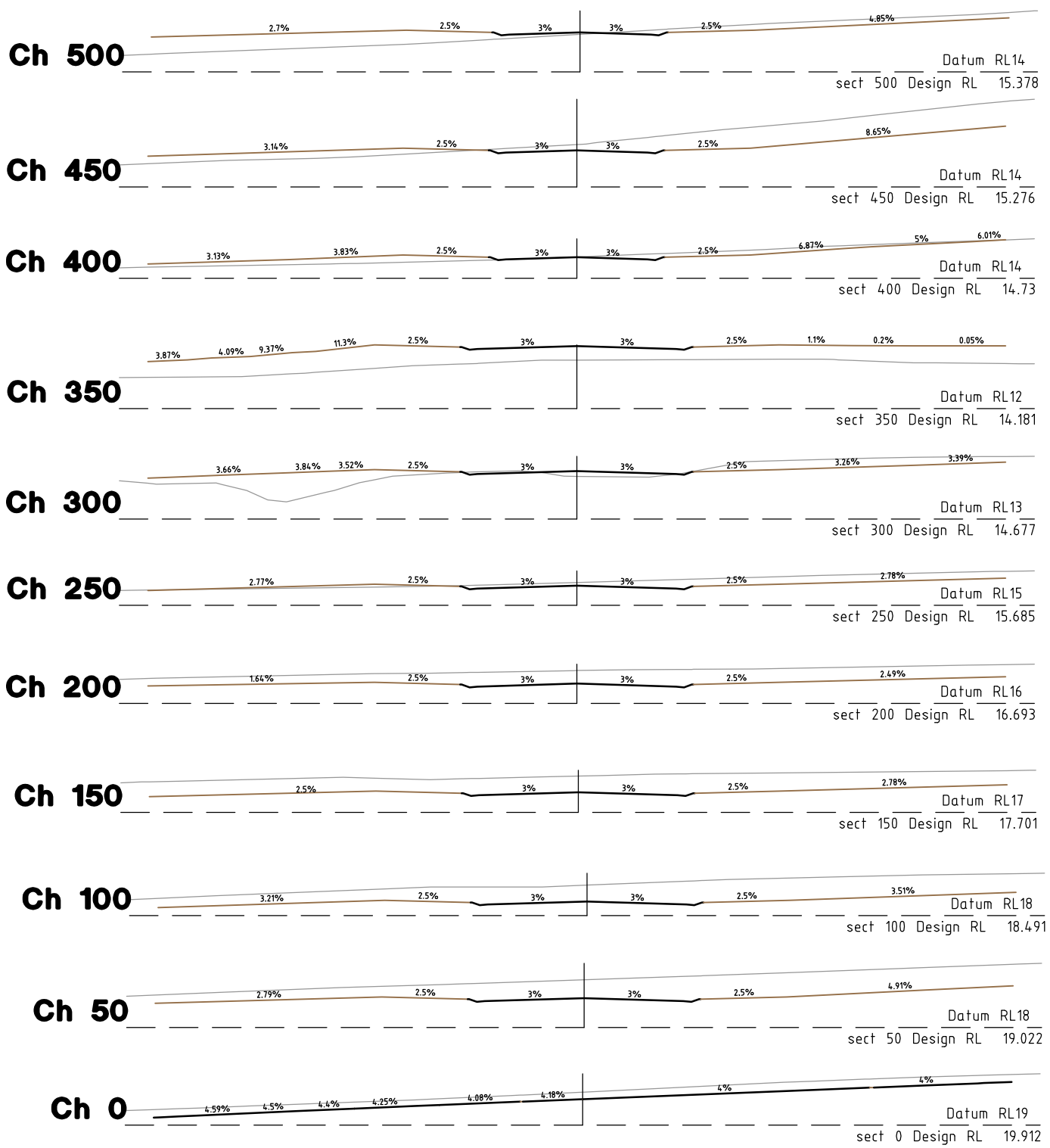
RIVERSIDE ESTATE

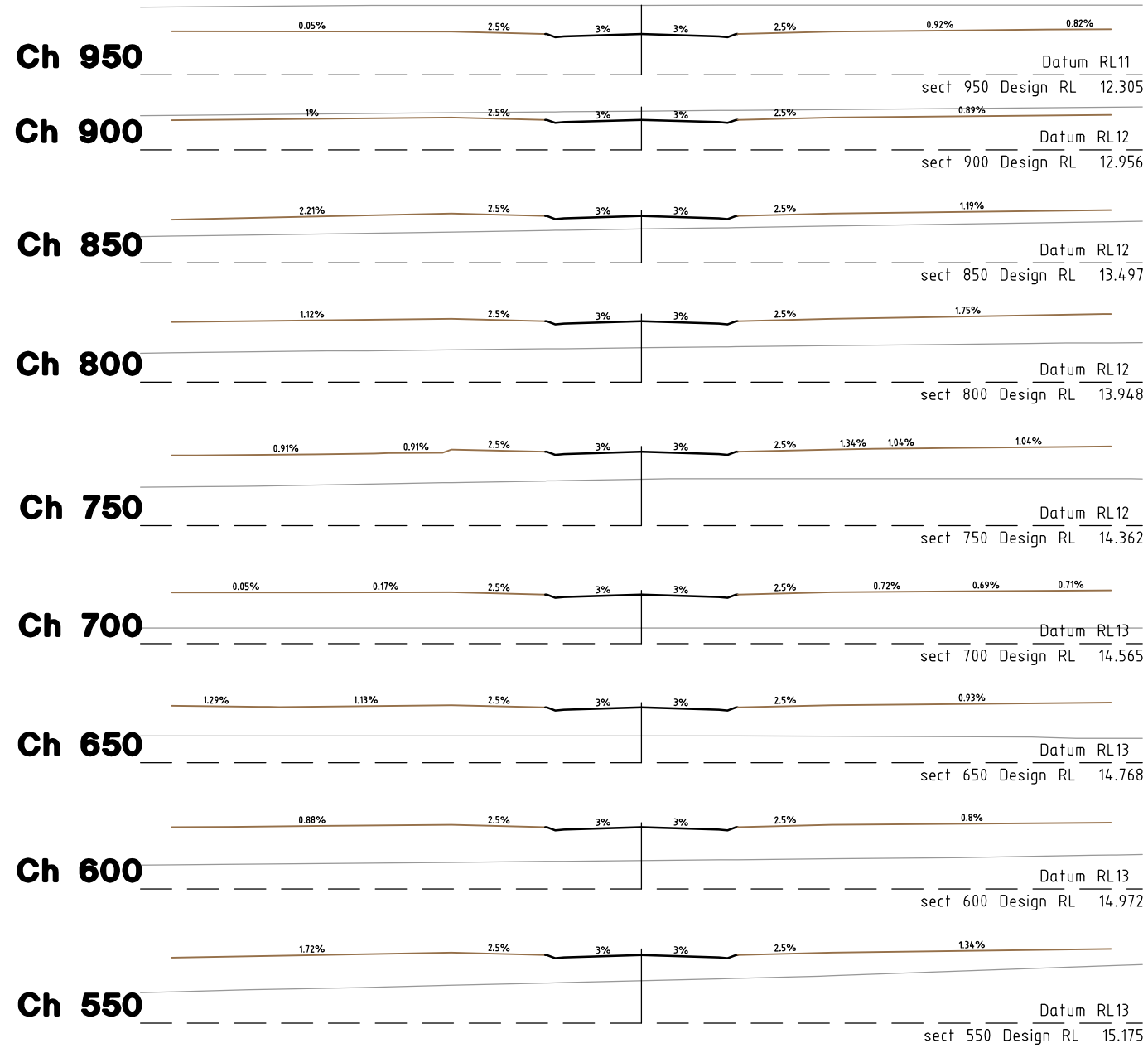
ROAD CROSS SECTION ROAD B
R12394 - ROAD CROSS SECTIONS 2

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES





0 1.0 4.0m
0 2.0 8.0m

1:100 (A1)
1:200 (A3)

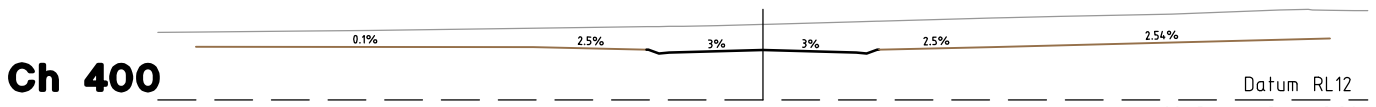
RIVERSIDE ESTATE

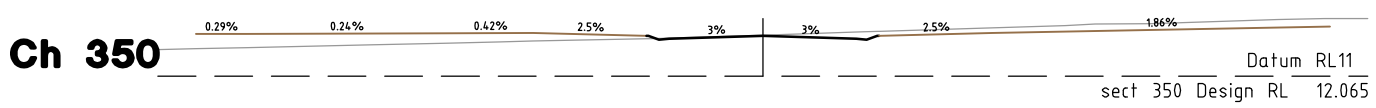
ROAD CROSS SECTION ROAD C
R12394 - ROAD CROSS SECTIONS 3

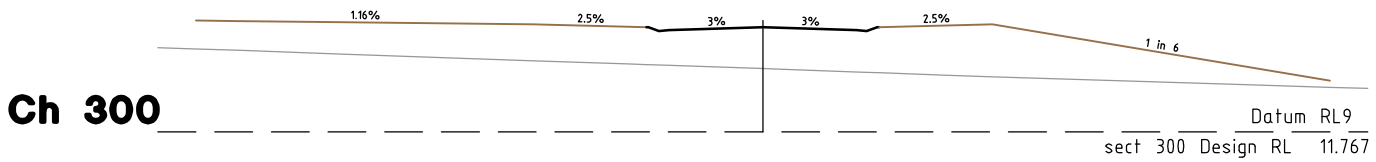
ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

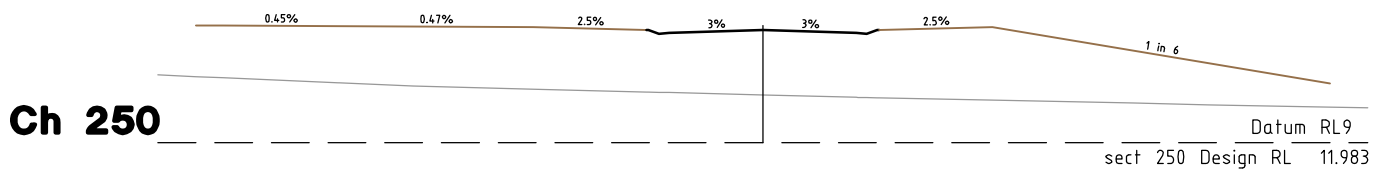
Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

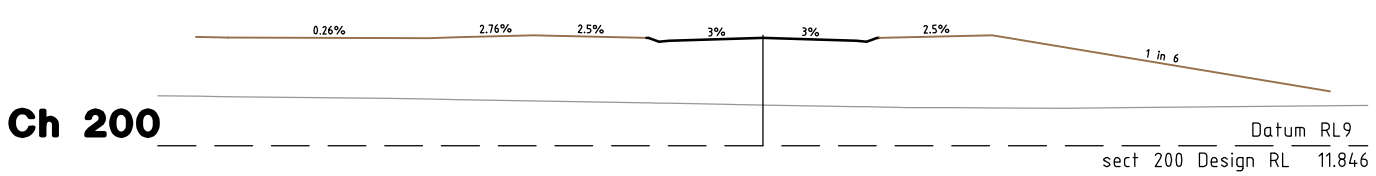
BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES

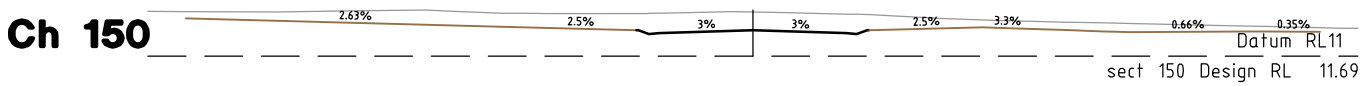


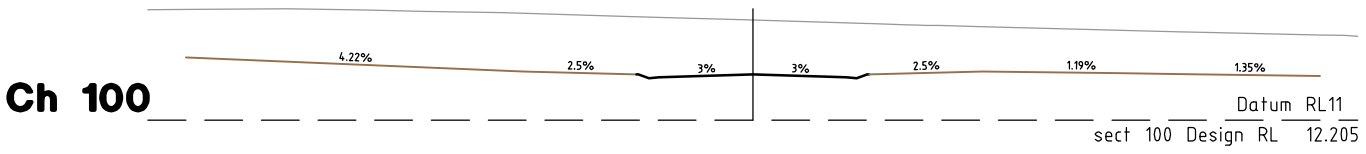


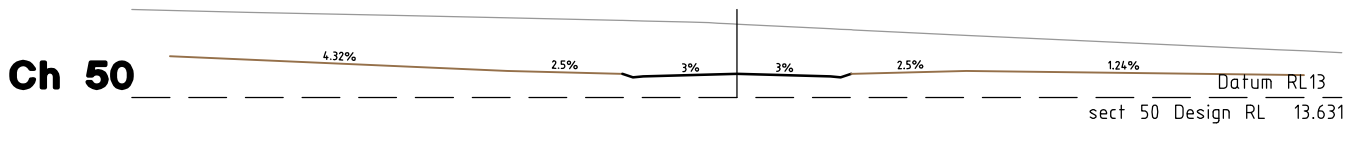


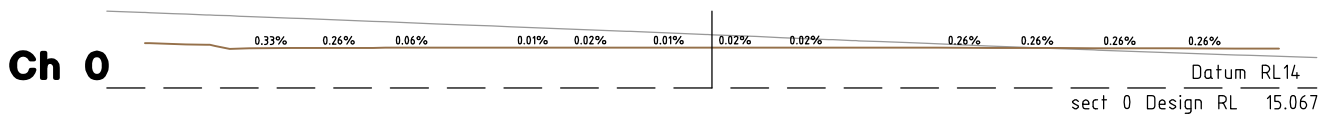


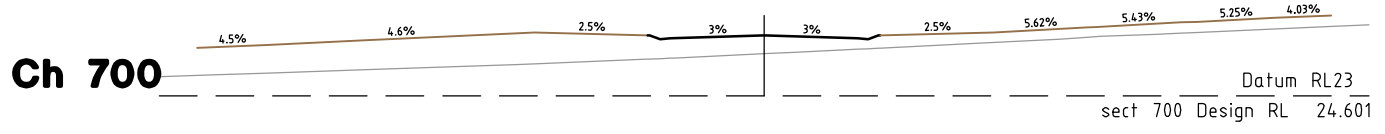


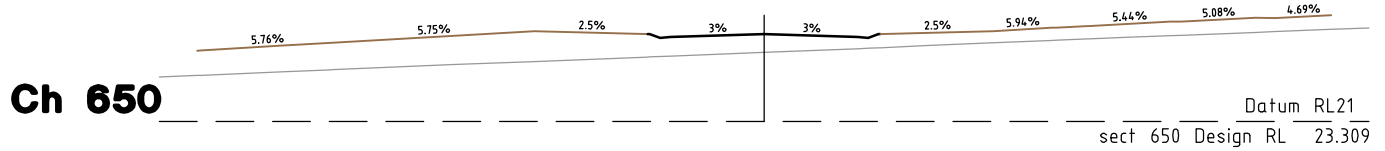


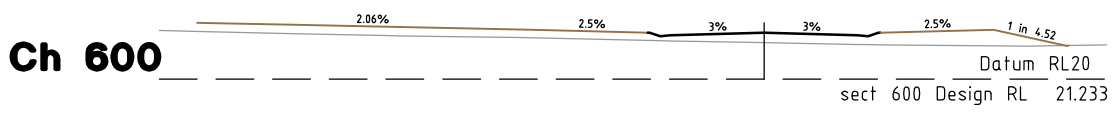


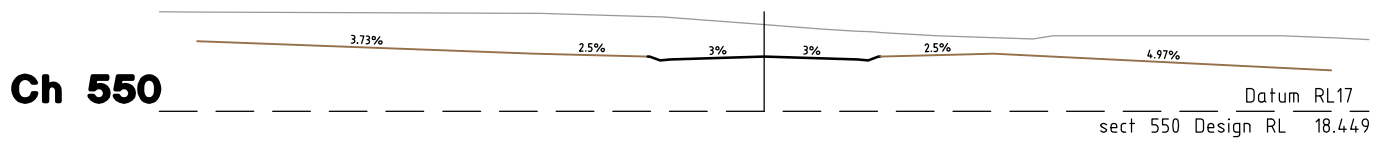


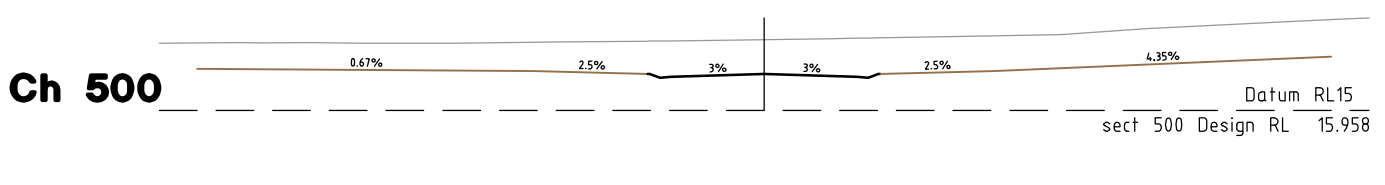


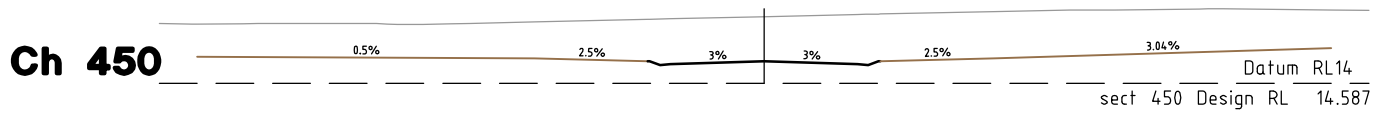


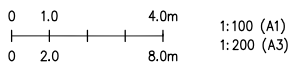












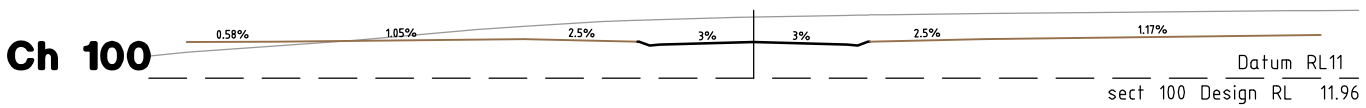
RIVERSIDE ESTATE

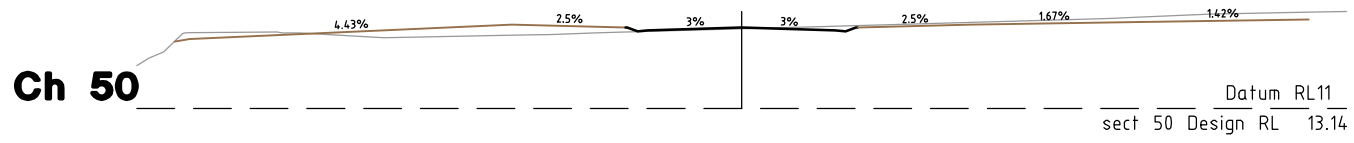
ROAD CROSS SECTION ROAD D
R12394 - ROAD CROSS SECTIONS 4

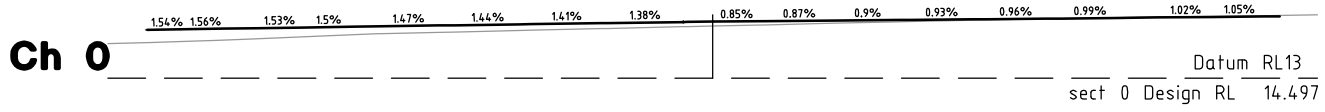
ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES







