BULK EARTHWORKS SUMMARY	
STRUCTURAL FILLING	
AREA	NETT SOLID FILL
OVERALL FILLING	
(ALLOTMENTS, BATTERS)	172,698 cu.m.
TOTAL FILL REQUIRED	172,698 cu.m.
EXCAVATION	
AREA	NETT CUT
OVERALL EXCAVATION	165,318 cu.m.
TOTAL CUT	165,318 cu.m.

i.e. 172,698 cu.m - 165,318 cu.m. = 7,380 cu.m. TO BE IMPORTED OF SITE
INCLUDING 200mm TOPSOIL STRIP
INCLUDING 200mm TOPSOIL RESPREAD TO LOTS, VERGES, DRAINAGE RESERVE AND OPEN SPACE AREAS
INCLUDING 300mm ROAD BOXING DEPTH

EARTHWORKS LEGEND

-4.5 TO -4.0 m	0.0 TO 0.5 m
-4.0 TO -3.5 m	0.5 TO 1.0 m
-3.5 TO -3.0 m	1.0 TO 1.5 m
-3.0 TO -2.5 m	1.5 TO 2.0 m
-2.5 TO -2.0 m	2.0 TO 2.5 m
-2.0 TO -1.5 m	2.5 TO 3.0 m
-1.5 TO -1.0 m	3.0 TO 3.5 m
-1.0 TO -0.5 m	3.5 TO 4.0 m
-0.5 TO 0.0 m	4.0 TO 4.5 m

BULK EARTHWORKS LAYOUT PLAN

SCALE 15 0 15 30 45 60 75 (metres)
1 : 1500 (FULL SIZE)

LEGEND

- DEVELOPMENT SITE BOUNDARY
- 90.0 EXISTING CONTOUR LIDAR
- SW EXISTING STORMWATER
- EXISTING EASEMENT
- 90.0 DESIGN SURFACE CONTOUR
- PROPOSED RETAINING WALL 0.6-1.0m
- PROPOSED RETAINING WALL 1.0-2.0m
- PROPOSED BATTER

PRELIMINARY
NOT FOR CONSTRUCTION OR TENDER

PROPOSED LAND DEVELOPMENT

2983 FOREST HILL FERNVALE RD, LOWOOD QLD 4311

FOR
LOWOOD ONE PTY LTD

A1 ORIGINAL SIZE BEFORE REDUCTION

VER.	DESCRIPTION	DATE
B	COUNCIL RFI UPDATES	24.04.24
A	PRELIMINARY CIVIL ENGINEERING DESIGN	10.04.24

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

PROJECT:
CONCEPT ENGINEERING DRAWINGS

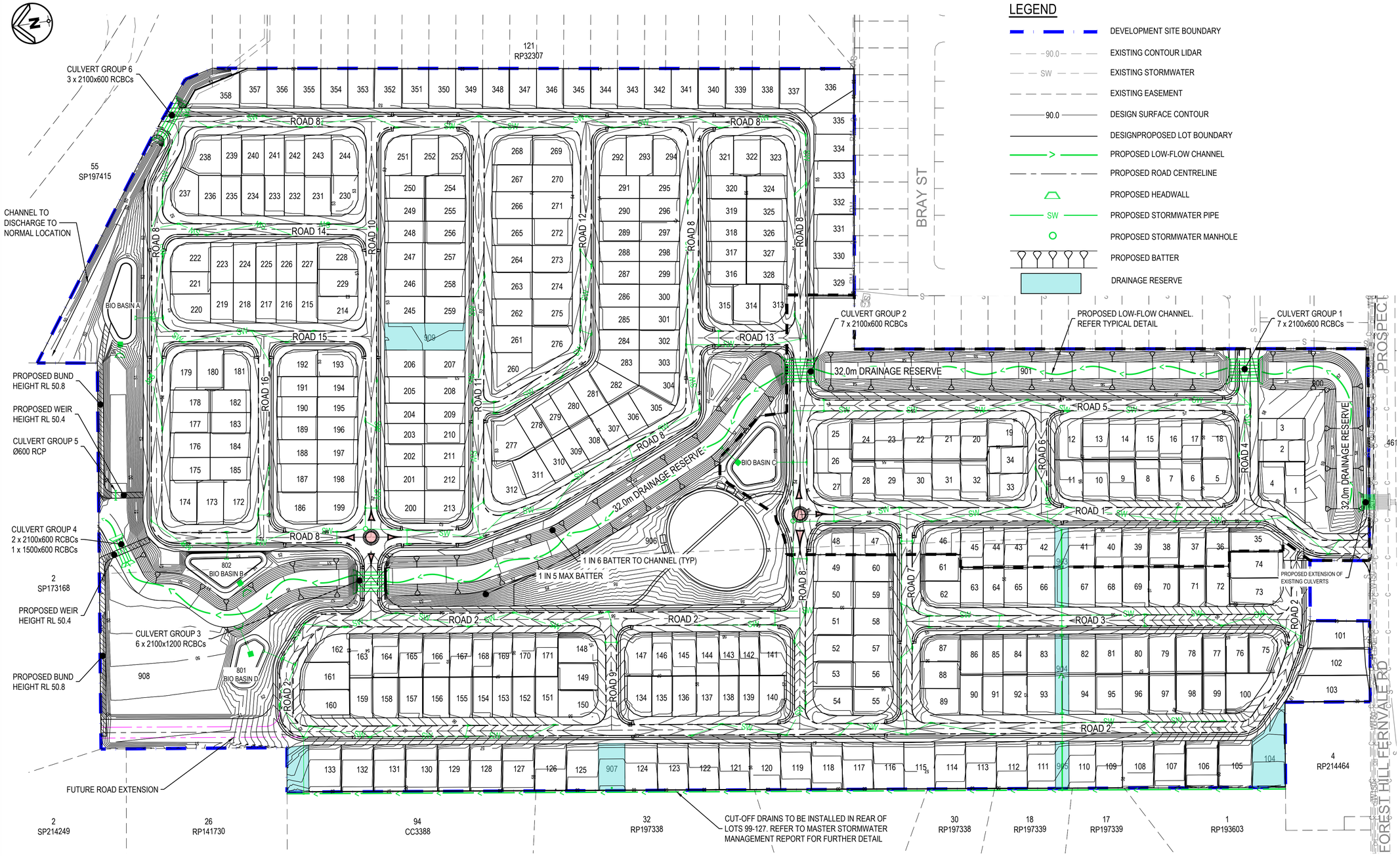
DRAWING TITLE :
BULK EARTHWORKS LAYOUT PLAN

DEVEL. APPLIC. No. :	-
DATE :	24.04.24
PROJECT LEADER :	JONATHAN CUELL
DESIGNER :	TG
DRAFTSPERSON :	CD
CHECKED :	FRASER LUCAS

APPROVED FOR AND ON BEHALF OF
BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365
RPEQ No. :

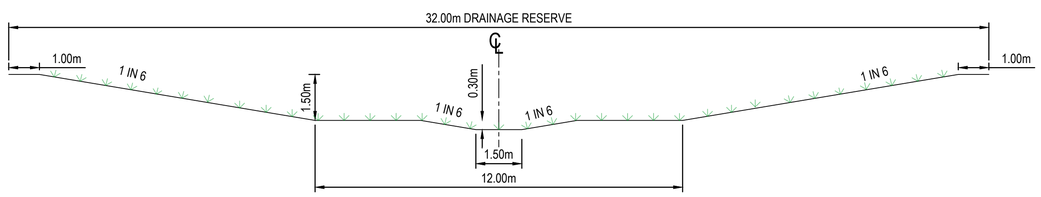
SCALE : AS NOTED	DATUM : AHD	FULL SIZE : A1
PROJECT No.: BE230128-00	DRAWING No. : SK200	VERSION: B

FILENAME: C:\Users\TuNgoc.Nguyen\OneDrive - Burchills Engineering Solutions\Documents\BE\2023\BE230128 2983 Forest Hill Fernvale Rd\03_Civil\01_DA\Rev_A\02_Acad\01_Master DA\SK200-BULK EARTHWORKS LAYOUT PLAN.dwg
PLOTTED: 25.04.2024 at 15:47



ROADWORKS AND DRAINAGE LAYOUT PLAN

SCALE 15 0 15 30 45 60 75 (metres)
1 : 1500 (FULL SIZE)



CHANNEL TYPICAL SECTION

SCALE 1 0 1 2 3 4 5 (metres)
1 : 100 (FULL SIZE)

PRELIMINARY
NOT FOR CONSTRUCTION OR TENDER

PROPOSED LAND DEVELOPMENT

2983 FOREST HILL FERNVALE RD, LOWOOD QLD 4311

FOR LOWOOD ONE PTY LTD

A1 ORIGINAL SIZE BEFORE REDUCTION

VER.	DESCRIPTION	DATE
B	COUNCIL RFI UPDATES	24.04.24
A	PRELIMINARY CIVIL ENGINEERING DESIGN	10.04.24

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5609 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

PROJECT:
CONCEPT ENGINEERING DRAWINGS

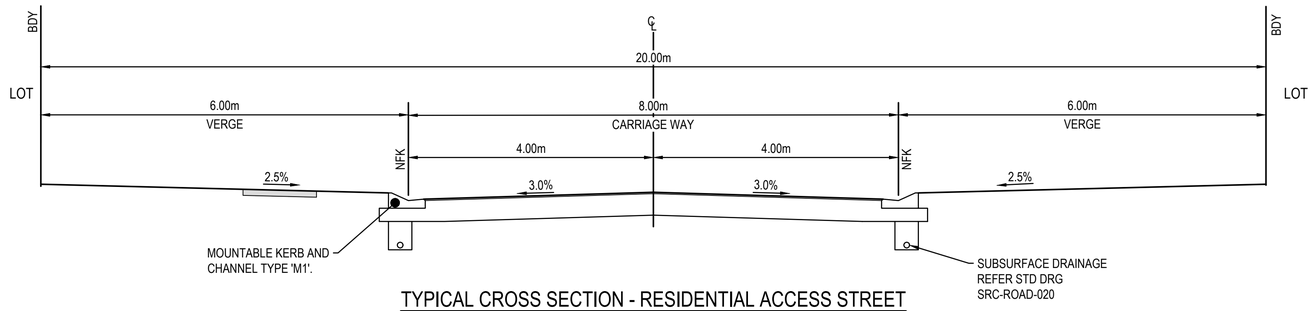
DRAWING TITLE :
ROADWORKS AND DRAINAGE LAYOUT PLAN

DEVEL. APPLIC. No. :	-	DATE : 24.04.24
PROJECT LEADER :	JONATHAN CUELL	
DESIGNER :	TG	
DRAFTSPERSON :	CD	
CHECKED :	FRASER LUCAS	

APPROVED FOR AND ON BEHALF OF
BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365
RPEQ No. :

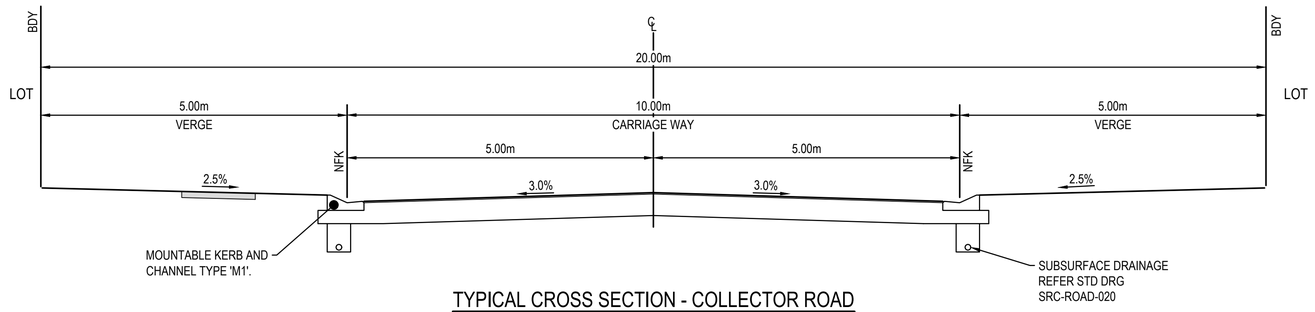
SCALE : AS NOTED	DATUM : AHD	FULL SIZE : A1
PROJECT No.: BE230128-00	DRAWING No. : SK300	VERSION: B

FILENAME: C:\Users\TLNguyen\OneDrive - Burchills Engineering Solutions\Documents\BE230128 2983 Forest Hill Fernvale Rd\03. Civil\01. DA\Rev A\02. Acad\01. Master DA\SK300-ROADWORKS AND DRAINAGE LAYOUT PLAN.dwg
PLOTTED: 25.04.2024 at 15:47



TYPICAL CROSS SECTION - RESIDENTIAL ACCESS STREET
8.0m K-K

SCALE 1.0 0 1.0 2.0 (metres)
1 : 50 (FULL SIZE)



TYPICAL CROSS SECTION - COLLECTOR ROAD
10.0m K-K

SCALE 1.0 0 1.0 2.0 (metres)
1 : 50 (FULL SIZE)

PRELIMINARY
NOT FOR CONSTRUCTION OR TENDER

PROPOSED LAND DEVELOPMENT

2983 FOREST HILL
FERNVALE RD, LOWOOD
QLD 4311

FOR
LOWOOD ONE PTY LTD

A1 ORIGINAL SIZE BEFORE REDUCTION

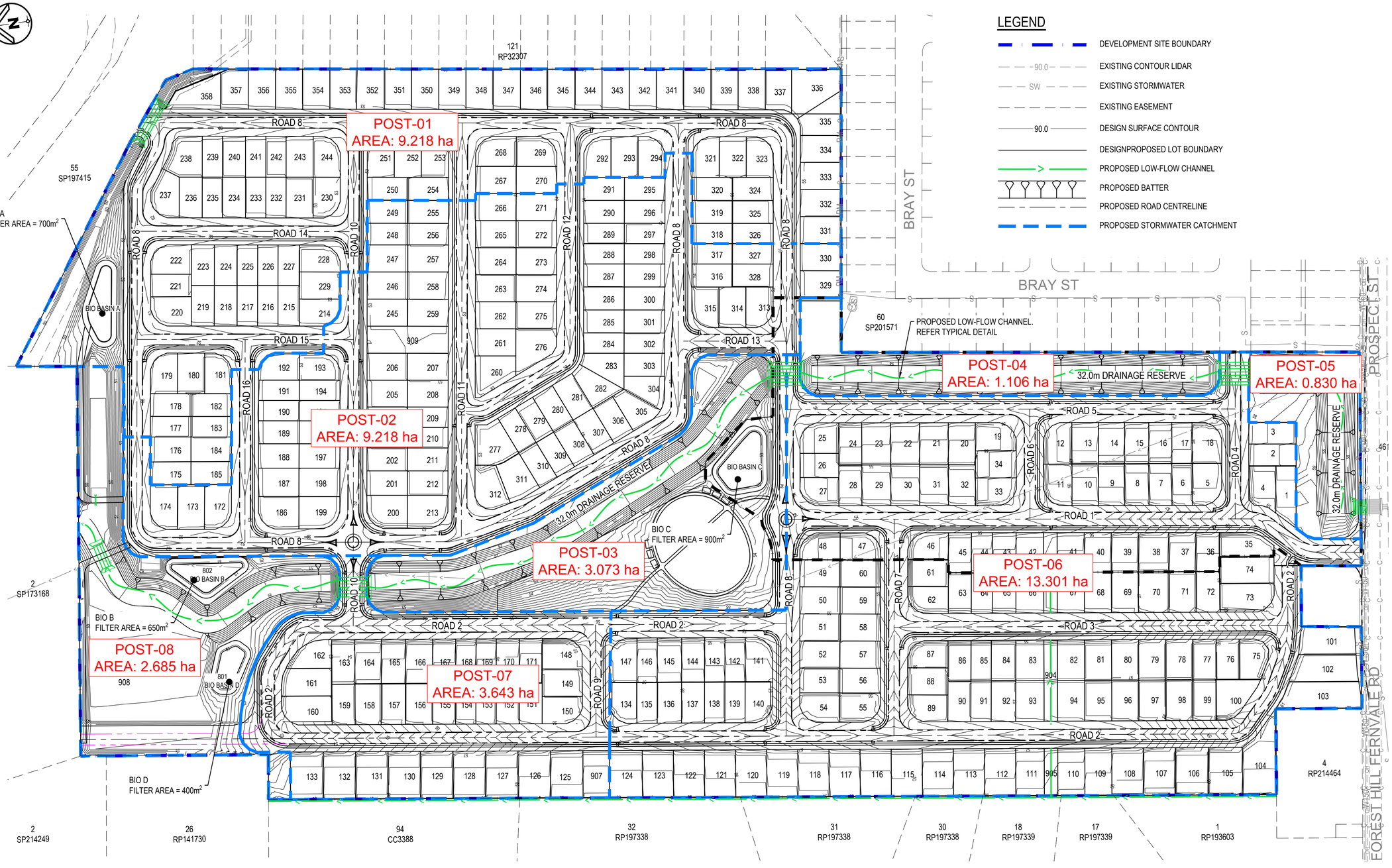
VER.	DESCRIPTION	DATE
B	COUNCIL RFI UPDATES	24.04.24
A	PRELIMINARY CIVIL ENGINEERING DESIGN	10.04.24

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

PROJECT:
CONCEPT ENGINEERING DRAWINGS

DRAWING TITLE :
TYPICAL ROAD CROSS SECTIONS

DEVEL. APPLIC. No. : -	DATE : 24.04.24
PROJECT LEADER : JONATHAN CUELL	
DESIGNER : TG	
DRAFTSPERSON : CD	
CHECKED : FRASER LUCAS	
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365	
RPEQ No. :	
SCALE : AS NOTED	DATUM : AHD / FULL SIZE : A1
PROJECT No.: BE230128-00	DRAWING No. : SK301 / VERSION: B



STORMWATER CATCHMENT PLAN

SCALE 15 0 15 30 45 60 75 (metres)
1 : 1500 (FULL SIZE)

PROPOSED LAND DEVELOPMENT

2983 FOREST HILL FERNVALE RD, LOWOOD QLD 4311

FOR LOWOOD ONE PTY LTD

A1 ORIGINAL SIZE BEFORE REDUCTION

VER.	DESCRIPTION	DATE
B	COUNCIL RFI UPDATES	24.04.24
A	PRELIMINARY CIVIL ENGINEERING DESIGN	10.04.24

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

PROJECT:

CONCEPT ENGINEERING DRAWINGS

DRAWING TITLE :

STORMWATER CATCHMENT PLAN

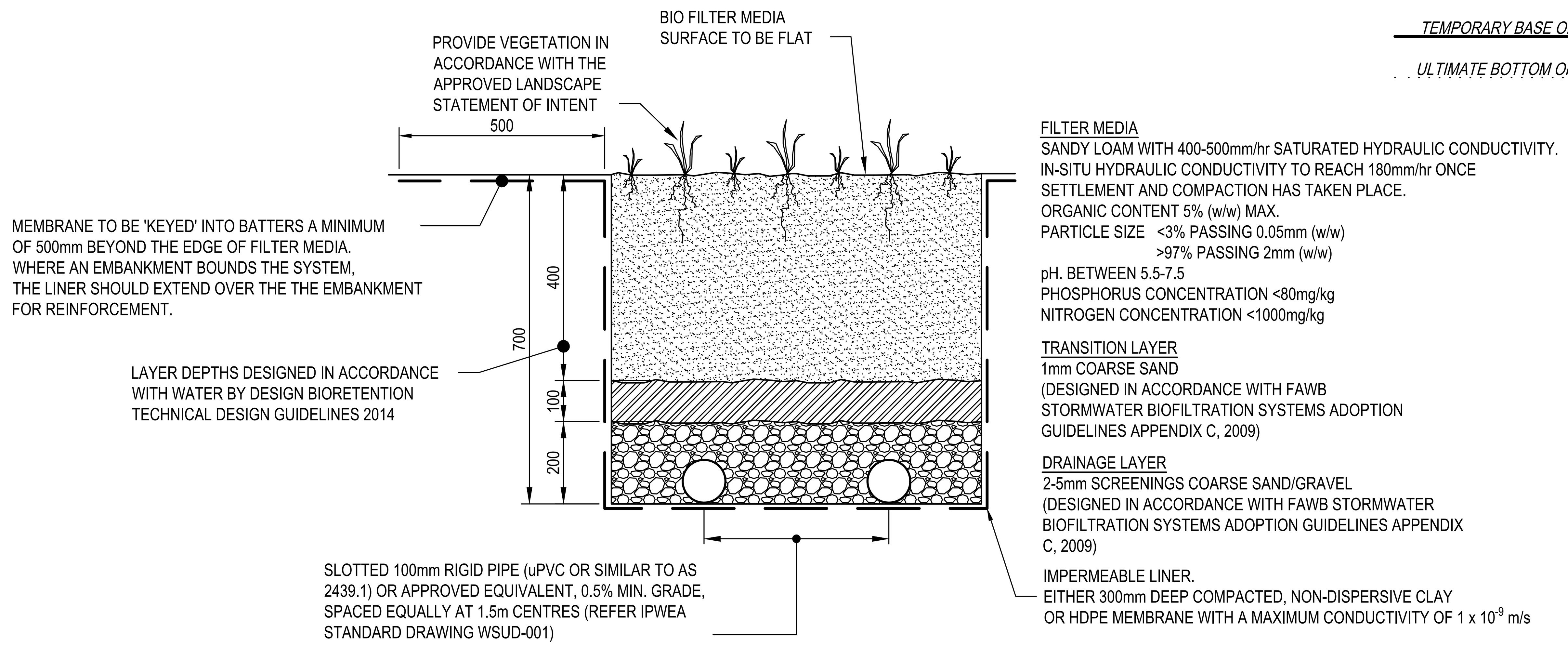
DEVEL. APPLIC. No. :	-
DATE :	24.04.24
PROJECT LEADER :	JONATHAN CUELL
DESIGNER :	TG
DRAFTSPERSON :	CD
CHECKED :	FRASER LUCAS

APPROVED FOR AND ON BEHALF OF
BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365

RPEQ No. :

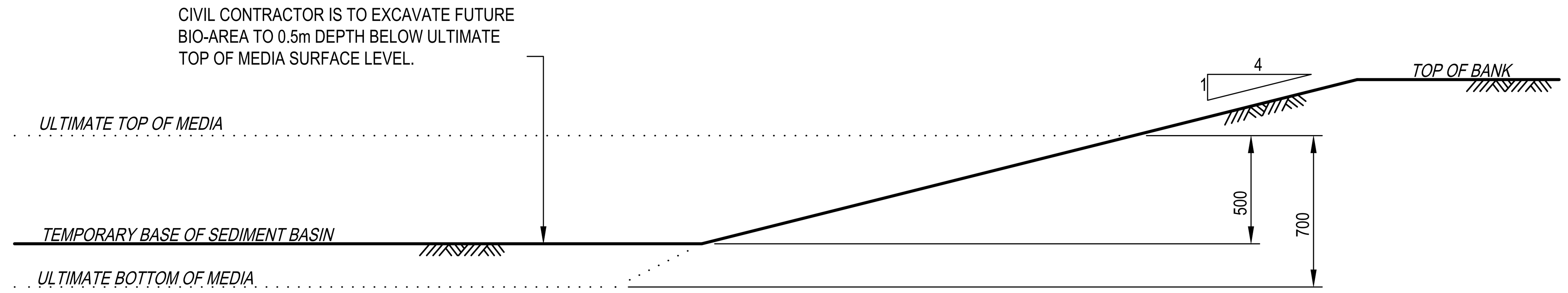
SCALE : AS NOTED	DATUM : AHD	FULL SIZE : A1
PROJECT No.: BE230128-00	DRAWING No. : SK305	VERSION: B

PRELIMINARY
NOT FOR CONSTRUCTION OR TENDER



TYPICAL BIO-RETENTION MEDIA CROSS SECTION

SCALE 0.1 0 0.1 0.2 0.3 0.4 0.5 (metres)
1 : 10 (FULL SIZE)



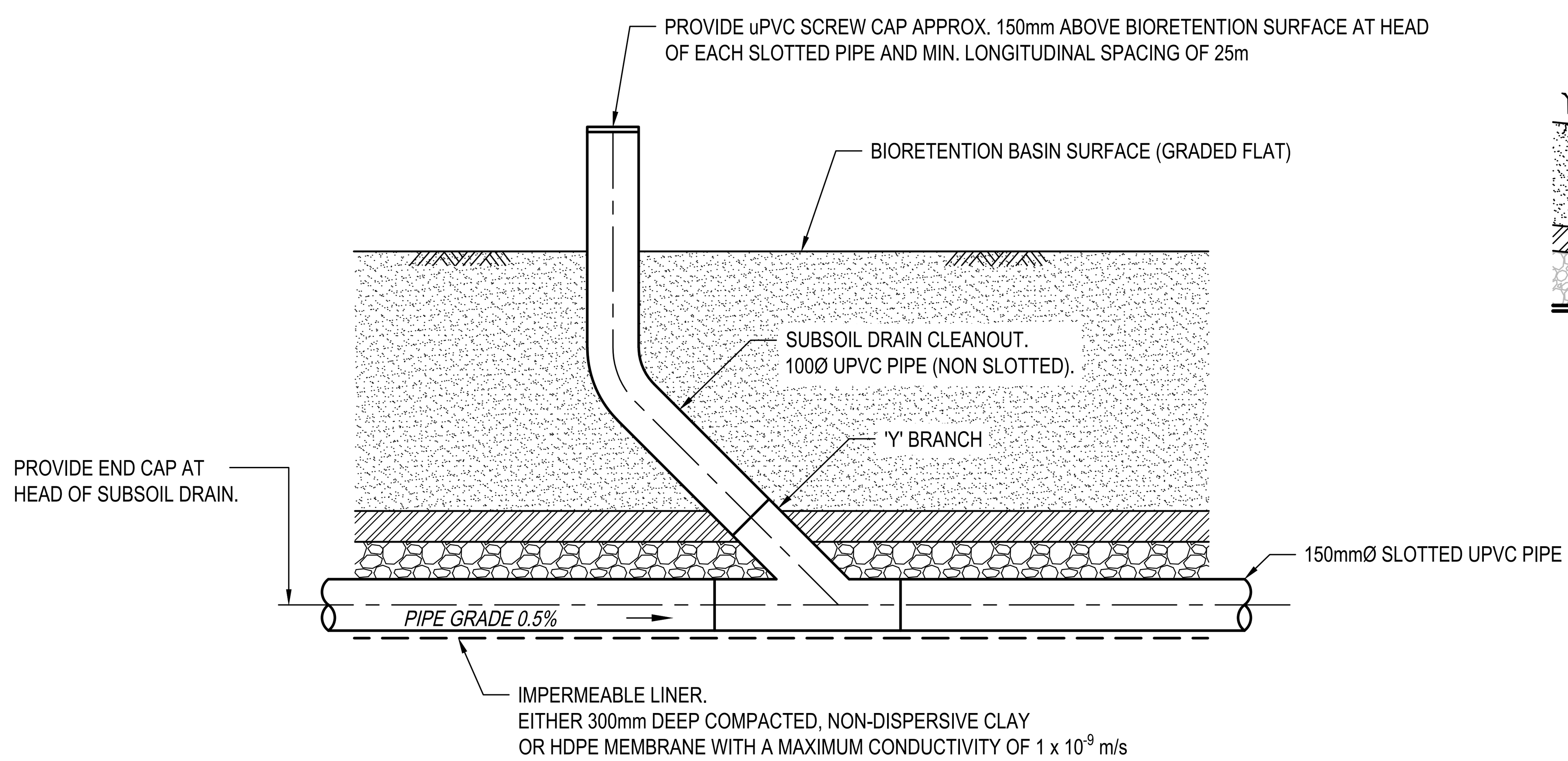
CONSTRUCTION PHASE 1 - CIVIL CONSTRUCTION PHASE

(TEMPORARY SEDIMENT CONTROL BASIN)

SCALE 0.2 0 0.2 0.4 0.6 0.8 1.0 (metres)
1 : 20 (FULL SIZE)

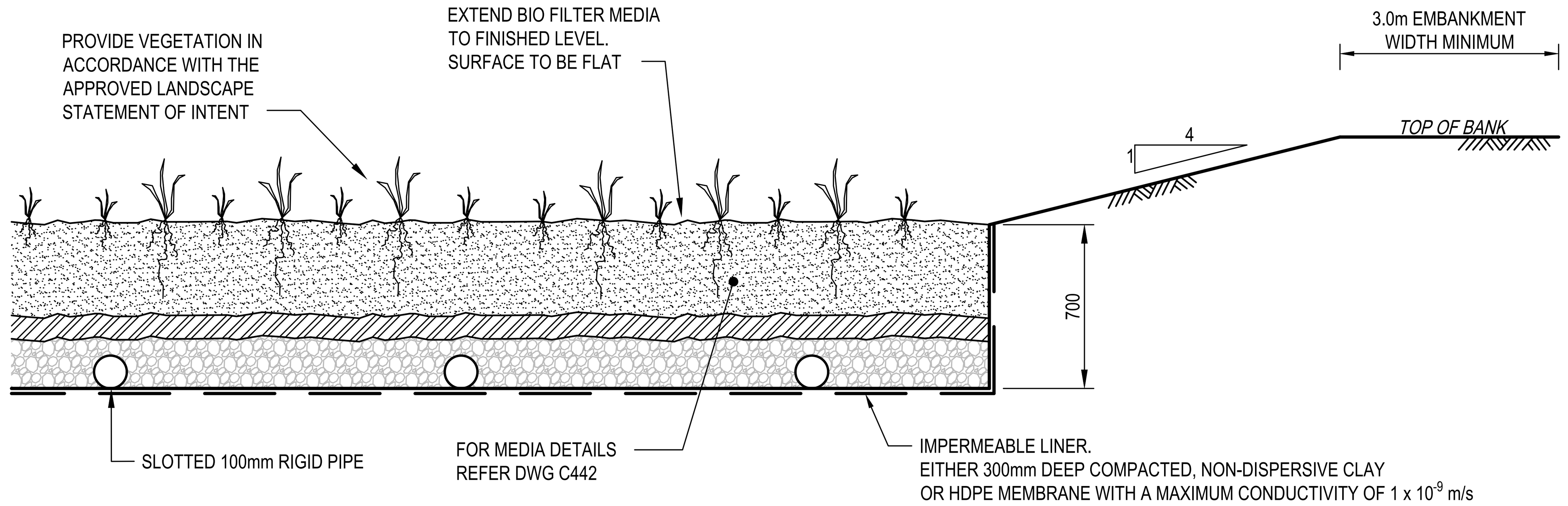
PHASE 1 NOTES - CIVIL CONSTRUCTION PHASE

- EXCAVATE BASIN TO NOMINAL 500mm DEPTH BELOW ULTIMATE TOP OF MEDIA LEVEL.
- SHAPE TEMPORARY SEDIMENT BASIN TO GENERAL EXTENTS OF ULTIMATE BASIN AND TO BASE LEVEL AS SHOWN ADJACENT AND ENSURE MINIMUM TOTAL SETTLING AND STORAGE VOLUME.
- CONTRACTOR TO MAINTAIN SEDIMENT BASIN AND PUMP-OUT AFTER RAINFALL EVENTS, INCLUDING MANUAL FLOCCULATION.