0 1.0 4.0m
0 2.0 8.0m

1:100 (A1)
1:200 (A3)

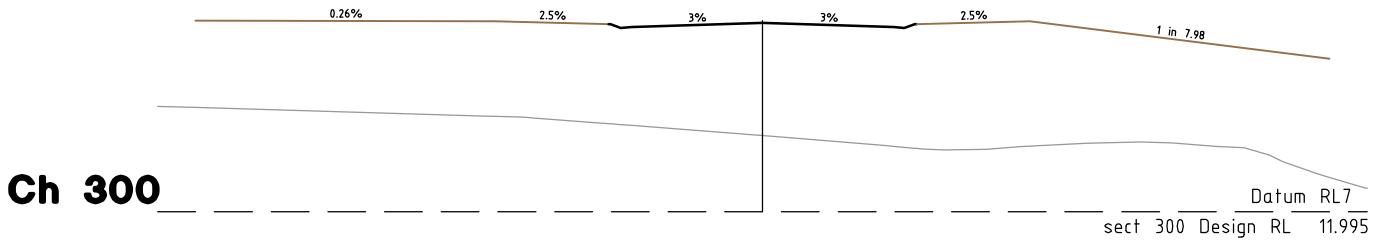
RIVERSIDE ESTATE

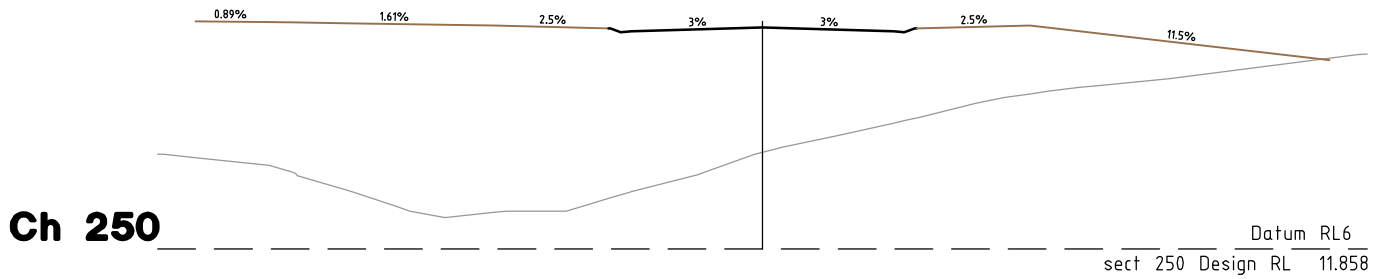
ROAD CROSS SECTION ROAD E
R12394 - ROAD CROSS SECTIONS 5

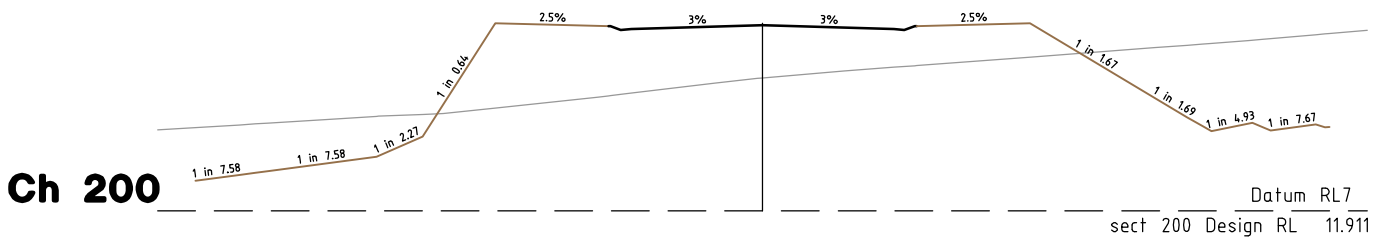
ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

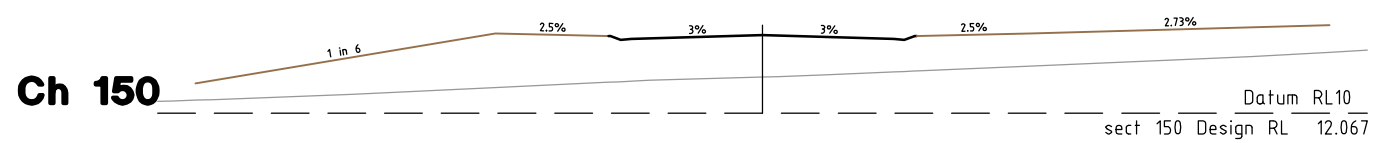
Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

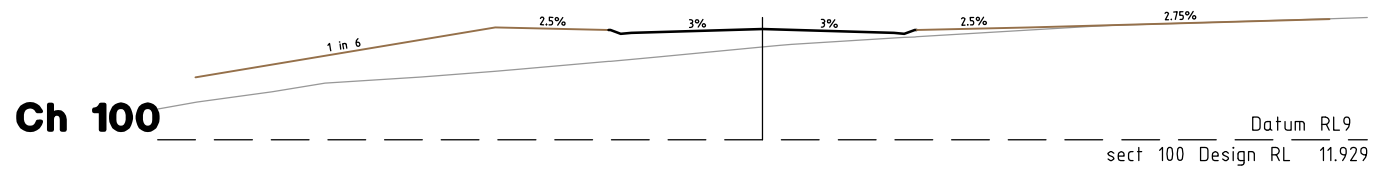
BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES

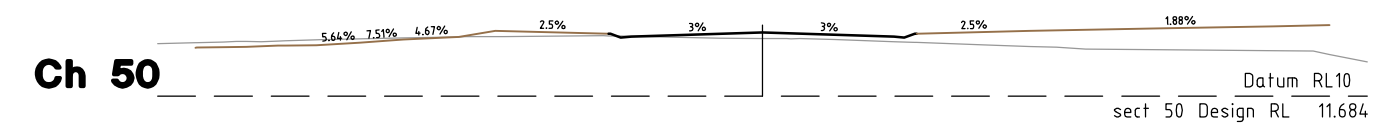


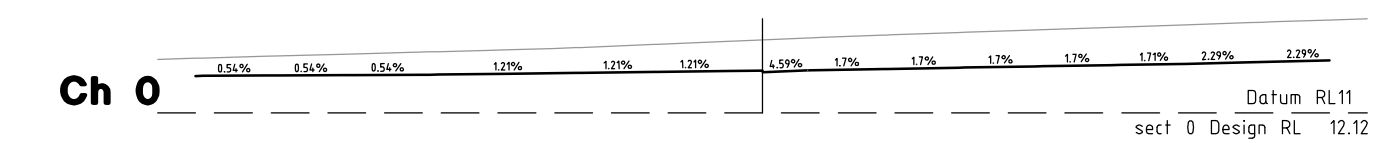


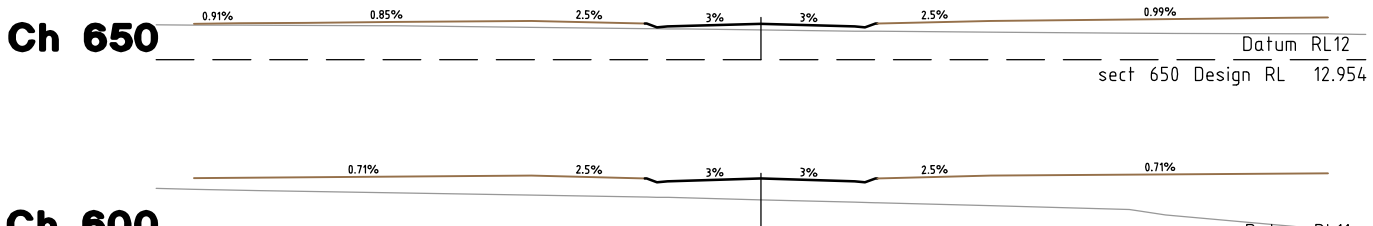


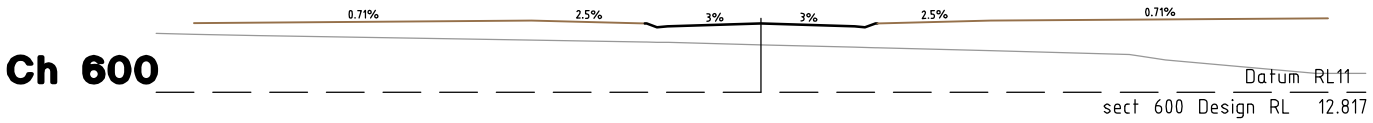


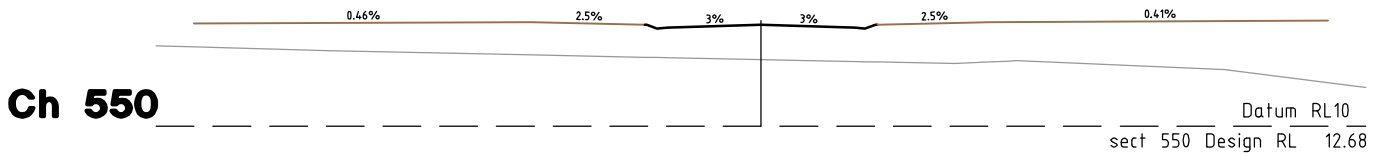


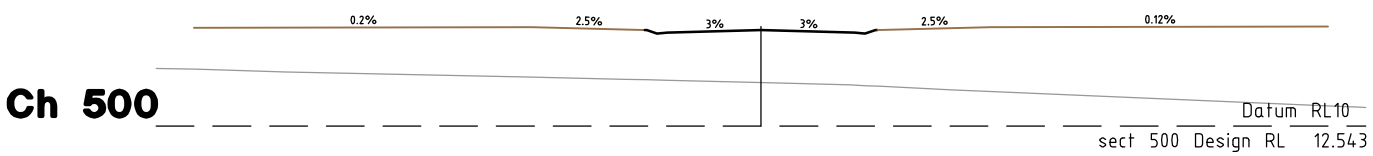


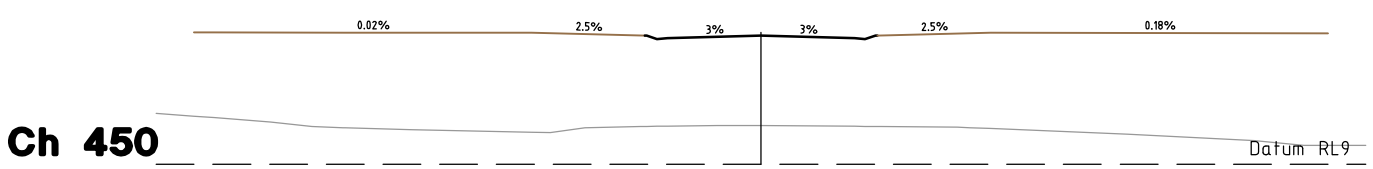


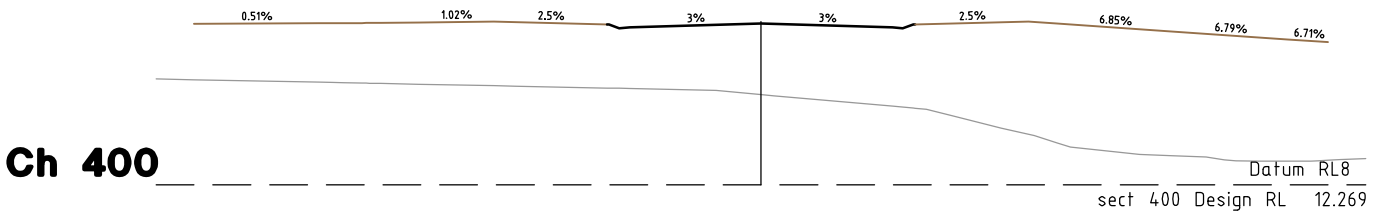


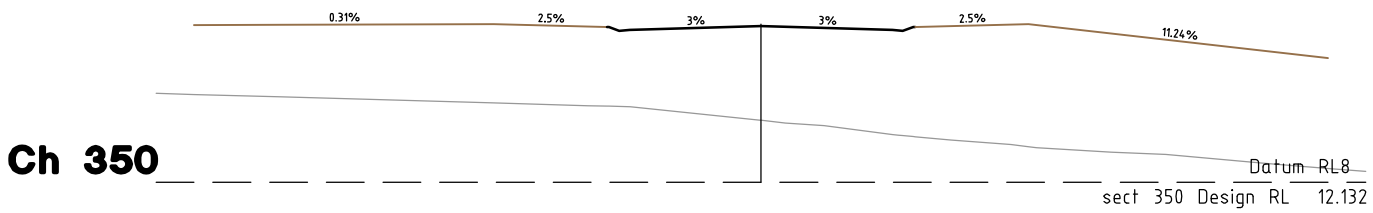












0 1.0 4.0m
0 2.0 8.0m

1:100 (A1)
1:200 (A3)

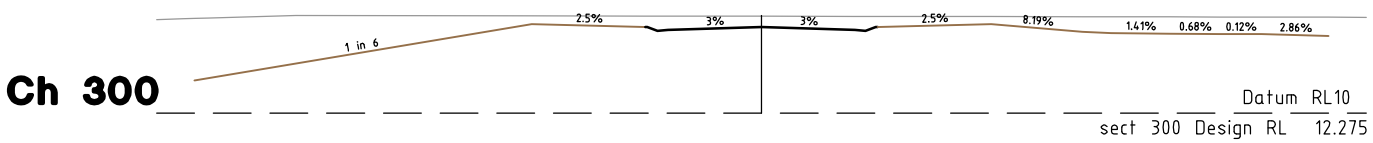
RIVERSIDE ESTATE

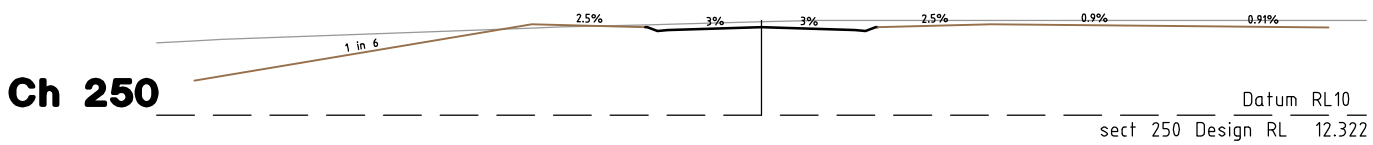
ROAD CROSS SECTION ROAD F
R12394 - ROAD CROSS SECTIONS 6

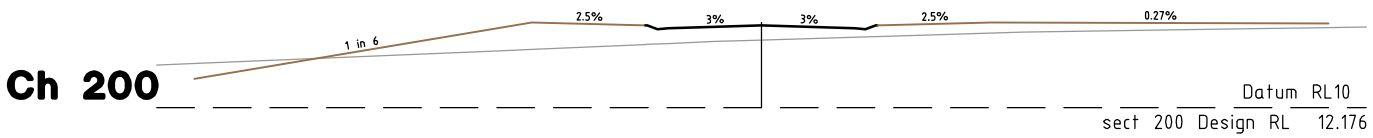
ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

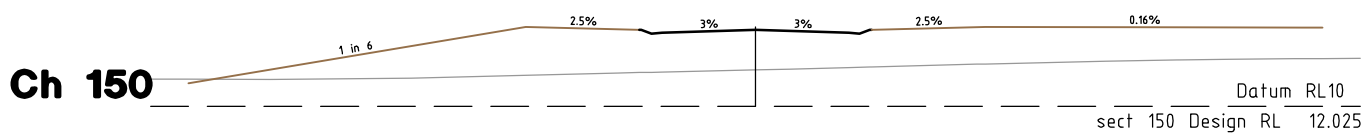
Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

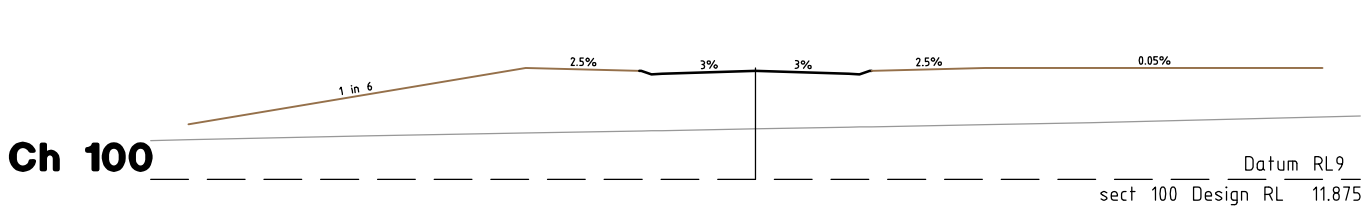
BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES

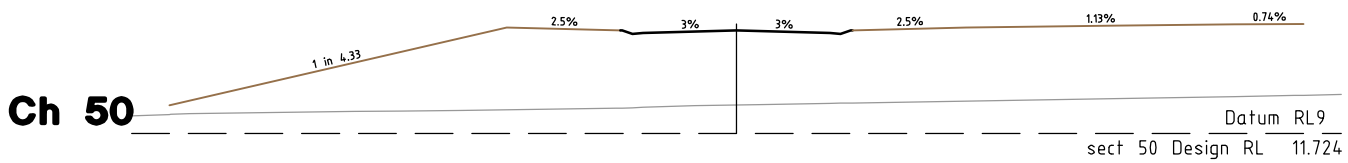


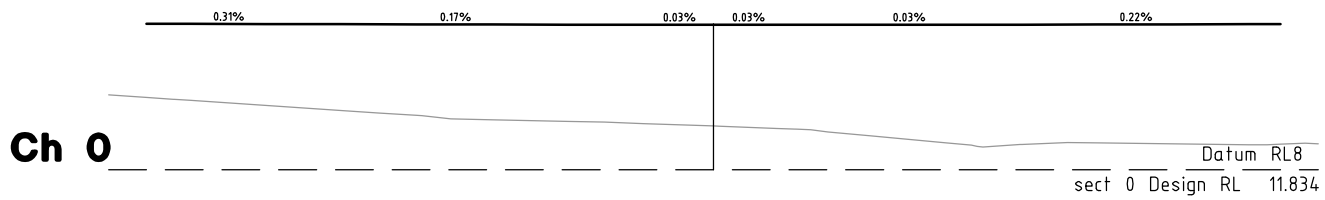


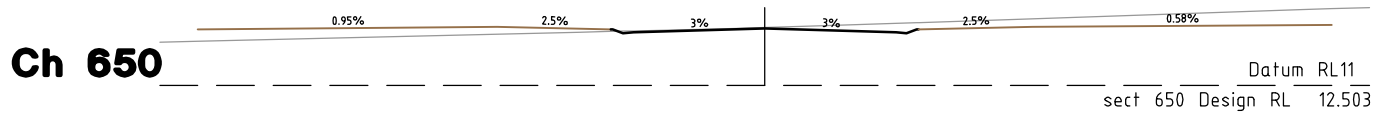


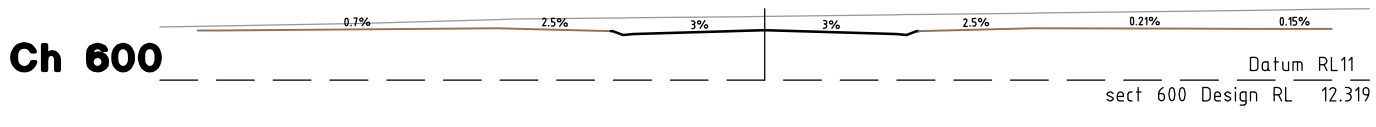


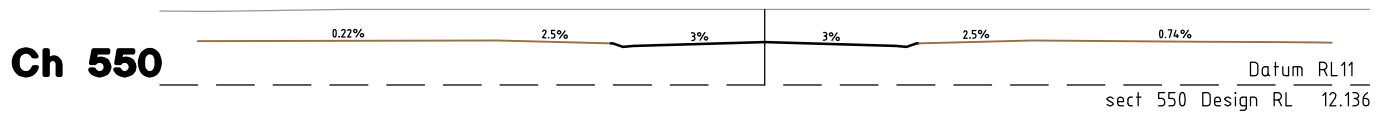


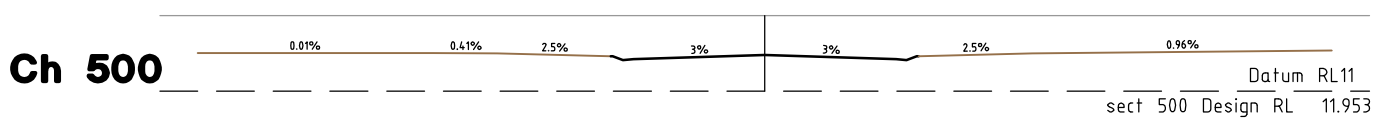


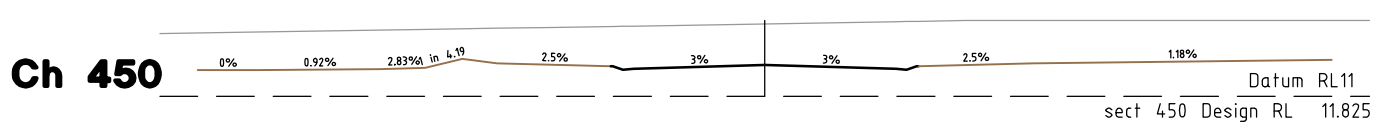


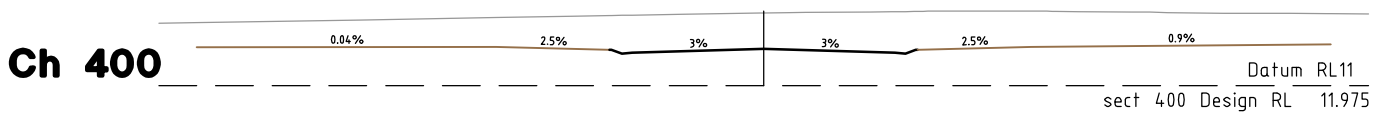


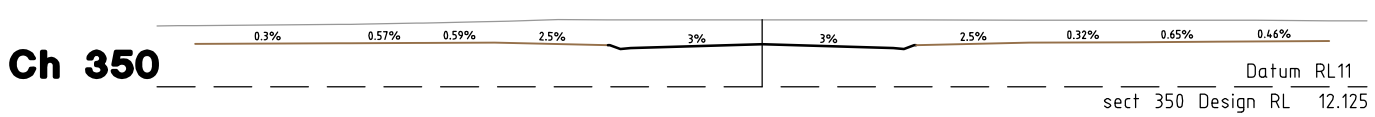


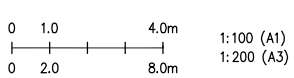












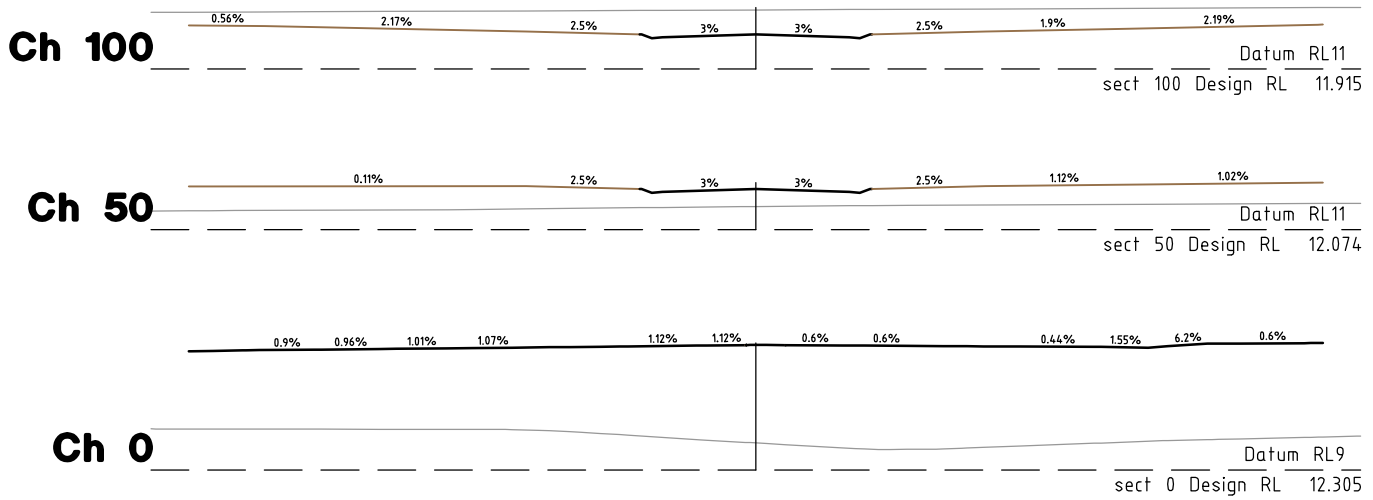
RIVERSIDE ESTATE

ROAD CROSS SECTION ROAD G
R12394 - ROAD CROSS SECTIONS 7

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



0 1.0 4.0m
0 2.0 8.0m

1:100 (A1)
1:200 (A3)

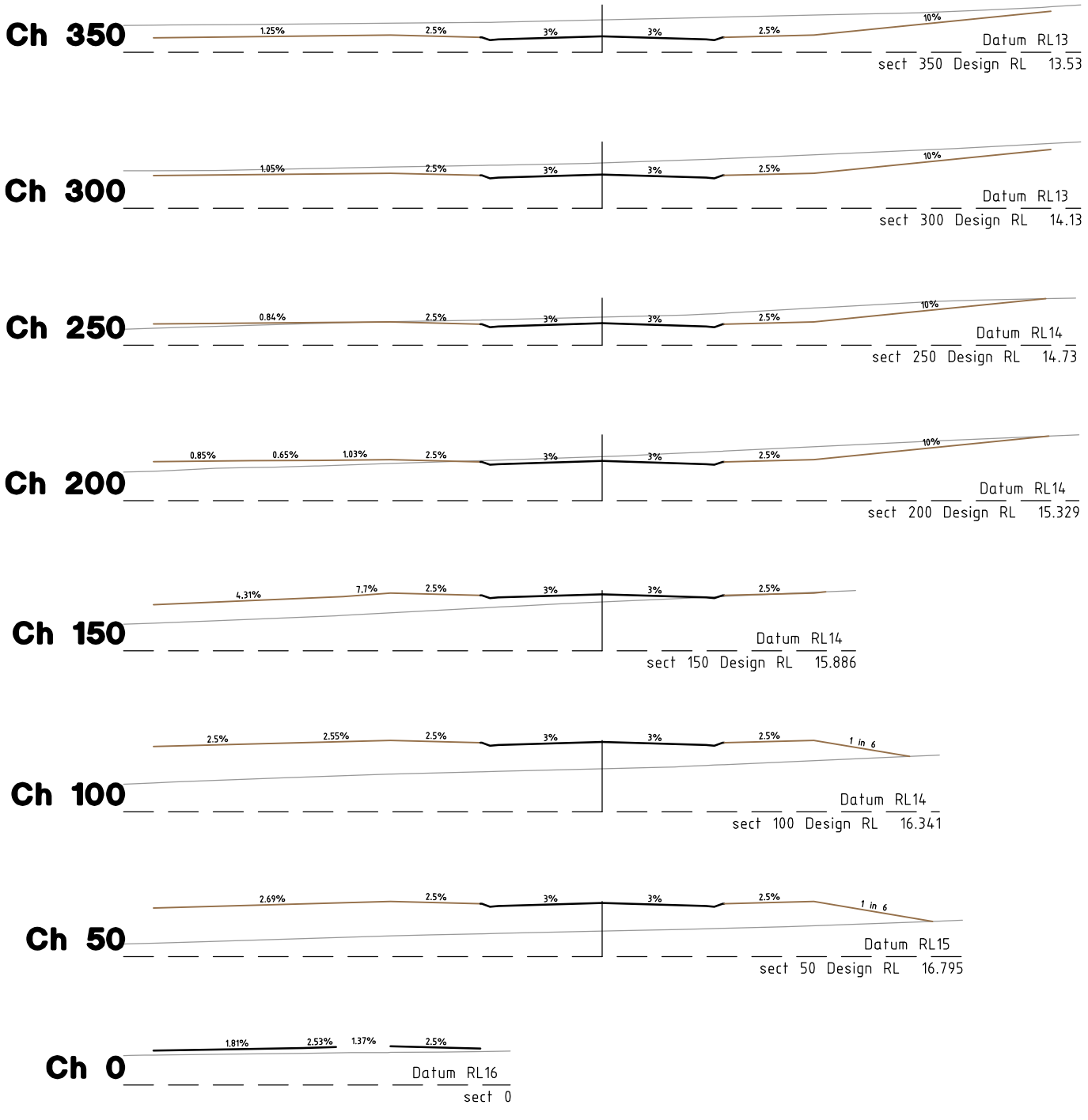
RIVERSIDE ESTATE

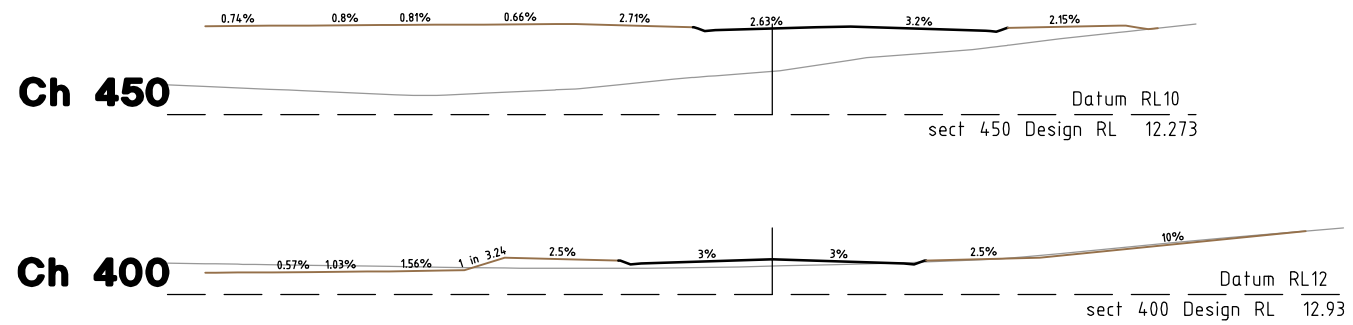
ROAD CROSS SECTION ROAD H
R12394 - ROAD CROSS SECTIONS 8

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES





0 1.0 4.0m
0 2.0 8.0m

1:100 (A1)
1:200 (A3)

RIVERSIDE ESTATE

ROAD CROSS SECTION ROAD I
R12394 - ROAD CROSS SECTIONS 9

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES

Appendix H Proposed Electrical Plan

LEGEND

- New Electrical Cable with Pillar Box (Preliminary Only)
- 12.0 Finished Surface Contours

RIVERSIDE ESTATE

ELECTRICAL PLAN - SHEET 1 OF 2
R12394 - ELECTRICAL

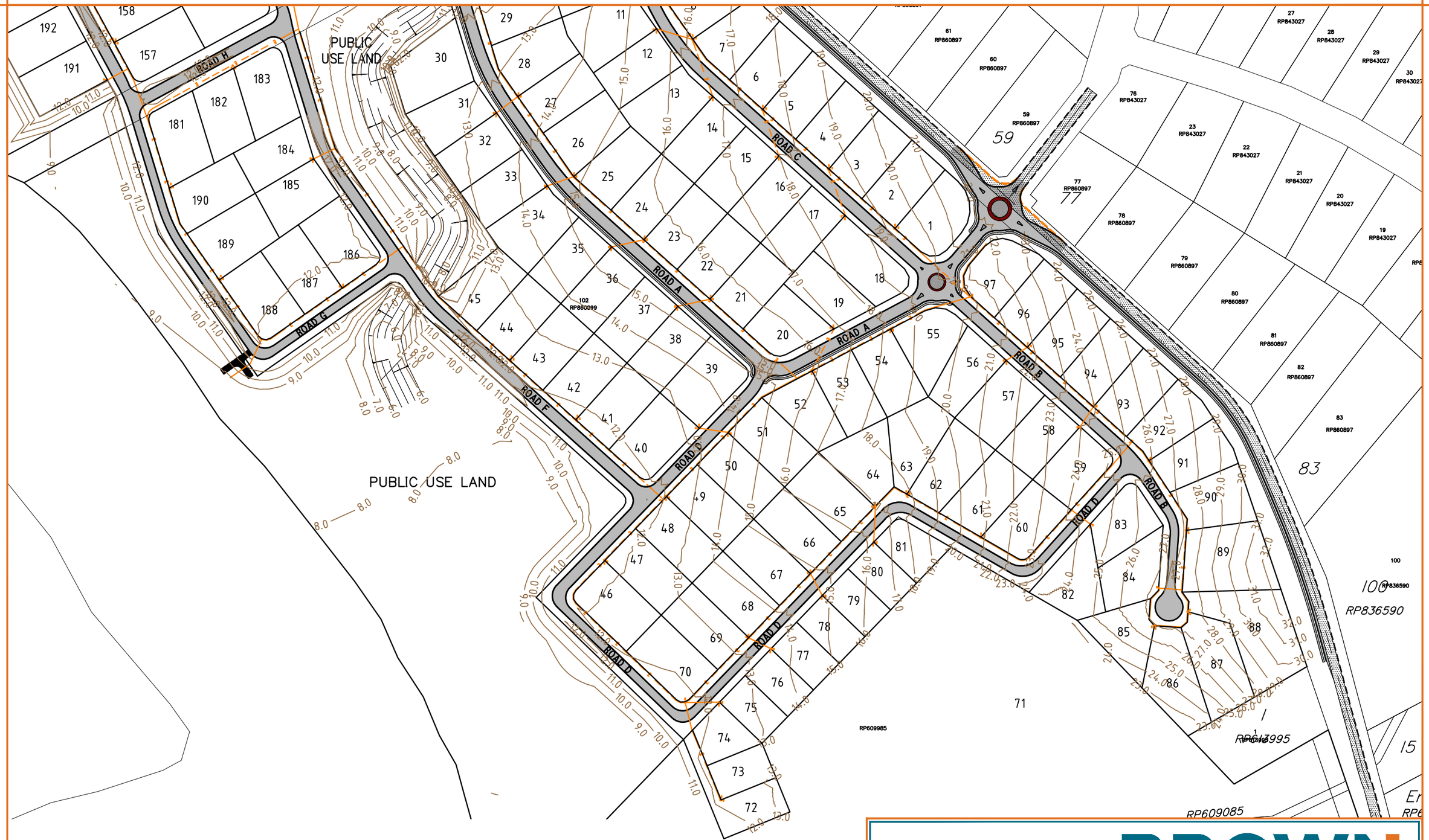
0 25.0 100.0m
0 50.0 200.0m

1:2500 (A1)
1:5000 (A3)

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES



LEGEND

New Electrical Cable with Pillar Box (Preliminary Only)

12.0 Finished Surface Contours

RIVERSIDE ESTATE

ELECTRICAL PLAN - SHEET 2 OF 2
R12394 - ELECTRICAL 2

0 25.0 100.0m
0 50.0 200.0m

1:2500 (A1)
1:5000 (A3)

ROCKHAMPTON
P.O. Box 1580
238 Quay Street,
Rockhampton Q 4700

Telephone (07) 4931 0777
Facsimile (07) 4921 4866
E-Mail: Rockhampton@brownconsulting.com.au

BROWN
Smart Consulting
INCORPORATING GRAHAM SCOTT & ASSOCIATES

TRAFFIC IMPACT ASSESSMENT

REPORT

PREPARED FOR Glenmore Holdings (Aust) Pty Ltd

12 DECEMBER 2014
R12394
ORIGINAL
CIVIL

calibre CONSULTING

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/84-2014

Dated: 15 September 2015

COMMERCIAL IN CONFIDENCE

Calibre Consulting
238 Quay Street,
ROCKHAMPTON QLD 4700

Ph: (07) 4931 0777

DOCUMENT CONTROL

R12394

Issue	Date	Issue Details	Author	Checked	Approved
A	12 DEC 2014	RRC IRR	LM	GS	GRAHAM SCOTT – RPEQ 2412

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1 INTRODUCTION

This report has been prepared for Glenmore Holdings (Aust.) Pty Ltd in response to the Rockhampton Regional Council (RRC) Information Request dated 22 May 2014. The notice has been issued in relation to Riverside Estate Stages 9-16 Material Change of Use (MCU) and Reconfiguring of Lot (ROL) application D/84-2014. This Traffic Impact Assessment (TIA) aims to assess specific conditions 9.2 of the Information Request, providing an intersection analysis of the Belmont Road / Birkbeck Drive / Alexandra Street Intersection.