TYPICAL BIO-RETENTION BASIN SUBSOIL DRAIN CLEANOUT

NTS



CONSTRUCTION PHASE 2 - OPERATIONAL PHASE

(ULTIMATE BIO-RETENTION BASIN)

SCALE 0.2 0 0.2 0.4 0.6 0.8 1.0 (metres)
1 : 20 (FULL SIZE)

PHASE 2 NOTES - OPERATIONAL PHASE

- UPON COMPLETION OF 80-90% OF BUILDING WORKS IN THE CONTRIBUTING CATCHMENT AREA, REMOVE THE PROTECTIVE LAYERS (TURFING, TOPSOIL AND GEOTEXTILE).
- EXTEND BIO FILTER MEDIA TO ULTIMATE SURFACE LEVEL.
- ESTABLISH VEGETATION IN THE BIO-RETENTION BASIN IN ACCORDANCE WITH LANDSCAPE ARCHITECTS SPECIFICATION.

PRELIMINARY
NOT FOR CONSTRUCTION OR TENDER

PLOTTED: 25.04.2024 at 15:47

PROPOSED LAND DEVELOPMENT

2983 FOREST HILL FERNVALE RD, LOWOOD QLD 4311

FOR
LOWOOD ONE PTY LTD

A1 ORIGINAL SIZE BEFORE REDUCTION

VER.	DESCRIPTION	DATE
B	COUNCIL RFI UPDATES	24.04.24
A	PRELIMINARY CIVIL ENGINEERING DESIGN	10.04.24

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

PROJECT:
CONCEPT ENGINEERING DRAWINGS

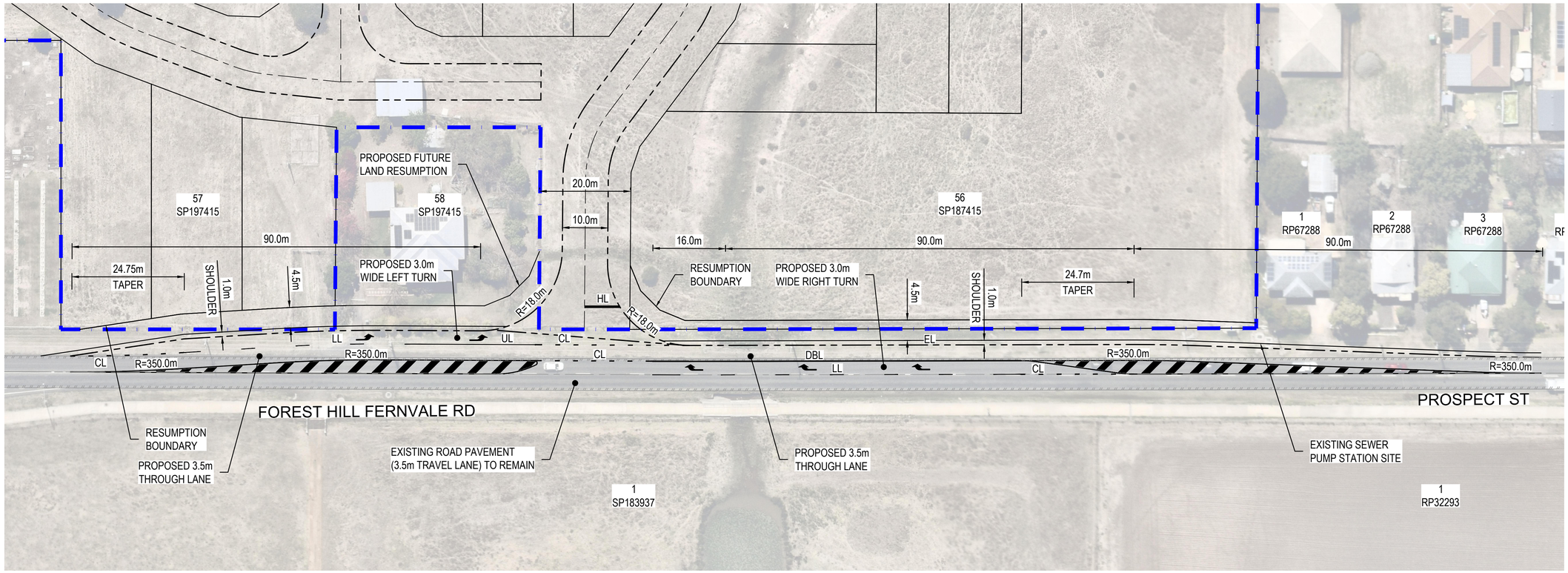
DRAWING TITLE :
TYPICAL BIO BASIN DETAILS

DEVEL. APPLIC. No. : -	DATE : 24.04.24
PROJECT LEADER : JONATHAN CUELL	
DESIGNER : TG	
DRAFTSPERSON : CD	
CHECKED : FRASER LUCAS	

APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365

RPEQ No. :

SCALE : AS NOTED	DATUM : AHD	FULL SIZE : A1
PROJECT No.: BE230128-00	DRAWING No. : SK310	VERSION: B



LEGEND

- DEVELOPMENT SITE BOUNDARY
- PROPOSED LOT BOUNDARY
- PROPOSED ROAD CONTROL LINE
- W — EXISTING Ø150 WATER MAIN
- RM — EXISTING SEWER RISING MAIN
- S — EXISTING SEWER MAIN
- C — EXISTING COMMS
- OH — EXISTING OVERHEAD ELECTRIC
- EXISTING FLOWPATH / WATERWAY

INTERSECTION FUNCTIONAL PLAN

SCALE 5 0 5 10 15 20 25 (metres)

1 : 500 (FULL SIZE)

PRELIMINARY
NOT FOR CONSTRUCTION OR TENDER

PROPOSED LAND DEVELOPMENT

2983 FOREST HILL FERNVALE RD, LOWOOD QLD 4311

FOR LOWOOD ONE PTY LTD

A1 ORIGINAL SIZE BEFORE REDUCTION

VER.	DESCRIPTION	DATE
B	COUNCIL RFI UPDATES	24.04.24
A	PRELIMINARY CIVIL ENGINEERING DESIGN	10.04.24

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

PROJECT:

CONCEPT ENGINEERING DRAWINGS

DRAWING TITLE :

INTERSECTION FUNCTIONAL PLAN

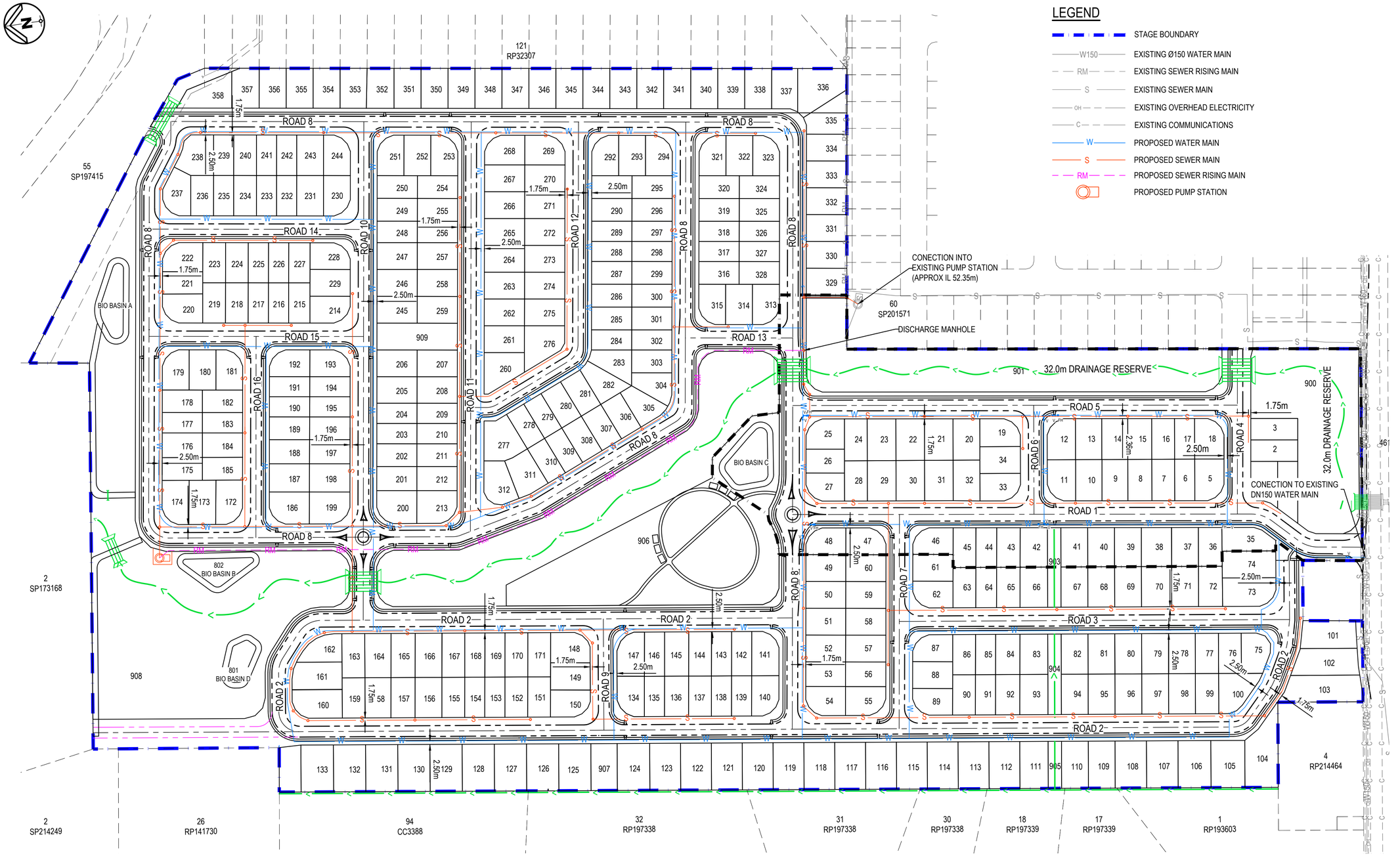
DEVEL. APPLIC. No. : -	DATE : 24.04.24
PROJECT LEADER : JONATHAN CUELL	
DESIGNER : TG	
DRAFTSPERSON : CD	
CHECKED : FRASER LUCAS	

APPROVED FOR AND ON BEHALF OF
BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365

RPEQ No. :

SCALE : AS NOTED	DATUM : AHD	FULL SIZE : A1
PROJECT No.: BE230128-00	DRAWING No. : SK320	VERSION: B

FILENAME: C:\Users\TuNgocNguyen\OT Vietnam Ltd Co\BCH23 - Documents\BE\2023\28 2983 Forest Hill Fernvale Rd\03 Civil\01 DWGs\xr A02 Acad\01 Master DWG\SK320-INTERSECTION FUNCTIONAL PLAN.dwg
PLOTTED: 25.04.2024 at 15:48



CONCEPT WATER AND SEWER LAYOUT PLAN

SCALE 15 0 15 30 45 60 75 (metres)
1 : 1500 (FULL SIZE)

PRELIMINARY
NOT FOR CONSTRUCTION OR TENDER

PROPOSED LAND DEVELOPMENT

2983 FOREST HILL FERNVALE RD, LOWOOD QLD 4311

FOR LOWOOD ONE PTY LTD

A1 ORIGINAL SIZE BEFORE REDUCTION

VER.	DESCRIPTION	DATE
B	COUNCIL RFI UPDATES	24.04.24
A	PRELIMINARY CIVIL ENGINEERING DESIGN	10.04.24

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

PROJECT:
CONCEPT ENGINEERING DRAWINGS

DRAWING TITLE :
CONCEPT WATER AND SEWER LAYOUT PLAN

DEVEL. APPLIC. No. :	-
DATE :	24.04.24
PROJECT LEADER :	JONATHAN CUELL
DESIGNER :	TG
DRAFTSPERSON :	CD
CHECKED :	FRASER LUCAS

APPROVED FOR AND ON BEHALF OF
BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365

RPEQ No. :

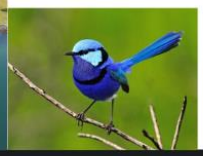
SCALE : AS NOTED	DATUM : AHD	FULL SIZE : A1

PROJECT No.:	DRAWING No. :	VERSION:
BE230128-00	SK500	B

FILENAME C:\Users\TJ.Nguyen\OT Vietnam Ltd Co\BCHQ\23. Documents\BCHQ2300\BE230128 2983 Forest Hill Fernvale Rd\03. Civil\01. DA\Rev A\02. Autocad\1. Master DA\SK500 CONCEPT WATER AND SEWER LAYOUT PLAN.dwg
PLOTTED: 25.04.2024 at 15:48

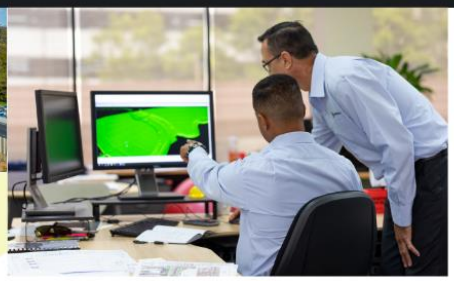
BURCHILLS
ENGINEERING SOLUTIONS



The experience **you deserve**



2983 Forest Hill Fernvale Road, Lowood

Master Stormwater Management Plan

Client: Lowood One Pty Ltd
Project No: BE230352
Document No: BE230128-RP-MSMP-02

April 2024

Document Control Record

Prepared by:	Melissa Blum
Position:	Senior Water Engineer
Signed:	
Date:	26/04/2024

Approved by:	Samuel Huddy
Position:	Senior Water Engineer RPEQ 29555
Signed:	
Date:	26/04/2024

Version No.	Description	Date	Prepared	Approved
00	Draft Issue	30/11/2023	MB	SH
01	Initial DA Submission	08/12/2023	MB	SH
02	Revised layout	26/04/2024	MB	SH

Recipients are responsible for eliminating all superseded documents in their possession

Coote Burchills Engineering Pty Ltd ACN: 166 942 365

Level 2, 26 Marine Parade SOUTHPORT QLD 4215
PO Box 3766, Australia Fair SOUTHPORT QLD 4215
Telephone: +61 7 5509 6400

Level 14, 167 Eagle Street BRISBANE QLD 4000
PO Box 83, BRISBANE QLD 4000
Telephone: +61 7 3606 0201

Unit 4, 462 Ruthven Street TOOWOOMBA QLD 4350
PO Box 1439, TOOWOOMBA QLD 4350
Telephone: +61 7 4580 4970

Level 1, 12 Byron Street BANGALOW NSW 2479
PO Box 315 BANGALOW NSW 2479
Telephone: +61 422 169 163

Level 1, 91 Landsborough Avenue SCARBOROUGH QLD 4020
PO Box 238, SCARBOROUGH QLD 4020
Telephone: +61 409 935 884

Level 3, 16 East Street IPSWICH QLD 4305
Telephone: +61 429 056 347

Email: admin@burchills.com.au

Executive Summary

Lowood One Pty Ltd have engaged Burchills Engineering Solutions to prepare a Master Stormwater Management Plan (MSMP) to accompany the Development Application to allow for the future staged development of a 358 lot subdivision on 2983 Forest Hill Fernvale Road, Lowood.

The MSMP has referenced relevant guidelines relating to stormwater management to form the conceptual basis of the stormwater plan. The following conclusions have been made as a result of this study.

Stormwater Quantity

It is proposed to use on-site detention (OSD) to maintain pre-developed flows from the site to the 1% AEP event. This has been achieved through the design of an open channel through the site that can convey the post-development 1% AEP flows. In addition, the bio-retention basins will also provide some detention.

It is also proposed to divert the external catchment flows around the site, using the following infrastructure:

- Flows from the west diverted using a cut-off drain and underdrainage at the rear of the lots.
- Flows from the residential area to the south-east using the internal road network and stormwater infrastructure to direct flows into the open drainage channel.
- Flows from the residential area to the north-east via formalisation of the existing channel.
- Flows from the regional catchment to the south of the site via the proposed open channel through the Site.

Hydraulic Assessment

The hydraulic assessment has been undertaken using Council's Lowood Flood Study TUFLOW model. The assessment has determined that the development is capable of remaining flood free during the 1% AEP flood event and that the impacts associated with the development are considered non-actionable.

Stormwater Quality

The stormwater quality on-site is proposed to be managed through the use of four bioretention basins. The total filter area of the bioretention basins is 2,650m^2. These basins achieve the Water Quality Objectives, in line with the Somerset Region Planning Scheme (Version 4.2) and the SEQ Water 'Water Quality Management in Drinking Water Catchments Development Guidelines' (2017).

Construction Management for Erosion and Sediment

Stormwater runoff quality during the construction phase of this development shall be managed in accordance with Best Practice Erosion and Sediment Control (IECA, 2008). The measures that have been identified are a generic approach to construction phase stormwater quality management. Site-specific details of the erosion and sediment control systems and procedures will be provided for each development stage when more information is available regarding in-situ soils and development staging.

Table of Contents

Tables

Figures

Appendices

1. Introduction

Lowood One Pty Ltd have engaged Burchills Engineering Solutions to prepare a Master Stormwater Management Plan (MSMP) to accompany a Development Application to be submitted to Somerset Regional Council (the 'Council' or 'SRC'). The Application sought is a Preliminary Approval for a Variation Request pursuant to section 50 of the Planning Act 2016 to allow for the future staged development of a 358 lot subdivision, including 19 duplex allotments.

The properties included in this Development Application include:

- Lot 56 Forest Hill Fernvale Road, Lowood (Lot 56 on SP 197415); and
- Lot 57 Forest Hill Fernvale Road, Lowood (Lot 57 on SP 197415).

1.1 Regulatory Requirements and Technical Guidelines

The strategies proposed in this MSMP have been developed to address the requirements of the Somerset Region Planning Scheme (Version 4.2), and have also been prepared in accordance with the following guidelines:

- SC6.5.9 Somerset Region Planning Scheme, Version 4.2 (SRC, 2016)
- *State Planning Policy July 2014* (DSPIP, 2014)*;*
- Queensland Urban Drainage Manual (QUDM) Fourth Edition (IPWEAQ, 2017);
- Australian Rainfall & Runoff: A Guide to Flood Estimation (Ball J, 2016);
- Australian Government – Bureau of Meteorology (Bureau of Meteorology, n.d.);
- MUSIC Modelling Guidelines (Water By Design, 2010);
- WSUD Technical Guidelines for South East Queensland – Version 1 (Healthy Waterways, BCC, MBWCP, 2006);
- Concept Design Guidelines for Water Sensitive Urban Design - Version 1 (Water By Design, 2009);
- Maintaining Vegetated Stormwater Assets - Version 1 (Water By Design, 2012);
- Wetland Technical Design Guidelines – May 2017 (Water By Design, 2017)
- Best Practice Erosion and Sediment Control (IECA, 2008); and
- Best Practice Erosion and Sediment Control Appendix B - Draft Document Revision December 2016 (IECA, 2016).

1.2 Purpose

The main objectives of this SMP have been established based on the following general set of criteria.

- Avoid the creation of nuisance flow or hazard problems;
- Protect the quality of surface and ground waters during construction and operation of new development;
- Maintain the natural hydraulic behaviour of catchments;
- Protect existing natural features and ecological processes; and
- Integrate stormwater management infrastructure carefully in the urban and natural landscape.

1.3 Scope

To achieve the above mentioned objectives, this SMP details the following:

- Site description including:
  - Topography;
  - Land Use; and
  - Vegetation.
- Erosion and Sediment:
  - Best Practice Erosion and Sediment Control Measures (IECA 2008) for the construction phase of the development.
- Stormwater Quantity:
  - Control measures to ensure no net increase in peak discharge from the subject site (up to the 1% Average Exceedance Probability (AEP)).
- Flood Impact:
  - Ensure that the development does not cause an adverse flood impact external to the subject site.
- Stormwater Quality:
  - Methods to ensure quality objectives of the receiving waters are achieved.

To minimise the impact of the proposed development on the external environment and to avoid significant and / or sustained deterioration in downstream water quality the proponent shall implement this SMP. This SMP may be amended as required, in response to a monitoring and maintenance program.

2. Site Details

2.1 Location

The subject site is located at, QLD, formally described as Lot 56 and 57 SP 197415. The site is identified by the Somerset Region Planning Scheme (Version 4.2) as *'Emerging Community.* Figure 2.1 below identifies the location of the subject site.

Figure 2.1 Subject Site Location (QLD Globe, 2023)

2.2 Existing Land Uses and Vegetation

The subject site is currently undeveloped and largely cleared. There is an existing open drain flowing through the site. The site is bounded by residential lots to the east and west, and by rural residential to the south and open space to the north. Access to the Site is from Forest Hill Fernvale Road.

2.3 Existing Topography

In general, the site drains to the north-east, with elevations ranging from 61m AHD to 50m AHD, and the outlet of the open drain at approximately 49m AHD.

Figure 2.2 Site Contours

2.4 Downstream Environment

Stormwater discharges from the site predominantly via the open drain running through the property, where it ultimately drains into Brisbane River.

2.5 Proposed Development

The proposed subdivision is for 358 lots, including 19 duplex allotments, requiring the filling of part of the Site above the Design Flood Level (1% AEP plus 300mm freeboard). A channel through the Site is proposed, to maintain the natural drainage through the site, while also providing on-site storage for flows up to the 1% AEP event. The Site will also include open space and bio-retention basins. Figure 2.3 shows the Site Plan prepared by Burchills Engineering Solutions, which is also included in Appendix A of this report.

Figure 2.3 Design Concept Plan (Burchills, 2024)

3. Stormwater Quantity Management Plan

3.1 Overview

The following section of this report outlines the measures required to meet the objective in regard to stormwater quantity. In order to meet the objective, it is necessary to ensure that the post development discharge from the site will not create a worse situation for downstream property owners than that which existed prior to the development (i.e. non-worsening) (IPWEAQ, 2017).

Due to the increase in impervious areas within the proposed development, peak stormwater flow rates will increase. In order to mitigate these flow rates from the development site, it is proposed to implement an online On-Site Detention (OSD) system. OSD systems temporarily store stormwater runoff and release flows at a controlled rate that is no greater than the pre-developed peak flow rate.

3.2 Conveyance of Flows

Important information about the conveyance of flows for the pre- and post-development scenarios are presented in Table 3.1. Pre- and post-development catchment plans are shown in Figure 3.1and Figure 3.2 and are also presented in Appendix C.

Table 3.1 Conveyance of Flows

Subject	Description
Lawful points of Discharge (LPD)	There is one LPD for the site: the outlet for the open drain through the Site.
Pre-development	**External catchment flows** Flows from BUR-LOW 80 are conveyed to the site via the existing stormwater network and discharged into the open drain through the site. Flows from BUR-LOW 89 are conveyed to the site via the existing stormwater network and discharged into the open drain along the north-eastern boundary. Flows from BUR-LOW 30 and 88 are conveyed via sheet flow across the site until entering the open drain through the middle of the site.
	Internal catchment flows Flows from the site are conveyed via sheet flow into the open drain through the site. Flow discharges the site at the LPD at the northern outlet of the drain, into catchment BUR-LOW 20.
	Downstream catchment flows BUR-LOW 20 accepts flows from BUR-LOW-87 and EXT and conveys them via an open drain to the north of the Site
Post-development	**External catchment flows** As per pre-development scenario, flows from BUR-LOW 80 are conveyed to the site via the existing stormwater network and discharged into the proposed channel through the site.

Subject	Description
	As per pre-development scenario, flows from BUR-LOW 89 are conveyed to the site via the existing stormwater network and discharged into the open drain along the north-eastern boundary. Flows from BUR-LOW 30 and 88 are conveyed via sheet flow to the site boundary. Flows will then be collected and piped to the proposed channel through the development.
	Internal catchment flows Flows from the internal catchments will be conveyed through the internal stormwater system to the relevant bioretention basin, as outlined below: - Post-01 to bioretention basin A - Post-02 to bioretention basin B - Post-06 to bioretention basin C - Post-07 to bioretention basin D The bioretention basins will discharge to the proposed open drain and OSD system, which has been designed to contain the 1% AEP design event flows. The proposed drain will discharge at the LPD.
	Downstream catchment flows As per the pre-development scenario.

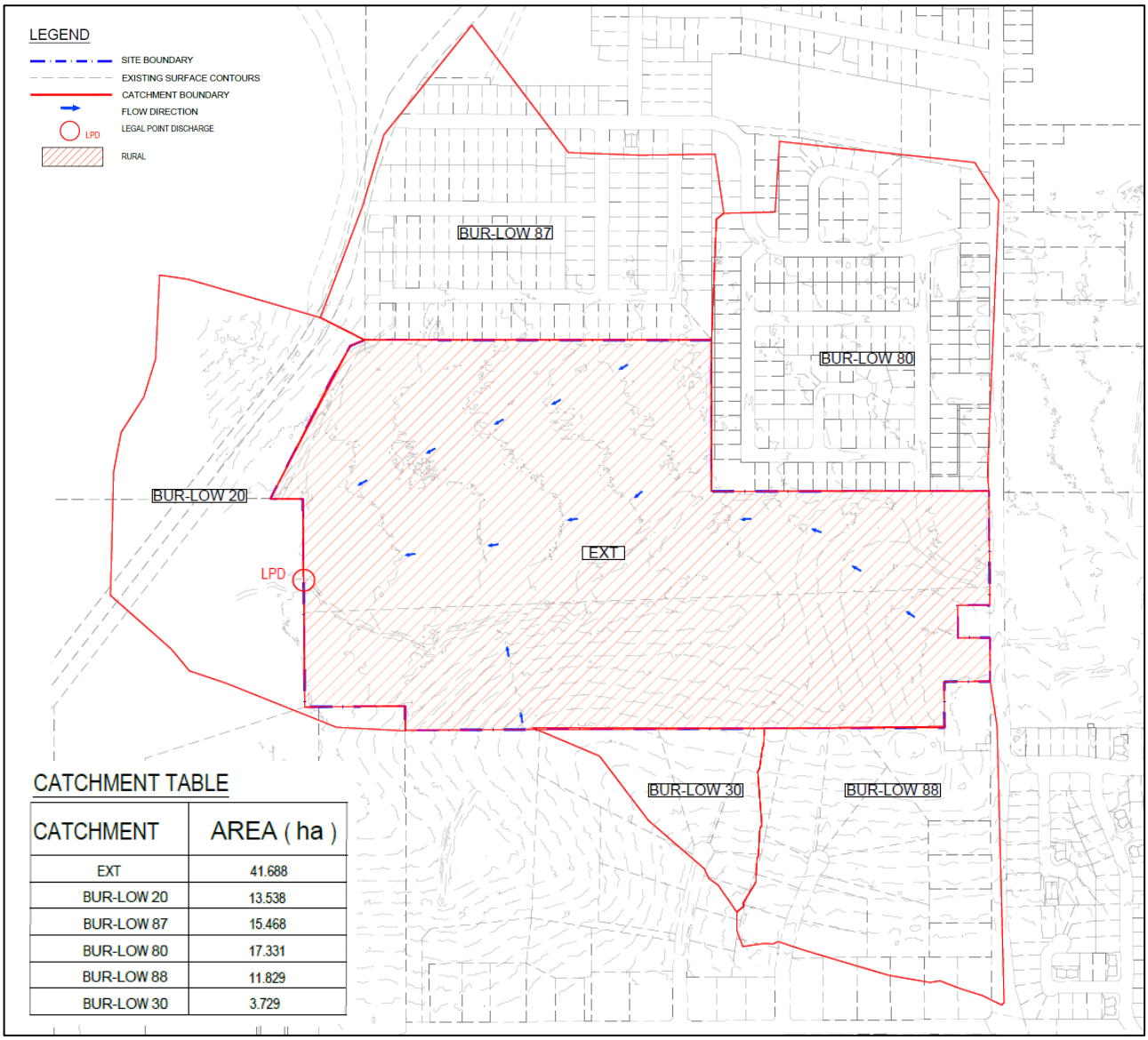
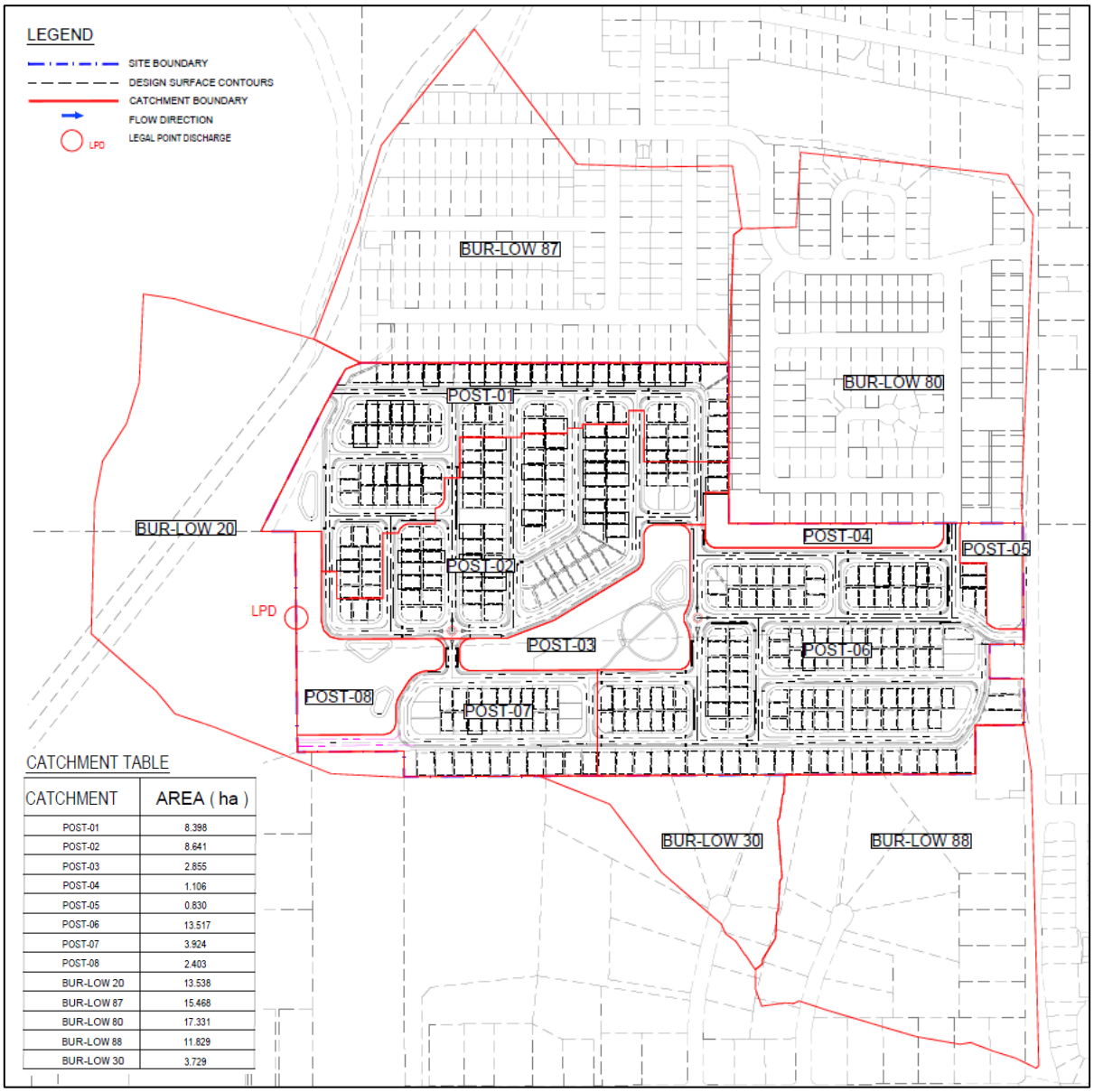


Figure 3.1 Pre-Development Catchment Map



CATCHMENT	AREA (ha)
POST-01	8.398
POST-02	8.641
POST-03	2.855
POST-04	1.106
POST-05	0.830
POST-06	13.517
POST-07	3.924
POST-08	2.403
BUR-LOW 20	13.538
BUR-LOW 87	15.468
BUR-LOW 80	17.331
BUR-LOW 88	11.829
BUR-LOW 30	3.729

Figure 3.2 Post-Development Catchment Map

3.3 Regional Detention Basin

3.3.1 Detention Configuration

It is proposed to design an open channel through the Site that can convey the 1% AEP post-development flows, ensuring that there is no increase in flows at the LPD. In addition, the bio-retention basins will also provide some detention. Details of the detention basins and locations of the basins are shown in Table 3.2 and Figure 3.3 respectively.

Table 3.2 OSD Details

Basin ID	Low Flow Outlet Pipe	High Flow Weir
Basin 1	2 x 2100 x 600 RCBC 1 x 1500 x 600 RCBC	49m RL 50.4
Basin 2	1 x 600 RCP	22m RL 50.4

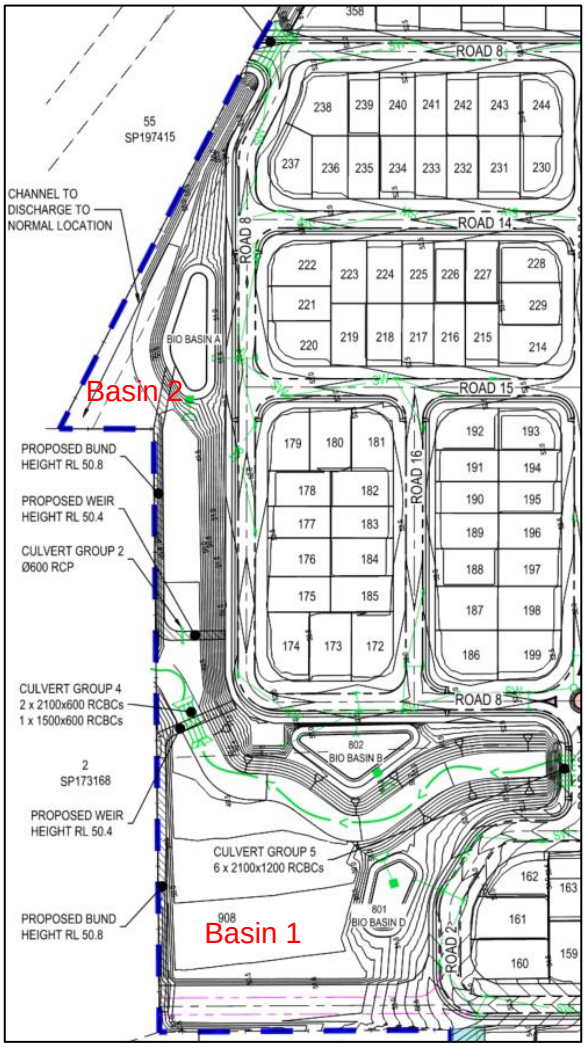


Figure 3.3 Basin Locations

3.3.1 Basin Depths

The preliminary hydraulic model has identified that peak water depths within the basin are in accordance with those outlined in QUDM, the following table includes information in relation to the basin depth.

Table 3.3 Detention Basin Depths 5% AEP Event

Basin ID	Event	Peak Water Surface (m AHD)	Detention Base Level (m AHD)	Peak Depth of Water – Detention Basin (m)
Basin 1	5% AEP	50.63	49.39	1.24
	1% AEP	50.70		1.32
Basin 2	5% AEP	50.47	49.22	1.26
	1% AEP	50.52		1.31

An assessment of basin freeboard has been completed. The critical 1% AEP storm event was simulated to confirm the freeboard level achieved; the results are presented in Table 3.4.

Table 3.4 Detention Basin Freeboard 1% AEP Event

Basin ID	Freeboard Achieved to detention Basin Top of Bund (m)	Peak Depth Over Weir (m)
Basin 1	0.08	0.12
Basin 2	0.03	0.12

3.3.2 Future Assessment

Given the conceptual level of design completed on the basin, the following assessment items / basin performance criteria are specified:

- Sensitivity analysis for basin / culvert blockage
- Basin Risk Assessment & Safety in Design Analysis

3.4 External Catchment Management

3.4.1 Catchment BUR-LOW 30

It is proposed that the external catchment BUR-LOW 30 will be conveyed via a cut-off drain at the rear of lots 118-105. The cut-off drain has been designed to convey the 1% AEP critical event while maintaining freeboard. The Manning's Open Channel equation was utilised to adequately size the channel, details of the equation inputs and results are shown below in Table 3.5.

Table 3.5 BUR-LOW 30 Mannings Channel Equation Inputs

Parameter	Value
Design 1% AEP Flow	1.47 m^3/s
Bottom Width	1 m
Side Batters	1V:2H
Manning Roughness	0.013 Concrete
Channel Slope	1%
Flow Depth	0.5 m
Top Width	3 m
Channel Capacity	**3.52 m3/s**

3.4.2 Catchment BUR-LOW 88

It is proposed that the external catchment BUR-LOW 88 will be conveyed via a cut-off drain and underdrainage at the rear of lots 905-104. The cut-off drain has been designed to convey the 1% AEP critical event while maintaining freeboard. Shown below in Table 3.6 are relevant input parameters.

Table 3.6 BUR-LOW 88 Mannings Channel Equation Inputs

Parameter	Value
Design 1% AEP Flow	4.47 m^3/s
Bottom Width	1 m
Side Batters	1V:2H
Manning Roughness	0.013 Concrete
Channel Slope	1%
Flow Depth	0.5 m
Top Width	3 m
Channel Capacity	**3.52 m^3/s**
Underdrainage Pipe Size	1.05 m
Blockage Factor	50%
Pipe Slope	1%
Pipe Capacity	**1.78 m^3/s**
Total System Capacity	**5.3 m^3/s**

3.4.3 Catchment BUR-LOW 80

It is proposed the external catchment BUR-LOW 80 will be conveyed onto the internal road network and into the open drainage channel via the stormwater infrastructure. Refer to the civil engineering drawings in Appendix D.

3.4.4 Catchment BUR-LOW 87

It is proposed to formalise the existing channel conveying runoff from BUR-LOW 87 to properly contain the flow and prevent flooding of the development. The proposed channel configuration is summarised in the following table.

Table 3.7 BUR-LOW 87 Mannings Channel Equation Inputs

Parameter	Value
Design 1% AEP Flow	4.91 m^3/s
Bottom Width	5 m
Side Batters	1V:4H
Manning Roughness	0.05 Unmaintained grass
Channel Slope	0.5%
Flow Depth	0.7 m
Top Width	10.6 m
Channel Capacity	**5.46 m3/s**

3.4.5 Catchment Major Regional

It is proposed to convey runoff from the major external catchment via a proposed open channel through the site, running south to north. The channel will convey an external catchment greater than 250ha and will contain a low-flow channel component to be design at a later stage. The proposed channel configuration is summarised in the following table.

Table 3.8 Major Regional Mannings Channel Equation Inputs

Parameter	Value
Design 1% AEP Flow	34.2 m^3/s
Bottom Width	20 m
Side Batters	1V:4H
Manning Roughness	0.06 Unmaintained grass
Channel Slope	0.7%
Flow Depth	1.1m
Top Width	32 m
Channel Capacity	**35.5 m^3/s**

4. Hydraulic Assessment

4.1 Hydraulic Model

4.1.1 Overview

Burchills have utilised Councils Lowood Flood Study (Water Technology, 2019) TUFLOW model for this assessment. The Lowood model represents the Lowood local catchment, draining into the Brisbane River to the north. the model does not include Brisbane River flooding. The model covers an area of 17km^2 and uses a 3m grid resolution. The resolution of the model is considered fit-for-purpose.

The refined Lowood model will be used for two purposes:

1. To design and test the proposed OSD, ensuring that there is no significant increase in flood level downstream, and

2. To undertake a Hydraulic Impact Assessment (HIA) to ensure that the proposed development is not resulting in a negative change in flood behaviour off-site (Section 4.2).

The information below provides a summary of the TUFLOW modelling, including any changes to the model. Distinction is made between any updates to the existing case scenario, as opposed to the post-development scenario.

4.1.2 Hydraulic Model Representation

The existing model domain and grid resolution were considered adequate for the HIA and have been retained.

4.1.3 Model Scenarios and Events

Two (2) distinct model scenarios were simulated for the HIA:

- Pre-development scenario – represents the existing conditions of the subject site and surrounding area in the TUFLOW model.
- Post-development scenario – represents the post-development conditions of the subject site, including the fill pads, access road and open channel.

In addition to the two above-mentioned scenarios, the following events were assessed:

- 0.5 EY
- 0.2 EY
- 10% AEP
- 5% AEP
- 2% AEP
- 1% AEP

4.1.3.1 Critical Duration Assessment

A critical duration and temporal pattern assessment was undertaken for the 1% AEP event, in accordance with ARR 2019. This involves simulating a range of durations from the 60 minute to the 720 minute for all 10 temporal patterns to determine which combination will produce the highest flows.

From this assessment, it was determined that the durations and temporal patterns shown in Table 4.1 below were critical.

Table 4.1 Critical Duration and Temporal Patterns

Event	Duration	Temporal Pattern
0.5EY	540 minutes	6
0.2EY	180 minutes	7
10%	120 minutes	7
5%	120 minutes	9
2%	90 minutes	8
1%	90 minutes	5

4.1.4 Model Extent and Boundary Conditions

The rainfall inflows for the model were refined across the Site, to better represent the Site behaviour in the pre- and post-development scenarios. The downstream boundaries have been retained as per Council's model.

The model inflow and outflow locations used in the refined TUFLOW model as well as the new hydraulic model extent are illustrated in Figure 4.1 below.

4.1.5 Model Topography

Council's model utilises LiDAR flown in 2009, as shown in Figure 4.2. To our knowledge, this is the best available topography data for the area and has been used for this study.

The post-development topography was based upon the bulk earthworks plan (refer to Appendix A) and is shown Figure 4.3.

4.1.6 Model Roughness

Figure 4.1 shows the pre-development model roughness, Figure 4.4 shows the post-development model roughness and Table 4.2 provides the Manning's n value assigned to each type of land use within the refined TUFLOW model.

Table 4.2 Model land use and roughness

Land use type	Manning's n
Road	0.025
Buildings	1.00
Low density residential	0.15
Medium density residential	0.02
Medium dense vegetation / creek channel	0.08
Minor overland flow paths	0.045
Open water bodies	0.03

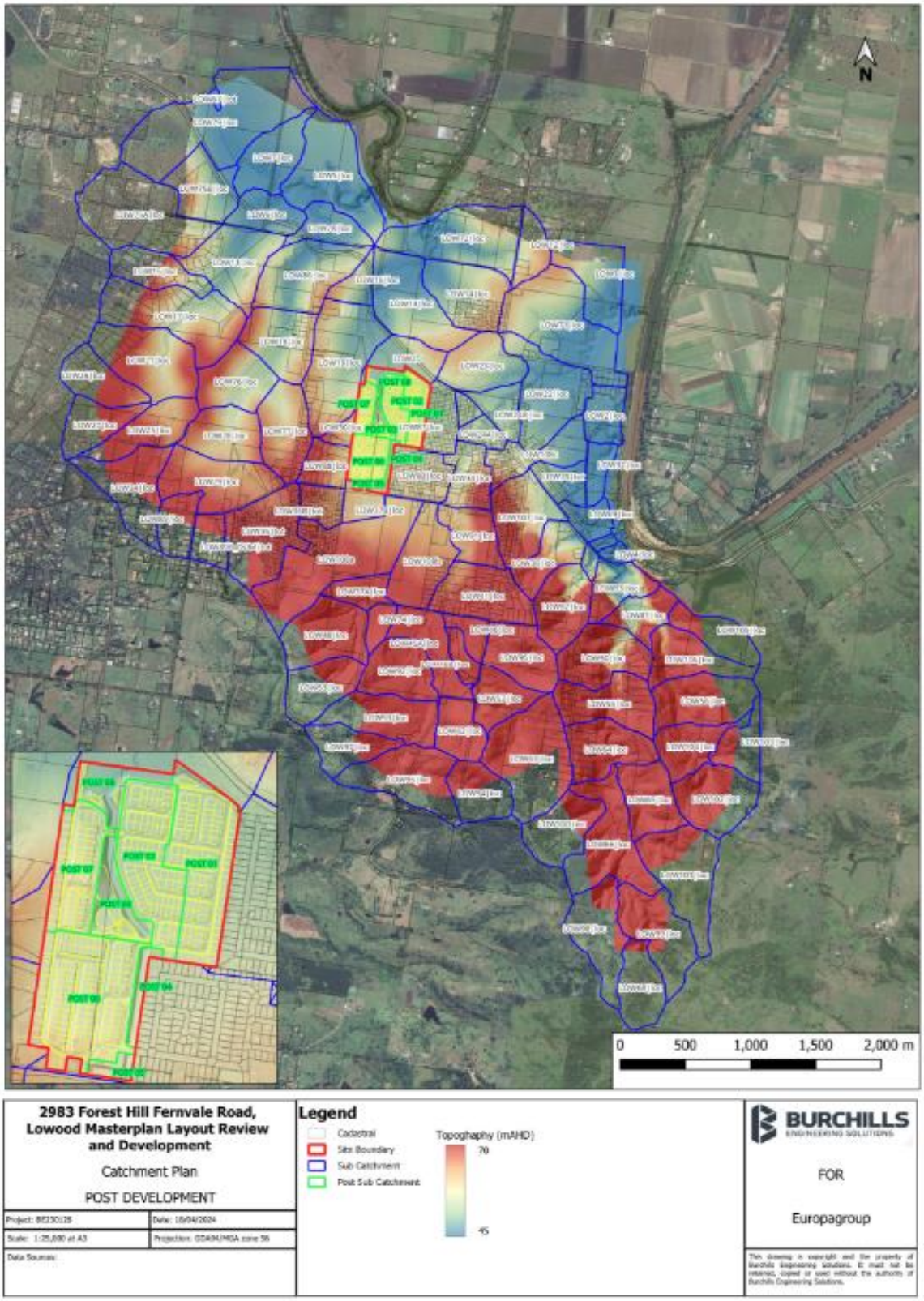


Figure 4.1 Post-development TUFLOW Model Features

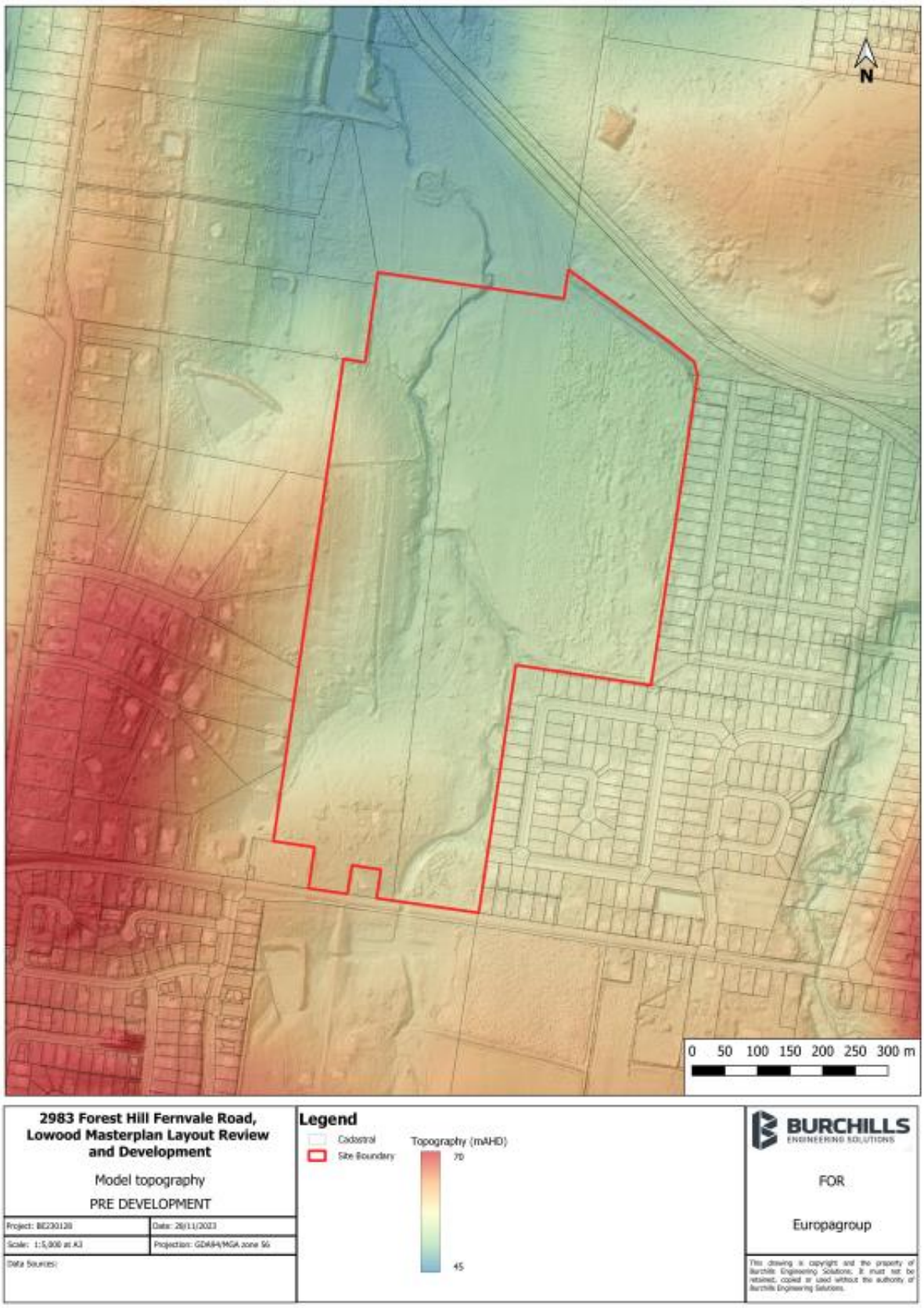


Figure 4.2 Pre-Development Model Topography

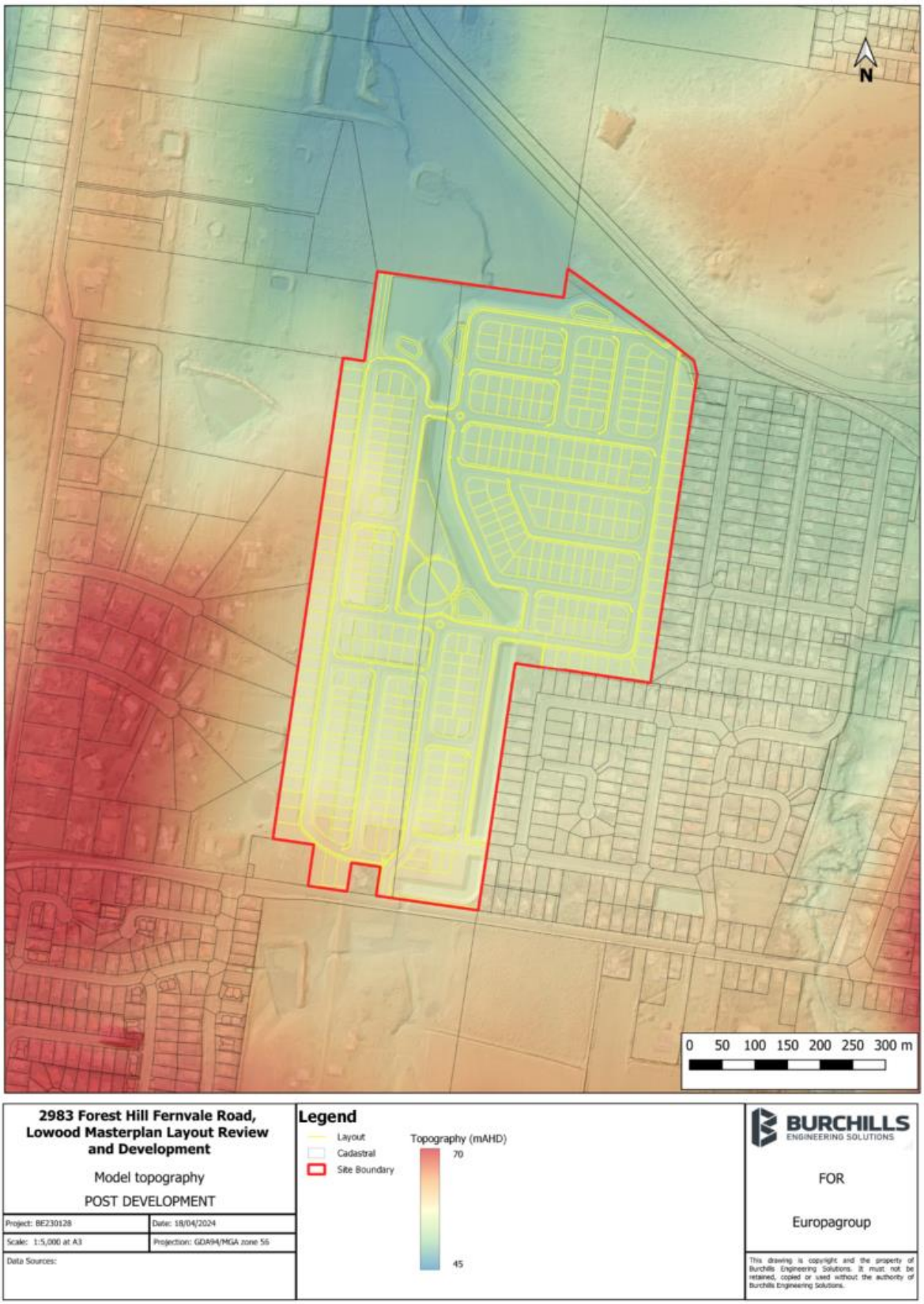


Figure 4.3 Post-Development Model Topography

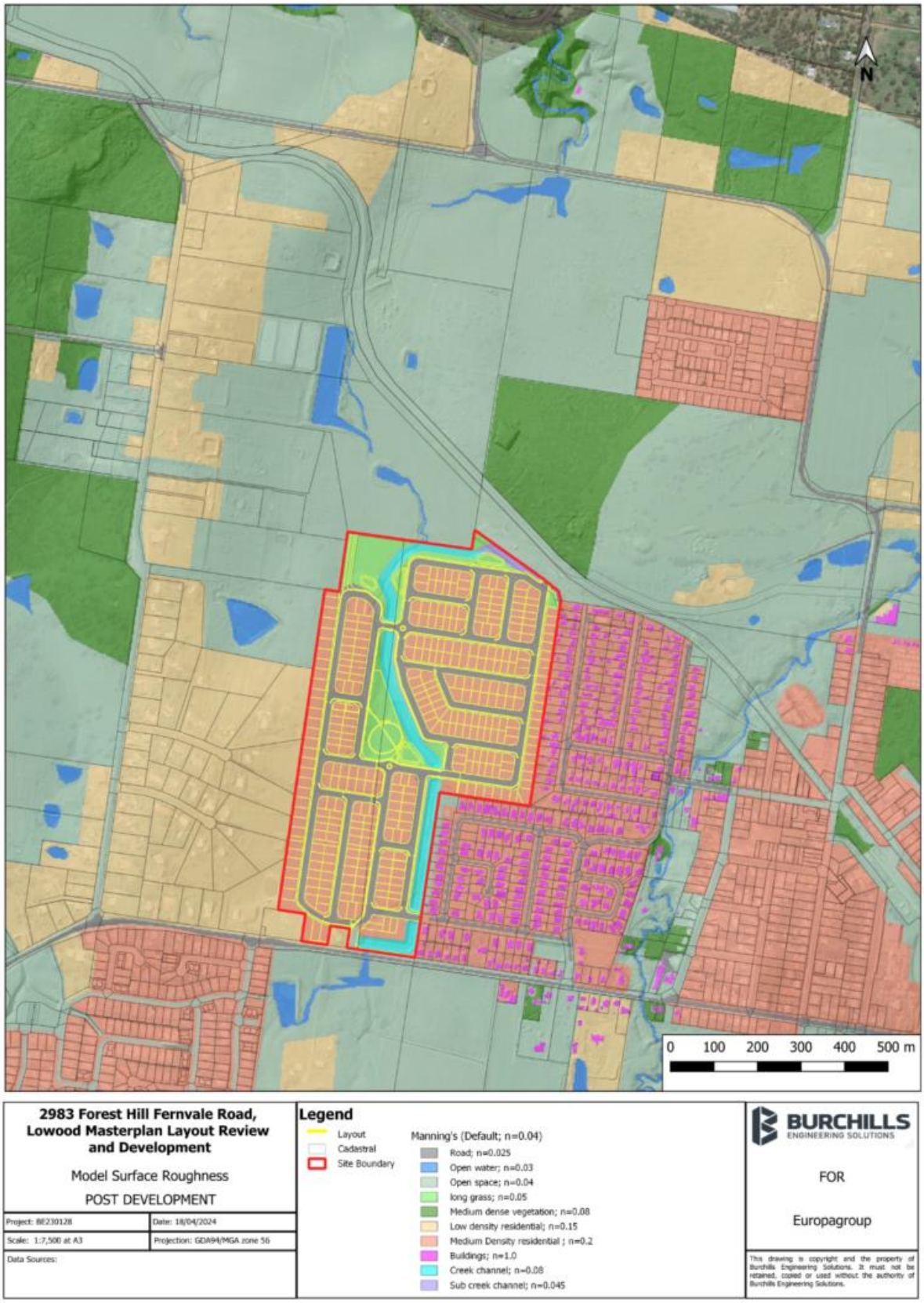


Figure 4.4 Post-Development Model Surface Roughness

4.1.7 Post-Development Scenario Representation

The post-development topography was represented in the model through the design DEM, as outlined in Section 4.1.5, and included the fill pads, basins and channel.