2 BACKGROUND

The proposed development, Riverside Estate – Stages 9-16, is located upon Belmont Road, Parkhurst (shown below).

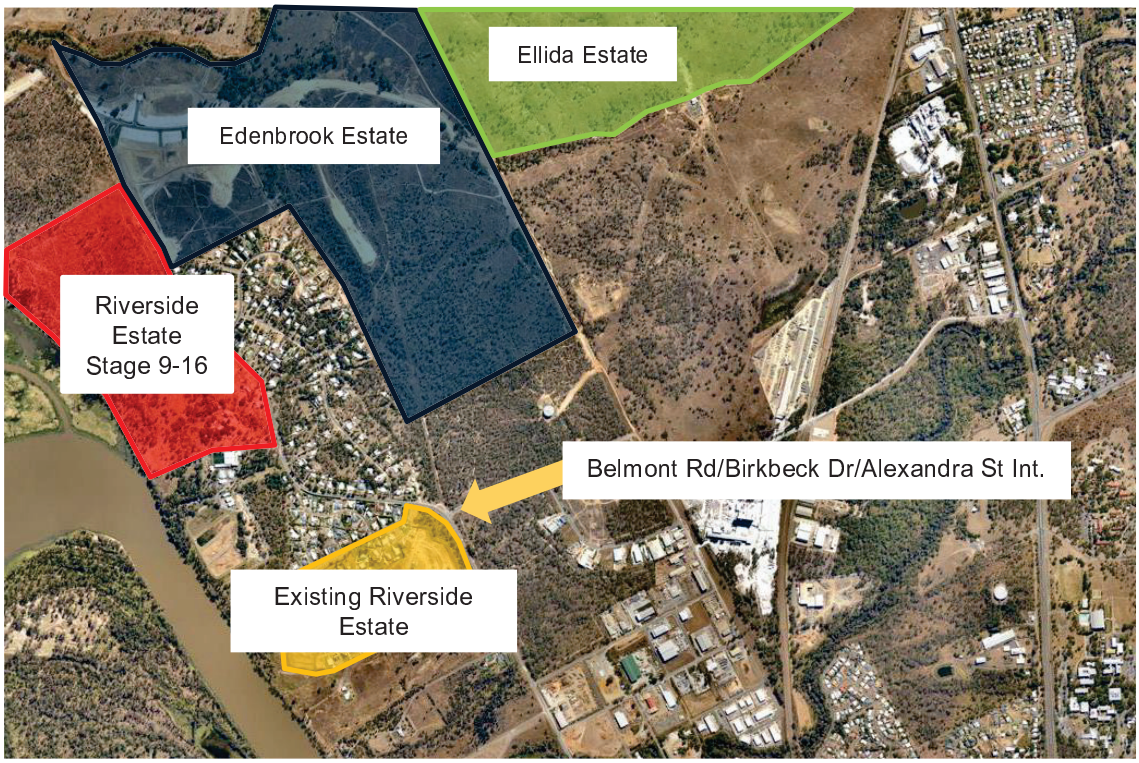


Figure 2-1: Locality Plan

The proposal includes the creation of 201 residential allotments plus Public Use Land (PUL), as shown on Capricorn Survey Group Drawing 5892-01-CPT (G), attached in Appendix A. In addition to the future Riverside Estate Stages 9-16, two additional nearby subdivisions (Edenbrook Estate and Ellida Estate) are likely to contribute a portion of their traffic towards the subject intersection.

3 TRAFFIC GENERATION & ASSUMPTIONS

3.1 EXISTING TRAFFIC GENERATION

Existing traffic generation for the Belmont Road/ Birkbeck Road/ Alexandra Street Intersection was established through an onsite traffic count completed by Calibre Consulting on the afternoon and morning of 2nd and 3rd December (respectively).

Utilising the aforementioned traffic count data, the following existing peak hours were established:

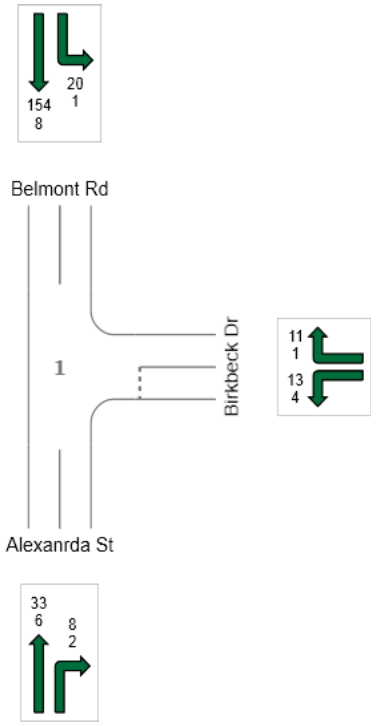


Figure 3-1: AM Peak Hour Traffic Volumes.

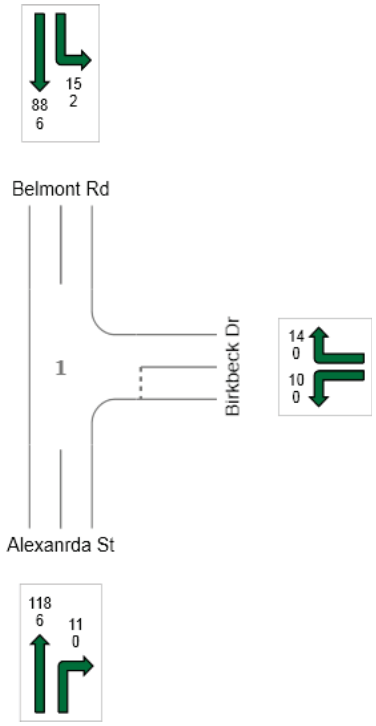


Figure 3-2: PM Peak Hour Traffic Volumes.

As per the Item 9.2 of the Rockhampton Regional Council Information Request, the additional volumes generated by the development of Edenbrook and Ellida Estates are to be considered within this analysis. Due to the unavailability of the traffic analysis associated with these two developments an overly conservative growth factor of 5% per year (compounding) has been assumed. This equates to approximately 9% per year lineal growth.

3.2 DEVELOPMENT TRAFFIC GENERATION

Traffic generation from the proposed developments (Riverside Estate Stages 9-16) have been calculated through the adoption of the following yields, in accordance with the RTA Guide to Traffic Generating Developments. Assumptions include:

Low Density Residential

- Single dwelling per allotment
- 0.85 vehicle movements per dwelling during peak hour
- Daily traffic generation of 10 movements per dwelling
- 2% Heavy Vehicles (HV)

From the above assumptions, a maximum of 171 peak hour movements have been created. Of the peak hour movements created, the following assumptions have been assumed in establishing intersection splits:

- 94% of generated traffic will utilise Alexandra Street to reach their peak hour destination with 6% travelling along Birkbeck Drive.
- 70% of generated traffic movements will exit the proposed estate during the AM peak hour with 30% returning. This assumption will be mirrored during the PM peak hour.

Utilising the above assumptions, the peak hour movements in **Table 3-1** were established.

Time	Belmont Road				Birkbeck Drive		Alexandra Street	
	Left		Thru		Right		Thru	
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
AM Peak	7.03	0.14	110.17	2.25	3.01	0.06	47.22	0.96
PM Peak	3.01	0.06	47.22	0.96	7.03	0.14	110.17	2.25

Table 3-1: Generated Traffic Splits

4 ANALYSIS

The following intersections have been analysed to assess the impacts upon the existing road infrastructure network by the introduction of traffic generated through the proposed development. The impact upon all intersections have been analysed using SIDRA Traffic Engineering Software Version 6.0.

4.1 EXISTING INTERSECTION – BELMONT RD / BIRKBECK DR / ALEXANDRA STREET INTERSECTION

The existing intersection in question, located in Parkhurst, will provide for the majority of all generated traffic. The layout is made up of the major legs heading approximately North/South with a secondary leg from the East, controlled by give way.

The speed environment of the intersection 60km/h on all legs with 3.5m wide lanes (one each way) on the major legs and approximately 6.0m (average) lanes on the secondary leg (Birkbeck Drive).

The intersection layout adopted for the SIDRA intersection analysis is presented below.

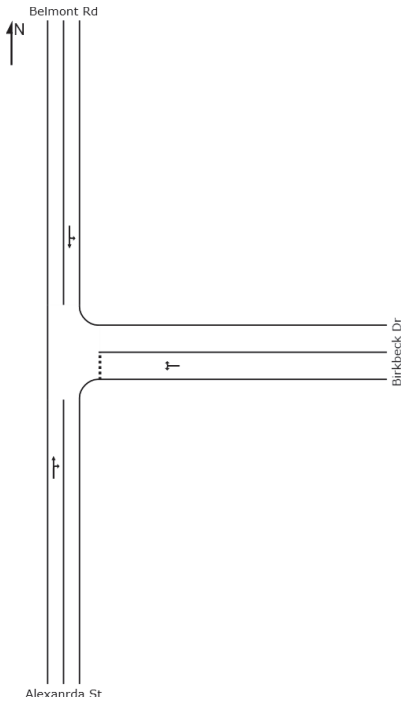


Figure 4-1: Adopted Intersection Layout

4.2 Sidra Input & Development Assumptions

In order to appropriately assess the impact of the proposed development upon the existing road network, the following assumptions have been made:

- The first stage will not be delivered until 2017 with the last stage being delivered in 2025 (approximately 25 lots per year).
- A final year analysis has been completed for the year 2035 (final year plus 10 years).
- A compound growth rate of 5% (compounding) has been assumed and applied against the existing traffic, to account for nearby development.

From the above assumptions, the following scenarios were analysed:

1) AM Peak – 2017 (3 Years Background Growth, No Development Generated Traffic)
2) AM Peak – 2015 (11 Years Background Growth Plus Development Generated Traffic)
3) AM Peak – 2035 (21 Years Background Growth Plus Development Generated Traffic)

4) PM Peak – 2017 (3 Years Background Growth, No Development Generated Traffic)
5) PM Peak – 2025 (11 Years Background Growth Plus Development Generated Traffic)
6) PM Peak – 2035 (21 Years Background Growth Plus Development Generated Traffic)

Traffic volumes utilised in the above scenarios are attached in Appendix B.

5 RESULTS

Standard SIDRA Intersection Analysis is commonly utilised to evaluate an intersections degree of saturation, Level of Service (LOS), queues and average delays. Under a standard sign controlled intersection, the desired ultimate practical degree of saturation is 0.75 with a minimum LOS of D.

A SIDRA 6.0 intersection analysis has been conducted upon the Belmont Road/ Birkbeck Drive/ Alexandra Street intersection. Analysis results have been tabulated below with complete lane summaries attached in Appendix C.

Scenario	DOS	LOS	Average Queue (m)
AM Peak 2017 (Background)	0.118	B	1.6
AM Peak 2025 (Background + Generated)	0.239	B	4.8
AM Peak 2035 (Background + Generated)	0.348	B	9.0
PM Peak 2017 (Background)	0.088	A	3.5
PM Peak 2025 (Background + Generated)	0.192	B	9.5
PM Peak 2035 (Background + Generated)	0.278	B	16.6

Table 5-1: SIDRA Intersection Analysis Output Summary

As shown above, the subject intersection is expected to accept the proposed development generated traffic without any significant impacts to the existing intersection's performance.

6 TURN WARRANT ANALYSIS

A turn warrant analysis has been completed for the above mentioned peak hours. A summary of the required treatments are summarised below:

Scenario	Required Treatment	Peak Hour Required
2014 BASELINE	BAR, BAL	Both, Both
2017 (BACKGROUND GROWTH)	BAR, BAL	Both, Both
2025 (BACKGROUND GROWTH)	CHR(S), AUL(S)	Both, AM
2025 (BACKGROUND + GROWTH)	CHR(S), AUL(S)	Both, AM
2035 (BACKGROUND GROWTH)	CHR, AUL(S)	PM, Both
2035 (BACKGROUND + GENERATED)	CHR, AUL	Both, AM

Table 6-1: Turn Warrant Summary

From the above, it can be determined that:

- The existing turn treatments are unsatisfactory at 2014 traffic levels with no basic turn treatments being installed.
- Turn treatments will be required to be upgraded to include CHR(S) and AUL(S) auxiliary lanes for both 2025 scenarios. Therefore, the addition of development generated traffic has not triggered an upgrade under this scenario.
- Under the 2035 scenarios, a difference within the required turn treatments for pre and post development is identified. However, it is noted that the existing background traffic with 21 years growth is exceptionally close to requiring an AUL treatment. Back calculation has indicated that the addition of a single left turning movement during the base count would equate to an AUL treatment being required in the 2035 scenario. Given the influence of the other nearby estates (Edenbrook and Ellida Estates), it is reasonable to accept that the proposed development (Riverside Estate Stage 9-16) will not solely, if at all, trigger a requirement to upgrade the left turn treatment to Birkbeck Drive in the future.

7 DISCUSSION

7.1 TRUNK INFRASTRUCTURE

As per Rockhampton Regional Council Transport Network Infrastructure Map 86-3, dated December 2012, the proposed development is located outside of the Priority Infrastructure Area (PIA). It has been identified by RRC that Alexandra Street will be upgraded to varying degrees, including 'upgrade Alexandra Street between Wade Street and Birkbeck Drive to two lane Urban Sub Arterial' by 2031.

7.2 TRAFFIC GROWTH

As previously discussed, no traffic impact assessments were available for use to assess the impact of their development upon the Belmont Road / Birkbeck Drive / Alexandra Street Intersection. Therefore, to account for unforseen growth an annual growth rate of 5% (Compounding) was adopted. This equates to a lineal growth rate of approximately 9% between 2017 and 2035, which is considered overly conservative. Utilising the above rates, an increase in vehicle movements between the count year and final year of 466 movements was identified (excluding the proposed development generated traffic). At 0.85 peak hour trip per lot this equates to 548 Lots.

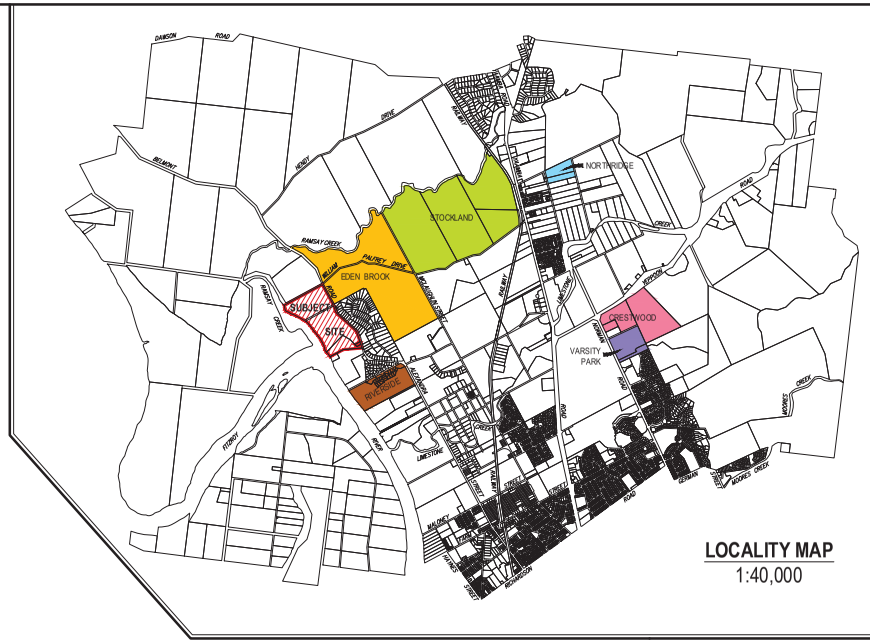
8 CONCLUSION

In conclusion, the intersection of Belmont Road, Birkbeck Drive and Alexandra Street has been analysed using SIDRA intersection analysis software. Incorporating an overly conservative growth factor it has been shown that the intersection can efficiently function beyond the year 2035 with the addition of the proposed development.

A turn warrant analysis has been undertaken and whilst the addition of development generated traffic has meant the upgrade from an AUL(S) to a AUL in the 2035 scenario, it would be unreasonable to attribute the entirety of this trigger towards the proposed development, if at all.

APPENDICES

APPENDIX A CAPRICORN SURVEY GROUP CONCEPT PLAN



LOCALITY MAP
1:40,000

IMPORTANT NOTE

This plan was prepared exclusively for M. Birkbeck for discussion purposes only and should not be used for any other purpose.

The areas shown hereon are subject to field survey and also to the requirements of council and any other authority which may have requirements under any relevant legislation.