In addition to this, a bund has been included along the northern boundary, with 3 x 2.1m x 0.6m culverts controlling the outflow from the Site.

The updated layout also includes an access road at the north-eastern corner of the site, which crosses the existing channel. 3 x 2.1m x 0.6m culverts have been placed at this road crossing to ensure that the conveyance of flow is maintained.

The proposed culverts are shown in Figure 4.5 below.

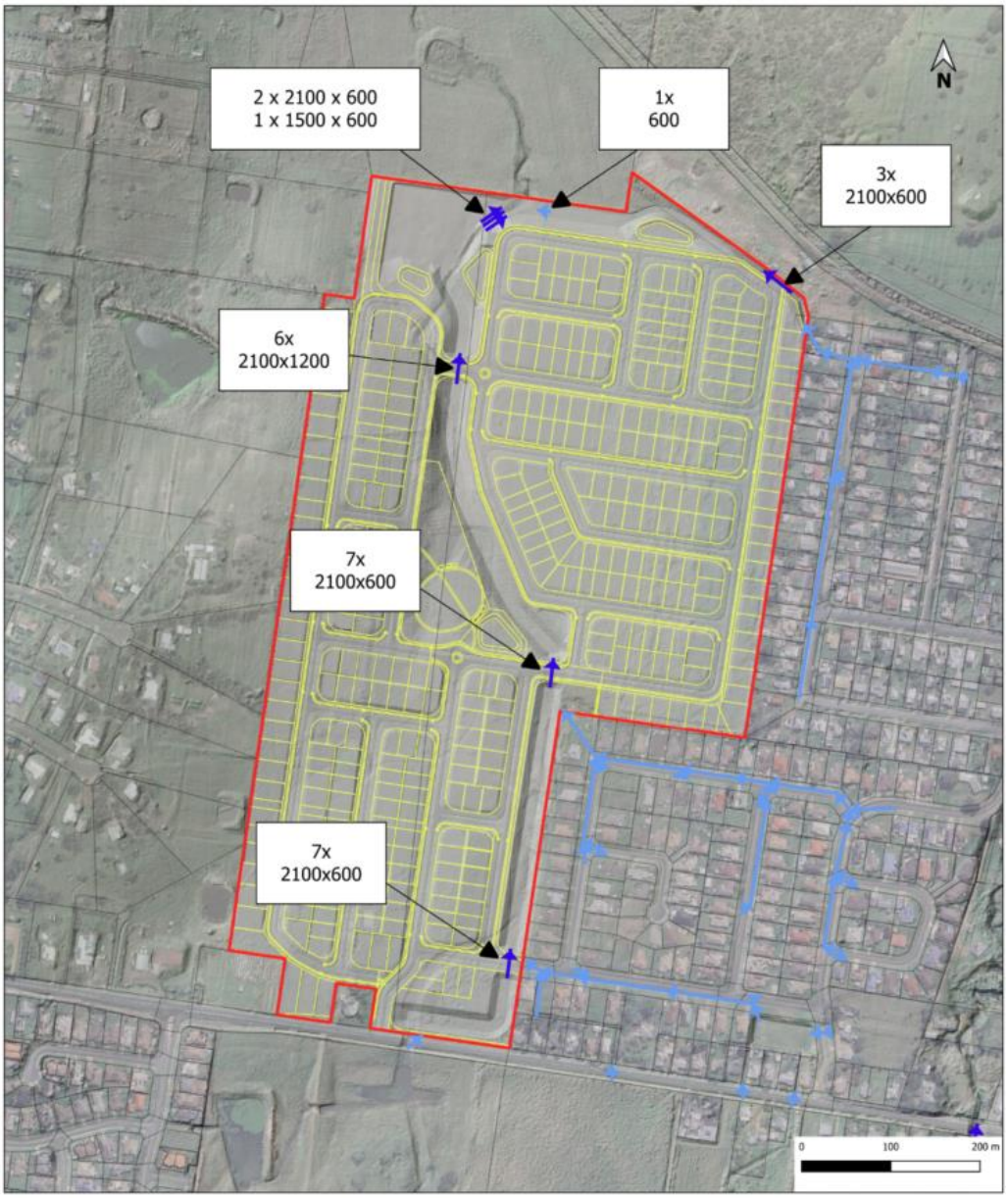


Figure 4.5 Post-Development Model Pipe Network

4.1.7.1 Post-Development Hydrology

The hydrology for the post-development scenario was also updated to reflect the impervious area changes to the Site. This was achieved by using an XP-SWMM model to represent the Site, using eight sub catchments, as shown in Figure 4.6.

The Site straddles five pre-development catchments, as shown in Figure 4.6. The flows from the existing catchments were scaled to exclude the development. The Catchment parameters for the modified catchments are presented in Table 4.3.

The rational method was used to compare the post-development flows for the 1% AEP event to ensure that the updated flows are reasonable. The results from this assessment are shown in Table 4.5.

Table 4.3 Catchment Modification & Representation

Catchments	Area (ha)	Fraction Imp. (%)
P01	8.4	75
P02	8.6	75
P03	2.9	5
P04	1.1	5
P05	0.8	5
P06	13.5	75
P07	3.9	75
P08	2.4	5
BUR_LOW20	13.5	60
BUR_LOW87	11.8	54
BUR_LOW80	15.5	60
BUR_LOW30	17.3	60
BUR_LOW88	3.7	60

Table 4.4 Rational Method vs XP-SWMM Generated Peak Discharges

Scenario	Catchment ID	Rational (m^3/s)	XP-SWMM (m^3/s)	Difference (%)
Post-developed	PO1	4.81	4.4	-8.6
	PO2	4.91	4.46	-9.2
	PO3	0.55	0.496	-9.7
	PO4	0.23	0.195	-13.2
	PO5	0.2	0.186	-7.9
	PO6	7.79	7.021	-9.9
	PO7	2.36	2.149	-8.9
	PO8	0.55	0.539	-2.8

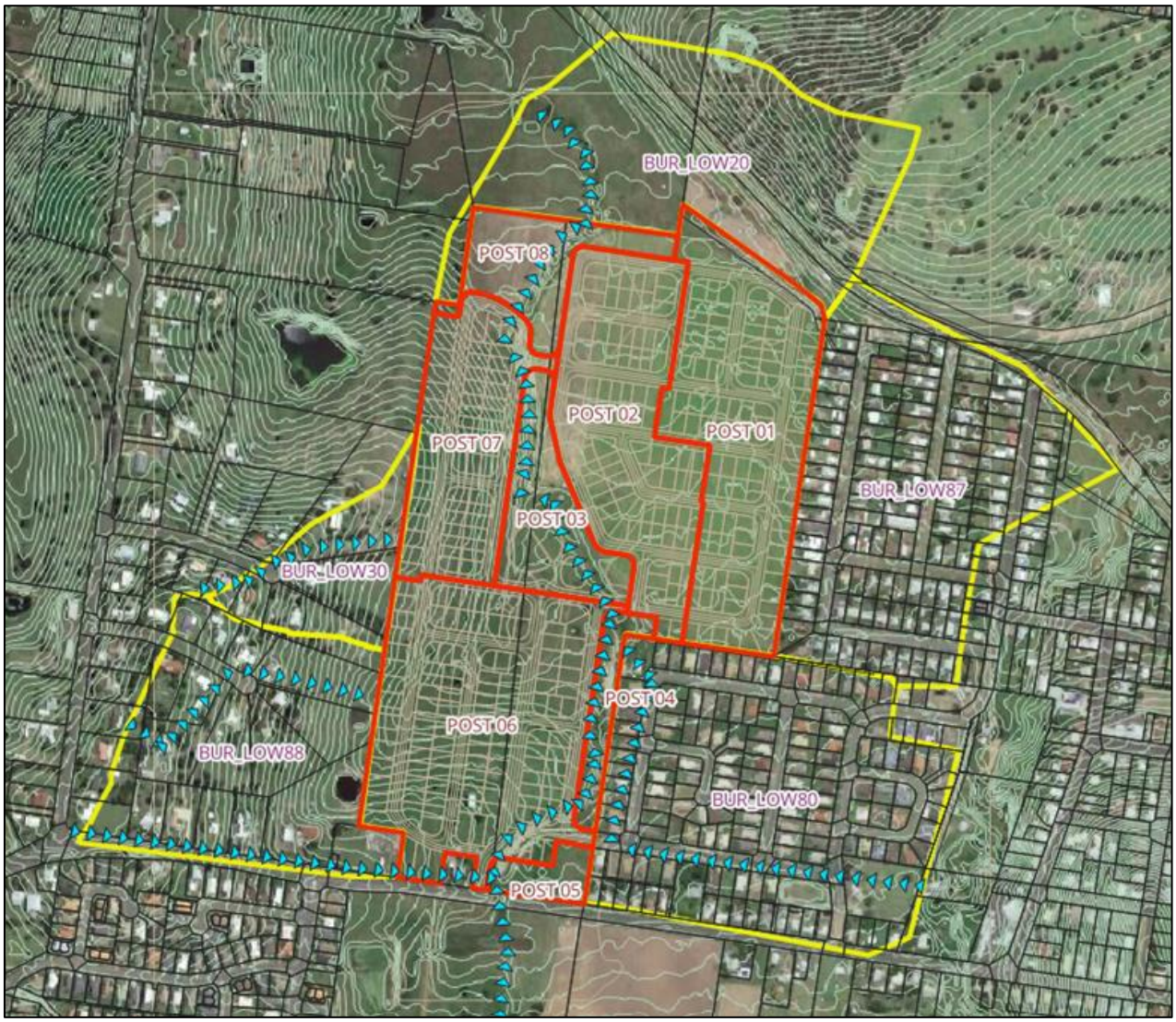


Figure 4.6 Post-Development Hydrology

4.2 Hydraulic Impact Assessment

4.2.1 Pre-Development Flood Behaviour

The existing site is within the Lockyer Creek floodplain and is subject to inundation during flood events from the 0.5EY. Flooding in events up to the 0.2EY is fairly contained within the existing channel. Forest Hill Fernvale Road begins to be overtopped at the site frontage in events larger than and including the 10% AEP event. The 1% AEP peak flood levels are shown in Figure 4.7.

Flood information from Council's Flood Information Certificate is shown in Table 4.5, with the minimum floor level being set to 60.16m AHD for the Site.

Table 4.5 Flood Information from Council's Flood Information Certificate

	5% AEP Flood Event	1% AEP Flood Event	0.2% AEP Flood Event
Max Water Level (m AHD)	59.33	59.36	59.37
Min Water Level (m AHD)	49.80	49.81	49.82
Max Water Depth (m)	1.58	1.73	1.91
Min Water Depth (m)	0	0	0
Max Velocity (m/s)	2.62	3.06	3.29
Min Velocity (m/s)	0	0	0
Max Hazard	H4	H4	H4
Min Hazard	H1	H1	H1

The H4 hazard classification is restricted to the open channel through the Site.

4.2.2 Post-Development Flood Behaviour

In the post-developed scenario the flood is conveyed through the primary site drainage channel to the LPD. Flood waters are contained within the channel and the development lots achieve the required freeboard.

Flood depth within the channel and detention basin is generally up to 1m in depth for the 1% AEP event. In more frequent events such as the 39% AEP, the flood depth in the channel ranges from 0.2-0.6m. Refer to Table 3.3 above for peak flood depth within the detention basin.

Flood velocity in the channel is relatively slow, peaking at approximately 1.5m/s in the 2% and 1% AEP events. The flow velocities within the channel are in accordance with QUDM (2017), Section 9.5.3 – 'Recommended maximum average velocities'.

Flow hazard within the channel is greater than 0.6m^2/s and is not safe for pedestrian access.

Peak water surface level, depth, velocity, hazard and afflux plots for the modelled events have been included in Appendix D of this report.

4.2.3 Access Road Flooding

The access road is flood free for all events up to the 1% AEP flood event. Minor flooding occurs on Forest Hill Road up to 100mm. The road is classified as trafficable during the 1% AEP event.

4.2.4 Hydraulic Impacts

The pre- and post-development maximum flood water surface elevations and velocities were compared for each of the AEP events to quantify the maximum flood impacts. The mapped results are presented in Appendix E.

For the 1% AEP, as shown in Figure 4.9, the proposed development results in minor flood increase downstream of the development, immediately downstream and also in the vicinity of an existing dam. Generally, the flood level afflux is no more than 10mm, with the peak flood level afflux limited to 30mm immediately downstream of the basin. All flood impacts are contained rural landuses and do not impact on any existing structures. There is also a localised increase in flood level in the order of 10-20mm in the vicinity of the existing dam at Clarendon Road, downstream of the development.

The results indicate that the proposed development does not increase flood velocities by greater than 0.2m/s in any event outside of the development and is therefore considered to not give rise to additional scour potential.

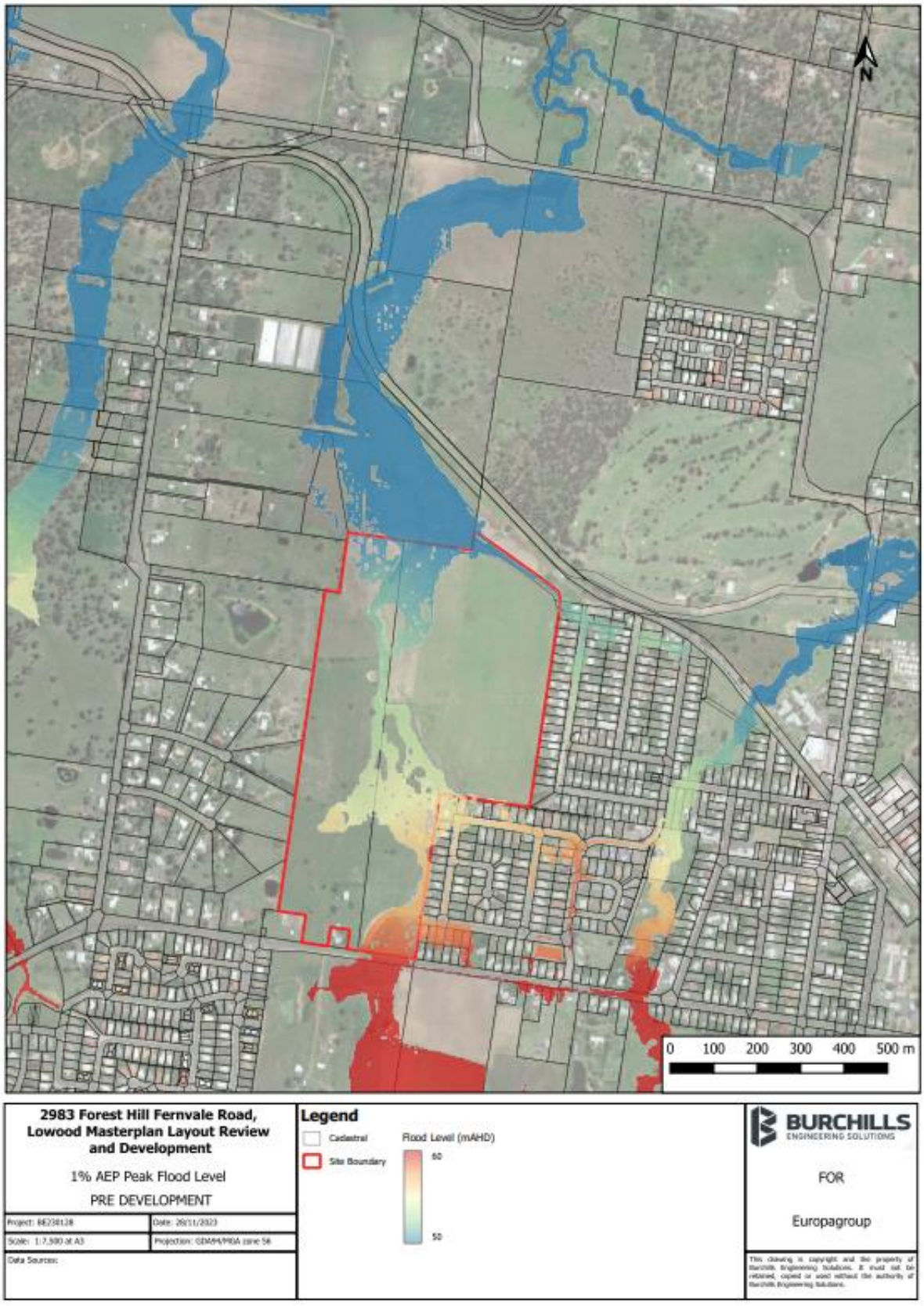


Figure 4.7 1% AEP Pre-Development Scenario Peak Water Level

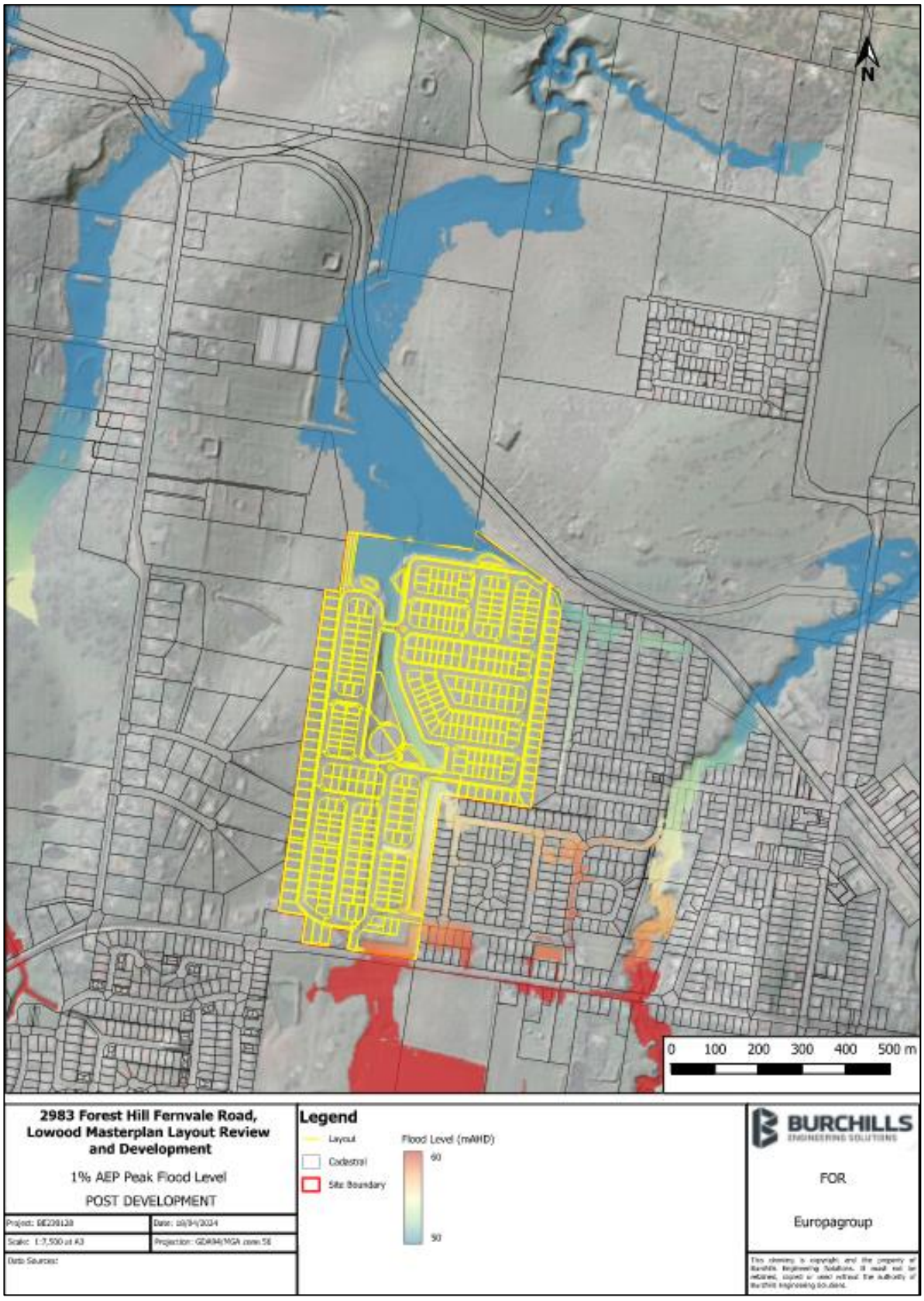


Figure 4.8 1% AEP Post-Development Scenario Peak Water Level

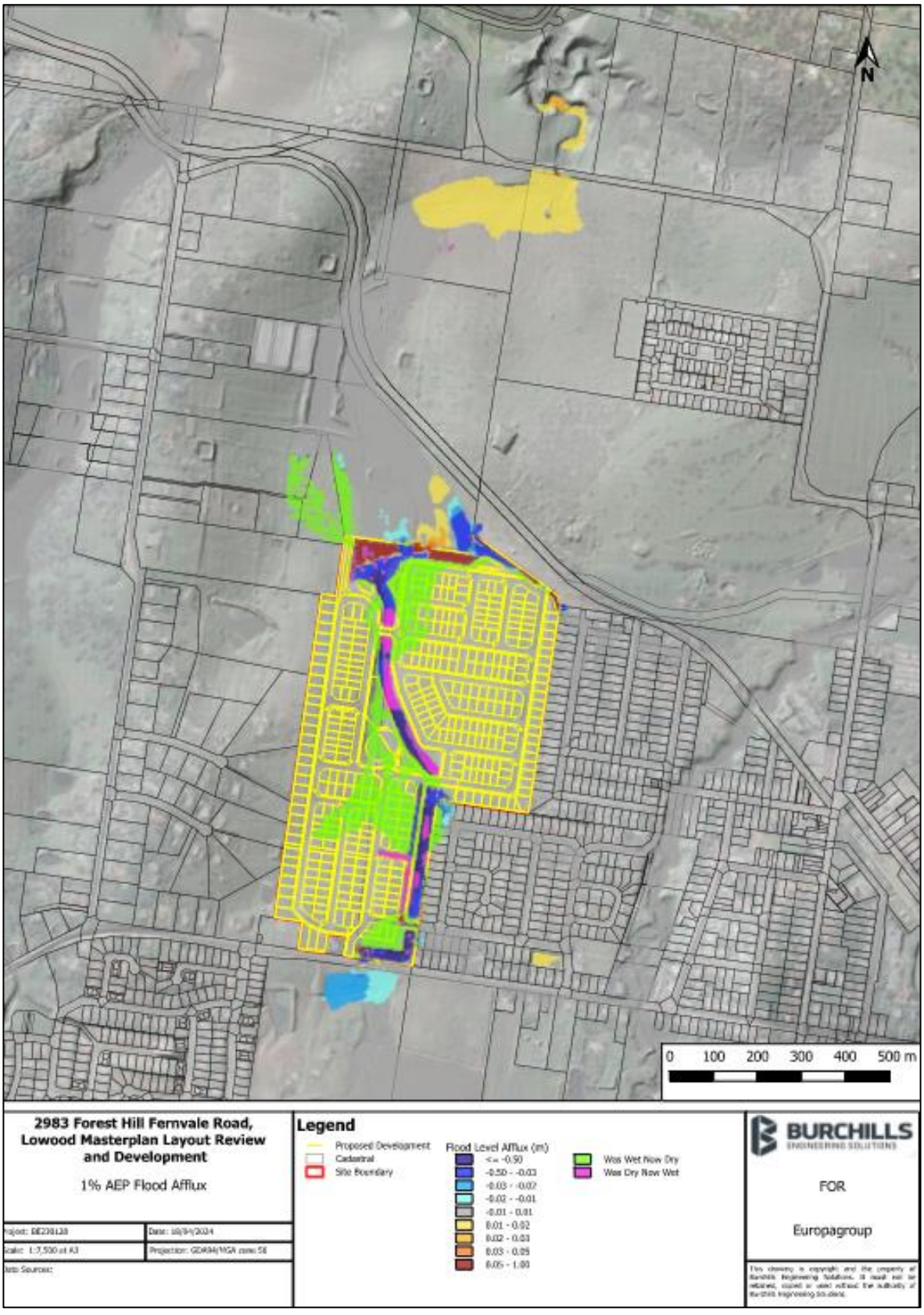


Figure 4.9 1% AEP Flood Water Level Impacts

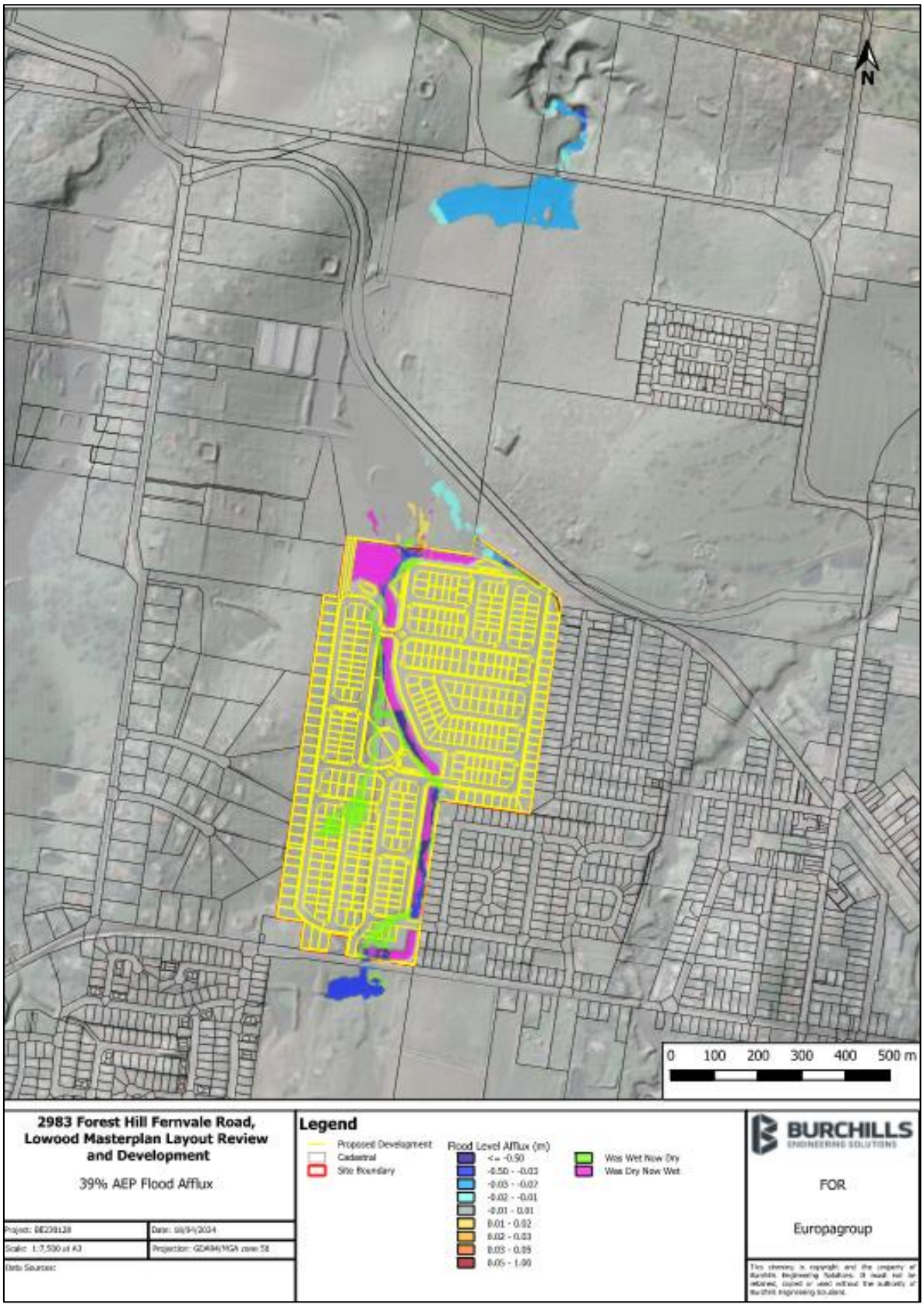


Figure 4.10 39% AEP Flood Water Level Impacts

5. Stormwater Quality Management Plan

5.1 Water Quality Objective (WQO)

In accordance with the Somerset Region Planning Scheme (Version 4.2) and the SEQ Water 'Water Quality Management in Drinking Water Catchments Development Guidelines' (2017), the total effect of permanent water quality control measures are to achieve reductions in the mean annual load generated by the development site at a minimum of:

- 85% for Total Suspended solids (TSS);
- 65% for Total Phosphorus (TP);
- 45% for Total Nitrogen (TN);
- 95% for Gross Pollutants (>5mm); and

This will ensure the environmental values of the downstream receiving waters are maintained and have been chosen as the WQO for the development.