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

This note is an integral part of this plan.

client
M. Birkbeck

project
Belmont Road
Parkhurst
Riverside Estate
Stages 9-16

plan of
Concept Plan
(201 Lots + Public Use Land)

rpd
Lot 102 on RP860099,
Lot 129 on PL4021 & Lot 2 on RP609985
Parish of Murchison
County of Livingstone

lga
Rockhampton Regional Council

rev	date	details	authorised
A	16-05-2013	Initial Issue	RJKF
B	13-08-2013	Image underlay added	RJKF
C	30-08-2013	Layout amended, underlay removed	RJKF
D	12-10-2013	Whole lot layout amended	RJKF
E	13-11-2013	Stage boundaries added	RJKF
F	6-12-2013	Layout and stage boundaries amended	RJKF
G	10-12-2013	Staging amended	RJKF

created

CSG capricorn survey group (cq) pty ltd
250 quay street, p.o. box 1391
rockhampton qld 4700
P 07 4927 5199
F 07 4922 2716
reception.csg@cq.com.au
ABN 22 154 830 565

scale **1:2500 @ A1**
datum **RRC 0.5m Contours**
sheet no. **1 of 1**
cad file **5892-01-CPT-G**
plan no. **5892-01-CPT**
revision **G**

APPENDIX B INTERSECTION ANALYSIS TRAFFIC VOLUMES

Traffic Analysis

	Belmont Road				Birkbeck Drive				Alexandra Street			
	Left		Thru		Left		Right		Thru		Right	
Time	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
AM Peak												
2014 Baseline	20	1	154	8	13	4	11	1	33	6	8	2
2017 (Background Growth)	23.2	1.2	178.3	9.3	15.0	4.6	12.7	1.2	38.2	6.9	9.3	2.3
2025 (Background Growth)	34.2	1.7	263.4	13.7	22.2	6.8	18.8	1.7	56.4	10.3	13.7	3.4
Ultimate Development Generated Traffic	7.0	0.1	110.2	2.2	0.0	0.0	3.0	0.1	47.2	1.0	0.0	0.0
2025 (Background + Generated)	41.2	1.9	373.6	15.9	22.2	6.8	21.8	1.8	103.7	11.2	13.7	3.4
2035 (Background Growth)	55.7	2.8	429.0	22.3	36.2	11.1	30.6	2.8	91.9	16.7	22.3	5.6
2035 (Background + Generated)	62.8	2.9	539.2	24.5	36.2	11.1	33.7	2.8	139.2	17.7	22.3	5.6

	Belmont Road				Birkbeck Drive				Alexandra Street			
	Left		Thru		Left		Right		Thru		Right	
Time	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
PM Peak												
2014 Baseline	15	2	88	6	10	0	14	0	118	6	11	0
2017 (Background Growth)	17.4	2.3	101.9	6.9	11.6	0.0	16.2	0.0	136.6	6.9	12.7	0.0
2025 (Background Growth)	25.7	3.4	150.5	10.3	17.1	0.0	23.9	0.0	201.8	10.3	18.8	0.0
Ultimate Development Generated Traffic	3.0	0.1	47.2	1.0	0.0	0.0	7.0	0.1	110.2	2.2	0.0	0.0
2025 (Background + Generated)	28.7	3.5	197.7	11.2	17.1	0.0	31.0	0.1	312.0	12.5	18.8	0.0
2035 (Background Growth)	41.8	5.6	245.2	16.7	27.9	0.0	39.0	0.0	328.7	16.7	30.6	0.0
2035 (Background + Generated)	44.8	5.6	292.4	17.7	27.9	0.0	46.0	0.1	438.9	19.0	30.6	0.0

APPENDIX C SIDRA OUTPUT

LANE SUMMARY

Site: AM Peak - 2017 Background

New Site
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Alexanrda St													
Lane 1	60	16.2	1642	0.036	100	2.8	LOS A	0.2	1.6	Full	500	0.0	0.0
Approach	60	16.2		0.036		2.8	NA	0.2	1.6				
East: Birkbeck Dr													
Lane 1	35	17.3	1084	0.033	100	10.1	LOS B	0.1	0.9	Full	500	0.0	0.0
Approach	35	17.3		0.033		10.1	LOS B	0.1	0.9				
North: Belmont Rd													
Lane 1	223	5.0	1897	0.118	100	1.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	223	5.0		0.118		1.1	NA	0.0	0.0				
Intersection	318	8.4		0.118		2.4	NA	0.2	1.6				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6

LANE SUMMARY

Site: AM Peak - 2025 Background + Generation

New Site
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Alexanrda St													
Lane 1	139	11.1	1639	0.085	100	3.5	LOS A	0.6	4.8	Full	500	0.0	0.0
Approach	139	11.1		0.085		3.5	NA	0.6	4.8				
East: Birkbeck Dr													
Lane 1	55	16.3	798	0.069	100	11.6	LOS B	0.2	1.9	Full	500	0.0	0.0
Approach	55	16.3		0.069		11.6	LOS B	0.2	1.9				
North: Belmont Rd													
Lane 1	455	4.1	1909	0.239	100	0.9	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	455	4.1		0.239		0.9	NA	0.0	0.0				
Intersection	650	6.6		0.239		2.4	NA	0.6	4.8				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6

LANE SUMMARY

Site: AM Peak - 2035 Background + Generation

New Site
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Alexanrda St													
Lane 1	195	12.6	1463	0.133	100	6.0	LOS A	1.2	9.0	Full	500	0.0	0.0
Approach	195	12.6		0.133		6.0	NA	1.2	9.0				
East: Birkbeck Dr													
Lane 1	117	12.5	637	0.183	100	13.5	LOS B	0.7	5.1	Full	500	0.0	0.0
Approach	117	12.5		0.183		13.5	LOS B	0.7	5.1				
North: Belmont Rd													
Lane 1	663	4.4	1906	0.348	100	1.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	663	4.4		0.348		1.0	NA	0.0	0.0				
Intersection	974	7.0		0.348		3.5	NA	1.2	9.0				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6

LANE SUMMARY

Site: PM Peak - 2017 Background

New Site
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Alexanrda St													
Lane 1	164	4.4	1877	0.088	100	1.2	LOS A	0.5	3.5	Full	500	0.0	0.0
Approach	164	4.4		0.088		1.2	NA	0.5	3.5				
East: Birkbeck Dr													
Lane 1	29	0.0	1149	0.025	100	9.0	LOS A	0.1	0.6	Full	500	0.0	0.0
Approach	29	0.0		0.025		9.0	LOS A	0.1	0.6				
North: Belmont Rd													
Lane 1	135	7.2	1866	0.072	100	1.4	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	135	7.2		0.072		1.4	NA	0.0	0.0				
Intersection	329	5.2		0.088		2.0	NA	0.5	3.5				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6

LANE SUMMARY

Site: PM Peak - 2025 Background + Generation

New Site
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Alexanrda St													
Lane 1	361	3.6	1883	0.192	100	1.6	LOS A	1.3	9.5	Full	500	0.0	0.0
Approach	361	3.6		0.192		1.6	NA	1.3	9.5				
East: Birkbeck Dr													
Lane 1	51	0.2	850	0.060	100	11.3	LOS B	0.2	1.4	Full	500	0.0	0.0
Approach	51	0.2		0.060		11.3	LOS B	0.2	1.4				
North: Belmont Rd													
Lane 1	254	6.1	1881	0.135	100	1.2	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	254	6.1		0.135		1.2	NA	0.0	0.0				
Intersection	666	4.3		0.192		2.2	NA	1.3	9.5				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6

LANE SUMMARY

Site: PM Peak - 2035 Background + Generation

New Site
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Alexanrda St													
Lane 1	514	3.9	1851	0.278	100	2.6	LOS A	2.3	16.6	Full	500	0.0	0.0
Approach	514	3.9		0.278		2.6	NA	2.3	16.6				
East: Birkbeck Dr													
Lane 1	78	0.1	640	0.122	100	13.1	LOS B	0.4	2.8	Full	500	0.0	0.0
Approach	78	0.1		0.122		13.1	LOS B	0.4	2.8				
North: Belmont Rd													
Lane 1	379	6.5	1876	0.202	100	1.3	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	379	6.5		0.202		1.3	NA	0.0	0.0				
Intersection	972	4.6		0.278		2.9	NA	2.3	16.6				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6

APPENDIX D TURN WARRANT TRAFFIC VOLUMES

Traffic Analysis

Turn Warrant Check (60km/h)	$Q_{M\,(R)}$	Q_R	Required Treatment	$Q_{M\,(L)}$	Q_L	Required Treatment
AM Peak						
2014 Baseline	222	10	BAR	162	21	BAL
2017 (Background Growth)	257	12	BAR	188	24	BAL
2025 (Background Growth)	380	17	CHR(S)	277	36	AUL(S)
2025 (Background + Generated)	547	17	CHR(S)	389	43	AUL(S)
2035 (Background Growth)	618	28	CHR(S)	451	59	AUL(S)
2035 (Background + Generated)	786	28	CHR	564	66	AUL
PM Peak						
2014 Baseline	235	11	BAR	94	17	BAL
2017 (Background Growth)	272	13	BAR	109	20	BAL
2025 (Background Growth)	402	19	CHR(S)	161	29	BAL
2025 (Background + Generated)	566	19	CHR(S)	209	32	BAL
2035 (Background Growth)	655	31	CHR	262	47	AUL(S)
2035 (Background + Generated)	818	31	CHR	310	50	AUL(S)

Sewer and Water Network Analysis

Client: Glenmore Holdings (Aust) Pty Ltd

Address: C/- Contour Consulting
349 Hobler Avenue
FRENCHVILLE QLD 4701

Site Address: Riverside Waters
Lot 102 on RP860099
Lot 129 on PL4021
Lot 92 on SP224420
Belmont Rd, PARKHURST, 4702

ROCKHAMPTON REGIONAL COUNCIL
AMENDED PLANS APPROVED
24 October 2019
DATE
These plans are approved subject to the current conditions of approval associated with
Development Permit No.: D/84-2014
Dated: 15 September 2015

Sewer Network Analysis

Description of Analysis:

A sewer network analysis for the proposed site was originally carried out in 2015 as future stages to the Riverside Estate development. Since this time the proposed development has been renamed Riverside Waters and the total number of allotments has increased from 201 to 222.

Preliminary approval has previously been granted for the residential development of lot 102 on RP860099 and Lot 129 on PL4021. The following report has been prepared to meet the further information request for a sewer network analysis to be provided in order to demonstrate that the proposed development will not have any adverse impacts on the existing reticulated sewer network.

It is understood that a further application for the preliminary approval of residential development of Lot 92 on SP224420 is currently being prepared. It has been requested that the additional 127 allotments from this further application be included in the network analysis.

It should be noted that the inclusion of these additional 127 allotments in this network analysis does not imply any approval of the application however if the preliminary approval is granted then the following analysis may be used as supporting information for the proposed sewer strategy.

The following drawings were provided by Contour Consulting

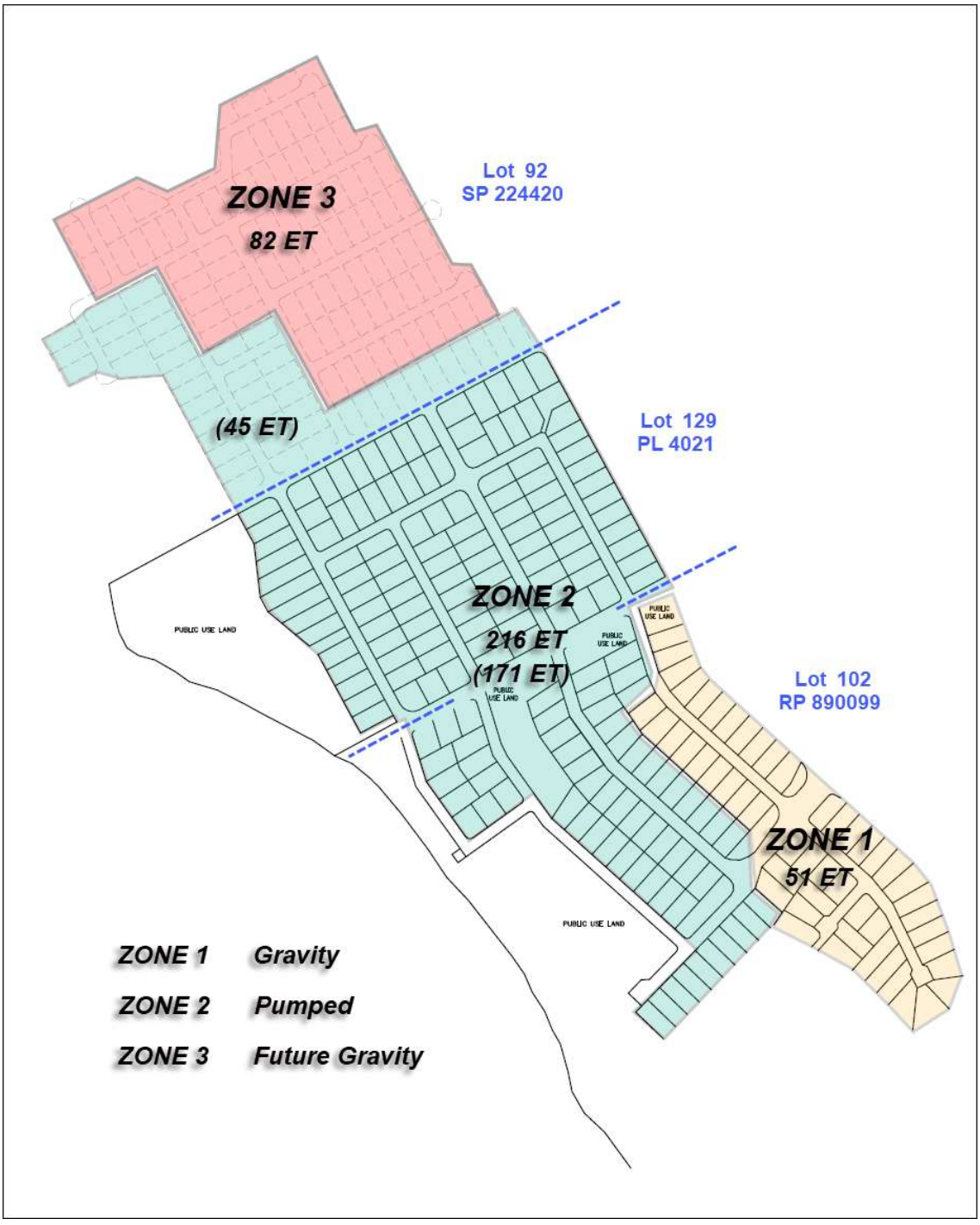
Refer Attachment A

Staging Plan

Allotment layout with finished contours

Network Analysis

From the information provided by Contour Consulting the proposed development has been separated in three catchment zones as shown below.

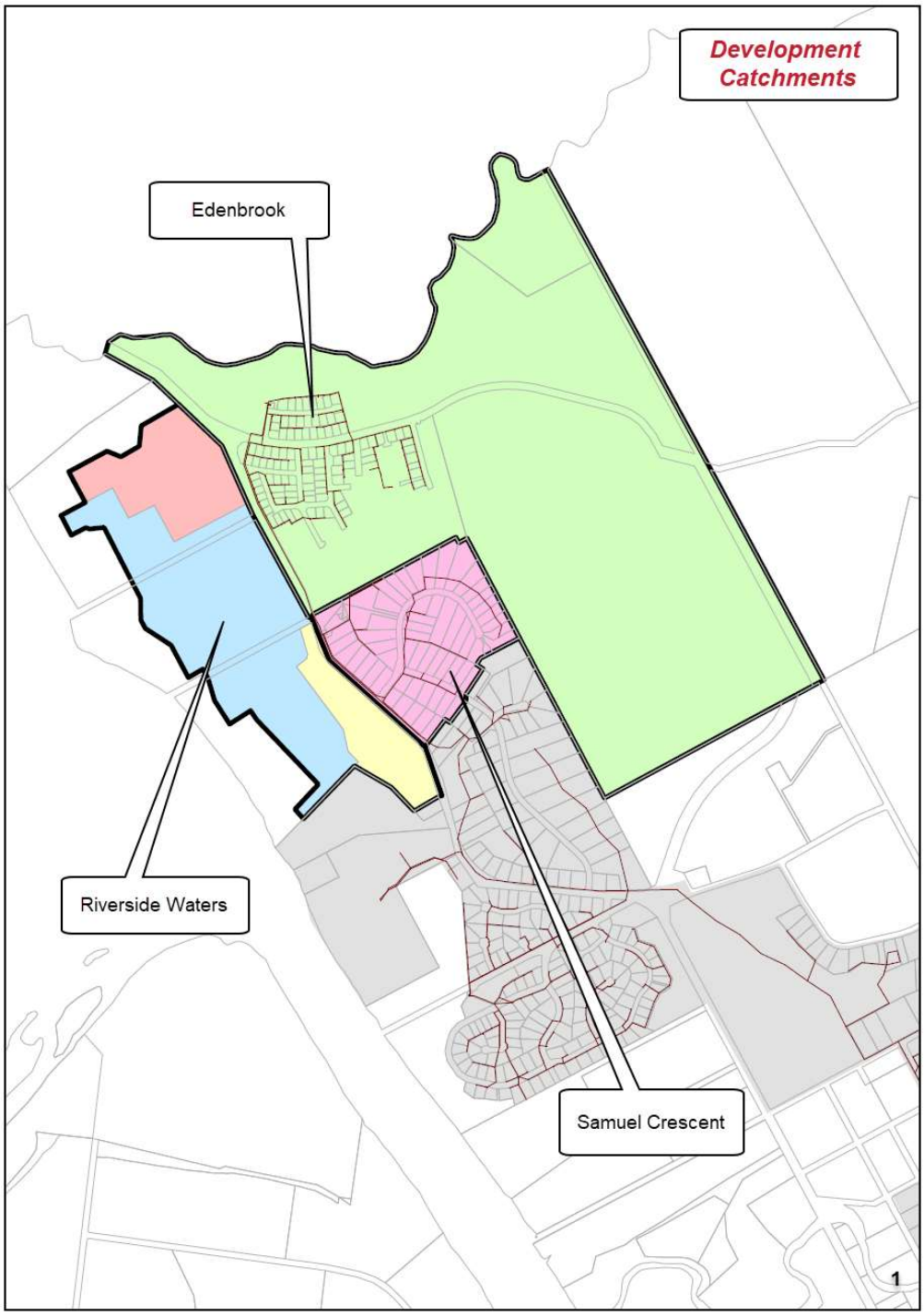


Proposed Catchment Zones

It is noted how Zone 2 extends across both Lot 129 on PL4021 and Lot 92 on SP224420.

Development Catchments

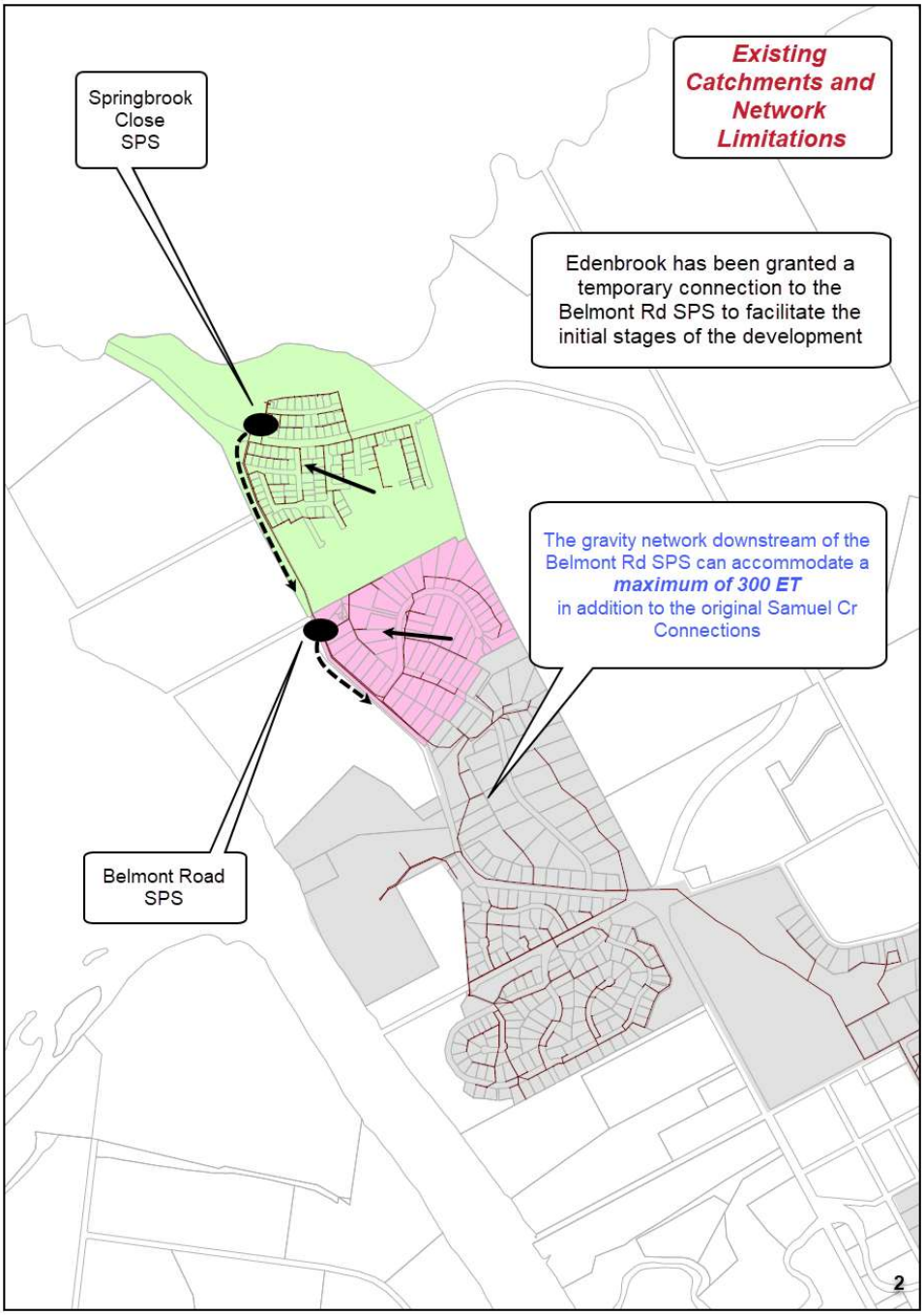
The following sketch shows where the Riverside Waters development lies in respect to the surrounding developments Edenbrook and Samuel Crescent.



Surrounding Developments

Belmont Road Sewage Pump Station

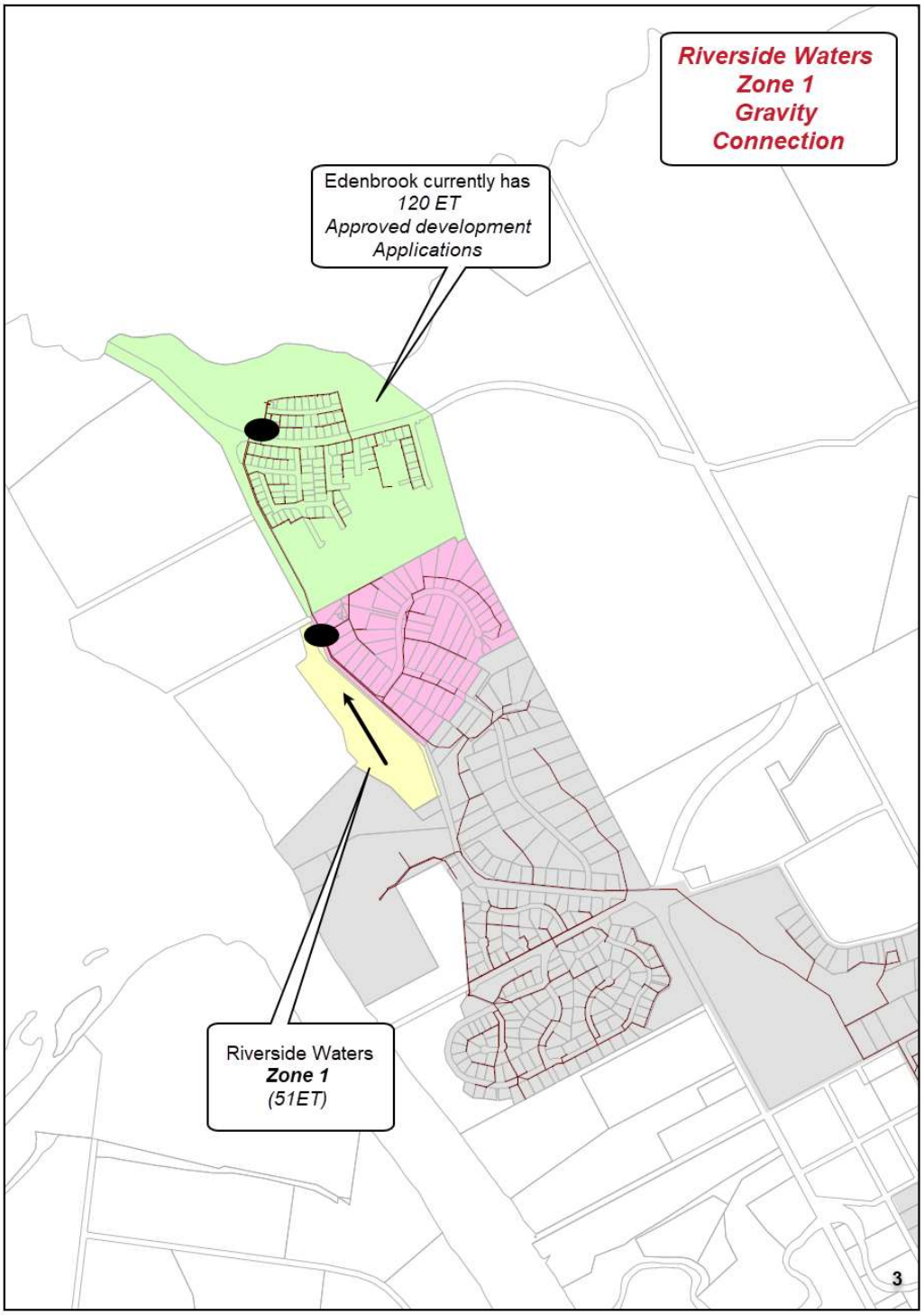
The Belmont Road sewage pump station was constructed in 1984 to service the Samuel Crescent catchment. The following sketch shows how the Edenbrook development was granted a temporary connection in 2014 to facilitate the initial stages of development via the Springbrook Close pump station.



Existing Belmont Road Sewer Pump Station Catchment

Riverside Waters Zone 1

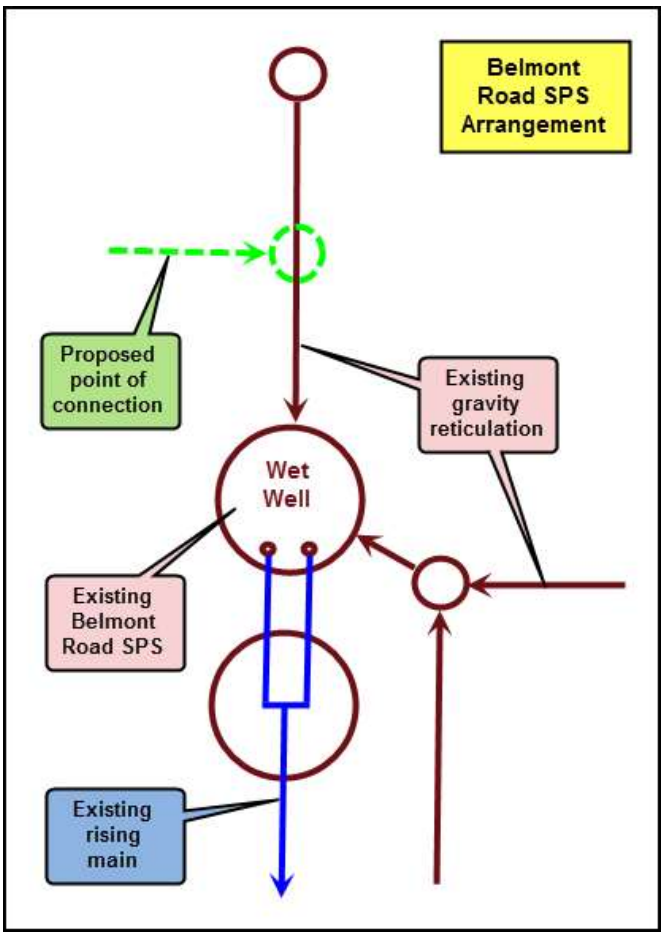
The following sketch shows where Zone 1 is to feed via gravity to the Belmont Road sewer pump station.



Riverside Water Zone 1 Gravity Connection

Point of Connection

The proposed point of connection to the existing sewer network is recommended to be via a new access chamber constructed over the existing sewer located north of the Belmont Road SPS.



Riverside Waters Connection to Existing Network

Catchment Limitations

The catchment capacity limitations are associated with the gravity sewer network located downstream from where the Belmont Road sewer pump station discharges. Recent network analysis confirms the gravity network has the capacity to accommodate an additional 300ET on top of the existing Samuel Crescent load.

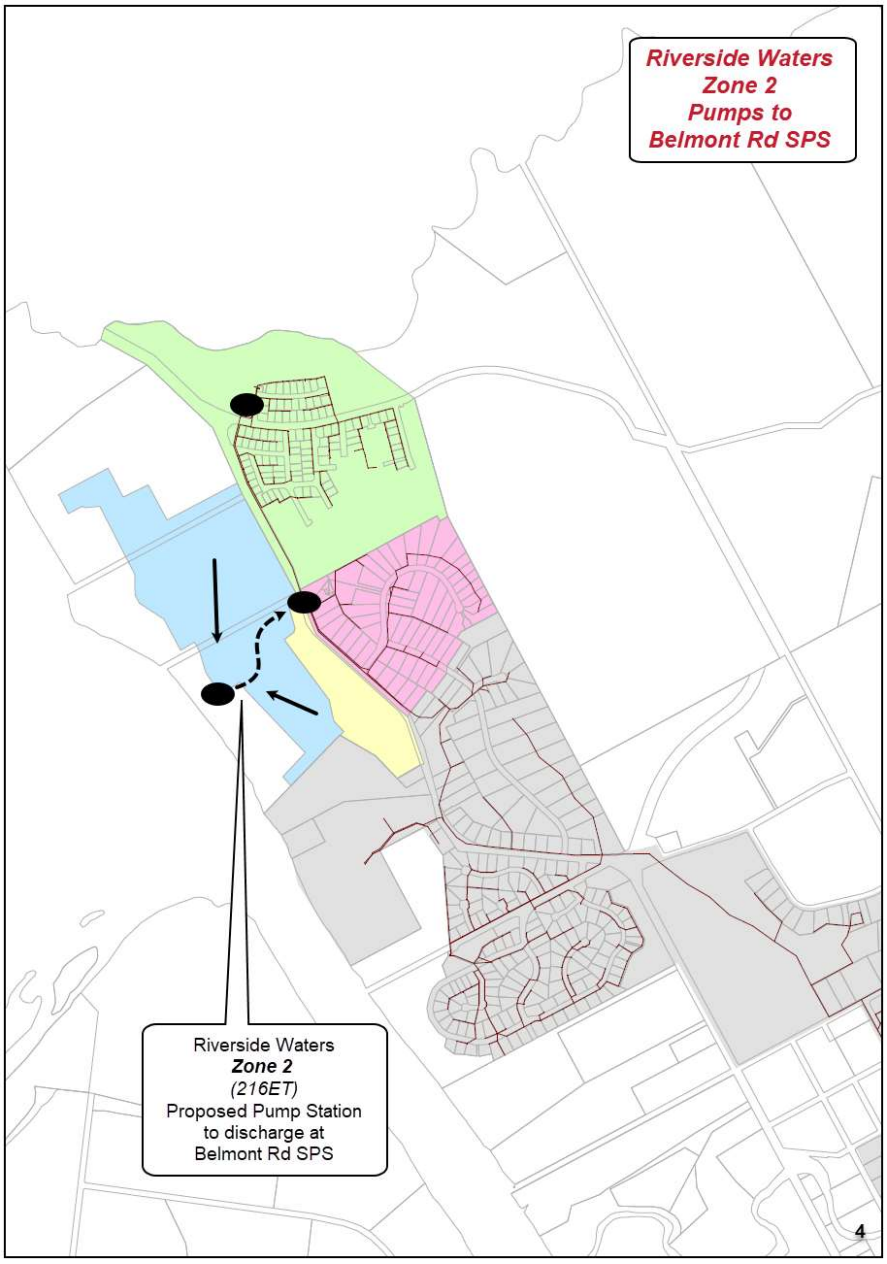
The Edenbrook development was originally granted temporary approval to discharge an additional 151ET into the Belmont Road sewer pump station until an alternative strategy would need to be implemented. Operational Works approvals for Edenbrook currently stand at approximately 120ET.

The available 180ET (300 available -120 Edenbrook) may be utilised by Edenbrook or Riverside Waters on a first come first serve basis of approved applications. Once triggered by either development, the Springbrook diversion scheme will need to be implemented (see below).

Riverside Waters Zone 2

It is assumed that the Riverside Waters Zone 2 may commence while Edenbrook is still connected to the Belmont Road sewer pump station.

The following sketch shows where Zone 2 feeds via gravity to the Proposed Riverside Waters sewer pump station.



Riverside Water Zone 2 Pumped Connection

Preliminary Pump station Sizing

The ultimate allotment yield for Zone 2 is 216ET

- The adopted sewer loading per EP is 200L/day
- The adopted EP per ET is 2.5
- ADWF = 200 / 3600 / 24

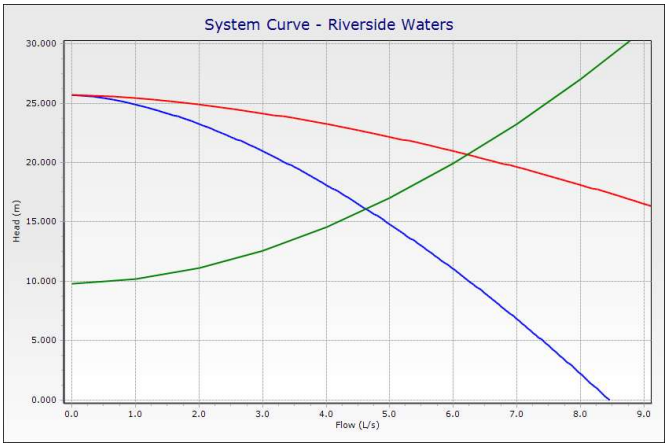
  = **0.0023 L/EP/s**

  = 0.0023 x 2.5 x 216

  = **1.3 L/s**
- PWWF = 5 x ADWF

  = 5 x 1.3

  = 6.5 L/s
- Length of Rising Main = 450m
- Diameter = 80mm
- Static Head = 10m



Riverside Waters Zone 2 – Pump Station System Curve

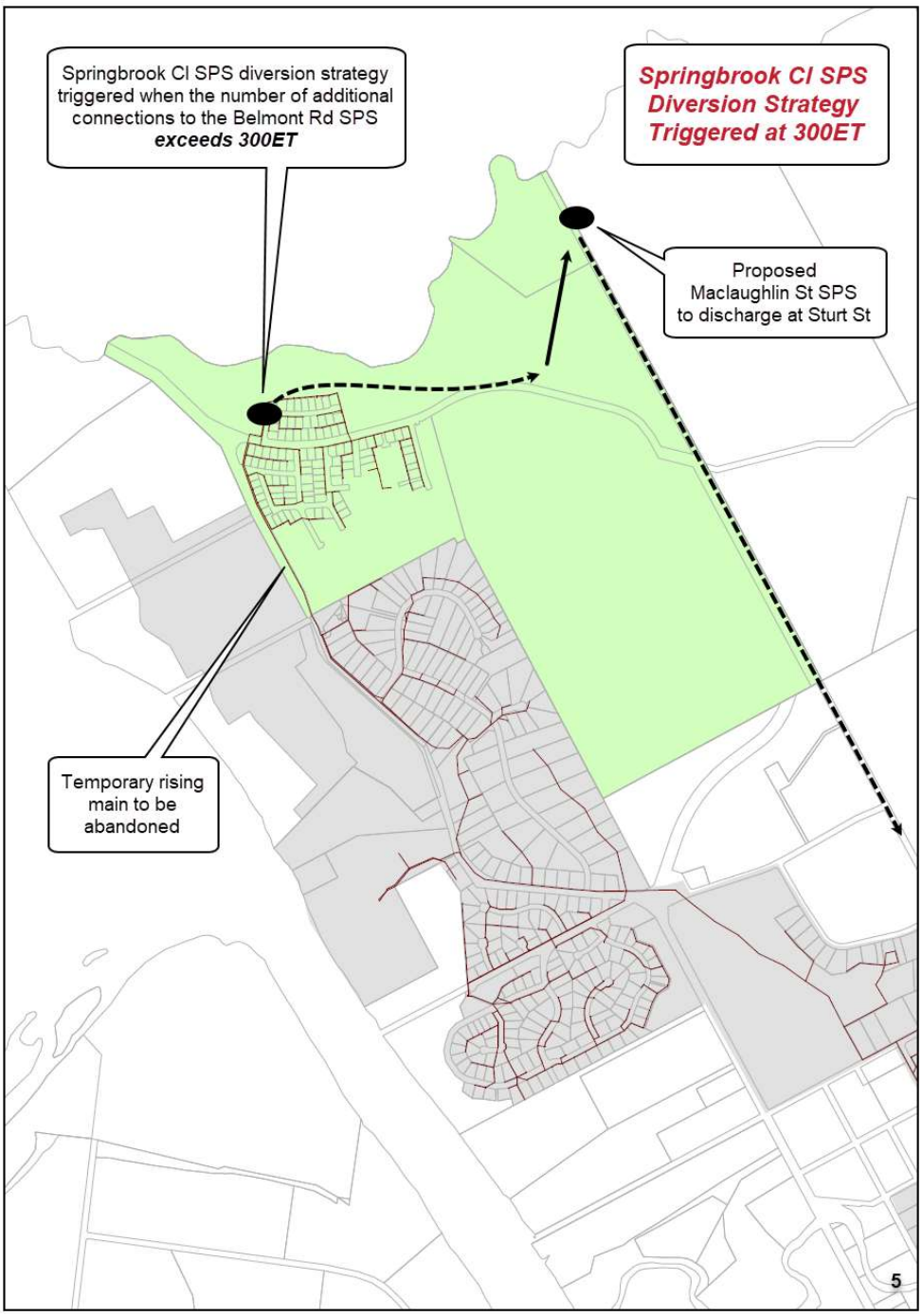
- Modelled Pumps CP 3060 HT 3-252 Rated Power 2.4kW