5.2 Treatment Train

5.2.1 Overall

To ensure the above WQO's can be met at each of the site's LPDs, a treatment train was proposed for the developed site and modelled using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) software.

It is proposed to use bioretention basins.

5.2.2 Bioretention Basins

The parameters of the proposed bioretention basins are presented in Table 5.1 and further detail of the input parameters used within MUSIC are included in Appendix B. The location of the proposed treatment train elements is included in the civil drawings located in Appendix D.

Table 5.1 Proposed Bio-Retention Basin Parameters

Basin ID	Parameter	Modelled Value
A	Filter area	700m^2
	Extended detention depth	0.3m
	Filter media depth	0.4m
	Transition Layer	0.10m
	Drainage Layer	0.2m
B	Filter area	650m^2
	Extended detention depth	0.3m
	Filter media depth	0.4m
	Transition Layer	0.10m
	Drainage Layer	0.2m
C	Filter area	900m^2*
	Extended detention depth	0.3m
	Filter media depth	0.4m
	Transition Layer	0.10m
	Drainage Layer	0.2m
D	Filter area	400m^2
	Extended detention depth	0.3m
	Filter media depth	0.4m
	Transition Layer	0.10m
	Drainage Layer	0.2m

* Bioretention Basin C is greater than 800m^2 and needs to split into two cells, TBC at detailed design phase.

Typical sections of a bioretention basin have been included in Figure 5.1 and Figure 5.2. The bioretention systems will be designed in accordance with the Water by Design Technical Guidelines (Water by Design, 2014) during the detailed design phase of the development.

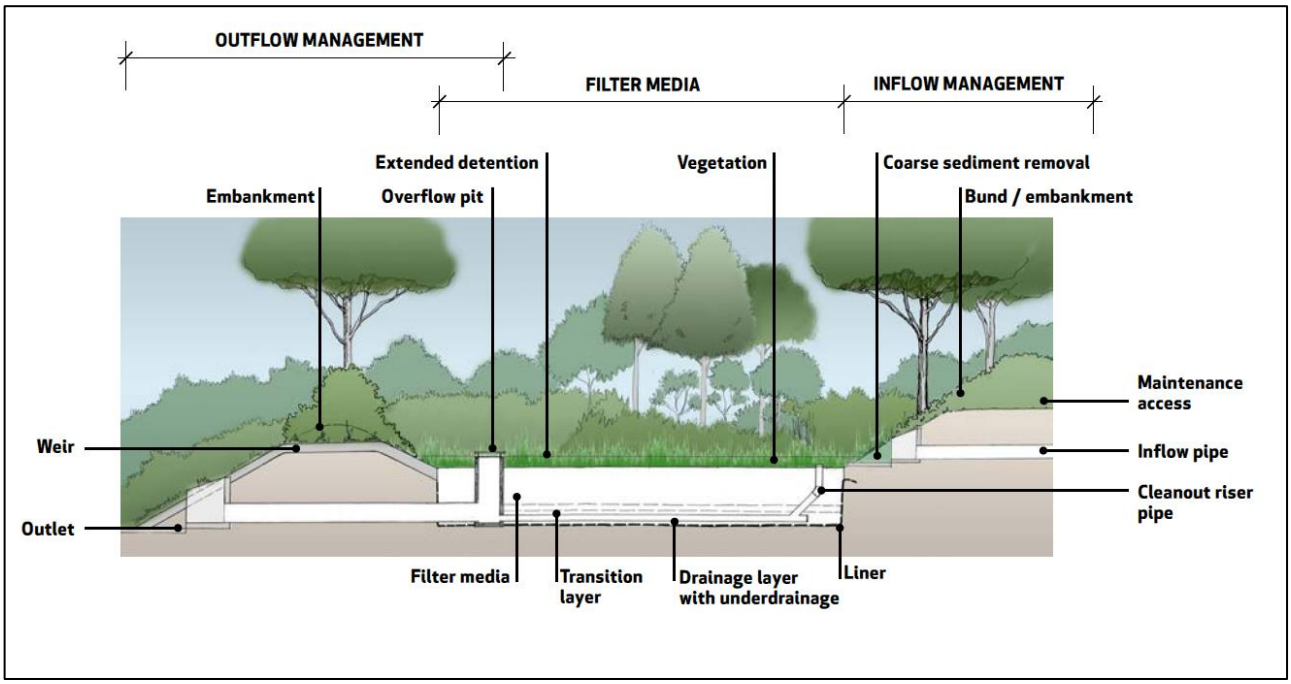


Figure 5.1 Typical Bioretention Basin (Water By Design, 2014)

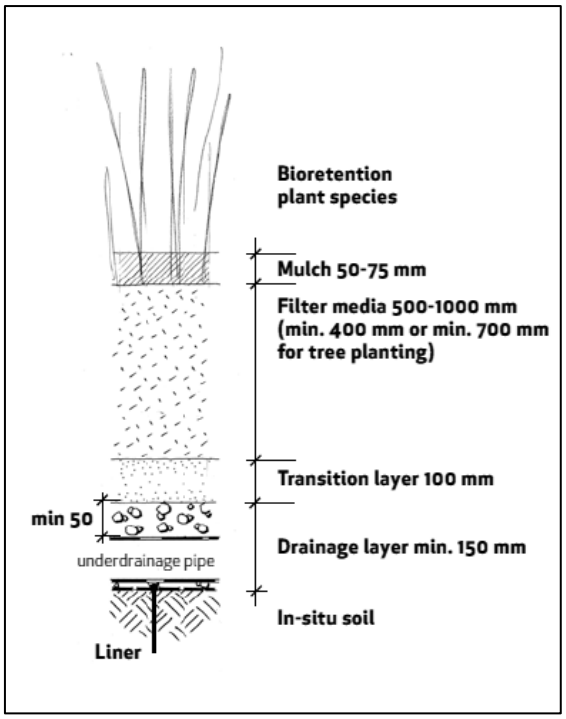


Figure 5.2 Typical Bioretention Drainage Profile (Water By Design, 2014)

5.3 MUSIC Results – Masterplan

Results of the MUSIC modelling for the treatment train effectiveness for the proposed development is summarised in Table 5.2. The results indicate the WQO are achieved for the rainfall data set simulated.

Table 5.2 Masterplan Treatment Train Effectiveness

Pollutant	Inflows (kg/yr)	Outflows (kg/yr)	Reduction Achieved (%)	Water Quality Objective (%)
TSS	50,400	7,380	85.4	85
TP	94.2	24.4	74.1	65
TN	449	236	47.5	45
GP	5,590	0	100	95

NOTE: All simulations have been run with pollutant export estimation set to 'stochastic generation'.

A screen capture of the MUSIC model and treatment train effectiveness results is presented in Figure 5.3.

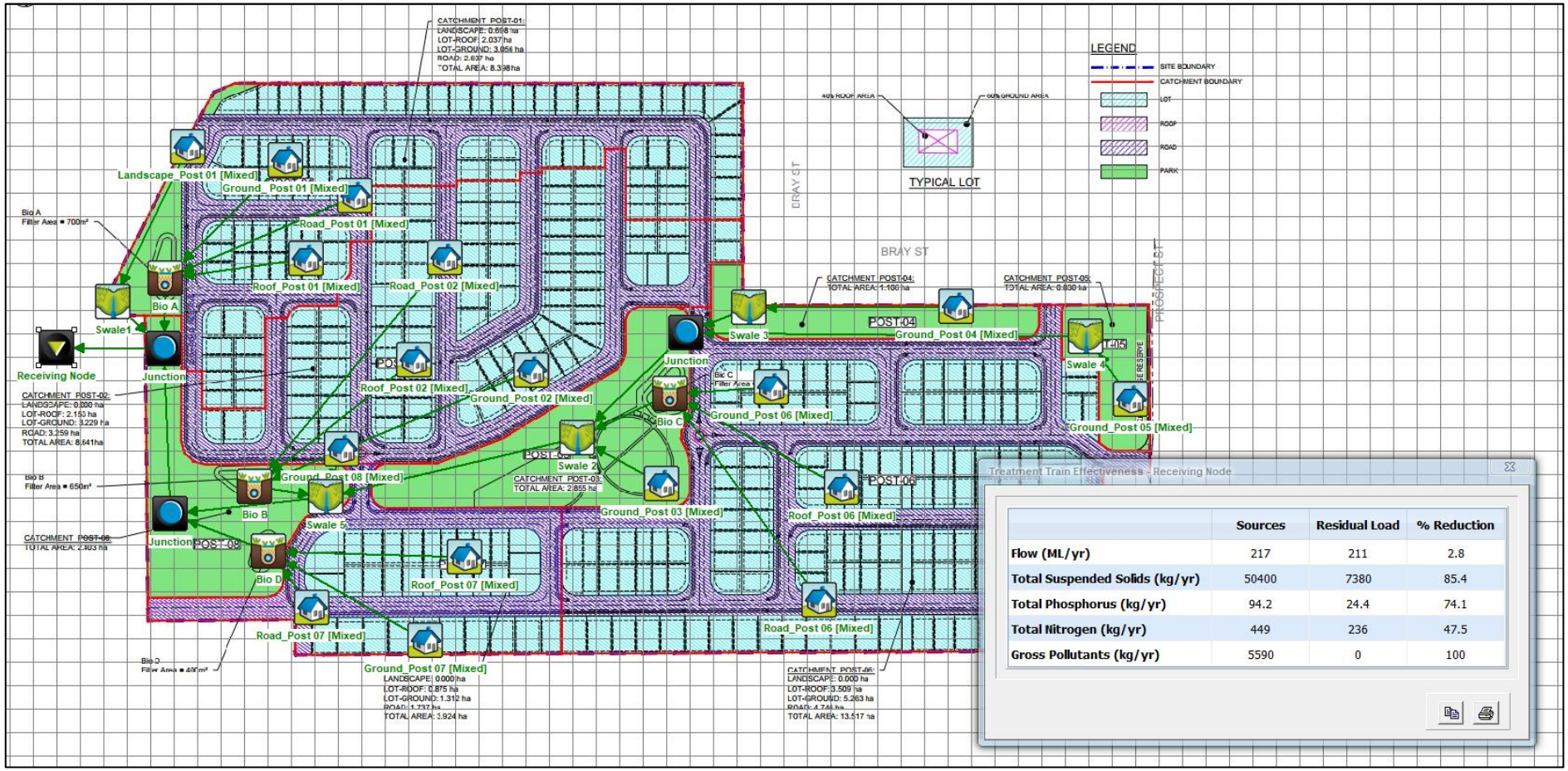


Figure 5.3 Masterplan Treatment Train Layout & MUSIC Results

6. Construction Management for Erosion and Sediment

6.1 Best Management Practices

Stormwater runoff quality during the construction phase of this development shall be managed in accordance with Best Practice Erosion and Sediment Control (IECA, 2008), which is the current recognised construction industry best management practice (BMP) for erosion and sediment control.

Erosion and Sediment Control (ESC) plans are required to be implemented during the construction phase to minimise environmental harm to on-site stormwater treatment devices and downstream receiving waters.

It is important to note that the measures identified below are a generic approach to construction phase stormwater quality management. Erosion and sediment control is highly dependent on local site conditions and staging of the proposed earth disturbing activities. Therefore, further details of the erosion and sediment control systems and procedures will be provided for each development stage when more information is available regarding in-situ soils and development staging.

6.2 Erosion Hazard Assessment

As part of the IECA guidelines, an erosion hazard assessment is to be completed to identify low-risk and high-risk short-term land disturbances within a given region (IECA, 2008). This Erosion Hazard Assessment estimates a TASK number which triggers if a site should be treated as high or low risk in regard to erosion control measures. A trigger value for high-risk site of 200 will be adopted for future stage as recommended by IECA. High risk sites trigger further need for assessment.

6.3 Erosion Control Standard

The best practice erosion control measures for high-risk development as detailed in Best Practice Erosion and Sediment Control (IECA, 2008) include the following:

- All reasonable and practical steps to be taken to apply best practice erosion control measures to completed earthworks, or otherwise stabilise such works, prior to anticipated rainfall - including existing unstable, undisturbed, soil surfaces under the management or control of the building/construction works;
- Land clearing limited to maximum 4 weeks work;
- Disturbed soil surfaces stabilised with minimum 75% cover within 10 days of completion of works within any area of a work site;
- Staged construction and stabilisation of earth batters; and
- Soil stockpiles and unfinished earthworks are suitably stabilised (covered) if disturbance is expected to be suspended for a period exceeding 10 days.

6.4 Sediment Loss Estimate

A sediment loss estimate will be completed for each stage of the development that will indicate the recommended sediment control techniques.

The potential volume of sediment loss from the subject site has been estimated using the Revised Universal Soil Loss Equation (RUSLE).

RUSLE calculates annual soil loss rates based on:

$$A = R. K. LS. C .P$$

Where:

A = annual soil loss due to erosion (t/ha/yr)

R = rainfall erosivity factor

K = soil erodibility factor

LS = topographic factor derived from slope length and slope gradient

C = cover and management factor

P = erosion control practice factor

6.5 Sediment Control Standard

Table B1 of the guidelines (IECA, 2016) provides a method for determining the sediment control standard for construction activities based on the estimated soil loss rate. Based on the size of the development, it is likely that Type 1 sediment controls are required for this site as a minimum. A list of Type 1 and supplementary sediment control techniques is provided in Table 6.1 based on Table 4.5.3 and Table 4.5.4 of the guidelines (IECA, 2008). These control techniques provide a guide that is recommended to be used to minimise the downstream effect of sediments.

Table 6.1 Sediment Control techniques

Techniques	Type 1	Supplementary
Sheet flow treatment	• Buffer Zone capable of infiltrating 100% of stormwater runoff or process water • Infiltration basin or sand filter bed capable of infiltrating 100% of flow	• Grass Filter Strips • Fibre Rolls
Concentrated flow treatment	• Sediment Basin	• Straw Bale Barrier • Kerb Inlet Sediment Traps (on-grade and sag inlet traps, including Gully Bags)
De-watering sediment control	• Type F/D sediment basin • Stilling pond	• Grass Filter bed
Instream sediment control	• Pump sediment-laden water to an off-stream Type F of Type D sediment basin or high filtration system	• Straw Bale Barrier (short-term device only)
Other		• Construction exits (Rock Pads, Wash Bays)

7. Conclusion

This Master Stormwater Management Plan (MSMP) has been prepared for Lowood One Pty Ltd to accompany the Development Application to allow for the future staged development of a 358 lot subdivision on 2983 Forest Hill Fernvale Road, Lowood. The MSMP has referenced relevant guidelines relating to stormwater management to form the conceptual basis of the stormwater plan.

The flood and stormwater assessment has relied upon the Council endorsed Lowood Flood Study and it has been demonstrated that the proposed regional detention basin included within the development does not cause an adverse impact on flood conditions external to the subject site.

The subject site is located within a drinking water catchment and therefore has higher water quality objectives set by Sommerset Regional Council. The proposed development incorporates a number of bioretention devices in order to meet the water quality objectives that has been demonstrated through MUSIC modelling.

During construction the development will implement best practice IECA guidelines and framework to ensure that erosion and sediment is kept to a minimum, prevent environmental damage further downstream.

Appendix A – Proposed Plans of Development

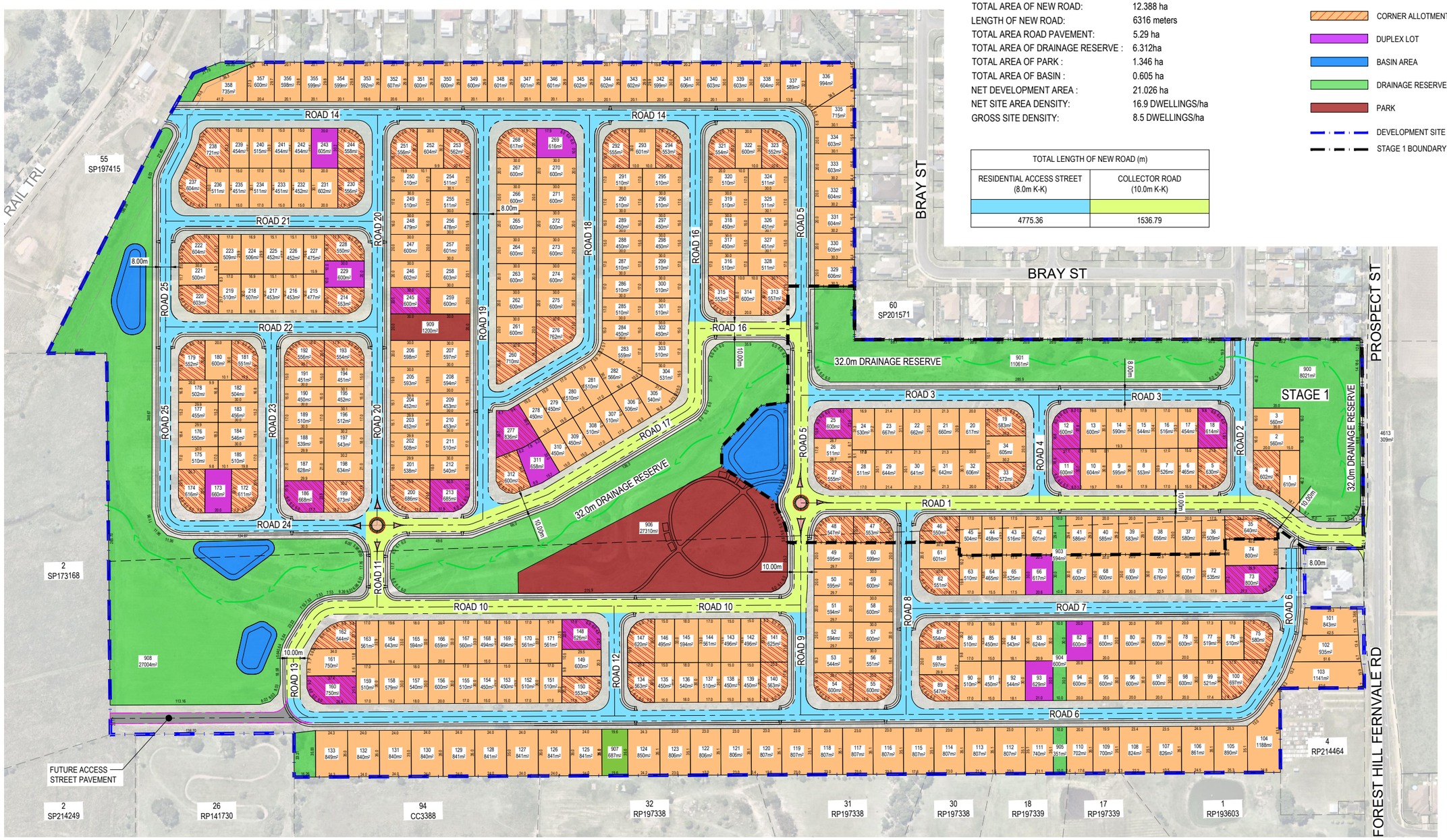
DEVELOPMENT SUMMARY

TOTAL RESIDENTIAL LOTS:	358
TOTAL DWELLINGS:	377
TOTAL SITE AREA:	41.677 ha
TOTAL AREA OF NEW ROAD:	12.388 ha
LENGTH OF NEW ROAD:	6316 meters
TOTAL AREA ROAD PAVEMENT:	5.29 ha
TOTAL AREA OF DRAINAGE RESERVE :	6.312ha
TOTAL AREA OF PARK :	1.346 ha
TOTAL AREA OF BASIN :	0.605 ha
NET DEVELOPMENT AREA :	21.026 ha
NET SITE AREA DENSITY:	16.9 DWELLINGS/ha
GROSS SITE DENSITY:	8.5 DWELLINGS/ha

TOTAL LENGTH OF NEW ROAD (m)	
RESIDENTIAL ACCESS STREET (8.0m K-K)	COLLECTOR ROAD (10.0m K-K)
4775.36	1536.79

LEGEND

- TYPICAL ALLOTMENTS
- CORNER ALLOTMENTS
- DUPLEX LOT
- BASIN AREA
- DRAINAGE RESERVE
- PARK
- DEVELOPMENT SITE BOUNDARY
- STAGE 1 BOUNDARY



Prepared for : LOWOOD ONE PTY LTD

Designer : QT
Checked : JC
Date : 27.03.24

MASTER PLAN
2983 FOREST HILL FERNVALE RD,
LOWOOD QLD 4311

SCALE 15 0 15 30 45 60 75 (metres)
1 : 1500 (FULL SIZE)

BE230128-00-SK001-B

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

Appendix B – MUSIC Input Parameters

Rainfall and Evapotranspiration Parameters

MUSIC modelling was based on 6-minute interval data obtained from the Bureau of Meteorology (BOM) for rainfall station 40584 HINZE, as summarised in Table D.7-1.

Table D.7-1 Meteorological and Rainfall Runoff Data Reporting Table

Input	Data Used in Modelling
Rainfall station	Wivenhoe
Time step	6 minute
Modelling period	1-01-1976 to 31-12-1985 (10 years)
Mean annual rainfall (mm)	1371
Evapotranspiration	1445
Rainfall runoff parameters	Residential
Pollutant export parameters	Residential

Catchment Parameters

Based on the proposed land uses within the development, the subject site has been modelled as tbc in Table D.7-2. The site has been divided into roof and ground level source nodes as per the architectural drawings included in Appendix A.

Table D.7-2 Land Use Parameters

Stage	Area (ha)	Land use	Total Impervious (%)
Post-01 Landscape	0.723	Ground	10
Post-01 Lot-Roof	2.036	Roof	100
Post-01 Lot-Ground	3.054	Ground	60
Post-01 Road	2.585	Road	90
Post-02 Lot-Roof	2.153	Roof	100
Post-02 Lot-Ground	3.229	Ground	60
Post-02 Road	3.267	Road	90
Post-03 Landscape	3.067	Ground	10
Post-04 Landscape	1.106	Ground	10

Stage	Area (ha)	Land use	Total Impervious (%)
Post-05 Landscape	0.830	Ground	10
Post-06 Lot-Roof	3.379	Roof	100
Post-06 Lot-Ground	5.069	Ground	60
Post-06 Road	4.271	Road	90
Post-07 Lot-Roof	1.019	Roof	100
Post-07 Lot-Ground	1.529	Ground	60
Post-07 Road	1.678	Road	90
Post-08 Landscape	2.685	Ground	10

The MUSIC catchment plan with full breakdown of roof and ground areas is presented in Appendix E. The pollutant loads and runoff parameters for each source node have been based on the data from the Water by Design MUSIC Modelling Guidelines (Water By Design, 2010), as summarised in Table D.7-3 and Table D.7-4.

Table D.7-3 Rainfall Runoff Parameters Urban

Parameter	All Nodes
Landuse	Residential
Rainfall threshold (mm)	1
Soil storage capacity (mm)	500
Initial storage (% capacity)	10
Field capacity (mm)	200
Infiltration capacity coefficient a	211
Infiltration capacity exponent b	5
Initial depth (mm)	50
Daily recharge rate (%)	28
Daily baseflow rate (%)	27
Daily deep seepage rate (%)	0

Table D.7-4 Pollutant Load Parameters

Urban Residential	Total Suspended Solids (log mg/L)		Total Phosphorous (log mg/L)		Total Nitrogen (log mg/L)	
	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
Storm Flow Concentration	1.30[1] 2.43[2] 2.18[3]	0.39	-0.89[1] -0.30[2] -0.47[3]	0.31	0.26	0.23
Base Flow Concentration	0[1] 1[2,3]	0[1] 0.34[2,3]	0[1] -0.97[2,3]	0[1] 0.31	0[1] 0.20[2,3]	0[1] 0.20[2,3]

NOTE: (1) Values applied to “Roof” areas
(2) Values applied to “Road” areas
(3) Values applied to “Ground” areas

Treatment Node Parameters

The following sections describe the modelling parameters applied to MUSIC for each of the treatment nodes included as part of the water quality assessment.