No of Pumps	Flow (L/s)	Head (m)	Efficiency (%)	Velocity (m/s)
1	4.80	16.2	51	0.95
2	6.37	20.9	46	1.27

Refer Attachment B Pump Operation Curves

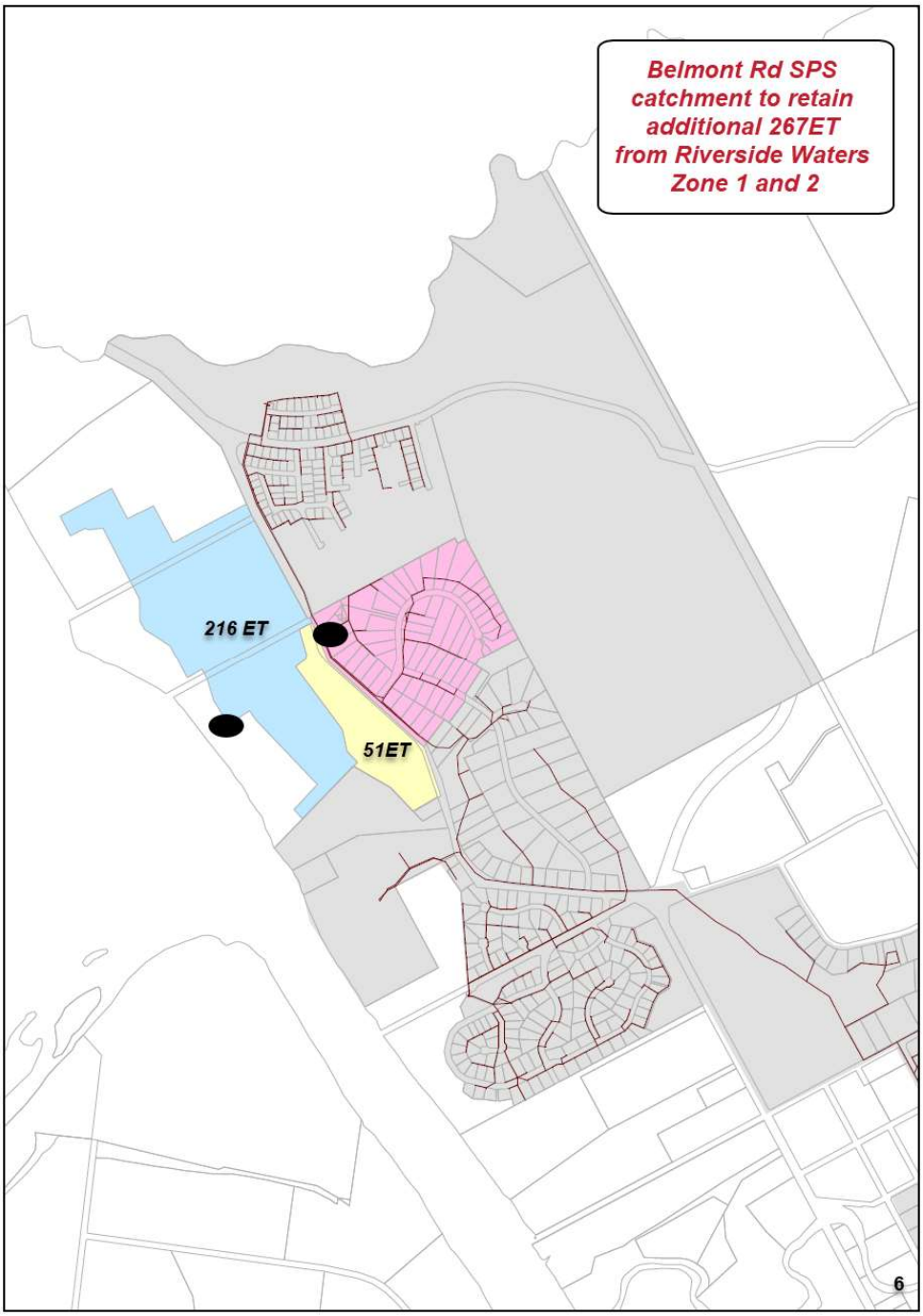
Catchment Limitation of 300 ET Triggered

It is assumed that the partial development of Zone 2 is likely to coincide with the catchment limitation trigger of 300ET being exceeded. This will trigger the implement the Springbrook Close sewer pump station diversion strategy. A high level sketch of the proposed diversion strategy is given below.



Springbrook Close Sewer Pump Station Diversion Strategy

With Edenbrook diverted this effectively enables Riverside Waters to utilise the additional capacity freed up at the Belmont sewer pump station. The total load on the Belmont Road sewer pump station from Riverside Waters is in the order of 267ET as shown below.

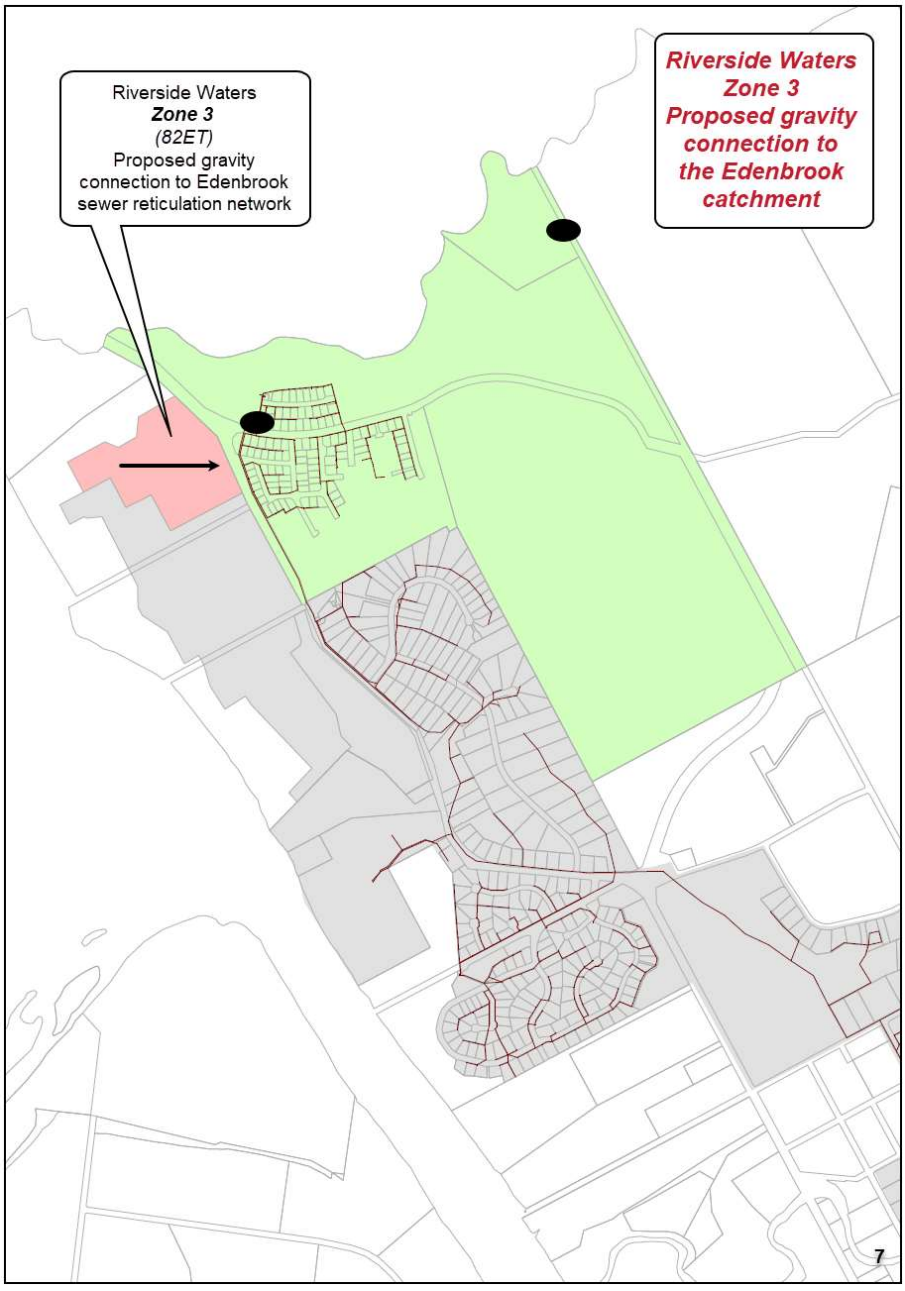


Total load on the Belmont Road sewer pump station from Riverside Waters is in the order of 267ET

It is noted that this is less than maximum allowable additional capacity of 300ET.

Riverside Waters Zone 3

The following sketch shows where Zone 3 is to feed via gravity into the Edenbrook sewer network.



Riverside Zone 3 to Discharge via Gravity into the Edenbrook Network

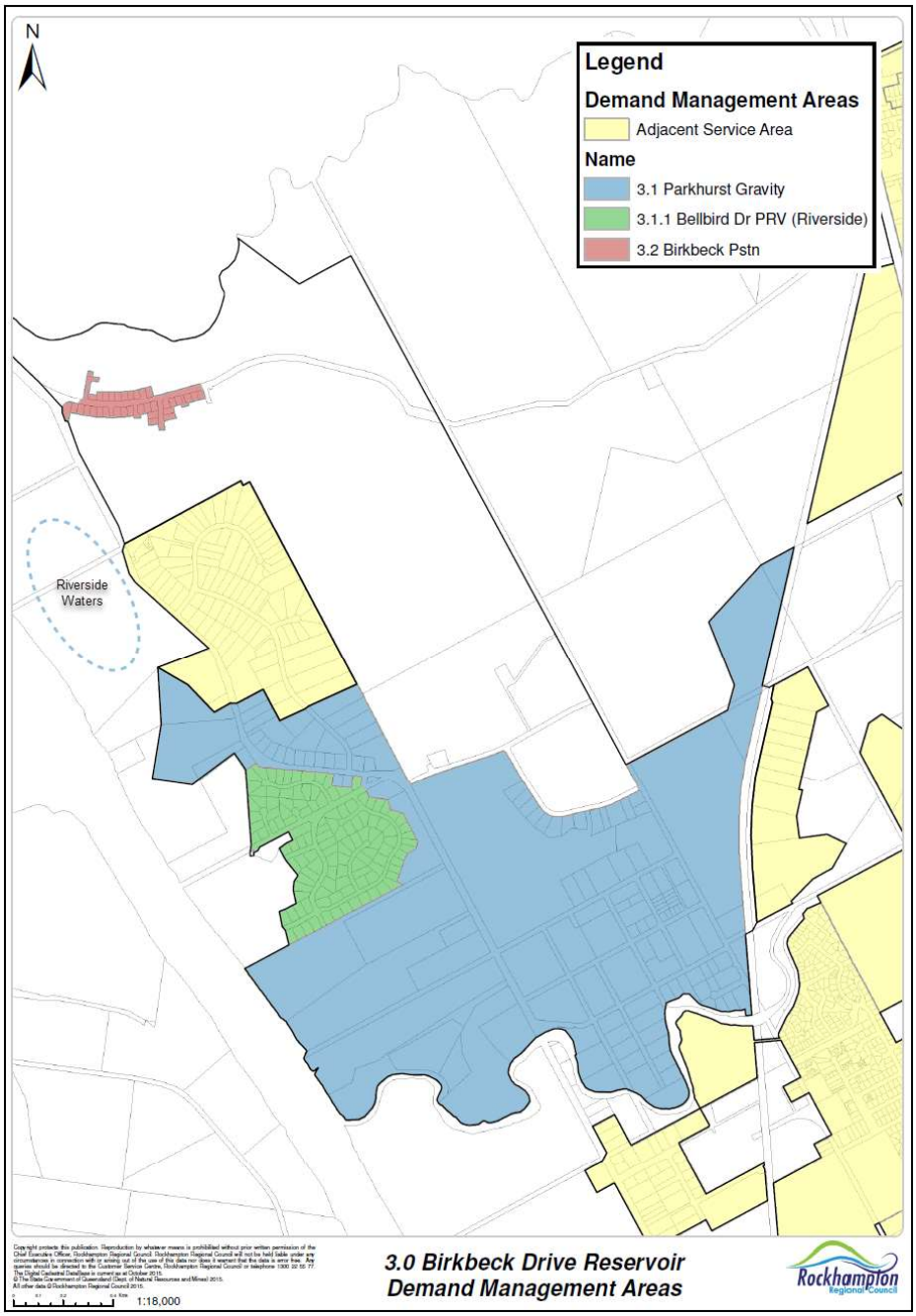
It is noted that as no sewer layout was provided for the proposed allotment layout within Lot 92 on SP224420, the gravity sewer within Zone 3 has been interpreted from the proposed finished contour sketch.

Water Network Analysis

Description of Analysis:

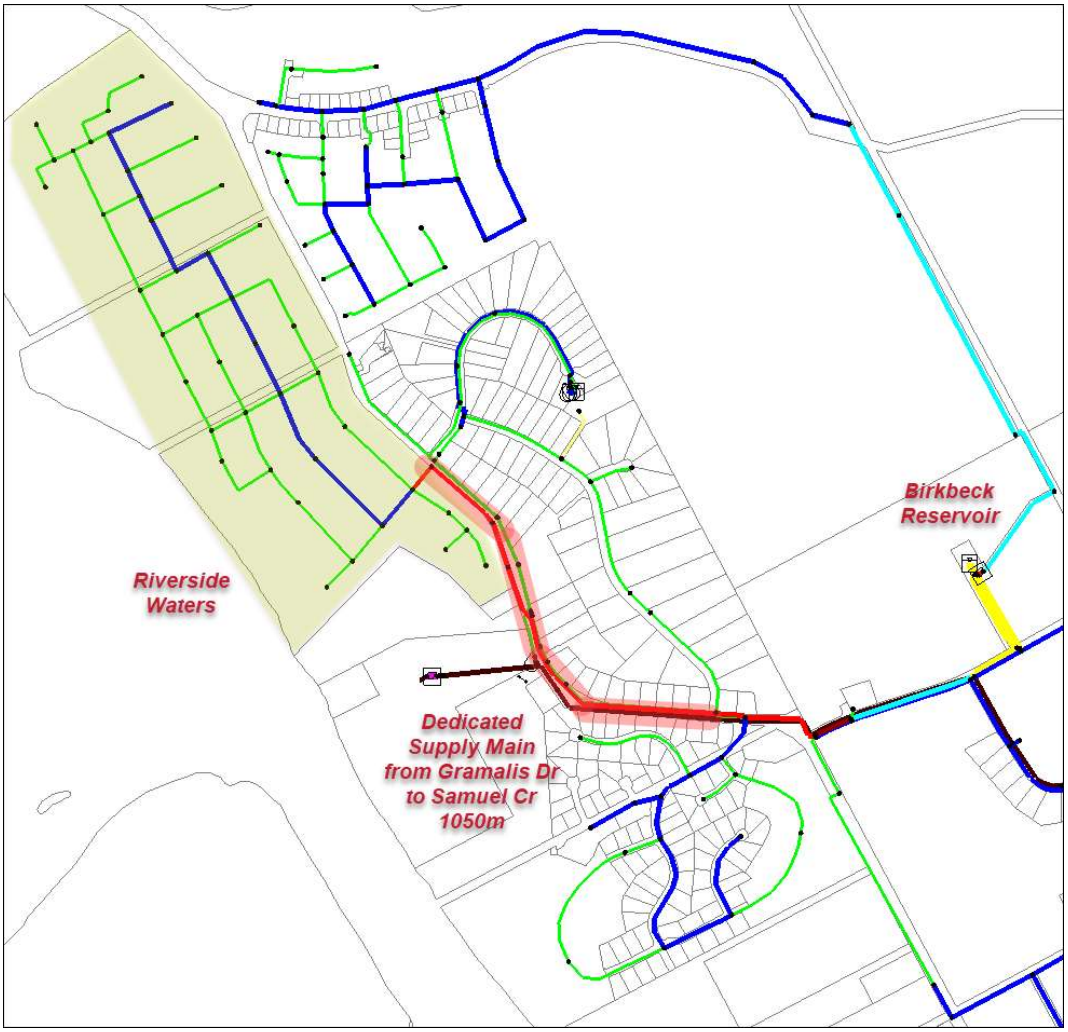
A water network analysis has been carried out for the 347 allotments proposed for the Riverside Waters development.

The following Demand Management Area map shows how the Riverside Waters development lies west of the Birkbeck reservoir Parkhurst Gravity area.



Birkbeck reservoir Parkhurst Gravity Service Area

It is proposed to service the development via a connection to the Parkhurst gravity zone. A dedicated supply main is proposed along Belmont Road between Gremalis Drive and Samuel Crescent as shown below.



Riverside Waters - Dedicated Supply Main

Network Analysis

Two scenarios were investigated for the 1,050m long supply main.

- 150mm Diameter Main
- 200mm Diameter Main

The scenarios were analysed to assess the capacity to provide a minimum service pressure of 220kPa and a fire fighting capacity of 15L/s at a minimum pressure of 120kPa.

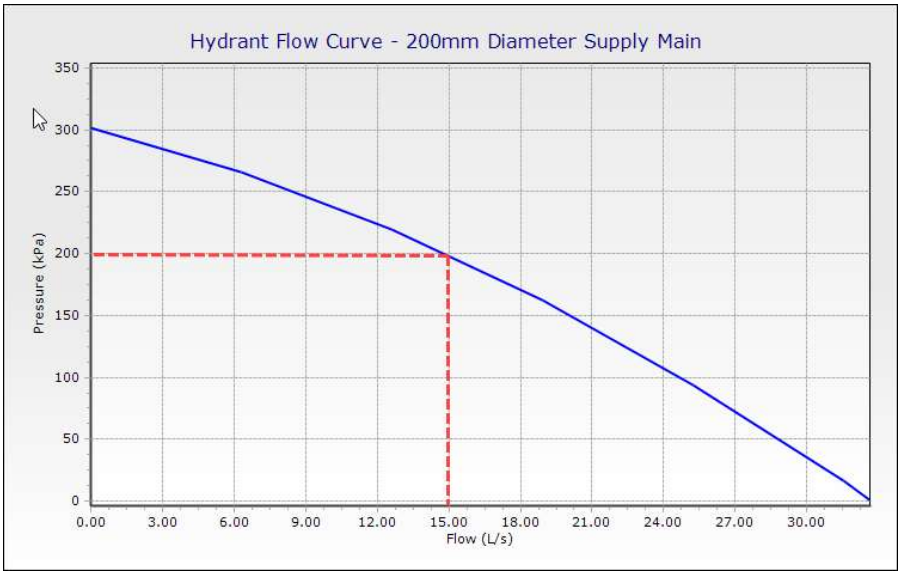
Results

The following table of results were taken from the critical node located at an elevation of 27m. They show that the 150mm diameter main was able to meet the minimum service pressure but could not provide the required fire flow achieving only 9L/s at 120kPa. The 200mm diameter remain meets all of the required design criteria.