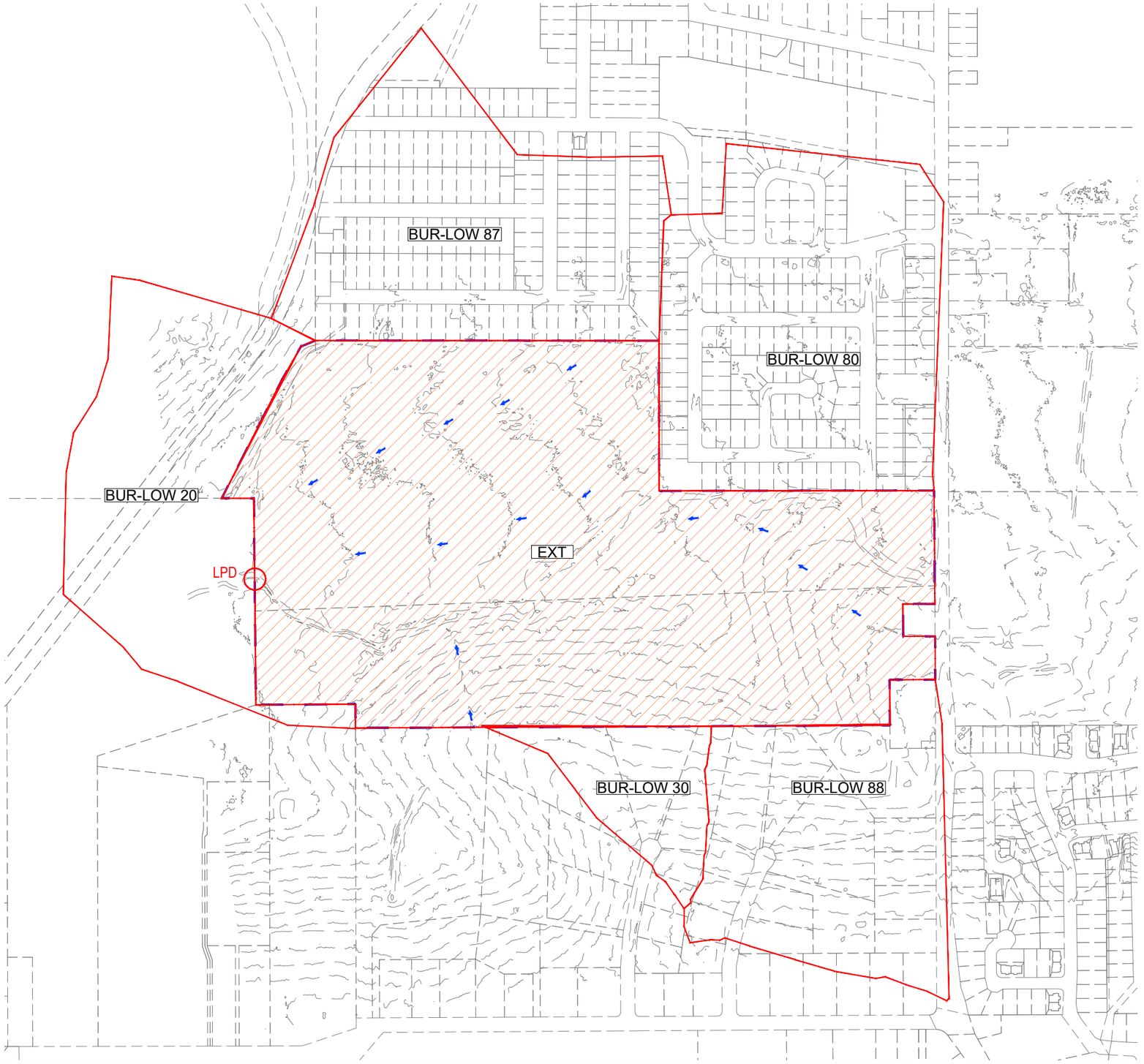
Bioretention System

The input parameters for the bioretention system are summarised in Table D.7-5.a

Table D.7-5 Bioretention Parameters

ID	A	B	C	D
Surface area (m2)	700	650	900	400
Has the filter area been calculated appropriately? (Y / N / N/A)	Y	Y	Y	Y
Extended detention depth (m)	0.3	0.3	0.3	0.3
Filter area (m^2)	700	650	900	400
Unlined filter media perimeter (m)	122	118	139	92
Saturated hydraulic conductivity (mm/hour)	200	200	200	200
Filter depth (m)	0.4	0.4	0.4	0.4
TN content of filter media (mg/kg)	400	400	400	400
Orthophosphate content of filter media (mg/kg)	30	30	30	30
Is the base lined? (Y/N)	Yes	Yes	Yes	Yes
Effectiveness of plant TN removal (effective/ineffective/unvegetated)	Effective	Effective	Effective	Effective
Overflow weir width (m)	75	69	95	44
Exfiltration rate (mm/hr)	0	0	0	0
If an exfiltration rate has been used, have node water balance losses been used in calculation of treatment train effectiveness? (Y / N / N/A)	N/A	N/A	N/A	N/A
If exfiltration rate has been used, is the exfiltration rate justified? (Y / N / N/A)	N/A	N/A	N/A	N/A
Underdrain present? (Y/N)	Yes	Yes	Yes	Yes
Submerged zone with carbon present?	No	No	No	No
Depth of submerged zone (m)	N/A	N/A	N/A	N/A
Confirmation that K and C* remain default? (Y/N)	Yes	Yes	Yes	Yes

Appendix C – Burchills Engineering Solutions Stormwater Catchment Drawings



LEGEND

- SITE BOUNDARY
- EXISTING SURFACE CONTOURS
- CATCHMENT BOUNDARY
- FLOW DIRECTION
- LPD — LEGAL POINT DISCHARGE
- RURAL

CATCHMENT TABLE

CATCHMENT	AREA (ha)
EXT	41.688
BUR-LOW 20	13.538
BUR-LOW 87	15.468
BUR-LOW 80	17.331
BUR-LOW 88	11.829
BUR-LOW 30	3.729

Prepared for : LOWOOD ONE PTY LTD

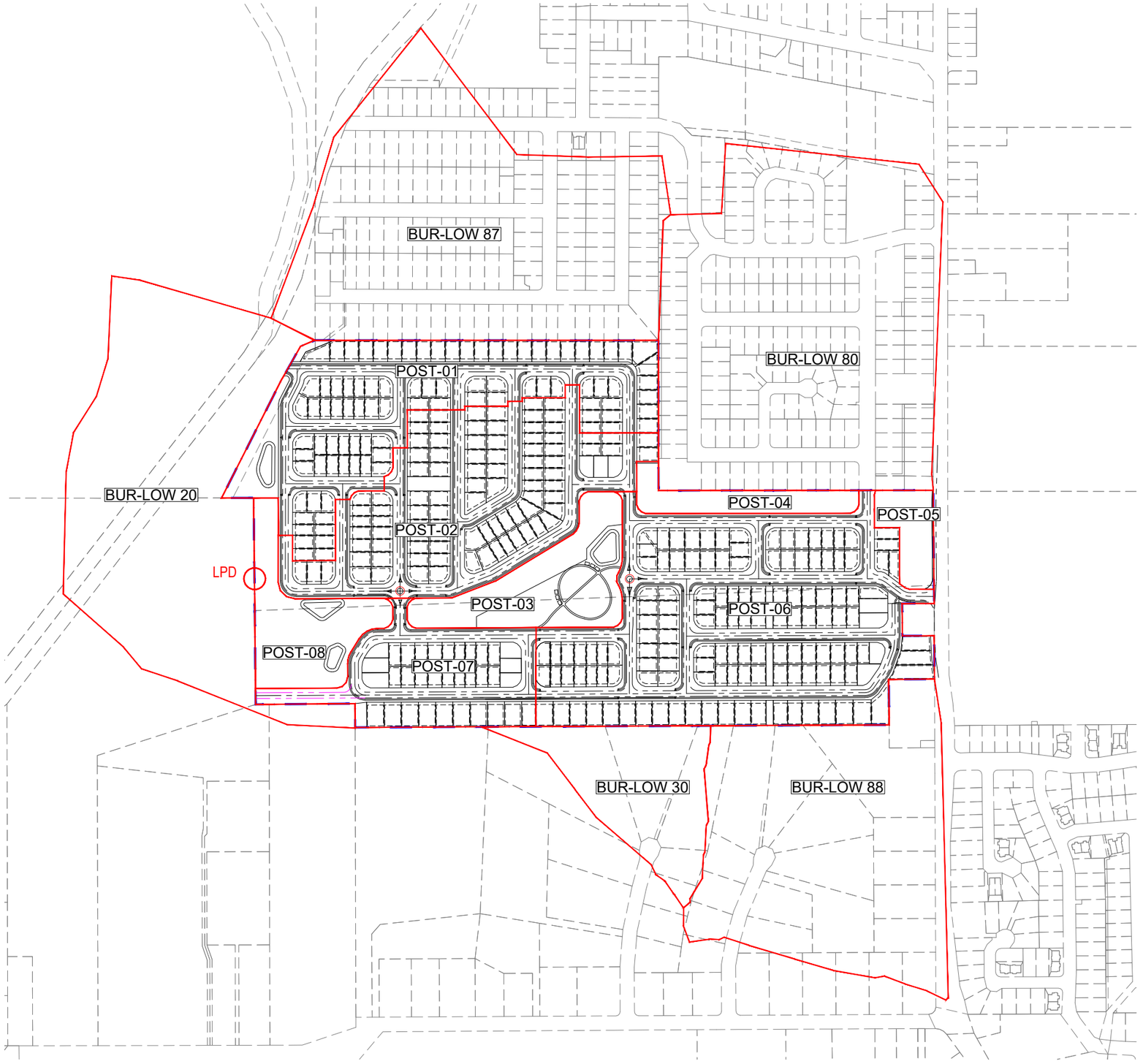
PRE-DEVELOPMENT CATCHMENT PLAN
2983 FOREST HILL FERNVALE RD LOWOOD

SCALE 50 0 50 100 150 (metres)
1 : 3000 (FULL SIZE)

BE230128-C900-A

Designer : MN
Checked : TN
Date : 15.04.24

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365



LEGEND

- SITE BOUNDARY
- DESIGN SURFACE CONTOURS
- CATCHMENT BOUNDARY
- FLOW DIRECTION
- LPD — LEGAL POINT DISCHARGE

CATCHMENT TABLE

CATCHMENT	AREA (ha)
POST-01	8.398
POST-02	8.641
POST-03	2.855
POST-04	1.106
POST-05	0.830
POST-06	13.517
POST-07	3.924
POST-08	2.403
BUR-LOW 20	13.538
BUR-LOW 87	15.468
BUR-LOW 80	17.331
BUR-LOW 88	11.829
BUR-LOW 30	3.729

Prepared for : LOWOOD ONE PTY LTD

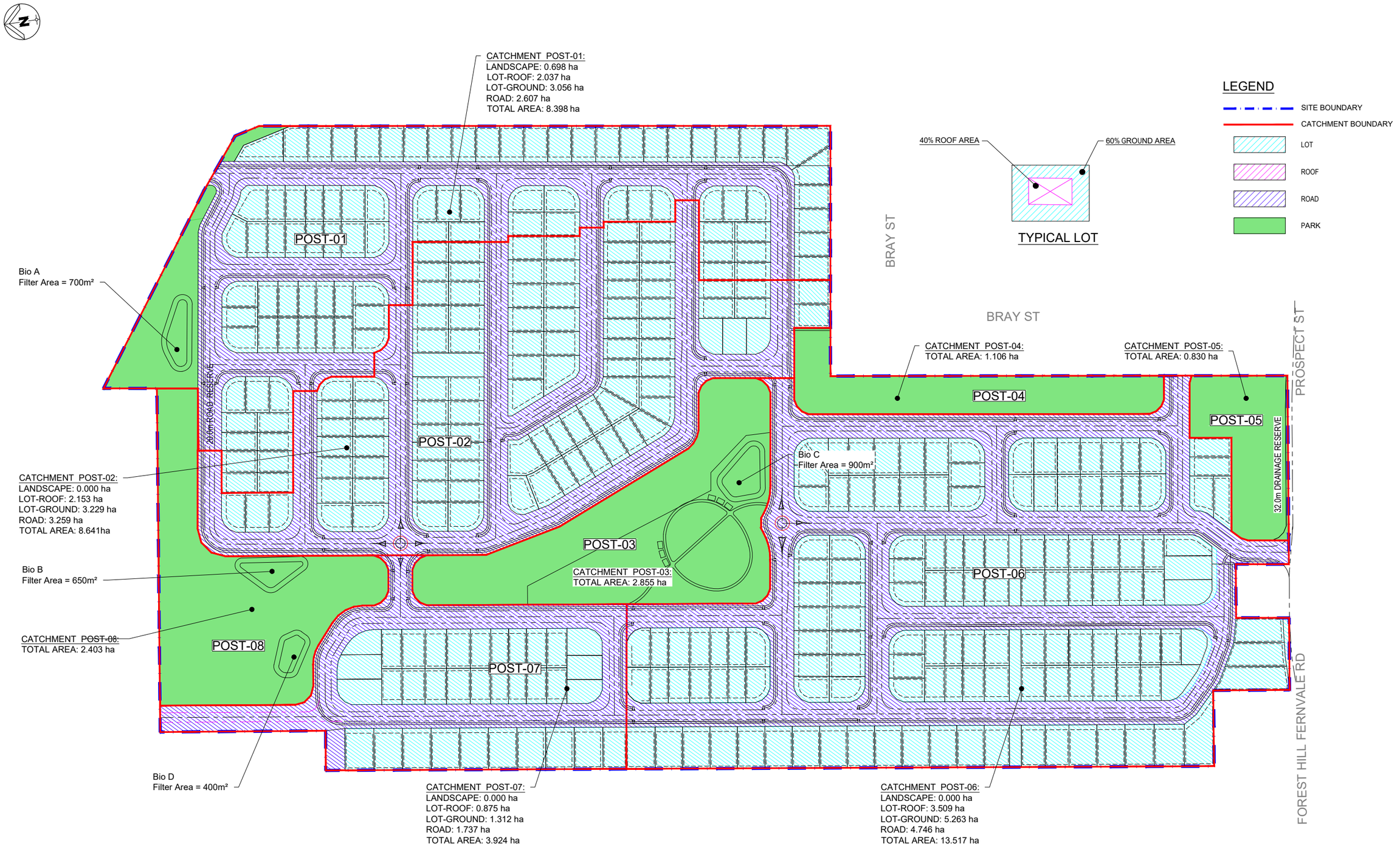
POST - DEVELOPMENT CATCHMENT PLAN
2983 FOREST HILL FERNVALE RD LOWOOD

SCALE 50 0 50 100 150 (metres)
1 : 3000 (FULL SIZE)

BE230128-C901-A

Designer : MN
Checked : TN
Date : 15.04.24

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365



Prepared for : LOWOOD ONE PTY LTD

MUSIC-DEVELOPMENT CATCHMENT PLAN
2983 FOREST HILL FERNVALE RD LOWOOD

SCALE 15 0 15 30 45 60 75 (metres)
1 : 1500 (FULL SIZE)

BE230128-C903-A

Designer : MN
Checked : TN
Date : 15.04.24

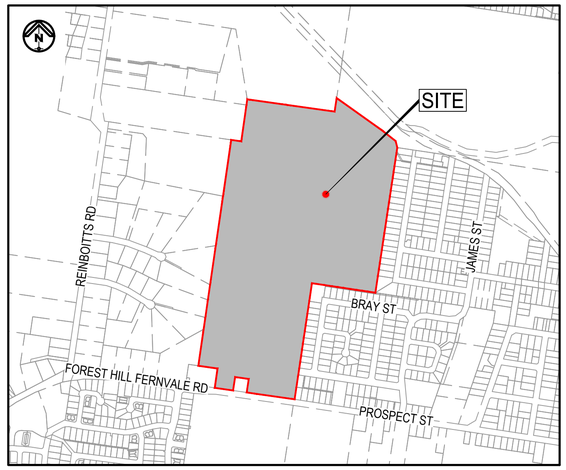
BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

Appendix D – Burchills Engineering Solutions Civil Engineering Drawings

PROPOSED LAND DEVELOPMENT
AT 2983 FOREST HILL FERNVALE RD, LOWOOD
QUEENSLAND 4311

CONCEPT MASTERPLAN ENGINEERING DRAWINGS

BE230128-00



LOCALITY PLAN

N.T.S.

DRAWING INDEX	
DWG.No	DESCRIPTION
SK000	COVER SHEET
SK200	BULK EARTHWORKS LAYOUT PLAN
SK300	ROADWORKS AND DRAINAGE LAYOUT PLAN
SK301	TYPICAL ROAD CROSS SECTIONS
SK305	STORMWATER CATCHMENT PLAN
SK310	TYPICAL BIO BASIN DETAILS
SK320	INTERSECTION FUNCTIONAL PLAN
SK500	CONCEPT WATER AND SEWER LAYOUT PLAN

PREPARED FOR

LOWOOD ONE PTY LTD

PREPARED BY

BURCHILLS
ENGINEERING SOLUTIONS

GOLD COAST | BRISBANE | TOOWOOMBA
IPSWICH | MORETON BAY
PHONE: +61 7 5509 6400
FAX: +61 7 5509 6411
EMAIL: ADMIN@BURCHILLS.COM.AU
COOTE BURCHILLS ENGINEERING PTY LTD
ABN 76 166 942 365

NOTE:

DESIGNS HAVE BEEN UNDERTAKEN USING SURVEY DATA
PROVIDED BY ONE SURVEYORS DATED 6 NOVEMBER 2023

DATE : 24.04.24		
PROJECT No.:	DRAWING No. :	VERSION:
BE230128-00	SK000	B

BULK EARTHWORKS SUMMARY	
STRUCTURAL FILLING	
AREA	NETT SOLID FILL
OVERALL FILLING	
(ALLOTMENTS, BATTERS)	172,698 cu.m.
TOTAL FILL REQUIRED	172,698 cu.m.
EXCAVATION	
AREA	NETT CUT
OVERALL EXCAVATION	165,318 cu.m.
TOTAL CUT	165,318 cu.m.

i.e. 172,698 cu.m - 165,318 cu.m. = 7,380 cu.m. TO BE IMPORTED OF SITE
INCLUDING 200mm TOPSOIL STRIP
INCLUDING 200mm TOPSOIL RESPREAD TO LOTS, VERGES, DRAINAGE RESERVE AND OPEN SPACE AREAS
INCLUDING 300mm ROAD BOXING DEPTH

EARTHWORKS LEGEND

-4.5 TO -4.0 m	0.0 TO 0.5 m
-4.0 TO -3.5 m	0.5 TO 1.0 m
-3.5 TO -3.0 m	1.0 TO 1.5 m
-3.0 TO -2.5 m	1.5 TO 2.0 m
-2.5 TO -2.0 m	2.0 TO 2.5 m
-2.0 TO -1.5 m	2.5 TO 3.0 m
-1.5 TO -1.0 m	3.0 TO 3.5 m
-1.0 TO -0.5 m	3.5 TO 4.0 m
-0.5 TO 0.0 m	4.0 TO 4.5 m

BULK EARTHWORKS LAYOUT PLAN

SCALE 15 0 15 30 45 60 75 (metres)
1 : 1500 (FULL SIZE)

LEGEND

- DEVELOPMENT SITE BOUNDARY
- 90.0 EXISTING CONTOUR LIDAR
- SW EXISTING STORMWATER
- EXISTING EASEMENT
- 90.0 DESIGN SURFACE CONTOUR
- PROPOSED RETAINING WALL 0.6-1.0m
- PROPOSED RETAINING WALL 1.0-2.0m
- PROPOSED BATTER

PRELIMINARY
NOT FOR CONSTRUCTION OR TENDER

PROPOSED LAND DEVELOPMENT

2983 FOREST HILL FERNVALE RD, LOWOOD QLD 4311

FOR
LOWOOD ONE PTY LTD

A1 ORIGINAL SIZE BEFORE REDUCTION

VER.	DESCRIPTION	DATE
B	COUNCIL RFI UPDATES	24.04.24
A	PRELIMINARY CIVIL ENGINEERING DESIGN	10.04.24

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

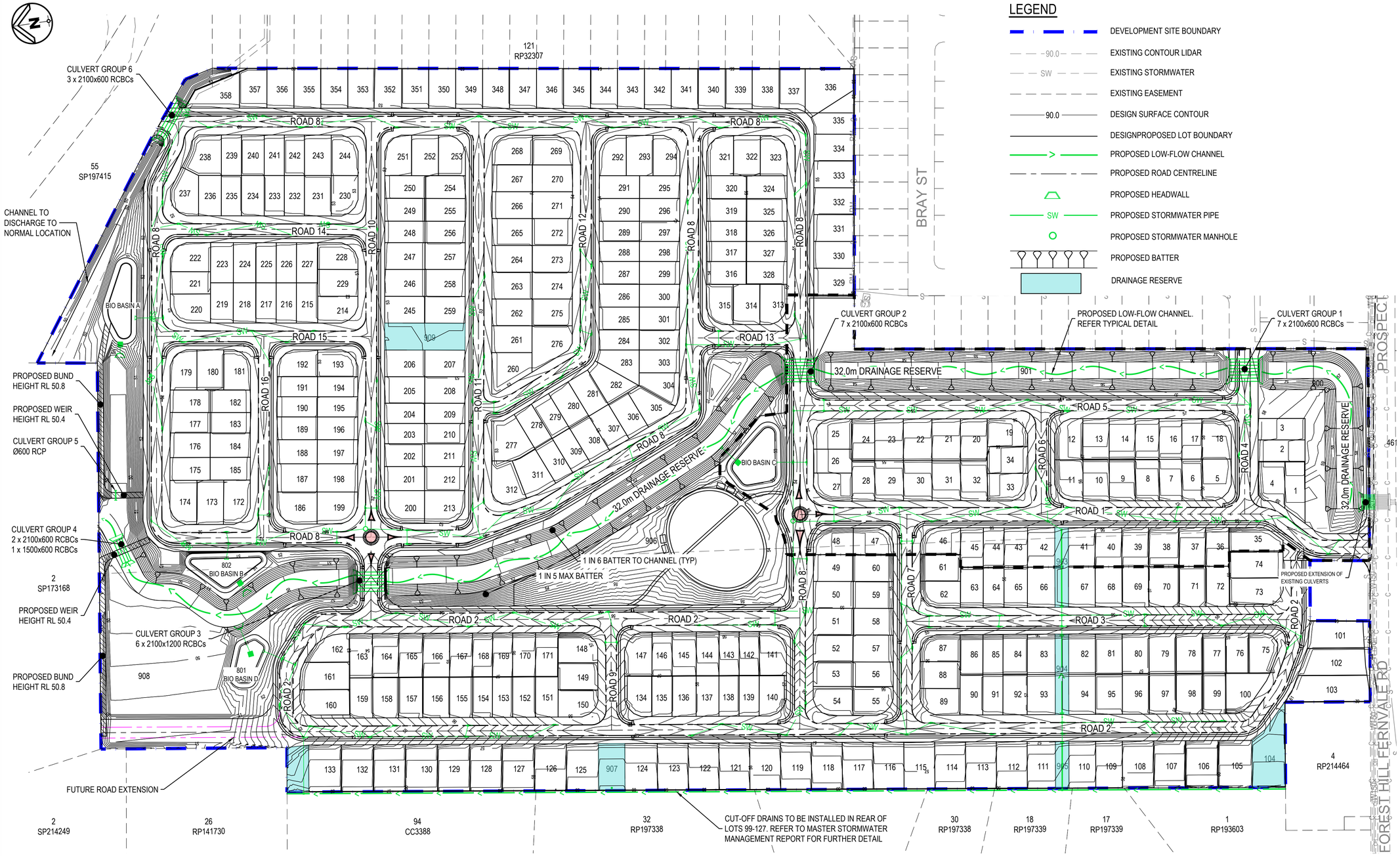
PROJECT:
CONCEPT ENGINEERING DRAWINGS

DRAWING TITLE :
BULK EARTHWORKS LAYOUT PLAN

DEVEL. APPLIC. No. :	-
DATE :	24.04.24
PROJECT LEADER :	JONATHAN CUELL
DESIGNER :	TG
DRAFTSPERSON :	CD
CHECKED :	FRASER LUCAS

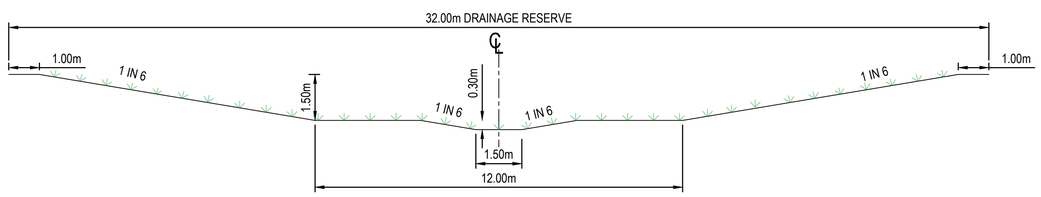
APPROVED FOR AND ON BEHALF OF
BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365
RPEQ No. :

SCALE : AS NOTED	DATUM : AHD	FULL SIZE : A1
PROJECT No.: BE230128-00	DRAWING No. : SK200	VERSION: B



ROADWORKS AND DRAINAGE LAYOUT PLAN

SCALE 15 0 15 30 45 60 75 (metres)
1 : 1500 (FULL SIZE)



CHANNEL TYPICAL SECTION

SCALE 1 0 1 2 3 4 5 (metres)
1 : 100 (FULL SIZE)

PRELIMINARY
NOT FOR CONSTRUCTION OR TENDER

PROPOSED LAND DEVELOPMENT

2983 FOREST HILL FERNVALE RD, LOWOOD QLD 4311

FOR LOWOOD ONE PTY LTD

A1 ORIGINAL SIZE BEFORE REDUCTION

VER.	DESCRIPTION	DATE
B	COUNCIL RFI UPDATES	24.04.24
A	PRELIMINARY CIVIL ENGINEERING DESIGN	10.04.24

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5609 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

PROJECT:
CONCEPT ENGINEERING DRAWINGS

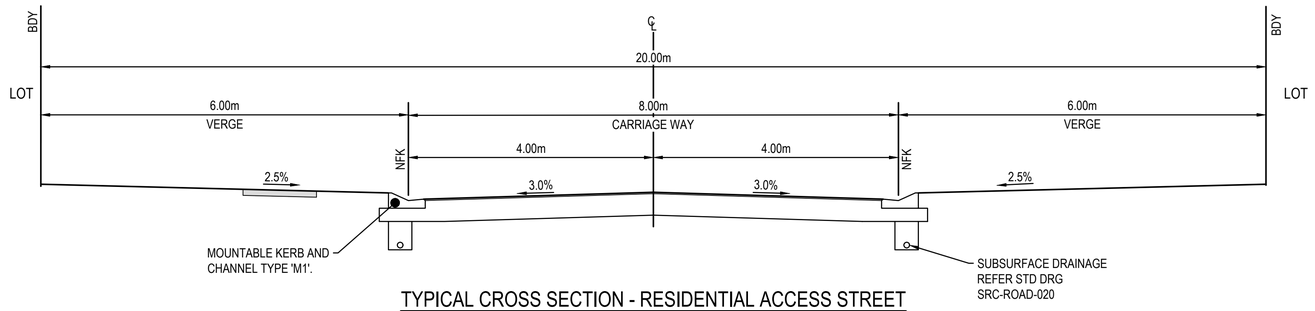
DRAWING TITLE :
ROADWORKS AND DRAINAGE LAYOUT PLAN

DEVEL. APPLIC. No. :	-
DATE :	24.04.24
PROJECT LEADER :	JONATHAN CUELL
DESIGNER :	TG
DRAFTSPERSON :	CD
CHECKED :	FRASER LUCAS

APPROVED FOR AND ON BEHALF OF
BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365

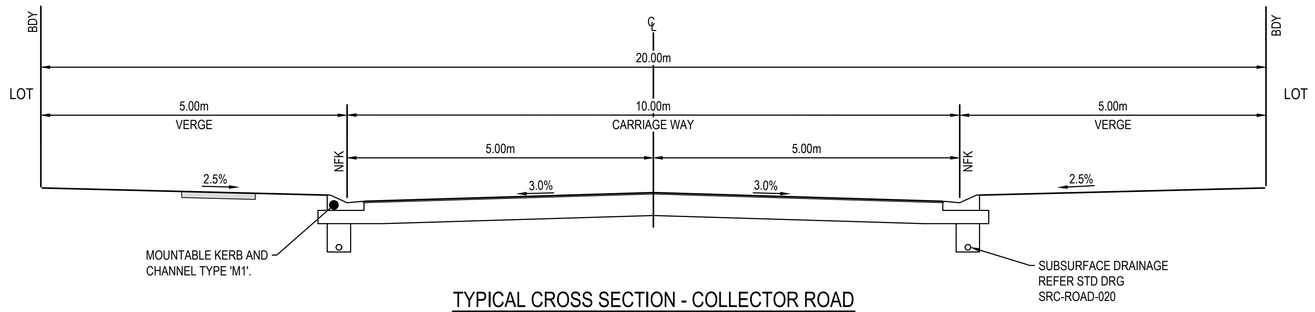
RPEQ No. :

SCALE : AS NOTED	DATUM : AHD	FULL SIZE : A1
PROJECT No.: BE230128-00	DRAWING No. : SK300	VERSION: B



TYPICAL CROSS SECTION - RESIDENTIAL ACCESS STREET
8.0m K-K

SCALE 1.0 0 1.0 2.0 (metres)
1 : 50 (FULL SIZE)



TYPICAL CROSS SECTION - COLLECTOR ROAD
10.0m K-K

SCALE 1.0 0 1.0 2.0 (metres)
1 : 50 (FULL SIZE)

PRELIMINARY
NOT FOR CONSTRUCTION OR TENDER

PROPOSED LAND DEVELOPMENT

2983 FOREST HILL
FERNVALE RD, LOWOOD
QLD 4311

FOR
LOWOOD ONE PTY LTD

A1 ORIGINAL SIZE BEFORE REDUCTION

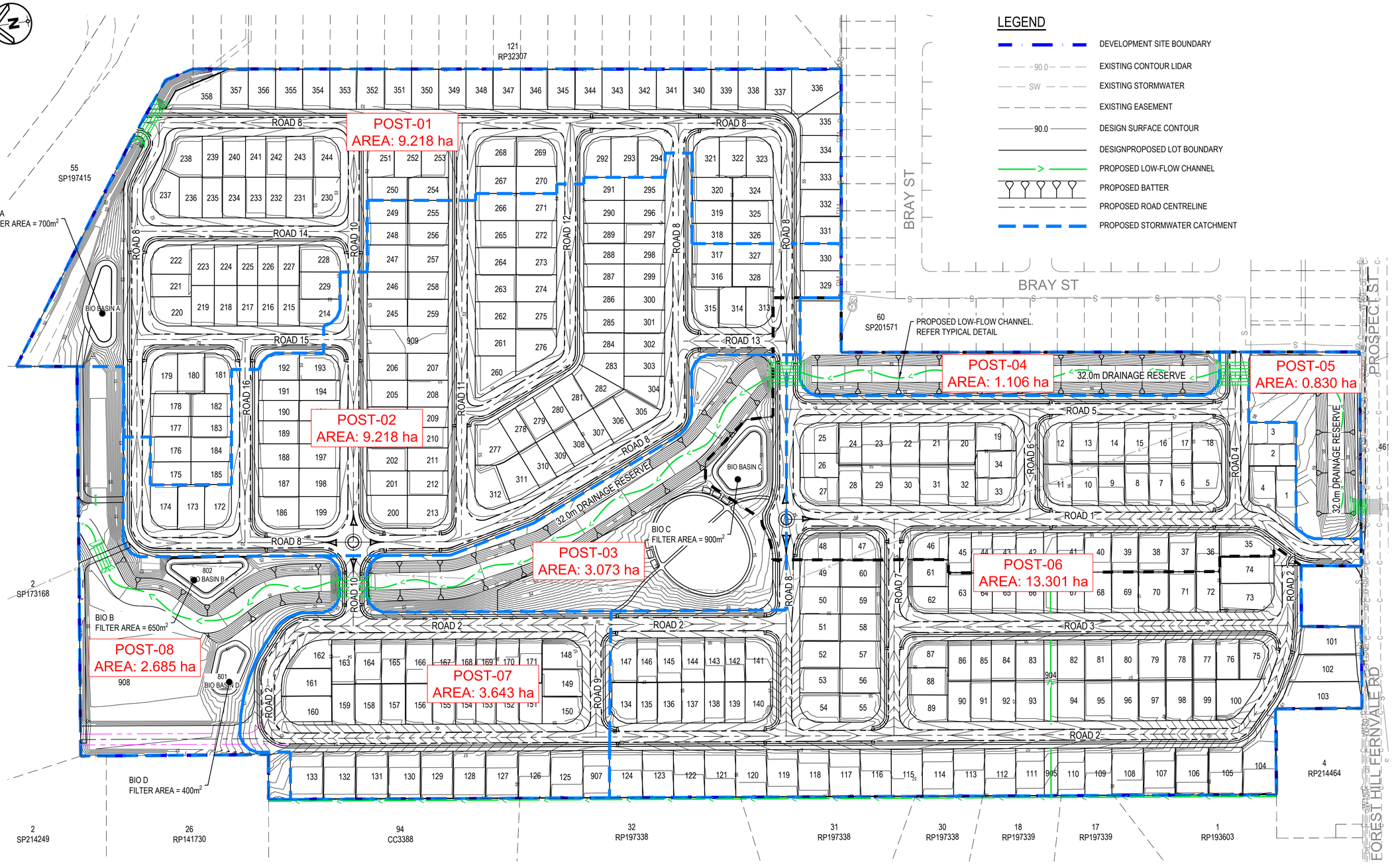
VER.	DESCRIPTION	DATE
B	COUNCIL RFI UPDATES	24.04.24
A	PRELIMINARY CIVIL ENGINEERING DESIGN	10.04.24