Scenario Diameter (mm)	Residential		Fire Flow
	Residual Pressure (kPa)		Max @ 120kPa (L/s)
	Min	Max	
150	246	334	**9**
200	301	334	23

200mm Diameter Supply Main Scenario Meets the Design Criteria

The hydrant flow curve at the critical node for the 200mm diameter supply main scenario is given below.



Hydrant Flow curve at Critical Node for 200mm Diameter Supply Main

The pressure results for all modelled nodes are given on the following page including the recommended minimum pipe size diameters for the internal network.

Maximum and Minimum Pressure results for all modelled nodes
Recommended minimum pipe size diameters for the internal network.

Recommendations

Water:
The initial three stages (51ET) of the Riverside Waters development will require significant external water infrastructure with the construction of 1,050m of 200mm diameter main in Belmont Road from Gremalis Drive to Samuel Crescent. It is noted that the critical 900mm diameter primary supply main from the Glenmore Water Treatment Plant is located along half the length of this route. Extensive liaison with Fitzroy River Water is required to ensure there is no risk to this main during construction.

Sewer:
The initial three stages are able to connect via gravity to the Samuel Crescent sewer network that is serviced by the Belmont Road sewer pump station. It is noted that the Belmont Road sewer pump station has a limited capacity to receive an additional 300ET. The available 300ET may be utilised by Edenbrook or Riverside Waters on a first come first serve basis of approved applications. There is currently approved applications for approximately 120ET.

The future stages of Riverside Waters identified within this report as Zone 2 will require the construction of an internal sewer pump station to permanently discharge into the Belmont Road sewer pump station (via the Zone 1 gravity network).

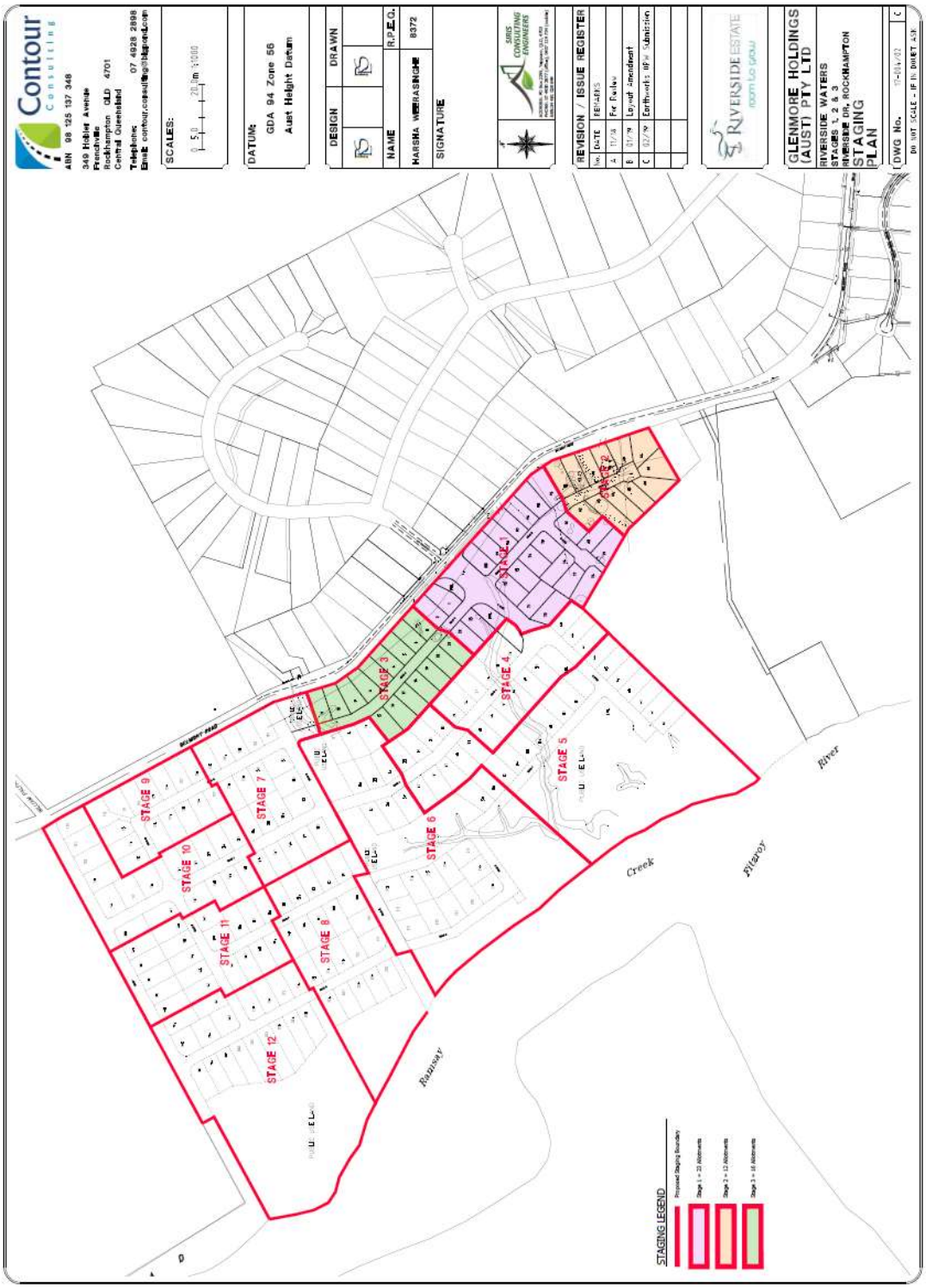
Zone 2 is comprised of 216ET. It should be noted that the full development of Zone 2 will not be able to occur until the "Springbrook Close Sewer Pump Station Diversion Strategy" has been implemented.

The future stage identified within this report as Zone 3 is to connect to the Edenbrook sewer network via gravity. The design of the "Springbrook Close Sewer Pump Station Diversion Strategy" will need to include capacity to accommodate the additional 82ET from Zone 3.

No sewer layout was provided for the proposed allotment layout within Lot 92 on SP224420. The potential for a gravity sewer layout within Zone 3 to discharge into the Edenbrook sewer network has been interpreted from the proposed finished contour sketch provided in Attachment A.

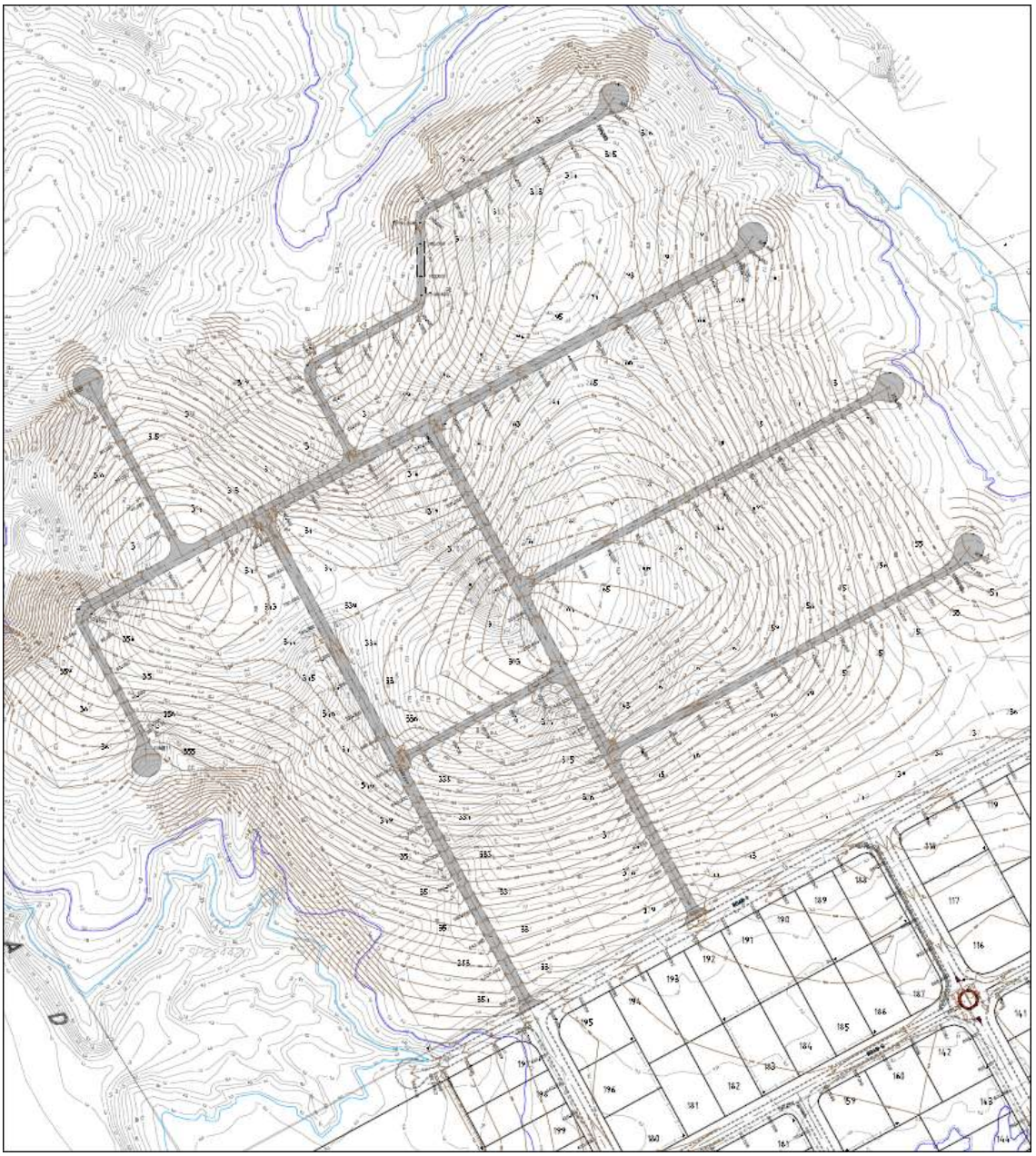
End of Report

Attachment A



Staging Plan for lot 103 on RP860099 and Lot 129 on PL4021

Overall Layout

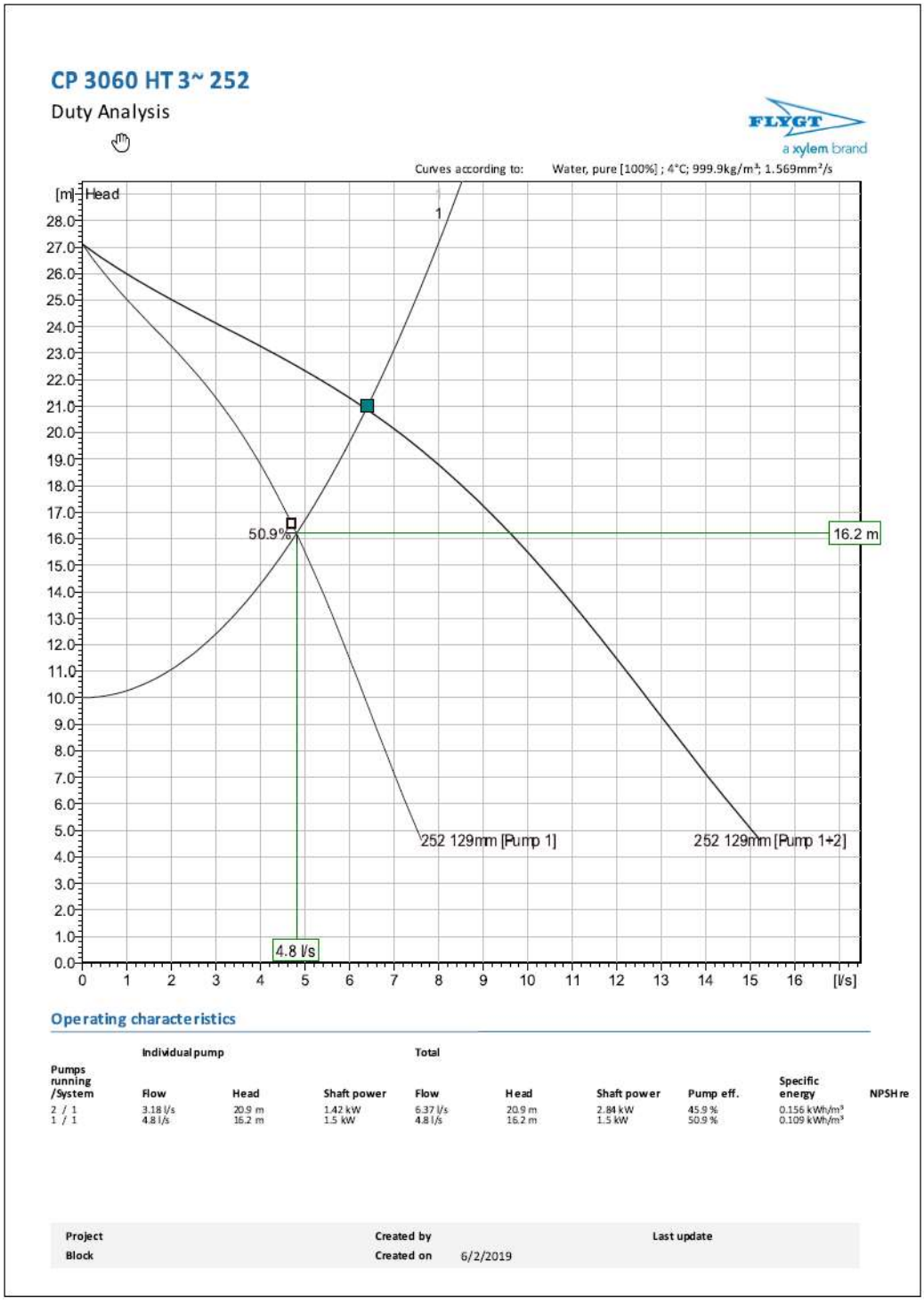


Proposed finished contours and allotment layout for Lot 92 on SP224420

Attachment B

Riverside

Internal Pump Station - Single Pump Operation



Operating characteristics

Pumps running /System	Individual pump Flow	Head	Shaft power	Total Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
2 / 1	3.18 l/s	20.9 m	1.42 kW	6.37 l/s	20.9 m	2.84 kW	45.9 %	0.156 kWh/m³	
1 / 1	4.8 l/s	16.2 m	1.5 kW	4.8 l/s	16.2 m	1.5 kW	50.9 %	0.109 kWh/m³	

Project	Created by		Last update
Block	Created on	6/2/2019	

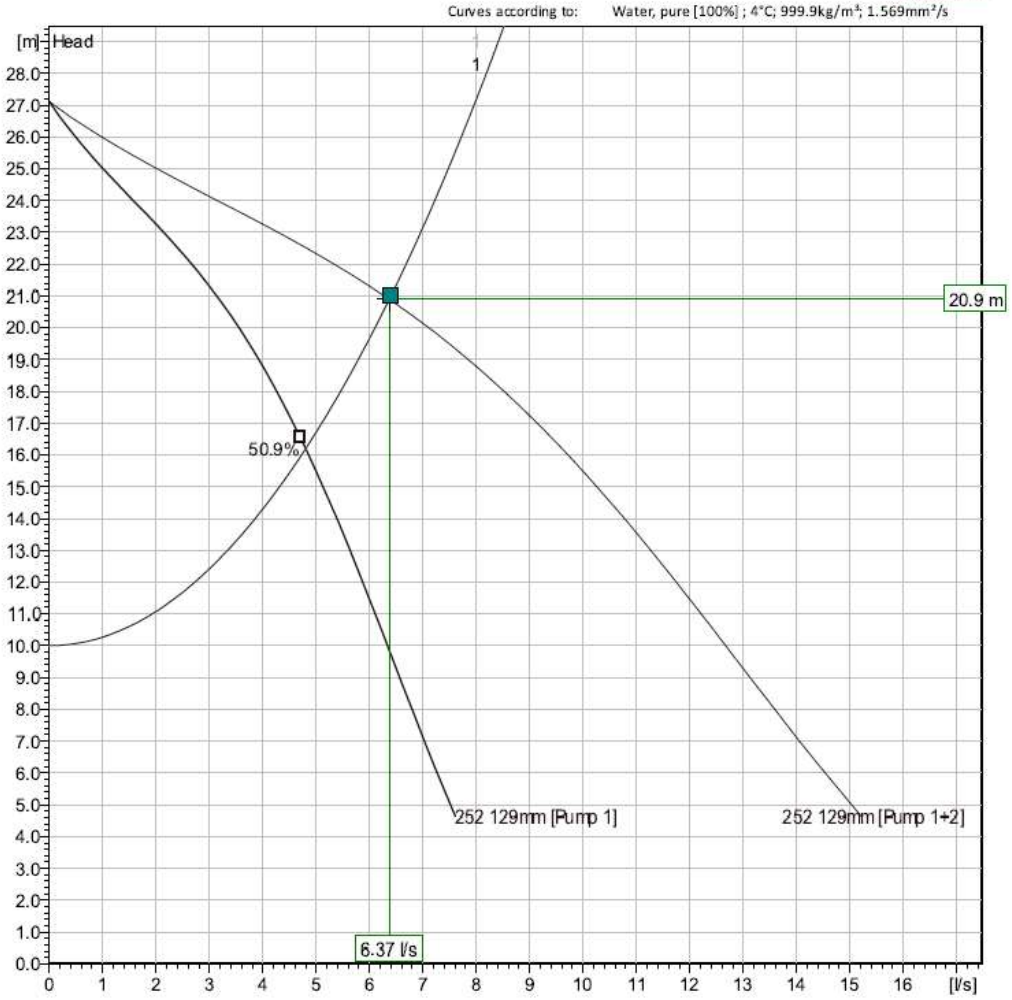
Riverside

Internal Pump Station - Dual Pump Operation

CP 3060 HT 3~ 252

Duty Analysis

FLYGT a xylem brand



Operating characteristics

Pumps running /System	Individual pump Flow	Head	Shaft power	Total Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
2 / 1	3.18 l/s	20.9 m	1.42 kW	6.37 l/s	20.9 m	2.84 kW	45.9 %	0.156 kWh/m³	
1 / 1	4.8 l/s	16.2 m	1.5 kW	4.8 l/s	16.2 m	1.5 kW	50.9 %	0.109 kWh/m³	

Project	Created by		Last update
Block	Created on	6/2/2019	