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

PROJECT:
CONCEPT ENGINEERING DRAWINGS

DRAWING TITLE :
TYPICAL ROAD CROSS SECTIONS

DEVEL. APPLIC. No. : -	DATE : 24.04.24
PROJECT LEADER : JONATHAN CUELL	
DESIGNER : TG	
DRAFTSPERSON : CD	
CHECKED : FRASER LUCAS	
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365	
RPEQ No. :	
SCALE : AS NOTED	DATUM : AHD / FULL SIZE : A1
PROJECT No.: BE230128-00	DRAWING No. : SK301 / VERSION: B



STORMWATER CATCHMENT PLAN

SCALE 15 0 15 30 45 60 75 (metres)
1 : 1500 (FULL SIZE)

PROPOSED LAND DEVELOPMENT

2983 FOREST HILL FERNVALE RD, LOWOOD QLD 4311

FOR LOWOOD ONE PTY LTD

A1 ORIGINAL SIZE BEFORE REDUCTION

VER.	DESCRIPTION	DATE
B	COUNCIL RFI UPDATES	24.04.24
A	PRELIMINARY CIVIL ENGINEERING DESIGN	10.04.24

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

PROJECT:

CONCEPT ENGINEERING DRAWINGS

DRAWING TITLE :

STORMWATER CATCHMENT PLAN

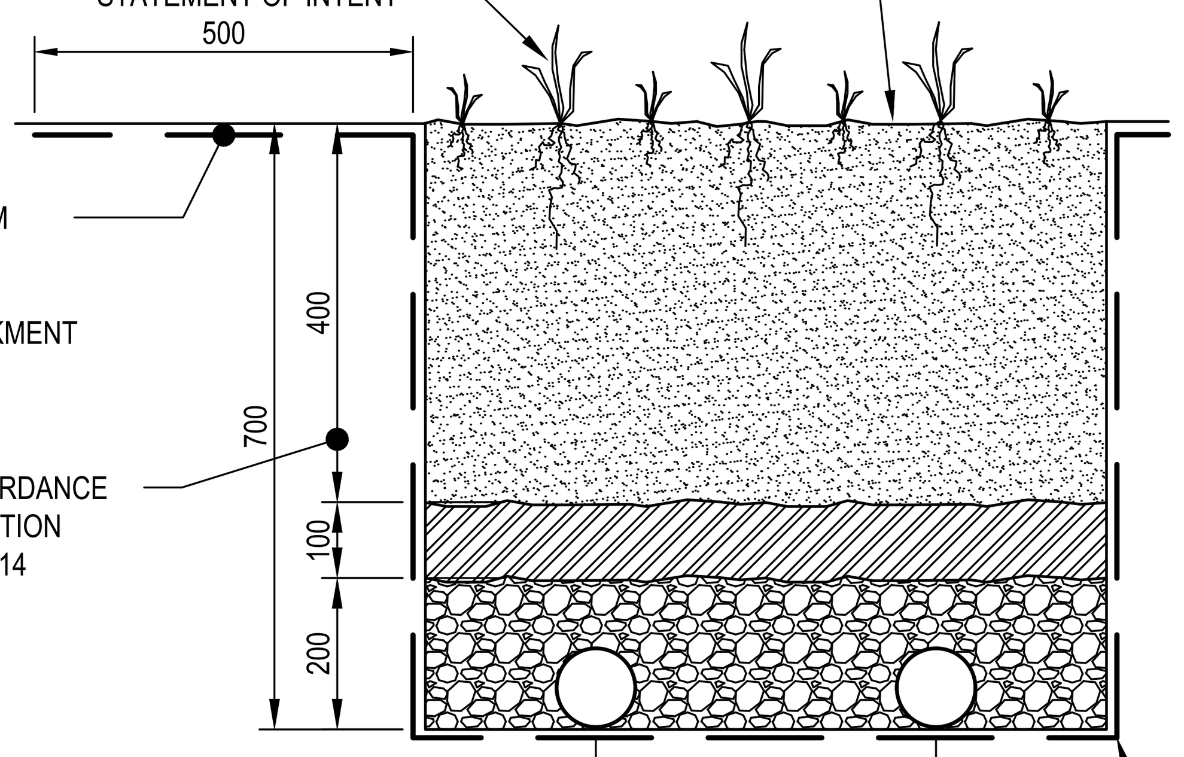
DEVEL. APPLIC. No. :	-
DATE :	24.04.24
PROJECT LEADER :	JONATHAN CUELL
DESIGNER :	TG
DRAFTSPERSON :	CD
CHECKED :	FRASER LUCAS

APPROVED FOR AND ON BEHALF OF
BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365

RPEQ No. :

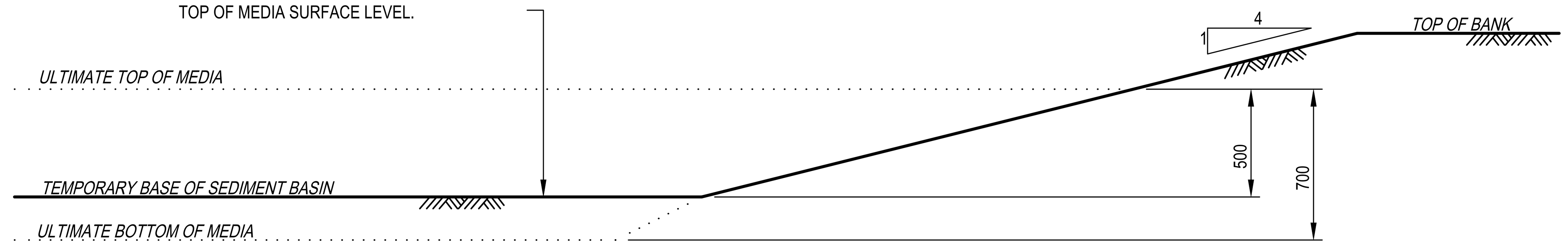
SCALE : AS NOTED	DATUM : AHD	FULL SIZE : A1
PROJECT No.: BE230128-00	DRAWING No. : SK305	VERSION: B

PRELIMINARY
NOT FOR CONSTRUCTION OR TENDER



TYPICAL BIO-RETENTION MEDIA CROSS SECTION

SCALE 0.1 0 0.1 0.2 0.3 0.4 0.5 (metres)
1 : 10 (FULL SIZE)



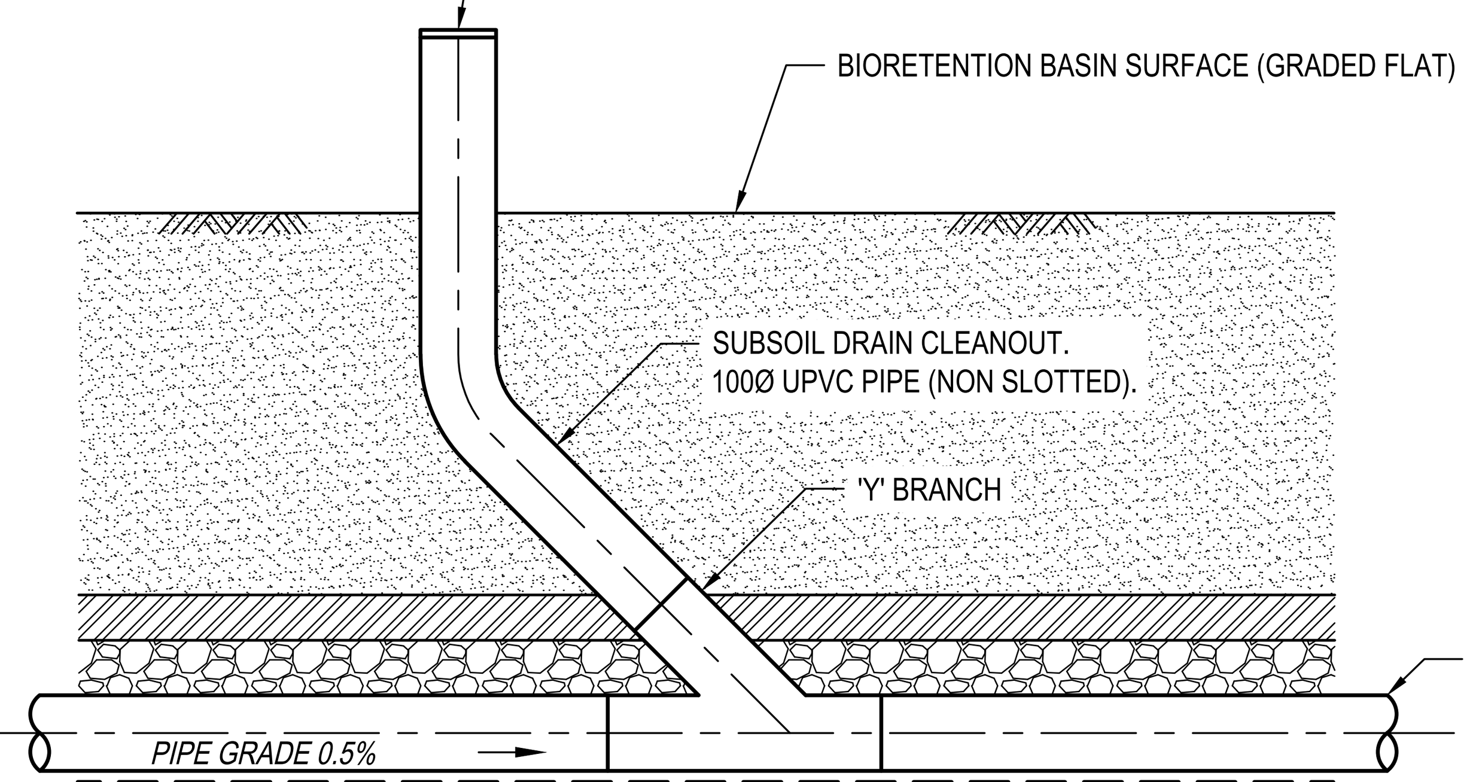
CONSTRUCTION PHASE 1 - CIVIL CONSTRUCTION PHASE

(TEMPORARY SEDIMENT CONTROL BASIN)

SCALE 0.2 0 0.2 0.4 0.6 0.8 1.0 (metres)
1 : 20 (FULL SIZE)

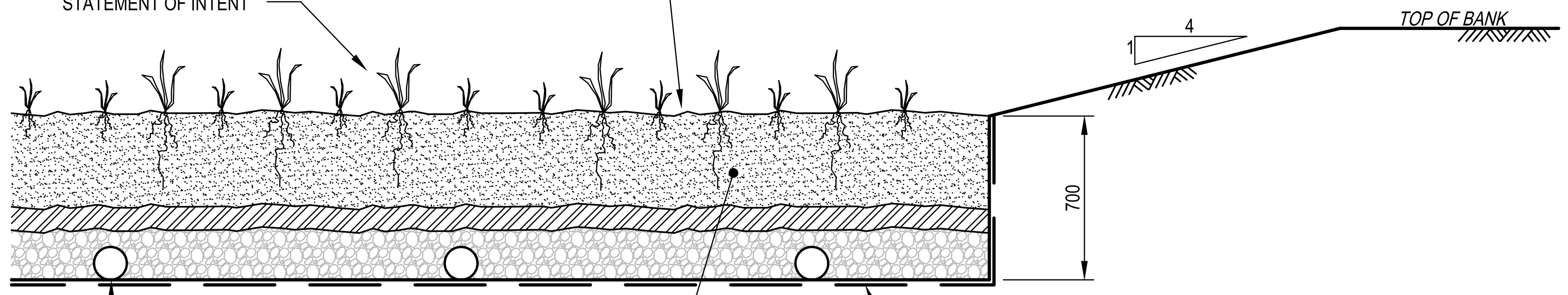
PHASE 1 NOTES - CIVIL CONSTRUCTION PHASE

- EXCAVATE BASIN TO NOMINAL 500mm DEPTH BELOW ULTIMATE TOP OF MEDIA LEVEL.
- SHAPE TEMPORARY SEDIMENT BASIN TO GENERAL EXTENTS OF ULTIMATE BASIN AND TO BASE LEVEL AS SHOWN ADJACENT AND ENSURE MINIMUM TOTAL SETTLING AND STORAGE VOLUME.
- CONTRACTOR TO MAINTAIN SEDIMENT BASIN AND PUMP-OUT AFTER RAINFALL EVENTS, INCLUDING MANUAL FLOCCULATION.



TYPICAL BIO-RETENTION BASIN SUBSOIL DRAIN CLEANOUT

NTS



CONSTRUCTION PHASE 2 - OPERATIONAL PHASE

(ULTIMATE BIO-RETENTION BASIN)

SCALE 0.2 0 0.2 0.4 0.6 0.8 1.0 (metres)
1 : 20 (FULL SIZE)

PHASE 2 NOTES - OPERATIONAL PHASE

- UPON COMPLETION OF 80-90% OF BUILDING WORKS IN THE CONTRIBUTING CATCHMENT AREA, REMOVE THE PROTECTIVE LAYERS (TURFING, TOPSOIL AND GEOTEXTILE).
- EXTEND BIO FILTER MEDIA TO ULTIMATE SURFACE LEVEL.
- ESTABLISH VEGETATION IN THE BIO-RETENTION BASIN IN ACCORDANCE WITH LANDSCAPE ARCHITECTS SPECIFICATION.

PRELIMINARY
NOT FOR CONSTRUCTION OR TENDER

PROPOSED LAND DEVELOPMENT

2983 FOREST HILL FERNVALE RD, LOWOOD QLD 4311

FOR
LOWOOD ONE PTY LTD

A1 ORIGINAL SIZE BEFORE REDUCTION

VER.	DESCRIPTION	DATE
B	COUNCIL RFI UPDATES	24.04.24
A	PRELIMINARY CIVIL ENGINEERING DESIGN	10.04.24

NOTE
This is an uncontrolled document issued for information purposes only, unless the checked sections are signed or completed.
Figured dimensions take precedence over scale. Do not scale reduced size drawings.
Verify dimensions prior to commencing any on-site or off-site works or fabrication.

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

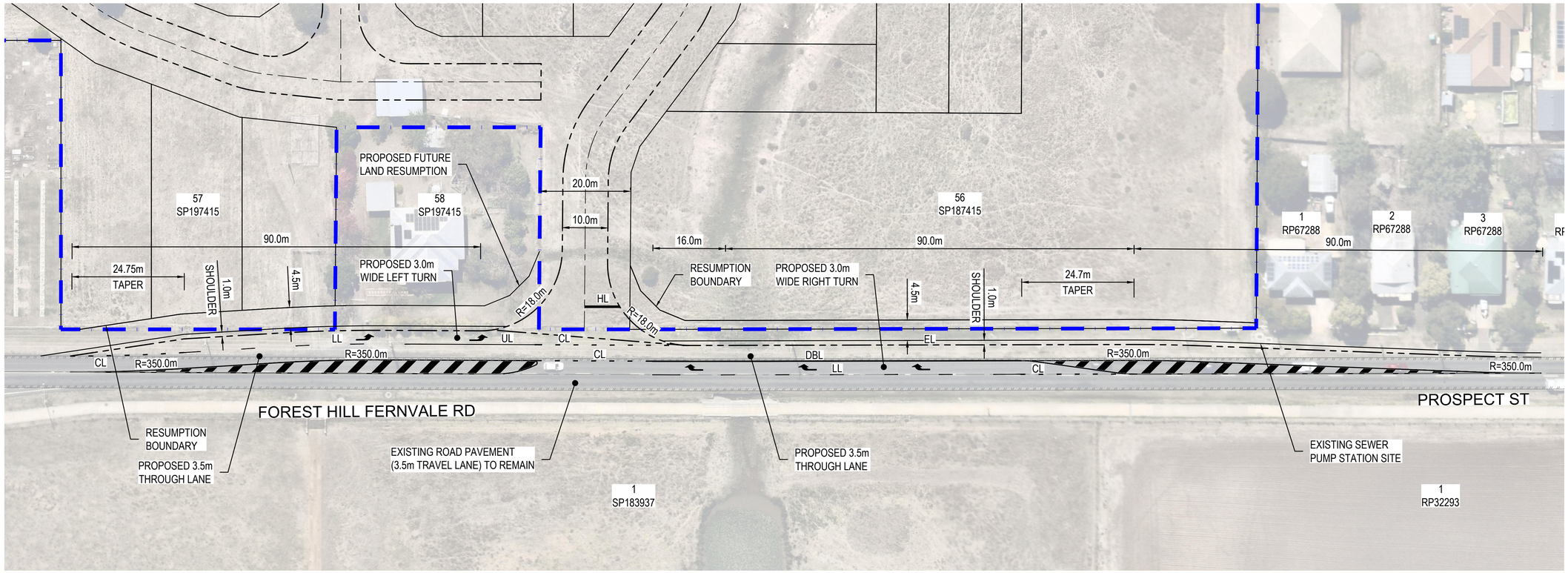
PROJECT:
CONCEPT ENGINEERING DRAWINGS

DRAWING TITLE :
TYPICAL BIO BASIN DETAILS

DEVEL. APPLIC. No. : - DATE : 24.04.24
PROJECT LEADER : JONATHAN CUELL
DESIGNER : TG
DRAFTSPERSON : CD
CHECKED : FRASER LUCAS

APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365
RPEQ No. :

SCALE : AS NOTED	DATUM : AHD	FULL SIZE : A1
PROJECT No.: BE230128-00	DRAWING No. : SK310	VERSION: B



LEGEND

- DEVELOPMENT SITE BOUNDARY
- PROPOSED LOT BOUNDARY
- PROPOSED ROAD CONTROL LINE
- W — EXISTING Ø150 WATER MAIN
- RM — EXISTING SEWER RISING MAIN
- S — EXISTING SEWER MAIN
- C — EXISTING COMMS
- OH — EXISTING OVERHEAD ELECTRIC
- EXISTING FLOWPATH / WATERWAY

INTERSECTION FUNCTIONAL PLAN

SCALE 5 0 5 10 15 20 25 (metres)
1 : 500 (FULL SIZE)

PRELIMINARY
NOT FOR CONSTRUCTION OR TENDER

PROPOSED LAND DEVELOPMENT

2983 FOREST HILL FERNVALE RD, LOWOOD QLD 4311

FOR LOWOOD ONE PTY LTD

A1 ORIGINAL SIZE BEFORE REDUCTION

VER.	DESCRIPTION	DATE
B	COUNCIL RFI UPDATES	24.04.24
A	PRELIMINARY CIVIL ENGINEERING DESIGN	10.04.24

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

PROJECT:
CONCEPT ENGINEERING DRAWINGS

DRAWING TITLE :
INTERSECTION FUNCTIONAL PLAN

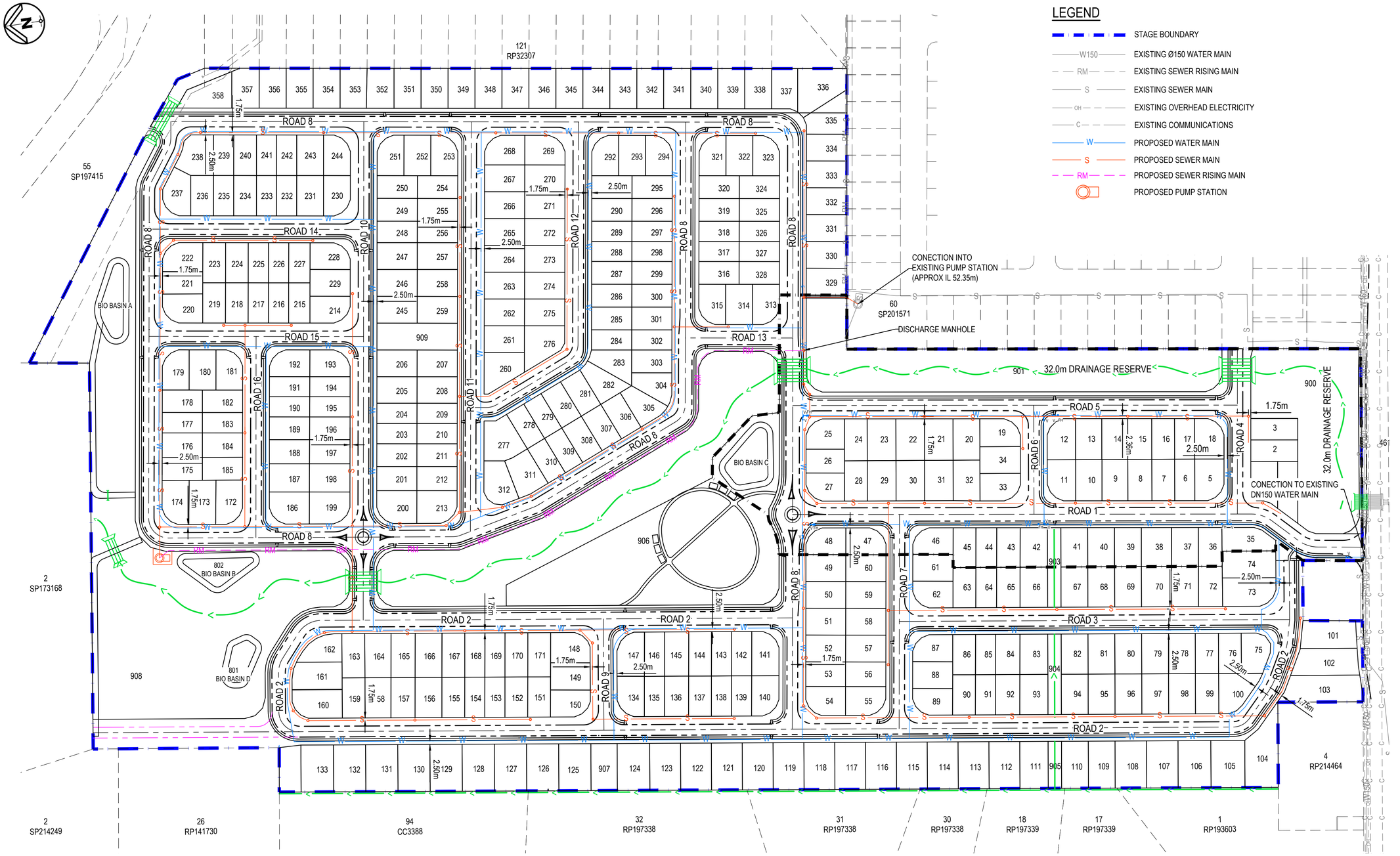
DEVEL. APPLIC. No. : -	DATE : 24.04.24
PROJECT LEADER : JONATHAN CUELL	
DESIGNER : TG	
DRAFTSPERSON : CD	
CHECKED : FRASER LUCAS	

APPROVED FOR AND ON BEHALF OF
BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365

RPEQ No. :

SCALE : AS NOTED	DATUM : AHD	FULL SIZE : A1
PROJECT No.: BE230128-00	DRAWING No. : SK320	VERSION: B

FILENAME: C:\Users\Tu Ngoc Nguyen\OT Vietnam Ltd Co\BCH23 - Documents\BCH23\00 BE230128 2983 Forest Hill Fernvale Rd\03 Civil\01 DWGs\ Ac\01 Master DWG\SK320-INTERSECTION FUNCTIONAL PLAN.dwg
PLOTTED: 25.04.2024 at 15:48



CONCEPT WATER AND SEWER LAYOUT PLAN

SCALE 15 0 15 30 45 60 75 (metres)
1 : 1500 (FULL SIZE)

PRELIMINARY
NOT FOR CONSTRUCTION OR TENDER

PROPOSED LAND DEVELOPMENT

2983 FOREST HILL FERNVALE RD, LOWOOD QLD 4311

FOR LOWOOD ONE PTY LTD

A1 ORIGINAL SIZE BEFORE REDUCTION

VER.	DESCRIPTION	DATE
B	COUNCIL RFI UPDATES	24.04.24
A	PRELIMINARY CIVIL ENGINEERING DESIGN	10.04.24

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

PROJECT:
CONCEPT ENGINEERING DRAWINGS

DRAWING TITLE :
CONCEPT WATER AND SEWER LAYOUT PLAN

DEVEL. APPLIC. No. :	-
DATE :	24.04.24
PROJECT LEADER :	JONATHAN CUELL
DESIGNER :	TG
DRAFTSPERSON :	CD
CHECKED :	FRASER LUCAS

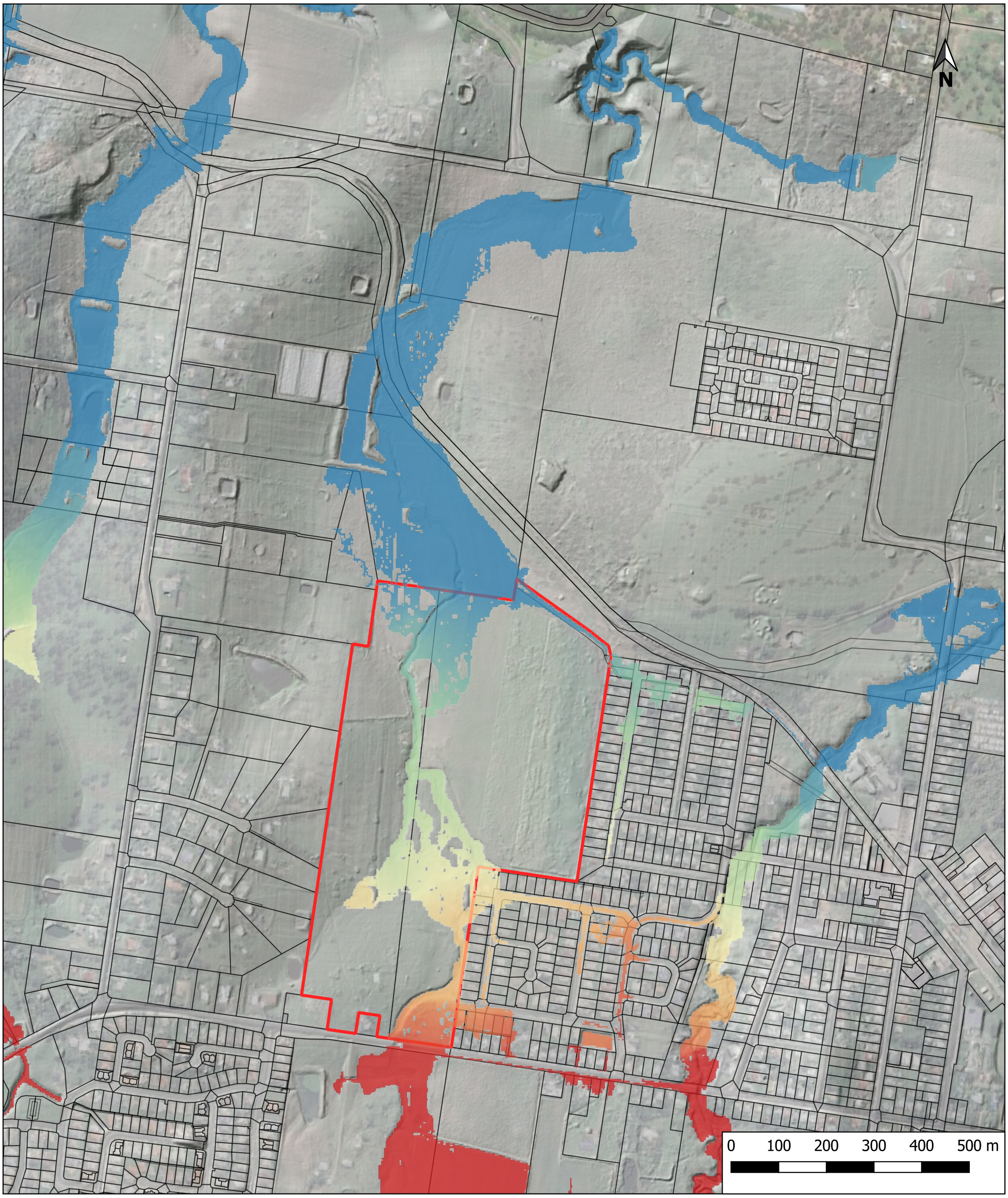
APPROVED FOR AND ON BEHALF OF
BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365

RPEQ No. :

SCALE : AS NOTED	DATUM : AHD	FULL SIZE : A1
PROJECT No.: BE230128-00	DRAWING No. : SK500	VERSION: B

FILENAME C:\Users\TJ.Nguyen\OT Vietnam Ltd Co\BCHK2\3. Documents\BCHK2300\BE230128 2983 Forest Hill Fernvale Rd\03. CAD\Rev A\02. Auto\01. Master CAD\SK500-CONCEPT WATER AND SEWER LAYOUT PLAN.dwg
PLOTTED: 25.04.2024 at 15:48

Appendix E – Flood Modelling Results



2983 Forest Hill Fernvale Road, Lowood Masterplan Layout Review and Development

1% AEP Peak Flood Level

PRE DEVELOPMENT

Project: BE230128	Date: 18/04/2024
Scale: 1:7,500 at A3	Projection: GDA94/MGA zone 56
Data Sources:	

Legend

- Cadastral
- Site Boundary

Flood Level (mAHD)

60

50

BURCHILLS ENGINEERING SOLUTIONS

FOR

Europagroup

N

0 100 200 300 400 500 m

2983 Forest Hill Fernvale Road, Lowood Masterplan Layout Review and Development

2% AEP Peak Flood Level

PRE DEVELOPMENT

Project: BE230128	Date: 18/04/2024
Scale: 1:7,500 at A3	Projection: GDA94/MGA zone 56
Data Sources:	

Legend

- Cadastral
- Site Boundary

Flood Level (mAHD)

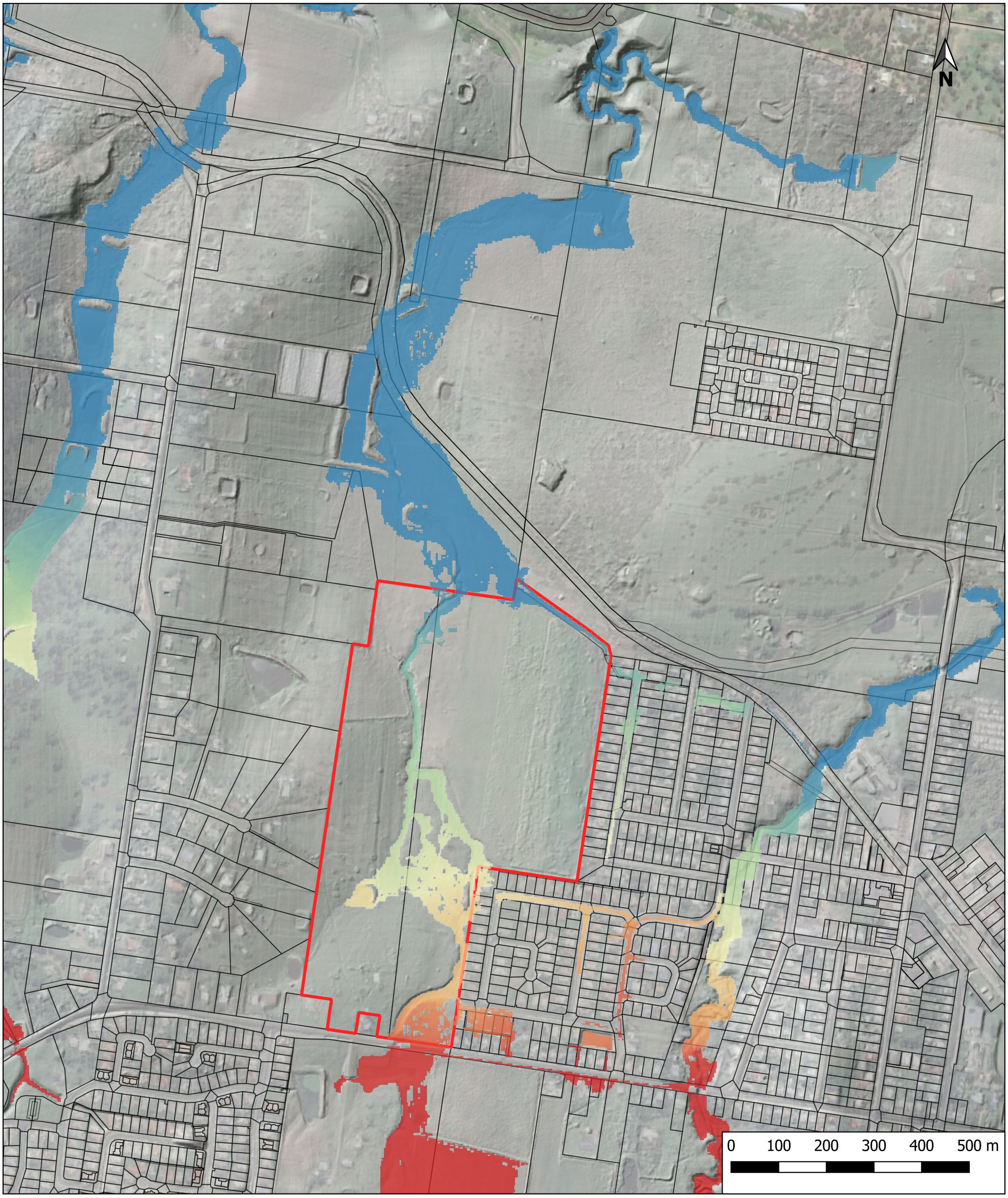
60

50

BURCHILLS ENGINEERING SOLUTIONS

FOR

Europagroup



2983 Forest Hill Fernvale Road, Lowood Masterplan Layout Review and Development

5% AEP Peak Flood Level

PRE DEVELOPMENT

Project: BE230128	Date: 18/04/2024
Scale: 1:7,500 at A3	Projection: GDA94/MGA zone 56
Data Sources:	

Legend

- Cadastral
- Site Boundary

Flood Level (mAHD)

60

50

BURCHILLS ENGINEERING SOLUTIONS

FOR

Europagroup

N

0 100 200 300 400 500 m

2983 Forest Hill Fernvale Road, Lowood Masterplan Layout Review and Development

10% AEP Peak Flood Level

PRE DEVELOPMENT

Project: BE230128	Date: 18/04/2024
Scale: 1:7,500 at A3	Projection: GDA94/MGA zone 56
Data Sources:	

Legend

- Cadastral
- Site Boundary

Flood Level (mAHD)

60

50

BURCHILLS ENGINEERING SOLUTIONS

FOR

Europagroup

N

0 100 200 300 400 500 m

2983 Forest Hill Fernvale Road, Lowood Masterplan Layout Review and Development

18% AEP Peak Flood Level

PRE DEVELOPMENT

Project: BE230128	Date: 18/04/2024
Scale: 1:7,500 at A3	Projection: GDA94/MGA zone 56
Data Sources:	

Legend

- Cadastral
- Site Boundary
- Flood Level (mAHD): 60 – 50

BURCHILLS ENGINEERING SOLUTIONS

FOR

Europagroup

2983 Forest Hill Fernvale Road, Lowood Masterplan Layout Review and Development

39% AEP Peak Flood Level

PRE DEVELOPMENT

Project: BE230128	Date: 18/04/2024
Scale: 1:7,500 at A3	Projection: GDA94/MGA zone 56
Data Sources:	

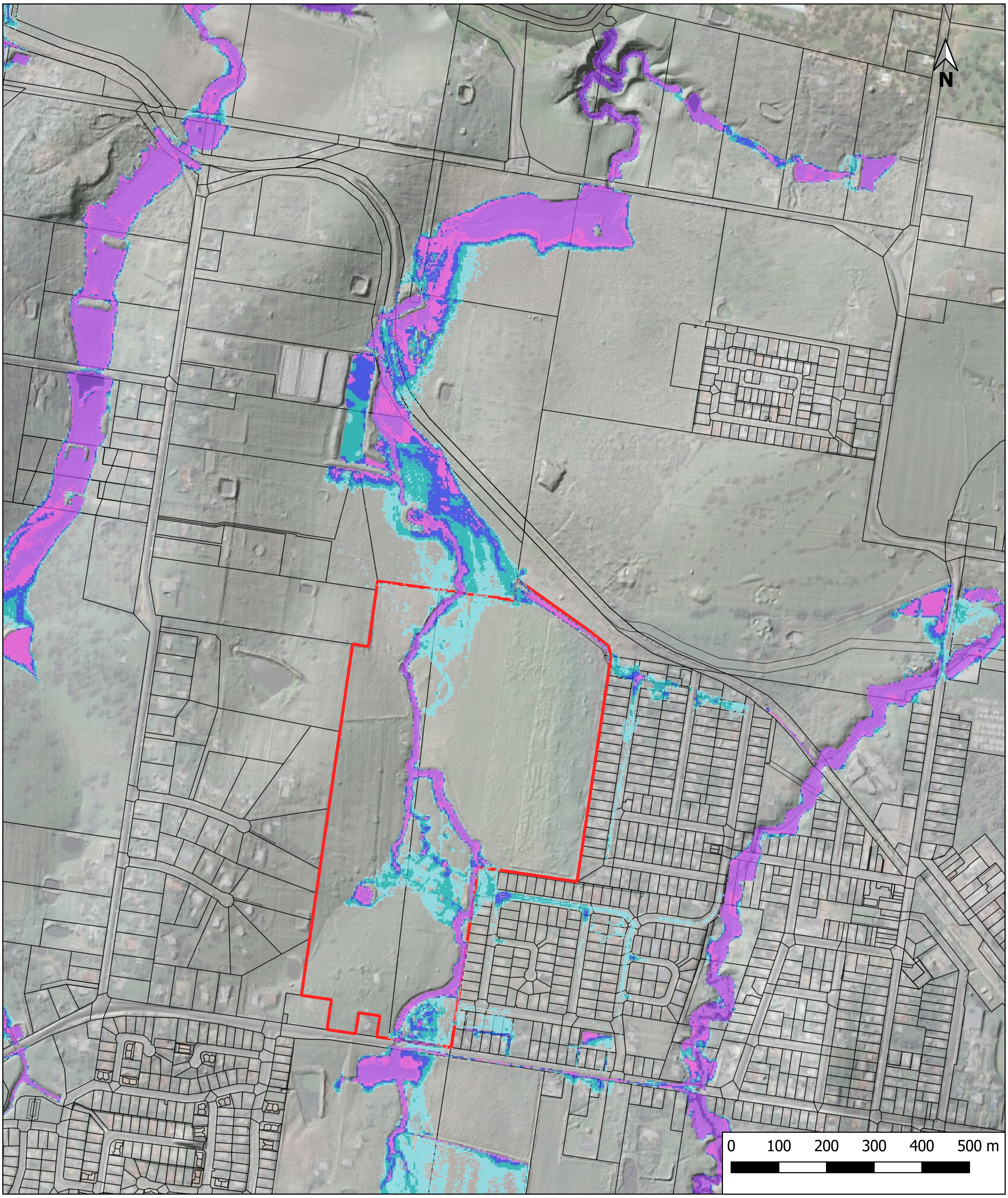
Legend

- Cadastral
- Site Boundary
- Flood Level (mAHD): 60 – 50

BURCHILLS ENGINEERING SOLUTIONS

FOR

Europagroup



2983 Forest Hill Fernvale Road, Lowood Masterplan Layout Review and Development

1% AEP Peak Flood Depth

PRE DEVELOPMENT

Project: BE230128	Date: 18/04/2024
Scale: 1:7,500 at A3	Projection: GDA94/MGA zone 56

Data Sources:

Legend

Cadastral

Site Boundary

Flood Depth (m)

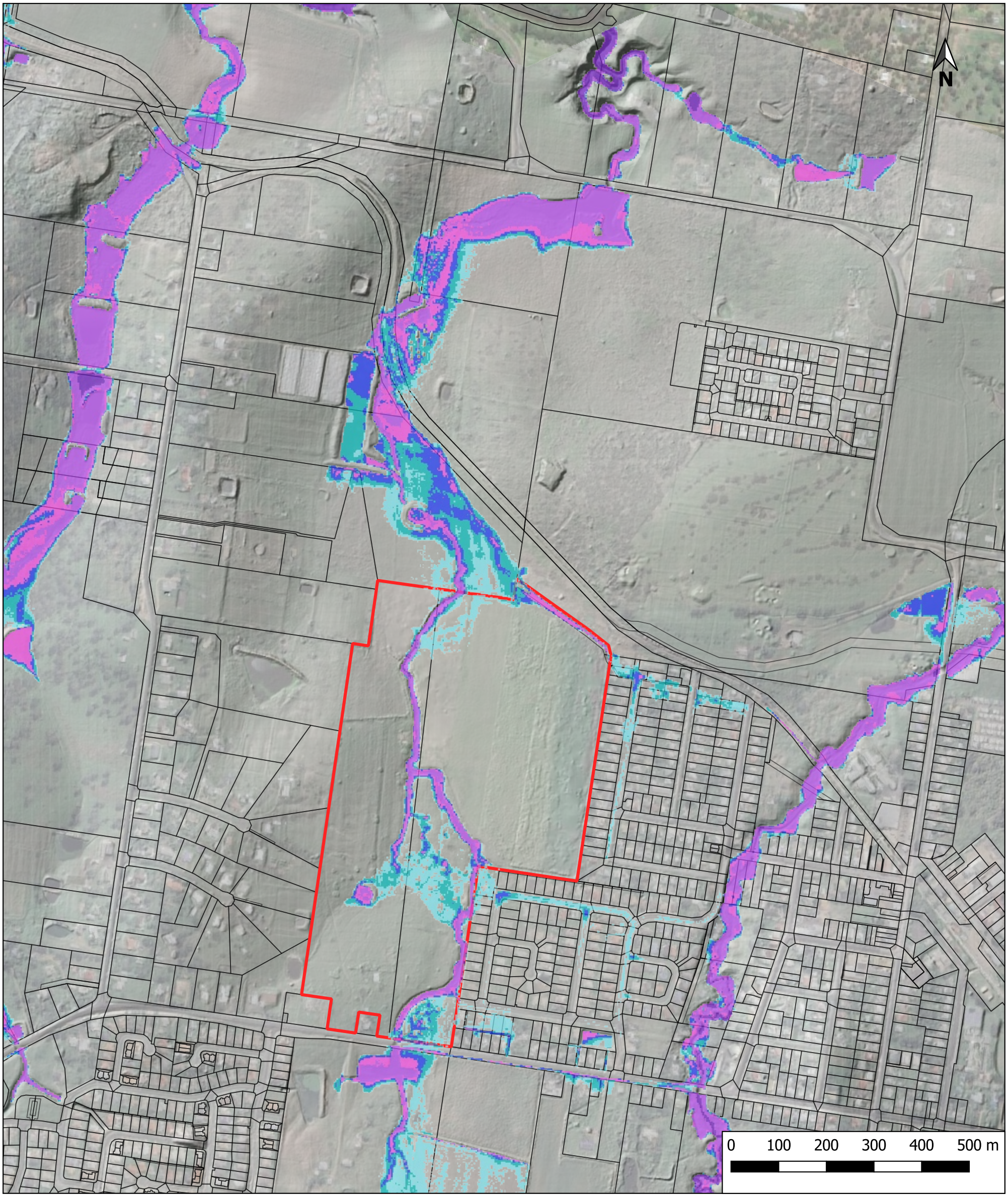
- <= 0.02
- 0.02 - 0.10
- 0.10 - 0.20
- 0.20 - 0.30
- 0.30 - 0.50
- 0.50 - 1.50
- \> 1.50

BURCHILLS ENGINEERING SOLUTIONS

FOR

Europagroup

DISCLAIMER: This figure and its contents are electronically generated, are confidential and may only be used for the purpose for which they were intended. Burchills Engineering Solutions will not accept responsibility for any consequences arising from the use of the figure for other than its intended purpose or where the drawing has been altered, amended or changed either manually or electronically by any third party. Some or all of the data presented on this plan may have been digitised or sourced from third parties, and as such may contain spatial innaccuracies.



2983 Forest Hill Fernvale Road, Lowood Masterplan Layout Review and Development

2% AEP Peak Flood Depth

PRE DEVELOPMENT

Project: BE230128	Date: 18/04/2024
Scale: 1:7,500 at A3	Projection: GDA94/MGA zone 56
Data Sources:	

Legend

- Cadastral
- Site Boundary

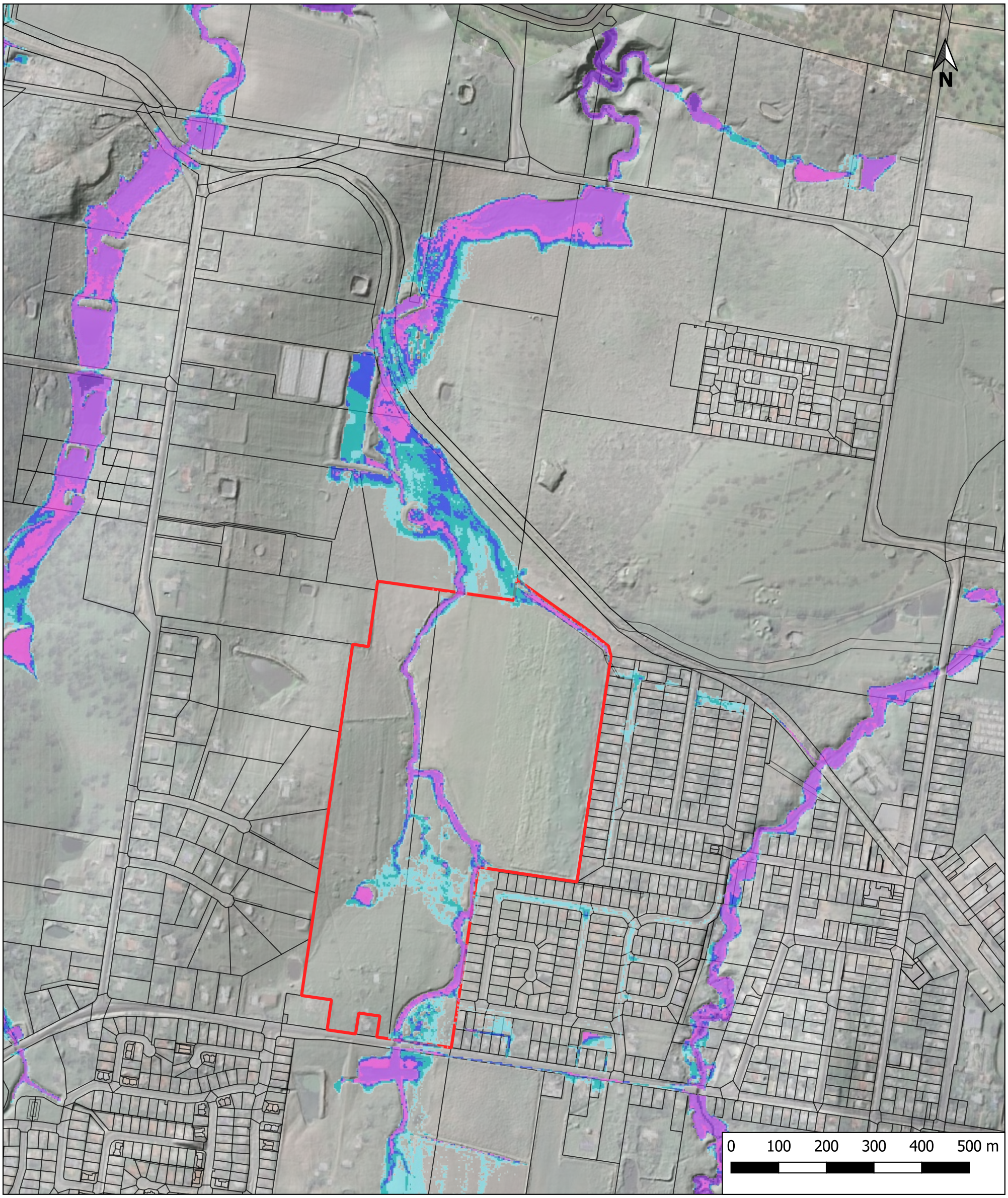
Flood Depth (m)

- <= 0.02
- 0.02 - 0.10
- 0.10 - 0.20
- 0.20 - 0.30
- 0.30 - 0.50
- 0.50 - 1.50
- > 1.50

BURCHILLS ENGINEERING SOLUTIONS

FOR

Europagroup



2983 Forest Hill Fernvale Road, Lowood Masterplan Layout Review and Development

5% AEP Peak Flood Depth

PRE DEVELOPMENT

Project: BE230128	Date: 18/04/2024
Scale: 1:7,500 at A3	Projection: GDA94/MGA zone 56
Data Sources:	

Legend

- Cadastral
- Site Boundary

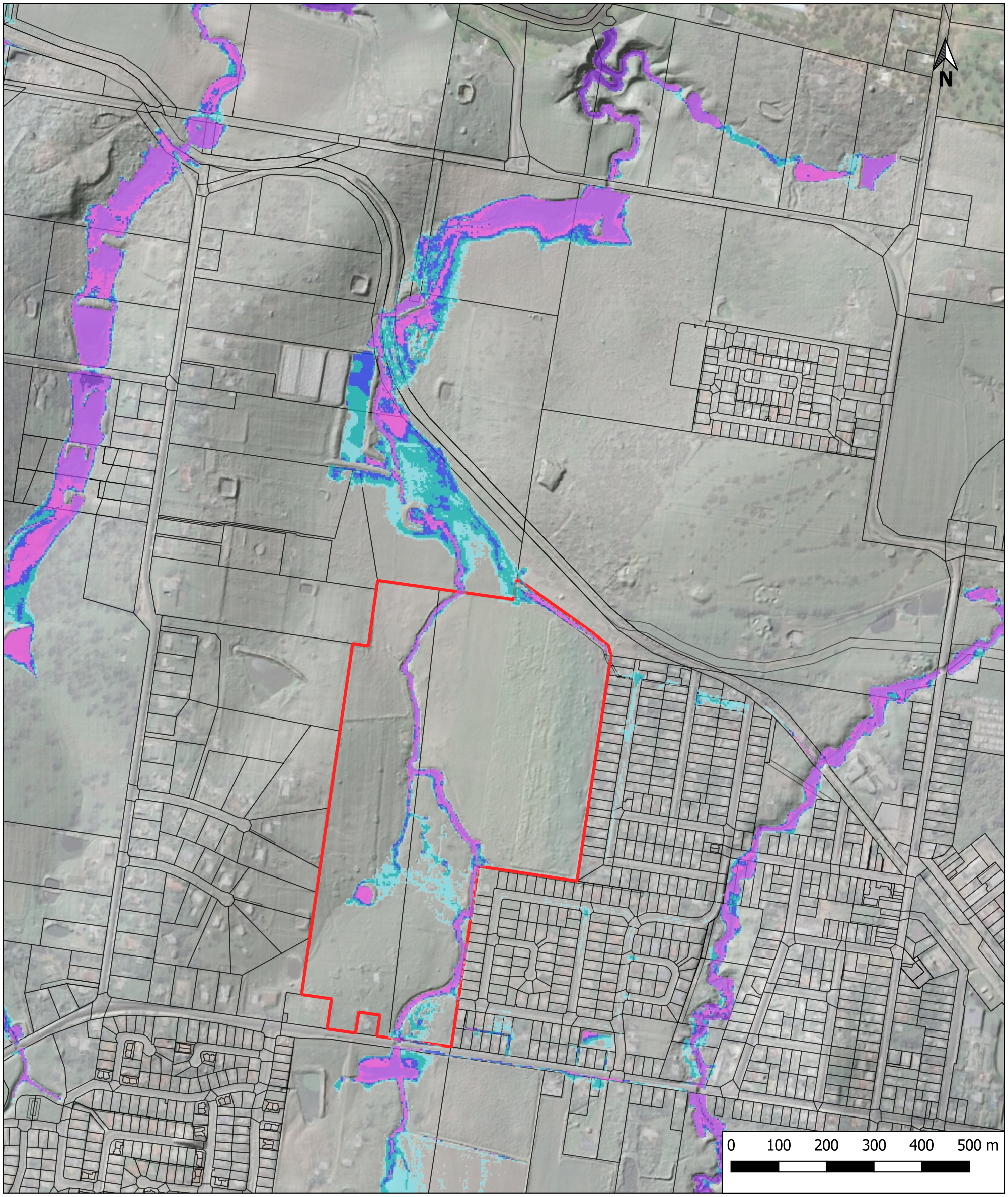
Flood Depth (m)

- <= 0.02
- 0.02 - 0.10
- 0.10 - 0.20
- 0.20 - 0.30
- 0.30 - 0.50
- 0.50 - 1.50
- > 1.50

BURCHILLS ENGINEERING SOLUTIONS

FOR

Europagroup



2983 Forest Hill Fernvale Road, Lowood Masterplan Layout Review and Development

10% AEP Peak Flood Depth

PRE DEVELOPMENT

Project: BE230128	Date: 18/04/2024
Scale: 1:7,500 at A3	Projection: GDA94/MGA zone 56
Data Sources:	

Legend

- Cadastral
- Site Boundary

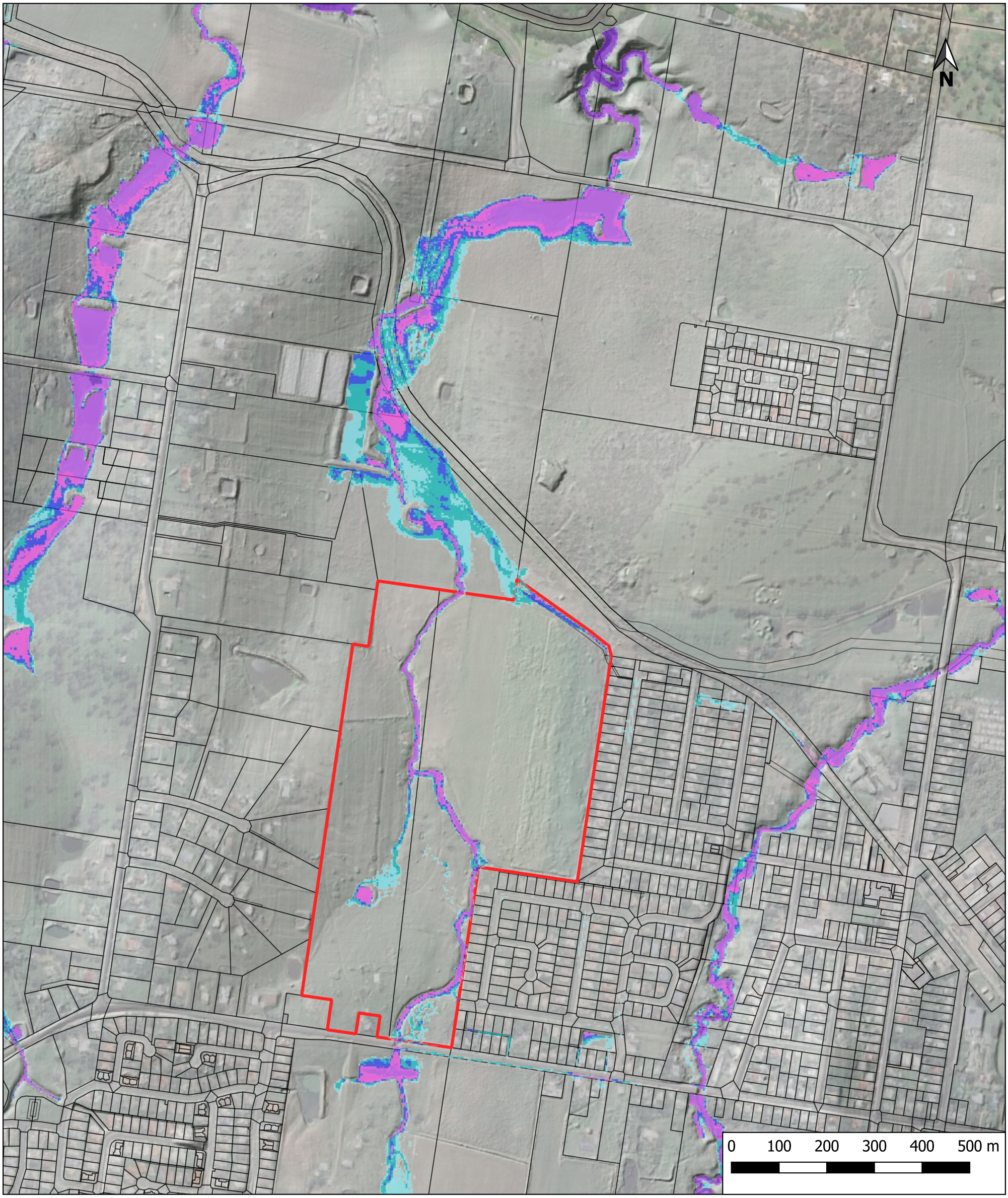
Flood Depth (m)

- <= 0.02
- 0.02 - 0.10
- 0.10 - 0.20
- 0.20 - 0.30
- 0.30 - 0.50
- 0.50 - 1.50
- > 1.50

BURCHILLS ENGINEERING SOLUTIONS

FOR

Europagroup



2983 Forest Hill Fernvale Road, Lowood Masterplan Layout Review and Development

18% AEP Peak Flood Depth

PRE DEVELOPMENT

Project: BE230128	Date: 18/04/2024
Scale: 1:7,500 at A3	Projection: GDA94/MGA zone 56
Data Sources:	

Legend

- Cadastral
- Site Boundary

Flood Depth (m)

- <= 0.02
- 0.02 - 0.10
- 0.10 - 0.20
- 0.20 - 0.30
- 0.30 - 0.50
- 0.50 - 1.50
- > 1.50

BURCHILLS ENGINEERING SOLUTIONS

FOR

Europagroup